

## ARTICLE 15 OPERATION AND MAINTENANCE

### 15.1 O&M obligations of the Concessionaire

15.1.1 With effect from “*O&M Handover Date* and thereafter during the remaining Concession Period, the Concessionaire shall operate and maintain the Project Highway in accordance with this Agreement either by itself, or through the O&M Contractor and if required, modify, repair or otherwise make improvements to the Project Highway to comply with the provisions of this Agreement, Applicable Laws and Applicable Permits, and conform to Specifications and Standards and Good Industry Practice. The obligations of the Concessionaire hereunder shall include:

- (a) permitting safe, smooth and uninterrupted flow of traffic on the Project Highway during normal operating conditions;
- (b) collecting and appropriating the Fee;
- (c) minimising disruption to traffic in the event of accidents or other incidents affecting the safety and use of the Project Highway by providing a rapid and effective response and maintaining liaison with emergency services of the State;
- (d) carrying out periodic preventive maintenance of the Project Highway;
- (e) undertaking routine maintenance including prompt repairs of potholes, cracks, joints, drains, embankments, structures, pavement markings, lighting, road signs and other traffic control devices;
- (f) undertaking major maintenance such as resurfacing of pavements, repairs to structures, and repairs and refurbishment of tolling system and other equipment;
- (g) preventing, with the assistance of concerned law enforcement agencies, any unauthorised use of the Project Highway;
- (h) preventing, with the assistance of the concerned law enforcement agencies, any encroachments on the Project Highway;
- (i) protection of the environment and provision of equipment and materials therefore;
- (j) operation and maintenance of all communication, control and administrative systems necessary for the efficient operation of the Project Highway;
- (k) maintaining a public relations unit to interface with and attend to suggestions from the Users, government agencies, media and other agencies; and
- (l) complying with Safety Requirements in accordance with Article 18.

15.1.2 The Concessionaire shall remove promptly from the Project Highway all surplus machinery and materials, waste materials (including hazardous materials and waste water), rubbish and other debris (including, without limitation, accident debris) and keep the Project Highway in a clean, tidy and orderly condition, and in conformity with the Applicable Laws, Applicable Permits and Good Industry Practice.

15.1.3 The Concessionaire shall maintain, in conformity with Good Industry Practice, all stretches of approach roads, over-passes, under-passes or other structures situated on the Site but not forming part of the carriageway.

## 15.2 Maintenance Requirements

The Concessionaire shall procure that at all times during the Concession Period, the Project Highway conforms to the maintenance requirements set forth in Schedule-F (the “**Maintenance Requirements**”).

## 15.3 Maintenance Manual

15.3.1 Prior to the O&M Handover Date the Concessionaire shall, in consultation with the Independent Engineer, evolve a repair and maintenance manual (the “**Maintenance Manual**”) for the regular and preventive maintenance of the Project Highway in conformity with the Specifications and Standards, Maintenance Requirements, Safety Requirements and Good Industry Practice, and shall provide 5 (five) copies thereof to the Authority and 2 (two) copies to the Independent Engineer. The Maintenance Manual shall be revised and updated once every 3 (three) years and the provisions of this Clause 15.3 shall apply, *mutatis mutandis*, to such revision.

15.3.2 Without prejudice to the provision of Clause 15.3.1, the Maintenance Manual shall, in particular, include provisions for maintenance of the Project Assets and shall provide for life cycle maintenance, routine maintenance and reactive maintenance which may be reasonably necessary for maintenance and repair of the Project Asset, including replacement thereof, such that their overall condition conforms to Good Industry Practice.

## 15.4 Maintenance Programme

On or before O&M Handover Date and no later than 45 (forty five) days prior to the beginning of each Accounting Year during the Concession Period, as the case may be, the Concessionaire shall provide to the Authority and the Independent Engineer, its proposed annual programme of preventive, urgent and other scheduled maintenance (the “**Maintenance Programme**”) to comply with the Maintenance Requirements, Maintenance Manual and Safety Requirements. Such Maintenance Programme shall include:

- (a) preventive maintenance schedule;
- (b) arrangements and procedures for carrying out urgent repairs;
- (c) criteria to be adopted for deciding maintenance needs;
- (d) intervals and procedures for carrying out inspection of all elements of the Project Highway;
- (e) intervals at which the Concessionaire shall carry out periodic maintenance;
- (f) arrangements and procedures for carrying out safety related measures; and
- (g) intervals for major maintenance works and the scope thereof.

15.4.2 Within 15 (fifteen) days of receipt of the Maintenance Programme, the Independent Engineer shall review the same and convey its comments to the Concessionaire with particular reference to its conformity with the Maintenance Requirements, Maintenance Manual and Safety Requirements.

15.4.3 The Concessionaire may modify the Maintenance Programme as may be reasonable in the circumstances, and the procedure specified in Clause 15.4.1 and 15.4.2 shall apply *mutatis mutandis* to such modifications.

## **15.5 Safety, vehicle breakdowns and accidents**

15.5.1 The Concessionaire shall ensure safe conditions for the Users, and in the event of unsafe conditions, lane closures, diversions, vehicle breakdowns and accidents, it shall follow the relevant operating procedures including the setting up of temporary traffic cones and lights, and removal of obstruction and debris without delay. Such procedures shall conform to the provisions of this Agreement, Applicable Laws, Applicable Permits and Good Industry Practice.

15.5.2 The Concessionaire's responsibility for rescue operations on the Project Highway shall be limited to an initial response to any particular incident until such time that the competent authority takes charge and shall include prompt removal of vehicles or debris or any other obstruction, which may endanger or interrupt the smooth flow of traffic. For this purpose, it shall maintain and operate a round-the-clock vehicle rescue post with one mobile crane having the capacity to lift a truck with a Gross Vehicle Weight of 30,000 (thirty thousand) kilograms.

## **15.6 De-commissioning due to Emergency**

15.6.1 If, in the reasonable opinion of the Concessionaire, there exists an Emergency which warrants de-commissioning and closure to traffic of the whole or any part of the Project Highway, the Concessionaire shall be entitled to de-commission and close the whole or any part of the Project Highway to traffic for so long as such Emergency and the consequences thereof warrant; provided that such de-commissioning and particulars thereof shall be notified by the Concessionaire to the Authority without any delay, and the Concessionaire shall diligently carry out and abide by any reasonable directions that the Authority may give for dealing with such Emergency.

15.6.2 The Concessionaire shall re-commission the Project Highway or the affected part thereof as quickly as practicable after the circumstances leading to its de-commissioning and closure have ceased to exist or have so abated as to enable the Concessionaire to re-commission the Project Highway and shall notify the Authority of the same without any delay.

15.6.3 Any decommissioning or closure of any part of the Project Highway and the re-commissioning thereof shall, as soon as practicable, be brought to the notice of affected persons by means of public announcements/notice.

## **15.7 Lane closure**

15.7.1 The Concessionaire shall not close any lane of the Project Highway for undertaking maintenance or repair works except with the prior written approval of the Independent Engineer. Such approval shall be sought by the Concessionaire through a written request to be made to the Independent Engineer, and a copy thereof furnished to the Authority, at least 7 (seven) days before the proposed closure of such lane and shall be accompanied by particulars thereof. Within 3 (three) days of receiving such request, the Independent Engineer shall grant permission with such modifications as it may deem necessary and a copy of such permission shall be sent to the Authority.

15.7.2 The provisions of Clause 15.7.1 shall not apply to de-commissioning under Clause 15.6.1 or to closure of any lane for a period not exceeding 2 (two) hours in a day at any time of the day and 6 (six) hours in a day at a time specified by the Independent Engineer as off-peak hours when

the flow of traffic is comparatively lower.

- 15.7.3 Upon receiving the permission pursuant to Clause 15.7.1, the Concessionaire shall be entitled to close the designated lane for the period specified therein, and in the event of any delay in re-opening such lane, the Concessionaire shall pay Damages to the Authority calculated at the rate of 0.1% (zero point one per cent) of the Performance Security for every stretch of 500 (five hundred) metres or part thereof for each day of delay until the lane has been re-opened for traffic, and in the event of non-payment of such delinquent amount forthwith and in any case within 7 (seven) days of issue of written notice by Authority, the same shall be recovered by encashment of the Performance Security in which case the provisions of Clause 9 hereof shall apply. For the avoidance of doubt, the Damages under this Clause 15.7.3 shall not apply to any Capacity Augmentation undertaken by the Concessionaire pursuant to Article 14 hereunder.

## **15.8 Damages for breach of O&M obligations**

- 15.8.1 In the event that the Concessionaire fails to repair or rectify any defect or deficiency set forth in the Maintenance Requirements within the period specified therein or is in breach of the Maintenance Programme, Maintenance Manual and/or Safety Requirements, it shall be deemed to be in breach of this Agreement and the Authority shall be entitled to recover Damages, to be calculated and paid for each day of delay until the breach is cured, at the higher of (a) 0.5% (zero point five per cent) of Performance Security, and (b) 0.1% (zero point one per cent) of the cost of such repair or rectification as estimated by the Independent Engineer. Recovery of such Damages shall be without prejudice to the rights of the Authority under this Agreement, including the right of Termination thereof, and in the event of non-payment by Concessionaire of such delinquent amount forthwith and in any case within seven days of issue of written notice by Authority, the same shall be recovered by encashment of Performance Security in which case the provisions of clause 9 hereof shall apply.
- 15.8.2 The Damages set forth in Clause 15.8.1 may be assessed and specified forthwith by the Independent Engineer; provided that the Authority may, in its discretion, demand a smaller sum as Damages, if in its opinion, the breach has been cured promptly and the Concessionaire is otherwise in compliance with its obligations hereunder. The Concessionaire shall pay such Damages forthwith.
- 15.8.3 The aggregate liability of the Concessionaire in any Accounting Year, under or in connection with the Agreement, shall not exceed the quantum of the Performance Security.

## **15.9 Authority's right to take remedial measures**

- 15.9.1 In the event the Concessionaire does not maintain and/or repair the Project Highway or any part thereof in conformity with the Maintenance Requirements, the Maintenance Manual or the Maintenance Programme or Safety Requirements, as the case may be, and fails to commence remedial works within 15 (fifteen) days of receipt of the O&M Inspection Report or a notice in this behalf from the Authority or the Independent Engineer, as the case may be, the Authority shall, without prejudice to its rights under this Agreement including Termination thereof, be entitled to undertake such remedial measures at the risk and cost of the Concessionaire, and to recover its cost from the Concessionaire. In addition to recovery of the aforesaid cost, a sum equal to 50% (fifty per cent) of such cost shall be paid by the Concessionaire to the Authority as Damages. For the avoidance of doubt, the right of the Authority under this Clause 15.9.1 shall be without prejudice to its rights and remedies provided under Clause 15.8.
- 15.9.2 In the event of non-payment by Concessionaire of such delinquent amount forthwith and in any case within seven days of issue of written notice by Authority the Authority shall have the right and the Concessionaire hereby expressly grants to the Authority the right to recover the costs and Damages specified in Clause 15.9.1 directly from the Escrow Account, and for that

purpose, the Concessionaire hereby agrees to give irrevocable instructions to the Escrow Bank to make payment from the Escrow Account in accordance with the instructions of the Authority under this Clause 15.9.2.

#### **15.10 Overriding powers of the Authority**

15.10.1 If in the reasonable opinion of the Authority, the Concessionaire is in material breach of its obligations under this Agreement and, in particular, the Maintenance Requirements, and such breach is causing or likely to cause material hardship or danger to the Users, the Authority may, without prejudice to any of its rights under this Agreement including Termination thereof, by notice require the Concessionaire to take reasonable measures immediately for rectifying or removing such hardship or danger, as the case may be.

15.10.2 In the event that the Concessionaire, upon notice under Clause 15.10.1, fails to rectify or remove any hardship or danger within a reasonable period, the Authority may exercise overriding powers under this Clause 15.10.2 and take over the performance of any or all the obligations of the Concessionaire to the extent deemed necessary by it for rectifying or removing such hardship or danger; provided that the exercise of such overriding powers by the Authority shall be of no greater scope and of no longer duration than is reasonably required hereunder; provided further that any costs and expenses incurred by the Authority in discharge of its obligations hereunder shall be recovered from the Concessionaire in accordance with the provisions of Clause 15.9 along with the Damages specified therein.

15.10.3 In the event of a national emergency, civil commotion or any other act specified in Clause 27.3, the Authority may take over the performance of any or all the obligations of the Concessionaire to the extent deemed necessary by it, and exercise such control over the Project Highway or give such directions to the Concessionaire as may be deemed necessary; provided that the exercise of such overriding powers by the Authority shall be of no greater scope and of no longer duration than is reasonably required in the circumstances which caused the exercise of such overriding powers by the Authority. For the avoidance of doubt, the consequences of such action shall be dealt in accordance with the provisions of Article 27. It is also agreed that the Concessionaire shall comply with such instructions as the Authority may issue in pursuance of the provisions of this Clause 15.10, and shall provide assistance and cooperation to the Authority, on a best effort basis, for performance of its obligations hereunder.

#### **15.11 Restoration of loss or damage to Project Highway**

Save and except as otherwise expressly provided in this Agreement, in the event that the Project Highway or any part thereof suffers any loss or damage during the Concession Period from any cause whatsoever, the Concessionaire shall, at its cost and expense, rectify and remedy such loss or damage forthwith so that the Project Highway conforms to the provisions of this Agreement.

#### **15.12 Modifications to the Project Highway**

The Concessionaire shall not carry out any material modifications to the Project Highway save and except where such modifications are necessary for the Project Highway to operate in conformity with the Specifications and Standards, Maintenance Requirements, Good Industry Practice and Applicable Laws; provided that the Concessionaire shall notify the Independent Engineer of the proposed modifications along with particulars thereof at least 15 (fifteen) days before commencing work on such modifications and shall reasonably consider any suggestions that the Independent Engineer may make within 15 (fifteen) days of receiving the Concessionaire's proposal. For the avoidance of doubt, all modifications made hereunder shall comply with the Specifications and Standards, Applicable Laws and the provisions of this Agreement.

### **15.13 Excuse from performance of obligations**

15.13.1 The Concessionaire shall not be considered in breach of its obligations under this Agreement if any part of the Project Highway is not available to traffic on account of any of the following for the duration thereof:

- (a) an event of Force Majeure;
- (b) measures taken to ensure the safe use of the Project Highway except when unsafe conditions occurred because of failure of the Concessionaire to perform its obligations under this Agreement; or
- (c) compliance with a request from the Authority or the directions of any Government Instrumentality the effect of which is to close all or any part of the Project Highway.

Notwithstanding the above, the Concessionaire shall keep all unaffected parts of the Project Highway open to traffic provided they can be operated safely.

15.13.2 The Concessionaire shall not be liable or responsible for any defect or deficiency in the Project Highway if such defect or deficiency is to be rectified or repaired by the contractor who had constructed the Project Highway or any part thereof.

### **15.14 Barriers and diversions**

The Authority shall procure that during the Concession Period, no barriers are erected or placed by any Government Instrumentality on the Project Highway except for reasons of Emergency, national security, law and order or collection of inter-state taxes. The Authority shall also make best endeavours to procure that no Government Instrumentality shall undertake or cause to be undertaken, except for reasons of Emergency, national security or law and order, any diversions of traffic from, or closing down of approach roads to the Project Highway that may cause a material adverse effect on the flow of traffic to and from the Project Highway.

### **15.15 Advertising on the Site**

The Concessionaire shall not undertake or permit any form of commercial advertising, display or hoarding at any place on the Site if such advertising, display or hoarding shall be visible to the Users while driving on such Highway; provided that this restriction shall not apply to the Toll Plazas, rest areas, bus shelters and telephone booths located on the Project Highway if the advertising thereon does not, in the opinion of the Authority, distract the Users or violates extant guidelines of MoRTH. All advertising on the Project Highway shall also conform to Good Industry Practice. For the avoidance of doubt, it is agreed that the rights of the Concessionaire hereunder shall be subject to Applicable Laws, as in force and effect from time to time and no compensation shall be claimed on account thereof.

## ARTICLE 16 MONITORING OF OPERATION AND MAINTENANCE

### 16.1 Monthly status reports

During Concession Period, the Concessionaire shall, no later than 7 (seven) days after the close of each month, furnish to the Authority and the Independent Engineer a monthly report stating in reasonable detail the condition of the Project Highway including its compliance or otherwise with the Maintenance Requirements, Maintenance Manual, Maintenance Programme and Safety Requirements, and shall promptly give such other relevant information as may be required by the Independent Engineer. In particular, such report shall separately identify and state in reasonable detail the defects and deficiencies that require rectification.

### 16.2 Inspection

The Independent Engineer shall inspect the Project Highway at least once a month. It shall make a report of such inspection (the “**O&M Inspection Report**”) stating in reasonable detail the defects or deficiencies, if any, with particular reference to the Maintenance Requirements, Maintenance Manual, the Maintenance Programme and Safety Requirements, and send a copy thereof to the Authority and the Concessionaire within 7 (seven) days of such inspection.

### 16.3 Tests

For determining that the Project Highway conforms to the Maintenance Requirements, the Independent Engineer shall require the Concessionaire to carry out or cause to be carried out tests specified by it in accordance with Good Industry Practice. The Concessionaire shall with due diligence carry out or cause to be carried out all such tests in accordance with the instructions of the Independent Engineer and furnish the results of such tests forthwith to the Independent Engineer. One half of the costs incurred on such tests, and to the extent certified by the Independent Engineer as reasonable, shall be reimbursed by the Authority to the Concessionaire.

### 16.4 Remedial measures

16.4.1 The Concessionaire shall repair or rectify the defects or deficiencies, if any, set forth in the O&M Inspection Report or in the test results referred to in Clause 16.3 and furnish a report in respect thereof to the Independent Engineer and the Authority within 15 (fifteen) days of receiving the O&M Inspection Report or the test results, as the case may be; provided that where the remedying of such defects or deficiencies is likely to take more than 15 (fifteen) days, the Concessionaire shall submit progress reports of the repair works once every week until such works are completed in conformity with this Agreement.

16.4.2 The Independent Engineer shall require the Concessionaire to carry out or cause to be carried out tests, at its own cost, to determine that such remedial measures have brought the Project Highway into compliance with the Maintenance Requirements and the procedure set forth in this Clause 16.4 shall be repeated until the Project Highway conforms to the Maintenance Requirements. In the event that remedial measures are not completed by the Concessionaire in conformity with the provisions of this Agreement, the Authority shall be entitled to recover Damages from the Concessionaire under and in accordance with the provisions of Clause 15.8.

### 16.5 Monthly Fee Statement

During the Concession Period, the Concessionaire shall furnish to the Authority within 7 (seven) days of completion of each month, a statement of Fee substantially in the form set forth

in Schedule-G (the “**Monthly Fee Statement**”). The Concessionaire shall also furnish to the Authority such other information as the Authority may reasonably require, at specified intervals, in discharge of its statutory functions.

#### **16.6 Reports of unusual occurrence**

The Concessionaire shall, prior to the close of each day, send to the Authority and the Independent Engineer, by facsimile or e-mail, a report stating accidents and unusual occurrences on the Project Highway relating to the safety and security of the Users and Project Highway. A weekly and monthly summary of such reports shall also be sent within 3 (three) days of the closing of each week and month, as the case may be. For the purposes of this Clause 16.6, accidents and unusual occurrences on the Project Highway shall include:

- (a) death or injury to any person;
- (b) damaged or dislodged fixed equipment;
- (c) any obstruction on the Project Highway, which results in slow down of the services being provided by the Concessionaire;
- (d) disablement of any equipment during operation;
- (e) communication failure affecting the operation of Project Highway;
- (f) smoke or fire;
- (g) flooding of Project Highway; and
- (h) such other relevant information as may be required by the Authority or the Independent Engineer.

#### **16.7 Video Recording**

The Concessionaire shall carryout video recording of each project every month since award of work till completion of construction and biannually during O&M period.

Authority has finalized specifications/methodology for video recording and identified zone-wise agencies & rates for the same. The Concessionaire may use these agencies so as to ensure uniformity in data collection. Recording shall have to be done in the presence of Team Leader of Independent Engineer. Recording of previous videos and current running side by side shall be loaded on Data Lake (<https://datalakeg.nhai.gov.in/nhai>) for easily capturing various developments during the month (a sample screenshot is attached herewith and also loaded on Data Lake along with a sample video for guidance) (enclosed at Annexure-I of this Article 16). Capturing Ortho-image for approx. 10% equivalent length of critical structures or any other specific area should be decided by the Ros/ PDs and be conveyed to the Drone Agency in the site-specific work order. Independent Engineer shall ensure that the features and quality of drone video is acceptable and video is not distorted/tampered with.

Independent Engineer shall analyse these drone videos and give their comments in its digital MPRs covering inter-alia but not limited to the encumbrances/lands not available, sites of COS demands, progress of project, mobilisation of plant & equipment, mobilisation of camp sites, progress on rectification of NCRs etc. along with the proposed action plan. Project



Director of NHAI shall cross-check drone videos during the monthly physical inspections and notify the discrepancies noticed, if any, between drone video, on Independent Engineer comments and ground reality. The discrepancies shall be examined and addressed through joint site inspections.

As per the policy, the Network Survey Vehicle (NSV) survey needs to be carried out twice in a year on completed project. Therefore, PDs should plan biannually drone based video recording during O&M period in such a manner so that there is no overlap and digital data of O&M period is available in regular intervals (quarterly) through NSV and drone videography.

In addition, PDs/ ROs can also undertake need based drone videography as and when required.

As the drone videos/ reports will be permanent record on Data Lake and will be used as evidences during dispute resolution process before Arbitral Tribunals/ Courts including Supreme Court, the drone video shall be carried out carefully and correctly without distortions/ tampering by all parties concerned. The amount spent on recording shall be charged to Concessionaire to the extent covered in the agreement.

## ARTICLE 18 SAFETY REQUIREMENTS AND MEDICAL AID

### 18.1 Safety Requirements

- 18.1.1 The Concessionaire shall comply with the provisions of this Agreement, Applicable Laws and Applicable Permits and conform to Good Industry Practice for securing the safety of the Users. In particular, the Concessionaire shall develop, implement and administer a surveillance and safety programme for providing a safe environment on or about the Project Highway, and shall comply with the safety requirements set forth in Schedule-H (the “**Safety Requirements**”).
- 18.1.2 The Authority shall appoint an experienced and qualified firm or organisation (the “**Safety Consultant**”) for carrying out safety audit of the Project Highway in accordance with the Safety Requirements and shall take all other actions necessary for securing compliance with the Safety Requirements.
- 18.1.3 All costs and expenses arising out of or relating to Safety Requirements shall be borne by the Concessionaire. Costs and expenses on works not covered in the scope of the Project or otherwise under the Agreement and arising out of Safety Requirements shall be borne from out of a dedicated safety fund (the “**Safety Fund**”) to be funded, owned and operated by the Authority or a substitute thereof and in the event that such costs cannot be borne out of the Safety Fund, the same shall be borne in accordance with Article 21.
- 18.1.4 Notwithstanding anything to the contrary contained in the Agreement, the Authority at any time, may also appoint any other experienced and qualified firm or organization to carry out work not covered in the scope of Project and arising out of Safety Requirements not covered under the Agreement. The Concessionaire shall provide all required support, assistance and access to facilitate such firm or organization to discharge its obligations.

### 18.2 Medical Aid Posts

- 18.2.1 For providing emergency medical aid during the Concession Period, as set forth in this Agreement, the Concessionaire shall assist the State Government or a substitute thereof to be designated by the Authority in setting up and operating a medical aid post (the “**Medical Aid Post**”) at each of the Toll Plazas with round-the-clock ambulance services for victims of accidents on the Project Highway. The Concessionaire shall, at its cost, maintain the Medical Aid Post buildings in accordance with Good Industry Practice.
- 18.2.2 No later than seven days from the *O&M Handover Date*, the Concessionaire shall provide to the State Medical Department or a substitute thereof to be designated by the Authority one ambulance in good working condition along with chauffeurs for round-the-clock ambulance services as set forth in Clause 18.2.1 and meet the operating costs of such ambulance including the salaries and allowances of the chauffeurs. For the avoidance of doubt, it is agreed that the Concessionaire shall not be liable for any other expenditure incurred by the State Medical Department or a substitute thereof to be designated by the Authority.

**SCHEDULE-F**  
**(See Clause 15.2)**  
**Maintenance Requirements**

**1. Introduction**

- 1.1 The Concessionaire shall be responsible for the improvement and Operation and Maintenance of the length of Project Highway stipulated by the Concession Agreement in accordance with scope defined in Schedule-B during the Concession Period. Thereafter, the length of Project Highway shall be transferred to National Highways Authority of India (NHA). This schedule elaborates the Operation and Maintenance (O&M) 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 the O&M requirements covers the entire Concession Period. The Concessionaire shall operate and maintain the Project Highway such that from O&M Handover date, lane availability at the end of each year of the Concession will be minimum of 99% on cumulative basis. For this purpose, lane availability at the end of each year will be computed as follows:

$$\frac{\{(Length\ of\ Project\ Road\ x\ Number\ of\ Lanes\ x\ Number\ of\ days\ since\ O\&M\ Handover\ Date)\ - \sum (lane\ length\ closed\ x\ number\ of\ days\ for\ which\ closed)\}}{\{(Length\ of\ Project\ Road\ x\ Number\ of\ Lanes\ x\ Number\ of\ days\ since\ O\&M\ Handover\ Date)\}}$$

- 1.2 The Concessionaire shall, at all times maintain the Project Highway in accordance with the provisions of this Agreement, Applicable Laws, and Applicable Permits. In particular, the Concessionaire shall at all times during the operation period, conform to maintenance requirements set forth in this schedule-F (“**Maintenance Requirements**”)
- 1.3 The Concessionaire shall repair & rectify any defect or deficiency set forth in this Schedule-F within the time limit specified therein and any failure in this behalf shall constitute a breach of the agreement & non-fulfillment of the Maintenance obligations by the Concessionaire. Upon occurrence of any breach hereunder, the Authority shall be entitled to effect reduction in monthly lump sum payment as set forth in Clause 15.8 of this Agreement, without prejudice to the rights of the Authority under this agreement including Termination thereof.
- 1.4 All Materials works and construction operations shall conform to the MORTH Specifications for Road and Bridges works, and the relevant IRC publications. Where the specifications for a work are not given, Good Industry Practice shall be adopted.
- 1.5 The Concessionaire shall, through its engineer, undertake daily visual inspection of the Project Highway and maintain a record thereof in a register to be kept in such form and manner as the Independent Engineer may specify. Such records shall be kept in safe custody of the Concessionaire and shall be open to inspection by the Authority and the Independent Engineer at any time during office hours.
- 1.6 The Concessionaire shall display a copy of this Schedule-F at the Toll Plaza[s] along with Complaint Register stipulated in Article-39.
- 1.7 All defects and deficiencies specified in this Schedule-F shall be repaired and rectified by the Concessionaire so that Project Highway conforms to the Maintenance Requirement on the Transfer date.

**2. Repair/rectification of Defects and deficiencies**

- 2.1 The obligations of the Concessionaire in respect of Maintenance Requirements shall include repair and rectification of the Defects and deficiencies specified in this Schedule-F within the time limit set forth therein.
- 2.2 The Concessionaire shall at all times maintain an adequate inventory of spares and consumables to meet the Maintenance Requirements.

**3. Other Defects and Deficiencies**

In respect of any Defect or deficiency not Specified in this Schedule-F, the Independent Engineer may, in conformity with Good Industry Practice, specify the permissible limit of deviation or deterioration with reference to the Specifications and standards, and any deviation or deterioration beyond the permissible limit shall be repaired or rectified by the Concessionaire in accordance with Good Industry Practice and within the time limit specified by the Independent Engineer.

**4. Extension of Time Limit**

Notwithstanding anything to the contrary specified in this Schedule-F, if the nature and extent of any defect or deficiency justifies more time for its repair or rectification than the time specified herein, the Concessionaire shall be entitled to additional time in conformity with Good Industry Practice. Such additional time shall be determined by the Independent Engineer and conveyed to Concessionaire and Authority with reasons thereof.

**5. Emergency repairs /restorations**

Notwithstanding anything to the contrary contained in this Schedule-F, if any defect, deficiency or deterioration in the Project Highway poses a hazard to safety or risk of damage to property, the Concessionaire shall promptly take all reasonable measures for eliminating or minimizing such danger.

**6. Operation and Maintenance (O&M) Requirements**

6.1 The Concessionaire shall take all such actions and do all such things, including without limitation, organizing itself, adopting measures and standards, executing procedures such as inspection procedures, highway patrols, 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 there on.
- b) Unimpaired performance of statutory duties and functions of the 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:

6.1.1 Adequate safety measures taking into account „Schedule-H“ are taken up on the construction zone during the O&M period.

6.1.2 Delay to users of the Project Highway and of adjoining roads or facilities is minimized.

6.1.3 Risk of adverse effects on the environment and on the amenity enjoyed by the owners and occupiers of property and/or land adjacent to the Project Highway, adjoining roads and facilities are minimized.

6.1.4 Accidents and emergencies on the Project Highway and facilities thereon are responded to as quickly as possible and their adverse effects minimized.

6.1.5 Risk of disturbance or damage or destruction to property of third party is minimized.

6.1.6 Members of the public are treated with due courtesy and consideration.

6.1.7 Users are given adequate information and forewarning of any event on or any other matter affecting the Project Highway which will enable them to minimize any adverse consequences on them of that event or matter.

6.1.8 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 maintenance Requirements.

6.1.9 Traffic data and data relating to the operation and maintenance of the Project Highway and its facilities and events on the Project Highway are collected and disseminated such that the NHAI and other persons or bodies with statutory duties or functions in relation to the Project Highway or adjoining roads are able to perform those duties and functions efficiently.

6.1.10 The project facilities provided under Schedule-B and Change of Scopes as applicable, shall be operated and maintained in order to fulfill the requirements set forth in the Concession Agreement.

6.1.11 The Scope for Operation and Maintenance includes but not limited to following obligations:

- Improvement – this includes improvement of the existing assets as per requirement of this Agreement and safety audit.
- Maintenance of Civil Works and Assets- this includes maintenance of civil works and all assets as per requirement of this agreement.
- Road Maintenance – this includes routine maintenance, preventive maintenance, periodic maintenance as per IRC:82-2015, Design overlay as per Manual of 4-laning/6-laning, disaster maintenance, exigencies, and inspections.
- Traffic Management – this includes enforcement of regulations together with the relevant authorities. This also includes hazard response, information gathering and dissemination,

Road patrols and ATMS surveillance etc.

- Safety– this includes accident prevention, after care, user education, enforcement, data collection and analysis.
- Facility Management – this includes periodic inspections, routine maintenance, Rehabilitation, and expansion planning.
- Road property management – this includes management of access, encroachment, and ribbon development.
- General responsibilities – this includes budgeting, compliance with legal and accounting requirements, and public relations.
- 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 as per contractual obligations:

- a. In general, the limit of the Concessionaire's responsibility is to maintain all areas within the Right of way of the Project Highway inclusive of all features such as interchanges, toll plaza, street lighting facilities, traffic light facilities, ATMS and other facilities present within the Project Highway.
- b. Limit of Maintenance by the Concessionaire for another road joining or crossing the concession limit shall be according to the following condition:
  - 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. as per concession agreement.
  - ii. The Concessionaire shall be responsible for maintenance of the road surface, or the roadside drains of the other roads that are within 100m beyond the Right of Way of Project Highway.
- 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 extended 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-A and B up to Right of Way of the Project Highway and their flares to junctions at any interchange 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 crossings 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 of Project Highway is required as a result of exceptional discharge.
- f. Report Formats- As per Article 15 of the Concession Agreement, the Concessionaire shall submit a Maintenance Program for the next year prepared in accordance with inventory of all assets created during COD of the project along with the deployment Schedule of manpower & other resources with testing facilities.
- g. The asset performance created by the Concessionaire as per the scope of the Concession agreement shall be assessed by Independent Engineer as per consultancy agreement and shall be honored by the concessionaire pertaining to the outcome of equipment-based monitoring provisions as applicable.

## **7. Traffic Management and Lane Closure**

- 7.1 Traffic Management during Operation and Maintenance of the Project Highway is an important activity the Concessionaire has to attend to ensure safety of the road users as well as the maintenance workers simultaneously throughout the Concession Period. It is usual activity to carry out various types of maintenance works at different stages and at different periods as per site requirement. Also, it is a vital activity during unforeseen and/or emergency situations arising on account of natural causes or accidents or administrative

reasons.

7.2 Traffic Management is required during planned scheduled like Routine and Periodic 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 deficiency/failure of an element of the Project Highway; and
- iii. Default of the Concessionaire with respect to any O&M activity on the Project Highway

7.3 The basic principles to be followed for traffic management and lane closure in this Project Highway shall be as follows:

7.3.1 Work programme schedule shall be prepared in a manner that diversion roads for the main traffic are minimized. Two-lanes of carriageway shall be available to the maximum extent possible.

7.3.2 Measures shall be taken such that the traffic is guided from a closed lane onto the operating lane without any conflict with the traffic from the opposite direction.

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

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

7.3.5 During traffic detour involving traffic diversion, adequate safety measures as in 'Schedule-H' shall be followed.

7.3.6 Proper and adequate information about the maintenance activity shall be notified to the road users well before approaching the work site. Traffic Management and Diversion arrangement at the work site shall be as per IRC: SP: 55- 2014 or subsequent updates thereof. In addition to this, Robot Flagman and other advanced traffic diversion devices shall be used for diversion arrangement.

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

7.5 In case of unscheduled activities, described above, an emergency traffic management for the affected reach of the highway shall be prepared and implemented in line with the guidelines set forth Specifications and Standards, complying with Article 18 and Schedule-H. This emergency traffic management plan shall take into account the various requirements spelt out in the Concession Agreement as well as in this schedule.

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

7.6.1 This stage could arise any time and shall have to be addressed based on its own merits. The extent of traffic management shall be assessed as per the site requirement and situation.

7.6.2 The nature of emergency requirement will determine the type and extent of the traffic diversion.

7.6.3 Traffic Management Plan in emergency shall be prepared and implemented as per Specifications and Standards set forth in Schedule-H.

## **8. Implementation of Asset Management Framework during O&M Period**

8.1 Introduction

8.1.1 Asset Management is a systematic process of maintaining assets, upgrading and operating assets, combining engineering principles with sound business practice and economic rationale, and providing tools to facilitate a more organised and flexible approach to making the decisions necessary to achieve expectations. Objective of Asset Management shall be to fulfill the requirements mentioned in 6.1 with optimum allocation of resources for management,

- operation, preservation, and maintenance of highway infrastructure asset.
- 8.1.2 Basic common requirement for Asset Management are:
- Establish a complete inventory of all road asset with all its elements.
  - Provide a clear picture of the current condition/performance of the road assets.
  - Create Real Time Database of the Asset Inventory and Condition with all-time data availability to all stakeholders.
  - Estimate future demand of traffic and service needs.
  - Estimate maintenance needs and costs.
  - Prioritise objectives related to the desired quality and performance of the road.
  - Define a strategy (Asset Management Plan) (This includes both Operation and Maintenance Plan).
  - Implementation of Asset Management Plan
- 8.1.3 As requirement of maintenance manual under Article 15 of the Concession Agreement, the Concessionaire shall in accordance with this schedule and Specifications and Standards also evolve an Asset Management Manual as required in Article 15 of the Concession Agreement. The same shall be submitted to Independent Consultant. Independent Consultant upon finding this as set Management Manual in accordance with schedules, Concession Agreement and the best industry practice of the day shall approve the same.
- 8.1.4 The Asset Management Manual prepared by the Concessionaire shall set out the Asset Management standards and details of the Operations & Maintenance activities to be undertaken during the Concession Period, so that the Project Facilities shall at all times conform to the Design Requirements/specifications.
- 8.1.5 The Asset Management Manual prepared by the Concessionaire shall set out the Asset Management standards and details of the Operations & Maintenance activities to be undertaken during the Concession Period, so that the Project Facilities shall at all times conform to the Design Requirements/specifications.
- 8.1.6 The manual shall include without limitation the following aspects:
- i. Organization structure with responsibilities of key personnel.
  - ii. Traffic Management Plan including the Corridor Control Plan.
  - iii. Safety Management Programme Including the Emergency Response Protocol.
  - iv. Inspection Procedures, Parameters, Frequency and schedule.
  - v. Routine and Periodic Maintenance Intervention Levels.
  - vi. Asset Management Project Deliverables and Tolerance Criteria.
  - vii. Environment Management Plan.
  - viii. Maintenance Programme.
  - ix. Management Information System.
  - x. Report Formats.
- 8.1.7 As per Article 15.4.1 of the Concession Agreement, the Concessionaire shall submit an annual Asset Management Plan/Maintenance Program for the next year prepared in accordance with Asset Management Manual.
- 8.1.8 The Asset Management System should be capable of monitoring real time compliance of the Asset Management Plan and provide necessary feedback to all stake holders.
- 8.1.9 In order to determine the Assets Performance Parameters for the Base Year, the Concessionaire shall carry out Revalidation and Testing on the road project to arrive at updated Base Year Parameters, 45 -days before Appointed Date {O&M Handover Date}. Initial Maintenance Requirement shall be assessed / revalidated based on Base Year Performance Parameters. It is hereby clarified that the concessionaire will arrive at Base Year Parameters within 45-days of the (a) Appointed Date for that part of O&M which is to be handed over to Concessionaire on Appointed Date, and (b) O&M Handover Date 2 for that part of O&M, which is to be handed over to Concessionaire on O&M Handover Date. NHAI / Independent Consultant may audit the Revalidation and Testing processes. The data to be collected for

performance indicator along-with recommended revalidation / testing procedures are as mentioned in the following table.

Description of Data	Recommended Process
Asset Inventory (Highway, Structures, Road Furniture, Facilities)	Visual Survey Manual Validation of Past Data
Pavement Distress – (Cracking and other visual distress)	Network Survey Vehicle or ROMDAS or equivalent technology
Roughness Value (IRI), Rutting, Skid Resistance	Network Survey Vehicle (Laser Profilometer) or ROMDAS or equivalent technology
Deflection Value/Remaining Life	Falling Weight Deflectometer
Condition Survey of Structures	Updation of Past Data by Visual Condition Survey and Thorough Inspection using Mobile Bridge Inspection Unit.
Condition Survey of Road Furniture, Facilities	Updation of Past Data by Visual Condition Survey and thorough Inspection using Retro Reflectometer.
Traffic Data	7-day ATCC based traffic Volume Count Survey backed by Video
Axle Load Data	2-days Axle Load Survey with axle Pad
Encroachment Data	Survey to be carried out including Geotagged Images
Aerial Imaging of the Asset	Drone, LiDAR, or equivalent technology
Utility Mapping	Ground Penetration Radar, Visual Inspection

8.1.10 The Concessionaire in-accordance of provisions of the Concession Agreement shall plan/programme inspections of the Project Highway classified in the following categories for effective O&M/Asset Management System Implementation:

- a. Routine Inspection
- b. Close Inspection
- c. Detailed Inspection

8.1.11 Routine Inspection

Routine Visual Inspections are to be carried out by highway/bridge maintenance engineers having knowledge of highway/road structures. The purpose of visual inspection is to report the obstacles to traffic, defects and deficiencies of pavement/structure, missing or damages to safety barrier (crash barriers) and traffic signs installed or erected on highway. Such inspections should be done daily. The visual inspection may be carried out by visual assessment with careful observation of the specific object/item of the Project Facilities for identification and for quantification of the deficiencies or damages of the Project Facilities. Geo-tagging Cameras and Distance Measuring Devices shall be used to update base asset performance parameters on daily basis. If timely inspection and reporting of these safety related deficiencies are not done, they could lead to accidents or severe maintenance problems.

8.1.12 Close Inspection



Close inspections for assessment of defects/deficiencies of Project Highway shall be periodic in nature and would require detailed examination of all elements of the Project Highway. Close inspection may be visual or may involve investigations to be carried out using instruments. The frequency of close inspections would depend upon the nature of the elements of Project Highway. This inspection is to be carried out by the Highway/Bridge Engineer having good knowledge of Highway with theoretical background to analyse the nature, and extent of defects/deficiencies, suggest suitable remedial measures to rectify/remedy them and quantify repair work.

8.1.13 Detailed Inspection

A detailed inspection is comprehensive and detailed assessment of defects/deficiencies of the Project Highway with the aid of standard equipment and non-destructive testing. Such an inspection is to be carried out on the basis of comprehensive checklist of items related to the materials, condition of element of Project Highway. A checklist is to be prepared well in advance of inspection. The detailed inspection should be undertaken during the most critical weather condition. Detailed inspection carried out will offer the most critical evaluation of the performance of the Project Highway elements.

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 recognize any structural distress/deficiencies and assess its seriousness with complete recommendation for appropriate repairs is important pre-requisites for entrusting this assignment to him.

8.1.14 The Concessionaire shall strictly maintain the assets of the Project Highway and adhere to the Asset Management Project deliverables and Tolerance Criteria as mentioned in the following tables.

Table 1: Maintenance Criteria for Pavements

Asset Type	Performance Parameter	Level of Service (LOS)		Frequency of Inspection	Tools/ Equipment	Standards and References for Inspection and Data Analysis	Time limit for Rectification / Repair	Maintenance specifications
		Desirable	Acceptable					
Flexible Pavement – Routine Inspection (Pavement of MCW, Service Road, Approach of Grade structures, approaches of connecting roads, slip roads, lay byes etc. as applicable)	Potholes	Nil	<0.1% of area and subjected to limit of 10mm in depth	Daily	Length Measurement Unit like Scale, Tape, odometer etc.	IRC 82: 2015 and Distress Identification Manual for Long Term Pavement Performance Program, FHWA 2003	24-48 hours	MORT&H Specification 3004.2
	Cracking	Nil	<5% subject to limit of 0.5 sqm for any 50m length	Daily			7-15 days	MORT&H Specification 3004.3
	Rutting	Nil	<5mm	Daily	Straight Edge		15 -30 days	MORT&H Specification 3004.2
	Corrugations and Shoving	Nil	0.1% of area	Daily	Length Measurement Unit like Scale, Tape, odometer etc.		2-7 days	IRC:82-2015
	Bleeding	Nil	<1% of area	Daily			3-7 days	MORT&H Specification 3004.4
	Ravelling/ Stripping	Nil	<1% of area	Daily			7-15 days	IRC:82-2015 read with IRC SP-81
	Edge Deformation / Breaking	Nil	<1m for any 100m section and/or width <0.1m at any Location restricted to 30cm from the edge.	Daily	Length Measurement Unit like Scale, Tape, odometer etc.		7-15 days	IRC:82-2015
Flexible	Roughness	2000 mm/km	2400 mm/km	Bi-	Network	ASTM E950 (98)	180 days	IRC:82-2015

Asset Type	Performance Parameter	Level of Service (LOS)		Frequency of Inspection	Tools/ Equipment	Standards and References for Inspection and Data Analysis	Time limit for Rectification / Repair	Maintenance specifications
		Desirable	Acceptable					
Pavement – Programmed Inspection	BI			Annually	Survey vehicle (NSV) with all its module such as Laser Profilometers, Transverse profile logger, Laser crack measurement system, Video logging modules, high resolution Odometer etc.	:2004 –Standard Test Method for measuring Longitudinal Profile of Travelled Surfaces with Accelerometer Established Inertial Profiling Reference and ASTM E1656 - 94:2000-Standard Guide for Classification of Automatic Pavement Condition Survey Equipment	15-30 days	IRC:82-2015
	Rutting	<10mm for any 50 m section and/or, length of section <5m	<10mm for any 50 m section and/or, length of section <10m	Bi-Annually				
	Pavement rating based on distress per IRC 82 / Pavement Condition Index as per ASTM 6433-07	>3/85	>2.1/70	Bi-Annually				
	Other Pavement Distresses	-	-	Bi-Annually				
	Skid	60SN	50SN	Bi-Annually				

Asset Type	Performance Parameter	Level of Service (LOS)		Frequency of Inspection	Tools/ Equipment	Standards and References for Inspection and Data Analysis	Time limit for Rectification / Repair	Maintenance specifications
		Desirable	Acceptable					
	Deflection/ Remaining Life		-	Annually	Tester Falling Weight Deflectometer	IRC 115: 2014	180 days	IRC:115-2014
Rigid Pavement (Pavement of MCW, Service Road, Grade separated structure, approaches of connecting roads, slip roads, lay byes etc. as applicable.	Roughness BI	<2200mm/km	<2400mm/km	Bi-Annually	Class I Profilometer Mounted on NSV	ASTM E950 (98):2004 and ASTM E1656 -94: 2000	180 days	IRC: SP:83-2018
	Skid	Skid Resistance No. at different speed of vehicles		Bi-Annually	SCRIM (Sideway force Coefficient Routine Investigation Machine or equivalent) British Pendulum Tester	IRC: SP:83-2018	180 days	IRC: SP:83-2018
	Minimum SN	Traffic Speed						
	36	50						
	33	65						
	32	80						
	31	95						
	31	100						
Embankment /Slope	Edge drops at shoulders	Nil	40mm	Daily	Length Measurement Unit like Scale, Tape, odometer etc.	IRC	7-15 days	MORT&H Specification
	Slope of camber/cross fall	Nil	<2% variation in prescribed slope of camber /cross fall	Daily			7-15 days	MORT&H Specification
	Embankment Slopes	Nil	<15 % variation in prescribe side slope	Daily			7-15 days	MORT&H Specification
	Embankment	Nil	Nil	Daily			NA	7-15 days

Asset Type	Performance Parameter	Level of Service (LOS)		Frequency of Inspection	Tools/ Equipment	Standards and References for Inspection and Data Analysis	Time limit for Rectification / Repair	Maintenance specifications
		Desirable	Acceptable					
	Protection							Specification
	Rain Cuts/Gullies in slope	Nil	Nil	Daily Specially During Rainy Season	NA	IRC	7-15 days	MORT&H Specification
Cut Section/ Slope	Unstable Slopes	Nil	-		NA	IRC	2-7 days	MORT&H Specification

In addition to above performance criterion, the concessionaire shall strictly maintain the rigid pavements as per requirements in the following tables:

Table 2: Maintenance Criteria for Rigid Pavements

S. No	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case $d < D/2$	For the case $d > D/2$
<b>CRACKING</b>						
1	Single Discrete Cracks Not intersecting with any joint Single Transverse (or Diagonal) Crack intersecting with one or more joints	w = width of crack, L = length of crack, d = depth of crack, D = depth of slab w = width of crack L = length of crack d = depth of crack D = depth of slab	0	Nil, not discernible	No Action	-
			1	w < 0.2 mm. hair cracks		
			2	w = 0.2 - 0.5 mm, discernible from slow-moving car	Seal without delay	Full Depth Repair Dismantle and reconstruct affected portion - See Para 5.4, within 15 days
			3	w = 0.5 - 1.5 mm, discernible from fast-moving car		
			4	w = 1.5 - 3.0 mm	Seal and stitch if L > 1 m. within 7 days	
			5	w > 3 mm.		
2	Single Transverse (or Diagonal) Crack intersecting with one or more joints	w = width of crack L = length of crack d = depth of crack D = depth of slab	0	Nil, not discernible	No Action	
			1	w < 0.2 mm. hair cracks	Route and seal with Epoxy within 7 days	Seal Staple within 15days & Cross stitch or
			2	w = 0.2 - 0.5 mm, discernible from slow-moving car		
			3	w = 0.5 - 3.0 mm, discernible from fast-moving car	Seal and stitch, if L > 1 m. within 7 days	Full Depth Repair Dismantle and reconstruct affected portion with norms & Specifications - See Para 5.5 & refer chapter 9 of IRC: SP: 83-2018, within 15 days.

S. No	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
			4	w = 3.0 - 6.0 mm	Not Applicable	Staple or Dowel Bar Retrofit within 15 days.
			5	w > 6 mm, usually associated with spalling, and/or slab rocking under traffic	Not Applicable, (full depth crack)	Staple or Dowel Bar Retrofit within 15 days
3	Single Longitudinal Crack intersecting with one or more joints	w = width of crack L = length of crack d = depth of crack D = depth of slab	0	Nil, not discernible	No Action	
			1	w < 0.5 mm, discernible from slow moving vehicle	Seal and stitch if L > 1 m within 7 days	Seal and Cross-Stich or Staple within 15 days
			2	w = 0.5 - 3.0 mm, discernible from fast vehicle		
			3	w = 3.0 - 6.0 mm	Seal & Staple, within 15 days	Partial Depth Repair with or without dowel bar retrofit within 15 days or
			4	w = 6.0 - 12.0 mm, usually associated with spalling	Not applicable	
			5	w > 12 mm, usually associated with spalling, and/or slab rocking under traffic	Not Applicable, (Rocking/ Spalling indicates full depth crack)	Full Depth Repair Dismantle and reconstruct affected portion - See Fig 5.6 and Chapter 9 of IRC: SP:83-2018, within 15 days
4	Multiple Cracks intersecting with one or more joints	w = width of crack	0	Nil, not discernible	No Action	
			1	w < 0.2 mm. hair cracks	Seal and stitch if L > 1 m. within 15 days	Dismantle and Reconstruct whole slab as per Specifications
			2	w = 0.2 - 0.5 mm, discernible from slow-moving car		
			3	w = 0.5 - 3.0 mm, discernible from fast-moving car	Full depth repair within 15 days	within 30days.

S. No	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
			4	w = 3.0 - 6.0 mm panel broken into 2 or 3 pieces		Reinstate sub- base, reconstruct whole slab within 30days.
			5	w > 6 mm and/or panel broken into more than 4 pieces		
5	Corner Break	w = width of crack, L = length of crack	0	Nil, not discernible	No Action	
			1	w < 0.5 mm; only 1 corner broken	Seal with low viscosity epoxy to secure broken parts within 7 days	
			2	w < 1.5 mm; L < 0.6 m, only one corner broken		
			3	w < 1.5 mm; L < 0.6 m, two corners broken	Partial Depth (Refer Figure 8.3 of IRC: SP:83-2018) within 15 days	Full depth repair within 30 days.
			4	w > 1.5 mm; L > 0.6 m or three corners broken		
			5	three or four corners broken		
6	Punchout (Applicable to Continuous Reinforced Concrete Pavement CRCP only)	w = width of crack L = length (m/m <sup>2</sup> )	0	Nil, not discernible	No Action	
			1	w < 0.5 mm; L < 3 m/m <sup>2</sup>	Not Applicable, (Punch-out is full depth Distress)	Seal with low viscosity epoxy to secure broken parts Within 15 days
			2	either w > 0.5 mm or L < 3 m/m <sup>2</sup>		
			3	w > 1.5 mm and L < 3 m/m <sup>2</sup>		Full depth repair - Cut out and replace damaged area taking care not to damage
			4	w > 3 mm, L < 3 m/m <sup>2</sup> and deformation		
			5	w > 3 mm, L > 3 m/m <sup>2</sup>		



S. No	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
				and deformation		reinforcement. Within 30 days.
<b>Surface Defects</b>						
					<b>Short Term</b>	<b>Long Term</b>
7	Ravelling or Honeycomb type surface	r = area damaged surface/total surface of slab (%) h = maximum depth of damage	0	Nil, not discernible	No action.	Not Applicable
			1	r < 2 %	Local repair of areas damaged and liable to damage. Within 15 days	
			2	r = 2 - 10 %	Bonded Inlay, if affecting 2 or 3 slabs. Within 30 days	
			3	r = 10-25%	Reconstruct slabs, if affecting 4 or more slabs. Within 30 days	
			4	r = 25 - 50 %		
8	Scaling	r = area damaged surface/total surface of slab (%) h = maximum depth of damage	0	Nil, not discernible	No action.	Not Applicable
			1	r < 2 %	Local repair of areas damaged and liable to within 7 days	
			2	r = 2 - 10 %	Bonded Inlay within 15 days	
			3	r = 10 - 20%		
			4	r = 20 - 30 %	Reconstruct slab within 30 days.	
9	Polished Surface/Glazing	t = texture depth, sand patch test	0		No action.	Not Applicable
			1	t > 1 mm		
			2	t = 1 - 0.6 mm	Monitor rate of deterioration	
			3	t = 0.6 - 0.3 mm		
			4			
5	t < 0.3 mm	Diamond Grinding if affecting 50% or more slabs in a continuous stretch of minimum 5 km. Within 30 days				
10	Popout (Small	n = number/m <sup>2</sup> ,	0	d < 50 mm; h < 25	No action.	Not Applicable

S. No	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
	Hole), Pothole Refer Para 8.4	d = diameter, h = maximum depth		mm; n < 1 per 5 m2		
			1	d = 50 - 100 mm; h < 50 mm; n < 1 per 5 m2	Partial depth repair 65 mm deep. Within 15 days	
			2	d = 50 - 100 mm; h > 50 mm; n < 1 per 5 m2		
			3	d = 100 - 300 mm; h < 100 mm n < 1 per 5 m2	Partial depth repair 110mm i.e., 10 mm more than the depth of the hole within 30 days	
			4	d = 100 - 300 mm; h > 100 mm; n < 1 per 5 m2		
			5	d > 300 mm; h > 100 mm; n > 1 per 5 m2	Full depth repair within 30 days.	
<b>JOINT DEFECT</b>						
					<b>Short Term</b>	<b>Long Term</b>
			0	Difficult to discern.	No action.	
11	Joint Seal Defects	loss or damage L = Length as % total joint length	1	Discernible, L < 25% but of little immediate consequence with regard to ingress of water or trapping incompressible material.	Clean joint, inspect later.	Not Applicable
			3	Notable. L > 25% insufficient protection against ingress of water and trapping	Clean and reapply sealant in selected locations. Within 7 days.	

S. No	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action
				incompressible material.	
			5	Severe; w > 3 mm negligible protection against ingress of water and trapping incompressible material.	Clean, widen and reseal the joint following strict procedures within 7 days.
12	Spalling of Joints	w = width on either side of the joint L = length of spalled portion (as % joint length)	0	Nil, not discernible	No action.
			1	w < 10 mm	Apply low viscosity epoxy resin/mortar in cracked portion within 7 days
			2	w = 10 - 20 mm, L < 25%	Partial Depth Repair, 30 - 50 mm deep, h = w+ 20% of w, within 30 days
			3	w = 20 - 40 mm, L > 25%	50 - 100 mm deep repair. H = w + 20% of w, within 30 days
			4	w = 40 - 80 mm, L > 25%	
			5	w > 80 mm, and L > 25%	
13	Faulting (or Stepping) in Cracks or Joints	f = difference of level	0	not discernible, < 1 mm	No action.
			1	f < 3 mm	
			2	f = 3 - 6 mm	Determine cause and observe
			3	f = 6 - 12 mm	Diamond Grinding within 15 days
			4	f = 12 - 18 mm	Raise sunken slab within 15 days.
			5	f > 18 mm	Strengthen subgrade and sub-base by

S. No	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					grouting, within 30 days.	
14	Blowup or Buckling	h = vertical displacement from normal profile	0	Nil, not discernible	No action.	
			1	h < 6 mm		
			2	h = 6 - 12 mm	Install Signs to Warn Traffic, within 24 hours days	
			3	h = 12 - 25 mm	Full Depth Repair, within 30 days.	
			4	h > 25 mm	Replace broken slabs, within 30 days.	
			5	shattered slabs, i.e. 4 or more pieces		
15	Depression	h = negative vertical displacement from normal profile. L = length	0	Not discernible. h < 5 mm	No action.	
			1	h = 5 - 15 mm		
			2	h = 15 - 30 mm, Nos < 20% joints	Install Signs to Warn Traffic, within 24 hours	
			3	h = 30 - 50 mm	Strengthen subgrade. Reinstate pavement at normal level, within 30 days.	
			4	h > 50 mm or > 20% joints		
			5	h > 100 mm		
16	Heave	h = positive vertical displacement from normal profile. L = length	0	Not discernible. h < 5 mm	No action.	
			1	h = 5 - 15 mm	Follow up.	
			2	h = 15 - 30 mm, Nos < 20% joints	Install Signs to Warn Traffic, within 24 hours	
			3	h = 30 - 50 mm		
			4	h > 50 mm or > 20% joints	Stabilise subgrade. Reinstate pavement at normal level, within 30 days	
			5	h > 100 mm		
17	Bump	h = vertical displacement from normal profile	0	h < 4 mm	No action.	
			1	h = 4 - 7 mm	Grind, in case of new construction. Within 7	

S. No	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
			3	h = 7 - 15 mm	days	
			5	h > 15 mm	Grind in case of Ongoing maintenance within 15 days	
18	Lane to Shoulder Drop-off	f = difference of level	0	Nil, not discernible < 3mm	No action.	
			1	f = 3 - 10 mm	Spot repair of shoulder. Within 3 days	
			2	f = 10 - 25 mm	Fill up shoulder within 7 days	
			3	f = 25 - 50 mm		
			4	f = 50 - 75 mm		
			5	f > 75 mm	For any 100 m segment, Reconstruct shoulder, if affecting 25% or more of segment, within 30 days.	
<b>DRAINAGE</b>						
					<b>Short Term</b>	<b>Long Term</b>
19	Pumping	quantity of fines and water expelled through open joints and cracks Nos/100 m stretch	0	not discernible	No action.	
			1 to 2	slight/occasional Nos < 10%	Repair cracks and joints without delay	Inspect and repair Sub-drainage at distressed sections and upstream
			3 to 4	appreciable/Frequent 10 - 25%	Lift or jack slab within 30 days.	
			5	abundant, crack development > 25%	Repair distressed pavement sections. Strengthen subgrade And sub-base. Replace slab. Within 30 days.	
20	Ponding	Ponding on slabs due to blockage of drains	0-2	No discernible problem	No action.	
			3 to 4	Blockages observed in drains, but water flowing	Clean drains etc., follow up, deep grooving in transverse direction to remove	Action required to stop water damaging foundation within 15 days.

S. No	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action
			5	Ponding, accumulation of water observed	water, within 7 days Deep grooving in transverse direction to remove water-hydro planning within 7 days

Table 3: Maintenance Criteria for Safety Related Items and Other Furniture Items

Asset Type	Performance Parameter	Level of Service (LOS)			Frequency of Measurement	Testing Method	Recommended Remedial Measures	Time limit for Rectification	Specifications and Standards
		Design Speed (kmph)	Desirable Minimum Sight Distance (m)	Safe Stopping Sight Distance (m)					
Highway	Availability of Safe Sight Distance	As per IRC SP:84-2019, a minimum of safe stopping sight distance shall be available throughout.			Monthly	Manual Measurements With Odometer along with	Removal of obstruction within 24 hours, in case of sight line affected by temporary objects such as trees, temporary encroachments.		IRC: SP:84-2019
		100	360	180					
		80	260	130		video/ image backup	In case of permanent structure or design deficiency: * Removal of obstruction/ improvement of deficiency at the earliest * Speed Restriction boards and suitable traffic calming measures such as transverse bar marking, blinkers, etc. shall be applied during the period of rectification.		
Pavement Marking	Wear	<70% of marking remaining			Bi-Annually	Visual Assessment as per Annexure-	Re-Painting	Cat-1 Defect – within 24 hours Cat-2 Defect –	IRC:35-2015

Asset Type	Performance Parameter	Level of Service (LOS)			Frequency of Measurement	Testing Method	Recommended Remedial Measures	Time limit for Rectification	Specifications and Standards
		Design Speed (kmph)	Desirable Minimum Sight Distance (m)	Safe Stopping Sight Distance (m)					
							within 2 months		
	Day time Visibility	During expected life Service Time • Cement Road - 130mcd/m <sup>2</sup> /lux • Bituminous Road - 100mcd/m <sup>2</sup> /lux			Monthly	As per Annexure- D of IRC:35- 2015	Re-Painting	Cat-1 Defect – within 24 hours Cat-2 Defect – within 2 months	IRC:35-2015
	Night Time Visibility	Initial and Minimum Performance for Dry Retro reflectivity during night time:			Bi-Annually	As per Annexure-E of IRC:35- 2015	Re-Painting	Cat-1 Defect – within 24 hours Cat-2 Defect – within 2 months	IRC:35-2015
		Design Speed	(RL) Retro-Reflectivity (mcd/m <sup>2</sup> /lux)						
			Initial (7Days)	Minimum Threshold Level (TL) and warranty period required up to 2 years					
		Up to 65	200	80					
		65 - 100	250	120					
		above 100	350	150					
		Initial and Minimum Performance for Night Visibility under wet condition (Retro reflectivity): • Initial 7 days Retro reflectivity: 100							

Asset Type	Performance Parameter	Level of Service (LOS)			Frequency of Measurement	Testing Method	Recommended Remedial Measures	Time limit for Rectification	Specifications and Standards
		Design Speed (kmph)	Desirable Minimum Sight Distance (m)	Safe Stopping Sight Distance (m)					
		mcd/m <sup>2</sup> /lux • Minimum Threshold Level: 50 mcd/m <sup>2</sup> /lux							
	Skid Resistance	Initial and Minimum performance for Skid Resistance • Initial (7days): 55BPN • Min. Threshold: 44BPN *Note: shall be considered under urban/city traffic condition encompassing the locations like pedestrian crossings, bus bay, bus stop, cycle track intersection delineation, transverse bar markings etc.			Bi-Annually	As per Annexure-G of IRC:35- 2015		Within 24 hours	IRC:35-2015
Road Sign	Shape and Position	Shape and Position as per IRC:67-2012. Signboard should be clearly visible for the design speed of the section			Daily	Visual with video/image backup	Improvement of shape, in case if shape is damaged. Relocation as per requirement	48 hours in case of Mandatory Signs, Cautionary and Informatory Signs (Single and Dual post signs), 15 Days in case of Gantry/ Cantilever Sign boards	IRC:67-2012
	Retro	As per specifications in IRC:67-2012			Bi-Annually	Testing of	Change of	48 hours in	IRC:67-2012



Asset Type	Performance Parameter	Level of Service (LOS)			Frequency of Measurement	Testing Method	Recommended Remedial Measures	Time limit for Rectification	Specifications and Standards
		Design Speed (kmph)	Desirable Minimum Sight Distance (m)	Safe Stopping Sight Distance (m)					
	reflectivity					each signboard using Retro Reflectivity Measuring Device. In accordance with ASTM D 4956-09	signboard	case of Mandatory Signs, Cautionary and Informatory Signs (Single and Dual post signs). 1 Month in case of Gantry/ Cantilever Sign boards	
Kerb	Kerb Height	As per IRC 86:2018 depending upon type of Kerb			Bi-Annually	Use of distance measuring tape	Raising Kerb Height	Within 1 Month	IRC 86:2018
	Kerb Painting	Functionality: Functioning of Kerb painting as intended			Daily	Visual with video/image backup	Kerb Repainting	Within 7-days	IRC 35:2015
Other Road Furniture	Reflective Pavement Markers (Road Studs)	Numbers and Functionality as per specifications in IRC: SP:84-2019 and IRC:35-2015, unless specified in Schedule-B.			Daily	Counting	New Installation	Within 2 months	IRC: SP:84-2019, IRC:35-2015
	Pedestrian Guardrail	Functionality: Functioning of guardrail as intended			Daily	Visual with video/image backup	Rectification	Within 15 days	IRC: SP:84-2019
	Traffic Safety	Functionality: Functioning of Safety			Daily	Visual with	Rectification	Within 7-days	IRC: SP:84-

Asset Type	Performance Parameter	Level of Service (LOS)			Frequency of Measurement	Testing Method	Recommended Remedial Measures	Time limit for Rectification	Specifications and Standards
		Design Speed (kmph)	Desirable Minimum Sight Distance (m)	Safe Stopping Sight Distance (m)					
	Barriers	Barriers as intended				video/image backup			2019, IRC:119-2015
	End Treatment of Traffic Safety Barriers	Functionality: Functioning of End treatment as intended			Daily	Visual with video/image backup	Rectification	Within 7-days	IRC: SP:84-2019, IRC:119-2015
	Attenuators	Functionality: Functioning of Attenuators as intended			Daily	Visual with video/image backup	Rectification	Within 7-days	IRC: SP:84-2019, IRC:119-2015
	Guard Posts and Delineators	Functionality: Functioning of Guard Posts and Delineators as intended			Daily	Visual with video/image backup	Rectification	Within 15 days	IRC:79-2019
	Overhead Sign Structure	Overhead sign structure shall be structurally adequate			Daily	Visual with video/image backup	Rectification	Within 15 days	IRC:67-2012
	Traffic Blinkers	Functionality: Functioning of Traffic Blinkers as intended			Daily	Visual with video/image backup	Rectification	Within 7-days days	IRC: SP:84-2019
Highway Lighting System	Highway Lights	Illumination: Minimum 40 Lux illumination on the road surface			Daily	The illumination level shall be measured with lux- meter	Improvement in Lighting System	24 hours	IRC: SP:84-2019
		No major failure in the lighting system			Daily	-	Rectification of failure	24 hours	IRC: SP:84-2019
		No minor failure in the lighting system			Monthly	-	Rectification of failure		IRC: SP:84-2019
	Toll Plaza Canopy Lights	Minimum 40 Lux illumination on the road surface			Daily	The illumination level shall be measured with lux- meter	Improvement in Lighting System	24 hours	IRC: SP:84-2019

Asset Type	Performance Parameter	Level of Service (LOS)			Frequency of Measurement	Testing Method	Recommended Remedial Measures	Time limit for Rectification	Specifications and Standards
		Design Speed (kmph)	Desirable Minimum Sight Distance (m)	Safe Stopping Sight Distance (m)					
		No major/minor failure in the lighting system			Daily	-	Rectification of failure	8 hours	IRC: SP:84-2019
Trees and plantation including median plantation	Obstruction in a minimum head- room of 5.5 m above carriageway or obstruction in visibility of road signs				Monthly	Visual with video/image backup	Removal of trees	Immediate	IRC: SP:84-2019
	Deterioration in health of trees and bushes				Daily	Visual with video/image backup	Timely watering and treatment. Or Replacement of Trees and Bushes.	Within 90 days	IRC: SP:84-2019
	Vegetation affecting sight line and road structures				Daily	Visual with video/image backup	Removal of trees	Immediate	IRC: SP:84-2019
Rest Area	Cleaning of toilets				Daily	-	-	Every 4 hours	-
	Defects in electrical, water and sanitary installations				Daily	-	Rectification	24 hours	-
Other Project Facilities and Approach roads	Damage or deterioration in Approach Roads, pedestrian facilities, truck lay-bys, bus-bays, bus-shelters, cattle crossings, Traffic Aid Posts, Medical Aid Posts, and other works				Daily	-	Rectification	15 Day	IRC: SP:84-2019

Table 4: Maintenance Criteria for Structures and Culverts

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specifications and Standards
Pipe/box/slab culverts	Free waterway/unobstructed flow section	85% of culvert normal flow area to available.	2 times in a year (before and after rainy season)	Inspection by Bridge Engineer as per IRC SP: 35- 1990 and recording of depth of silting and area of vegetation	Cleaning silt up soils and debris in culvert barrel after rainy season, removal of bushes and vegetation, U/s of barrel, under barrel and D/s of barrel before rainy season.	15 days before onset of monsoon and within 30 days after end of rainy season.	IRC 5-2015, IRC SP:40-2019 and IRC SP:13-2004
	Leak-proof expansion joints if any	No leakage through expansion joints	Bi-Annually	Physical inspection of expansion joints as per IRC SP: 35- 1990 if any, for leakage strains on walls at joints.	Fixing with sealant suitably	30 days or before onset of rains whichever comes earlier	IRC SP:40-2019 and IRC SP:69-2011
	Structurally sound	Spalling of concrete not more than 0.25 sq.m.	Bi-Annually	Detailed inspection of all components of culvert as per IRC SP:35-1990 and recording the defects	Repairs to spalling, cracking, delamination, rusting shall be followed as per IRC: SP:40-2019.	15 days	IRC SP 40-2019 and MORTH Specifications clause 2800
		Delamination of concrete not more than 0.25 sq.m. Cracks wider than 0.3 mm not more than 1m aggregate length					
Protection works in good condition	Damaged of rough stone apron or bank	2 times in a year (before and after rainy	Condition survey as per IRC SP:35-1990	Repairs to damaged aprons and	30 days after defect observation or	IRC: SP 40-2019 and IRC: SP:13-2004.	

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specifications and Standards
		revelment not more than 3 sq.m, damage to solid apron (concrete apron) not more than 1 sq.m	season)		pitching	2 weeks before onset of rainy season whichever is earlier.	
Bridges including ROB's, Flyover and Viaducts etc. as applicable	Riding quality or user comfort No pothole in wearing coat on	No pothole in wearing coat on bridge deck	Daily	Visual inspection as per IRC SP:35-1990	Repairs to BC or wearing coat	15 days	MORT&H Specification 2811
Bridges including ROB's, Flyover and Viaducts etc. -Super Structure	Bumps	No bump at expansion joint	Daily	Visual inspection as per IRC SP:35-1990	Repairs to BC on either side of expansion joints, profile correction course on approach slab in case of settlement to approach embankment	15 days	MORT&H Specification 3004.2 & 2811
	User safety (condition of crash barrier and guard rail)	No damaged or missing stretch of crash barrier or pedestrian hand railing	Daily	Visual inspection and detailed condition survey as per IRC SP: 35- 1990	Repairs and replacement of safety barriers as the case may be	3days	IRC: 5-2015, IRC SP: 84-2019 and IRC SP: 40- 2019
	Rusted reinforcement	Not more than 0.25 sq.m	Bi-Annually	Detailed condition survey as per IRC SP: 35-1990 using Mobile Bridge Inspection unit.	All the corroded reinforcement shall need to be thoroughly cleaned from rusting and applied with anti-corrosive coating	15 days	IRC SP: 40-2019 and MORTH Specification 1600 IRC SP: 40-2019 and MORTH Specification
	Spalling of concrete	Not more than 0.50 sq.m					
	Delamination	Not more than 0.50 sq.m					

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specifications and Standards
					before carrying out the repairs to affected concrete portion with epoxy mortar/concrete.		
	Cracks wider than 0.30 mm	Not more than 1m total length	Bi-Annually	Detailed condition survey as per IRC SP: 35-1990 using Mobile Bridge Inspection Unit.	Grouting with epoxy mortar, investigating causes for cracks or other defects development and carry out necessary rehabilitation.	48 Hours	IRC SP: 40-2019 and MORTH Specification 2800
	Rainwater seepage through deck slab	Leakage - nil	Quarterly	Detailed condition survey as per IRC SP: 35-1990 using Mobile Bridge Inspection Unit.	Grouting of deck slab at leakage areas, waterproofing, repairs to drainage spouts	1 month	MORTH specifications 2600 & 2700.
	Deflection due to permanent loads and live loads	Within design limits.	Once in every 10 years for spans more than 40 m	Load test method	Carry out major rehabilitation works on bridge to retain original design loads capacity	6 months	IRC SP: 51-2015
	Vibrations in bridge deck due to moving trucks	Frequency of vibrations shall not be more than 5 Hz	Once in every 5 years for spans more than 30m and every 10 years for spans between 15 to 30	Laser displacement sensors or laser vibro- meters	Strengthening of super structure	4 months	AASHTO, LRFD specifications
	Leakage in Expansion joints	No damage to elastomeric sealant	Bi-Annually	Detailed condition survey as per IRC SP:	Replacement of seal in expansion joint. Replacement	15 days	MORTH specifications 2600 and IRC

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specifications and Standards
		compound in strip seal expansion joint, no leakage of rainwater through expansion joint in case of buried and asphalt plug and copper strip joint.		35-1990. using Mobile Bridge Inspection Unit.	of Sealing compound in case of leakage I copper strip type joint.		SP: 40- 2019.
	Debris and dust in strip seal expansion joint	No dust or debris in expansion joint gap.	Monthly	Detailed condition survey as per IRC SP: 35-1990. using Mobile Bridge Inspection Unit.	Cleaning of expansion joint gaps thoroughly	3 days	MORTH specifications 2600, IRC SP: 40-2019 and IRC: SP:69-2011
	Drainage spouts	No down take Pipe missing/broken below soffit of the deck slab. No silt, debris, clogging of drainage spout collection chamber.	Monthly	Detailed condition survey as per IRC SP: 35-1990. using Mobile Bridge Inspection Unit.	Cleaning of drainage spouts thoroughly. Replacement of missing/broken down take pipes with a minimum pipe extension of 500mm below soffit of slab. Providing sealant around the edrainage spout if any leakages observed.	3 days	MORTH specification 2700
Bridges including ROB"s, Flyover and	Cracks/ spalling of concrete /rusted steel	No cracks, spalling of concrete and rusted steel	Bi-Annually	Detailed condition survey as per IRC SP: 35-1990 using Mobile Bridge	All the corroded reinforcement shall need to be thoroughly cleaned	30 days	IRC SP: 40-2019 and MORTH specification 2800

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specifications and Standards
Viaducts etc.- Bridge Substructure				Inspection Unit.	from rusting and applied with anti-corrosive coating before carrying out repairs to substructure by grouting/guniting and micro concreting depending on type of defect noticed		
	Elastomeric Bearings	Delamination of bearing reinforcement not more than 5%, cracking or tearing of rubber not more than 2 locations per side, no rupture of reinforcement or rubber	Bi-Annually	Detailed condition survey as per IRC SP: 35-1990 using Mobile Bridge Inspection Unit.	In case of failure of even one bearing on any pier/abutment, all the bearings on that pier/abutment shall be replaced, in order to get uniform load transfer on to bearings.	3 months	MORTH specification 2810, IRC SP: 40-2019 and IRC:83 (Part-II)-2018
	POT/PFFE and Spherical Bearings	No locking of movable and rotational parts, No Corrosion, Cleanliness	Bi-Annually	Detailed condition survey as per IRC SP: 35-1990 using Mobile Bridge Inspection Unit.	Unlocking of affected parts, Cleaning of Rust and repainting. General Cleaning of bearings.	30 days	IRC:83 (Part-III)-2018, IRC:83 (Part-IV)-2014
Bridges including ROB"s, Flyover and Viaducts etc. - Bridge	Scouring around Foundations	Scouring shall not be lower than maximum scour level for the bridge	Bi-Annually	Condition survey and visual inspection as per IRC SP:35-1990 using Mobile Bridge Inspection Unit. In	Suitable protection works around pier/abutment	1 month	IRC SP: 40-2019, IRC: 89-2019, IRC:78-2014, MORTH specification 2500



Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specifications and Standards
Foundations				case of doubt Underwater camera for Inspection of deep wells in Major Rivers.			
	Protection works in good condition	Damaged of rough stone apron or bank revetment not more than 3 sq.m, damage to solid apron (concrete apron) not more than 1 sq.m	2 times in a year (before and after rainy season)	Condition survey as per IRC SP:35-1990	Repairs to damaged aprons and pitching	30 days after Defect observation or 2 weeks before onset of rainy Season whichever is earlier.	IRC: SP 40-2019, IRC: SP:13- 2004 and IRC:89-2019

**Note:**

1. Any structure / part of the structure component during entire concession period which is found not complying with all /or either of the requirements of this table will be rehabilitated or even reconstructed to achieve the desired level of services.
2. MoRT&H Specification for Roads and Bridge works (Vth Revision) shall be applicable.
3. IRC Codes indicated above shall be applicable as per year of publication in consonance with the start of project implementation.

**Annexure D: Service Level Agreement:**

- (i) The uptime availability of all critical components of Hybrid ETC/ETC lanes shall be 99% per lane per month for 90% of total lanes in a toll plaza (rounded off to nearest integer). The permissible downtime is 7 hours per lane per month. For the balance 10% lanes, uptime availability of all critical components shall be 98% per lane per month.
- (ii) The downtime for a toll lane shall be calculated at a cumulative level when any of the below mentioned critical component is non-operational for that specific lane:
- a. RFID Reader
  - b. Toll Lane Controller System
  - c. Automatic Vehicles Classification Controller and Sensor
  - d. Automatic Barrier
  - e. Customized Keyboard
  - f. Thermal Receipt Printer
  - g. License Plate Image Capture Camera
  - h. Incident Capture Camera
  - i. Any plaza level Equipment that results in lane downtime.
- (iii) For all the components of Hybrid ETC/ETC System, the uptime availability shall be 98% per lane per month.
- (iv) Scheduled downtime is defined as a period of time when system will remain unavailable for conducting necessary preventive maintenance, urgent repairs etc. The maximum scheduled downtime for any Site shall be 4 hours per lane per month.
- (v) The formula for calculation of Hybrid ETC System availability shall be as follows:  

$$\text{System Uptime} = [1 - \{A/(B-C)\} * 100]$$
Where A = Time for which system is down per month basis scenarios  
B = Total time in a month  
C = Scheduled downtime basis as per section (iv) above.
- (vi) The Concessionaire shall maintain adequate inventory to ensure the service level's prescribed in section i. are adhered. Spares of critical components of Hybrid ETC/ETC System as identified in section (ii) above.
- (vii) The Concessionaire shall ensure that the Hybrid ETC/ETC Systems are operational as per the service levels defined in section (i) above to facilitate payment of user fee through ETC. In case, a vehicle user with a valid, functional ETC RFID tag with sufficient balance in the linked account is not able to pay user fee through ETC, through any lane owing to malfunctioning of Hybrid ETC/ETC equipment/hardware, the vehicle user shall be permitted to pass without payment of any user fee.
- (viii) In case of non-adherence to service levels as defined in section (i), Damages shall be levied on each lane as per the below table. This shall be over and above the Damages described in clause G:

S. No.	Downtime (per month)	Toll plazas with less than or equal to 10 lanes	Toll plazas with greater than 10 lanes
<b>A</b>	<b>Per Lane (beyond permissible limit)</b>	<b>Damages (% of monthly user fee revenue as per Escrow Account or as reported in [Schedule G] of Concession Agreement whichever is higher)</b>	<b>Damages (% of monthly user fee revenue as per Escrow Account or as reported in Schedule G of Concession Agreement whichever is higher)</b>
1	Up to 2 hours	1%	0.5%
2	2 hours – 5 hours	3%	1%
3	5 hours – 10 hours	4%	2%
4	Greater than 10 hours	5%	3%
<b>B</b>	<b>SWB System Downtime</b>		
If SWB information is not available in Overweight transactions		Deductions = SWB downtime in hours (per month) X 0.5% of monthly user fee revenue as per Escrow Account or as reported in Schedule G of Concession Agreement whichever is higher * This shall be calculated for each SWB separately and added to arrive at the final Damages for SWB.	

The total Damages for a month shall be calculated by adding the Damages imposed on each lane and SWB at the Toll Plaza. The maximum Damages per month shall be capped at Rs. 25,00,000 which may be revised to the extent of variation in WPI after every three years from the date of signing of the Agreement. An INDICATIVE example is shown in the table below:

Example – 6 lane toll plaza		
Estimated user fee revenue (as per Escrow Account or as reported in Schedule G whichever is higher)	INR 40,000,000 per month (INDICATIVE)	
Lane	Downtime (outside SLA in minutes)	Damages
Lane 1	40	4,00,000
Lane 2	0	
Lane 3	30	4,00,000
Lane 4	100	4,00,000
Lane 5	140	12,00,000
Lane 6	0	0
<b>Total Damages</b>		<b>24,00,000</b>

B. The Concessionaire shall ensure that all transaction files are uploaded as per defined service levels provided in the table below:

S. No.	Service	Service Level	Recipient	Service Provide	Remarks
1	Sending clean TC transactions from ETC system at the Specified Toll Plaza to ACQUIRER HOST	Sending clean transaction files in the specified format on a 10 minutes batch mode 24*7.  This duration can be modified by IHMCL/NHA at its discretion	ACQUIRER HOST	Concessionaire/Toll Plaza Operator ETC system at Specified Toll Plaza	Clean transaction files should be sent in the file format as prescribed in the interface control documents of CCH. Transactions sent in incorrect file format will be rejected by ACQUIRER HOST and would need to be re-sent within the defined SLA Proceeds of the

S. No.	Service	Service Level	Recipient	Service Provide	Remarks
					transaction amount of such incorrect file formats will not be credited to Concessionaire/Toll Plaza Operator till file is re-sent inn correct file format within the timeline specified by ACQUIRER HOST.
2	ETC Transaction File/Violation File Acknowledgement	Once in a day.  This duration can be modified by IHMCL/NHAI at its discretion.	Concessionaire/Toll Plaza Operator ETC system at Specified Toll Plaza	ACQUIRER HOST	ACQUIRER HOST shall send one reconciliation file for all clean ETC transaction (TRC) and a separate file containing violation transactions (VRC) which were shared by concessionaire as is violation=01. These files will be generated at midnight and posted in SFTP server.
3	Processing violation transactions post scrutiny of supporting document sent by Concessionaire/Toll Plaza Operator to ACQUIRER HOST	T+5 (T being settlement day)  This duration can be modified by IHMCL/NHAI at its discretion.	Concessionaire/Toll Plaza Operator ETC system at Specified Toll Plaza	ACQUIRER HOST	
4	Frequency of sending Black List file to ETC system at Specified Toll Plazas	Every 10 minutes  This duration can be modified by IHMCL/NHAI at its discretion.	Concessionaire/Toll Plaza Operator ETC system at Specified Toll Plaza	ACQUIRER HOST	
5	Populating the Black List file in ETC system and at all ETC lanes of all Specified Toll Plazas	I. Within 10 minutes of receipt from /ACQUIRER HOST	Concessionaire/Toll Plaza Operator ETC system at Specified Toll Plaza	Concessionaire/Toll Plaza Operator	Post 10 minutes TAT of blacklist file being sent by ACQUIRER HOST for updation at ETC system any transaction file received by ACQUIRER HOST from ETC system of toll plaza containing the same blacklisted tag will be rejected by ACQUIRER HOST.
6	Response on chargeback request forwarded	3 Days	Service Provider/ ACQUIRER	ETC Concessionaire/Toll Plaza Operator	Concessionaire/Toll Plaza Operator has to respond within 3 days

S. No.	Service	Service Level	Recipient	Service Provide	Remarks
	by Service Provider/ ACQUIRER HOST		HOST		on all chargebacks request forwarded by/ ACQUIRER HOST.

**Finance related points**

1	Credits of transactions to Concessionaire/ Toll Plaza Operator respective plaza current A/c (for all violation transactions, credit to be done as per the Mapper Class)	T+1 working day  (T being transaction date)	Concessionaire/Toll Plaza Operator ETC collection Current Account/ Account specified by NHA in case of Specified Toll Plaza operated by NHA	ACQUIRER HOST	
2	Credits of Debit Adjustment funds for violation transactions to Concessionaire/ Toll Plaza Operator respective plaza current A/c	Maximum T+6 working days  (T being settlement date)	Concessionaire/Toll Plaza Operator ETC collection Current Account/ Account specified by NHA in case of Specified Toll Plaza operated by NHA	ACQUIRER HOST	
3	Process for handing claims/reversals initiated by ETC Concessionaire / Toll Plaza Operator	Will be treated on case-to-case basis	ETC Concessionaire/Toll Plaza Operator"s Collection A/c	ACQUIRER HOST	

**8.1.15 Testing and Investigation**

After thorough visual inspection and detailed condition survey of various bridge components at 5 years interval and also whenever distress/ serious distress observed in the conditional survey, following test shall need to be carried out: -

S. No	Name of Tests	Minimum no. of tests sample per span/pier/abutment	Minimum no. of spans to tested in a bridge	Frequency of testing
1	Ultra-Pulse Velocity Test	3	1 span for every 3 spans	5 Years
2	Rebound Hammer Test	3	1 span for every 3 spans	5 Years
3	Half Cell Potential Test	3	1 span for every 3 spans	5 Years
4	Carbonation Depth	3	1 span for every 3 spans	5 Years
5	Transient Dynamic Response test	3	1 span for every 3 spans	5 Years
6	Laser vibrometer test	1 at mid span	1 span for every 3 spans	Once every 5 years for spans more than 30m and every 10 years for spans between 15 to 30m

- 8.1.16 The results of tests like Profilometer/Transient Dynamic Response tests, the encrypted files should be submitted to the Authority and Independent Consultant. The results of tests conducted shall be updated in Asset Management System and should be preserved.
- 8.1.17 For all the items in Table 4 for which Priority Level is critical, redundant inventory shall be maintained at site for all times by the concessionaire.
- 8.1.18 The Concessionaire shall maintain the Project Highway in traffic-worthy condition and the Project's Ancillary 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.
- 8.2 Based on updated base parameter and future demand of traffic and service needs, Concessionaire shall define an asset management strategy/operation and maintenance plan.
- 8.3 Asset Management Plan – Operations
- Asset Management plan on the operation side shall prescribe procedures and systems for activities including but not be limited to the following for the regular and emergency operations of the Project Highway and facilities thereon.
- Permitting smooth and uninterrupted flow of traffic during normal operating conditions
  - Functioning of Toll System including charging and collecting fees from the road users in accordance with the Concession Agreement and IRC: SP 84-2019
  - Functioning of the lighting system
  - Functioning of the Patrolling System as per IRC: SP 84-2019
  - Functioning of rescue and medical aid services
    - Ambulance
    - Fire Brigade
    - Tow away truck and cranes
  - Functioning of Advanced Traffic Highways Management System as per standard ATMS provisions as contained in Functional and Technical Specifications released by the NHAI vide Ref.No. NHAI/CO/ATMS/02-2021, February is being practiced. Latest Policy / Circular at the time of execution shall prevail.
  - Functioning of the Project Facilities
    - Administrative, Operation and Maintenance Base Camp
    - Rest Areas
    - Truck Lay-Byes
    - Public toilets and other sanitary facilities at rest areas and Truck Lay-Byes
    - Potable Water supply system including supply of drinking water at Truck Lay-Byes, Rest Areas, Toll Plazas etc.

- Solid wastes disposal system including those from litterbins

- 8.3.1 Minimizing disruption to the traffic in the event of emergency accidents and/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, hurricane, and earthquakes.
  - Failure of a system due to human error, electrical or mechanical failure.
- 8.3.2 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 update/report the same on Asset Management System.



**SCHEDULE –H**  
*(See Clause 18.1.1)*

**SAFETY REQUIREMENTS**

**1** Guiding principles

- 1.1. Safety Requirements aim at reduction in injuries, loss of life and damage to property resulting from accidents on the Project Highway, irrespective of the person(s) at fault.
- 1.2. Users of the Project Highway include motorised and non-motorised vehicles as well as pedestrians and animals involved in or associated with accidents. Vulnerable Road Users (VRU) include pedestrians as well as riders of motorised two-wheelers, bicycles and other vehicles which do not provide adequate occupant protection.
- 1.3. Safety Requirements apply to all phases of construction, operation and maintenance with emphasis on identification of factors associated with accidents, consideration of the same, and implementation of appropriate remedial measures.
- 1.4. Safety Requirements include measures associated with traffic management and regulation such as road signs, pavement marking, traffic control devices, roadside furniture, highway design elements, enforcement and emergency response.

**2** Obligations of the Concessionaire

The Concessionaire shall abide by the following insofar as they relate to safety of the Users:

- (a) Applicable Laws and Applicable Permits;
- (b) Manual for Safety in Road Design, issued by MORTH;
- (c) Relevant Standards/Guidelines of IRC relating to safety, road geometrics, bridges, culverts, road signs, pavement marking and roadside furniture;
- (d) Provisions of this Agreement; and
- (e) Good Industry Practice.

**3** Appointment of Safety Consultant

For carrying out safety audit of the Project Highway under and in accordance with this Schedule-H, the Authority shall appoint from time to time, qualified firms or organizations as its consultants (the "Safety Consultant"). The Safety Consultant shall employ a team comprising, without limitation, one road safety expert and one traffic planner to undertake safety audit of the Project Highway.

**4** Safety measures during Development Period

- 4.1 No later than 90 (ninety) days from the date of this Agreement, the Authority shall appoint a Safety Consultant for carrying out safety audit at the design stage of the Project. The Safety Consultant shall collect data on all fatal crashes and other road accidents which occurred on the Project Highway in the preceding two years by obtaining copies of the relevant First Information Reports (FIRs) from the police stations having jurisdiction. The information contained in such FIRs shall be summarized in the form prescribed by IRC/MORTH for this purpose and the data shall be analysed for the type of victims killed or injured, impacting vehicles, location of accidents and other relevant factors.
- 4.2 The Concessionaire shall provide to the Safety Consultant, in four copies, the relevant drawings containing the design details that have a bearing on safety of Users (the "Safety Drawings"). Such design details shall include horizontal and vertical alignments; sightlines; layouts of intersections;



interchanges; road cross-section; bridges and culverts; side drains; provision for parked vehicles, slow moving vehicles (tractors, bullock carts, bicycles) and pedestrians; bus bays; truck lay-bys; and other incidental or consequential information. The Safety Consultant shall review the design details and forward three copies of the Safety Drawings with its recommendations, if any, to the Independent Engineer who shall record its comments, if any, and forward one copy each to the Authority and the Concessionaire.

- 4.3 The accident data and the design details shall be compiled, analysed and used by the Safety Consultant for evolving a package of recommendations consisting of safety related measures for the Project Highway. The safety audit shall be completed in a period of three months and a report thereof (the "Safety Report") shall be submitted to the Authority, in five copies. One copy each of the Safety Report shall be forwarded by the Authority to the Concessionaire and the Independent Engineer forthwith.
- 4.4 The Concessionaire shall Endeavour to incorporate the recommendations of the Safety Report in the design of the Project Highway, as may reasonably be required in accordance with Applicable Laws, Applicable Permits, Manuals and Guidelines of MORTH and IRC, Specifications and Standards, and Good Industry Practice. If the Concessionaire does not agree with any or all of such recommendations, it shall state the reasons thereof and convey them to the Authority forthwith. In the event that any or all of the works and services recommended in the Safety Report fall beyond the scope of Schedule-B, the Concessionaire shall make a report thereon and seek the instructions of the Authority for funding such works in accordance with the provisions of Article 18.
- 4.5 Without prejudice to the provisions of Paragraph 4.4, the Concessionaire and the Independent Engineer shall, within 15 (fifteen) days of receiving the Safety Report, send their respective comments thereon to the Authority, and no later than 15 (fifteen) days of receiving such comments, the Authority shall review the same along with the Safety Report and by notice direct the Concessionaire to carry out any or all of the recommendations contained therein with such modifications as the Authority may specify; provided that any works or services required to be undertaken hereunder shall be governed by the provisions of Article 18.
- 5 Safety measures during Construction Period
- 5.1. A Safety Consultant shall be appointed by the Authority, no later than 4 (four) months prior to the expected Project Completion Date, for carrying out a safety audit of the completed Construction Works.
- 5.2. The Safety Consultant shall collect and analyse the accident data for the preceding two years in the manner specified in Paragraph 4.1 of this Schedule-H. It shall study the Safety Report for the Development Period and inspect the Project Highway to assess the adequacy of safety measures. The Safety Consultant shall complete the safety audit within a period of 4 (four) months and submit a Safety Report recommending a package of additional road safety measures, if any, that are considered essential for reducing accident hazards on the Project Highway. Such recommendations shall be processed, *mutatis mutandis*, and acted upon in the manner set forth in Paragraphs 4.3, 4.4 and 4.5 of this Schedule-H.
- 5.3. The Concessionaire shall make adequate arrangements during the Construction Period for the safety of workers and road Users in accordance with the guidelines of IRC for safety in construction zones, and notify the Authority and the Independent Engineer about such arrangements. All the safety arrangements shall be photographed and geocoded images with date and time stamp shall be submitted after completion of each activity.

6. Safety measures during Operation Period

- 6.1. The Concessionaire shall develop, implement and administer a surveillance and safety programme for Users, including correction of safety violations and deficiencies and all other actions necessary to provide a safe environment in accordance with this Agreement.
- 6.2. The Concessionaire shall establish a Highway Safety Management Unit (the "HSMU") to be functional on and after Appointed Date and designate one of its officers to be in-charge of the HSMU. Such officer shall have specialist knowledge and training in road safety and traffic engineering by having attended a course conducted by a reputed organization on the subject.
- 6.3. The Concessionaire shall keep a copy of every FIR recorded by the Police with respect to any accident occurring on the Project Highway. In addition, the Concessionaire shall also collect data for all cases of accidents not recorded by the Police but where a vehicle rolled over or had to be towed away. The information so collected shall be summarized in the form prescribed by IRC/ MORTH for this purpose. The Concessionaire shall also record the exact location of each accident on a road map. The aforesaid data shall be submitted to the Authority at the conclusion of every quarter and to the Safety Consultant as and when appointed.
- 6.4. The Concessionaire shall submit to the Authority before the 31st (thirty first) May of each year, an annual report (in ten copies) containing, without limitation, a detailed listing and analysis of all accidents of the preceding Accounting Year and the measures taken by the Concessionaire pursuant to the provisions of Paragraph 6.1 of this Schedule-H for averting or minimizing such accidents in future.
- 6.5. Once in every Accounting Year, a safety audit shall be carried out by the Safety Consultant to be appointed by the Authority. It shall review and analyse the annual report and accident data of the preceding year, and undertake an inspection of the Project Highway. The Safety Consultant shall complete the safety audit within a period of 1 (one) month and submit a Safety Report recommending specific improvements, if any, required to be made to the road, bridges, culverts, markings, signs, road furniture and Project Facilities, including cattle crossings and pedestrian crossings. Such recommendations shall be processed, *mutatis mutandis*, and acted upon in the manner set forth in Paragraphs 4.3, 4.4 and 4.5 of this Schedule-H.
7. Costs and Expenses  
Costs and expenses incurred in connection with the Safety Requirements set forth herein, including the provisions of Paragraph 2 of this Schedule, shall be met in accordance with Article 18, and in particular, the remuneration of the Safety Consultant, safety audit, and costs incidental thereto, shall be met out of the Safety Fund.