File No.RW/NH-34066/01/2020-QCZ

Government of India

Ministry of Road Transport & Highways

(Quality Control Zone)

No.1, Parliament Street, Transport Bhavan, New Delhi-110001

Dated: 1st Oct, 2020

To,

1. The Chief Secretaries of all State Governments/UTs.

2. The Principal Secretaries/ Secretaries of all States/ UTs PWD dealing with National Highways, other centrally sponsored schemes and state schemes.

3. All Engineer-in-Chief and Chief Engineers of all States/ UTs PWD dealing with National Highways, other centrally sponsored schemes and state schemes.

4. The Chairman, National Highways Authority of India (NHAI), G-5&6, Sector-10, Dwarka, New Delhi-110075.

5. The Managing Director, National Highway Infrastructure Development Corporation Ltd., 3rd floor, PTI Building, Parliament Street, New Delhi-110001.

6. Director General (Border Roads), Seema Sadak Bhawan, Ring Road, New Delhi -110010.

7. All CE-ROs, ROs and ELOs of the Ministry.

Subject: Guidelines and Standard Operating Procedure for Quality Control/Assurance in construction of National Highways and other centrally sponsored projects.

Madam/Sir,

The development and maintenance of National Highways is the responsibility of the Central Government and these are being developed and maintained through various executing agencies such as NHAI, NHIDCL, BRO, respective PWD of State

01/10/2020

Governments etc. In the recent past Central Government has launched several schemes for capacity augmentation and development of National Highway network in the country. These schemes require huge quantity of natural and manmade resources, besides large capital investments.

2. The construction of quality roads are not only essential for efficient utilization of national resources and capital cost but also to provide safe and comfortable journey to the road users with minimum operating cost.

3. The construction of National Highways is taken up on various modes such as Build Operate and Transfer (BOT), Engineering Procurement and Construction (EPC), Hybrid Annuity Mode (HAM) etc. Each mode has different roles and responsibilities of various stakeholders regarding fund/resource mobilization, planning, designing, construction and maintenance of Highway facility. Though the contractor is primarily responsible for construction of quality road yet the role of other stakeholders are also equally important to ensure quality control/assurance.

4. The construction of National Highways is carried out as per the standards and specifications laid down in various IRC standards and MoRTH Specification for Road and Bridge works. To ensure quality, field laboratory is to be established and manned by qualified engineers/technician. The quality of natural materials, factory manufactured materials, specialized items, mix items are important for construction of quality roads. The various quality control tests on various ingredients and mixes and their frequencies are stipulated in MoRTH specifications for road and bridge works. As such it is important for all the stakeholders to ensure that all the quality test at the specified frequencies are conducted.

01/10/2020

5. In case quality control/assurance is not ensured as per codal provision of MoRTH/IRC various deficiencies to the finished product may occur. Some of these deficiencies and areas of concern where attention of all the stakeholders is required may be as under:-

a) Inadequacy in thickness of granular/bituminous/concrete layers.

b) Quantity of bitumen as per design mix.

c) Not using specified grade of bitumen.

d) Depression/cracks in concrete slabs.

e) Bituminous mix not conforming to acceptance criteria.

f) All the tests specified in the IRC code/ MoRTH specification for the materials i.e. Bitumen, Cement, Steel, Aggregate etc. and propriety items i.e. expansion joints, bearings etc. must be carried out at site laboratory or by third party, which are most often left out.

g) All the tests required for soil and aggregates.

h) Test on various ingredients and mixes at the specified frequency.

i) Bitumen is to be purchased from oil refineries rather than private agencies.

j) Providing proper slope and compaction of earthen shoulder and embankments.

k) Shifting of utilities are to be done at the extreme boundary of ROW.

l) Deployment of adequate personnel by the contractor and Engineer to ensure quality control/assurance.

m) The quality checks and tests, as specified in contract agreement, are to be witnessed by the Authority's/Independent Engineer.

6. The various aspects of quality control/assurance have been specified in IRC: SP: 112-2017 "Manual for Quality Control in Road and Bridge works" which has to be referred in conjunction with MoRTH specification for road and bridge works. Some

01/10/2020

of the important requirements for implementation of quality assurance system efficiently and role/responsibility of various stakeholders has been highlighted below:

A) Contractor

a) The quality assurance plan incorporating organizational duties, responsibility, procedure, inspection, tests frequencies, acceptance criteria, internal audit etc. shall be submitted by the Contractor for the approval of Authority's/Independent Engineer.

b) The field laboratory shall be set up with adequate equipment and facilities not limited to the provisions as stipulated in clause 120 of MoRTH specification for Road and Bridge works.

c) The field laboratory shall be adequately lit, ventilated, with proper water supply and sanitary arrangements. Separate room shall be arranged for test that uses inflammable substances. The quality control engineer shall regularly ensure about the proper maintenance and upkeep of field laboratory.

d) The personnel responsible for the quality control i.e. Material Engineer, Quality Control Engineer, Lab Technician etc. shall be of proper qualification, experience and expertise. The contractor shall engage adequate number of these personnel for quality control/assurance during the construction as well as maintenance period.

e) Normally most of the tests on factory manufactured materials such as Steel, Bitumen, Cement, Geo-synthetic etc. and specialized items such as bridge bearing, expansion joints, crash barriers etc. are conducted in the manufacturer's laboratory or specialized laboratory. However, certain tests are also to be conducted by the contractor on such materials in the field laboratory as indicated in IRC: SP: 112-2017 to ascertain the quality.

01/10/2020

f) Most of the equipment used in the field laboratory involves measuring devices such as proving rings, dial gauges, load cell, temperature gauges, weighing pads etc. whose accuracy degrade with the passage of time, due to their wear and tear. As such calibration of these devices should be carried out as specified in the IRC:SP:112-2017 to ensure reliability of the material/mix.

g) All the inspection, measuring and testing equipment shall be calibrated with the help of NABL accredited laboratory and verified prior to their use and also at specific interval as specified by the equipment manufacturer and/or other standards available in this regard including IRC:SP:112-2017.

h) All the Plant, Equipment and Machinery deployed in the project are to be regularly calibrated and maintained for their intended use by the contractor. Some of the calibrations can be done at site by an external agency which is qualified and accredited to perform a specific calibration. For details including frequency of calibration IRC: SP: 112-2017 may be referred.

i) The performance of the paver and grader etc. in producing the desired workmanship and finished properties shall be verified in the field and suitable corrections shall be made to the equipment/processes. The plant or equipment, which is unable to produce the desirable quality at site shall be removed and replaced with the approved equipment as per contract.

j) All the ingredients of GSB, WMM, Bitumen layer, concrete etc. shall be tested on day to day basis at various stages including in stock piles, bins, dry mix, final mix loaded in the truck and at field as applicable and relevant.

k) Samples shall be collected from the pavement layers prior to compaction and after compaction to verify the properties of mix including its density etc.

l) Process parameters viz. moisture, temperature, line and level shall be checked prior to compacting the layers so that the end product fulfils the requirements of the specifications.

m) Some of the tests may have to be conducted in the third party laboratories in case of special tests and also if the contractor does not have the test equipment and

01/10/2020

expertise to carry out the tests which include special tests on Cement, Bitumen, Steel Bearings, Aggregate, Geo-synthetic, Reinforced Earth fill, stone polishing value of aggregate etc.

n) The Contractor shall maintain all the records/documents for quality control/assurance and handover a copy of it to the Authority's/Independent Engineer before the completion certificate is issued.

B) Authority's/Independent Engineer

a) The quality assurance plan submitted by the contractor shall be approved by the Authority's/Independent Engineer.

b) The Authority's/Independent Engineer shall approve the field laboratory of the contractor and ensure its proper maintenance/upkeep.

c) The personnel responsible for the quality control i.e. Material Engineer, Quality Control Engineer, Lab Technician etc. shall be of required knowledge, experience and expertise. The Independent/Authority's Engineer shall engage adequate number of these personnel for quality control/assurance.

d) The Authority's/Independent Engineer shall witness certain percentage of in-house tests conducted by the manufacturer/supplier and check the test reports for all the factory manufactured materials such as Steel, Bitumen, Cement, Geo-synthetic etc. and specialized items such as bridge bearing, expansion joints, crash barriers etc.

e) The Authority's/Independent Engineer based on quality assurance plan and certain test report/test conducted on the factory manufactured items shall approve the source of supply for such factory made items. The manufactured material shall be tested at field laboratory and in the accredited laboratory as relevant, as determined by the Authority's/Independent Engineer.

01/10/2020

f) The Authority's/Independent engineer shall ensure and certify about the calibration of measuring devices such as proving rings, dial gauges, load cell, temperature gauges, weighing pads etc. used in the field laboratory.

g) The Authority's/Independent Engineer shall regularly ensure that the contractor carry out the calibration of all the Plants, Equipment and Machinery deployed in the projects on regular basis for their intended use.

h) The Authority's/Independent Engineer shall verify and check the performance of the paver and grader etc. in producing the desired workmanship and finished properties. If required, suitable corrections shall be got made to the equipment/processes or equipment replaced so that desired quality is achieved at site.

i) The Authority's/Independent Engineer shall ensure that all the ingredients of GSB, WMM, Bitumen layer, concrete etc. are tested on day to day basis at various stages including in stock piles, bins, dry mix, final mix loaded in the truck and at field as applicable and relevant and also witness requisite test and issue his acceptance before laying next layer.

j) The Authority's/Independent Engineer shall ensure collection of samples from the pavement layers prior to compaction and after compaction to verify the properties of the mix including its density etc.

k) Process parameters viz. moisture, temperature, line and level shall be checked by the Authority's/Independent Engineer, prior to compacting the layers so that the end product fulfils the requirements of the specifications.

l) In-process inspection and final inspection against a standard checklist given in MoRTH specification should be ensured by the Authority's/Independent Engineer for proper quality of work as per specifications and standards.

m) The Authority's/Independent Engineer shall also witness certain percentage of quality tests as specified in the Contract Agreement of the respective works. In case of EPC mode, the recently issued documents specify test checks by the Authority's Engineer at least 50% of the quantity or number of tests described for

01/10/2020

each category or types of test for quality control. In case of HAM, the percentage of quality tests to be witnessed is 10%.

n) The Authority's/Independent Engineer shall submit a monthly inspection report to the Authority and the Contractor bringing out the result of inspection along with Non Conformance Report (NCR), if any. Such monthly inspection reports including details of non-conformance shall be uploaded on PMIS portal every month during construction and O&M period. Wherever a material/work does not pass acceptance criteria as per MoRTH specifications for road and bridge work and additional quality characteristic for factory manufactured and specialized items, the Authority's/Independent Engineer has to decide following option in accordance with the condition of contract/specification

i) The work to be re-carried out to meet acceptance criteria.

ii) The work to be accepted with reduce pay factor.

iii) The material may be re-graded for alternate use.

iv) The work may be rejected and replaced.

o) Some of the tests may have to be conducted in the third party laboratories in case of special tests and also if the contractor does not have the test equipment and expertise to carry out the tests which include special tests on Cement, Bitumen, Steel Bearings, Aggregate, Geo-synthetic, RE fill, stone polishing value of aggregate etc. The Authority's/Independent Engineer can also order confirmatory tests in external laboratory, even though the contractor has the test facility at site laboratory.

p) Authority's/Independent Engineer shall perform as per obligations under Terms of Reference (TOR) with respect to inspection on daily, weekly and monthly basis and report to the Authority.

q) The Authority's/Independent Engineer shall ensure that the Contractor submits all the records/documents for quality control/assurance and handover a copy of it to the Authority before the completion certificate is issued.

01/10/2020

r) The completion certificate is to be issued by the Authority's/Independent Engineer with the prior approval of Authority, as per provision of the Contract Agreement. The Authority's/Independent Engineer should ensure that a video of completed work on the date of completion should invariably be prepared and furnished as an authentic documentary evidence of completion of works within 15 days of completion without which completion certificate should not be issued. Authority's Engineer, apart from furnishing a certificate of completion and all tests as per specifications in accordance with contract, would also certify that all NCRs issued during the contract have been closed after successful rectification of defects within the completion date.

s) The Authority's Engineer shall carry out all the requisite tests on completion of the work using equipments such as Network Survey Vehicle (NSV), Falling Weight Deflectometer (FWD), Mobile Bridge Inspection Unit (MBIU), Retro-reflectometer etc. Further these tests shall also be conducted at interval as specified in the contract/ extant guidelines of Ministry so as to ensure the road components meets all the performance parameters as defined in the schedules/ contract agreement. The frequency of such tests may be as under:

(i) Network Survey Vehicle (NSV): For testing of surface defects and roughness of pavement- As per contract/ extant guidelines

(ii) Falling Weight Deflectometer (FWD): For testing of strength of pavement- As per contract/ At least once a year

(iii) Mobile Bridge Inspection Unit (MBIU): For assessment of bridge conditions - As per contract/ At least twice a year

(iv) Retro-reflectometer: For testing of road signs- As per contract/ At least twice a year

C) PIU/PWD Division/ Regional Office.

01/10/2020

a) The Superintending Engineers or Executive Engineers of State PWD/Project Directors / Regional Officers or its officers shall devote more time for inspection of the work and shall also ensure that certain quality tests during execution of the work and also on completion of the work are performed in their presence and also upload the inspection report on PMIS portal.

b) The Regional Officers /its officers shall visit as per circular dated 18.03.2020 (copy enclosed for ready reference) during the construction and Operation & Maintenance period of the projects, preferably during the stage when bituminous work/concrete work is being carried out by the contractor. During the visit, some tests shall also be performed during his/her presence. Regional Officer may also depute his officer for such inspection, however, the overall responsibilities of monitoring of quality assurance shall lie with the Regional Officer. Such inspection reports of Regional Officers/its officers covering comments on quality of works shall also be uploaded on PMIS portal. Regional Officers/ its officers shall also inspect some of the centrally sponsored projects such as CRF, EI & ISC etc. and submit inspection report inter-alia including report on quality assurance/control followed in the execution of works, to all concerned. A suggestive format of inspection report is attached at Annexure-I.

c) The Regional Officers or its officers/Superintending Engineers or Executive Engineers of State PWD/Project Directors have to ensure that all works are being executed strictly in accordance with the requirement of the MoRTH specifications. He/She shall ensure that the contractor has setup a field laboratory with adequate equipment and personnel in order to carry out quality control test for works as per specifications of MoRTH. A certificate in this regard shall be issued by the Regional Officers/ Project Directors while countersigning the very first bill of the contractor.

d) The details of such tests performed by the Regional Officers or its officers/Superintending Engineers or Executive Engineers of State PWD/Project Directors as mentioned above shall be indicated in the bills to be countersigned/ signed by the Regional Officers or its officers/Superintending Engineers or Executive Engineers of State PWD/Project Directors before releasing the final bill.

01/10/2020

e) The Regional Officers/its officers shall not delay in releasing/counter signing the bill of the contractor. The time limit prescribed in the contract agreement for making the payment to the contractors is to be adhered by the Regional Officers.

f) The completion certificate is to be issued by the Authority's/Independent Engineer with the prior approval of Authority, as per provision of the Contract Agreement. Therefore, all Executing Agencies (NHAI, NHIDCL, State PWDs, and BRO etc.) should ensure that the completion certificate is approved after verifying/ confirming that all works/ items including ancillary items forming part of the project Highway are completed in all respect conforming to the Standards & Specifications of the Ministry. A video of completed work on the date of completion should invariably be prepared and submitted as an authentic documentary evidence of completion of work.

g) The Regional Officers/ Project Directors of MoRTH, NHAI, NHIDCL etc. should also verify/ confirm that the work has been completed in all respects, before considering the payment of final bill/ bonus etc. as per extant Guidelines.

D) Quality Control Zone

a) Formulation of policy guidelines, dissemination of information on practices and suggesting measures/issuing direction for system improvement on Quality Assurance & Quality Control for National Highway works as well Centrally Sponsored Schemes among Executing Agencies (State & UT PWDs/ NHAI/NHIDCL/BRO) of this Ministry.

b) Quality Control Zone set up in the Ministry may request any Regional Officer of the Ministry/NHAI/NHIDCL/BRO and/or officers of PWD etc. to submit the documents related to the quality control/assurance and their inspection report of any project under their jurisdiction. Based on such documents received in the Quality Control Zone and their inspection report, further instructions may be issued for necessary compliance including non-acceptance of some of the works completed without following the due procedure as stipulated in the quality assurance plan or not meeting the quality standards as stipulated in the IRC Codes/MoRTH specifications.

01/10/2020

c) An Officer of Quality Control Zone or a team with or without NLPM may select any of the project of Ministry/NHAI/NHIDCL/BRO, on random basis and may inspect the records/documents related to quality control/assurance. The Officer of Quality Control Zone or a team may also carry out certain tests in their presence to check the quality of the ingredients & mix and acceptance properties of finished work etc. Based on such inspection of Quality Control Zone, instructions with the approval of Secretary (RT&H) may be issued to the PIU/ PWD Division/ RO Office for necessary compliance.

7. An indicative checklist consisting the roles and responsibilities of various stakeholders for quality control/ assurance is also attached at Annexure-II.

8. This issues with the approval of Secretary (RT&H).

Yours faithfully,

01/10/2020

(Mohd Zaid)
Assistant Executive Engineer
(Quality Control Zone)

Copy to:

1. All Technical Officers at the Headquarters
2. Secretary General, Indian Roads Congress
3. Director, IAHE, NOIDA
4. PPS to Secretary (RTH), PPS to DG (RD) &SS, PS to AS&FA, PS to ADG-I/II/III/IV.
5. NIC-with request to upload on the Ministry's portal.

ANNEXURE-I

Format of Inspection Note of RO

<table>
<tr><td colspan="2">Inspection Note of ..... (Name of Officers) ..... on .....</td></tr>
<tr><td>Name of Inspecting Officers :
Date :
Name of work :
Contractor / Concessionaire :
Consultant / Authority Engineer Firm.
Team Leader.
Project Incharge</td><td></td></tr>
<tr><td>Project Particulars (Km)</td><td></td></tr>
<tr><td>Length (Km)</td><td></td></tr>
<tr><td>Major Bridge/ Structure No.</td><td></td></tr>
<tr><td>Minor Bridge/ Structure No.</td><td></td></tr>
<tr><td>Sanctioned Cost</td><td></td></tr>
<tr><td>Date of Sanction</td><td></td></tr>
<tr><td>Tendered Amount</td><td></td></tr>
<tr><td>Date of Start</td><td></td></tr>
<tr><td>Scheduled Date of Completion</td><td></td></tr>
<tr><td>Status of LA</td><td>Date of handing over LA (if given at different date, please mention each date & area)
<table>
<tr><th colspan="2">Chainage</th><th>Length in (km)</th><th>Area in (hec)</th><th>Date of Handing Over</th></tr>
<tr><td>From</td><td>To</td><td></td><td></td><td></td></tr>
</table></td></tr>
<tr><td rowspan="5"></td><td>If LA not done give details CALA wise</td></tr>
<tr><td>Length affected due to LA</td></tr>
<tr><td>No of patches</td></tr>
<tr><td>Status 3A/3D/3G/3H</td></tr>
<tr><td>Authority with which pending and since when</td></tr>
<tr><td rowspan="6">Status of Forest clearance/ wildlife</td><td>Length affected due to Forest</td></tr>
<tr><td>Date of handing over</td></tr>
<tr><td>If pending</td></tr>
<tr><td>Stage where pending</td></tr>
<tr><td>Authority with which pending</td></tr>
<tr><td>Since when</td></tr>
<tr><td>Physical Progress (%)</td><td></td></tr>
<tr><td>Length Completed up to DBM/BC</td><td></td></tr>
<tr><td>Major bridge Completed</td><td></td></tr>
</table>

01/10/2020

Minor bridge Completed		
CDs Completed		
Financial progress : % & expenditure incurred in Rs Cr.		
Quality of work (General Report).		
Specific Observation on Quality /Specification		
Non compliance of Systems / Quality		
(i)	Compliances by AE/EE on MPR & uploading on PMIS	
(ii)	NCR issued	
(iii)	NCR closed	
(iv)	Approval of Design / Drawing	
(v)	Compliance by AE of supervision quality test at required frequency and registered duly signed by TL/ EE	

01/10/2020

ANNEXURE-II

CHECK LIST FOR QUALITY CONTROL/ASSURANCE

Sr. No.	Activity	Roles/ Responsibilities of Contractor	Roles/ Responsibilities of AE/IE	Roles/Responsibilities of PIU/PWD Division/ RO Office
1	Field Laboratory with adequate equipment	To setup	To approve	To ensure
2	Upkeep and maintenance of laboratory	Responsible for upkeep & maintenance	To ensure	To ensure
3	Quality Control Personnel	Material Engineer, QC Engineer, Lab Technician etc.	Ensure the deployment of Contractor's personnel and to deploy team of Material Engineer, QC Engineer, Lab Technician etc.	Approve the personnel of AE/IE and designate at least one officer for Quality Control
4	Quality Assurance Plan	To be submitted	Review and Approval	To ensure
5	Source of man-made materials	To indicate	To approve	To ensure
6	Calibration of measuring devices such as proving rings, dial gauges, load cell, temperature gauges, weighing pads etc.	Responsible	Ensure and certify	To ensure
7	Calibration of plant, Equipment and Machinery such as batching plant, hot mix plant etc. on regular basis	Responsible	To ensure	To ensure
8	Tests on factory made materials such as cement, steel, bitumen, geo-synthetics etc.	Most of the tests to be conducted in manufacturer's lab, some tests in field lab and/or in third party laboratory	Witness and ensure tests	To ensure

01/10/2020

9	Specialized items such as bridge bearing , expansion joints, crash barriers etc.	Most of the tests to be conducted in manufacturer's lab	Witness and ensure tests	To ensure
10	Testing of Ingredients of GSB, WMM, concrete etc.	Responsible	To ensure	To ensure
11	Third party laboratory	Responsible for third party lab testing in absence of adequate expertise and/or equipment	Ensure testing by contractor and can also order confirmatory test even in presence of test facility at site	To ensure
12	Performance of Paver and grader	To ensure	To check and verify	To ensure
13	Collection of samples from pavement layers for verification	Responsible	To ensure	To ensure
14	All tests for raw material, finished layers as per MoRT&H specifications	Responsible for performing tests with frequency as per MoRTH specifications	To ensure	To ensure
15	Percentage of Tests	Conduct 100% tests	Witness tests as per the contract agreement (At least 50% of the tests as per recent EPC Document & 10% of the tests for HAM projects)	Visit at least once during the construction period and some tests shall also be performed during his/her presence
16	Monthly Inspection Report	To comply	To submit	To ensure
17	Acceptance/ Rectification	To comply	Based on test results, decision to be made for acceptance/rectification	To ensure
18	Documentation	Maintain all records and provide a copy to AE/IE	To ensure	To ensure
19	Completion Certificate	Request	Issue	Approve

01/10/2020

ANNEXURE-III

Format of Inspection Note of RO under O&M

Inspection Note of ..... (Name of Officers) ..... on	
Name of Inspecting Officers : Date : Name of work : Contractor / Concessionaire : Consultant / Authority Engineer Firm. Team Leader. Project Incharge	
Project Particulars (Km)	
Length (Km)	
Major Bridge/ Structure No.	
Minor Bridge/ Structure No.	
Commercial Operation Date	
DLP status (whether in DLP or not)	(i) If yes, remained defect liability period
	(ii) If No, details of Maintenance Contractor and AE/IE
Maintenance Program (Whether approved by AE/IE or not)	

S. No.	Nature of defect or deficiency	Chainage	Instructions given regarding rectification
A). Roads			
1. Carriage way and paved shoulders			
(i)	Breach or blockade		
(ii)	Pot holes		
(iii)	Cracking		
(iv)	Rutting		
(v)	Stripping of Bitumen		
(vi)	Damage to pavement edges		
(vii)	Bleeding/ Skidding		
2. Shoulders/ Embankment/ Culverts			
(i)	Variation in prescribed slope of camber/ cross fall		
(ii)	Edge drop exceeding prescribed limits		
(iii)	Variation in prescribed slope of embankment		
(iv)	Rain cuts/ gullies in slope		
3. Road side furniture/ Trees and plantation/ Toll Plaza/ others			
(i)	Damages to shape and position of road signs		
(ii)	Poor visibility or loss of retro reflectivity		
(iii)	Problems in Street Lighting		

01/10/2020

(iv)	Obstruction in minimum head room above carriage way or obstruction in visibility due to plantation		
(v)	Failure of toll collection equipment including ETC or lighting or damage to toll plaza		
(vi)	Damage or detrition in approach roads, pedestrian facility, truck lay-bays, bus-bays and others)		
B) Bridges			
(i)	Cracking in superstructure		
(ii)	Spalling/ scaling in superstructure		
(iii)	Cracks and damages including settlement and tilting in piers, abutments, return walls and wing walls		
(iv)	Loosening and malfunction of joints		
(v)	Damages/ deterioration in parapets and handrail		
(vi)	Damage to wearing coat		
Note: Any deficiency/ defect found which has not been enlisted here shall be included in Inspection Note.			

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01/10/2020