

Karnataka Rural Infrastructure Development Limited, Bangalore



Guidelines

for

Quality Monitoring by District Quality Monitors

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1. Introduction

Karnataka Rural Infrastructure Development Limited is undertaking in Government of Karnataka is responsible for construction activity in several works of Government Departments such as construction of hostels in department of higher education, Collegiate education, Polytechnics, Social Welfare Departments, Stadiums in Youth service departments, Water supply works, Suvarna Grama works and works of BBMP, BMRCL through out Karnataka. It is the responsibility of the KRIDL to ensure quality of all the works entrusted to KRIDL. However, since the programme lays special emphasis on the quality and timely completion of works, a three tier quality management mechanism has been operationalised.

In order to provide detailed guidance to the field engineers about the tests and testing procedures, the KRIDL has published Quality Control Hand Book, and for recording the test results, Quality Control Registers have been prescribed.

The *first tier* of quality management mechanism is envisaged as in-house quality control system to ensure the implementation of quality standards by way of carrying out mandatory tests, however, the *second tier* is envisaged as independent quality check and monitoring mechanism to be operationalised by KRIDL. Whereas, the KRIDL is responsible for quality management through operationalization of the first two tiers, the Department of Rural Development and Panchayat Raj arranges for quality monitoring through independent monitors termed as District Quality Monitors (DQMs). The objective of this *third tier* of quality mechanism is to monitor the quality of works executed by the KRIDL with a view to ensure that the works under the programme conform to standards and to see whether the quality management mechanism in the KRIDL is effective. The role of this tier is to provide guidance to KRIDL implementation machinery and the field engineers rather than ‘fault finding’, as such; the shortcomings are identified by the DQMs and a feedback is provided to the KRIDL for improvement.

2. Arrangements of Inspection

The DQMs shall be given the programme to inspect the works in designated districts during the designated months. The PIU shall make necessary arrangements for visit of DQMs. The detailed guidelines for arrangement of inspection of DQMs are given below:

1. The District Quality Monitors will be sent the letter of request with programme of inspection of works. The copy of the letter will also be endorsed to the PIUs for making necessary arrangements.
2. On receipt of the letter the PIU shall contact the DQM and get the tentative programme of inspection. In case, the PIU does not contact the DQM, the SQM may take initiative.
3. It shall be responsibility of the PIU to ensure adequate arrangements for inspection of DQM. In these revised guidelines, it is mandatory for the DQM to make observations on the basis of quality control tests/ hand-feel tests/ measurements performed under his personal supervision for which necessary equipments, staff and implements would be required; therefore, ***it shall be the personal responsibility of the PIU to ensure that requisite staff and equipments are provided to DQM for performing/ getting performed required tests*** (List of equipments and staff required for inspection is enclosed as **Annexure 1**).
4. The details of schedule of visit will be available on website www.kridl.gov.in in the last week of the preceding month to enable the PIUs to make necessary arrangements.
5. The DQM is required to inspect maximum of three districts in a single visit in month.
6. *In the present format, the DQM is required to perform/ get performed the prescribed tests which would take time and it would not be possible to make desired observations in a day for one completed work of maximum 3km length or 2 ongoing works each of maximum 3km length in which about 50% work has been completed, as such; the DQM should finalize a suitable programme to spend not more than 3 days in each district inspecting not more than 1 completed work or 1 completed and one on-going work in just initial stages or 2 on-going works both with less than 50% physical progress(per day). The inspection of 1-2 road works is suggested with a view that normally, a road in PMGSY would not be of a length more than 3 Km, however; if the length of road work is more, every 3 Km length or part thereof shall be treated as another work. It must be clearly understood that the observations required during the*

work should be made with due care and diligence. **In no case, the superficial inspection/ observations would be accepted by KRIDL.**

7. The DQM is expected to make his own arrangements to travel up to nearest rail/ air head of one of the District Headquarters of the districts allotted to him. The PIU shall make necessary arrangements for transport required for inspection of works within the District and from one District to the next. The PIU may make arrangements of boarding of DQM in Government Guest Houses/ Inspection Bungalows but in case of non-availability of such an accommodation, the DQM may stay in private Hotels/ Guest Houses and the reimbursement to DQM for boarding charges will be done by KRIDL as per *terms and conditions*.

8. The programme of inspection is valid for the inspection of works for only the months mentioned in letter of request; therefore, in no case should the inspection spill over to the next month. This is necessary as the same district might have been allotted to another DQM for the next month. The inspection of works would therefore not be valid for purposes of reimbursement of expenses by KRIDL for a month other than the allotted one.

9. The DQM shall not be entitled for remunerations including travel expenses etc. for such inspections which are carried out in contravention to the guidelines or found to be superficial.

3. Prioritization of Works for Inspection

It has been noticed that the DQMs are not able to inspect the works as per the priorities given in the guidelines. It is also noticed that either the PIUs have tendency to offer the works of their choice for inspection or some DQMs prefer to inspect the works which are situated at convenient locations. It has been therefore decided that the DQM before proceeding to the concerned district for inspection would obtain the list of works in the district and after obtaining the list, he will select the works as per the criteria for prioritization of works given in this guidelines.

While inspecting the works, the DQM shall prioritize the selection of works as follows:

- 1. Priority 1** shall be to inspect works which are at earthwork stage. This is with a view to examine the system and procedures which is being followed by the PIU. DQM intervention at this stage would help in ensuring that subsequent stages of the work are carried out after system deficiencies are removed.
- 2. Priority 2** ongoing works which have not been inspected at all by DQM before.
- 3. Priority 3** shall be ongoing works that have not been inspected by DQM in the last 8 months.
- 4. Priority 4** shall be inspection of completed works and which have not been inspected by DQM in the 6 month period upon completion.
- 5.** The same ongoing road work shall not be inspected if the previous inspection by DQM is less than 6 months earlier and no ongoing work shall be inspected if it has been inspected twice before by any DQM , and, no complete work shall be inspected if it has been inspected once before by any DQM
- 6.** If the DQM is inspecting any work after the inspection by a SQM, he shall inspect the work with a view to analyze the quality of work in light of the observations made by SQM also.
- 7.** Complaint cases and ATR cases shall be got inspected on case to case basis.

4. Information and Details to be furnished to DQM by PIU

The PIU shall ensure that the information as detailed in the following paragraphs is provided to DQM :

1. The PIU shall furnish the phase-wise list of works to the DQM in the format given below in which the details about previous inspections shall compulsorily be mentioned. The PIU shall also make available a road map showing the location of works to enable planning of the itinerary and selection of works to be inspected.

Name of PIU _____ Date _____

Name of Work	Phase and Date of Start	% Progress	Details of Inspt. (if any) by DQM/ SQM	Action Taken/ Rectification Done and whether re-inspected	Date of Inspt.
			Name of SQM/DQM		

2. The DQM shall select works out of this list in accordance with the priority given in the guidelines and shall enclose a copy of the list of works given to him by the Programme Implementing Unit. However, if the DQM is given a list of works to be inspected with the inspection programme, works from this list only shall be inspected. Detailed reasoning shall be furnished by DQM in case of deviation in selection of works from the specified list

3. After the DQM selects the works to be visited, the PIU shall provide the necessary works information in respect of the work in Part I of the Inspection Report Format (enclosed as **Format 1**). It is expected that the PIU would provide all the information to the DQM without wasting any time.

4. The PIU shall produce to DQM the original estimate of the work being inspected along with working drawings.
5. The PIU shall produce the Quality Control Registers Part I and Part II to enable the DQM to understand the details of tests conducted.
6. The DQM shall get some hand feel tests and field test conducted under this personal supervision as such, the PIU shall necessarily provide the essential equipment and facilities and manpower to DQM for the purpose.
7. The work which has already been inspected by DQM earlier may also be selected by DQM for inspection (*the work inspected by DQM shall not be inspected by other DQM till 6 months after the inspection of earlier DQM*).
8. The PIU shall provide the copy of report of DQM/SQM to DQM, so that while inspecting the work, the DQM could look into the issues raised by DQM/ SQM. If, there is marked difference in the observations of SQM/DQM made during the previous visits, the DQM is also required to analyze the reasons for difference in observations, therefore; **it is mandatory for PIU to provide copy of SQM/DQM inspections conducted earlier.**

5. Inspection, Observation and Grading of Works

A) FOR BUILDING WORK

The objective of second tier of Quality Monitoring for KRIDL works by District level independent monitors is to identify shortcomings in respect of quality of works and to guide the PIUs about the **specifications, good practices and effective execution of works** with desired quality. The role of these monitors is to critically examine the works and give feedback about quality of works and quality management related shortcomings to the first tier quality management team and KRIDL to enable systemic improvements. After the selection of work for inspection as per guidelines, the PIU would furnish the details of work in the part-1 of the prescribed format. The DQM should visit the work and perform **critical inspection** of the entire work.

5.1 How to make observations: There could be many methods of inspecting, making observations and evaluating various items and sub-items involved in construction of a work. With a view to achieve uniformity, objectivity in observations and evaluation, the efforts have been made to standardize the methods of observations and evaluation. Various items and sub-items involved in construction of a building works have been listed in **Annexure 1**. Each of the sub-items shown in the Appendix shall be examined by DQM as per the method of observation mentioned in column – 4 and as per the frequency mentioned in column – 5. The quality of the sub-item/item would be quantified in one of the 2/3 grades prescribed in column – 6. **The DQM shall base his observations on the method of field tests, hand feel tests, measurements and visual observations as specified in column – 4 of the Annexure 2 only and in no other way.**

The PIU/AE shall record detailed information regarding works at the space provided in Format-1 Part-I.

The DQM shall record observations at the space provided in Format-1 Part-II.

5.2 How to organize inspection for buildings: The DQM is expected to inspect the entire work of construction of buildings to ascertain the quantum of work, item wise, quality of work, and decide about the location of detailed observation.

5.3 Grading of Building Works: The quality of every item and sub-item of work would be evaluated by the DQM on the basis observations made as per prescribed standard method. The grading would be recorded in every item and abstracted at appropriate space provided in Part III of the format. The grading of work

would be done with an intention to quantify the observations showing level of **satisfaction in relation to the specification** of the work/item under observation. The objective would be to indicate to the Executing Agency, as to whether the material or workmanship is acceptable, or unacceptable. If the item is unacceptable, the improvement could be done by either replacement of the entire material/portion of work or by rectification in workmanship or material. The grading should be able to indicate to the PIU/ District, the level of intervention required for improvement. Therefore, based on the type of item and method of observation, each item/ sub-item of work would be graded in any of the categories i.e. '**Satisfactory (S)**', '**Requires Improvement (RI)**' or '**Unsatisfactory (U)**' out of the categories prescribed as per column 6 of the **Annexure 2**. Based on grading, the PIU shall take action for rectification of defect, therefore, it is very important to record the defect as well as the suggestive method by which the rectification could be done. The DQM shall record, in the space provided in Part II observation sheet, **the grade as well as clear and express reasons for grading the item of work as 'RI' or 'U' along with his suggestions for improvement**. The reasons and suggestions shall be recorded clearly in such a way that there are no ambiguities or contradictions with observations in other items. The detailed method of making observations and grading of item/ sub-item of works is given in paragraphs below.

5.4 How to fill up the reporting format and grade the items/ sub-items of the work: The detailed guidelines for making observations, filling up of the inspection format and grading are given below. It shall be ensured by the DQM that space provided for observations are not left blank without any observations. *The space for observations in respect of items not executed should be filled up by writing "Item not executed" but if material is available at site, testing shall be done and observations be made for the quality of material.*

5.5 Observations on Quality Arrangements: In case of ongoing works this item shall be examined. The observations about establishment of field/mobile/laboratory would be made. It should be carefully seen that whether the

field laboratory has adequate equipments and whether the equipments are being used to actually test the material and workmanship of the road work.

If field/mobile/laboratory has not been established, 'U' grade would be awarded; if laboratory is established but does not have sufficient equipments or the equipments have not been used, 'RI' grade would be awarded; if field/mobile/laboratory with sufficient equipments has been established and equipments are being used 'S' grade would be awarded.

5.6 Attention to Quality: Two types of observations are required to be made in this item. The first observation is regarding the maintenance of Quality Control Register Part I and II in case of ongoing works. It should be carefully seen that whether adequate number of tests as per prescribed mandatory frequency have been carried out or not (see abstract of tests in Quality Control Register). The other observation would be about the verification of test results recorded by the PIU. In the subsequent paragraphs, the process for sampling and field testing is mentioned, the results of field tests carried out by DQMs shall be cross referenced with the test results recorded in Quality Control Register Part-I and the comment on correctness of the test results shall be recorded by the DQM.

If, record of tests is properly maintained and monitored through Quality Control Register Part I and II, all the tests as per prescribed frequency have been carried out 'S' grade would be awarded. If, the above items have been partly attended 'RI' grade would be awarded and if, these items have not been attended by PIU 'U' grade would be awarded.

On verification of the test results recorded by the PIU, the sub-item about verification of test results would be graded. The grading would be 'S' if test results recorded by PIU reasonably matches with the test results obtained by DQM after field testing at the same location otherwise the item would be graded 'U'.

5.7 Observations on geometrics for buildings: In case of ongoing and completed works, it is to be ascertain that all the works are as per the specification of SR and measurements as per the estimate. If, it is felt that the provisions has not been made in estimate but are required as per field conditions, in such cases, clear observations should be made in the space provided under 'General Observations'.

If the above item have been executed as provided in Estimate 'S' grade would be awarded otherwise 'U' grade would be awarded.

5.8 Observations about the quality of building work- General: The observation about the quality of work is required to be made for every item and sub-item of construction in the manner given in subsequent sub-paragraphs. In case of ongoing works of building construction, item of works/item under observation, it is easy to take sample, where as for completed work. Shall be based on test performed by engineers and recorded in register.

Item of observation from dimensions, as per sanction estimate, it is there are not to be observed.

Whether the sizes of construction is acceptable or not is to be ascertained.

Whether quality of material is acceptable or not is to be ascertained.

Whether quality of workmanship is acceptable or not is to be ascertained.

The above observation can easily be made if the quality of work is good as per specification sanctioned estimate. 'S' Grade would be awarded, if the work is required improvement its construction RI would be awarded, if work is not upto standard there is necessity of rework is there. Then 'U' Grade would be awarded.

5.9 General Observations of DQMs: The DQM is expected to interact with the PIU staff and Engineers. The work of DQM is guidance rather than fault finding, as such, the interaction with the personal should be oriented towards guidance. The DQM is expected to make observations about progress of work with reference to works programme and the action taken by PIU for liquidated damages etc. In case of ongoing works, the DQM should find out whether the work has been completed within sanctioned cost or not. The DQM should specifically focus his general observations about the action taken by PIU on observation made by senior officers/DQMs and other DQMs and make clear remarks about the efficacy of action taken. In addition, the DQM is free to make other observations but it is clarified here that the DQMs should not make such observations which are in contravention to guidelines of KRIDL or provisions of specifications.

It should be clearly understood by DQM that his observations should not amount to direct or indirect un-due advantage to either Engineer, consultants or other personnel involved in the work.

5.10 Sub-item/Item wise Grading and Overall Grading of Work: For building

Item. No	Sub item for observation	Awarded Grade
1.	Earthwork Excavation	
2.	Foundation & Basement	
3.	RCC footing, column,	
4.	Superstructure	
5.	RCC roof, beam	
6.	Joineries	
7.	Plastering	
8.	Flooring	
9.	Water supply & Sanitation	
10.	Electrification	
11.		
12.		
13.		
14.		
	Overall Grading	

If, any of the items in item no. 4, 5, 6 and 7 are graded as ‘U’, overall grading of the work shall be ‘U’ i.e. ‘Unsatisfactory’.

If, all the items given in above four items are ‘S’ but grading in any of other items is ‘U’ or ‘RI’, the overall grading of work shall be ‘S-RI’ i.e. Satisfactory but Requiring Improvement.

If grading of all items is ‘S’, the overall grading of work shall be ‘S’ i.e. ‘Satisfactory’.

6. Inspection, Observation and Grading of Works B) FOR ROADS

The objective of second tier of Quality Monitoring for KRIDL works by District level independent monitors is to identify shortcomings in respect of quality of works and to guide the PIUs about the **specifications, good practices and effective execution of works** with desired quality. The role of these monitors is to critically examine the works and give feedback about quality of works and quality management related shortcomings to the first tier quality management team and KRIDL to enable systemic improvements. After the selection of work for inspection as per guidelines, the PIU would furnish the details of work in the part-1 of the prescribed format. The DQM should visit the work and perform **critical inspection** of the entire work.

6.1 How to make observations: There could be many methods of inspecting, making observations and evaluating various items and sub-items involved in construction of a work. With a view to achieve uniformity, objectivity in observations and evaluation, the efforts have been made to standardize the methods of observations and evaluation. Various items and sub-items involved in construction of a rural road have been listed in **Annexure 2**. Each of the sub-items shown in the Appendix shall be examined by DQM as per the method of observation mentioned in column – 4 and as per the frequency mentioned in column – 5. The quality of the sub-item/item would be quantified in one of the 2/3 grades prescribed in column – 6. **The DQM shall base his observations on the method of field tests, hand feel tests, measurements and visual observations as specified in column – 4 of the Annexure 2 only and in no other way.**

The DQM shall record observations at the space provided in Format-1 Part-II.

6.2 How to organize inspection for roads: The DQM is expected to traverse through the entire road length to ascertain the quantum of work such as length of road, number of CDs, protection works, side drains, catch water drains, rigid pavement and other aspects of the work. After the traverse, the DQM would decide about the locations for detailed observations.

In case of on-going work/item of work it is easier to take samples of material; however, in case of completed work/item it may be difficult to take samples. As can be seen from **Annexure 2**, the tests are generally required to be made in one kilometer, as such, in case of completed work, it is suggested that after traversing the entire length of the road, the DQM should select one such spot in every kilometer, which is fairly representative of the overall quality of the road in that kilometer. The observations can be made on this spot by digging a pit either on pavement or at half pavement and half shoulder, as decided by the DQM.

6.3 Grading of Road Works: The quality of every item and sub-item of work would be evaluated by the DQM on the basis observations made as per prescribed standard method. The grading would be recorded in every item and abstracted at appropriate space provided in Part III of the format. The grading of work would be done with an intention to quantify the observations showing level of **satisfaction in relation to the specification** of the work/item under observation. The objective would be to indicate to the Executing Agency, as to whether the material or workmanship is acceptable, or unacceptable. If the item is unacceptable, the improvement could be done by either replacement of the entire material/portion of work or by rectification in workmanship or material. The grading should be able to indicate to the PIU/ District, the level of intervention required for improvement. Therefore, based on the type of item and method of observation, each item/ sub-item of work would be graded in any of the categories i.e. '*Satisfactory (S)*', '*Requires Improvement (RI)*' or '*Unsatisfactory (U)*' out of the categories prescribed as per column 6 of the **Annexure 2**. Based on grading, the PIU shall take action for rectification of defect, therefore, it is very important to record the defect as well as the suggestive method by which the rectification could be done. The DQM shall record, in the space provided in Part II observation sheet, **the grade as well as clear and express reasons for grading the item of work as 'RI' or 'U' along with his suggestions for**

improvement. The reasons and suggestions shall be recorded clearly in such a way that there are no ambiguities or contradictions with observations in other items. The detailed method of making observations and grading of item/ sub-item of works is given in paragraphs below.

6.4 How to fill up the reporting format and grade the items/ sub-items of the work: The detailed guidelines for making observations, filling up of the inspection format and grading are given below. It shall be ensured by the DQM that space provided for observations are not left blank without any observations. *The space for observations in respect of items not executed should be filled up by writing “Item not executed” but if material is available at site, testing shall be done and observations be made for the quality of material.*

6.5 Observations on Quality Arrangements: In case of ongoing works this item shall be examined. The observations about establishment of field/mobile/laboratory would be made. It should be carefully seen that whether the field laboratory has adequate equipments and whether the equipments are being used to actually test the material and workmanship of the road work.

If field/mobile/laboratory has not been established, ‘U’ grade would be awarded; if laboratory is established but does not have sufficient equipments or the equipments have not been used, ‘RI’ grade would be awarded; if field/mobile/laboratory with sufficient equipments has been established and equipments are being used ‘S’ grade would be awarded.

6.6 Attention to Quality: Two types of observations are required to be made in this item. The first observation is regarding the maintenance of Quality Control Register Part I and II in case of ongoing works. It should be carefully seen that whether adequate number of tests as per prescribed mandatory frequency have been carried out or not (see abstract of tests in Quality Control Register). The other observation would be about the verification of test results recorded by the PIU. In the subsequent paragraphs, the process for sampling and field testing is mentioned, the results of field tests carried out by DQMs shall be cross referenced with the test results recorded in Quality Control Register Part-I and the comment on correctness of the test results shall be recorded by the DQM.

If, record of tests is properly maintained and monitored through Quality Control Register Part I and II, all the tests as per prescribed frequency have been carried out 'S' grade would be awarded. If, the above items have been partly attended 'RI' grade would be awarded and if, these items have not been attended by PIU 'U' grade would be awarded.

On verification of the test results recorded by the PIU, the sub-item about verification of test results would be graded. The grading would be 'S' if test results recorded by PIU reasonably matches with the test results obtained by DQM after field testing at the same location otherwise the item would be graded 'U'.

6.7. Observations on geometrics for roads: In case of ongoing and completed works, the observations shall be made for this item. The measurements about the road way width, carriage way width, and adequacy of camber shall be made at a selected RD and shall be tabulated in reporting format. The observations about execution of horizontal curve, super elevation, and extra widening *as per the provisions of DPR* shall be made and entered at relevant space in the reporting format. If, it is felt that the provisions about camber, super elevation, extra widening etc. has not been made in Estimate but are required as per field conditions, in such cases, clear observations should be made in the space provided under 'General Observations' at the end of reporting format. If above items have been executed properly as provided in Estimate 'S' grade would be awarded otherwise 'U' grade would be awarded.

6.8. Observations about the quality of road work- General: The observation about the quality of work is required to be made for every item and sub-item of construction in the manner given in subsequent sub-paragraphs. In case of flexible pavements the observation about sub-grade, sub-base, base-course and surface course are required to be made for on-going as well as completed works. In case of on-going works/items under observations, it is easy to take samples; however, in case the item under observation is already complete or the entire work is complete it is required to take at least one observation pit of appropriate size and depth in every Km. The observations in case of completed works shall be based on tests performed on samples drawn form

these observation pits. After reconnaissance, a location of fairly representative quality of road may be identified for digging a pit. The size of pit could be about 30cm x 30cm and upto a depth where the sub-grade starts. The pit should be dug with the help of appropriate tools but the observation should start right from application of the digging tool. Needless to add that the observation about sub-base course, base-course and sub-grade can be taken from the same pit and it may not be generally required to dig more than one pit in one Km.

From the surface course, the material of PMC/surface dressing may be removed and kept separately. The top layer of WBM can be removed, thickness of layer can be measured and course aggregate and fine aggregates can be separated easily. The gradation test can be performed on these samples of aggregate. The hand-feel tests for plasticity may be performed on fine aggregates. For ascertaining the adequacy of compaction, hand-feel test is mentioned in sub-para b of sub-para C below. The same process can be repeated in other layers of WBM. If it is difficult to distinguish between the different layers of WBM, still the gradation tests can be performed and fair assessment about the gradation of the aggregates, adequacy of compaction, plasticity of the screening/filler material may be done.

After making observations about WBM, the observations about thickness, gradation and plasticity of material can be easily made for GSB but for adequacy of compaction, sand replacement/core cutter method may be adopted. After making observations about GSB, the observations about the sub-grade could be easily made.

6.9 Observation of Earth Work for road : The Earth Work in rural roads could be either for embankment construction or for formation cutting. The observations shall be made for ongoing as well as completed works. The award of grades shall be done for earthwork in embankment and for cutting based on the type of works involved. There may be situations where either of the two sub-items would be involved but in exceptional cases where both the items have been executed, the grading of both the items may be suitably done. The DQM shall make the observations in the following manner.

(a) Earthwork and Sub-grade in Embankment:

(i) Suitability of material for embankment construction: The DQM shall make detailed observations at-least at one location per kilometer and the RD at which observation is made shall be recorded in the table given in the reporting format. The DQM shall make observation about the suitability of the soil by visual classification of soil as prescribed in Annex 5.1 of Operations Manual and clear observations regarding the suitability should be made in reference to Specifications clause 301. In case of completed works or completed item of work the observations shall be based on test pit.

If soil is suitable “S” grade would be awarded otherwise “U” grade would be awarded.

(ii) For making observations about adequacy of compaction, the DQM shall carry actual field test for field density of the sub-grade/embankment. The field density shall be taken either by core cutter method or by sand replacement method, for ascertaining the OMC & MDD the DQM shall examine the QC Registers and record the value in reporting format.

In case of on-going works at-least one test per Km for field density shall be done. If the compaction work is on-going, one test for Field Moisture Content of the soil shall also be done to understand whether the compaction is being done at OMC or not.

The findings shall be recorded in the report in the prescribed table. The observation sheet shall be enclosed with the report.

If degree of compaction is found to be adequate “S” grade would be awarded otherwise “U” grade would be awarded.

(iii) The visual observation about the side slopes and profile shall be made and recorded for *completed work only*.

If proper side slopes with proper profile exist “S” grade would be awarded otherwise “U” grade would be awarded.

(b) Earthwork and Sub-grade in Cutting:

The visual observations about stability and workmanship of cut slopes and adequacy of slope protection shall be made by the DQM. If cut slopes with adequate stability exist, “S” grade would be awarded, if the defects can be rectified by some improvement, ‘RI’ grade would be awarded, and otherwise, “U” grade would be awarded.

6.10 Observation of Granular Sub-base of road: The construction of Granular Sub-base is required to be done as per clause 401 of specifications, as such; the DQM is required to make observations about quality of material as well as workmanship for ongoing as well as completed works.

(a) Quality of Material: At-least one test of gradation shall be carried out by the DQM for every kilometer of road. The observation sheet for the gradation test result shall be enclosed with the report. For the assessment of plasticity of the material, it may not be possible to carry out the tests for liquid limit and plasticity index; however, the DQM can carry out hand feel tests of making ball by mixing small quantity of water in the material and try to make balls. If, well defined ball can be made by hands, the material would generally be plastic enough to be ranked as suitable and if ball cannot be made by hands the material is treated non-plastic to the desired extent. If the material is of suitable gradation and plasticity “S” grade would be awarded otherwise “U” grade would be awarded.

(b) Workmanship and Compaction for road: Generally the field density test by sand replacement method shall be carried out but if it is not be possible to carry out detailed test about the compaction of GSB material, the adequacy of compaction may be judged by making visual observations about the density of compacted layer. In case of on-going works or in case of completed item, the observations about the denseness of GSB layer can be made at time of application of pick axe or crow bar while digging the test pit. If degree of compaction is found to be adequate “S” grade would be awarded otherwise “U” grade would be awarded.

6.11 Observations of Base Course for road: In rural roads, generally the base-course is being constructed with WBM. The construction of WBM base course is required to be done as per the provisions contained in clause 405 of Specifications for Rural Roads. The observations about WBM shall be made for completed as well as ongoing work by DQM in the following manner:

(a) Quality of Material: At-least one test for gradation of aggregate of every layer of WBM shall be done for each kilometer in case of on-going works as well as completed works. The observation sheet for the gradation test result shall be enclosed with the report. For the assessment of plasticity of the crushable aggregate used as fillers or screenings, it may not be possible to carry out the tests for liquid limit and plasticity index, however, the DQM can carry out hand feel tests of making ball by mixing water into the material and make observations as to whether the material is non-plastic to the desired extent or is plastic enough to be ranked as suitable.

If grading of course aggregate/ fine aggregate and plasticity of crushable aggregate/ filler is suitable “S” grade would be awarded otherwise “U” grade would be awarded.

(b) Compaction: The exact assessment of compaction in a WBM is quite difficult, however; it is quite simple to make fair assessment about the fact that whether the compaction has been adequately done or not. For assessing the adequacy of compaction, the DQM is supposed to carry out the volumetric

analysis. After digging the pit course and fine aggregates can be separated by sewing or by manual measures and comparative quantity of fillers and coarse aggregate can fairly be judged, the coarse aggregate can be refilled in the same pit and it should be observed that how much bulging has taken place above the level of compacted surface. This process will give a fair idea as to whether the proper compaction has been done. The DQM shall make all the observations about the compaction only after carrying out the above hand feel test. It may however be noted by DQMs that by even the visual observations during the process of application of pick axe or crow bar also the compactness of WBM layer can be fairly assessed.

If compaction is found to be adequate “S” grade would be awarded otherwise “U” grade would be awarded.

6.12 Observations on Bituminous Construction for road: In Rural Roads, generally the BT surfacing is being done over prime coat, tack coat. BT work generally consists of 20mm premix carpet with seal coat. In few cases, surface dressing is constructed, whereas, in some other cases, modified penetration macadam is also constructed. It is rare to have BM or other types of BT surfacing under PMGSY. The observations about BT surface shall be made by DQM in the following manner:

- (a) **Quality of BT surface in case of completed work:** At the selected location the observation on a pit shall be tabulated in which thickness of layer shall be assessed. The observations in a pit shall reveal the fact that whether the BT surface has been constructed after proper cleaning of the granular surface or not, this observation should be assessed and recorded. Quality of workmanship shall be assessed in light of surface evenness, surface colour and texture, camber etc.

In case of ongoing works/item of works, based on the stage of construction, the observations about cleaning of granular surface receiving BT, Prime coat, Tack coat etc. shall be made. The observations about gradation of aggregate by gradation test and verification of grade of bitumen by examination of original test report of the manufacturer shall be done. The observations will include the quality of aggregate, quality and quantity of binder, temperature at mixing point and laying temperature, rolling and other aspects.

If material and workmanship is found satisfactory, ‘S’ grade shall be awarded otherwise ‘U’ grade shall be awarded.

6.13 Observations on Shoulders for road: The DQM should make observations about the classification of soil and if suitable soil is used for shoulders “S” grade would be awarded otherwise “U” grade would be awarded. The DQM should make visual observation about the shoulders and ascertain whether the shoulder has been

constructed simultaneously with GSB and record observation carefully. If compaction is found to be adequate “S” grade would be awarded otherwise “U” grade would be awarded.

6.14 Observations on Cross Drainage Works for road: The DQM shall inspect at least 50% of CDs situated on roads. In Rural Roads generally flushed causeways and vented causeways with Hume pipes are built. Box culverts and Slab culverts are also common. The DQM shall give details about the span and type of CDs with their numbers. Detailed observations about every inspected CD work with reference to Material and Workmanship shall be made by DQMs. In the reporting format the observations about Causeways of all the spans and Culverts upto 6 m. span shall be recorded, however, for Culverts/ bridges beyond 6 m. span separate observation sheet shall be enclosed in which detailed observations about quality of material and workmanship shall be made by DQM, at present detailed format is not being prescribed. The effect of quality grading of CD beyond 6 m. span shall be decided by KRIDL on case to case basis.

General observation about quality of material used in CD works shall be made and recorded by the DQM. If proper CD work is found “S” grade would be awarded, if CD work requires improvement ‘RI’ grade would be awarded, if work is not upto the standards “U” grade would be awarded.

General observation about workmanship of CD works shall be made and recorded. If workmanship in CD work is found satisfactory “S” grade would be awarded, if it requires improvement ‘RI’ grade would be awarded, if work is not upto the standards “U” grade would be awarded.

6.15 Observations on Side Drains and Catch Water Drains for road: In Rural Roads situated in plain areas Kuchha Side Drains are required and these drains are required to be integrated with Cross Drains. In hilly and rolling terrain Catch Water Drains are constructed. Detailed observations should be made about these drains.

If proper drainage work is found “S” grade would be awarded, if CD work requires improvement ‘RI’ grade would be awarded, if work is not upto the standards “U” grade would be awarded.

6.16 Observations on Cement Concrete Pavements and Associated Drains: The observations about CC Pavements or other type of rigid or semi-rigid pavements and Associated Side Drains should be made in respect of Material and Workmanship. If quality and workmanship is found acceptable, “S” grade would be awarded otherwise “U” grade would be awarded.

6.17 Observations on Road Furniture and Markings: Main Informatory Board, Citizen Information Board and Logo Board is required to be fixed during the construction of work, however, other signage are fixed after the work is completed. It is prescribed that all the information in the boards should be displayed in local language and it is essential that information should be provided in such a way that it is well understood by the local people. The observations about signage fixing, language used and quality of signage should be made by DQM. If furniture are found properly fixed with information in understandable language and the quality and workmanship is acceptable in case of ongoing and completed works (as specified), “S” grade would be awarded otherwise “U” grade would be awarded.

6.18 General Observations of DQMs: The DQM is expected to interact with the PIU staff and Engineers. The work of DQM is guidance rather than fault finding, as such, the interaction with the personal should be oriented towards guidance. The DQM is expected to make observations about progress of work with reference to works programme and the action taken by PIU for liquidated damages etc. In case of ongoing works, the DQM should find out whether the work has been completed within sanctioned cost or not. The DQM should specifically focus his general observations about the action taken by PIU on observation made by senior officers/DQMs and other DQMs and make clear remarks about the efficacy of action taken. In addition, the DQM is free to make other observations but it is clarified here that the DQMs should not make such observations which are in contravention to guidelines of PMGSY or provisions of specifications. **It should be clearly understood by DQM that his observations should not amount to direct or indirect un-due advantage to either Engineer, consultants or other personnel involved in the work.**

6.19 Sub-item/Item wise Grading and Overall Grading of Work: The sub-item wise grading of every item of work would be entered in the table at Para 15 of reporting format and the item grading would be the lowest of the grading of sub-items within that item. The overall Item Grading would be entered in the table at Para 16 (table also given below) of the reporting format and the overall grading of work shall be calculated in the following manner for road.

	Item	Awarded Grade
1	Quality Control Arrangements	
2	Attention to Quality	
3	Geometrics	
4	Earthwork and Sub-grade in Embankment/Cutting	
5	Granular Sub-base	
6	Base Course Non-Bituminous and shoulders	
7	Bituminous Surfacing	
8	Shoulders	
9	CD Works	
10	Side Drains and Catch Water Drains	
11	CC/Semi-Rigid Pavement and Associated Pukka Drains	
12	Road Furniture and Markings	
Overall Grading		

If, any of the items in item no. 4, 5, 6 and 7 are graded as 'U', overall grading of the work shall be 'U' i.e. 'Unsatisfactory'.

If, all the items given in above four items are 'S' but grading in any of other items is 'U' or 'RI', the overall grading of work shall be 'S-RI' i.e. Satisfactory but Requiring Improvement.

If grading of all items is 'S', the overall grading of work shall be 'S' i.e. 'Satisfactory'.

*S-Satisfactory

-RI-Required improvement

*U-Un-satisfactory

Signature :

Name :

Date :

7. Reporting and Performance Evaluation of DQMs

The observations of the DQM shall be recorded by DQM in his own handwriting. The reporting format shall be prepared in 4 copies, one copy shall be handed over by DQM to the PIU immediately after the inspection is over and in all cases before the DQM leaves the district where the works have been inspected. One set each of the observations should be sent to District Quality Coordinator of the concerned District and Chief Engineer of concerned department at headquarter soon after the inspection is over in that district. The reports should be sent to officers by name.

The performance of DQMs shall be evaluated in KRIDL on the basis of observations recorded in reporting formats. The reporting formats selected on random basis from time to time shall be evaluated. Generally, the performance of DQM would be evaluated on the following points:

- a.** Whether the DQM has carried out inspection as per the guidelines,
 - b.** Is there lack of application of mind by DQM in recording observations,
 - c.** Is there a tendency to avoid desirable technical observations,
 - d.** Whether the DQM has left inspection format incomplete without any reasons.
- The continuation of DQMs would depend on the performance not only related to the quality of field inspections and reporting but also on the observance of Code of Conduct.

Annexure 1

Annexure 1					
Districtment showing item-wise observations, their method, frequency and awardable quality grading for buildings					
	Sub item for observation	In case of work	Method of Observation	Frequency	Grades
1	2	3	4	5	6
Item 1 - Quality Arrangements					
	Quality Arrangements	On-going	Verification of field/mobile/laboratory and availability of equipments.	General observation	S/RI/U
Item Grade					S/RI/U
Item 2 - Attention to Quality					
a	Maintenance of QC Registers	On-going/ Complete	Verification of QC Register I and II	General observation	S/RI/U
b	Verification of test results	On-going/ Complete	Verification of test results on the basis of field tests.	Not Specified	S/U
Item Grade					S/RI/U
Item 3 – Geometries					
a	Foundation	Ongoing/ complete	Visual observation/actual measurements	1 per floor	S/U
b	Basement and Plinth		Visual observation/actual measurements	1 per floor	S/U
c	Superstructure BBM/SBM/SSM		Visual observation/actual measurements	1 per floor	S/U
d	RCC works- Column Lintel/Chajja Beam Roof Slab		Visual observation/actual measurements	1 per floor	S/U
e	Joineries	Ongoing/ complete	Visual observation/actual measurements	1 per floor	S/U
f	Water supply and Sanitation	Ongoing/ complete	Visual observation/actual measurements	1 per floor	S/U
g	Electrification	Ongoing/ complete	Visual observation/actual measurements	1 per floor	S/U
Item Grade					S/U

Annexure 2

Annexure 2					
Districtment showing item-wise observations, their method, frequency and awardable quality grading for roads					
	Sub item for observation	In case of work	Method of Observation	Frequency	Grades
1	2	3	4	5	6
Item 1 - Quality Arrangements					
	Quality Arrangements	On-going	Verification of field laboratory and availability of equipments.	General observation	S/RI/U
Item Grade					S/RI/U
Item 2 - Attention to Quality					
a	Maintenance of QC Registers	On-going	Verification of QC Register I and II	General observation	S/RI/U
b	Verification of test results	On-going/ Complete	Verification of test results on the basis of field tests.	Not Specified	S/U
Item Grade					S/RI/U
Item 3 – Geometrics					
a	Road way width	Ongoing or complete	Actual Measurements	2 per Km	S/U
b	Carriageway width		Actual Measurements	2 per Km	S/U
c	Camber		Measurement	2 per Km	S/U
d	Super-elevation & Extra Widening at Curves		Measurement	2 per Km	S/U
e	Longitudinal Gradient in case of road in hilly/ rolling terrain.	Ongoing/ complete	Visual Observation/ Measurements	2 critical stretches in a Km	S/U
Item Grade					S/U
Item 4 - Earth Work and Sub-grade in Embankment/ Cutting					
a	Quality of Material for Embankment/ Sub-grade	Ongoing or complete	Visual Classification of Soils	1 per Km	S/U
b	Compaction		Field Density Test by sand replacement/core-cutter method.	1 per Km	S/U
c	Side Slopes and Profile	Complete	Measurement	4 Observations per Km	S/U

d	Stability and Workmanship of Cut Slopes (in case of hilly/rolling terrain)	Ongoing or complete	Visual Observation	4 per Km	S/U
e	Adequacy of Slope Protection (in case of high embankments/hilly/rolling terrain)		Visual Observation	4 per Km	S/U
Item Grade					S/U
Item 5 - Sub-Base					
Quality of Material					
a	Grain Size	Ongoing or complete	Gradation Test	1 per Km	S/U
b	Plasticity		Hand-feel test of ball making with moisture content	1 per Km	S/U
c	Compaction	Ongoing or complete	Field Density Test by sand replacement/ core cutter method.	1 per Km	S/U
d	Total Thickness of Layer	Ongoing or complete	Measurement by taking pit for full layer thickness	1 per Km	S/U
Item Grade					S/U
Item 6 - Base Course – Water Bound Macadam					
Quality of Material					
a	Grain Size of Course Aggregate	Ongoing or complete	Gradation Test	1 per Km	S/U
b	Plasticity of Crushable Aggregate used as fillers		Hand-feel test of ball making with moisture content	1 per Km	S/U
c	Adequacy of Compaction through volumetric analysis.		Hand-feel test by digging pit and volumetric analysis.	1 per Km	S/U
d	Thickness of every layer of WBM.		Actual Measurement by taking pit	1 per Km	S/U
Item Grade					S/U
Item 7 - Bituminous Layer – Premix Carpet (PMC)/ Surface Dressing (SD)					
a	Gradation of Aggregate	Ongoing	Grain Size Analysis (Gradation Test).	1 at hot-mix plant/ 1 per Km	S/U

b	Mixing Temperature of Mix.	Ongoing	Measurement of temperature by thermometer.	1 at hot-mix plant	S/U
c	Laying Temperature of Mix.	Ongoing	Measurement of temperature by thermometer.	1 where laying is in progress.	S/U
d	Thickness of layer	Ongoing or complete	Measurement by taking pit	2 per Km	S/U
e	Surface Evenness	Ongoing or complete	By straight edge	2 per Km	S/U
Item Grade					S/U
Item 8 - Shoulders					
a	Quality of material for shoulders	Complete	Visual classification of soil	1 test per Km	S/RI/U
b	Degree of compaction	Complete	Field Density Test by sand replacement/core-cutter method.	1 test per Km	S/RI/U
c	Camber.	Complete	Measurements	1 test per Km	S/RI/U
Item Grade				S/RI/U	
Item 9 - Cross Drainage Works – Causeways of all spans and Culverts upto 6 m. span.					
a	Quality of Material – Concrete, Stone/ brick masonry, Hume pipes including size etc.	Ongoing or complete	Visual observation (for CC verify cube test results from records)	General observation	S/RI/U
b	Quality of Workmanship such as positioning of pipes, wing walls, cushion over H Pipes etc.		Visual observation	General observation	S/RI/U
Item Grade					S/RI/U
Item 10 - Side Drain and Catch Water Drain					
General quality of Side Drains/ Catch Water Drains and their integration with CDs.		Ongoing or complete	Visual observation	General observation	S/RI/U
Item Grade					S/RI/U
Item 11 - CC/ Semi Rigid Pavements and Associated Pukka Drains					
a	Quality of Material – Concrete, Stone/ Concrete Block Pavement etc.	Ongoing or complete	Visual Observation	1 per 100 m. Length of Pavement	S/U

b	Strength of CC in Concrete Pavement/ Concrete Block Pavement		Strength using appropriate rebound hammers/ verification of cube test results from test records.	1 per 100 m. Length of Pavement	S/U
c	Quality of Workmanship – Wearing surface texture, Adequacy of setting of concrete, Joints, Edges etc.		Visual observation	General observation	S/U
d	Thickness of Layer		Measurements	1 per 100 m. Length of Pavement	S/U
Item Grade					S/U
Item 12 - Road Furniture and Markings					
a	Citizen Information Board, Main Informatory Board, Quality and whether fixed during construction.	Ongoing	Visual observation	General observation	S/U
b	Logo boards, 200 m stones and Km stones, quality and whether fixed after completion.	Complete	Visual observation	General observation	S/U
C	Whether the information in boards is given in local language.	Complete/ Ongoing	Visual observation	General observation	S/U
Item Grade					S/U

Annexure 3

Requirement of Man power, Equipments and Implements for making the Observations by District Quality Monitor

The following Man power, Equipments and Implements are required for making the Observations by District Quality Monitor during the inspection of a roadwork under PMGSY.

1. One or two unskilled laborers are required to dig the pit and take the samples of the material depending upon the work involved.
2. In addition, the following equipments and implements will also be required:

#	Observation	Method of Observation	Equipments/ Implements Required
1	2	4	6
Item - Geometrics			
1	Widths	Actual Measurements	Measuring tapes of 20m, thread, spirit level and straight edge.
2	Camber	Actual Measurements	
3	Horizontal Curve, Superelevation and extra widening	Actual Measurements	
4	Longitudinal Section	Actual Measurements	
Item - Earth Work and Sub-grade in Embankment			
1	Quality of Material	Visual Classification of Soils	Visual Observation
2	Compaction	Field Density Test by sand replacement/ Core Cutter method.	Rapid Moisture Meter, Sand Replacement Test/ Core Cutter Apparatus.
Item - Sub-Base			
1	Quality of Material		
	a. Grain Size	Gradation Test	Standard Sieves.

	b. Plasticity	Hand-feel test.	
2	Compaction	Field Density Test by sand replacement/ Core Cutter method.	Rapid Moisture Meter, Sand Replacement Test/ Core Cutter Apparatus.
3	Total Thickness of Layer	Measurement	Measuring Tape and Steel Scale of 30cm.
Item - Base Course – Water Bound Macadam			
1	Quality of Material		
	a. Grain Size of Course Aggregate	Gradation Test	Standard Sieves.
	b. Suitability of Course Aggregate in respect degree of hardness.	Hand-feel test .	
	c. Plasticity of Crushable Aggregate used as fillers	Hand-feel test.	
2	Adequacy of Compaction through volumetric analysis.	Hand-feel test.	Pick axe, crow bars and steel Scale of 30 cm.
3	Thickness of every layer of WBM.	Measurement.	Steel Scale of 30cm.
Item - Bituminous Layer – Premix Carpet (PMC)/ Surface Dressing (SD)			
1	Gradation of Aggregate	Gradation Test.	Standard Sieves.
3	Mixing Temperature of Mix.	Measurement.	Thermometers.
4	Laying Temperature of Mix.	Measurement.	Thermometers.
5	Thickness of layer	Measurement.	Steel Scale of 30cm.
Item - CC/ Semi Rigid Pavements and Associated Pukka Drains			
3	Thickness of Layer	Measurement.	Steel Scale of 30cm.

