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RAJIV AWAS YOJANA

RAY

Quality Assurance Manual
2014

सत्यमेव जयते

Government of India
Ministry of Housing & Urban Poverty Alleviation

Rajiv Awas Yojana (RAY)

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Contents

List of Tables

Abbreviations

^{0}C	Degree Celsius temperature
AC	Asbestos cement
AISC	American Institute of Steel Construction
ANSI	American National Standard Institute
ASTM	American Society for Testing and Materials
BIS	Bureau of Indian Standards
BMTPC	Building Materials and Technology Promotion Council
BOQ	Bill of Quantities
BS	British Standards
BSUP	Basic Services to the Urban Poor
CI	Cast Iron
CLTC	City Level Technical Cell
Cm	Centimetre
Cm^2/sqcm	Square centimeter
Cm^3/cubic cm	Cubic centimeter
CPHEEO	Central Public Health and Environmental Engineering Organization
CPWD	Central Public Works Department
CSC	Construction Supervision Consultants
CSMC	Central Sanctioning & Monitoring Committee
Dia	Diameter
Dm^2/sqdm	Square decimeter
Dm^3/cubic dm	Cubic decimeter
DMP	Disaster Management Plan
DPR	Detailed Project Report
DSC	Design and Supervision Consultants
DU	Dwelling Unit
EIA	Environmental Impact Assessment
ELSR / ESR	Elevated Storage Reservoir
Engg. / Eng	Engineer
EWS	Economically Weaker Section
Fig	Figure
Fps system	Foot pound second system
GC	Galvanised corrugated
Gl	Galvanised iron
GLR	Ground Level Reservoir
Gm	Gram
GoI	Government of India
GP	Galvanised plain
GPS	Global Positioning System

GTS	Geo Trigonometric Survey
HIG	High Income Group
HUDCO	Housing and Urban Development Corporation Limited
IER	Indian Electricity Rules 1956
IHSDP	Integrated Housing and Slum Development Programme
IOC	Indian Oil Corporation
IRC	Indian Road Congress
IS	Indian Standards
ISO	International Organization for Standardization
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
Kg	Kilogram
Kl	Kilolitre
Km	Kilometre
LIG	Low Income Group
M	Metre
M^2/sqm	Square metre
M^3/cum	Cubic metre
MIG	Medium Income Group
MIS	Management Information System
Ml	Millilitre
Mm	Millimetre
Mm^2/sqmm	Square Milimetre
MoA	Memorandum of Agreement
MoEF	Ministry of Environment and Forest
MoHUPA	Ministry of Housing and Urban Poverty Alleviation
MoRTH	Ministry of Road Transport and Highways
NBO	National Building Organization
NCR	Non-Conformance Report
NDE	Non Destructive Examination
NGO	Non- Governmental Organization
No	Number
O&M	Operations and Maintenance
PHED	Public Health Engineering Department
PMC	Project Management Consultant
PMU	Programme Management Unit
PPP	Public Private Partnership
PVC	Polyvenyl chloride
PWD	Public Works Department
Q	Quintal
QA	Quality Assurance
QAP	Quality Assurance Plan
QC	Quality Control

QMS	Quality Management System
QS	Quality Surveillance
RAY	Rajiv Awas Yojana
RCC	Reinforced cement concrete
Re/Rs	Rupee/Rupees
SLMSC	State Level Monitoring and Sanctioning Committee
SLNA	State Level Nodal Agency
SLTC	State Level Technical Cell
SOR	Schedule of Rates
SW	Stone ware
SWG	Standard wire Gauge
T	Tonne
TBM	Temporary Bench Mark
ToR	Terms of Reference
TPIMA	Third Party Inspection and Monitoring Agency
TSS	Total Station Survey
UGR	Under Ground Reservoir
ULB	Urban Local Body
UT	Union Territory

Preface

Rajiv Awas Yojana (RAY) envisages a "Slum Free India" with inclusive and equitable cities in which every citizen has access to basic civic and social services and decent shelter.

In pursuance of this vision of "Slum free India", Rajiv Awas Yojana (RAY) was launched in June 2011 in two phases; the preparatory phase for a period of two years which ended in June 2013 and implementation phase. Central Government has approved the implementation phase for the period of 2013-2022.

RAY envisages a two-step implementation strategy i.e. preparation of Slum free City Plan of Action (SFCPoA) and preparation of projects for selected slums.

RAY Scheme Guidelines issued by the Ministry broadly describe the Scope, Coverage, Reforms, Implementation Approach, Central Assistance, Administrative and Implementation structure and Monitoring mechanisms under RAY.

However, to assist States/ULBs to implement RAY, the following operational guidelines have been prepared by the Ministry:

1. Guidelines for Reforms
2. Guidelines for GIS, MIS and GIS-MIS integration
3. Guidelines for preparation of Slum-free City Plan of Action
4. Guidelines for Community Participation
5. Guidelines for preparation of Detailed Project Reports
6. Guidelines for Project Management
7. Guidelines for Social Audit
8. Guidelines for Capacity Building
9. Quality Assurance Manual

The above mentioned guidelines are uploaded on the Ministry's website at www.mhupa.gov.in.

Operational guidelines provide a general reference framework for implementation under RAY. Feedback and suggestions are welcome and may be posted at Ministry through RAY Vaarta (www.mhupa-ray.gov.in), an interactive website which serves as a common platform for discussions and dissemination of information.

Introduction to Quality Assurance Manual

Quality is conformity to standards and requirements to achieve excellence and is one of the key parameters to access the successful completion of any Project.

Quality Assurance (QA) is the planned and systematic actions necessary to provide adequate confidence that the work will satisfy quality requirements. Quality Assurance attempts to improve and stabilise implementation to avoid, or at least minimize, issues which may lead to the defect(s) during construction.

Quality Assurance is normally expressed together with Quality Control. Quality Control (QC) is a system of maintaining standards by reviewing, checking, inspecting and testing. Quality control needs to emphasize testing of materials used during implementation.

This Quality Assurance Manual (QAM) has been prepared with the objective of putting in place a comprehensive, consistent and common system through Testing and Inspections for quality assurance to address specific need of the project to be taken up for implementation of under Rajiv Awas Yojana with the focus on the activities primarily on supervision and quality control of construction works of the project after award of contract.

The QA manual shall be used for day-to-day reference of the Engineers in the field and the Contractors engaged in the construction works of Housing, Social Amenities & basic Civic Infrastructure. This manual will also help the implementing agencies to set the procedures to be adopted by the contractor for Quality Control. The manual contains checklists and quality control tests & their frequency related to various civil works primarily with construction proposed under RAY.

To ensure this important aspect (Quality) of project management, provisions of QAM shall be made part of the contract agreement. The quality control requirements prescribed in this Manual will be mandatory for all RAY works. This manual would also serve as a useful reference to the quality assurance agencies at National, State, City and slum levels.

If any quality tests or assurances are required to be performed and it is not covered in this manual, the same shall have to be done in lines with the stipulations/provisions of relevant code of practice by BIS. If there are any differences between the tests and other quality control procedures described in the Manual and those stipulated in the contract documents and specifications, the later shall prevail.

This QA Manual focuses on the implementation activities of the project following contract award and primarily on supervision and quality control of construction works. The Manual does not attempt to suggest technical specifications, since these are stated in the contract documents. This manual will provide guidance on good engineering practice, however its recommendations are not intended to be exhaustive. Its aim is to ensure that the works are executed as per specifications. Quality Assurance and test results shall be interpreted as applicable for different contracts in accordance with contractual provisions.

1. Quality management system

To address various levels of deficiencies in slums, there can be three types of interventions as under:

a) In-situ re-development (Housing and infrastructure)
b) In-situ up-gradation (Filling gaps in housing and infrastructure)
c) Slum relocation (Housing and infrastructure) in unavoidable cases.

(Refer Scheme & Operational Guidelines of RAY for details)

Works in slums are often very small in size and widely scattered with very limited basic facilities like road access to heavy plant/ equipment etc. It is, therefore, necessary that while developing a suitable Quality Management System (QMS) for construction work, such constraints are kept in view. The types of quality control tests and their frequency have also to be judiciously selected so as to be achievable under the prevailing conditions. Keeping the above factors in mind, a three tier quality management system together with a simplified practical approach to Quality Assurance in RAY works along with role and responsibilities of contractors is prescribed as detailed in subsequent paragraphs.

1.1 Three tier quality management system

1.1.1 City Level (First Tier):

The City Mission Directorate is envisaged as a first tier of quality management with the primary function of construction supervision and quality control. The quality management shall be facilitated through the Project Implementation Team comprising of officials/ engineers & CLTC experts. This implementation team shall be assisted by Project Management Consultants (PMC) i.e. Construction Supervision Consultants (CSC) or Design and Supervision Consultants (DSC) of the city directorate wherever PMC is mobilised. The first tier of quality management at city has the primary function of quality control through enforcement of technical standards and quality control requirements through regular testing, close supervision and inspection. The quality management functions of Implementation team shall include the following:

a) Preparation of realistic detailed project report (DPR) with adequate attention to investigations

and pre-construction activities which are essential for proper design and estimation of the project following relevant specifications.

b) Preparation of bid documents and effective selection process for procurement of works, based on proven capacity and ability of the contractors.

c) Supervising Site Quality Control arrangements including materials and workmanship, primarily through testing as per provisions of this manual.

d) Ensuring that:
   (i) Contractors have brought the necessary machinery and equipment to site.
   (i) Field laboratory has been established.
   (i) Key engineering personnel have been deployed by the Contractor and
   (i) The work programme has been approved.

e) Taking timely action to ensure replacement of defective material and rectification of defective workmanship.

f) Submission of monthly tests reports.

g) Verification of Non Conformance Reports (NCR) whenever non-conformance occurs and the action taken by the Contractor on the NCR.

h) Payment to the Contractor shall be regulated as per the Quality Control tests.

The frequency of inspection visits to site by the team members of directorate will depend up on rules enforce in the State/UT, however following frequency is recommended while the work is in progress:

(i) Junior Engineer – Daily
(ii) Assistant Engineer – Twice a week
(iii) Executive Engineer – Once a week

The Contractor shall be responsible to set up and maintain an adequately equipped Field Laboratory for routine tests for quality control required to be conducted on a day to day basis. Field Laboratory will be manned by suitably trained personnel in material testing and quality control works. Special or sophisticated tests, may be outsourced, to approved National Accreditation Board for Laboratories (NABL) accredited Test Laboratories or Higher Technical (academic) Institutes or Research Laboratories.

In case of beneficiary led execution, the required testing shall be ensured by Project Implementation team in approved laboratories. Implementing agency shall ensure that the capacities of beneficiaries are enhanced for ensuring quality of works. They should be trained in various aspects of Quality management like material testing and sampling.

Quality control requires the project team to continuously inspect the work in progress to ensure that it is in line with the project scope and with an effective quality control programme which includes specified standards and service requirements. This team shall be responsible for overall quality of works to be implemented through contractor or beneficiaries themselves. The team shall carry out regular quality inspections during all critical activities but not limited to as under:

1. Excavation
2. Formation of embankments
3. Placing of reinforcing steel
4. Concrete batching and pouring
5. Laying of pavement layer
6. Completion of excavation trenches for pipe laying
7. Completion of laying and jointing of pipes
8. Pressure/leakage testing of pipeline
9. Backfilling
10. Installation of electrical and mechanical equipment
11. Testing, trial runs and commissioning of electro-mechanical equipment
12. Any other items as specified in the contract documents

The team shall also inspect the materials certified by manufacturers upon delivery to the site. The contractor shall give advance notice to the City Directorate when critical activities are proposed or major equipment items are to be delivered. On completion of one stage of the construction and before proceeding to the next stage the team member shall inspect and certify the quality of the works completed before granting approval for the next stage of the works to start. The final inspection shall encompass tests on completion and trial runs. The certification of quality will be based on the documents and the periodic site visits. List of tests to be conducted as per manual shall be prepared with their frequency so as to ensure the best quality works are implemented. The specifications which are part of the schedule should clearly outline the works to be carried out as per Standard Specifications.

Concerned team member(s) shall record their observations. Daily work record / Site order book as prescribed in this manual shall also be maintained. All test samples should be preserved, with proper identification numbers, test log reference, test date, and other applicable information. These samples must be stored at contractor's office/laboratory by the contractor.

It would be essential for the implementing agencies to establish the structures necessary for community participation in various processes and activities under the scheme. The participation and involvement of the slum dwellers from the stage of survey, planning, implementation including quality assurance and concurrent social audit is essential. To ensure community participation, cities are expected to create Slum Dwellers Association at each selected slum level and Slum Dwellers' Federation at the city level. (Refer to Guidelines for Community Participation and Social Audit for details)

1.1.2 State Level (Second Tier):

Function of the second tier of independent quality management is to ensure that the Quality Management System at the site is functioning satisfactorily and suggest possible improvements where required. For this, they may be required to carry out and report:

i) Independent quality tests to verify that the quality management system achieving its intended objectives.
ii) Systemic flaws in the quality control process and action to improve the process.

For effective implementation and monitoring of ongoing projects under RAY, States / SLNA should appoint Third Party Inspection and Monitoring Agency (TPIMA) through open and transparent bidding process preferably before implementation of the projects.
TPIM agencies, appointed by the SLNA will undertake desk review and field visits for monitoring the progress and quality pertaining to stages of pre-construction, construction, commissioning & testing and post construction as per their scope of work.

Each State/UT will report the progress of TPIMA on a quarterly basis through IPoMS. SLNA shall ensure that the comments for rectifications proposed by TPIMA are complied with. SLNA will have to be satisfied with the performance of TPIMA and will provide certificate signed by

competent authority to MoHUPA for reimbursement of claims. Role and responsibility of TPIMA are annexed at Appendix E. TPIMA shall submit Inspection report on quality control in the format prescribed at **Appendix E.**

Monitoring will also be done by members of SLNA and SLTC. Upon completion of a project, the State Nodal Agency, through the State Government, would submit completion report to the Central Government.

The role of second tier in monitoring the quality of the work is of crucial importance during construction stage and therefore the State Quality Monitors (Members of SLNA, SLTC and TPIMA) are required to carry out inspections at appropriate stages of work under progress.

The State Govt. /SLNA shall prescribe frequency of inspections by various officers. Their inspection and quality testing supervision will therefore be counted as part of effective supervision of the first tier of quality management. During the visits to the work, they will oversee the operations of the quality control testing procedure and record their observations in the Inspection Register. The suggested agenda for the inspection is described as under:

1. Physical inspection of the works under execution and inspection of quality of workmanship;
2. Review of site documentation and contractor compliance;
3. Sample verification of test reports and quality certificates;
4. Review of issues, constraints and lacunae in quality system implementation;
5. Preparing of action plans for improving the quality.

They should ensure that the work is carried out strictly as per approved designs and drawings and as per specifications and provisions of approved project. It should also be ensured that Quality control lab has been established by the contractor and qualified personal as per provisions of contract have been deployed. It is also be ensured that records and registers of quality control have been maintained properly and observations are being recorded.

They will also verify that the Non-Conformance Reports are issued in time and action is being taken by Contractor promptly. They will prepare Inspection Reports which shall be sent to the Implementation team for taking remedial action.

1.1.3 National Level (Third Tier):

Ministry of Housing and Urban Poverty Alleviation will periodically monitor the scheme including quality. Central Sanctioning and Monitoring Committee (CSMC) will meet as often as required to sanction, review and monitor the progress of projects sanctioned under the Mission. Appraisal agencies are expected to thoroughly check the specifications of various components incorporated in the DPRs before final appraisal so that the quality of works does not suffer during implementation. Monitoring of progress and quality of projects executed by the implementing agencies in the States/Cities will be facilitated through Central Monitoring Agencies (CMA) on random basis as per requirements.

The objective of this third tier of quality mechanism is to monitor the quality of works executed by the States / ULB's with a view to ensuring that the works under the programme conform to standards and to see whether the quality management mechanism in the State is effective. The role of this tier is to provide guidance to State implementation machinery and the field engineers rather than 'fault finding'. As such, the shortcomings are identified by the third tier and a feedback is provided to the States for improvement.

1.2 Role and Responsibilities of the Contractor(s)

Contractors are responsible for the execution and completion of the work(s) in accordance with the contractual provisions, specified standards & specifications and within the contractual time and contract price for the work(s). For the turnkey contracts, contractors are also responsible for preparing design, drawings, quantity surveying, cost estimation etc. and obtaining their approval.

Notwithstanding the full provisions of the respective contracts documents, Contractors are responsible for providing the following:

1. Adequacy of necessary plant, equipment, construction material, construction technology / methodology and labour to be used in the permanent and temporary works;
2. Transportation and storage facilities for all materials and equipment.
3. Temporary office and proper hygienic accommodation for staff and labour
4. Ensuring health and education facilities for the children of labour if any;

5. Drinking water and sanitation facilities at the site;
6. Necessary staff and laboratory equipment for testing and quality control.
7. Personnel Protective Equipment (PPE) to field staffs
8. Safety Hand Book for safe engineering practice
9. Approved Environmental Management Plan (EMP)
10. Construction programme in consultation with the implementing agency and community.
11. Execution of all the works as per approved designs and drawings, specification and terms of contract agreement.

2. Project Scheduling and Implementation milestones

Depending upon the deficiencies in the selected slum(s) with regard to housing, basic civic infrastructure and social amenities, either of the following types of interventions may be considered.

i. In-situ Re-development.
ii. In situ Up-gradation
iii. Slum Relocation.

After sanction of DPR(s), the project implementation needs to be completed within the agreed time frame, adhering to the quality without any cost overrun. To achieve this, it is necessary that the project implementation schedule is properly firmed up with definite measurable milestones using project management techniques/software. Monitoring of milestones shall be ensured on regular basis through IPoMS.

Broad parameters of project schedule for the type of intervention selected are:

1. For In-situ re-development intervention

After sanction of the DPR, pre award scheduling with time frame shall be as under.

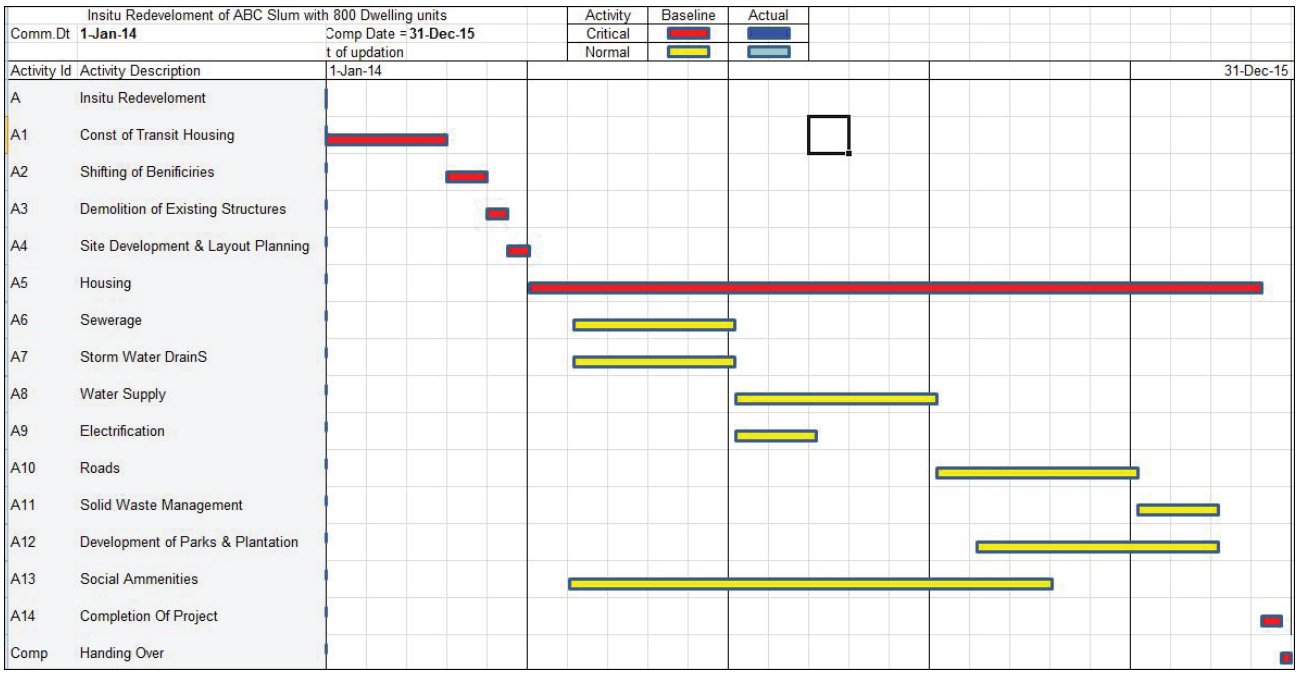
Activity Id	Activities	Duration Months
P1	Tender packaging, Preparation and Approval of Tender documents ***(This activity is to be taken up in anticipation of project sanction)***	-
P2	Invitation of Tender(s) and Receipt	1
P3	Evaluation of Tender(s)	0.5
P4	Approval of Tender(s)	1
P5	Award of contract(s)	0.5

Post award of contract(s), after handing over the site to the contractor the major activities of the project with construction period of 24 months with tentative time frame may be as under (The time frame would vary with the project size):

Activity Id	Activities	Duration Months
A1	Construction of Transit Housing	3
A2	Shifting of Beneficiaries	1
A3	Demolition of Existing Structures	0.5
A4	Site Development & Layout Plan	0.5
A5	Housing	18
A6	Sewerage	4
A7	Storm Water Drains	4
A8	Water Supply	5
A9	Electrification	2
A10	Roads	5
A11	Solid Waste Management	2
A12	Development of Parks & Plantation	6
A13	Social amenities	12
A14	Completion of project	0.5
Comp	Handing Over	0.5

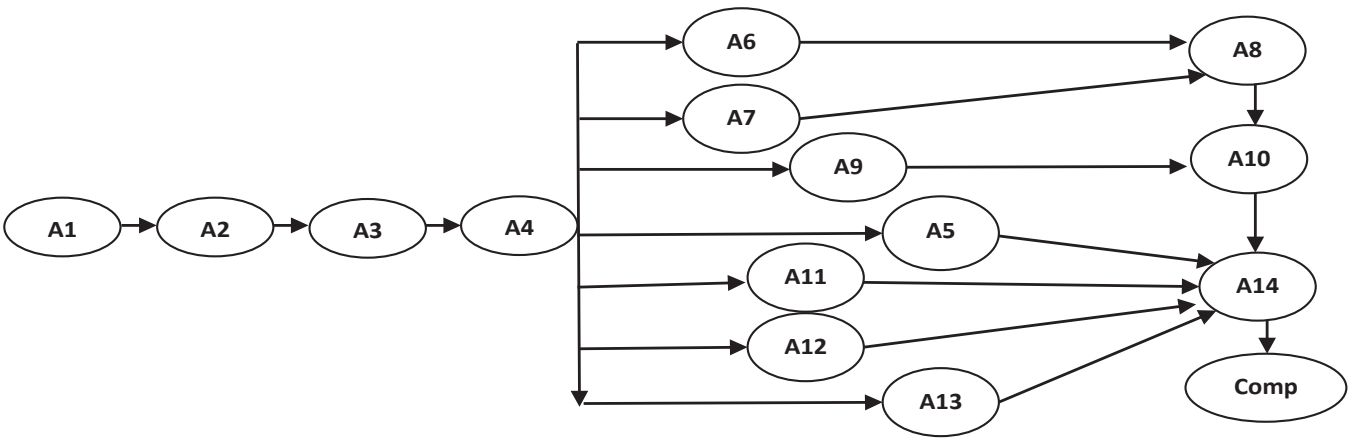
Activity A5, A6, A7, A9, A11, A12 and A13 can occur at the same time after site layout is completed. Project network tools shall be used for planning, scheduling and monitoring project progress. The Project Implementation for the illustrative example can be shown in following ways:

A) Gantt Chart



B) CPM Network

Activity A5, A6, A7, A9, A11, A12 and A13 can occur at the same time after site layout is completed. A1 – A2 – A3 – A4 – A5 – A14 – Comp is the longest path, (critical path) – if one of the activities on this path is delayed then the whole project will be delayed by the same amount of time.



2. For In situ Up-gradation intervention

Activities as outlined for in-situ redevelopment intervention may be taken up either fully or partially depending upon the site condition in case of up-gradation intervention.

3. For Slum relocation intervention

Construction activities as outlined for in-situ redevelopment intervention can directly be taken up in this case as the land (vacant) is freely available.

Administrative and Technical issues during implementation of works:

During implementation of project, certain issues as under may also need to be addressed in time to avoid delays in execution and subsequent cost overrun.

Administrative issues:

1. Non acquisition of land or delay in acquisition

2. Non receipt of approval/permissions
3. Delay in release of funds
4. Delay in creation of implementation mechanism.
5. Delay in award of contracts
6. Diversion of funds to non-project activities
7. Delay in contribution from Beneficiaries and resistance of beneficiaries for relocation.
8. Delay in appointment of TPIMA
9. Delay in data entry in IPoMS
10. Non utilization of completed dwelling units.

Technical issues:

1. Variation and/or deviation in scope of work (i.e. BOQ and Design)
2. Lack of quality control and supervision
3. Non establishment of field lab and Non deployment of personal by the contractor
4. Use of sub-standard material, Poor workmanship, improper curing etc.
5. Cost escalation due to hasty planning and lack of forecast.
6. Lack of supporting infrastructure (i.e. inadequate access in to the slum etc.).

3. Control of Materials and Equipment components

This section provides an overview of control requirements for materials and equipment components, including site testing, manufacturers' certification and third party inspection.

Control and approval of construction materials and equipment components to be incorporated in the works shall be based on the following:

1. Test reports for materials tested at site, such as cement, sand, water, aggregates , bitumen etc.
2. Manufacturer's certificates and IS mark for manufactured items.
3. Third party inspection for various items as per contract documents.

3.1 Materials Tested on Site:

The materials to be tested on site include cement, water, aggregates for concrete, bricks and stones, soil for embankments, and aggregates and bituminous materials for road works. For aggregates and soil, the contractor shall obtain the approval of the borrow source or quarry before extracting material. The list of materials to be tested on site is given in the **Table 1** below. Test procedures are presented in **Table 2** under the referenced procedure numbers. Test report formats are included in Appendix B. The reports are to be maintained in a bound register, where in 3 copies of report will be prepared, two copies are to be submitted with monthly report and third copy to be retained by contractor.

Table 1 List of Materials Tested on Site

Sl. No.	***Material***	***Test Procedure No.***
1	Cement	QC-M-01
2	Sand / Fine Aggregates.	QC-M-02
3	Water for Construction Works (can be tested in approved lab)	QC-M-03
4	Bricks	QC-M-04
5	Size Stone	QC-M-05
6	Coarse Aggregate for Concrete Work	QC-M-06
7	Soil/Earth/Sub-grade Material	QC-M-07

Sl. No.	*Material*	*Test Procedure No.*
8	Granular Sub-base (GSB) Material	QC-M-08
9	Material for WBM / WMM	QC-M-09
10	Metal for BM/DBM/BC/Surface Dressing/MSS/Premix Carpet	QC-M-10
11	Binder for WBM	QC-M-11
12	Fine Aggregate for DBM/BC	QC-M-12
13	Lime	QC-M-13
14	Bitumen	QC-M-14
15	Borrow Material	QC-M-15
16	Steel (to be procured directly from manufacturer along with test certificates)	

Table 2 Procedures for Testing Materials on Site

CEMENT			**QC-M-01**	
Sl. No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
1	Normal consistency	TC-M-01-01	One for each source and when called for by the Engineer Sampling should comply with IS 3535	On receipt of material at site and before using as directed by the Engineer. Test certificate to be produced to the Engineer before use.
2	Fineness	TC-M-01-01		
3	Setting time – Initial/ final	TC-M-01-01		
4	Compressive strength -72 hrs, 168 hrs, 672 hrs.	TC-M-01-01		
For sulphate resistant cement as per IS-12330 OPC 43/53 shall conform to IS 8112/ 12269				

SAND			**QC-M-02**	
Sl. No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
1	Particle Size and shape IS 2386-Part-I	(For Sieve analysis)	One test for 20 m^3	On receipt at site and test certificate to be produced to the Engineer before use.
2	Fineness modulus	TC-M-02-01	One test for 20 m^3	
3	Deleterious constituents	TC-M-02-01	One test for 20 m^3	
4	Bulking test	TC-M-02-01	One test per 20 m^3 or part there of	
5	Silt content IS2386-PartII	-	One test for 20 m^3	

WATER FOR CONSTRUCTION WORKS			QC-M-03	
Sl. No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
1	Alkalinity and acidity as per IS-3025	TC-M-03-01	Once per source of supply and when called for by the Engineer	Before use of water from that source
2	Solids	TC-M-03-01		

BRICKS & BRICK TILES			QC-M-04	
Sl. No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
1	Compressive strength	TC-M-04-01	One test per 50,000 bricks or part thereof	On receipt at site
2	Physical properties	TC-M-04-01		
3	Water absorption test	TC-M-04-01		

SIZE STONE			QC-M-05	
Sl. No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
1	Water absorption test	TC-M-05-01	One test per source and when called for	On receipt at site
2	Dimension check	Lab format	As directed by the Engineer	
3	Type of rock	Lab format		

COARSE AGGREGATE FOR CONCRETE			QC-M-06	
Sl. No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
1	Aggregate Impact or Los Angeles Abrasion Value as per IS-2386 Part-IV	TC-M-06-01/1 TC-M-06-01/2	One for each source of supply and when called for by the Engineer	On receipt of material at site
2	Soundness as per IS-2386 Part-V	TC-M-06-02		
3	Deleterious material as per IS 2386-Part II	-		
4	Particle size distribution IS 2386-I	-		
5	10% Fine value as per IS 2386-Part IV	-		
6	Water Absorption	TC-M-05-01		
When required, the contractor shall furnish the mix design along with material properties at least 15 days in advance.				

SOIL/EARTH/SUB-GRADE MATERIAL			QC-M-07	
Sl. No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
1	Swelling index IS 2720 part XL	TC-M-09-01	Two sets for 3000 m^3 or part thereof	On receipt at site
2	Liquid limits and plasticity index	TC-M-09-02		
3	Deleterious material IS 1498	Lab format		
4	OMC & MDD Test	TC-M-09-03		
5	Chemical properties	Lab format		
6	Grain Size Distribution Graph (by wet sieve analysis)	TC-M-09-04		
7	Void ratio gradation	Lab format		
8	Soaked CBR test (optional)	TC-M-07-01	Two sets for 3000 m^2 or part thereof and as directed by the Engineer	

GRANULAR SUB-BASE MATERIAL			QC-M-08	
Sl. No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
1	California Bearing Ratio Test	TC-M-07-01	As required	On receipt at site
2	Material combinations	Daily log		
3	Moisture content as per IS-2270	TC-M-07-02	1 test per 250 m^3 or part thereof	Prior to compaction
4	Fineness value BS 812 Part III	Lab format	As required	On receipt at site
5	Soundness of material	TC-M-06-02		
6	Air voids content	Lab format		
7	Gradation by wet sieve analysis	TC-M-06-04	1 test per 200 m^3 or part thereof	
8	Atterberg limits	TC-M-09-02		
9	Deleterious constituents	Lab format		
10	OMC and MDD	TC-M-09-03		
The contractor shall furnish the GSB design mix along with material properties and test results at least 15 days before laying GSB at site.				

MATERIAL FOR WBM / WMM			QC-M-09	
Sl. No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
1	Aggregate Impact Value	T C - M - 0 6 - 01/1	One test for 200 m^3	On receipt at site
2	Grading by wet sieve analysis	TC-M-06-04	One test for 100 m^3	
3	Flakiness Index and Elongation Index	TC-M-06-03	One test for 200 m^3 of aggregate	
4*	Atterberg limits of binding material *(Only for WBM)	TC-M-09-02	One test for 25m^3 of binding material	
5	Atterberg limits of portion of aggregate passing 425 micron sieve.	TC-M-09-02	One test for 100 m^3 of aggregate	
6	Water Absorption Test	TC-M-05-01	Initially one set of 3 representative specimen for each source of supply and subsequently, when warranted by changes in the quality of aggregate	
7	Soundness Test	TC-M-06-02	One for each source of supply and when called for by the Engineer	On receipt at site and when absorption value is more 2%
8*	Density of compacted layer of WMM *(Only for WMM)		One test for 500 m^3	

METAL FOR BM / DBM / BC / SURFACE DRESSING / MSS / PRE-MIX CARPET			QC-M-10	
Sl. No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
1	Aggregate Impact Value	TC-M-06-01/1	One test for 50 m^3 of aggregate or part thereof	On receipt at site and before using in the hot mixing
2	Flakiness Index and Elongation Index of aggregates	TC-M-06-03		
3	Water absorption of aggregates	TC-M-06-06	Initially one set of 3 representative specimen for each source of supply and subsequently, when warranted by changes in the quality of aggregate	
4	Stripping value	TC-M-11-01		
5	Gradation by wet sieve analysis	TC-M-06-04	As directed by the Engineer for individual component and for combined coarse, fine aggregate and filler.	
6	Soundness Test	TC-M-06-02	One for each source of supply and when called for by the Engineer	On receipt at site and when absorption value is more than 2%
7	10% Fine Value as per IS 2386 – Part IV	-	One for 45 cum of part	
For DBM and BC, the contractor shall furnish the material properties and proposed job mix formula at least 20 days in advance.				

BINDER FOR WBM			QC-M-11	
Sl. No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
1	Atterberg Limit Test	TC-M-09-02	One test for 100 m^3 of binding material	On receipt at site

FINE AGGREGATE FOR DBM/BC			QC-M-12	
Sl. No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
1	Passing 2.36 mm sieve and retained on 75 micron sieve	Daily log	As directed by the Engineer	Before use
2	Deleterious matter	Daily log	Visual observation of lot before use	

LIME			QC-M-13	
S l . No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
1	Chemical properties as per IS: 6932, 1514	Lab format	3 final test samples for a lot size up to 100 tons as per Table 3 in IS 712	On receipt at site.
2	Physical properties as per IS: 6932	Lab format		

BITUMEN			QC-M-14	
Sl. No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
1	Grade of bitumen as directed/defined (Penetration Test)	TC-M-10-01	Two samples per test subject to all or some tests as directed by the Engineer	On receipt of material at site before unloading from the truck
2	Ductility Test	TC-M-10-02		
3	Flash and Fire Point Test	Lab format		
4	Viscosity Test	Lab format		
5	Softening Test	Lab format		

BORROW MATERIAL *(Soil to be used in Embankment / Sub grade / GSB)*			QC-M-15	
Sl. No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
1	Digging of borrow area for sampling	No format	25 m c/c or closer depending upon soil strata variation	Before material is extracted for use in construction.

BORROW MATERIAL *(Soil to be used in Embankment / Sub grade / GSB)*			QC-M-15	
Sl. No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
2	Sand Content	TC-M-15-01 (use relevant test report formats and summarize results in TC-M-15-01)	2 sets of observation per 3000 m^3 of soil and in each 6 observations required.	Before material is extracted for use in construction.
3	Wet Sieve Analysis			
4	Plasticity Index			
5	Modified Proctor Density			
6	Soaked CBR Test			
7	OMC			
8	MDD			
Borrow material source must be approved before extracting material.				

3.2 Materials and Equipment certified by Manufacturer

Apart from tests conducted on field, acceptance of certain manufactured materials and equipment components, as stipulated in the contract, shall be based on test certificate(s) from the manufacturer conforming to BIS and on visual inspection. These items shall bear the ISI mark. Implementing agency shall review the manufacturers' certificates for conformance to contract requirements before these items are delivered to the site, installed or otherwise incorporation in the works. Materials and equipment subject to manufacturer's certification are as under:

1. Cement
2. Steel/Reinforcing Steel
3. Paint, Primers and Protective Coatings
4. Water Proofing Compound
5. Metal Works such as windows, barbed wire, MS ladder, footrest, rolling shutters
6. GI, CI,DI, HDPE, MDPE and PVC Pipes.
7. Glazed Stoneware Pipes (GSW) for general civil works
8. Gratings & Plates
9. Manhole Covers
10. Sanitary Fittings
11. Joint Filler Material
12. Pre-fabricated Water Tanks

13. Flow Measuring Devices
14. Electrical Conduits
15. Electrical Wires/Cables
16. Switches & Sockets
17. Distribution Boards
18. Earthing Material
19. Insulators
20. Lightening Arrestor
21. Batteries
22. Cable Termination Kit
23. Fire Fighting Equipment
24. Any other items as specified in the contract documents

3.3 Materials and Equipment Inspected By Third Party

Materials and equipment are to be inspected by a third party as stipulated in the contract documents. Third party inspection would normally take place at the factory during or upon completion of manufacture. Before delivery on site, Third Party Inspection (TPI) certificates shall be reviewed for conformance to requirements. Inspection criteria should be stipulated in the contract document. A list of materials and equipment suggested for inspection by third party is as under:

- DI, CI, BWSC, PSCC, GRP, PVC, HDPE,MDPE and other Pipes
- NP Pipes (RCC) for Sewers & Pipe Culverts
- Equipment, Specials, Valves & Fittings for Water Supply & Waste Water Systems
- All types of Pumps and Motors
- Transformers
- Electrical Cables
- Telephone / Internet Cable and accessories.
- Electrical Starters
- Switch Boards (HV/MV/LV)
- Manhole Frames & Covers
- Fire Fighting Equipment
- SWM bins and Equipment.
- All other items as specified in the contract documents

4. Quality Assurance of General Civil and Structural Works

This section covers materials to be used for building works, the testing of works and the inspection of workmanship for general civil and structural works. The key elements to be inspected in these works are concreting, stone masonry, brick masonry and finishes. The requirements for testing and control of materials for these works are outlined in **Section 3.**

4.1. Testing of Works

The works to be tested on site include excavation, cement concreting and stone & brick masonry. All the materials proposed to be used in these works shall be tested by the contractor and get these approved well in advance of execution of these works.

Tests for general civil and structural works are listed in **Table 3**. Test procedures are presented in **Table 4,** under the referenced test numbers. Required materials tests are also indicated (materials testing procedures are presented in Section 3). Test report formats are included in Appendix B. The contractor shall conduct tests as stipulated.

Table 3 List of Tests for General Civil and Structural Works

Sr. No	Process	Material Name	Format No.	Test Ref. No.
1	Embankment Formation	Soil/Earth	QC-M-07	QC-G-01
2	Excavation/Backfilling			QC-G-02
3	Concreting	Steel	MC*	QC-G-03
		Cement	QC-M-01	
		Coarse Aggregates	QC-M-06	
		Sand	QC-M-02	
		Water	QC-M-03	
4	Size Stone Masonry	Size Stone	QC-M-05	QC-G-04
		Cement	QC-M-01	
		Sand	QC-M-02	
		Water	QC-M-03	
5	Brick Masonry	Bricks	QC-M-04	QC-G-04
		Cement	QC-M-01	
		Sand	QC-M-02	
		Water	QC-M-03	

Note: * MC = Manufacturer Certified.

Table 4 Procedures for Testing General Civil and Structural Works

Sr. No	Type of Test	Test Report Format No.	Frequency of Test	Timing of Test/ Inspection
Embankment Formation			**QC-G-01**	
1	Moisture content as per IS-2720	TC-M-09-03	One test for each 250 m^3 of soil	In-process
2	Field density test as per IS-2720	TC-M-09-03	5-10 density tests for each 1,000 m^2 compacted area, or as directed by Engineer	
3	Compaction	Daily log	As per required number of passes	While compacting
Excavation/Backfilling			**QC-G-02**	
1	Layout, slopes of excavation, benching and over-burden	Daily log	As directed by the Engineer	After excavation
2	Sub-soil water, shoring and strutting	Daily log		
3	Bottom levels and compaction	Daily log		
4	Soil classification	Daily log		
5	Backfilling and compaction	Daily log		After backfilling
Concreting			**QC-G-03**	
1	Compressive strength as per IS-516	TC-G-01-01	One test for 1-5 m^3 of concrete Two tests for 6-15 m^3 of concrete Three tests for 16-30 m^3 of concrete Four tests for 31-50 m3 + one set every 50 m^3 of additional concrete work.	Test samples to be taken while pouring. Testing to be done as specified in contract.

Sr. No	Type of Test	Test Report Format No.	Frequency of Test	Timing of Test/ Inspection
2	Slump test per IS-1199	TC-G-01-02	Random checks throughout concreting as directed by the Engineer	Before pouring concrete
3	Inspection of steel reinforcement placement and bending, and formwork	Daily log	Before pouring concrete	Before pouring concrete
4	Concrete Pour Report	TC-G-01-03	When pouring is done	Immediately after pouring
Mortar			**QC-G-04**	
1	Compressive strength as per IS-2250	TC-G-01-01	One sample for every 2 m^3 of mortar subject to a minimum of three samples for a day's work	Test samples to be taken while before mortaring. Testing to be done as specified in contract.
2	Consistency as per IS-2250	TC-G-02-01		

4.2. Important considerations for implementation of projects under RAY.

a) Site selection

The development of a project should not cause damage to the natural surroundings of the site. Site development should be carried out in light of a holistic perspective of optimal use of land and environment. It should be ensured that the existing landscape is preserved and protected from degradation during the process of construction. It should also be ensured that the site is tenable and not prone to flooding and other hazards.

b) Use of cost effective technologies

The innovative and cost effective technologies such as pre-cast systems should preferably be adopted for fast and timely execution of projects. The use of industrial waste like fly ash as the

construction material shall be encouraged so that valuable natural resources like fertile soil and fossil fuels are saved. For detailed information on innovative and cost effective technologies, website www.bmtpc.org of Building Materials and Technology Promotion Council (BMTPC) and website www.tifac.org.in of Technology Information, Forecasting and Assessment Council (TIFAC) may be referred .

c) Green Technologies

Conservation of the environment and ecology should be built into the habitat planning, which includes water conservation through reducing strategies (use of dual pour cistern for flushing and low flow plumbing fixtures), handling of household waste (segregation of bio-degradable waste for composting), reduced dependency on virgin material (e.g. wood for doors and windows), use of renewable sources of energy (i.e. Solar lights), rain-water harvesting (provision of open spaces and rain water collection system apart from roof water harvesting), innovative and energy efficient technologies (e.g orientation of building to get maximum benefit of natural light and ventilation).

d) Functional features

The living room of dwelling unit should be located near the entrance facing preferably the open space, wherever possible. The bedroom should be located away from the entrance and living room to ensure privacy. The bedroom should be connected with a balcony wherever possible.

The kitchen should have adequate ventilation and natural sunlight and it should preferably be adjoining the living room. The working platform must be adequately wide and free from obstructions. The design should provide adequate space for appliances such as stove, sink etc. Proper arrangement for storage space i.e. loft, shelves shall be ensured.

The bathroom should also have adequate ventilation and natural lighting. The bath fittings and sanitary fittings must be of a high quality to withstand regular and prolonged use. The joints of water and sanitary fixtures should be made leak proof to avoid spilling of walls. Proper slope shall be maintained in floor to drain water effectively particularly in bathroom and toilets. The bathroom / toilet floor should be lower than the other flooring of the house.

e) Other features

Plinth level of buildings should be 60 to 75 centimeters above natural ground level/ existing road level to avoid backflow of water. R.C.C. bands at sill, lintel and roof levels for load bearing structures should be provided.

The entrance of building should be constructed in a visually appealing manner. For security reasons, the entrance must be constructed in such a way that it provides adequate protection. The entrance also needs to protect the building against inhospitable weather such as harsh sunlight and excessive rains.

Minimum level of accessibility for persons with disabilities shall be ensured by provision of ramps, handrails etc.

The doors and window frames shall be preferably made of metal (MS Tubular) / stone frames to save wood.

Re-use of building materials retrieved from site like bricks, stone etc. should be encouraged to ensure maximum resource recovery and safe disposal of wastes generated during construction. This will also reduce the burden on the landfill.

Effective curing of structural component shall be ensured. It should be ensured that the plaster on the walls fully dries before the commencement of the paint job. In case, there is any seepage on the walls, then that fault should be fully rectified. The floor should be covered with plastic sheeting to avoid paint spilling on the floor.

In case the building is being constructed adjacent to any existing building proper water proofing by using plastic sheeting etc. should be ensured so that the walls of existing building are not dampened.

f) Infrastructure

The infrastructure component should be planned to reduce site disruption due to laying of utility lines. Efficient placement of utilities like water supply pipes, gas pipelines, electrical and

telephone cables etc should be ensured. It should also be ensured that proper signage indicating underground utilities are provided at site to facilitate proper operation and maintenance and future expansion works if any.

Community information (Display boards) shall be installed at the entry / prominent place of the intervened slum. These boards should contain the type of works including layout plan of infrastructure , sections etc. proposed for the intervened slum, cost of the project, duration of the project, details of implementing agency with details of contact person and telephone numbers etc.

Proper measures should be ensured to utilize rainwater for various applications (including groundwater recharge) where potable municipal water is normally used, to reduce the load on both the municipal supplies as well as the sewerage system and to improve the groundwater level.

Provision of adequate potable water as per norms shall be ensured. Proper mechanism for testing of drinking water should also be ensured. It should also be ensured that the treated wastewater is meeting the desired standards for reuse/disposal.

While planning for the segregation of solid waste, it is to be ensured that separate dust bins are provided for segregating bio degradable waste.

Parking arrangement as required for the intervened slums should be made. Sheds shall be provided for livestock depending on the beneficiary's requirements. While planning for social amenities. They should be ensured that proper planning is done as per socio- economic pattern of the project / beneficiaries. Proper attention must be given to ensure that livelihood of community is not affected. If need arises proper arrangements like cattle shed/ common working space etc. must be provided.

Community centers / multipurpose centers should act as a hub for community groups. They should have space adaptable as a meeting area, dancehall, music room, place for tuitions etc. They should be equipped with Internet connection and computer facilities as far as possible. In case of smaller slums health kiosks may be established for which a space of around 200sqft.

(For housing the ANM for providing basic outreach services) would be provisioned under RAY.

In bigger slums / slum cluster having population of about 10-15 thousand building of about 2500Sqft. can be constructed under RAY and made available for establishment of new UPHC. Otherwise an area of land measuring arount 4000 sqft can be provided at the time of slum redevelopment to be used for the construction of UPHC to serve the population. NUHM will support the cost of construction of building.

It should be ensured that electrical supply outlets are sufficient to meet the electrical equipment needs. Electrical supply outlets need to be placed on each wall and at entry and outside building. A master switch should be installed controlling all equipment. Electrical supply should be adequate to accommodate future growth. Lighting needs to be even across the rooms. Natural lighting should be provided wherever possible. Phone jacks should be placed in the rooms at appropriate place..

The drainage system should be so provided that the main drain is connected to the outfall to avoid water logging in the rehabilitated project area. Special attention should be paid to proper alignment, gradient, proper bedding and correct depth. It should be ensured that connection with sewers is not made, and free board is provided

The design of Infrastructure components shall be carried out as per provisions of CPHEEO Manuals, IRC Codes, BIS Codes, UDPFI guidelines with relevant amendments and other relevant specifications. For details websites www.cpheeo.nic.in, www.irc.org.in and www.bis.org.in may be referred.

Breathing in asbestos dust can cause irreversible lung damage and cancer. Hence the use of Asbestos products should be avoided in RAY Projects.

5. Quality Assurance of infrastructure works

The infrastructure to be development of selected slums under RAY shall consist of Roads, Water supply, Sewerage, Drainage, Solid Waste Management, Electrification etc. This section covers the Quality assurance of infrastructure works including testing of works and the inspection of workmanship. Before starting the work, Engineer in charge shall:

1) Study the contract drawings, contract conditions and special conditions, specifications, special provisions, the technical note issued by the sanctioning authority, the estimate of quantities, etc. to have a clear understanding of the scope and extent of the work.
2) Review construction programme given in the project report and see whether it is possible to adhere to this in the light of availability of resources and related factors. If not, prepare a revised programme to reflect the actual situation and revised cost, where necessary and submit to higher authorities with justification, for approval. The programme should be based on Critical Path Method for major works and in the form of bar charts for other cases.
3) Check whether the project involves permission or approval of other departments/agencies etc.
4) Look into the stipulated contract time for completion vis-à-vis the working seasons and calendar months to ensure that the tasks are completed according to the specified programme.
5) Keep at site:
    - Survey and investigation report including material test results.
    - Bill of quantities.
    - Site order book; Work diaries
    - Quality control record book;
    - A set of working drawings mounted on cloth and
    - Up-to-date construction programme
6) Take all precautions for safeguarding the environment during the course of construction
7) Ensure that all construction should be with reference to the final centre line of the main location survey.
8) Ensure that all survey monuments, bench marks, beacons, etc. should be maintained accurately during the construction process. A survey file containing the setting out data for traverse points and levels shall be prepared and maintained during the construction process.

9) Ensure that surplus water should be removed away from the construction area quickly and effectively.

5.1. Road works

This section covers the Quality assurance of infrastructure works including testing of works and the inspection of workmanship for road works, including earthworks, placement of sub-base and WBM layers, application of prime and tack coats, and placement of bituminous layers. The requirements for testing and control of materials for road works are outlined as under:

The Specifications for road works shall be based on the current Indian Roads Congress (IRC) specifications, recommended codes of practice and Ministry of Roads Transport and Highways (MoRTH) specifications.

5.1.1. Testing of Road works

List of Tests for Road Works are tabulated below in Table 5 . Test Procedures are presented Table 6 , under the referenced test numbers. Inspection checklist for road works is presented in Appendix D.

Table 5 List of Tests for Road Works

Sl. No.	Process	Material		Test Ref. No.
		Name	Format No.	
1.	Embankment Formation	Soil/Earth	QC-M-07 QC-M-15	QC-R-01
2.	Excavation			QC-R-02
3.	Granular Sub-base Laying	Granular Sub-base	QC-M-08	QC-R-03
4.	WBM Laying	WBM	QC-M-09	QC-R-04
		Binder	QC-M-11	
5.	Prime Coat Application	Bitumen	QC-M-14	QC-R-05
6.	Tack Coat Application	Bitumen	QC-M-14	QC-R-05
7.	Surface Dressing	Bitumen	QC-M-14	QC-R-06
		Metal	QC-M-10	
8.	Bituminous Macadam Laying	Bitumen	QC-M-14	QC-R-07
		Metal	QC-M-10	

Sl. No.	Process	Material		Test Ref. No.
		Name	Format No.	
9.	DBM Laying	Bitumen	QC-M-14	QC-R-08
		Metal	QC-M-10	
		Fine Aggregates	QC-M-12	
		Filler (Lime)	QC-M-13	
10.	Mix Seal Surfacing	Bitumen	QC-M-14	QC-R-06
		Metal	QC-M-10	
		Fine Aggregates	QC-M-12	
11.	Bituminous Concrete Laying	Bitumen	QC-M-14	QC-R-08
		Metal	QC-M-10	
		Fine Aggregates	QC-M-12	
		Filler (Lime)	QC-M-13	
12.	On Completion of Laying of BM / DBM / BC	*Stage completion test*		QC-R-09

Table 6 Procedures for Testing Road Works

Embankment Formation			**QC-R-01**	
S l . No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
1	Moisture content as per IS-2720	TC-M-09-03	One test for each 250 m3 of soil	In-process
2	Field density test as per IS-2720	TC-M-09-03	• For earthwork in embankment/ cutting 5-10 density tests for each 1000 m^2 compacted area • For earthwork in sub grade/GSB and shoulders, 10 density tests for 500 m^2 compacted area	
3	Rolling operation	Daily log	As per required number of passes	While rolling

Excavation			QC-R-02	
Sl. No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
1	Layout, slopes of excavation, benching and over-burden	Daily log	As directed by the Engineer	After excavation
2	Sub-soil water, shoring and strutting	Daily log		
3	Bottom levels and compaction	Daily log		
4	Soil classification	Daily log		

Granular Sub-Base Laying			QC-R-03	
Sl. No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
1	Moisture content as per IS-2720	TC-M-09-03	One test for 500m2 of compacted soil (3 observations per test)	In-process
2	Field density test as per IS-2720	TC-M-09-03	10 observations selected randomly for every 500m2 of compacted area	
3	Rolling operation	Daily log	Required No. of passes	While rolling

WBM Laying			QC-R-04	
Sl. No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
1	Field Density Test by sand replacement method	TC-R-06-01	As directed by the Engineer	In-process

Prime Coat/Tack Coat Application			QC-R-05	
Sl. No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
1	Temperature Test	Daily log	At regular close intervals	In-process
2	Rate of spreading	TC-R-02-01	Three tests for every 50 m length	

Surface Dressing/Mix Seal Surfacing/ Pre-mix Carpet			QC-R-06	
Sl. No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
1	Rate of spread of mix material	TC-R-02-01	One test for every 500 m^3 of mix with 6 observations	In-process

Bituminous Macadam Laying			QC-R-07	
Sl. No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
1	Temperature Test	Daily log	At regular close intervals	In-process
2	Rate of spread of mix material	TC-R-02-01	2-3 observations at every 10 m interval during paving	

DBM/BC Laying			QC-R-08	
Sl. No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
1	Temperature Test	Daily log	At regular close intervals	In-process
2	Rate of spread of mix material	TC-R-02-01		
3	Stability of Mix/Marshal Stability Test	TC-R-05-01	3 samples for each 400 tons of mix produced subject to a minimum of 2 tests per plant per day.	While hot mixing

On Completion of BM / DBM / BC Layers Stage Completion Test			QC-R-09	
Sl. No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
1	Core test for compacted layer (bitumen content, density and voids)	TC-R-07-01	One test for 250 m^2 of compacted area	On completion of stage and before proceeding to next stage
2	Surface regularity and control of alignment	TC-R-07-02	One test for every 300 m of road length	

5.2. Pipeline (Water Supply, Sewerage & Drainage) & water retaining structures

This section covers the testing of works and the inspection of workmanship for pipeline works and liquid retaining structures. The requirements for testing and control of input materials are outlined in previous sections

5.2.1. Testing of Works

The works to be tested on site include bedding for pipelines, pipeline laying and jointing, and hydrostatic, leakage and water tightness tests after completion. All the materials proposed to be used in these works must have been tested by the Contractor and get these approved well in advance of commencing works. The contractor shall obtain the approval when a particular stage is completed and before proceeding to the next stage.

Tests for pipeline works and liquid retaining structures are listed in **Table 7**. Test procedures are presented in **Table 8**, under the referenced test numbers. Required materials tests are also indicated (materials testing procedures are presented in previous section). Test report formats are included in Appendix B.

Table 7 List of Tests for Pipeline Works and Liquid Retaining Structures

Sl. No.	Activity	Material		Test Ref. No.
		Name	**Format No.**	
1	Bedding for Pipeline			
1.1	Earth Bedding	Earth/Soil	QC-M-07	QC-P-01
1.2	Gravel Bedding	Gravel	QC-M-08	

Sl. No.	Activity	Material		Test Ref. No.
		Name	Format No.	
1.3	Concrete Bedding	Cement	QC-M-01	QC-P-02
		Sand	QC-M-02	
		Water	QC-M-03	
		Coarse Aggregate	QC-M-06	
		Steel	MC (1)	
2	Pipeline Laying and Jointing			
2.1	GSW Pipe	Cement	QC-M-01	QC-P-02 QC-P-03
		Sand	QC-M-02	
		Water	QC-M-03	
		Pipes	MC (1)	
2.2	RCC, CI and DI Pipes	Pipes	TPI/MC (1)	
		Gaskets	TPI/MC (1)	
2.3	Coated and Lined Steel/PSC Pipes	Coated and lined steel/ PSC pipes	TPI (1)	
2.4	PE/PVC pipes	Pipes	TPI/MC (1)	
3	Manhole/Valve Chamber Construction	Cement	QC-M-01	QC-P-02 QC-P-03
		Sand	QC-M-02	
		Water	QC-M-03	
		Bricks	QC-M-04	
		Coarse Aggregate	QC-M-06	
		Cover	TPI (1)	
		Frame/Vent shaft etc.	MC (1)	
		Steel	MC (1)	
4	Completion of Pipeline Laying and Jointing	Stage Completion Test		QC-P-04
5	Completion of Manhole/ Valve Chamber Construction	Stage Completion Test		QC-P-05
6	Completion of Liquid Retaining Structures (Wet Wells, Storage Reservoirs, Pretreatment Units, RCC Open Channels, etc.)	Stage Completion Test		QC-P-06

Note: 1. MC = manufacturer certified; TPI = third party inspection.

Table 8 Procedures for Testing Pipeline Works and Liquid Retaining Structures

Earth Bedding			QC-P-01	
Sl. No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
1	Moisture content as per IS-2720	TC-M-09-03	One test for each 250 m3 of soil	In-process
2	Field density test as per IS-2720	TC-M-09-03	One test for each 100 m^2 of compacted area	

Concreting			QC-P-02	
Sl. No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
1	Compressive strength as per IS-516	TC-G-01-01	• One test for 1-5 m^3 of concrete • Two tests for 6-15 m^3 of concrete • Three tests for 16-30 m^3 of concrete • Four tests for 31-50 m3 of concrete + one set every 50 m^3 of additional concrete work.	Test samples to be taken while pouring. Tests to be done as specified in the contract.
2	Slump test per IS-1199	TC-G-01-02	Random checks throughout concreting period as directed by the Engineer	Before pouring concrete
3	Steel reinforcement placement and bending	Daily log	Before pouring concrete	Before pouring concrete
4	Concrete Pour Report	TC-G-01-03	When pouring is done	Immediately after pouring
5	Permit for concreting	TC-G-01-03 A	Before each concreting	-

Mortar			QC-P-03	
Sl. No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
1	Compressive strength as per IS-2250	TC-G-01-01	One sample for every 2 m^3 of mortar subject to a minimum of three samples for a day's work	Test samples to be taken while placing. Tests to be done as specified in the contract.
2	Consistency as per IS-2250	TC-G-01-02		

Completion of Pipeline Laying and Jointing			QC-P-04	
Sl. No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
1	Hydrostatic test for NP pipes	TC-P-04-01	One test for defined stretch	On completion of stage
2	Hydrostatic test for pressure pipes	TC-P-04-02	One test for defined stretch	On completion of stage

Completion of Manhole/Valve Chamber			QC-P-05	
Sl. No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
1	Leakage Test	TC-P-05-01	100% inspection	On completion of stage

Completion of Liquid Retaining Structures			QC-P-06	
Sl. No.	**Type of Test**	**Test Report Format No.**	**Frequency of Test**	**Timing of Test/ Inspection**
1	Water tightness for underground structures	TC-P-06-01	One test per structure	On completion of stage
2	Water tightness for elevated structures	TC-P-06-02	One test per structure	

5.2.2. Control of electromechanical works

This section gives an overview of the quality control requirements for electromechanical works, such as water treatment and supply systems, sewage treatment plants, compost plants, pumping systems, and power supply and distribution systems. The requirements for testing and control of input materials and components, including manufacturers' certification and third party inspections, are outlined in Section 3.

Materials and components to be incorporated into electromechanical works shall be inspected as soon as they are delivered, to ensure that they meet the specifications and design requirements, are in agreement with shipping documentation, and are accompanied by manufacturer's certifications or third party inspection certificates, as applicable. Accepted materials and equipment shall be properly stored by the contractor until needed. If manufacturer's installation instructions conflict with design or contract requirements, these shall be notified immediately. Installation shall proceed only after the materials and components are approved.

A series of inspections and tests during installation and completion of electromechanical works shall be performed by the contractor or the equipment manufacturer and witnessed by Engineer-in-charge, as follows:

- Preparatory Inspections: Prior to installation, the civil and structural works where electromechanical equipment is to be installed shall be inspected to ensure conformance with designs and equipment installation requirements.
- Installation Inspections and Tests: A system of inspections and tests, as specified in the contract or recommended by the equipment manufacturer, shall be employed throughout movement to position and installation of equipment and systems. Inspections shall be performed at critical points during installation. Surveillance shall be provided throughout the progress of work to ensure that installation is performed in accordance with the contract requirements, approved drawings, acceptable workmanship standards and configuration control requirements. All field modifications and retrofit work shall be performed under the surveillance of the installation inspector.
- Installation Verification Inspections: Prior to all mechanical and electrical testing, verification inspections shall be performed to ensure that equipment has been satisfactorily installed.
- System Tests: These tests shall be conducted as appropriate to demonstrate that the installed

systems are free from damage due to shipment and installation, and that equipment performs in accordance with specifications.

- Integrated Tests: After completion of system tests, integrated tests shall be performed to demonstrate that the system performs satisfactorily when connected to its interfacing systems or sub-systems. These tests will be followed up by commissioning tests.
- Commissioning Tests: These consist of a series of tests performed under service operating procedures to demonstrate compatibility of the physical plant with operating procedures.
- Final Inspections: Final inspections shall be performed to ensure that the completed work is in accordance with the contract and that all previously identified discrepancies have been resolved satisfactorily.

5.2.3. External Electrification:

All supply and installation work shall be carried out as per specification and in accordance with the construction drawings and shall conform to requirements called for in the Indian Electricity Rules 1956 with its latest amendment, Indian Electricity Acts and all relevant codes and practices issued by the Bureau of Indian Standard as amended up-to-date. The work shall also comply with the provisions of the general or local set of legislatures and regulations of any local or other statutory authority which may be applicable.

Contractor shall obtain approval of the layout at site from the Engineer-in-Charge before commencement of the work. Contractor shall Furnish samples of materials at site for approval including arranging necessary tests on samples, as directed by the Engineer-in-Charge in an approved Laboratory.

Contractor shall employ a full time experienced supervisor having electrical supervisor's certificate of competency endorsed by the Licensing Board, Directorate of Electricity of concerned State to supervise the work.

Contractor shall keep the appropriate Electrical Inspector & supply authority be informed from time to time as per the execution programme of the work shall be the responsibility of the contractor and he shall be responsible to ensuring that all work passes their approval.

6. Document Control

6.1. Test Report Controls

All the tests and field checks are to be carried out as per the applicable quality control requirements. The tests are carried out by the contractor who will designate (Engineer) a laboratory-in-charge authorized to sign test reports for him. The witnessing officer will sign the reports and put his name and designation.

The flow of test report documentation shall generally be as follows:

i) Test reports shall be submitted by the contractor to the Engineer – in -charge.

ii) Engineer – in -charge representative shall issue a Conformance/Non-Conformance Report (CNC Report) to the contractor after review of test results using Format **QF-1 of Appendix C.** The CNC reports will have a running serial number for each contract package.

iii) The CNC report shall be entered in the Test Report Log by the contractor at the site, using Format of **QF-2 of Appendix C**. The details of input materials will be recorded in the Material Register, using **QF-3 of Appendix C.** The contractor shall maintain all test records properly.

iv) Other approvals given to the contractor will be recorded in the daily logs of the contractor which should form part of the contractor's monthly report. A recommended format for Daily Work Record/Site Order Book is illustrated in Format **QF-4 of Appendix C**

v) Hindrance during execution if any shall be recorded in Hindrance register as per QF-5 of Appendix C

Similar procedures shall be followed for the transmittal and review of test reports for tests performed at outside laboratories, for manufacturers' certificates, and for third party inspection reports.

6.2. Tracking of Instructions

During the process of construction, different agencies are expected to conduct site visits and instruct the contractor to ensure quality and timely construction within the costs to the extent possible. The multiplicity of agencies is a special feature of the project sanctioned under RAY. Hence there may be some ambiguity in the instruction flow if these are not transmitted and recorded properly.

All the instructions to the contractor shall flow through the Engineer in charge of the Implementing Agency. The instructions are of the following types:

1. All instructions related to the contract administration including approval of the contract variation orders, time extensions, notices related to rate of progress etc. to be issued by Implementing agency.
2. The instructions regarding quality, testing, monitoring and work scheduling can be issued by the CMA, State quality monitors and representatives of implementing agencies also. In case of conflict of instructions of the in these matters, the instructions of the Implementing Agency would prevail.
3. Instructions issued during site visits or inspections of the various agencies, which are normally recorded in the contractor's Site Order Book, shown in QF-4 of **Appendix C;** and
4. Instructions issued during review meetings in the form of minutes, letters, etc.

All instructions noted above are to be recorded by the contractor in the Instruction Log. Instructions also include notices of rejection of work inspected because it was found to be non-conforming to requirements and which has to be redone or rectified.

6.3. Site Order Book

The Contractor shall be responsible to maintain a Site Order Book, in triplicate, at the site of the works at all times, and this shall be open for inspection by authorized representatives of Central, State and Implementing agencies.

The Site Order Book has two primary purposes – to record the day-to-day instructions to the Contractor and the Contractor's compliance with these instructions, and to record the inspection and acceptance of work completion stages along with issuing approvals to the Contractor to proceed with the next stage of construction.

As noted above, the status of the Contractor's compliance with instructions issued is to be summarized in the Instruction Log and reviewed monthly by the implementing agency and during the periodic inspections by supervising agencies. In cases where the Contractor has failed to comply with the instructions, the reasons therefore shall be determined and necessary remedial actions taken.

The Implementing agency will maintain a file of site orders issued to contractor for record and compliance.

6.4. Correspondence Control

Out-going letters (including transmittal letters and notes) originating from various organizations involved in the Project (Implementing agency, contractors, manufacturers, etc.) shall be signed only by the designated project executive of that organization.

All letters should have a reference code and number, and should refer to a single subject only, which shall be clearly stated on top of the letter, after the recipient's address. All outgoing letters should be numbered sequentially. All replies should refer to the originator's reference code and number and subject.

Incoming correspondence should be stamped and dated, and preferably given an internal reference code and number. All incoming and outgoing correspondence should be logged chronologically, either in computer correspondence registers or in manual correspondence logs.
Copies of outgoing correspondence and originals of incoming should be filed in chronological files at the document center of each project organization. There should be only one chronological file for all outgoing correspondence. Regarding incoming correspondence, there could be more than one chronological file, based on the volume of correspondence expected to be received from project related organizations (for example Implementing agency can maintain separate incoming chronological files for each contractor, etc.)

APPENDICES

Appendix A :Checklist of Testing Laboratory Equipment

Contract Package No: ____ *Name of Work:* _____

Contractor Name: _____

Testing Equipment	Type of Test	Yes	No
Balance (2 type) volume measuring apparatus & hand tools etc.	General laboratory test		
Oven	Drying and moisture content determination		
Sieves, sieve shaker and hydrometer	Grain size analysis and classification of soil and aggregates		
Atterberg limit apparatus	*Plasticity of Soil*		
Procter/modified proctor (IS heavy) density equipment	Soil compaction test		
Sand replacement cylinder and core cutter	In-situ density test for field compaction control		
Compression testing machine 100 MT and 5 MT capacity	Compressive strength of cement, concrete, brick, etc.		
Cylinder and cube moulds for concrete and mortar	Concrete sampling		
Slump cone	Workability and control of water in concrete casting		
Vicat apparatus	Setting time determination of cement		
Laboratory CBR equipment	Determination of strength of road pavement and layers		
Dynamic cone penetration test equipment	Determination of strength of road pavement and layers		
SPT equipment and hand auger	Boring, sampling and soil strength test		
Unconfined compression testing machine	Determination of shear strength of cohesive soil		
Direct shear equipment	Determination of angle of internal friction of soil		
Consolidation test equipment	Determination of settlement / compressibility of soil		

Testing Equipment	Type of Test	Yes	No
Los Angles Abrasion test/ Impact Testing Machine	Los Angeles Abrasion test/ Impact Test		
Core drilling equipment	In-situ sampling		
Bitumen test equipment	Ductility test and Penetration test		
Pressure Gauges and Pumps	Pressure Testing		
Marshal stability test equipment	Road works. To be available at Hot Mix Plant site.		
Rapid Moisture Meter	Checking moisture content at site		
Metallic Contact Digital Thermocouple	Checking temperature of bitumen		

Appendix B : Test report formats

Sl. No	Test Report Title	Format No.
1.	Test Certificate for Cement	TC-M-01-01
2.	Test Certificate for Sand	TC-M-02-01
3.	Test Certificate for Water for Construction Works	TC-M-03-01
4.	Test Certificate for Bricks	TC-M-04-01
5.	Water Absorption Test	TC-M-05-01
6.	Aggregate Impact Value Test	TC-M-06-01/1
7.	Los Angeles Abrasion Test	TC-M-06-01/2
8.	Soundness Test	TC-M-06/02
9.	Flakiness and Elongation Index Test	TC-M-06-03
10.	Gradation/Sieve Analysis	TC-M-06-04
11.	California Bearing Ratio Test (CBR)	TC-M-07-01
12.	Moisture Content Test (Field)	TC-M-07-02
13.	Free Swell Index Test for Soils	TC-M-09-01
14.	Liquid Limit and Plasticity Index (Attterberg Limits)	TC-M-09-02
15.	OMC & MDD Test	TC-M-09-03
16.	Grain Size Distribution	TC-M-09-04
17.	Penetration Test for Grading Bitumen	TC-M-10-01
18.	Ductility Test for Bitumen	TC-M-10-02
19.	Bituminous Mix Dispatch Slip	TC-M-10-03
20.	Stripping Value for Aggregates	TC-M-11-01
21.	Approval of Borrow Material Source for Soil	TC-M-15-01
22.	Concrete Compressive Strength Test	TC-G-01-01
23.	Concrete Slump Test	TC-G-01-02
24.	Daily Concrete Report	TC-G-01-03
25.	Consistency of Mortar Test	TC-G-02-01
26.	Rate of Spreading for Road Works	TC-R-02-01
27.	Marshal Stability Test	TC-R-05-01
28.	Field Density Test by Sand Replacement Method	TC-R-06-01
29.	Core Test for Compacted Layer for BM/DBM/BC	TC-R-07-01
30.	Surface Regularity and Control of Alignment	TC-R-07-02
31.	Hydrostatic Test for NP Pipes	TC-P-04-01
32.	Hydrostatic Test for Pressure Pipes	TC-P-04-02
33.	Leak Test for Manholes	TC-P-05-01
34.	Leak Test for Underground RCC Structures	TC-P-06-01
35.	Leak Test for Elevated RCC Structures	TC-P-06-02

TEST CERTIFICATE FOR CEMENT

Format No.: TC-M-01-01 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Brand & Type of Cement :		Quantity : ___ T, _____ Bags	
Consignment No.: _____ Stores Entry No.:_____	No. of Samples Tested:_____ Tested as per IS_____	Date	Sample Collected : _____ Tested : _____

1. CONSISTENCY

Trial No.	Wt. of cement (gms)	Wt. of water added (gms)	Percentage of water (%)	Reading of indicator (mm)	Consistency (P)	Remarks

2. SETTING TIME

Setting Time	Time recorded when water added	Time recorded at set	Setting time	Remarks
Initial Set				
Final Set				

3. FINENESS (BY DRY SIEVING)

Wt. of cement used	Retained on 90 micron IS Sieve	Percentage retained	Remarks

4. COMPRESSIVE STRENGTH (Check for 72, 168 and 672 hrs.)

Room Temp	Date of		Age of specimen	Crushing load (T)	Crushing Strength kg/cm^2	Remarks
	Casting	Testing				

(Cube Size = 7.06 cm, Wt. of Cement = 200 gms, Wt. of Standard Sand = 600 gms)

Comments of Laboratory In-Charge_____

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Signed & Sealed by Laboratory In-Charge

Witnessed by:

_____ Name

_____ Designation

_____ Signature

TEST CERTIFICATE FOR SAND

Format No.: TC-M-02-01 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Source of Supply:		Quantity : _____ .	
Consignment No.: Stores Entry No.:	No. of Samples Tested:_____ Tested as per IS-_____	Date	Sample Collected: _____ Tested : _____

Whether Bulking Test Carried out for this Source : YES/NO,
If yes, give Lab Ref. No.:_____, Date_____

Dry Bulk Density (Loose):_____

1. *SIEVE ANALYSIS (IS-2386)*

Sieve No.	Sieve Size (mm)	Retained on Each Sieve (% Wt)	Cumulative Percentage Retained	Passing Through (%Wt)	Grading Limits/Remarks

2. *FINENESS MODULUS:* _____

3. *DELITERIOUS MATERIAL:*

Type of Material _____

% by Weight _____

Comments of Laboratory In-Charge _____

_____

_____

_____

_____

Signed & Sealed by Laboratory In-Charge

Witnessed by:

_____	_____	_____
Name	Designation	Signature

TEST CERTIFICATE FOR WATER FOR CONSTRUCTION WORK

Format No.: TC-M-03-01 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Source of Supply:			
	No. of Samples Tested:_____ Tested as per IS-_____	Date	Sample Collected: _____ Tested : _____

S. No	*Color*	*pH Value*	*Organic Solids (mg/l)*	*Inorganic* Solids *(mg/l)*	*Sulphates (as SO_4) (mg/l)*	*Chlorides (as Cl) (mg/l)*	*Suspended Matter (mg/l)*
Limits		*>6*	*<200*	*<3000*	*<500*	*PCC <2000 RCC <1000*	*<2000*

Traces of Oil & Grease _____

Average Hardness as $CaCO_3$ _____

Comments of Laboratory In-Charge _____

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_____

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Signed & Sealed by Laboratory In-Charge

Witnessed by: _____ Name _____ Designation _____ Signature

TEST CERTIFICATE FOR BRICKS

Format No.: TC-M-04-01 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Source of Supply:		Quantity : _____ Nos.	
Consignment No.: Stores Entry No.:	No. of Samples Tested:_____ Tested as per IS-_____	Date	Sample Collected:_____ Tested : _____

1. PHYSICAL PROPERTIES

Dimensional Conformance	
Sounding	
Color	
Foreign Particles	
Obliqueness	

2. COMPRESSIVE STRENGTH

S. No	Frog Mark	Size of Brick LxBxH mm	Crushing Surface Area (cm^2)	Crushing Load (T)	Crushing Strength (kg/cm^2)	Remarks

3. WATER ABSORPTION TEST

S. No	Frog Mark	Wt. of Oven Dried Brick (gms)	Wt. of Wet Brick (gms)	Wt. of Water Absorbed (gms)	% of Water Absorbed	Remarks

Comments of Laboratory In-Charge _____

_____

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_____

Signed & Sealed by Laboratory In-Charge

Witnessed by:

Name	Designation	Signature

WATER ABSORPTION TEST

Format No.: TC-M-05-01 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Source of Supply:		Quantity : _____ .	
Consignment No.: Stores Entry No.:	No. of Samples Tested:_____ Tested as per IS-_____	Date	Sample Collected: _____ Tested : _____
Material Name :			

S. No	Wt. of Oven Dried Material (gms)	Wt. of Wet Material (gms)	Wt. of Water Absorbed (gms)	% of Water Absorbed	Remarks

Water Absorption of Material : _____

Comments of Laboratory In-Charge _____

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_____

Signed & Sealed by Laboratory In-Charge

Witnessed by: _____ _____ _____

Name Designation Signature

TEN PERCENT FINE VALUE

Format No.: TC-M-06-01/1-A **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Source of Supply:		Quantity: _____ .	
Consignment No.: Stores Entry No.:	No. of Samples Tested:_____ Tested as per IS-_____	Date	Sample Collected:_____ Tested : _____

No.	Detail	Unit	Trial				
			1	2	3	4	5
1	Wt. of dry aggregate passing 12.5 mm and retained on 10 mm sieve	Gms					
2	Load required to bring the percentage Fines within 7.5 to 12.5 (x)	Tonnes					
3.1	Weight of material passing through 2.36 mm IS Sieve (first sample) = y_1	Gms					
3.2	Weight of material passing through 2.36 mm IS Sieve (second sample) = y_2 $y = \frac{y_1 + y_2}{z}$	Gms					
3	Load required for 10 percent fines $= \frac{14 * x}{y + 4}$	Tonnes					

Average Value: _____

Comments of Laboratory In-Charge _____

_____

Signed & Sealed by Laboratory In-Charge

Witnessed by:

_____ _____ _____

Name Designation Signature

AGGREGATE IMPACT VALUE TEST

Format No.: TC-M-06-01/1 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Source of Supply:		Quantity : _____ .	
Consignment No.: Stores Entry No.:	No. of Samples Tested:_____ Tested as per IS-_____	Date	Sample Collected: _____ Tested : _____
Material Name :	**No. of Std. Blows : 15**		**Height of Fall : 380 mm**

No.	Detail	Unit	Trial				
			1	2	3	4	5
1	Wt. of dry aggregate passing 12.5 mm and retained on 10 mm sieve + cylinder measure	Gms					
2	Wt. of cylindrical measure	Gms					
3	Wt. of dry aggregate taken (1)-(2)	Gms					
4	Wt. of crushed aggregate passing 2.36 mm sieve after subjecting the test specimen to 15 blows	Gms					
5	Aggregate Impact Value 100*(4)/(3)	%					

Average Value: _____

Comments of Laboratory In-Charge _____

_____

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_____

Signed & Sealed by Laboratory In-Charge

Witnessed by: _____ Name _____ Designation _____ Signature

LOS ANGELES ABRASION TEST

Format No.: TC-M-06-01/2 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Source of Supply:		Quantity : _____.	
Consignment No.: Stores Entry No.:	No. of Samples Tested:_____ Tested as per IS-_____	Date	Sample Collected: _____ Tested : _____
Material Name :	**No. Of Revolutions 500/100 rpm**		**No. Of Abrasive Changes**

No.	Detail	Unit	Trial				
			1	2	3	4	5
1	Weight of aggregate of specified gradation	Kg					
2	Weight of passing IS 1.7 mm sieve after specified revolution	Kg					
3	Los Angeles Abrasion Value =100*(2)/(1)	%					

Average Value: _____

Comments of Laboratory In-Charge _____

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Signed & Sealed by Laboratory In-Charge

Witnessed by: _____ _____ _____

Name Designation Signature

SOUNDNESS TEST

Format No.: TC-M-06-02 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Source of Supply:		Quantity : _____.	
Consignment No.: Stores Entry No.:	No. of Samples Tested:_____ Tested as per IS-_____	Date	Sample Collected: _____ Tested : _____
Material Name :	**Immersion Time**		**Type of Solution**

No.	Detail	Unit	Number of Cycle									
			1	2	3	4	5	6	7	8	9	10
1	Wt. Of clean dry aggregate of specified size range	Gms										
2	Wt. of dry aggregate dried in oven after each cycle	Gms										
3	Loss of aggregate after 10 number of cycles subject to immersion and oven drying after each cycle =(1)-(2)	Gms										
4	Soundness Value =100*(3) / (1)											

Average Value: _____

Comments of Laboratory In-Charge _____

_____

_____

Signed & Sealed by Laboratory In-Charge

Witnessed by: _____ _____ _____

Name Designation Signature

FLAKINESS AND ELONGATION INDEX TEST

Format No.: TC-M-06-03 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Source of Supply:		Quantity : _____.	
Consignment No.: Stores Entry No.:	No. of Samples Tested:_____ Tested as per IS-_____	Date	Sample Collected: _____ Tested : _____
Material Name :			

Sieve Range (mm)	Total Wt. of Aggregate (gms)	Wt. Of Aggregate Passing Thickness Gauge	Flakiness Index	Wt. Of Non-flaky Sample	Wt. of Aggregate Passing Elongation Gauge	Elongation Index
63-50						
50-40						
40-31.5						
31.5-25						
25-20						
20-16						
16-12.5						
12.5-10						
10-6.3						

Flakiness Index _____

Elongation Index _____

Comments of Laboratory In-Charge _____

_____

_____

Signed & Sealed by Laboratory In-Charge

Witnessed by: _____ _____ _____

Name Designation Signature

GRADATION/SIEVE ANALYSIS

Format No.: TC-M-06-04 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Source of Supply:		Quantity : _____.	
Consignment No.: Stores Entry No.:	No. of Samples Tested:_____ Tested as per IS-_____	Date	Sample Collected: _____ Tested : _____
Material Name :			

Sieve No.	Sieve Size (mm)	Wt. Of material retained (g)	Retained on Each Sieve (% Wt)	Cumulative Percentage Retained	Passing Through (%Wt)	Grading Limits/ Remarks

Comments of Laboratory In-Charge _____

_____

_____

Signed & Sealed by Laboratory In-Charge

Witnessed by:

_____ Name

_____ Designation

_____ Signature

CALIFORNIA BEARING RATIO (CBR) TEST

Format No.: TC-M-07-01 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Source of Supply:		Quantity : _____.	
Consignment No.: Stores Entry No.:	No. of Samples Tested:_____ Tested as per IS-_____	Date	Sample Collected: _____ Tested : _____
Specimen Preparation Method			
Type of Compaction Used			
Condition of Specimen at Test			

Density Determination				Moisture Content	Before Compaction			After Compaction		
Mould No.				Mould No.						
				Cup No.						
Wt. of mould +soil				Wt. Of cup +wet soil						
Wt. of mould				Wt. Of cup +dry soil						
Wt. of compacted soil				Wt. Of water						
Volume of mould				Wt. Of cup						
Bulk density (g/cc)				Wt. Of dry soil						
Dry density (g/cc)				Moisture content %						
MDD				OMC						
Degree of compaction				Variation						

Mould No.						
Penetration (mm)	Proving Ring Reading	Load (kg/cm^2)	Proving Ring Reading	Load (kg/cm^2)	Proving Ring Reading	Load (kg/cm^2)
0						
0.5						
1.0						
1.5						
2.0						
2.5						
3.0						
4.0						

Penetration (mm)	Proving Ring Reading	Load (kg/cm^2)	Proving Ring Reading	Load (kg/cm^2)	Proving Ring Reading	Load (kg/cm^2)
5.0						
7.5						
10.0						
12.5						

Swell	Initial Reading	Final Reading	Net Swell	Swell	Average Swell
Mould No.					

CBR at 2.5 mm _____ CBR at 5.0 mm _____ Average CBR value at penetration ___ mm = %

Comments of Laboratory In-Charge _____

_____

_____

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Signed and Sealed by Laboratory In-Charge

Witnessed by: _____ Name _____ Designation _____ Signature

MOISTURE CONTENT TEST (FIELD)

Format No.: TC-M-07-02 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Source of Supply:		Quantity : _____ .	
Consignment No.: Stores Entry No.:	No. of Samples Tested:_____ Tested as per IS-_____	Date	Sample Collected: _____ Tested : _____

Test No.	1	2	3	4	5
Container No.					
Wt. of wet soil taken (S_w)					
Wt. of dry soil in pan (S_d)					
Wt. of water ($W=S_w-S_d$)					
Moisture content $= 100^* W/S_d$					

Comments of Laboratory In-Charge _____

_____

_____

_____

Signed and Sealed by Laboratory In-Charge

Witnessed by: _____ Name _____ Designation _____ Signature

FREE SWELL INDEX TEST FOR SOILS

Format No.: TC-M-09-01 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Source Of Supply:		Quantity : _____ T/M^3	
Consignment No.: _____ Stores Entry No.:_____	No. of Samples Tested:_____ Tested as per IS-_____	Date	Sample Collected : _____ Tested : _____
Oven Dry Soil Passing Through 425-micron IS Sieve	**Weight of Each Sample _____ gms**	**Glass Graduated Cylinders _____ ml size**	

1. Volume of Soil Specimen read from the Graduated Cylinder Containing Distilled Water (V_d) _____ ml

2. Volume of Soil Specimen read from the Graduated Cylinder Containing Kerosene (V_k) _____ ml

3. Free Swell Index .. 100 x $(V_d-V_k)/V_k$ _____ %

Comments of Laboratory In-Charge _____

_____

_____

_____

_____

Signed & Sealed by Laboratory In-Charge

Witnessed by: _____ Name _____ Designation _____ Signature

LIQUID LIMIT AND PLASTICITY INDEX (Atterberg limits)

Format No.: TC-M-09-02 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Source Of Supply:		Quantity : _____ T/M^3	
Consignment No.: _____ Stores Entry No.:_____	No. of Samples Tested:_____ Tested as per IS-_____	Date	Sample Collected : _____ Tested : _____

Sr. No.	Particular	Unit	Liquid Limit					Plastic limit		
			1	2	3	4	5	1	2	3
	No. of blows	no								
	Cup No.									
	Wt. of cup +wet soil (W1)	g								
	Wt. of cup +dry soil (W2)	g								
	Wt. of water = W3=(W1-W2)	g								
	Wt. of cup = W4	g								
	Wt. of dry soil W5=W2-W4	g								
	Moisture content W=W3/W5x100	%								

Liquid limit W_L: %

Plastic limit, W_p: %

Plasticity index, Ip = W_L - W_p = %

Comments of Laboratory In-Charge _____

_____

_____

_____

Signed & Sealed by Laboratory In-Charge

Witnessed by: _____ Name _____ Designation _____ Signature

OMC & MDD TEST

Format No.: TC-M-09-03 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Brand & Type of Cement :		Quantity : _____ T/M^3	
Consignment No.: _____ Stores Entry No.:_____	No. of Samples Tested:_____ Tested as per IS-_____	Date	Sample Collected : _____ Tested : _____

a) Bulk density

S. No.	Particular	Unit	Test no.							
			1	2	3	4	5	6	7	8
	Wt. of mould + compacted soil (W1)	gms								
	Wt. of mould (W2)	gms								
	Wt. of compacted soil (W1 - W2)	gms								
	Volume of mould (V)	cc								
	Wet density (rb) (W1-W2)/V	g/cc								

b) Dry density

S. No.	Particular	Unit	Test no.							
			1	2	3	4	5	6	7	8
	Wt. of cup + wet soil (W3)	gms								
	Wt. of cup + dry soil (W4)	gms								
	Wt. of water = W5=(W3-W4)	gms								
	Wt. of cup (W6)	gms								
	Wt. of dry soil, W7=W4-W6	gms								
	Moisture content =W=(W5/W7)x100	%								
	Dry density = rd=rb(1+W/100)	g/cc								

Maximum dry density

Mean MDD: g/cc _____

Mean OMC: % _____

Comments of Laboratory In-Charge _____

_____

Signed & Sealed by Laboratory In-Charge

Witnessed by: _____ _____ _____

Name Designation Signature

GRAIN SIZE DISTRIBUTION GRAPH

Format No.: TC-M-09-04 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Source Of Supply:		Quantity : _____ T/M^3	
Consignment No.: _____ Stores Entry No.:_____	No. of Samples Tested:_____ Tested as per IS-_____	Date	Sample Collected : _____ Tested : _____

1. Description of soil :
2. Type of sieve analysis : day/wet
3. Total wt. of soil sample : W (g) =

IS Sieve opening	Wt. of sieve dish (g)	Wt. of sieve + dry soil (g)	Wt. of soil retained (g)	Cumulative wt. retained (g)	Cumulative percent retained	----
100 mm						
63 mm						
22 mm						
6.3 mm						
4.75 mm						
2.0 mm						
600 micron						
212 micron						
75 micron						
63 micron						
Passing 63 micron						

Report on gradation of curve:

Uniformity coefficient =Cu = D60/D10 =

Comments of Laboratory In-Charge _____

_____

Signed & Sealed by Laboratory In-Charge

Witnessed by: _____ _____ _____

Name Designation Signature

PENETRATION TEST FOR GRADING BITUMEN

Format No.: TC-M-10-01 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Brand & Type of Cement :		Quantity : _____ T	
Consignment No.: _____ Stores Entry No.:_____	No. of Samples Tested:_____ Tested as per IS-_____	Date	Sample Collected : _____ Tested : _____

1. Pouring temperature, ^{0}C :
2. Period of cooling in atmosphere, minutes :
3. Room temperatures, ^{0}C :
4. Period of cooling in water bath, minutes :
5. Actual test temperatures, ^{0}C :

Sr. No.	Particulars	Test no.		
		1	2	3
	Initial Penetrometer dial reading (R1)			
	Final Penetrometer dial reading (R2)			
	Penetration value R2 - R1			

Mean Penetration Value

Comments of Laboratory In-Charge _____

_____

_____

_____

Signed & Sealed by Laboratory In-Charge

Witnessed by: _____ Name _____ Designation _____ Signature

DUCTILITY TEST FOR BITUMEN

Format No.: TC-M-10-02 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Source of Supply :		Quantity : _____ T	
Consignment No.: _____ Stores Entry No.:_____	No. of Samples Tested:_____ Tested as per IS-_____	Date	Sample Collected : _____ Tested : _____

1. Grade of bitumen :
2. Pouring temperatures, ^{0}C :
3. Test temperatures, ^{0}C :
4. Periods of coding, minutes :
   a) In air :
   b) In water bath before trimming :
   c) In water bath after trimming :

Sr. No.	Particulars	Briquette Number		
		1	2	3
	Ductility (cm)			

Mean Ductility (cm):

Comments of Laboratory In-Charge _____

_____

_____

_____

Signed & Sealed by Laboratory In-Charge

Witnessed by: _____ Name _____ Designation _____ Signature

BITUMINOUS MIX DISPATCH SLIP

Format No.: TC-M-10-03 **Lab Ref. No: _____** **Date _____**

Package Name:	Package No.:
Contractor Name:	Contract No.:
Location of Hot Mix Plant :	Date : Time

1. Truck No :
2. Weight of Loaded Truck :
3. Weight of Empty Truck :
4. Net Weight :
5. Temperature of Mix :
6. Type of Mix :
7. % of Bitumen :

Signature of Hot Mix Plant Agent

Signature of Employers Representative

STRIPPING VALUE FOR AGGREGATES

Format No.: TC-M-11-01 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Source of Supply:		Quantity : _____ T/M^3	
Consignment No.: _____ Stores Entry No.:_____	No. of Samples Tested:_____ Tested as per IS-_____	Date	Sample Collected : _____ Tested : _____

Sr. No.	Particulars	Unit	Test no.		
			1	2	3
	Type of aggregate				
	Type of binder				
	% binder used				
	Total wt. of aggregate	g			
	Total wt. of binder				
	Temperature of water-bath				
	Stripping value				

Mean stripping value (%)

Comments of Laboratory In-Charge _____

_____

_____

_____

Signed & Sealed by Laboratory In-Charge

Witnessed by: _____ Name _____ Designation _____ Signature

APPROVAL OF BORROW MATERIAL SOURCE
FOR SOIL TO BE USED IN EMBANKMENT/SUBGRADE/GSB

Format No.: TC-M-15-01 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Location of Borrow Material Source:			
Inspected By	No. of Samples Tested:_____ Tested as per IS-_____	Date	Sample Collected : _____ Tested : _____
Inspection Date			

Sample No	Sand content %	Wet sieve analysis					Plasticity Index %	Proctor Density g/cc	CBR %	Compaction test	
		4.75	0.60	0.30	0.15	0.075				MDD %	OMC %

Comments of the Engineer _____

_____

☐ **APPROVED** ☐ **NOT APPROVED**

Give Source Reference No. _____

(This ref no. is to be quoted by the contractor whenever material from this source is used)

Signature of the Engineer/ Authorised Representative Signature of the Contractor

Witnessed by: _____ Name _____ Designation _____ Signature

PERMIT FORMAT FOR CONCRETING

Format No.: TC-G-01-03A **Lab Ref. No: _____** **Date _____**

Date of Concreting _____

This Permit Format must be presented to Employer's Representative at least one day advance of proposed concreting. Concreting can be done only if Permit Format is duly signed by authorized representative of implementing agency.

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Where the concrete used:			
Supervised By:		Quantity : _____ T/M^3	
Daily Log Ref._____ Date _____	Mix Grade: _____ Time Start ____ Finish ____	Date	Sample Collected : _____ Tested : _____

Materials	Status of Testing and Approval	Quantity available at site
Cement		
CA1		
CA2		
Fine Aggregate		
Water		

Equipments	Status
Mixer	
Weight Batching M/C	
Vibrator	
Cube moulds	
Cone, Alternative Power Labour	
Availability of Skilled manpower	
Availability of Labour	

Centering & Shuttering

1. **IS formwork plan submitted and approved.**
2. **IS formwork checked by Engineer in Charge.**

Reinforcement

IS reinforcement placed as per approved drawings and design and checked by Engineer in charge.

Plasticizers

1. **IS use of plasticizers approved.**
2. **Name and make of plasticizer**
3. **Type of plasticizer**

Labor Amenities

Approved for concreting

Signature of authorized representative of implementing agency

CONCRETE COMPRESSIVE STRENGTH TEST

Format No.: TC-G-01-01 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Pour Card No:	Pour Card Date:	Quantity : _____ T/M^3	
Daily Log Ref._____ Date _____	No. of Samples Tested:_____ Tested as per IS-_____	Date	Sample Collected : _____ Tested : _____

Sr. No.	Particulars	Unit	Test no.		
			1	2	3
	Identification mark/Sample No.				
	Wt. of specimen	Kg			
	Length of specimen	Cm			
	Breadth of specimen	Cm			
	Height of specimen	Cm			
	Cross sectional area of the specimen	cm^2			
	Crushing load	Kg			
	Compressive strength	kg/cm^2			

Average compressive strength of concrete = _____ kg/cm^2

Comments of Laboratory In-Charge _____

_____

_____

_____

Signed & Sealed by Laboratory In-Charge

Witnessed by: _____ Name _____ Designation _____ Signature

CONCRETE SLUMP TEST

Format No.: TC-G-01-02 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Pour Card No:	Pour Card Date:	Quantity : _____ T/M^3	
Daily Log Ref._____ Date _____	No. of Samples Tested:_____ Tested as per IS-_____	Date	Sample Collected : _____ Tested : _____

S. No.	Particulars	Unit	Test no.		
			1	2	3
	Wt. of cement	kg			
	Wt. of fine aggregate	kg			
	Wt. of coarse aggregate	kg			
	Water/cement ratio				
	Wt. of water	kg			
	Slump	mm			

Average Slump of concrete = _____ mm

Comments of Laboratory In-Charge _____

_____

_____

_____

Signed and Sealed by Laboratory In-Charge

Witnessed by: _____ Name _____ Designation _____ Signature

DAILY CONCRETE REPORT

Format No.: TC-G-01-03 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Where the concrete used:			
Supervised By:		Quantity : _____ T/M^3	
Daily Log Ref._____ Date _____	Mix Grade: _____ Time Start ____ Finish ____	Date	Sample Collected : _____ Tested : _____

Concrete materials per bag of cement

Material	Size	TC Ref	Fineness module	Specific gravity	Impact value	Water absorption	Dry batch weight
Cement							
Coarse Aggregate 1 CA1							
Coarse Aggregate 2 CA2							
Fine Aggregate							
Water							

Sieve Size mm	**Gradation** % Finer		
	CA1	CA2	FA
40			
20			
4.75			
2.36			
1.18			
0.60			
0.30			
0.15			

No. of Concrete Cubes for Testing			
Cube No			
Time			
Cube No			
Time			

Slump Test

Sl.No	Time	Value	Sl.No	Time	Value
1			5		
2			6		
3			7		
4			8		

Temperature Test

Time	Air Temperature	Concrete Temperature

Signature of Contractor Signature of Engineer

Witnessed by: _____ Name _____ Designation _____ Signature

CONSISTENCY OF MORTAR TEST

Format No.: TC-G-02-01 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Pour Card No:	Pour Card Date:	Quantity : _____ T/M^3	
Daily Log Ref._____ Date _____	No. of Samples Tested:_____ Tested as per IS-_____	Date	Sample Collected : _____ Tested : _____

S. No.	Particulars	Unit	Test No.	
			1	2
	Wt. of cement	kg		
	Wt. of sand	kg		
	Water/cement ratio			
	Wt. of water	kg		
	Dial gauge reading before penetration	mm		
	Dial gauge reading after penetration	mm		
	Consistency of mortar	mm		

Average Consistency of mortar = _____ mm

Comments of Laboratory In-Charge _____

_____

Signature of Test Lab

Witnessed by: _____ _____ _____

Name Designation Signature

RATE OF SPREADING

Format No.: TC-R-02-01 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Work Type: Primer/Tack Coat/Surface Dressing/MSS/Pre-mix Carpet/BM/DBM/BC Chainage: from _____ to _____		Quantity : _____ T/M^3	
Daily Log Ref._____ Date _____	Vehicle Speed: ____ km/h Temperature: ____ Pressure: _____	Date	Sample Collected : _____ Tested : _____

TRAY IDENTIFICATION	1	2	3	4	5
Weight of empty tray (g) W_e					
Weight of empty tray+ bitumen sprayed (g) W_b					
Wt. Of bitumen sprayed on tray $W_n = W_b - W_e$					
Area of tray (m^2) A					
Rate of application $= 100 * W_n / A$					

Average rate of application = kg/m^2

Specification limits = kg/m^2

Comments of Site Incharge _____

_____

_____

Signature of the Engineer with Date Signature of Contractor

Witnessed by: _____ Name _____ Designation _____ Signature

MARSHAL STABILITY TEST

Format No.: TC-R-05-01 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Hot Mix Plant Data:		Quantity : _____ T/M^3	
Daily Log Ref._____ Date _____	No. of Samples Tested:_____ Tested as per IS-_____	Date	Sample Collected : _____ Tested : _____

Stability and flow value determinations

Type of grading of aggregates : Grade of bitumen :

Mixing temperature, ^0C Compacting temperature, ^0C

Number of blows on either side = Proving ring calibration factor =

Flow value dial, 1 division =

Sample No.	Bitumen content percent	Maximum proving ring reading	Stability value, kg		Flow dial reading	Flow value, 0.25/0.1 mm units
			Measured	Corrected		
1						
2						
3						
Average						
1						
2						
3						
Average						
1						
2						
3						
Average						
1						
2						
3						
Average						
1						
2						
3						
Average						
1						
2						
3						
Average						

…continued

DENSITY AND VOID DETERMINATIONS

W1 = G1 = W2 = G2 = W3 = G3 = W4 = G4 =

Sample No.	Bitumen content, percent	Height of sample, mm	Weight, g		Bulk Density, G_b	V_v	V_b	VMA	VFB
			in air	in water					
1									
2									
3									
Average									
1									
2									
3									
Average									
1									
2									
3									
Average									
1									
2									
3									
Average									
1									
2									
3									
Average									
1									
2									
3									
Average									

Result

(i) Maximum stability, kg = , at bitumen content, % =

(ii) Maximum bulk density, g/cc = , at bitumen content, % =

(iii) Percent air voids = , at bitumen content, % =

Average bitumen content =

Comments of Laboratory In-Charge _____

_____

Signed & Sealed by Laboratory In-Charge

Witnessed by: _____ Name _____ Designation _____ Signature

FIELD DENSITY TEST BY SAND REPLACEMENT METHOD

Format No.: TC-R-06-01 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
		Quantity : _____ T/M^3	
Daily Log Ref._____ Date _____	No. of Samples Tested:_____ Tested as per IS-_____	Date	Sample Collected : _____ Tested : _____

I. Determination of Bulk Density of Sand

S. No	Particulars	Unit	Trial No		
			1	2	3
1	Inside dia. of calibrating container	Cm			
2	Inside height of calibrating container	Cm			
3	Volume of calibrating container	CC			
4	Wt. of sand + cylinder before pouring	Gm			
5	Wt. of sand in the cone	Gm			
6	Wt. of sand + cylinder after pouring in calibrating container	Gm			
7	Wt. of sand filling with calibrating container	Gm			
8	Bulk density of sand	Gm/cc			

II. Determination of Bulk Density of Soil In-situ

S. No	Particulars	Unit	Trial No		
			1	2	3
1	Wt. Of wet soil from hole	Gm			
2	Wt. Of sand + cylinder after pouring into the hole	Gm			
3	Wt. Of sand in the soil	Gm			
4	Volume of the hole	CC			
5	Bulk density of soil in-situ	Gm/cc			

III. Determination of Dry Density of Soil In-situ

S. No	Particulars	Unit	Trial No		
			1	2	3
1	Container No.				
2	Wt. Of container	Gm			
3	Wt. Of container + wet soil	Gm			
4	Wt. Of container + dry soil	Gm			
5	Wt. Of dry soil	Gm			

S. No	Particulars	Unit	Trial No		
			1	2	3
6	Wt. Of water	Gm			
7	Water content %	%			
8	Dry density	Gm/cc			

Signed by Lab in-charge

Witnessed by: _____ _____ _____

Name Designation Signature

CORE TEST FOR COMPACTED LAYER FOR BM/DBM/BC

Format No.: TC-R-07-01 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Hot Mix Plant Data:		Quantity : _____ T/M^3	
Daily Log Ref._____ Date _____	No. of Samples Tested:_____ Tested as per IS-_____	Date	Sample Collected : _____ Tested : _____

Stability and flow value determinations

Type of grading of aggregates : Grade of bitumen :

Mixing temperature, ^{0}C Compacting temperature, ^{0}C

Number of blows on either side = Proving ring calibration factor =

Flow value dial, 1 division =

Sample No.	Bitumen content from analysis %	Maximum proving ring reading	Stability value, kg		Flow dial reading	Flow value, 0.25/0.1 mm units
			Measured	Corrected		
1						
2						
3						
Average						
1						
2						
3						
Average						
1						
2						
3						
Average						
1						
2						
3						
Average						
1						
2						
3						
Average						

(Continued)

DENSITY AND VOID DETERMINATIONS

W1 = G1 = W2 = G2 = W3 = G3 = W4 = G4 =

Sample No.	Bitumen content from analysis, %	Height of sample, mm	Weight, g		Bulk Density, G_b	V_v	V_b	VMA	VFB
			in air	in water					
1									
2									
3									
Average									
1									
2									
3									
Average									
1									
2									
3									
Average									
1									
2									
3									
Average									
1									
2									
3									
Average									
1									
2									
3									
Average									

Result

(i) Maximum stability, kg = , at bitumen content, % =

(ii) Maximum bulk density, g/cc = , at bitumen content, % =

(iii) Percent air voids = , at bitumen content, % =

Average bitumen content =

Comments of Laboratory In-Charge _____

_____

Signed & Sealed by Laboratory In-Charge

Witnessed by: _____ _____ _____

Name Designation Signature

SURFACE REGULARITY AND CONTROL OF ALIGNMENT

Format No.: TC-R-07-02 **Lab Ref. No: _____** **Date _____**

Package Name:	Package No.:
Contractor Name:	Contract No.:
Road Name:	Total Stretch Length Inspected:
Daily Log Ref: Date	Date Inspected
	Inspected By

1. Horizontal Alignment

Chainage (m)		Horizontal Alignment Tolerances reckoned from center line of carriageway	
From	To	At the edges of the carriageway	At the edge of the road and lower layers

2. Tolerances in Surface Levels

Chainage (m)		Sub-grade	Sub-base	Base		Wearing Course	
From	To			Machine Laid	Manual Laid	Machine Laid	Manual Laid

3. Surface Regularity of Pavement Courses

Chainage (m)		Irregularity – 4 mm		Irregularity – 7 mm	
From	To	Length		Length	
		300 m	75 m	300 m	75 m
		No. of Irregularities		No. of Irregularities	

Signature of Inspecting Authority

HYDROSTATIC TEST FOR NP-PIPES

Format No.: TC-P-04-01 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Daily Log Ref._____ Date _____	Tested as per CPHEEO _____	Date Tested	Test Head : 2.5 m at highest point Observation: 1 hr

Sl. No	ID (mm)	Time in hrs	Stretch	Length (m)	Water level Drop (mm)		Volume of water to restore to original level (liters)	
					10 min	30 min	10 min	30 min

Comments of the Engineer _____

_____

Any rectification to be done by the contractor _____

_____

Signature of the Engineer in charge Signature of the Contractor

Witnessed by: _____ Name _____ Designation _____ Signature

HYDROSTATIC TEST FOR PRESSURE PIPES

Format No.: TC-P-04-02 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:
Contractor Name:		Contract No.:
Daily Log Ref._____ Date _____	Tested as per CPHEEO _____	Date Tested

S. No	Material of pipe	ID (mm)	Stretch	Length (m)	Applied test pressure (kg/cm^2)	Time in hrs)			Observations
						1	2	4	

Comments of the Engineer in charge _____

_____

Any rectification to be done by the contractor _____

Signature of the Engineer in charge Signature of the Contractor

Witnessed by: _____ _____ _____

Name Designation Signature

LEAK TEST FOR MANHOLE

Format No.: TC-P-05-01 **Lab Ref. No: _____** **Date _____**

Package Name:		Package No.:	
Contractor Name:		Contract No.:	
Daily Log Ref._____ Date _____	Tested as per CPHEEO _____	Date Tested	Duration of Water Retention: 24 hrs

S. No	Manhole No.	Water Level (m)		Sign	Drop in water level (mm)	Remarks
		Initial	Final			

Comments of the Engineer in charge _____

_____

_____

Any rectification to be done by the contractor

Signature of the Engineer in charge

Signature of the Contractor

Witnessed by:

Name	Designation	Signature

LEAK TEST FOR UNDERGROUND RCC STRUCTURES

Format No.: TC-P-06-01 **Lab Ref. No: _____** **Date _____**

Package Name:	Package No.:
Contractor Name:	Contract No.:
Name of Structure:	Size:

Date of Filling		Initial Water level (m)		
Observation No.	Date of Observation	Water Level (m)	Drop (mm)	Remark
1				
2				
3				
4				
5				
6				
7				

Comments of the Engineer in charge _____

_____

_____

Any rectification to be done by the contractor _____

_____

Signature of the Engineer in charge _____ Signature of the Contractor

Witnessed by: _____ _____ _____

Name Designation Signature

LEAK TEST FOR ELEVATED RCC STRUCTURES

Format No.: TC-P-06-02 **Lab Ref. No: _____** **Date _____**

Package Name:	Package No.:
Contractor Name:	Contract No.:
Name of Structure:	Size:

Date of Filling		**Initial Water level (m)**	
Observation No.	Date of Observation	Observation	Remark
1			
2			
3			
4			
5			
6			
7			

Comments of the Engineer in charge _____

_____

_____

Any rectification to be done by the contractor _____

_____

_____

Signature of the Engineer in charge Signature of the Contractor

Witnessed by: _____ _____ _____

Name Designation Signature

Appendix C : Formats

S.No.	Title	Format No.
	Conformance/ Non-Conformance Report	QF - 1
	Test Report Log	QF - 2
	Material Register	QF - 3
	Daily Work Record/Site Order Book	QF - 4
	Performa for Hindrance Register	QF - 5
	Inspection Register	QF - 6
	Instruction Log	QF - 7
	Review Meetings	QF - 8
	Quality Certificate	QF - 9

Format QF-1 : Conformance/ Non-Conformance Report

Ref: Date: _____

To
[Contractor]

Package No. : _____;Contract No.: _____

Title of Work : _____

Based on the review of the submitted test reports, as mentioned in the table below, our comments and instructions are mentioned herein for your suitable action.

Test Report No.	Date	Test Laboratory	Material	Comments *(Conforms/ Does not conform. See instructions below)*

Instructions (Actions to be taken by Contractor): _____

_____

_____

_____

_____

_____

_____

_____

Engineer – in - Charge

Format QF-2 : Test Report Log

Contract Package No. : _____; Title of Work: _____

Contract No. : _____; Contractor: _____

Date of Sample	Lab Name	Material / Process	Test Report No.	Date of TR	CNC Report No.	Date	C / NC	Action to be Taken by Contractor	Inspecting Authority Sign

Note: C – Conformance; NC - Non-Conformance

_____

Engineer – in - Charge

Format QF-3: Material Register

Contract Package No. : _____; Title of Work: _____

Contract No. : _____; Contractor: _____

Name of Material : _____; Unit of Measurement: MT/Bags/Drums/M^3/M^2

Inward Date	Inward No.	Source of Supply	Quantity	Test Report No.	CNC Report No.	Date of Issue	Quantity Issued	Quantity Balance	Inspecting Authority Sign
Cumulative Inward including this									
Cumulative Inward including this									

Format QF-4: Daily Work Record/Site Order Book

Name of Work ……

Date of commencement / period for completion ……

Sl. No	Remarks of Inspecting Officer or Contractor	Action taken and by Whom	Remarks

(3 copies per set – one copy each to be sent to Engineer in charge, Implementing Agency records by the Contractor; one copy to be retained at site)

Format QF-5: Performa For Hindrance Register

Name of Work .....

Sl. No	Nature of hin-drance	Items of work that could not be executed due to this hin-drance	Date of start of hin-drance	Date of Removal of hin-drance	Over-lap-ping peri-od , if any	Net hin-drance in days	Sign. Contractor representative.	Sign. Of Engineer in charge

Format QF-6: Inspection Register

Name of Work .....

S.No	Date and Time	Officers name and Designation	Items Inspected and specific defects noticed & action to be taken	Signature	Defects taken to Site Order Book / Letter written			Final Action / result.
					Site Order Book page No. / letter no.	Date	Sign. of Engineer – in - charge	

Format QF-7: Instruction Log

Contract Package No. : _____

Title of Work : _____

Contract No. : _____

Contractor : _____

Date of Instruction	Instruction	Mode of Transmittal				Compliance Action by Contractor	Inspecting Authority Sign
		Charge Order	Site Instruction	Letter	Minutes		

Format QF-8 : Review Meetings

Meeting Conducted on: _____Previous Meeting on: _____

Contract No.	
Name of the Works	
Contract Amount	
Name of Contractor	
Notice to Proceed	
Contract Duration	
Completion Date	
Elapsed Time:	_____mos._____ %
Scheduled Work Completion:	_____ %
Actual Work Completed:	_____ %

Compliance with commitments made during last review meeting

Sr. No	Commitments by Contractor / IA During Last Review Meeting	Whether Complied	If Not, Why & When Will Be Complied

Review of Progress, Quality and Coordination during this Period

Sr. No	**Problems, Issues, Actions to be Taken**	**Action By**	**Due Date**

Any Other Business / General Comments:

[Affix Dated Signatures]

_____ _____ _____

Format QF-9 : Quality Certificate

Contract No.	
Name of the Works	
Contract Amount	
Name of Contractor	
R.A. Bill No./Date	

Period Covered : _____ ; to: _____

This is to certify that we have inspected the conduct of the works in accordance with the established Quality Control procedures and that the items included in this Interim Payment Certificate satisfy the required quality of works and are acceptable with regard to the specifications and standards as proscribed under the Contract.

Signature/Date:

_____

[Site in Charge]

ACCEPTANCE NOTE

This is to certify we accept the Quality Certificate.

Signature/Date:

_____

[Engineer in Charge]]

Note: This Quality Certificate and Acceptance Note shall be completed and attached to each Interim Payment Certificate(Running Bill) before payment is made.

Appendix D : Inspection Checklists.

S.No.	Checklist Name	Format No.
1.	General Check list for Works	GC-1
2.	Inspection Checklists for Building Works	IC-1
3.	Inspection Checklists for Roads	IC-2
4.	Inspection Checklists for Drains	IC-3
5.	Inspection Checklists for Water Supply	IC-4
6.	Inspection Checklists for Sewerage	IC-5
7.	Checklist for Community Monitoring	IC-6

Format GC – 1: General Check list for Works

Sl.No	Item to be checked	Yes / No/ Remarks
1.	Is the Community Information (Display) Board installed at the entry to slum? Is it useful in knowing the details of works?	
2.	Is the People's Estimate (pamphlet) also distributed to the community?	
3.	Is there a Community Monitoring Committee in the slum?	
4.	Is it able to monitor the Progress and Quality of work effectively?	
5.	**AVAILABILITY OF DOCUMENTS:** Are copies of following available at site i) Contract documents incl. contract drawings, ii) Construction (working) drawings, iii) Estimates and designs ? iv) Are the Site Order Book and Quality Control Test Registers properly maintained and available at contractor's site office?	
6.	Is there a Work Plan of the contractor?	
7.	Are the TBMs set up & verified by Engineer – in - charge?	
8.	Are the underground works commenced / done first i.e., sewerage, water supply, drains, street lighting, roads in that sequence?	
9.	Are the construction of sewerage & drainage commenced from down-stream end?	
10.	Are the Drain top levels below the road edge levels and also below the Courtyard Levels of houses in general?	
11.	Are there any encroachments to be removed?	
12.	Is there any delay in progress of work with reference to work plan?	
13.	Is there any deviation in work or field conditions with reference to design? Does any technical / financial problem need to be addressed?	
14.	Is the construction as per construction drawings?	
15.	Is the Contactor conducting quality control tests? Is the Quality control test register being maintained properly and endorsed by the Engineer – in -charge?	
16.	Is proper barricading provided where necessary to ensure safety of residents?	
17.	Are drains and sewers properly connected to their disposal points?	
18.	Is there free flow of drainage?	
19.	What is the feedback of community on: i) quality of work & ii) functional aspects of works?	
20.	Specific remarks on performance of consultant (where mobilised). Is there a Resident Engineer stationed for the slum for supervision?	

Sl.No	Item to be checked	Yes / No/ Re-marks
21.	Whether regular site visits are done by Engineer – in – charge?	
22.	**CONCRETE WORK:** **CEMENT:** Is the manufacturer's test certificate for cement produced? Is it fresh (<1 month from date of manufacture), free from lumps? Is it stacked properly in stacks less than 10 bags height over a raised wooden platform to prevent contact with moisture? Is air entry into the store room prevented to prevent formation of lumps?	
23.	**AGGREGATES**: Is the fine aggregate (FA or sand) of good quality coarse river sand and conform to the grading requirements of mortar / concrete (as applicable) as per IS: 383?	
24.	Has bulking of sand been tested? If there is bulking, has the volume of sand been adjusted accordingly?	
25.	Is the Coarse Aggregate (CA) of hard variety, cubical in shape and not flaky and conforms to the grading requirements of CA for concrete as per IS: 383?	
26.	Is the content of deleterious matter like coal & lignite, clay lumps, material finer than 75 micron IS sieve (dust), soft fragments, organic matter etc. <5% as per IS: 383?	
27.	Is the Maximum Size of Aggregate maintained as specified? (For RCC, it should not be more than 20 mm; for PCC, it should not be more than ¼ of the minimum thickness of the member subject to a maximum of 50 mm). For pavement concrete, it should not be more than 25 mm as per MORTH.	
28.	Is the % water absorption <2% for the CA for concrete?	
29.	Has the concrete mix design been done by a designated laboratory and approved by the Engineer-in-Charge?	
30.	Is the CA being wetted before being used for concrete?	
31.	Is the concrete being mixed in a mechanical mixer with hopper?	
32.	Is the minimum cement content not less than that specified as per Table 5 of IS: 456 based on exposure conditions and the type of work?	
33.	Is the water / cement ratio properly adhered to as per mix design?	
34.	Are the concrete cube samples taken for compressive strength testing in accordance with sampling criteria in IS: 456?	
35.	Is the concrete properly placed in position from a height of less than 0.5 m?	
36.	Is the workability as per slump test in the required range for the nature of work being undertaken?	

Sl.No	Item to be checked	Yes / No/ Remarks
37.	Is the concrete being emptied from the drum onto a smooth impermeable platform?	
38.	Is vibrator being used on the work? Is there a spare vibrator?	
39.	Is the form work strong enough to prevent bulging when vibrated? Is it free from holes etc. to prevent loss of cement slurry?	
40.	Is the concrete being cured adequately as per requirements ?	
41.	Is the form work removed only after the expiry of prescribed period for the type of structural element?	
42.	Is the acceptance criteria being followed as per IS: 456?	
43.	Are manufacturer's test certificate produced for conformance to IS: 1786 for Tor steel and to IS 432 for mild steel (as applicable) from manufactures?	
44.	Have the i) yield strength test, ii) % elongation test, iii) rebend test been conducted for the steel being used on major / important works? Does it meet the specifications?	
45.	Is there any coating of earth or dirt etc. for the steel which prevents formation of proper bond with the concrete?	
46.	Is the steel of adequate anchorage length, with proper cover (higher specified cover for water retaining structures as per IS: 3370) with chairs and placed in forms and properly tied with GI binding wire?	
47.	Are the overlaps of required bond / anchorage? Ie Minimum 50 times dia. of bar for tension Ie. Minimum 40 times dia. of bar for compression Whether overlaps are staggered?	
48.	Is proper detailing of reinforcement done as per SP 34, particularly at **joints**?	
49.	Has the reinforcement assembly been checked by the Engineer – in - charge-prior to laying of concrete w.r.t. approved designs?	
50.	Is necessary provision / arrangement for services like water supply, electrical fixtures etc. made in the form work prior to laying of concrete (for buildings)?	
51.	Is sampling of concrete cubes and compressive strength testing done as per the sampling criteria in IS: 456-2000?	
52.	**BRICK WORK:** Are the bricks well burnt without un burnt portions, of rectangular shape, with sharp edges, free from cracks and of correct size? Are they properly stacked in stacks not more than 20 courses?	
53.	Do they give clear metallic sound when struck with a hammer? Are they intact and do not break when dropped from a height of about 2m?	

Sl.No	Item to be checked	Yes / No/ Remarks
54.	Are the bricks soaked in water for 2 hours before being used?	
55.	Have the bricks been tested for compressive strength? Do they satisfy 50 kg/cm^{2} for 1st class bricks (for sewer man holes) and 35 kg/cm^{2} for 2nd class bricks for other works?	
56.	Is the % water absorption after 24 hours not more than 20%?	
57.	Does the sand fall in the grading as prescribed? Is the mortar used as per specified mix proportions?	
58.	Is the frog (manufacturer's mark) kept on the top of the brick while laying the brickwork?	
59.	Are the joints in each layer broken to prevent stress concentration?	
60.	Is the thickness of mortar joint as per specification? (Not more than 12 mm for 2nd class brickwork and 10 mm for 1st class brickwork)	
61.	Are the joints raked when mortar is green for at least 7.5 mm before plastering?	
62.	Is the brickwork cured for at least 14 days after construction?	
63.	Any constraints to speedy progress of work?	
64.	Any constraints to maintaining quality of work?	
65.	Any other remarks of the Inspecting Officer	

Signature of Inspecting officer

Format– IC – 1: Checklists for Building Works

Sr. No.	Items	Remarks by Implementation agency / Authorised representative	Compliance by Contractor
1)	**EXCAVATION & PCC**		
A. Pre Excavation			
1	Construction Drawings indicating levels available at Site		
2	Proper safety precautions taken for site and public		
3	Precautions taken for dewatering and protecting site from flooding		
4	Dumping ground established		
5	Setting out and levels as per drawings		
6	Intermediate levels checked		
	B. Post Excavation		
1	Characteristics of excavated strata noted and deviations informed		
2	Appropriate shoring and shuttering done		
3	Final excavation levels, surface inspected and approved		
4	Anti-Termite Treatment has been done post excavation		
2)	**PLAIN CEMENT CONCRETE WORKS**		
A . Pre-concreting			
1	All levels and dimensions checked for correctness		
2	Shuttering is as per plan and has no gaps in between		

Sr. No.	Items	Remarks by Implementation agency / Authorised representative	Compliance by Contractor
3	All materials are of specified brand and grade		
B. During Concreting			
1	Mixing of concrete has been done as specified		
2	Slump and other tests carried out as specified		
3	Honeycombing removed		
4	Required number of Samples have been taken for carrying out slump tests, cube tests etc		
C. Post Concreting			
1	Concreting has been done as per specified line and level		
2	Curing has been done as specified		
3	Compaction has been done properly		
4	Remedial measures taken for removal of defects		
3)	**ANTI TERMITE TREATMENT (ATT)**		
1	Chemicals for ATT are as per specifications		
2	Chemicals in use are within the expiry date.		
3	Sufficient quantities of chemicals are available at site for ATT.		
4	Safety precautions have been taken for carrying out ATT and storage of Chemicals.		

Sr. No.	Items	Remarks by Implementation agency / Authorised representative	Compliance by Contractor
5	Record of consumption maintained at site.		
4)	**BACKFILLING**		
1	Filling material/ earth is as per specification		
2	Anti-termite treatment has been carried out before commencement of backfilling		
3	Filling has been done in layers of 300 mm, watered and compacted as per specifications		
4	Proper compaction method has been adopted		
5	Filling has been done to the required levels		
5)	**REINFORCED CEMENT CONCRETE WORKS**		
A. Pre-concreting			
1	All specified materials available at site		
2	Cement is of the required grade and not more than three months old.		
3	Shuttering checked for Staging & Propping, line & level, dimensions cleaning etc and its quality approved		
4	Application of oil & grease carried out		

Sr. No.	Items	Remarks by Implementation agency / Authorised representative	Compliance by Contractor
5	Mixer/Vibrator as specified available at site with adequate means to run them during concreting		
6	Cut-out & Sleeves/Inserted		
7	Surface of reinforcement is clean and free from rust		
8	Bars have been provided as per structural drawings		
9	Lap length & dowels provided as per codal provisions		
10	Pin bars & chairs/cover blocks provided as per requirements		
11	Tying of bars has been done correctly		
12	Service lines(Electrical, Plumbing, Others) if any, provided before commencement of concrete		
B. General Arrangement			
1	Availability/ Arrangement of pumps etc, proper access & walkway checked		
2	Adequacy of vibrators/ needle including diesel vibrator		
3	Slump cone & test cubes made		
4	Safety and health measures taken before commencement		

Sr. No.	Items	Remarks by Implementation agency / Authorised representative	Compliance by Contractor
C. During Concreting			
1	All necessary precautions taken before commencement of concreting		
2	Samples of taken for slump, cube tests etc for each batch		
3	Proper Compaction done and checks on Staging & Scaffolding carried out		
4	Covering of green concrete carried out		
5	Surface finish checked		
6	Construction joints provided		
D. Post Concreting			
1	De-shuttering started on Vertical faces / Other faces carried out as per codal provisions		
2	Proper curing of concrete carried out		
3	Line& Level of surface checked for correctness		
4	Defects, notified and removed		
5	Cube and other test results will be intimated to the engineer in charge for further action		
6) MASONRY, MORTAR AND PLASTER			
A. Pre-Masonry Work			
1	Availability of material as per daily requirement checked		

Sr. No.	Items	Remarks by Implementation agency / Authorised representative	Compliance by Contractor
2	Quality check for bricks/ blocks/ sand/ cement carried out		
3	Provisions kept for electrical and other services		
B. During masonry work			
1	Checking for line/ level/ right angle carried out		
2	Mortar checked for mix proportion		
3	Proper raking of joints		
4	Seismic bands provided as per zonal requirements		
C. Post masonry			
1	Check cleaning of dead mortar and broken bricks/ blocks etc.		
2	Curing carried out as per requirements		
D. Plastering/Pointing			
1	Mortar for plastering as specified for each side of wall		
2	Quality of cement and sand checked		
3	Curing work done as per requirement		
4	Preparation of surface		
E. During Plastering			
1	Mortar mixing in tray		
2	Addition of water proofing compound		
3	Proper roughing of first coat		

Sr. No.	Items	Remarks by Implementation agency / Authorised representative	Compliance by Contractor
4	Check for collection of mortar spills		
5	Cleaning of dead mortar		
6	Check of waviness		
7	Check for grooves/ drip moulds		
8	Application of cement slurry on concrete surface		
F. After Plastering			
1	Curing		
2	Check for hollowness		
3	Check for cracks		
4	Check for diagonal		
5	Lime wash after 3 days (within5 days in case of neeru application)		
6	Safety and health measures		
7)	**WATER PROOFING**		
1	Surface for waterproofing has been prepared and cleaned		
2	Safety measures/ precautions taken before commencement of works		
3	Specified type of water proofing used		
4	Specified material used for waterproofing		
5	The material used was as per specification		
6	Work has been carried out as per specifications by the department/ specialized agency		

Sr. No.	Items	Remarks by Implementation agency / Authorised representative	Compliance by Contractor
8)	**IPS/TILE FLOORING AND DADO**		
1	Layout of floor checked and proper slopes for draining water are maintained specially in bath room and toilet.		
2	Thickness bases at GL checked of different floor		
3	Check for proper back filling under floor done		
4	Metal/glass strips laid properly in IPS flooring		
5	Curing of IPS Flooring done as per requirements		
6	Dado provided as per required height		
7	Cleaning and finishing done		
9)	**PLUMBING & WATER SUPPLY**		
1	GI/CI/HDPE pipes etc. confirms to relevant IS codes		
2	Pipes of required diameter and their fittings used		
3	Plumbing and Water Supply work carried out through a licensed plumber		
4	Works done as per specification		
5	Plumbing and Water Supply works tested on completion -		
6	Defects rectified		

Sr. No.	Items	Remarks by Implementation agency / Authorised representative	Compliance by Contractor
10)	**INTERNAL ELECTRICAL WORKS**		
A.GENERAL			
1	Layout plans: showing the position of L.T Panels/ distribution board, lighting fixtures, lighting distribution, scheme, receptacles, etc available before commencement of work		
2	All the following items are as per specification and of approved makes L T Panels/ Distribution Boards Lighting Fixtures Conduits, including accessories Receptacles Junction Boxes Cables/Wires Any other item		
B. SURFACE CONDUIT WIRING / CONCEALED CONDUIT WIRING			
1	Conduit and accessories are of specified make, gauge and diameter		
2	Proper installation of all conduit wiring and concealed wiring.		
C. CHECK LIST FOR EARTHING			
1	Earth electrode provided as specified.		

Sr. No.	Items	Remarks by Implementation agency / Authorised representative	Compliance by Contractor
2	Types and size of main/sub main and circuit earthing conductors provided as specified		
D. MAIN AND DISTRIBUTION BOARDS			
1	Main switch board is fabricated based on approved shop drawings and the entire material used is as per BIS Code.		
2	Make of switches and other items as specified.		
	CHECK LIST FOR EXTERNAL ELECTRICAL WORKS		
A. CHECK LIST FOR O.H. LINES			
1	Poles used are of approved make as specified and conform to relevant BIS codes.		
2	Test certificate as applicable.		
3	Pole embedded below ground level as specified.		
4	Metallic poles are adequately earthed with specified size of earth conductor.		
5	Strays struts, insulators, conductors used conform to relevant BIS Code.,		
6	Earth wire conductor used as specified.		
7	Lightning arrestors used as specified		

Sr. No.	Items	Remarks by Implementation agency / Authorised representative	Compliance by Contractor
8	Spacing of poles, spans and clearance between, conductors and, surroundings kept as specified.		
9	Insulators used for specified grade.		
B. CABLE LAYING			
1	Trenches of specified dimensions excavated and prepared		
2	Required quantity of sand cushioning provided; cable laid; another layer of sand and brick protective covering provided. Refilling done earth ramming and dressing done.		
3	Cables entry point in building or crossing roads path protected by providing Hume pipes or PVC pipe		
4	Cable tested before and after laying and before emerging		
C. CHECK LIST FOR EARTHING			
1	Earth electrode provided as specified		
2	Types and size of main/ sub main and circuit earthing conductors provided as specified.		
11)	**DRAINAGE WORKS**		
1	Excavation for drains carried out as per the approved lay-out		

Sr. No.	Items	Remarks by Implementation agency / Authorised representative	Compliance by Contractor
2	Bed Concrete laid as per specifications with proper slopes and cuttings		
3	All pipes procured and laid as per requirement		
4	Jointing of pipes done as per specifications		
5	Manholes provided as per design		
6	Materials for construction of manhole as specified		
7	End of the pipes plugged		
8	Drainage line tested before putting to use		
12)	**CEMENT CONCRETE ROADS**		
1	Materials used for construction of sub base, base and cement concreting is as specified		
2	Grading of Aggregates is as per specifications		
3	Right of Way Maintained as per drawings		
4	Aggregates spread uniformly to proper profile		
5	Centre line, gradient and camber maintained as specified -		
6	Cross section levels of precedent layer recorded		
7	Tests of aggregates carried out as specified and record		

Sr. No.	Items	Remarks by Implementation agency / Authorised representative	Compliance by Contractor
8	Top concrete surface is of required grade and mix		
9	All tests carried out as per the relevant BIS Codes		
13)	**OTHERS**		
1	Whether the provision for adequate ventilation and natural lighting has been made as per National Building code?		
2	Whether facility for storage in terms of Almirah/ Shelves / Lofts / Platform has been made ?		
3	Whether Sanitary fittings have been provided?		

Signature of inspecting officer

Format– IC – 2 : Inspection checklists for Roads

Sl.No.	Item to be checked	Remarks by Implementation agency / Authorised representative	Compliance by Contractor
1.	Is the construction as per construction drawings?		
2.	Are the Road Edge Levels are above the Drain Top Levels and Courtyard Levels?		
3.	Is the Formation properly done??		
4.	Is the Granular Sub-base material of good quality and required grading?		
5.	Is the consolidation properly done? Is it tested for field density?		
6.	Are the CA, FA (Coarse / Fine Aggregates) and water of good quality and free from deleterious material?		
7.	Is the lean concrete properly cured for 3 days prior to laying pavement slab?		
8.	Is the concrete mix design given by a reputed laboratory and approved by the Engineer-in-Charge?		
9.	Is a trial length of road laid with the mix design in the presence of Engineer – in -charge?		
10.	Is the Vibrator being used? Is there a spare vibrator in case of repair of the first one? Are the edges properly vibrated, preferably using a pin vibrator along the edges?		
11.	Is the form work adequate for keeping it for at least 12 hours without removal and to continue further work? Are spikes of 20 mm dia steel rods provided to retain the form work and prevent bulging when vibration is done?		
12.	Is Curing done properly, preferably by ponding at least for 14 days and preferably for 21 days?		
13.	Are offsets given for offsite roads?		
14.	Are the Contraction Joints saw cut to 1/3rd depth and provided at 4.5 m interval? Are they properly sealed with 60/70 grade bitumen?		

Sl.No.	Item to be checked	Remarks by Implementation agency / Authorised representative	Compliance by Contractor
15.	Are the Construction Joints provided whenever work is stopped for >30 minutes and do they coincide with Contraction Joints? Are they properly sealed with 60/70 grade bitumen?		
16.	Are Expansion Joints provided at the specified interval and at junctions with bridges and culverts? Are they properly filled with good quality compressible joint filler and sealed with 60/70 grade bitumen?		
17.	Are the joints formed without acute angles?		
18.	Are Longitudinal Joints saw cut to 1/3rd depth and provided whenever width of pavement is >4.5 m? Are they properly sealed with 60/70 grade bitumen?		
19.	Are Shoulders formed properly to level with necessary consolidation?		
20.	Are there cracks/damage observed in pavement or near joints? If so, what is the plan for rectification of the same or replacement of the affected portion? What might have caused the defects and how to prevent them?		
21.	Is there any i) segregation or ii) honeycombing observed? If so, is it being rectified properly?		
22.	Is the finishing of the road proper?		
23.	Are the road junctions properly formed?		
24.	Is the road laid to proper camber and longitudinal grade to enable proper drainage?		
25.	Are the dimensions correct?		
26.	Are any post construction tests done like Rebound Hammer Test and Ultrasonic Pulse Velocity Meter Test to assess the strength of cost after curing?		

Signature of inspecting officer

Format– IC – 3 : Inspection checklists for Drains

Sl.No.	Item to be checked	Remarks by Implementation agency / Authorised representative	Compliance by Contractor
1.	Is the construction as per approved construction drawings?		
2.	Are the Drain Top Levels below the Road Edge Levels and Courtyard Levels for onsite drains?		
3.	Is Proper alignment and gradient maintained for the drains?		
4.	Are the dimensions correct?		
5.	Is proper granular bedding provided under the bed concrete after removing loose, slushy soil? Is the bed concrete of Good quality?		
6.	Is the construction done to the required gradient?		
7.	Are the CA, FA and water of good quality & free from deleterious material?		
8.	Are the concrete cube samples taken by Engineer – in -charge and tested? If so, do they satisfy compressive strength requirements?		
9.	Is Vibrator being used?		
10.	Is Curing done properly for the specified period?		
11.	Is the internal drainage properly connected to the outfall drain?		
12.	Are the Road side drain walls raised to just below road level? Are the dimensions of these walls adequate?		
13.	Is the finishing of the drain good?		
14.	Are the culverts adequate to discharge the drainage? If not, do they need widening?		
15.	Are the water pipe lines across the drain or beside the drain being shifted /realigned/encased to prevent pollution of water?		
16.	Is there any need to rehabilitate existing damaged drain section if any, which inhibits the efficiency of functioning of the drain?		

Signature of inspecting officer

Format– IC – 4 : Inspection checklists for Water Supply

Sl.No.	Item to be checked	Remarks by Implementation agency / Authorised representative	Compliance by Contractor
1	Is the construction as per approved construction drawings?		
2	Is the trench to proper i) alignment? ii) depth conforming to minimum cover, and iii) width?		
3	Is proper bedding provided under (& around if necessary) the pipe with granular material like sand or crusher dust?		
4	Are the manufacturer's test certificates for raw material made available? Has the pipe testing been witnessed by Engineer – in-charge? Do the results satisfy the requirements of IS: 4984? Is the % of reprocessed HDPE material maintained less than 10%?		
5	Are there any cracks in the DI/CI in the pipes or the lining?		
6	Whether specials like bends, tees etc. conform to the material and pressure of the relevant pipe line?		
7	Is the jointing of pipes good, particularly at junctions and while giving house service connections? Have good quality jointing materials (like solvent cement for PVC; butt welding using welding machine for HDPE; Jiffy joints with Rubber rings and gaskets for DI/CI been used? Are the rubber rings and gaskets field tested and are positioned properly with jointing material?		
8	Are thrust blocks provided at bends as per requirements of BIS?		
9	Is the backfilling done properly by watering and ramming in layers duly removing boulders etc. and slightly higher than GL?		
10	Are the house connections of GI or MDPE? Is the quality of GI/MDPE pipes as per standards?		

Sl.No.	Item to be checked	Remarks by Implementation agency / Authorised representative	Compliance by Contractor
11	Are the i) valves, ii) valve chambers, covers and iii) specials of good quality? iv) are they properly and safety located to prevent their breaking due to traffic? v) do they conform to the relevant pipe line requirements?		
12	Whether air valves conform to the pipe line requirements?		
13	Whether non-return valves conform to the pipe line requirements?		
14	Whether pressure release valves conform to the pipe line requirements?		
15	Are horizontal stretches in the pipe line avoided to prevent air accumulation?		
16	Have proper Arrangements for Interconnection with Source of supply done? Are concrete / RCC thrust blocks provided at bends as applicable?		
17	Has the Hydraulic test on pipeline/s been conducted? Is it witnessed by the Engineer – in -charge & community?		
18	Is the test pressure adequate and as per specifications?		
19	Is there any leaks/cracks/damages observed in the pipes or joints?		
20	Have all Households taken House Service Connections?		
21	Are the pressures adequate? Have all pit taps, if any, been removed after laying new distribution lines/ replacing old lines?		
22	Are there any un served Households?		
23	Is there any pollution or scope for pollution of drinking water? If so, are necessary precautions taken **or** planned?		
24	Is water **actually** reaching the consumer's house with adequate pressure?		

Sl.No.	Item to be checked	Remarks by Implementation agency / Authorised representative	Compliance by Contractor
25	**PUMP SETS:** **i)** Are the pumps procured as per specifications of duty and head? Has testing of pump set been conducted in the presence of Engineer – in -charge? ii) Have the pump sets passed the tests and satisfy the duty and head requirements? iii) Have all accessories like panel board, switch gear of the pump sets been supplied and are they suitable and satisfy the quality requirements? iv) Is the starter provided appropriate to the KW of the pump set? iv) Has Trial run been conducted and is it successful? v) Have single phasing preventor, over load relay & capacitors been provided?		
26	Are the cable sizes provided as per design and operating conditions?		
27	Is positive suction condition ensured for centrifugal pump sets?		
28	Has an eccentric taper been provided on the suction side?		
29	Have the required sluice valves and non-return valve on delivery side been provided? Is the piping devoid of unnecessary bends etc. to reduce friction losses?		
30	Have proper earthing, lightning arrestors and safety controls been provided?		
31	Have dismantling joints been provided for the valves at the pump house?		
32	Has the electrical connection been given to the pump sets?		
33	Has the correct Contracted Maximum Demand (CMD) been agreed with the State Electricity Board ?		
34	For a tube well, has the capacity (KW) of the submersible pump set been fixed based on the depth and yield of water after conducting yield test?		
35	**SUMP / OHSR / GLSR** Is the safe bearing capacity (SBC) of soil for foundation of Sump / OHSR been tested?		

Sl.No.	Item to be checked	Remarks by Implementation agency / Authorised representative	Compliance by Contractor
36	Does the design of foundation for the Sump / OHSR need any revision based on the SBC?		
37	Have necessary strengthening of foundation done for poor soils like BC soil and / or high water table, if met?		
38	Has the reinforcement assembly at each stage been checked by the Engineer – in - charge?		
39	Is the form work for floor slab/ roof slab / dome adequate and safe?		
40	Is the steel being used comply with the relevant specifications? Are the manufacturer's test certificates available on site?		
41	Has the steel been tested for tensile strength, % elongation and rebend test? If so, do the results satisfy the requirements of the code?		
42	Has the minimum cover in accordance with IS: 3370 provided for RCC water retaining structures?		
43	Is the detailing at joints properly done as per SP: 34?		
44	Have puddle pipes been provided in the floor slab of OHSR?		
45	Has the SUMP / OHSR /GLSR been tested for water tightness in accordance with IS: 3370?		
46	Is there any leakage through the Sump / OHSR / GLSR?		
47	Is the scour of OHSR/GLSR connected to natural drain?		
48	Have the inlet and outlet been inter connected (bye pass)?		
49	Has the overflow pipe been connected to the outlet pipe?		
50	Have proper lightning arrestor, water level indicators, ventilators, ~~phenial~~, ladders, staircase, railing been provided?		
51	Has the ground below the ELSR been raised to prevent stagnation of water?		

Signature of inspecting officer

Format– IC – 5 : Inspection checklists for Sewerage

Sl.No.	Item to be checked	Remarks by Implementation agency / Authorised representative	Compliance by Contractor
1	Is the sewer construction done from the down-stream (D/S) end considering the Invert Levels of Manhole (MH)on out fall sewer / Inlet of Septic Tank?		
2	Has TBM been established in the poor settlement and have the invert levels been established based on this TBM from the d/s end?		
3	Have the invert levels been checked through the LF book by the Engineer – in - Charge?		
4	Are sight rails and boning rods used in aligning and fixing the invert levels of sewer?		
5	Are the i) Invert Levels of inlet and outlet of septic tank and ii) invert levels of sewers fixed as per construction (working) drawings?		
6	Is the sewer construction done from the d/s end? Is the direction of socket facing the upstream end?		
7	Is proper granular bedding provided under the sewer for the required depth?		
8	Is the sewer jointing done properly using solvent cement for UPVC pipes and Hessian/jute yarn soaked in cement mortar 1:1 ½ and cocked with a cocking tool into the socket end?		
9	Are the manufacturer's test certificates available at the site? Have the pipe testing been witnessed by Engineer – in –charge ? Do the test results satisfy the requirements?		
10	Is the sewer trench to proper i) Alignment? ii) Gradient? iii) Depth? and iv) Width?		
11	Is the sewer jointing properly done as per specification?		
12	Is the backfilling done properly by watering and ramming in layers, removing boulders etc. and slightly higher than GL?		

Sl.No.	Item to be checked	Remarks by Implementation agency / Authorised representative	Compliance by Contractor
13	Are the 'Y's & 'Tee's of good quality?		
14	Is the connection to trunk main/septic tank properly planned /given?		
15	If the main sewer is to be joined to the outfall (trunk) sewer, is the crown level of the main sewer higher than the crown level of the outfall (trunk) sewer to prevent back flow?		
16	Has the Hydraulic Testing of sewer lines witnessed by the; Engineer & the community? If there is any leakage etc., has it been rectified?		
17	Have all Households taken House Connections?		
18	Are the Manholes (MH) properly constructed as per design and drawings and to proper spacing, to the correct invert level using first class bricks? Are they properly cured? Are the sewers properly aligned and joined at the MH?		
19	Are the top of Man Holes provided flush with the road level?		
20	Are Man Hole frames and covers of appropriate strength provided i.e., LD / MD / HD / EHD considering the type of traffic to take care of traffic loads? Are they of good quality?		
21	Has proper channelling (benching) been provided at the invert of the Man Hole?		
22	Are there any un-served Households?		
23	**SEPTIC TANK:** Has the effect of GWT been considered in the design of floor slab? Has necessary strengthening of foundation done for poor soils like BC soil, if met with?		
24	Have the baffle walls been provided properly at the right place?		
25	Have the Invert Levels for inlet and outlet properly adhered to and the influent enters the septic tank and leaves it satisfactorily?		
26	Has free board of 0.30 m been provided for the septic tank?		

Sl.No.	Item to be checked	Remarks by Implementation agency / Authorised representative	Compliance by Contractor
27	Has slope towards the inlet been given at the bottom to enable proper sludge removal?		
28	Is the septic tank outlet properly connected to either dispersion trenches or to storm water drain?		
29	Has the reinforcement assembly at each stage been checked by the Engineer – in - charge?		
30	Is the form work for floor slab/ roof slab / dome adequate and safe?		
31	Is the steel being used comply with the relevant specifications? Are the manufacturer's test certificates available on site?		
32	Has the steel been tested for tensile strength, % elongation and rebend test? If so, do the results satisfy the requirements of the code?		
33	Has the minimum cover in accordance with IS: 3370 provided for RCC water retaining structures?		
34	Is the detailing at joints properly done as per SP: 34?		
	Have man holes been provided at the inlet and outlet?		
35	Has the septic tank been tested for water tightness in accordance with IS: 3370?		
36	Is there any leakage through the septic tank?		

Signature of inspecting officer

Format– IC – 6 Community Monitoring Committee - Checklist

Sl. No	Item to be checked	Yes / No / Remark	Remarks by Implementation agency / Authorised representative	Compliance by Contractor if any
1.	Is the Community Information (Display) Board installed near the entry to the slum? Is it useful in knowing the details of works?			
2.	Is the People's Estimate (pamphlet) distributed to the community?			
3.	Does the Contractor / Engineer enable proper Community Monitoring of the works? How can it be made more effective?			
4.	Are the underground works commenced / done first i.e., sewerage, water supply, drains, street lighting, roads in that sequence?			
5.	Are the construction of sewerage & drainage commenced from downstream end?			
6.	Does it seem the waste water will enter their houses when the drains and roads are completed?			
7.	Is adequate Gradient maintained for drains and sewers to enable free flow of waste water?			
8.	Are the water pipelines and sewers constructed to proper i) alignment, ii) depth and iii) is the jointing good?			
9.	Has the Testing of i) water pipe line and ii) sewers been witnessed by the Engineer – in – charge and community?			
10.	Is drinking water reaching the houses with adequate pressure?			
11.	Are there any encroachments to be removed?			
12.	Is there any delay in progress of work? What are the constraints?			
13.	Community's perception of the general quality of work? Satisfactory or not?			
15.	Are the materials / equipment of the contractor safe?			
17.	What is the Frequency of visits of Engineer – in – charge			

18.	Have ALL Households taken i) water connections and ii) sewer connections?			
19.	Any other remarks of the Community Monitoring committee			

Signature of Community Monitoring
Committee Members

Appendix E : Role and Responsibilities of TPIMA:

The TPIM agency is expected to undertake monitoring pertaining to stages of pre-construction, construction, commissioning & testing and post- construction:

a. Pre-construction stage:

During pre-construction stage, the TPIMA is expected to perform activities as under:

i. Examination of project documentation with respect to sanctioned covenants
ii. Report on targeted beneficiaries of the scheme (socio economic surveys, stake holder's consultation, process etc.)
iii. Review of Land requirement/ availability & other clearances to begin construction
iv. Examination of bid documentation & bid process
v. Review of Project Implementation Plan and procurement process
vi. Review of Site preparation
vii. Review of Project Management Mechanisms/ Structures (e.g. PERT/CPM Charts)
viii. Review of probability of Cost & Time overruns during pre-construction stage

b. Construction stage:

During the construction stage, the TPIMA should furnish reports on:

i. Compliance to statutory requirements
ii. Safety and health aspects
iii. Convergence of scheme with education, health and social security
iv. Beneficiary participation in the project
v. Physical and financial progress of the project & fund utilization
vi. Quality assurance systems and project quality (As per Inspection report at Table TPQ1)
vii. Social infrastructure and aesthetics
viii. Variations with respect to sanctioned covenants
ix. Cost variations and time overruns
x. Remedial measures to improve physical & financial progress and quality of the project
xi. Progress of resettlement and rehabilitation, if any

xii. Court cases/ Litigation

c. Commissioning stage:

During this stage, the TPIMA would furnish following:

i. Reports on completion of projects and assets created
ii. Requirement and system of Operation & maintenance (O&M)
iii. Assessment of capacity of ULB staff and their training requirements

d. Post construction Stage

During the post-construction stage, the TPIMA should furnish reports on:

i. Functionality, usage & capacity created
ii. Overall performance and sustainability of the assets created
iii. O&M of assets created including common amenities
iv. Social and environment impact analysis
v. User/Beneficiary satisfaction

TPIMA would continue to function for one year after filing of project completion report and provide a final report on the overall performance of the project. TPIMA would essentially report on the following:

(i) Baselines of the project, including entire process trail – which would ensure that all necessary processes of clearance, approvals - administrative, technical and financial sanctions are in place. At the desk review report generated at the initiation milestone, this section of the report would document the process flows and benchmarks that are adopted by the concerned level of implementation.
(ii) Outcomes of the project (at initiation milestone)/ the specific milestone – expected state of physical and financial progress.
(iii) Physical and financial progress including execution process – this will require to be done from two ends (i) supply end, i.e. SLNA and (ii) level of implementing agency

(iv) Compliance and exception reports in process trail, technical and qualitative standards, financial propriety and integrity. In case any processes are certified, the monitoring report must clearly state this fact to Project Implementation Agency, SLNA and Mission Directorate.

(v) Recommendations on how to reduce exceptions, including milestones if any needs to be re-phased, or any process that may need to be streamlined.

(vi) Follow-up action of the report, which would be ascertained in the next report.

Table TPQ 1: Inspection Report of TPIMA on quality control for projects under Rajiv Awas Yojana (RAY)

1.0	**PARTICULARS OF PROJECT**	
1.1 (a)	Name of State/UT	
1.1 (b)	Name of City	
1.1 (c)	Name of Implementing Agency	
1.1 (d)	Name of Project	
1.2 (a)	Description of work	
1.2 (b)	Agreement No.	
1.2 (c)	Name of Agency/ Contractor	
1.3 (a)	Scheduled date of commencement	
1.3 (b)	Actual date of commencement	
1.4 (a)	Scheduled date of completion	
1.4 (b)	Expected/ Actual date of completion	
1.5 (a)	Date of Inspection	
1.5 (b)	Percentage progress at the time of inspection vis-à-vis expected as per contract and reasons for delay, if any	
1.5 (c)	Details of mile stones as per contract vis-à-vis their achievement	
1.6	Name and Designation of Inspecting Officer (TPIMA)	
1.7	Name and Designation of State/ ULB Officer(s) present during inspection	
1.8	Name of Representative present during inspection	
2.0	**QUALITY CONTROL MEASURES**	
2.1 (a)	Whether authenticated copy of contract document is available at site	
2.1 (b)	Whether copy of specifications as per contract is available at site	
2.1 (c)	Whether list of I.S.I. marked/ approved materials to be used is available at site	
2.1 (d)	Whether Testing facilities to check conformance of material is available as per contract document	
2.2	Whether well-equipped field laboratory as per requirement of contract document is established at site	
2.3	Whether Inspection Registers, Site order book etc. are maintained at site	

2.4	Whether Registers for prescribed tests of material are maintained at site	
2.5	Whether soil investigation has been done? (give brief details)	
2.7	Suitability of water for construction	
(a)	What is the source of water?	
(b)	Has water been tested and approved by Engineer-in-Charge before construction	
(c)	Has water been tested subsequently as per requirement	
2.8 (a)	Whether all mandatory tests have been carried out at stipulated frequency?	
(b)	Whether tests of material are being done from accredited labs also, if yes details of such labs.	
(c)	Comments of TPIMA on tests already done	
(d)	Action Taken Report on previous report of TPIMA	
(e)	Frequency of visit by TPIMA	
(f)	Details of the samples/ testing done by TPIMA (TPIMA to carry out minimum 10% random sampling and testing of all mandatory tests for all the items from NABL (*National Accreditation Board for Testing and Calibration Laboratories*) accredited labs as per requirement of implementation)	
2.9 (a)	Whether materials have been approved by Engineer-in-Charge? If so, whether samples are available at Site	
(b)	Whether cement, steel, aggregates etc. being used in the work, got tested before use.	
(c)	Whether manufacturer test certificate for cement, steel, pipes etc. have been obtained with supply and are being maintained (In separate files)	
2.10	Whether sample housing units/items have been completed and approved by Engineer-in-Charge before start of mass finishing work?	
2.11(a)	Whether proper control on batching, mixing, placing, compacting and curing of RCC has been ensured at site.	
2.11(b)	Whether RMC is being used in RCC work, if yes, provide details of control & checks ensured at plant of site	
2.12	Any other particular comments	

S.No.	Components	Whether in Progress (Yes/ No)	Whether Inspected (Yes/ No)	Comments
3.0	**SITE INSPECTION REPORT:**			
3.1	**Building Work**			
(a)	Earth work			
(b)	PCC work			
(c)	RCC work			
(d)	Brick work			
(e)	Stone work			
(f)	Marble work			
(g)	Wood work			
(h)	Steel work			
(i)	Flooring			
(j)	Roofing			
(k)	Finishing			
(l)	Internal Services			
3.2	Infrastructure Work (As per Table TPQ2)			
3.3	Checking of floor slope (especially in bath, WC, kitchen, terrace & Balcony etc.)			
3.4	Whether dampness/ leakages noticed? If yes, state location and probable reasons.			
3.5	Whether finishing of works has been done properly?			
4.0	**SITE INSPECTION ON WORK-MANSHIP ASPECTS** (Attach separate sheet, if required)			
5.0	**Any other observations:**			

Tabe TPQ2 : Infrastructure works to be checked by TPIMA

(Only Applicable components are to be included in the report)

S.No	Components	Sub Components	Whether in progress (Yes/ No)	Whether Inspected (Yes/ No)	Comments
1.	Water Supply	ESR			
		GSR			
		Pipe Line			
		Sump			
		Pump House			
		Pump Sets			
		Tube-well			
		WTP			
2.	Sewerage	Pipe line			
		Septic Tank			
		STP			
		Digester			
		Effluent Treatment Chamber			
		Man Holes			
3.	Storm Water Drains	BM Drains			
		CC Drains			
		RCC Drains			
		Pipes			
4.	Roads & Culverts	BT Roads			
		CC roads			
		RCC roads			
		Culverts			
		Pavements			
		Plantation			
		Jogging Tracks			
		Restoration			
5.	Electrification	Street Lights			
		Cables			
		Supply lines			
		Transformers			
		Street light poles			
6.	Solid Waste Manage-ment	Dust Bins			

S.No	Components	Sub Components	Whether in progress (Yes/ No)	Whether Inspected (Yes/ No)	Comments
		Dumping Yards			
		Landfill site			
7.	Compound wall	Compound wall			
		Fencing			
8.	Retaining Wall				
9.	Temporary Transit units				
10.	Community Centers				
11.	Livelihood Centres				
12.	Informal Education Centre				
13.	Informal sector Market				
14.	Animal Pen				
15.	Sheds				
16.	Anganwadi				
17.	Parks				
18.	Play Equipment				
19.	Site Development				
20.	Fire Fighting Equip-ment				
21.	Lifts				
22.	Miscellaneous and / or others (if any)				

References

The Manual covers the overall quality assurance system and the field level quality control procedures for different types of works, based on the standard specifications. This Quality Assurance manual has been prepared referring following sources:

a. Relevant IS Codes

b. CPWD Specifications

c. National Building Code.

d. MoRD Specifications

e. IRC Publications

f. CPHEEO Manuals

g. Quality Control Guidelines for Housing projects. (MoHUPA)

h. Quality Assurance Handbook for Rural Roads.

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