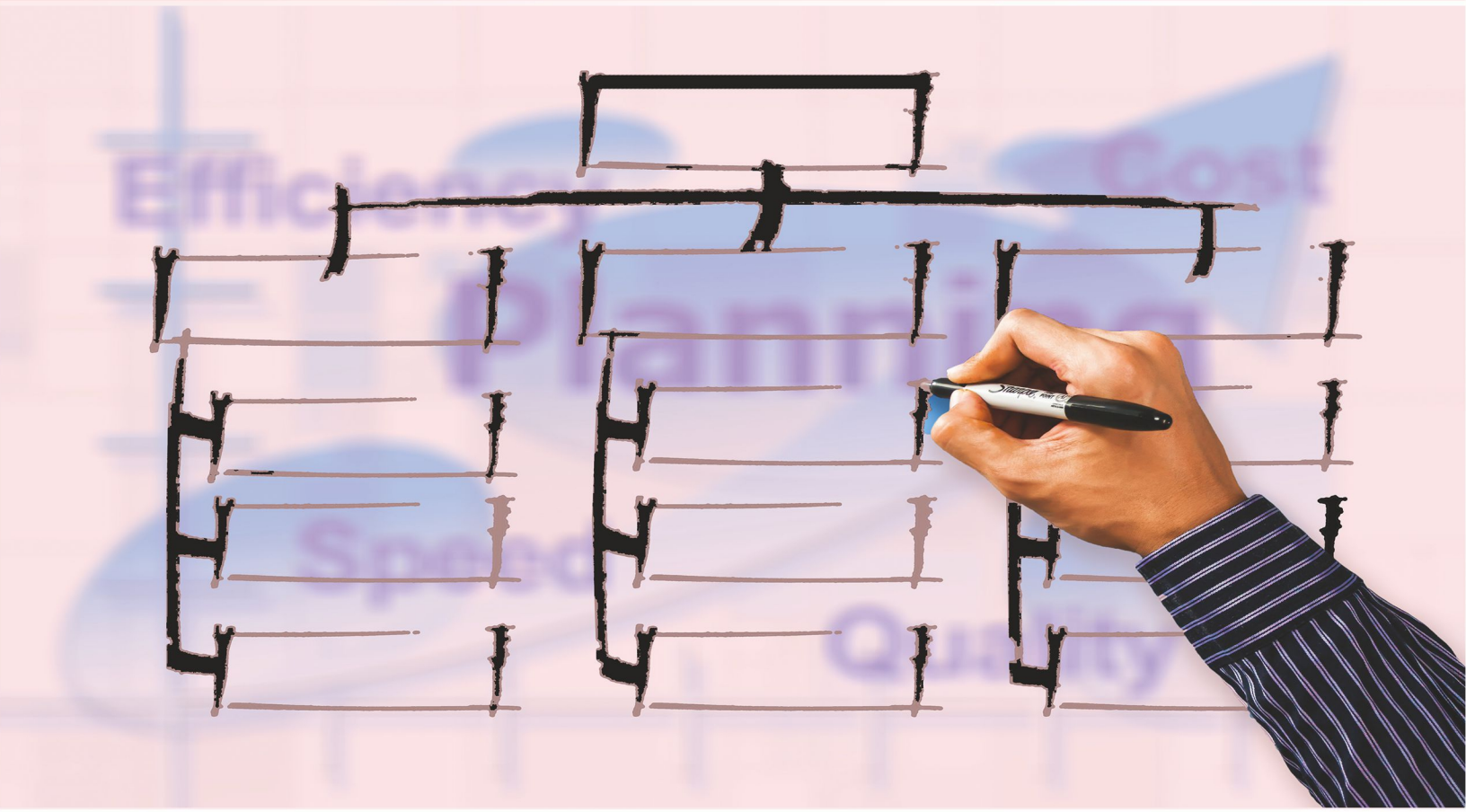
150 YEARS OF CELEBRATING THE MAHATMA

सत्यमेव जयते

स्वच्छ भारत
एक कदम स्वच्छता की ओर

HANDBOOK ON TOTAL QUALITY MANAGEMENT 2019



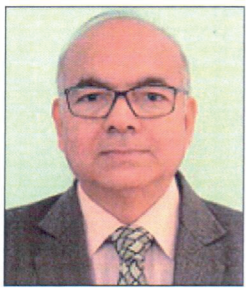
CPWD

Director General, CPWD, New Delhi



HANDBOOK
ON
TOTAL QUALITY MANAGEMENT
2019

Published under the Authority of
Director General
Central Public Works Department
Ministry of Housing and Urban Affairs



PRABHAKAR SINGH
Director General

सत्यमेव जयते

भारत सरकार
Government of India

CPWD
केन्द्रीय लोक निर्माण विभाग
निर्माण भवन, नई दिल्ली-110011

Central Public Works Department
Nirman Bhawan, New Delhi-110011
Tel : 23062556/1317, Fax : 23061884
E-mail : cpwd_dgw@nic.in

FOREWORD

It gives me immense pleasure to note that a handbook on "Total Quality Management" is being brought out by the CPWD to facilitate Field Engineers to achieve quality in construction and maintenance of Government buildings and services.

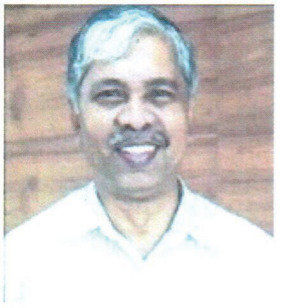
CPWD being a Premium Engineering Organization of Government of India is committed to execute its works with utmost quality. CPWD has been delivering the projects attaining higher degree of client's satisfaction in terms of quality and time. Since the quality has to be inculcated at every level, it has been felt necessary that Engineers should have easy and ready access to various guidelines and circulars issued by the Department from time to time, so as to enable them to take timely and appropriate action. This Publication on Total Quality Management is an endeavor to fulfill this requirement for CPWD Engineers.

This hand book has been made basically for use in CPWD, though may be beneficial to other Government Departments and Public Sector undertakings, who have adopted similar system of working. I am sure this will be well received by the all concerned.

I would like to express my thanks to Dr. K. M. Soni, ADG(Tech.), CPWD and his entire dedicated team with whose efforts bringing out, this publication could become possible in a short time.

(Prabhakar Singh)

Place: New Delhi
Dated: July 2019



सत्यमेव जयते

CPWD

Dr. K.M. Soni
Additional Director General (Tech)

भारत सरकार
Government of India

Central Public Works Department
Nirman Bhawan, New Delhi

Preface

Central Public Works Department (CPWD) has always been giving emphasis on quality in planning, designing, construction and maintenance works. During Bhuj earthquake in 2001 when many private buildings suffered heavy damage, buildings designed and constructed by CPWD showed earthquake resistance clearly indicating that quality is a function of durability.

Quality cannot be achieved in case all those involved in the process do not enforce it. In other terms Total Quality Management ((TQM) system is to be followed.

CPWD in past has switched over to Quality Assurance from Quality Control. Now, the efforts are being made to adopt TQM. Accordingly, this handbook is being published.

I am thankful to Shri M.K. Mallick, CE (CSQ) and his team of dedicated officers who brought out this publication in time.

(Dr. K.M. Soni)
Addl. DG (Tech)

Place: New Delhi

Date: July, 2019

Contributed by

1.	**Dr. K. M. Soni**	ADG (Tech) CPWD
2.	**Sh. M. K. Mallick**	CE CSQ (Civil) CPWD
3.	**Sh. A. V. Kujur**	SE (QA-cum TLC) CSQ, CPWD
4.	**Sh. V. P. Sahu**	SE (C&M) CSQ CPWD
5.	**Sh. M.C. Singhal**	EE (QA) CSQ CPWD
6.	**Sh. S. K. Sharma**	AE (QA) CSQ CPWD
7.	**Sh. D. S. Adhikari**	AE (QA) CSQ CPWD
8.	**Sh N. N. Sharma**	AE (QA) CSQ CPWD
9.	**Sh. Mohd. Tarik**	AE (QA) CSQ CPWD

Cover page designed by-

10.	**Shri. Sachin Sharma**	Dy. Architect, O/o CA, NDR
11.	**Ms Roopanshi Goel**	Int. Architect

DISCLAIMER

Whereas every care has been taken to ensure that all relevant and essential provisions required for quality execution in Construction and Maintenance Works are reproduced in this Handbook, and discrepancy if any shall be governed as per contents of original publication of CPWD Works Manual 2019 and its SOPs-2019, GCC-2019 and CPWD Specifications etc. All executing entities are requested to bring it to the notice of the Directorate, if any conflicting provisions / discrepancies are noticed in this Handbook.

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1.0 Introduction

Quality Eras

Inspection is considered the first era in quality process out of four eras described by Crosby and is probably still in vogue in most places in construction industry. Inspections are customary, costly and painstaking. Theory of probability is applied during testing by taking samples. Eventually, inspections do not contribute greatly to reducing the error rate. The problem is addressed after it has arisen. Thus, even 100 % inspections will not mean that all the defects have been removed or rooted out.

According to Crosby, second era was of the quality control in which emphasis was given on product uniformitywith reduced inspections. Quality control is defined as “all those operational techniques and activities that are used to fulfil requirements for quality” (ISO). Therefore, emphasis in quality control is on techniques and activities. Inspections, monitoring and feedback are carried out in quality control. It has nothing to do directly with the customer's satisfaction. Inspections do not ensure conformance of specifications of one hundred percent work. Inspections in a work may also result to corrective action rather than preventive action. Operational techniques and monitoring also lead to “paper quality” in which the papers assure the quality with or without any consideration of the work.

Quality assurance as per ISO is defined as “all the planned and systematic activities, implemented within the organization for quality management, to provide adequate that a product or service will satisfy given requirements for quality.” Therefore, quality assurance is essentially a preventive activity and is therefore to be systematically planned in advance. The activity includes identification and planning of the checks, inspection and control of process as a part of quality control. Quality assurance also means establishment of a quality system which can demonstrate the requirements. Therefore, concept of quality assurance if not adopted over quality control by any organisation, simple change of name will not lead to any improvement.

Total Quality Management (TQM) is defined as “the management approach of an organization, centred on quality, based on the participation of all its members and aiming at long term success through customer satisfaction, and benefits to all members of the organization and to society.” In fact, in this approach, customer is the person who accepts the product of any process. Suppose, cement is received by a person, then person receiving cement is customer. When cement is mixed and concrete is produced in a mixer, the person receiving concrete to place becomes the customer and so on so forth. Thus, participation of all members is essential in TQM. Everybody must be involved, from all levels and across all functions. A culture of continuous improvement must be established.

TQM is also a philosophy based on the quest for progress and continuous improvement. In Japanese, process of continuous improvement has been termed as Kaizen. In quality improvement, waste and total cost must reduce. Quality improvement can only result from planned management action. Importance of TQM can be understood from the statement of Crosby's four eras of quality as

organizations adopting inspections only say, “We don't know why we have quality problems” while in TQM, they say, “We know why we don't have quality problems”. Errors can be caused at any stage of management and workers and thus, involvement of everyone is essential in TQM. Question is whether error can be stopped and the answer is verysimple – no as it is natural to make errors. But the errors have to be eliminated and not at later stage but right at the stage it is likely to occur or it has occurred by preventing it or correcting it as the case may be. It cannot be passed on to other person or process. Thus, TQM includes self inspection.

Concept of Zero Defects

Any variation that is caused while translating customer needs into correct specifications or while producing the required entity is considered as a defect. In fact, many people believe that it is uneconomical to eliminate all defects and some believe that defects or variations are normal, particularly in civil engineering works. But as per a quality guru, Philip B. Crosby, 'zero defects' are both technically and economically possible. An example has shown that once management demanded perfection, it happened and workers produced it. Of the three most common causes of workers errors, lack of knowledge, lack of proper facilities, and lack of attention, management concluded that the lack of attention was often addressed. Therefore, a goal was set to promote a constant, conscious desire to do a job right the first time as per Garvin. The resulting programme was called zero defects.

Crosby argues that if management is serious about achieving zero defects, it has to be serious about prevention. He proposed four absolutes of quality management as given below:

I. Quality means conformance to the requirements.

ii Quality comes from prevention.

iii. Quality performance standard is zero defects

iv. Quality measurement is the price of non-conformance i.e. cost of quality.

CPWD brings out specifications by which the requirements are well defined. Wherever specifications of items are not available in CPWD Specifications, NIT approving authorities have to clearly elaborate them in the tender documents. Preventive action has to be taken to achieve the quality and for the same, CPWD has the system of approval of samples. Zero defect performance can only be achieved if architects, designers, NIT approving authorities, supervisory staff, contractors, suppliers and workers are following the concept of quality. CPWD has the system of defining the responsibilities, training and skilling the workers to achieve the same through manuals and general conditions of contracts. Therefore, every stakeholder has to contribute to achieve the quality and this is challenging task.

As per Crosby, it takes a long time to transfer from conviction to conversion but as soon as the transfer

process begins, it is a positive sign that improvement has started to take place. The concepts that "Work cannot be done as per the documents" or "Quality is better than others" are considered roadblocks. Zero defects are only possible if each and everyone are involved in quality process. Though difficult but not impossible, concept of zero defects can be implemented if zero defects concept is implemented in every product, every process and by every person in the process. Since, stakeholders in a construction work are many including architect, engineers, contractors, suppliers, local bodies, zero defects become more complex and very difficult to achieve in construction and maintenance.

STATED AND IMPLIED NEEDS

In a construction work, architects, planning engineers and supervising engineers consider stated needs stated by the customer. Therefore, needs are to be stated at the very initial stage and thereafter to be implemented. In a construction work, even if needs are stated initially by the customer, changes are likely to be cropped up during construction process, hence deviations from the stated needs become essential for customer satisfaction as samples are not available in a construction work as in case of factory made products.

Stated needs are compiled in the form of drawings, specifications, conditions - general or special and clauses of the contract. Implied needs are part of the dimensions of quality. The dimensions of quality for a product are performance, features, reliability, conformity to specifications/standards, durability, serviceability, aesthetics and perceived quality. Time and timeliness service, completeness, consistence, courtesy, accessibility and convenience, and responsiveness are the dimensions of quality for a service but are to be included in construction as the civil engineering is also a part of the service. Thus for a construction work, the dimensions of a product as well as a service are to be considered for a quality work. In fact, product plays a major role during construction and service dimensions play a major role during maintenance. It must be understood that a customer who is not expert in the architectural and engineering profession will not be in position to spell out all the implied needs and hence, these are to be considered by the architect, engineers and builders.

Implied needs are most important. An architect or an engineer has to plan and construct the structure which conforms to local bye laws, is safe during normal and exceptional conditions like disasters, conforms to prevalent codes and guidelines and satisfy to the customer for end use. A customer must feel happy and satisfied while using the product/work. In fact, it is more of the implied needs which contribute to happiness to the customer and hence these are more important. Customer satisfaction leads to improve quality of his life and hence quality is largely based on the satisfaction of needs. Sometimes, architects and engineers may insist to the customer/client about the satisfactory inclusion of implied needs in the tender documents or during execution but we must understand that it is the client who has upper hand and as such his needs are to be satisfied for achieving the quality. Remember, client

will be satisfied only if we have understood his needs in detail and the same are incorporated in tender documents and satisfied through implementation during execution of work.

A building is a fixed asset and one does not change it easily and thus gets attached sometimes emotionally may be house or office for his/her life. Therefore, the dimensions of the quality and problems/comfort received from the asset during life of the building affect customer satisfaction. Thus, it becomes essential that the life cycle concept is considered by the architects, engineers and construction agencies. In fact, many times it is the maintenance stage from which customer forms a view about the quality of a work and hence, TQM in construction sector has to include life cycle concept. Life cycle concept includes all the stages right from the inception to dismantling. In fact, quality costs in a civil engineering structure should not only include prevention, appraisal costs and failure costs during construction but also such costs incurred during its useful life in maintenance stage. The needs of maintenance stage are to be considered while planning and executing a work. A work should require minimum maintenance and operational costs for a customer's satisfaction.

Thus, quality is not an absolute word but interrelated with stated or implied needs. Quality would depend upon the customer needs. For example, granite flooring cannot be said to be a quality work compared to cement concrete flooring just granite flooring is of richer specifications. Both are to be assessed separately for quality. Therefore, we and the customer should be very clear about the needs and specifications otherwise the difference between quality and specifications may not be appreciated as many times superior specifications are wrongly misunderstood the parameters of quality.

HUMAN RESOURCE MANAGEMENT

In TQM, everyone has to contribute to quality. Therefore, personnel involved in achieving quality, have to be quality conscious and trained. Thus, to achieve quality in any work, one must

I. Know, understand and agree to the requirements of the job.

ii. Know how to do the job and why it is being done.

iii. Have the knowledge of materials, process and equipment to do the job.

iv. Know what to do when the things go wrong.

For above, it is essential that orientation and development training to the supervisors is imparted in quality which includes new materials, methods, and machinery in a systematic manner for the customer satisfaction. Therefore, the persons involved in construction or maintenance activities must have the knowledge and capability of doing quality works. Hence, personnel management i.e. right person for right job is essential to achieve quality. CPWD training academy and regional training institutes are equipped and responsible for the training.

From above concept, quality cannot be achieved in cases of;

i. Accepting work not up to the standard may be because of urgency or any other reason at first stage itself.

ii. Delaying decision on rejecting the substandard work or taking action against for a substandard work right in first instance.

iii. Passing the instructions to overlook quality.

iv. Putting off the job till somebody else takes over the charge and thus not taking action right for the first time.

v. Not solving the problem but delaying or shirking of own responsibility.

vi. Refusing to listen and solve the problems.

vii. Technically incompetent personnel

It is also said that most people want to do a quality job, contrary to general belief. Therefore, management should ensure that;

i. Personnel engaged in works are technically competent and have the right training, placement, and knowledge.

ii. Quality conscious contractors are selected for the work.

iii. Co-ordination and feedback system is available.

iv. A system is designed for co-ordination between architects, engineers, contractors and workers and implemented.

v. System of reward and punishment is available and implemented for not following quality.

CONTRACT AND QUALITY

Quality in construction is achieved through joint efforts of employer, architects, engineers, contractors and other stakeholders. Since, contractor not only arranges the material but implements the quality, his role in achieving quality is very critical. Therefore, selection of a contractor is

extremely essential to achieve quality. Also, contract document and conditions play an important role in selection of a contractor; contract is thus also related to quality. Quality is to be included by the planners, engineers, quantity surveyors, and then quality managers. Hence, quality may depend upon:

i. Client's coordination with the planners and his “stated needs”

ii. Planners (Engineers and Architects)

iii. Designers

iv. Supervisory staff

v. Contractors

vi. Suppliers

vii. Quality control managers

viii. Workers

ix. Account officers making payments

x. Quality management concept being followed

Since drawings, designs, selection of contractor, inspections, time, quality control measures, specifications, rates, welfare and safety measures, payment conditions etc. are part of contract document; contract document also has a bearing on quality. Thus contact document has to be prepared considering the quality requirements. Quality requirements are to be well defined in the tender documents. CPWD prepares and revises General Conditions of Contract (GCC) time to time and leaves on NIT approving authority for inclusion of conditions required at site. General provisions are included and even requirements of lab and other equipment are to be included by NIT approving authority hence NIT approving authority has a vital role in drafting the conditions. It can also be thought if standard conditions can be prepared for certain type of works and made part of GCC.

As men (Workers and technical supervisors), materials, financial resources and methods required in a work are arranged by the contractor, quality is also largely dependent upon its implementation by the contractor. Thus, it is essential that a quality conscious contractor is selected to achieve the quality.

Though CPWD has its own system of enlistment of contractors and selection criterion of contractors for major works are also included in the tender or contract documents, this has to be reviewed from time to time based on feedback on quality control. Evaluation of quality may be required from time to time rather than only during revalidation for CPWD enlisted contractors. Time overrun and quality are also linked and as such completion of work on time and before time has to be given considerable weightage. Thus it is essential that quality contractor is selected and if found not following quality, action right at first time should be taken against the contractor rather than during revalidation.

Specifications and Quality

Specifications are backbone of a contract both in terms of materials and workmanship. A material of poor specifications with best of workmanship will never lead to satisfaction so also a best material with poor workmanship. Therefore, a right combination of material and workmanship and their incorporation in the contract are essential requirements of a quality work. Hence, the role of architects, quantity surveyors, and planners becomes important who have a vital role in preparing contract documents. Drawings and designs are part of specifications. Contractors quote the rates based on the specifications of the materials, intricacy and skill involved in providing and fixing. A single piece of granite slab fixed on the stairs will have different rates compared to pieces fixed, as wastage and cutting will be different in both the cases. As such even if the same material is used, specifications for fixing should be available in contract document for quality. If all specifications are not included, contractor may quote rates as per his wisdom and later will try to work according to rates quoted and not as per actual requirements or implied needs. Thus specifications in a contract are the part of the quality. As such all drawings whether architectural, structural or services have to be part of the tender documents. CPWD has made part of availability of such drawings of its Green Manual and Works Manual to achieve quality.

Contract conditions and Quality

Contract document may include technical specifications, general conditions and special conditions. Some conditions may have financial implications. If effect of such conditions is not included by the contractors or during evaluation of tenders by the employer, implementation of conditions becomes very difficult which may affect the quality also. For example, suppose a condition is included that the earthwork will be inclusive of rates of pumping of water in case of high ground water table expected or during rains. If the item of pumping water is not available in Bill of Quantities and thus not payable separately as per condition available, contractor will avoid work during rains or will delay to pump out the water as it may be costing more than earthwork in excavation itself. Similarly if small patch is required to be plastered in a multi-storeyed building, cost of repair may be negligible compared to scaffolding cost and if a condition is included that cost of scaffolding is included in the plaster without considering site conditions, the item may not be executed or may be done from the openings available with some temporary and unsafe arrangements affecting the quality. Similarly if safety provisions and welfare provisions of construction workers are included without considering their financial implications, it may result mostly in non-implementation which may affect the quality.

Acceptance Criterion

Since acceptance criterion of a work is stipulated in the contract, quality of work should be same whosoever is engineer in charge. But even after specifications and contract clauses are same, quality of

work differs in two works sometimes when carried out by different contractors and sometimes even if same contractor has carried out the work. This may be due to acceptance criterion set by engineers. Acceptance criterion of an engineer may be depending upon his/her qualification, knowledge, exposure, experience, morality and management practices adopted by him. Hence, through training, reward and punishment, it is to be ensured that the acceptance criterion does not change and is quality based. As acceptance of a work is important, rejection is equally or more important. Time factor has more weight age in case of rejection than the acceptance. Timely rejection of a work, right at first time leads to better quality than decision. If concrete in a basement column is rejected during casting or immediately after casting. In case it is not done and upper floors are casted, it is very difficult to recast or rectify the defects. It is the duty of an engineer to follow it let it is known to the contractor, not only in terms of specifications and workmanship but also for frequency of tests, sample preparation and materials approval.

MECHANIZATION AND QUALITY

Mechanization has a great potential and can be adopted almost in every facet of building construction nowadays but unfortunately not adopted. Mechanisation and use of power driven small equipment and tools lead to quality. If chase cutter or tile master is used, it will lead to quality work. Hence, NIT approving authority and field engineers msut utilize them more often.

SAFETY AND QUALITY

Safety and quality are complementary. Therefore, all safety measures must be implemented to achieve the quality.

Structural safety of a structure is important at execution stage and during post construction stage. Failure of a structure during execution stage is mostly due to some of the following reasons:

i. Unsafe design. TS authority has to ensure structural safety.

ii. Not following the correct design. The design might have been revised but old execution made based on old drawing. Old drawing is not destroyed, kept at site and even an entry is not made of its revision in the old drawing. Field engineers must take adequate precautions to adopt only final drawings.

iii. Collapse of temporary structures like failure of scaffolding. Such structures have to be designed particularly when double height scaffolding is required. Field engineers must clear the scaffolding and inspect before clearance, record it and then only casting of concrete carried out.

iv. Incorrect sequence of removal of props like removal of props from fixed side in a

cantilever

v. Removal of centering and shuttering before specified and required stripping period.

vi. Use of different grades and types of materials not considered in the design like use of PPC in place of OPC and removing centering and shuttering specified for OPC.

vii. Sudden change of conditions like flooding.

Collapse of the structures at post construction period is also possible. These failures may be under normal conditions as well as during critical conditions like earthquakes, cyclones and floods. Some of the reasons are numerated in the followings:

I. Removal of load bearing structural members. It should not be allowed in any case without taking structural safety precautions.

II.. Additions and alterations. Such construction should only be carried out with the approval of architect and structural engineer.

iii. Due to changed conditions because of construction of other structures like underground metro construction may create distress in adjoining structures. CPWD engineers should examine it and take up the matter with concerned authorities in advance.

iv. Natural disasters like earthquakes etc. CPWD engineers should immediately assess the damage and report submitted to competent authorities.

v. Aging of structures and residual strength not adequate to take loads. Inspections should be carried out and report submitted for unsafe structures as per the Manual by the field engineers.

vi. Poor maintenance conditions leading to deterioration of strength of the structural members. Maintenance should be carried out after restoration of the structure.

vii. Changed use like a building designed for office building being used for library. Field engineers should take up the matter with the client when noticed such instances. They should also send their advisory to the clients. Advisory should be given to the client in case of Post Tensioned slabs, not to drill the holes in slabs which may lead to failure.

viii. Poor drainage conditions around the building or rise of ground water table leading to reduction in bearing capacity of the soil. All drainage points should be inspected and

action taken before rains by field staff.

For workers safety, all precautions should be taken as a worker who is not feeling safe cannot deliver the quality. Public safety and environmental issues like pollution are also to be taken care as they also affect the quality.

CONTINUOUS IMPROVEMENT

TQM is not one time concept and is based on continuous improvement. Hence continuous improvement is essential in product, process, and management. Education and training are very important for continuous improvement process. Therefore, Training Academy and Regional Training Institutes have to ensure that education and training is imparted to all involved in the process. Early in the process, all levels of management must be trained to implement their part of the quality improvement programmes. Thus training and skill up gradation of all the stakeholders like architects, engineers, contractors and workers is the part of quality though CPWD has still not started training or orientation programmes for the contractors before start of work.

As already stated, quality is a relative term and not absolute one. CPWD still has system of inspections, testing of materials and procedure. Responsibilities for the quality are also defined based on the items and a comprehensive quality assurance plan.

Though inspections and quality control are old concepts, quality is not the outcome of only inspections and quality control engineers but the outcome of one and all involved in the process and that is called Total Quality Management (TQM). Thus be the contractor, supplier, engineer, designer, quality control engineers or the workers involved in the process, all have to contribute to the quality though their duties and responsibilities may be different. Quality has to be built in planning and implemented in filed ultimately.

It is also known that poor quality work involves wastage; wastage of material, labour, finance and resources. This is the reason that a contractor avoids rectification or redoing the work. But if he has to do it, the work becomes costly than even a good quality work. Hence, quality work can only be achieved if it has been done right for the first time. This is again the principle of TQM or zero wastage. So to achieve a quality work, everyone involved in the process has to go for a quality work right at the first instance, be the contractor, engineer or worker. And if work has been done as per quality standards right at the first instance, it would eliminate multiple levels and frequency of inspections.

2.0 Provisions in CPWD Works Manual and Standard Operating Procedures (SoPs)

QUALITY ASSURANCE

Para 7.1 Chief Technical Examiners Organization

7.1.1 Functions

The Chief Technical Examiner's Organisation is the technical wing of the Central Vigilance Commission. The Chief Technical Examiner's Organisation conducts inspections of works of CPWD from the vigilance angle on its own or on a complaint being received by/referred to them. The inspections can be carried out by them for works of any magnitude, both in respect of original and repair works.

7.1.2 Returns

1. Quarterly return of the works in progress, as per CTE's circulars from time to time are required to be submitted to CTE after consolidation at the regional level or as notified by the Directorate from time to time.

SOP No. 7/1 : CTE's Organisation – Returns and Inspections (Refer Para 7.1.2)

(1) The work wise returns are submitted in proforma given in Annexure -48. These returns are required to be submitted for the quarters ending March, June, September and December.

(2) The proforma for quarterly progress report in respect of stores and purchase is given in Annexure -49.

(3) Various documents relevant to the work generally asked for by the CTE are kept ready at site. A list of such documents is given in Annexure -50.

(4) To expedite replies and settle the points and to ensure timely action, the time limit fixed by the CTE are strictly adhered to by officers of CPWD at all levels.

(5) To watch proper disposal of replies, the T/S Authority/ Engineer in Charge maintains a register in proforma given in Annexure -51.

(6) A Register of overpayments pointed out by the CTE Organisation and subsequent recoveries effected, is maintained by the NIT authority in the proforma given in Annexure -52.

(7 Notice for rectification of defects, recoveries to the made etc., is issued by the concerned officer, who is party to the contract, acting for and on behalf of the President of India.

(8) Qtrly. progress reports to be sent to CTE for:

Category I	Civil works, Turnkey works Contracts, Stores & Purchases, PPP- Public Private Partnership, Sale of Goods/Scrap/Land	Rs. Five crore and above.
Category-II	Electrical/Mechanical works Maintenance/ Service contracts including Electronics / instrumentation Telecommunication /Man powe Supply / Consultancy contracts:	Rs. One crore and above.
Category-III	Horticulture works :	Rs. Ten lakhs and above.

(9) The work wise returns are to be submitted on separate sheets.

(10) No reference to be made to CTE inspection/examination of works in any correspondence made with the contractor.

2. The Engineer in Charge/CE/ADG shall monitor CTE paras and ensure that the paras of CTE are settled on priority.

3. While making correspondence with the contractor, Engineer in Charge shall not quote/give reference of CTE's inspections. The Engineer in Charge shall accompany CTE/representatives of CTE during inspections and issue inspection paras of the CTE to the contractor as his own observations.

Para7.2 Quality Assurance and Technical Audit Wing

7.2.1 Introduction

1) The Quality Assurance activity has to ensure a progressively improved and uniform quality of the finished work. In order to achieve this, the pre-requisites cover among other things, an inbuilt provision in the contract for a system of continuous check on quality by the field staff and the contractor, availability of adequately manned and equipped agency for overseeing the quality aspects, and periodical appraisal of quality and a system of feedback for effecting possible improvements.

2) The NIT Approving Authority has to ensure through contract conditions that the Concept of Total Quality Management (TQM) is in-built in the work delivery system for which everyone shares well defined responsibilities.

3) For budgeted works, engagement of TPQA agency will be done for the works above Rs 20 crores or as per the directions issued from time to time by the CPWD Directorate. For Deposit works, TPQA provisions will be made as per MOU. For all other contracts where no TPQA is engaged, the existing QA units of CPWD or as notified from time to time shall carry out the Quality Assurance checks on random basis.

8.13 Consultancy Works to Government Organizations/Institutes

Consultancy work (such as proof checking of structural design or original structural design of typical or

special structure, assignment of specialized job requiring analysis of structures and soil investigation, Architectural/ Landscape Design consultancy work and seeking expert advice for retro-fitting of buildings or third party quality audit (TPQA) of the work (as per request of the client) can be assigned to IITs, NITs, Govt. Engineering College, Central Building Research Institute (CBRI), and other central/state Govt. Institutes, without call of tenders.

Para 4.8 EPC (Engineering, Procurement and Construction) Contracts:

For executing contract on EPC methodology, the following important provisions are to be considered while framing estimate, preparing NIT etc:

(1) Enabling estimate can be submitted as per client requirement for carrying out pre-construction activities wherever required for conceptual planning purpose to assess the precise requirement of the scope of work.

(2) The concerned CA/SA unit or the consultant appointed by the NIT approving authority shall prepare the concept design, preliminary drawings and specifications based on detailed requirements of the work, in consultation with the client before preparation of Preliminary Estimate.

(3) The tenders based on EPC mode cannot be the model based on item rates and quantities hence the estimated cost for such tenders may be worked out on the basis of CPWD plinth area rates as per norms and the cost suitably modified considering applicable cost index or by adopting any other appropriate method as decided by NIT approving authority. Preliminary drawings and specifications approved by the client shall form part of the NIT.

(4) Soil investigation report shall be appended in the NIT for indicative purpose only.

(5) The responsibility of investigations, designing, planning, procurement, construction, safety, quality, and risk of engineering lies with the contractor and the same will be incorporated in the NIT.

(6) Mode of measurements for payment purpose will be decided by the NIT approving authority.

(7) The award of work shall be decided based on competitive call of tenders. The Chief Engineer ascertains the reasonability of prices using analytical methods such as tendered amount for similar works whose tenders were accepted in the recent past, PAR rates duly enhanced by the current cost index and any other method approved by the Chief Engineer for ascertaining the reasonability of the tendered amount of the L1 bidder.

(8) In case the tender received is more than A/A & E/S, revised A/A & E/S or in principle approval from the competent authority shall be necessary.

CONTRACT MANAGEMENT

Para 5.6.2 Preliminaries

The Engineer in Charge and his representatives shall be responsible for execution of works and contract management according to the drawings, design, specifications, quality, and agreement etc. Time of completion of work shall be considered as an essential factor of contract management.

Para 5.6.4 Responsibility for Quality of Work

The officer who records/test checks the measurements for an item of work will be responsible for the quality, quantity/ measurements and dimensional accuracy of that item of work. In respect of all works, the responsibility of various officers for checking of materials and workmanship of items of works shall be as given below in SoP 5/10. The T/S authority shall be responsible for the overall quality of work.

In case, the quality has been checked by the QA unit of CPWD, the removal of defects shall be ensured within reasonable time by the Engineer in Charge and the QA unit. The responsibility of quality for the items checked by the quality assurance unit of CPWD will also lie with the QA unit in addition to the Engineer in Charge and his representatives.

SoP 5/10 Responsibility of officers for Quality of Work

1. To ensure that materials duly approved are used in the work, samples of various materials are approved by the Engineer in Charge and by NIT approving authority not below the rank of SE for projects above the powers of EE.
2. Wherever necessary the above mentioned authorities appro
3. Approved samples of materials are signed by the approving authority and the contractor and preserved till the end of the project. ve the sources for respective materials.
4. Samples of various materials, fittings are approved well in advance and displayed at sites of works with make and name of the manufacturer/supplier.
5. The material non conforming to specifications are promptly rejected and removed from site.
6. It is incumbent upon the Engineer in Charge to keep a watch over regular testing of materials before making payment at the stage of each running bill. For this purpose, a proforma as per Annexure -54 is prescribed.
7. Samples for tests are taken mostly by the Junior Engineers, or some by the Assistant Engineers.
8. Samples for 10% of mandatory tests are collected by the Engineer in Charge. 10% of the field tests

are got done by the Engineer in Charges in their presence.

9. A Guard file is maintained at all work sites, containing copies of all inspection reports to-date.

10. Site Order book, Record of tests,, etc. are put up for entries and review to every inspecting officer. Similarly online Inspection register are reviewed by the inspecting officers.

11. The inspecting officers of the rank of Superintending Engineer and above not only confine themselves to review of progress, coordination and general matters, but also inspect the work from quality Assurance aspects.

12. The Engineer in Charge invariably reviews and signs the guard file of earlier inspections, Site Order Book, Register of tests carried out etc.

13. Checklist

    (i) As and when any important item is taken up for execution, the Junior Engineer/Assistant Engineer should go through the specifications and invariably make a checklist.

    (ii) This checklist is got approved from the Engineer in Charge, and is shown to the inspecting officers.

    (iii) The important items inter-alia include foundation work, including reinforcement and shuttering, brickwork, cast-in-situ mosaic flooring, doors & windows, plumbing, including water supply pipe lines, roof treatment, earth filling etc. which are a few illustrative items for checklist purpose.

    (iv) Sample checklists for items of concrete for raft, columns/beams/slabs, water supply lines, brickwork and plastering are given in Annexure -26 for guidance.

14. To avoid dampness and leakage, the Engineer in Charges ensures that necessary tests are carried out for proper slopes of canopies, chajjas, terracing, drainage arrangements, water tightness of expansion joints, joints in the water supply, drainage and sanitary works before these are covered/ concealed, and also ensure rectification of defects noticed.

15. The Engineer in Charge ensure availability of the required test equipments for field tests, as well as an updated copy of specifications, copies of agreement at sites of works.

16. In respect of all works, the responsibility of various officers for checking of materials and workmanship is given in Annexure -27.

Para 5.6.6 Periodic Inspection of Works

The works shall be inspected frequently by various officers concerned with the work to ensure that the

work in general is being carried out according to quality, design, drawing, and specifications. The programme for inspection of the works shall be followed as per details given in SOP 5/12 mentioned below:

SOP 5/12- Periodic Inspection of Works

1. The various levels of field officers executing the work as well as CA/SA/Arch concerned with the work, mandatorily inspect the works frequently to ensure that the works are in general being executed according to the design, drawings and specifications laid down in the contract.

2. The Engineer in Charge draws a quarterly programme of inspection in respect of various works in his/her Division. The minimum number of inspections for each work are : 1 for every 2 bills for the works at his/her head-quarters, and 1 for every 3 bills for the works outside the headquarters. A copy of this programme is sent to his/her next higher authority.

3. Similarly an Officer not below the rank of SE draws a quarterly programme of inspection in respect of various works In particular, for contracts accepted by SE and above level officers, and for other important works, the programme for inspection is so drawn that the NIT approving authority inspects at least once at each of the following stages during the execution of each work:

	At SE's HQ	**Outside SE's HQ**
(i)	Upto 3rd RA bill	Upto 5th RA bill
(ii)	4th to 6th RA bill	6th to 10th RA bill
(iii)	7th to 9th RA bill	11th to 15th RA bill and so on

Para 5.14 Test Checking of Measurements

The T/S authority shall be responsible for the overall quality of the work. Test Checking of measurements shall be carried out by respective officers as given in SOP 5/24 as mentioned below:

SOP 5/24

1. Test check by the Assistant Engineer

(i) The Assistant Engineer satisfies himself/ herself before passing a bill for payment, or before submitting it to the Divisional Officer for payment, that the work or supply billed for has actually been carried out/completed in accordance with the terms and conditions of the contract.

(ii) The Assistant Engineer is to personally inspect all the works of any magnitude and submit the same to division office before for payment.

(iii) He/She is required to check measure the works in his/her charge as below:

(a) All items of work in a project irrespective of their cost, are and recorded by the Junior Engineer-in-charge of the work. It is, however, open to the Assistant Engineer to record measurements for any particular item of work himself. In case of absence of Junior Engineer, the Assistant Engineer records measurements.

(b) The Officer accepting the tender for any work may stipulate and require the Assistant Engineer to record measurements himself or exercise 100% check on the measurements recorded by his subordinate for any item including those, which, owing to their situation, cannot subsequently be checked measured or which have very high unit rates or which in the opinion of the Officer are important.

(iv) Important works, within meaning of the above, include items which owing to the situation cannot be subsequently checked or which have very high unit rates. For guidance, these items are classified generally as below :-

(a) Items of work which owing to their situation cannot subsequently be checked :

(i) All work below ground level such as Concrete, Masonry, Steel work etc. in foundation; and

(ii) Fabricated Steel work in columns, beams, etc. which are encased either in masonry or concrete, reinforcement in RCC/RB work.

(iii) Wood work, Iron work etc. hidden by ceilings, wall paneling or floor boardings.

(iv) Bitumen painting of roofs under mud phuska and tiles paving or under terrace concrete.

(v) Water proofing compounds used in gauging cement.

(vi) Lines of pipes buried in floor or masonry in Internal sanitary, water supply or drainage installations.

(vii) Earthing installation, cable laying etc.

(b) Items of works which are considered to have very high unit rates:

(i) RCC Work.

(ii) Items in sunk ashlar stone or marble work, plain sunk or moulded in walls, columns, arches ordomes.

(iii) Stone or marble work in wall lining. All steel cladding, structural glazing etc.

(iv) All wood work in Chowkhats, frames or trusses in Indian or Burmah Teakwood.

(v) All joinery work in shutters, trellis works, miscellaneous wood work etc. whether in Indian Teak or Burma Teak wood.

(vi) All brass, oxidised brass or other similar costly fittings of doors, windows etc. where payable separately.

(vii) All major equipments for AC, lifts, Generator sets, Sub-station equipments, fireworks

(viii) any other items desired by Engineer-in-charge.

(v) In case of works at headquarters of the Sub-Division, AE should check measure not less than 50% of the value of the measurements recorded by his/her Junior Engineer before any running/final bill is paid. In case of works outside headquarters of the Sub- Division, the Assistant Engineer should check measure upto 50% of the value of work done before preparing final bills or before making payment of alternate running/final bills.

(I) Incaseofworksatheadquartersofthe Sub-Division,AEshouldcheckmeasure not less than

(ii) 50% of the value of the measurements recorded by his Junior Engineer before any running/final bill is paid.

(iii) In case of works outside headquarters of the Sub-Division, the Assistant Engineer should check measure upto 50% of the value of work done before preparing final bills or before making payment of alternate running/final bills.

Note: For the purpose of test check, “measurements” means the “corresponding monetary value of measurements of work done.”This, however, does not apply to “Levels”, in which case the test check has to be based on the number of levels recorded.

(vi) While test checking the works of repetitive type, the Assistant Engineer (Elect) should test check 100% of all items of at least one unit, taken at random, besides test checking isolated and individual items in other units to bring the total extent of check measurement to the desired limit of 50% of value of work done.

(vii) Besides the mandatory test check of RCC and hidden items of work, the test check of measurements by Assistant Engineer shall also include not less than 50% of the plumbing work for sanitary and water supply wherever applicable.

(viii) Inthecaseofworksoutsidetheheadquartersofthe Sub-Divisioncostingupto20%of his tender acceptance power, check measurements by the Assistant Engineer need not be insisted upon.

He will, however, have to accept general responsibility for the correctness of the bill as a whole.

2. Test check by the Engineer in Charge

(i) The Engineer in Charge should test check 10% of the measurements recorded by his/her subordinates at least every alternate bill for works at his/her headquarter, and at least every third bill for works outside his/her headquarter. Measurements selected by EE is independent of measurements test checked by AE. However this will not apply to items, the measurement of which are a checked 100% by AE. In respect of works costing up to 20% of his/her tender acceptance power at places outside the headquarter of the division, and in case of works costing upto 10% of his/her tender acceptance power at the headquarter of the division, the Engineer in Charge may, in his/her discretion, authorize payment without any test check by him. He/she will, however, have to accept general responsibility for the correctness of the bill as a whole.

(ii) Test check of RCC and plumbing works

(a) Test check of the Engineer in Charge is also include at least 10% test check of the measurements of RCC items so as to ensure structural safety of building.

(b) Besides the mandatory test check of RCC and hidden items of work, the test check of measurements by the Engineer in Charge is also include not less than 10% of the plumbing work for sanitary and water supply.

(iii) Test check of steel

(a) In the case of receipt of steel, the Engineer in Charge is test check 10% of the total consignment received in a month. Any consignment test checked by the Engineer in Charge is checked by him/her100%.

(b) Permitted variation between the quantities as per supplier's bills and as received and accounted for in stock account, is 0.5% in the steel bars upto and including 12 mm dia, and 1% in the case of steel bars of higher dia.

(c) If in any consignment the variation on lower side exceeds the aforesaid limits, 100% check of the measurements is carried out by the Engineer in Charge, and detailed investigation into the reasons for the short age recorded.

(iv) Test check in road works

In case of road work involving supplying and laying of sub-base and base course material:

(a) The stacks is uniformly distributed along the road. The collection of stone metal is completed for

the entire work, or for complete length of 1 km, or as directed by the Engineer-in-Charge, and measured before the work of laying and consolidation is taken up in hand.

(b) The Assistant Engineer is test check not less than 50%, and the Engineer in Charge, not less than 10% of the supply of materials in each length of 1 km before the work of laying is started.

(v) Test checks to be attested

The individual items checked is clearly shown in the Measurement Book, and the result recorded by the officer concerned. The items thus checked is attested by the dated initials of the checking Officer.

(vi) Consolidated record of checks/test checks

(a) A collective record of all the check carried out from time to time is prepared in each Measurement Book.

(b) The result is indicated by the word "Satisfactory" or "Unsatisfactory" as judged at the time on merits of each case. Unsatisfactory result is communicate to the JE or both the JE and AE as the case is.

Para 5.1.6 Justification of tenders

However, while preparing the justification nothing shall be added extra for -

(1) Cost of engineering establishment deployed by the contractor.

(2) Cost of effort in arranging Tools and Plants (T&P) and heavy machinery which have not been considered in the analysis of rates for the items included in the scheduled of Qunatities of the work.

(3) Cost of providing cleaner environment at site & labour welfare facilities.

(4) Cost of Quality Assurance set up enhancing testing lab.

SOP 5/19 Secured Advance on material brought at site

Guidelines for Secured advance on material brought at site shall be as below:

(4)(iii) The quality of materials is as per the specifications.

Details to be submitted by Contractor along with Progress Report.

The progress report submitted by the contractor shall contain the details as mentioned below apart from details may be required as per NIT conditions.

(1) Apart from the progress reports which are being compiled and submitted to higher authorities from

various levels in the department, there should be a stipulation in the contract for large value works, say, Rs. 20 Crores and above, or as may be decided by the NIT approving authority, for the contractor has to submit monthly progress report of the work in a computerized form showing the rate of progress of work, progress during the previous period etc. The progress report shall contain the followings:-

(i) Project information, giving the broad features of the contract.

(ii) Introduction, giving a brief scope of the work under the contract, and the broad structural or other details.

(iii) Construction schedule of the various components of the work through a bar chart for the next three quarters (or as may be specified), showing the milestones, targeted tasks and upto date progress.

(iv) Progress chart of the various components of the work that are planned and achieved, for the month as well as cumulative upto the month, with reasons for deviations, if any, in a tabular format.

(v) Plant and machinery statement, indicating those deployed in the work, and their working status.

(vi) Man-power statement, indicating individually the names of all the staff deployed in the work, along with their designations.

(vii) Financial statement, indicating the broad details of all the running account payments received upto date, such as gross value of work done, advances taken, recoveries effected, amounts withheld, net payments, details of cheque payments received, etc.

(viii) A statement showing the extra and substituted items submitted by the contractor, and the payments received against them, items pending for sanction/decision by the Department, broad details of the bank Guarantees, indicating clearly their validity periods, broad details of the insurance policies taken by the contractor, if any, the advances received and adjusted.

(ix) Progress photographs, in colour, of the various items/components of the work done upto date, to indicate visually the actual progress of the work.

(x) Quality assurance and quality control tests conducted during the month, with the results thereof.

Para5.7(2) Site Document

For maintaining and operating other site documents viz Site order book, physical inspection register (where ever applicable), cement register, dismantle register etc details are given in SOP 5/14 as mentioned below:

1. Site Order book

(i) The form of the site order book is given in Annexure -28.

(ii) Verbal orders of Senior Officers are confirmed by the JE/AE in writing in all cases. However, implementation of these verbal orders is not delayed for want of confirmation.

(iii) EE and AE concerned, sign the Site Order Book in token of having read all the instructions issued by various Officers and replies made thereto.

(iv) In case the EE or AE himself/herself wants to give any instructions, he/she records them in the Site Order Book.

(v) The JE/AE records their observations in the Site Order Book if any defective work is found, or if the contractor is not complying with any of the terms of the contract, or on the slow progress of work, if any.

(vi) The Site Order Book is maintained at the site of the work, and is never removed from there under any circumstance.

(vii)The contractor or his/her authorized agent is also at liberty to note his/her difficulties etc. in this book.

(viii) The compliance of orders/instructions given by the supervisory staff and the date(s) of its (their)compliance is recorded side by side in the Site Order Book by the Junior Engineer/ Assistant Engineer with dated initials.

(ix) The Engineer in Charge periodically reviews the Site Order Book to ensure that it is being properly maintained and used. The Site Order Book is consulted at the time of making payments to the contractor.

(x) Assistant Engineer verifies at site whether the defects pointed out during construction have been rectified or not, and also proposes part rates, if necessary, for the items of work for which defects were pointed out but have not been rectified.

(xi) While recording instructions, reference of CTE's inspection/ Quality Assurance inspection should not be quoted in the Site Order Book.

2. Inspection Registers

(i) Senior Officers record the observations of their site inspections through Online site Inspection register module for each project registered in PMS.

(ii) Online site inspection register becomes functional after the registration of work in PMS module on CPWD website.

(iii) The inspecting officer after log in through his/her PIMS id selects the concerned project for work and records his or her observations.

(iv) The Engineer in Charge and his subordinate officers carries over such observation and defects on which action is to be taken by contractor to the Site Order Book with appropriate cross references of the Online Inspection register.

(v) The concerned site staff add compliance note against the observations and also upload site photographs, if needed.

(vi) All the concerned officers of the project from JE to DG, CPWD can view the compliance and can also add new observations or comments in subsequent remarks.

(vii) In case compliance note is found to be unsatisfactory, the concerned senior officers can add subsequent remarks in this regard.

(viii) The observations can also be drafted in separate word file and then copied to the online register.

(ix) There is also a provision for subordinate officer to prepare the draft observation/ compliance note and submit to approving authority. After approval, the observations are automatically uploaded in online register in the name of approving authority.

(x) Observations recorded are reviewed by Sr. officers during their subsequent inspections to ensure their compliance.

(xi) Monthly report of observations made by an officer is generated by the module.

(xii) In exceptional cases, if manual inspection register is required to be maintained then prior approval of an Officer not below the rank of SE is obtained. In this regard a docketed Inspection register shall maintained as per proforma given in Annexure -29.

3. Cement Registers

(I)The proforma for the Cement Register is as per Annexure -30.

(ii) The Assistant Engineer/Engineer in Charge checks the registers maintained for accounting of cement at different work sites.

(iii) In case of works costing above Rs. 1,00,000/- or as notified by the Directorate from time to time, situated outside their headquarters, they inspect the registers and stores during their respective

visits and inspection of the works.

In case of works where Ready Mixed Concrete (RMC) is stipulated to be used from an approved source/manufacturer, such registers are not be maintained. However, the computerized dispatch slips that are sent with each dispatch of RMC are kept on record.

4. Dismantled materials arising out of dismantlement through departmental works

(i) The serviceable materials obtained from dismantlement of a building or structure wherever not sold by tender or auction, is recorded without value in the Measurement Book for record purpose

(ii) On the basis of the measurements, the serviceable materials are taken in the Register of Dismantled Materials in the form at Annexure -31.

(iii) The Assistant Engineer after duly attesting the entries made in the Measurement Book makes a suitable note that these materials have been entered in the Register and strikes out the page with a red diagonal line.

(iv) A separate folio or set of folios is kept apart for keeping the accounts of dismantled materials pertaining to each work.

(v) The serviceable materials obtained from dismantlement is used in the works as far as possible and is shown as issued to works accordingly in the Register.

(vi) The un-disposed balances is physically verified at least once a year and the result of the verification recorded in the "Remarks Column".

(vii) This register (even for "Nil" transactions) is submitted by the Assistant Engineer regularly each month along with the monthly accounts for scrutiny in the Divisional Office.

(viii) After the transactions have been checked by the Divisional Accountant, the Register is laid before the Engineer in Charge for monthly review. The fact of such review is placed on record in all cases preferably in Form CPWA 96 (memo of review).

(ix) In no case dismantled materials is collected on the road berms. If for any reason, it is not found possible to comply with these instructions in any particular case, then written approval of the Superintending Engineer and local authority, if any, is obtained.

(x) The "Empties", i.e. empty drums, tins, bags, and other containers are also included and accounted for in the Register of Dismantled Materials.

5. Dismantled materials arising out of dismantlement through contract

(i) In case a building or structure is dismantled through contract, a stipulation/provision in the schedule of work is generally made in the NIT/contract that the contractor has to take away the dismantled materials within specified time, and for which he/she gives credit to the Department at his/her tendered and accepted rates.

(ii) In cases where the intrinsic value of the dismantled materials is more than the cost of dismantlement of the building/structure. In that event, sufficient safeguard is taken through suitable stipulation/provision in the NIT/contract whereby the contractor has to deposit the cost of dismantled materials in full with the Department before he/she is allowed to take up the dismantling work. The cost of dismantling is paid to him/her after he/she completes the dismantling work.

(iii) Usual provision for security deposit/performance guarantee is made in the contract to ensure that the contractor completes the dismantling work, and that he/she does not just walk away with the costly dismantled materials.

(iv) In case where dismantlement is part of construction contract, lump sum stipulation is made for dismantling and removing the dismantled material, recovery of which is made as early as possible preferably from the first three running bills.

Para 5.7.2 Testing of Material from outside Laboratories

Guidelines on Testing of Material from outside laboratories are given below:

SOP No.5/16 : Outside/Independent Testing Facilities

1. Extensive testing of the materials used for construction is a pre-requisite for attaining high quality of the work. This is also require specialized tests, physical, chemical, ultrasonic, x-ray and various other types of tests which cannot possibly be carried out in a site laboratory. These tests also require specialized personnel who regularly deal in such testing. Therefore the need arises for carrying out the tests in outside laboratories.

2. These laboratories are in the Government sector, Semi Government or Private sector. All govt. Institutes, Indian Institutes of Technology, National Institutes of Technology, Central and State research Centers, Centrally and State funded laboratories stands approved. No approval is required for testing in these laboratories/institutes.

3. However, the outside private laboratories are approved in the following manner:-

   (i) The SE will approve the private lab irrespective of distance for tests. For this purpose , labs accredited by NABL or any other accreditation body which operates in accordance with ISO/IEC 17011 and accredits labs as per ISO/IEC 17025 for testing and calibration scopes is eligible.

   (ii) A lab will have to submit details of space available, equipments, staff (Technical and non Technical), Accreditation and approval from various department/institutes. For this purpose labs accredited by NABL or any other accreditation body which operates in accordance with ISO/IEC 17011 and accredits labs as per ISO/IEC-17025 for testing and calibration scopes is eligible.

   (iii) Initial approval of lab is for one year and can be revalidated for further one year and so on.

   (iv) Every lab is audited for maintenance and calibration of equipments and employment of staff prior to approval/ revalidation.

4. However, testing of material in any Govt. Lab/Public Undertaking Lab/IIT or NIT Lab/Government Engineering College is allowed by Engineer in Charge without prior approval of Superintending Engineer or higher officers provided these labs have all necessary facility to carry out the required test.

Annexures

(from CPWD Works Manual and SoP)

1.	Annexure - 26	32 - 36
2.	Annexure - 27	37 - 39
3.	Annexure - 28	40
4.	Annexure - 29	41
5.	Annexure - 48	42
6.	Annexure – 49	43
7.	Annexure - 50	44 - 45
8.	Annexure - 51	46
9.	Annexure - 52	47
10.	Annexure - 53	48 - 49
11.	Annexure - 53 A	50
12.	Annexure - 54	51
13.	Annexure - 55	52 - 55
14.	Annexure - 56	56 - 59

ANNEXURE - 26

(Refer SOP No. 5/10)

CHECK LISTS FOR VARIOUS ITEMS

PART - A

CHECK LIST FOR ITEMS OF FOUNDATION CONCRETE

Name of work: .....

Name of contractor .....

Agreement no. .....

1.	Date of inspection		
2.	Location		
3.	Material used for concrete whether tested		
	(a)	Sand	Yes/No
	(b)	Coarse aggregate	Yes/No
	(c)	Water	Yes/No
	(d)	Admixture, if any	Yes/No
4.	Raft top level, whether provided as per details		Yes/No
5.	Architectural/structural drawing correlated		Yes/No
6.	Whether location of construction joint has been discussed with Executive Engineer, and he has approved it		Yes/No
7.	Cleaning over water proofing surface and construction joint done		Yes/No
8.	CC cover blocks of 60 mm, thickness provided (min 2 in one square metre area)		Yes/No
9.	Reinforcement placement as per relevant structural drawing checked		Yes/No
10.	Layout of columns as per relevant structural drawing checked		Yes/No
11.	Placement of shuttering plates and key board for proper construction joint with shuttering oil		Yes/No
12.	Cement slurry applied on construction joint before pouring of concrete		Yes/No
13.	Trained mason available		Yes/No
14.	Concreting to start from farthest point to nearest point with respect of weight batching plant		Yes/No
15.	Concrete mix has been designed		Yes/No
16.	Plasticiser being used		Yes/No
17.	Adequate number of concrete vibrators in working condition available		Yes/No
18.	Slump checked		Yes/No
19.	Sample cubes taken		Yes/No

20. Signature of Junior Engineer .....

21. Signature of Assistant Engineer .....

22. Signature of Executive Engineer .....

PART — B

CHECK LIST FOR COLUMNS/BEAMS/SLABS

1.	Date of inspection		
2.	Drawing no.		
3.	Location		
4.	Whether materials used conform to relevant Specifications?		
	(a)	Sand	Yes/No
	(b)	Coarse aggregate	Yes/No
	(c)	Water	Yes/No
	(d)	Admixture, if any	Yes/No/NA
5.	Whether structural drawings correlated with architectural drawings?		Yes/No
6.	Whether the centre line of column/beams checked with reference to grid lines as per architectural drawings?		Yes/No
7.	Whether treatment of expansion joint, wherever required, is done?		Yes/No
8.	Whether cleaning, repairing and approval of shuttering plate, application of quality shuttering oil is done?		Yes/No
9.	Whether shuttering is in true plumb and vertical and properly done and maintained during concreting?		Yes/No
10.	Whether reinforcement detailing, their placement are as per structural drawings?		Yes/No
11.	Whether proper gauge binding wire is used and with full cross binding and tightening of reinforcement bars with stirrups?		Yes/No
12.	Whether required minimum cover to reinforcement is maintained?		Yes/No
13.	Whether stainless steel cramps, angle irons for holding stones and any holding arrangement for electrical/mechanical/fire fighting/other services have been seen and approved by JE (E)/AE(E)		Yes/No
14.	Whether conduits for various electrical/mechanical/fire fighting/other services have been seen and approved by JE(E)/AE(E)?		Yes/No
15.	Whether concrete of approved design mix within maximum permissible water-cement ratio is used?		Yes/No
16.	Whether admixture of good brand quality approved by Engineer-in-charge is used?		Yes/No
17.	Whether technical supervision at batching plant/mixer and at point of concreting done?		Yes/No

18. Whether concreting is placed within initial setting time of mixing? Yes/No
19. Whether proper compaction with vibrator is done? Yes/No
20. Whether the concreting has been done in a lift not exceeding 1.5 m? Yes/No
21. Whether cubes as per requirement filled for testing? Yes/No
22. Signature of Junior Engineer …….
23. Signature of Assistant Engineer ……
24. Signature of Executive Engineer ……
Post-concreting:
25. Whether shuttering stripped off as per specification, and laitance removed immediately thereafter? Yes/No
26. Whether proper arrangement of curing and curing period maintained as per specifications? Yes/No
27. Whether hacking of RCC surface by proper hacking tool for subsequent plastering/finishing is carried out ? Yes/No
28. Signature of Junior Engineer ……..
29. Signature of Assistant Engineer …….
30. Signature of Executive Engineer ……

PART - C

CHECK LIST FOR BRICK WORK

1. Date of inspection
2. Drawing no.
3. Location
4. Whether materials used conform to relevant Specifications and whether mandatory tests done?
   (a) Sand Yes/No
   (b) Bricks Yes/No
   (c) Water Yes/No
5. Whether structural drawings co-related with architectural drawings? Yes/No
6. Whether the centre line of brickwork checked with reference to grid lines as per architectural drawings? Yes/No
7. Whether bricks soaked in water before use for sufficient period? Yes/No
8. Whether queen closers are used at junction of walls? Yes/No
9. Whether brickwork is in true plumb and vertical and all layers truly horizontal? Yes/No
10. Whether graduated wooden straight edge storey rod being used for keeping height of brick courses uniform? Yes/No

11.	Whether wall height being constructed in a day is being restricted to 1 m height?	Yes/No
12.	Whether parts of wall left at different levels are raked back at an angle of 45 degrees or less with the horizontal? (Toothing is not to be permitted)	Yes/No
13.	Whether top courses of all plinths, parapets, steps and top of walls below floor and roof slabs laid with brick on edge? Whether marucona provided at corners in such brickwork?	Yes/No
14.	Whether thickness of joints in brickwork is kept 1 cm ± 20%?	Yes/No
15.	Whether mortar of approved mix within maximum permissible water cement ratio is used?	Yes/No
16.	Whether all horizontal and vertical joints are being filled?	Yes/No
17.	Whether proper arrangement of curing and curing period maintained as per specification?	Yes/No
18.	Whether date of work done written?	Yes/No
19.	Signature of Junior Engineer ……..	
20.	Signature of Assistant Engineer …….	
21.	Signature of Executive Engineer …….	

PART - D

CHECK LIST FOR BRICK WORK

1.	Date of inspection	
2.	Drawing no.	
3.	Location	
4.	Whether materials used conform to relevant specifications and whether mandatory tests done?	Yes/No
5.	Whether surface cleaned of all loose mortar and efflorescence?	Yes/No
6.	Whether all conduiting and electrical piping done?	Yes/No
7.	Whether all doors, windows etc. fixed?	Yes/No
8.	Whether all defects of brickwork/CC/RCC rectified?	Yes/No
9.	Whether preparation of surface done?	Yes/No
10.	Whether 2.5 m long aluminum straight edge and plumb bob being used to check verticality and evenness of surface?	Yes/No
11.	Whether 15 cm x 15 cm bunda at every 2 m horizontally and vertically being provided to serve as gauges?	Yes/No
12.	Whether uniform groove provided at junctions of all plaster and ceiling plaster?	Yes/No
13.	Whether mortar of approved mix within maximum permissible water cement ratio is used?	Yes/No

14. Whether proper arrangement of curing and curing period maintained as per specifications? Yes/No
15. Whether date of work done written? Yes/No
16. Signature of Junior Engineer ……..
17. Signature of Assistant Engineer …….
18. Signature of Executive Engineer …….

PART - E

CHECK LIST FOR WATER SUPPLY LINES

1. Date of inspection
2. Drawing no.
3. Location
4. Whether materials used conform to relevant Specifications and whether mandatory tests done? Yes/No
5. Whether plumber employed is licensed plumber or not? Yes/No
6. Whether plan for piping system has been prepared and got approved? Yes/No
7. Whether all pipes and fittings are ISI marked? Yes/No
8. Whether a sample system has been prepared and got approved? Yes/No
9. Whether clamps provided at specified spacing? Yes/No
10. Whether pipe lines checked at required pressure before covering? Yes/No
11. Whether weight of flushing pipe checked? Yes/No
12. Whether flushing cistern is ISI marked and internally painted with bitumastic paint? Yes/No
13. Whether fittings like wash basin, sink pan, cistern, bib cock, stop cock, wheel valves, etc. are ISI marked? Yes/No
14. Whether PVC water storage tank is ISI marked? If not, whether sample sent for testing? Yes/No
15. Signature of Junior Engineer ……
16. Signature of Assistant Engineer …….

ANNEXURE - 27

(Refer SOP No. 5/10)

RESPONSIBILITY FOR QUALITY

1. Civil Work

Item of work			Works costing	
			Above Rs. 50 lakhs	Upto Rs. 50 lakhs
A.	**Materials**			
	(a)	Sand, stone, metal & chips, bricks, ordinary glass panes	JE & AE	JE
	(b)	Timber, paints, polish, door, shutters, windows, door/ window fittings, sanitary and water specials, glass panes	JE & AE	JE
	(c)	Marble, granite, kota stone and similar stone work items	AE & EE	JE & AE
	(d)	Cement and steel	AE & EE	JE & AE
	(e)	Bitumen, bitumen emulsion, mastic	AE & EE	JE & AE
B.	**Items of work**			
	(a)	Foundation upto plinth	AE & EE	JE & AE
	(b)	Brick masonry/stone masonry	JE & AE	JE
	(c)	Centering and shuttering excluding sunshades/ shelves	AE & EE	JE & AE
	(d)	Reinforcement and RCC	AE & EE	JE & AE
	(e)	Structural steel work	AE & EE	AE
	(f)	Steel work	AE	JE & AE
	(g)	Aluminum work	AE & EE	JE & AE
	(h)	Wood work/wood substitutes	AE & EE	JE & AE
	(i)	Flooring - CC, mosaic glazed/ceramic tiles	AE & EE	JE & AE
	(j)	Flooring & cladding - marble, granite, kota,sand stone etc.	AE & EE	AE
	(k)	Plastering, painting & polishing	JE & AE	JE
	(l)	Joints in pipes i/c testing, slopes in flooring i/c verandah, balcony, toilets, terrace	AE & EE	JE & AE
	(m)	Bitumen painting of roofs	JE & AE	JE
	(n)	Water proofing treatment	AE	JE & AE
	(o)	Fittings of doors/windows	AE	JE & AE
	(p)	False ceiling work	AE & EE	AE
	(q) (i)	Storage tanks	AE & EE	JE & AE
	(ii)	Sluice valves, fire hydrants	AE	JE & AE
	(iii)	CI/Hume pipes & specials and their leadcaulked joints	AE & EE	JE & AE

	(r)	(i)	Manholes i/c covers & frames	JE & AE	JE
		(ii)	CI Inspection bends & chambers	JE & AE	JE
	(s)		General quality of work with particular reference to lines & levels/adherence to drawings and specifications & functionality	EE & SE	AE & EE
	(t)		Road works		
		(i)	Preparation of sub grade	JE & AE	JE & AE
		(ii)	Sub base/base course	JE & AE	JE & AE
		(iii)	Wearing course	AE & EE	JE & EE
C.	**Other important material/items**			To be decided by tender accepting authority	

2. E& M Works

Item of work				Works costing	
				Above Rs. 20 lakhs	Upto Rs. 20 lakhs
A.	**Materials**				
	(a)		Conduit wires, switches, accessories internal wiring, MCB's, MCB DB's	JE & AE	JE
	(b)		Finished goods of Internal EI i.e. fans, electrical fittings, exhaust fans, call bells etc.	AE & EE	JE & AE
	(c)		L T / HT cables	AE & EE	JE & AE
	(d)		S/STN equipments, L T Panel/HT Panel Elect. main boards, DG Sets, Bus trunking, rising mains	AE & EE	JE & AE
	(e)		All the major equipment concerning wet riser/ sprinkler system, fire detection system etc. like pumps, DG Sets, pipes, valves,hoses, cabinets, panels, sprinklers, detectors,detecting panels, manual call boxes, PA system equipments etc.	AE & EE	JE & AE
	(f)		Air conditioning equipments like chilling units, cooling towers, Pump AHU's, duct insulation, GI sheets, pipes, control instrument etc.	AE & EE	JE & AE
	(g)		Major equipments of other special services like CCTV, BMS, EPABX, computer networking etc.	AE & EE	JE & AE
B.	**Items of Works**				
	(a)		Internal EI work i/c UG cabling etc.	JE & AE	JE
	(b)		Sub Station work	JE & AE	JE
	(c)		Fire fighting, fire detection work	JE & AE	JE
	(d)		A/C works & other specialized Services	JE & AE	JE
C.	**Other important materials/items**			To be decided by tender accepting authority	

3. Horticulture Works

Item of work			Works costing	
			Above Rs. 5 lakhs	Upto Rs. 5 lakhs
A.	**Materials**			
	(a)	Supply of Plants	SO/ADH & DDH	SO/ADH
	(b)	Supply of T&P	SO/ADH & DDH	SO/ADH
	(c)	Supply of Cut Flower	SO/ADH & DDH	SO/ADH
	(d)	Supply of various materials required for day to day use.	SO/ADH	SO/ADH
	(e)	Supply of Earth & Manure	SO/ADH & DDH	SO/ADH
	(f)	Supply of Earthern/Cement pot	SO/ADH	SO/ADH
B.	**Excavation works**			
	(a)	Trenching	SO/ADH	SO/ADH
	(b)	Excavation	SO/ADH & DDH	SO/ADH
	(c)	Filling of earth in excavated area	SO/ADH & DDH	SO/ADH
	(d)	Grassing, fine dressing, spreading etc.	SO/ADH & DDH	SO/ADH
	(e)	fabricating of Tree Guards	SO/ADH & DDH	SO/ADH
	(f)	Digging of Holes	SO/ADH & DDH	SO/ADH & DDH
C.	**Maintenance Works**			
	(a)	Renovation of Lawn	SO/ADH & DDH	SO/ADH
	(b)	Complete maintenance of garden feature.	SO/ADH & DDH	SO/ADH
	(c)	Maintenance of Potted plants/cut flowers arrangement.	SO/ADH	SO/ADH
	(d)	General quality of works & specification and functionally as well as adherence to landscape plan.	DDH/DOH	SO/ADH
	D.	Other important Material and items not covered above	To be decided by tender accepting authority	

ANNEXURE - 28

(Refer SOP No. 5/14)

SAMPLE FORM FOR SITE ORDERS BOOK

Name of work ..... Date of commencement/period for completion .....

Sl. No.	Remarks of the Inspecting Officer or Contractor	Action taken by Whom	Remarks
1	2	3	4

ANNEXURE - 29

(Refer SOP No. 5/14)

SAMPLE FORM OF INSPECTION REGISTER

Name of work: .....

Sl. No.	Date and time	Officer's 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 AE / EE	
1	2	3	4	5	6	7	8	9

ANNEXURE - 48

(Refer SOP No. 7/1)

STATEMENT SHOWING THE QUARTERLY PROGRESS OF ORIGINAL WORKS FOR THE QUARTER ENDING……..

Civil Works costing Rs. Five crore and above.

Electrical Works costing Rs. 100 lakhs and above.

Horticulture Works costing Rs. 10 lakhs and above.

Sl. no.	Name of work & location	Est. cost in lakhs Rs.	Tender cost in lakhs Rs.	% above/ below Schedule of Rates applicable	Agreement no.	Agency	Date of Comme-ncement	Date of comp-letion	Physical progress of work	Name of Engineer- in charge	Remarks
1	2	3	4	5	6	7	8	9	10	11	12

ANNEXURE - 49

(Refer SOP No. 7/1)

STATEMENT SHOWING THE QUARTERLY PROGRESS OF SUPPLY/PURCHASE CONTRACTS FOR THE QUARTER ENDING……..

Sl. no.	Name of the organization with location	Contract no.	Brief details of the materials required	Value of the contract	Mode of ten-dering	Sched-uled delivery period	Present status	Remarks
1	2	3	4	5	6	7	8	9

ANNEXURE - 50

(Refer SOP No. 7/1)

LIST OF DOCUMENTS CONSIDERED ESSENTIAL FOR INSPECTIONS BY CTE AND WHICH MAY BE CALLED FOR EXAMINATION OF A WORK

(1). (a) Press Cuttings, including extended dates, if any

(i) For pre-qualification of architects/consultants.

(ii) For pre-qualifications of contractors.

(iii) Call of tenders.

(b) Register of sale of tenders,

(c) Register of opening of tender.

(2) File giving reference to financial sanction and approval of competent administrative authority - Preliminary estimate.

(3) Copy of detailed estimate and its technical sanction by competent authority.

(4) Approved N.I.T. (Notice Inviting Tenders) in Original.

(5) Rejected tenders and comparative statements for :

(a) Selection of architects/consultants.

(b) Short-listing or pre-qualification of tenders.

(c) Other tenders.

(6) Justification statement and corresponding notings in support of tenders/offers accepted.

(7) Details of negotiations, if any, made before acceptance of tenders.

(8) Original contracts with consultant/contractor.

(9) Guarantee Bonds etc. towards security for work, machinery/mobilisation advance etc. including extension of validity.

(10) Insurance policies for work, materials, equipment, men etc. including extension of validity.

(11) Guarantees for water tightness, termite proofing etc.

(12) Standard specifications.

(13) Standard Schedule of Rates.

(14) Drawings - architectural and structural.

(15) All connected Measurement Books, Level Books, field books and lead chart.

(16) All Running Account Bills with all connected statements/vouchers etc.

(17) Statement showing details of check of measurements by superior officers - copies of orders laying down such requirements.

(18) Materials at site accounts/dismantled materials record.

(19) Site Order Books/Texts records/Log Books.

(20) Details of extra/substituted items and of deviated quantities being executed/ considered for execution in the work along with analysis of rates.

(21) Office correspondence files and inspection notes, if any, issued by inspecting officers.

(22) Complaint records, if any.

(23) Any other documents relevant to the works.

ANNEXURE - 51

(Refer SOP No. 7/1)

REGISTER OF OBSERVATION MEMOS RECEIVED FROM THE CHIEF TECHNICAL EXAMINER

Sl. No.	No. & date of Observation Memo	Name of work	Name of contractor	Remarks regarding subsequent Agreement
1	2	3	4	5

ANNEXURE - 52

(Refer SOP No. 7/1)

REGISTER SHOWING OVER PAYMENT ASSESSED/POINTED OUT BY C.T.E. ORGANISATION AND SUBSEQUENT RECOVERIES EFFECTED

Sl. no.	Reference no. and date	Name of work and agreement no.	Name of contractor	Amount of over payment assessed/ pointed out by CTE	Amount of over payment finally accepted by EE for recovery	Actual date of recovery of over-payment	Remarks
1	2	3	4	5	6	7	8

ANNEXURE - 53

(Refer SOP No. 7/2)

LIST OF EQUIPMENT FOR FIELD TESTING LABORATORY

A. For Building Work

1. Balances
   - (i) 7 kg. to 10 kg. capacity, semi-self indicating type - accuracy 10 gm.
   - (ii) 500 gm. capacity, semi-self indicating type - accuracy 1 gm.
   - (iii) Pan balance- 5 kg. capacity - accuracy 10 gms.
2. Ovens-electrically operated, thermostatically controlled upto 110°C - sensitivity 1°C.
3. Sieves: as per IS 460-1962.
   - (i) I.S. sieves - 450mm internal dia, of sizes 100 mm, 80 mm, 63mm, 50 mm, 40 mm, 25 mm, 20 mm, 12.5 mm, 10 mm, 6.3 mm, 4.75mm, complete with lid and pan.
   - (ii) I.S. sieves- 200mm internal dia (brass frame) consisting of 2.36mm, 1.18mm, 600 microns, 425 microns, 300 microns, 212 microns, 150 microns, 90 microns, 75 microns, with lid and pan.
4. Sieve shaker capable of 200 mm and 300 mm dia sieves, manually operated with timing switch assembly.
5. Equipment for slump test- Slump cone, steel plate, tamping rod, steel scale, scoop.
6. Dial gauges, 25 mm travel - 0.01 mm/division least count - 2nos.
7. 100 tonnes compression testing machine, electrical-cum manually operated.
8. Graduated measuring cylinders 200 ml capacity - 3 Nos.
9. Enamel trays (for efflorescence test for bricks).
   - (i) 300 mm × 250 mm × 40 mm- 2 nos.
   - (ii) Circular plates of 250 mm dia - 4 nos.

B. For Road Works

1. Balances
   - (i) 7 kg to 10 kg capacity, semi-self indicating type - accuracy 10 gm.
   - (ii) 500 gm capacity, semi-self indicating type, accuracy 1 gm.
   - (iii) Chemical balance, 100 gm capacity - accuracy- 0.1 gm.
   - (iv) Pan balance - 5 kg. capacity - 10 gm accuracy.
   - (v) Platform scale- 300 kg capacity.
2. Oven electrically operated, thermostatically controlled.
   - (i) Upto 200°C for determination of loss on heating of bitumen.
3. Sieves as per IS 460-1962.
   - (i) I.S. sieves - 450 mm of internal dia of sizes 100 mm, 80mm, 63mm, 50mm, 40mm, 25mm, 20mm, 12.5mm, 10mm, 6.3mm, 1.75mm, complete with lid and pan.

(ii) I.S. sieves - 200 mm internal dia (brass frame) consisting of 2.36mm, 1.18mm, 600 microns, 425 microns, 300 microns, 212 microns, 150 microns, 90 microns and 75 microns with lid and pan.

4. Sieves shaker capable for shaking 200mm and 300mm dia sieves, electrically operated with timer.
5. Dial gauge
   (i) 25mm travel - 0.01mm/division.
6. Load frame-5 tonnes capacity, electrically operated with speed control.
7. Aggregate impact test apparatus as per IS 2386-Part IV-1963.
8. Compaction apparatus (Proctor) as per IS 2720-Part VII-1974.
9. Modified ASHO compaction apparatus as per IS 2720-Part-III-1974.
10. Sand pouring cylinder with control funnel and tube complete as per IS 2720-Part XXVIII-1974.
11. Sampling tins with rods 100mm dia × 50mm ht., 1/2kg capacity, and miscellaneous items like moisture tins etc.
12. Constant temperature bath for accommodating bitumen test specimen, electrically operated and thermostatically controlled.
13. Penetrometer with automatic time controller and with adjustable weight accessories and needles as per IS 1203-1958.
14. Oxhlet extraction apparatus complete with extraction thimbles etc.
15. Laboratory mixer, about 0.02 cu-meter capacity, electrically operated with heating jacket.
16. Hubbard field stability test apparatus complete.
17. Marshall compaction apparatus as per ASTM 1559-62T, and complete with electrically operated leading unit, compaction pedestal bearing head assembly, dial micrometer, and bracket for flow measurement, load transfer bar, specimen mould (4 inch. dia) with base plate, columns, mould (4 inch, dia) with base plate, collars, specimen extracted. Compaction hammer, 4.53 kg (10lb)/457 mm (18inch) fall.
18. Distant reading thermometers.
19. Graduated cylinder 1000 ml. capacity.
20. Enamel tray.

ANNEXURE - 53 A

(Refer SOP No. 7/2)

FIELD TESTING INSTRUMENTS

1. Steel tapes - 3 m
2. Vernier calipers
3. Micrometer screw 25 mm gauge
4. A good quality plumb bob
5. Spirit level, minimum 30 cms long with 3 bubbles for horizontal vertical
6. Wire gauge (circular type) disc
7. Foot rule
8. Long nylon thread
9. Rebound hammer for testing concrete
10 Dynamic penetrometer
11. Magnifying glass
12. Screw driver 30 cms long
13. Ball pin hammer, 100 gms
14. Plastic bags for taking samples
15. Moisture meter for timber
16. Earth resistance tests (for Electrical Divisions)
17. Meggar (for Electrical Divisions)

ANNEXURE - 54

(Refer SOP No. 7/2)

PROFORMA FOR MANDATORY TESTS TO BE ATTACHED WITH RUNNING BILLS

Name of the work: ……..Name of ontractor…….. Agreement no. and date …… R/A Bill No.……

Sl.no.	Item	Quantities as per agreement	Frequency as per specification	No. of tests required	Upto date quantity	No. of tests required	No. of tests actually done	Remarks
1	2	3	4	5	6	7	8	9

Note: If the number is less than that required, then reasons shall be recorded.

Signature of Junior Engineer

Signature of Assistant Engineer

Signature of Executive Engineer

ANNEXURE - 55

(Refer SOP No. 7/2)

PROFORMA FOR QUALITY CONTROL INSPECTION BY CIRCLE OFFICE QA TEAM

PART - I

1. General
   - 1.1 Name of work.
   - 1.2 Division and Sub-Division.
   - 1.3 Inspecting officer.
   - 1.4 Assisted by.
   - 1.5 Date of present inspection.
   - 1.6 Referenc-e to memos of previous Inspection.
2. Particulars of work
   - 2.1 Estimated cost put to tender.
   - 2.2 Tendered amount.
   - 2.3 Agreement no.
   - 2.4 Name of contractor.
   - 2.5 Registration class of contractor.
   - 2.6 Date of start of work.
   - 2.7 Due date of completion.
   - 2.8. % age progress of work at the time of inspection
3. Routine Quality Control
   - 3.1 Quality control aids.
     - 3.1.1 Is field staff equipped with:
       - (a) Copy of agreement with relevant specifications (detailed as well as special).
       - (b) Copy of preliminary estimate, detailed estimate and measurements.
       - (c) Upto date architectural as well as structural drawings.
       - (d) Testing facilities with the help of necessary field instruments/equipments (List of equipments available at site including level, theodolite, etc. may be given).
4. Observations on compliance of Quality Control system after intensive inspection under following sub- heads:
   - 4.1 Earthwork.
   - 4.2 Concrete work.
   - 4.3 R.C.C. work.
   - 4.4 Brick work.

4.5 Stone work.

4.6 Steel work.

4.7 Flooring (including marble work, if any).

4.8 Roofing.

4.9 Finishing.

4.10 Miscellaneous.

4.11 Services, etc.

5. Quality and Testing of materials/Products

5.1 Comment on:

5.1.1 Testing facilities available with the Department at site.

5.1.2 Testing facilities arranged with other Department/institution.

5.1.3 Testing facilities further required to be arranged.

5.2 Testing

5.2.1 Are all mandatory tests being carried out at the frequency mentioned in CPWD Specifications?

5.2.2 No. of tests failed and approximate quantity rejected.

5.2.3 General observations on tests, viz. erratic results, consistently low or high results etc.

5.2.4 Follow up action taken on unsatisfactory results, with lapses in prompt follow up action.

5.2.5 Samples tested by Assistant Engineer (P) and their results (Samples should invariably be taken where material/product at site does not appear to conform to the latest test results.

5.3 Is material/product of make borne on approved list of Department/ISI?

5.3.1 Are tests carried out on materials/products (covered under 5.3) found satisfactory?

6. Comments on adequacy of resources employed by the contractor at site for timely completion of work.

PART - II TECHNICAL AUDIT

1. General details of work.

1.1 A/A & E/S amount for the work and corresponding provision available for this work in the sanction.

1.2 Amount of detailed estimate.

1.3 Item rate/percentage rate/lump sum tender.

1.4 No. of tenders received and tendered amount (call of tender).

1.5 Authority accepting the tender.

1.6 Is the detailed estimate technically sanctioned on the basis of complete set of architectural and structural drawings?

2. Deviation from plan/drawings.
   - 2.1 Deviations, if any.
   - 2.2 Reasons for deviation, financial implication and sanction of competent authority.
3. Deviation in quantities of items.
   - 3.1 Reasons for deviations.
   - 3.2 Sanction of competent authority for the deviation.
4. Extra and substituted items.
   - 4.1 Amount of items sanctioned so far.
   - 4.2 Sanction of competent authority.
   - 4.3 Any minus extra item paid? Detail the reasons.
5. Issue of materials.
   - 5.1 The theoretical consumption commensurate with the work executed and quantity lying at site.
   - 5.2 Check recovery memo from the last running bill/final bill and short recovery made, if any.
   - 5.3 Any material not stipulated issued?
     - 5.3.1 Sanction/approval of competent authority for such issue.
     - 5.3.2 Approval of rate under three rate formula.
6. Payment to contractor.
   - 6.1 Amount of last bill paid to the contractor.
   - 6.2 Normal frequency of payment.
   - 6.3 Test check of measurements by Assistant Engineer/Executive Engineer.
   - 6.4 Part rates paid/justification for the same.
   - 6.5 Advances to contractor.
     - 6.5.1 Checking up of secured advance, if any, with reference to materials lying at site.
     - 6.5.2 Reasonableness of advance for un measured work.
     - 6.5.3 Hypothecation of documents and safe custody of materials for which advances have been given.

PART - III PROGRESS MONITORING

1. System adopted at site for monitoring progress.
2. Percentages progress achieved vis-a-vis time given for completion.
   - 2.1 Steps taken to accelerate progress when shortfall is noticed.
3. Any extension of time required?
4. Co-ordination amongst various agencies involved in execution of work.
5. Constraints noticed in smooth progress of work and directions if any, received from Executive Engineer/Superintending Engineer/Chief Engineer to overcome them.

PART - IV RECOMMENDATION

1. Give specific recommendations for immediate attention of Superintending Engineer on:
   1.1 Improving quality control on specific items.
   1.2 Comments on items lagging behind for want of drawings, materials, decision etc.

To
SE

[Assistant Engineer (QA)]

PART - V
DIRECTION OF SE ON THE REPORT

1. EE to improve quality of following items.
2. EE to issue notice to contractor for rectification of following defects at .....
3. EE to improve slow progress.
4. Directions, if any, for solving deadlocks/problems at site.
5. Further follow up action by AE(QA) on next inspection.

To
AE (QA)

[Superintending Engineer]

Annexure - VI
Quarterly Statement Of Works

Sl. No.	Name of work	Est. cost (in lakhs) Rs.	Tender cost (in lakhs) Rs.	%age above / below estimated cost	Agreement No.	Agency	Date of commencement	Stipulated date of completion	Physical progress of work	Name of Engineer incharge with address	Remarks
1	2	3	4	5	6	7	8	9	10	11	12

ANNEXURE - 56

(Refer SOP No. 7/2)

PROFORMA FOR PREPARING OBSERVATIONS BY CORE WING/REGIONAL QA UNITS

1.0 Particulars of work

1.1 (a) Name of work:

(b) Description/scope of work:

1.2 (a) Sub-Division and name of Assistant Engineer:

(b) Division and name of Executive Engineer:

(c) Circle and name of Superintending Engineer:

(d) Zone and name of Chief Engineer:

1.3 Agency/contractor:

(a) Name:

(b) Registration class:

1.4 Agreement no:

1.5 Stipulated date of start:

1.6 Stipulated time and date of completion:

1.7 (a) Estimated cost put to tender:

(b) Schedule of rates applicable:

1.8 Accepted tendered cost with overall percentage:

1.9 Percentage progress at the time of inspection vis-a-vis expected as per contract and reasons for delay, if any:

1.10 Inspecting officer:

(Name & Designation)

1.11 Officers and contractor present during inspection:

(Name & Designation)

1.12 Date of inspection and number:

2.0 Quality Control aids:

2.1 Is site equipped with:

(a) Copy of agreement:

(b) CPWD Specifications/along with (upto date) correction slips:

(c) List of ISI marked/approved materials to be used:

(d) Guard File containing Inspection Reports of CTE/QCTA/AE(QC)/CE/SE etc.

(e) Testing facilities to check conformance to acceptance criteria:

(f) QACW Circulars on Quality Control.

2.2 Is field laboratory existing and well equipped?

3.0 Departmental procedure aspects:

3.1 Maintenance of Inspection Register

3.2 Highlights of inspections by CE, SE, AE(P) requiring compliance

3.3 Are Test Registers maintained in standard forms?

3.4 Are Test Registers reviewed by EE/SE with dates?

3.5 Cement Register:

(a) Is Cement store checked by AE/EE periodically as stipulated?

(b) Comment on cement stock with reference to Cement Register:

3.6 Site Order Book and Schedule of defects:

(a) Is Site Order Book properly maintained?

(b) Is the Site Order Book reviewed by EE and SE?

(Mention details)

(c) Have timely notices been issued to the contractor with the Schedule of defects/ damages and date of compliance?

In case of failure to rectify defects/damages whether action under clause 14/17 initiated?

4.0 Process control aspects:

4.1 Is soil investigation done? (give brief details)

4.2 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 (i.e. after every 3 months) and found fit for use in works?

4.3 Are 10% (25% for concrete) of all samples for testing taken in presence of EE

4.4 Are all mandatory tests carried out at stipulated frequency?

4.5 Are materials approved by Engineer-in-charge?

If so, are samples available at site?

4.6 Are sample units/items completed and approved by EE before start of mass finishing work?

4.7 Specific control on RCC work like centering/shuttering, proportioning with boxes: mixing by full bag capacity hopper fed mixer: control of slump: placing/compaction with vibrator:

4.8 Any other particular comments on adequacy of process control:

5.0 Site inspection for observations and comments on Quality Control system in place:

5.1

Sub-head of work in progress	Whether in progress (If so, tick mark)	Whether inspected (If so, tick mark)	Location
(a) Earth work			

(b) Concrete 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			

5.2 Observations on floor slope (especially in Bath, WC, Kitchen, Terrace, Balcony etc.)

5.3 Observations on QC for dampness/leakages prevention.

If dampness/leakage noticed, then state locations and probable reasons.

5.4 Samples collected by QC Core/Cell

6.0 Observations on site material QC aspects.

(Keeping in view the requirements of contract specifications: BIS marked/CPWD approved products etc.)

(Attach separate sheet, if required)

7.0 Observations on workmanship QC aspects. (Attach separate sheet, if required).

8.0 Test audit of RA bill:

(Indicate RA bill no., gross amount, Vr. no. and date)

8.1 Deviation in Quantities

(a) Whether deviation in quantities noticed?

(b) If so, the reason there of and whether prior approval of competent authority has been obtained before allowing deviations?

(c) Whether revised T/S is required due to these deviation? If yes, the action taken.

8.2 Items not conforming to specifications:

(a) Whether notice was issued as specified in contract?

(b) Whether approval in principle was obtained from competent authority before acceptance of sub- standard work?

8.3 Extra/substituted items

(a) Are justification of item in remark column of EI/SI proper?

(b) Whether prior approval of competent authority for execution of EI/SI has been obtained before execution?

(c) Whether sanction of competent authority issued?

8.4 Part Rates - whether rates held back are adequate?

8.5 Comments on secured advance paid with reference to materials lying at site.

8.6 Test Check by AE/EE

(a) Critical item:

(b) Hidden items:

(c) Extent (whether satisfactory?)

8.7 Any other observation?

[The observation made about quality of material and workmanship relate to only what could be randomly seen at locations specified. Executive Engineer and supervisory staff shall thoroughly inspect the entire work for such defects as observed as well as for other defects and take suitable remedial measures properly. The Executive Engineer shall be responsible for accepting any defective work that went unnoticed but pointed out during such inspection.]

8.8 Progress of Work and Programme Chart

(a) Whether progress of work is as per stipulated milestone/approved revised milestone? If no action taken by EE.

(b) Whether contractor has submitted the programme to complete various activities of work within stipulated date of completion as per contract condition duly accepted by EE?

(c) Whether monthly progress report submitted by contactor as per programme submitted has been certified by JE/AE and reviewed by EE/SE?

(d) Any notice under clause 3 (a), (b) or (c) for inordinate delays has been issued or not. If yes, the action taken by EE

3.0 Provisions in CPWD Green RatingManual

Criterion 2: Quality and Safety

Total Marks: 12

Synopsis: Safety and quality are supplementary to each other in construction works and part of sustainability. Safety and quality plans are essential to be prepared before commencement of works so that execution is carried out with safety and quality from day one. Availability of structural designs is also essential before award of work so that they are adequately correlated with architectural drawings and green concept is implementable from architectural and structural considerations.

Compliance Procedure and Award of Marks:

Criterion no. 2.1: Quality Assurance

Maximum Marks: 4

1. (a) Quality assurance plans available before commencement of work: 2 points

   (b) Available after commencement of work: 1 point

   (c) Quality assurance plan not prepared: Nil

2. (a) 100% execution/implementation of quality assurance plan as prepared in 1 (a) above: 2 points.

   (b)Part implementation or no implementation of quality assurance plan: Nil

Criterion no. 2.2: Safety Assurance

Maximum Marks: 4

1. (a)Safety assurance plan available before commencement of work: 2 points

   (b) Available or made available after commencement of work: 1 point

   (c) Safety assurance plan not prepared: Nil

2. (a)Implementation of safety plan as per the policy of the Department: 2 points

   (b)Part implementation of safety plan or not being implemented: Nil

Criterion no. 2.3: Structural Drawings for Structural Safety Assurance

Maximum Marks: 4

3. (a) All structural designs and drawings available before commencement of work in EPC contracts

and before award of work in other contracts: 4 points

(b) Partly available but available before commencement of activities but no hindrance leading to delay in completion of work: 2

(c) Hindrance due to structural drawings leading to delay in completion of work: Nil

4.0 Provisions in Rules for Enlistment of Contractors in CPWD – 2019

Rule 19.2

It shall be mandatory for the contractor to submit the perfor mance report (PR) of each work

executed by him in the approved format duly filled with all the required details to respective Executive Engineer within 3 months of completion of work under intimation to enlisting authority as laid out in the preceding para. However, there shall be no bar for Departmental officers to take cognizance of bad performance of the contractor where he deliberately avoids submission of PR.

If the quality of work assessed in annexure-VII is not satisfactory during currency of the validity of enlistment, then a show cause notice shall be issued to the contractor by the Enlistment Authority as to why his name should not be deleted from the approved list of the contractors & the decision taken by the Enlistment Authority on the recommendations of Empowered Committee considering explanation of the contractor, if any, regarding suspension of contractor for participating in CPWD tenders, shall be final and binding.

20.0 Inspection Reports

The agency shall provide all the necessary documents of work executed by him to the inspecting authority after receipt of intimation for inspection of work from department and shall accompany and facilitate the team of CPWD officers for inspection of work. Apart from completed works, the ongoing works will also be inspected by team of CPWD Officers. Necessary Inspection Report will be issued by Inspecting team in Annexure-IV- A/Annexure-VII. The grading of Quality and Capability of contractor in the Annexure-X will be based on the said Inspection reports of the ongoing works/completed works.

Annexure IV -A (Refer Rule 10)
Assessment of Quality for Fresh Enlistment

Name of Work:
Date of receipt of reference from Enlistment Authority:
Date of Inspection:
Date of submission of report:

A. General Observation & Operational Aspects	Yes/ No	Remarks
1. Availability of approval from local bodies in case of Construction of Private Buildings.		
2. Availability of approved Structural drawings		
3. Observation on seepage/ leakage in the Building		
4. Whether Line & level Maintained		
5. In case of basement, observation on seepage, if any.		
6. Any Structural defects / distress observed. If yes give details		
7. Whether safety measures adopted at site as per CPWD Safety Code and or govt. guidelines are adequate or not .		
8. Whether the Welfare facilities provided to labour as per Clause 19 H of GCC for CPWD Works/and or govt. guidelines are adequate or not .		
9. Whether AHU getting automatically switched off and fire damps closed in case of fire signal		
10. Whether thimbles used for termination of wires in DBs, EBDs & Panels?		
B. Quality of Work (Maximum marks in each attribute=10)	**Marks Assessed**	
1. Quality of plaster/ finishing		
2. Quality of R C C / C C Work		
3. Quality of Flooring		
4. Quality of Wood Work		
5. Quality of Steel Work / Aluminium Work		
6. Quality of Plumbing and Sanitary Installation		
7. Quality of Workmanship		
8. Quality of Waterproofing		
9. If cladding done, observation on efficiency/ quality of cladding /Brick work		
10. Quality of internal electrification work		
11. Quality of DBs, EBDs& Panels?		
12. Quality of E&M equipments, panels & feeder pillar.		
13. Quality of fire alarm system/ fire fighting system		
14. Quality of Air Conditioning work.		
15. Quality of Sub-station based on complete live diagram, capacitor panel, power factor, insulating Mat, cleanliness, cable termination, earthing pits, earthing of transformer / DG sets.		
16. Any Other aspect (To be elaborated)		

Average Marks (To be awarded out of 100 Marks based on average of marks assessed on each attribute mentioned at B above).

Note:- All the above parameters may be considered for assessing the overall quality of work executed by the contractor. Relevant Documents & Photographs must be attached with the inspection report.

In case, any attribute is not applicable, the same may not be included in assessment and mentioned are not applicable (N/A)

ANNEXURE VII (Refer Rule 19)
PERFORMANCE REPORT OF WORKS FOR REVALIDATION
PART I

(To be filled in by the contractor in duplicate in respect of each work cost of which falls within the range prescribed for eligibility as per para 19 of Enlistment Rules read with Rule-10. One copy be submitted to Reporting Officer and other, containing acknowledgement of receipt and seal of office of reporting officer, be submitted to Enlistment Authority).

1.	Period	
2.	Name & Address of contractor	
2.1	Name(s) of Proprietor/partners	
3.	Class, Category and Enlistment No.	
4.	Name & address of enlisting authority	
5.(A)	Name of Work	
5(B)	Services included (for composite works only)	
i.	Civil Services included (Water supply and sanitary installation, Drainage work and Water proofing work	
ii.	Internal Electrical Installation included	Yes/No
iii.	E&M services included (Fire fighting, Fire alarm, HVAC, Lift, Electrical Sub Station and DG Set)	
6.	Agreement No.	
7.	Name & Address of C.P.W.D. Division	

S.N.	ITEM	
8.1	Estimated Cost	
8.2	Tendered amount	
8.3	Stipulated date of Commencement	
8.4	Stipulated date of Completion	
8.5	Actual date of completion	
8.6	Percentage progress with date, if work not complete	
8.7	Gross amount of final bill/work done	
8.8	Amount of compensation levied, if any	
8.9	Amount of reduced rate items, if any	
8.10	Did the contractor go for arbitration?	
8.11	If yes, total amount claimed and amount awarded.	
9	Designation **and** email address of	
9.1	Reporting officer	
9.2	Reviewing officer	
9.3	Enlistment Authority	

Signature of the contractor

PART II

(To befilled by the department)

9.0 Certified that details given by the contractor in Part - I have been verified and found to be correct/have been corrected wherever necessary. Delay is partly /not/ fully attributable to contractor.

Signature of Divisional/Sub Divisional Engineer

10.0 Note : After submission of Annexure VII by contractor, reporting officer shall write the Report and forward to Reviewing officer within a week's time. Reviewing officer shall then forward the report to the Enlisting authority within a week's time.

Class	I(A), I(AA), I(AAA) and I(Super)	I	II	III	IV	V
Reporting Officer	EE	EE	EE	EE	AE	AE
Reviewing Officer	Next Higher Authority					
Report to be sent to o/o	Enlistment Authority					

PART – III
(To be filled by the department)

(Serial 1 to 7 is repeat information of Part I for proper linkage and confirmation)

1.	Period	
2.	Name & Address of contractor	
3.	Class, Category and Enlistment No.	
4.	Name & address of enlisting authority	
5.	Name of Work	
6.	Agreement. No.	
7.	Name & Address of C.P.W.D. Division	

11.0 Contract Performance:

S.N.	Status of Contract	Remark (Yes/No/NA)
11.1	Successful Completion of Work	
11.2	Determination of Contract	
11.3	Part work done at the risk and cost of Contractor	

12.0

A. General Observation & Operational Aspects (To be filled by Reporting Officer)

Aspects for observation	Yes/ No	Remarks
1. Availability of approval from local bodies in case of Construction of Private Buildings.		
2. Availability of approved Structural drawings		
3. Observation on seepage/ leakage in the Building		
4. Whether Line & level Maintained		
5. In case of basement, observation on seepage, if any.		
6. Any Structural defects / distress observed. If yes give details		
7. Whether safety measures adopted at site as per CPWD Safety Code and or govt. guidelines are adequate or not .		
8. Whether the Welfare facilities provided to labour as per Clause 19 H of GCC for CPWD Works/and or govt. guidelines are adequate or not .		
9. Whether AHU getting automatically switched off and fire damps closed in case of fire signal		
10. Whether thimbles used for termination of wires in DBs, EBDs & Panels?		
	(Signature of Reportin Officer) Nameand Designation	
B.Quality of Work (Maximum marks in each attribute=10)	**Marks Assessed**	
	By Reporting Officer	**By Reviewing Officer**
1. Quality of plaster/ finishing		
2. Quality of R C C / C C Work		
3. Quality of Flooring		
4. Quality of Wood Work		
5. Quality of Steel Work / Aluminium Work		
6. Quality of Plumbing and Sanitary Installation		
7. Quality of Workmanship		
8. Quality of Waterproofing		
9. If cladding done, observation on efficiency/ quality of cladding /Brick work		
10. Quality of internal electrification work		
11. Quality of DBs, EBDs& Panels?		
12. Quality of E&M equipments, panels & feeder pillar.		
13. Quality of fire alarm system/ fire fighting system		
14. Quality of Air Conditioning work.		
15. Quality of Sub-station based on complete live diagram, capacitor panel, power factor, insulating Mat, cleanliness, cable termination, earthing pits, earthing of transformer / DG sets.		
16. Any Other aspect (To be elaborated)		
Average Marks*		

(*To be awarded out of 100 Marks, based on average of marks assessed on each attribute mentioned at B above).

Note:-

1. All the above parameters may be considered for assessing the overall quality of work executed by the contractor.
2. In case of difference in scores of quality by Reporting officer and Reviewing officer, average of the two will be considered.
3. Average marks obtained shall be rounded off to next full marks.

In case, any attribute is not applicable, the same may not be included in assessment and mentioned as " Not applicable (N/A)"

13.0 Grading on capability of contractor

13.0	Parameters	Marks Assessed on a scale of 20	
		By Reporting Officer	By Reviewing Officer
i.	Technical proficiency		
ii.	Financial soundness		
iii.	Mobilizations of adequate T&P		
iv.	Mobilizations of man power		
v.	General behavior		
	Total Marks		

Note:-

1. In case of difference in scores on capability by Reporting officer and Reviewing officer, average of the two will be considered.
2. Average marks obtained shall be rounded off to next full marks.

Signature of Reporting Officer
(Name and Designation)

Signature of Reviewing Officer
(Name and Designation)

ANNEXURE – X (Refer Rule21)

Criteria For Evaluation Of Contractor's Performance For Fresh Enlistment/Upgradation/Revalidation

Name of Contractor:
Present Class & Category in which Enlisted if any:
Details ofWorks assessed

Item No.	Parameter	Calculation for Points		Score		Max. Marks
1	Levy of Compensation	Compensation levied for Delay = C Tendered Amount = E B = 100 x (C/E)		20 if B = 0 10 if B = 5 or more 12 if C is not decided. Marks for values in between are to be determined by Straight line variation.		20
2	Contract Performance	I	Successful Completion of Work **or**	(a) without litigation = 20 (b) with litigation = 15		20
		II	Part work done at the risk and cost of Contractor **or**	=12		
		III	Determination of Contract	= 0.0		
3	Quality	(Based on assessment in Annexure-IV-A and Annexure-VII)		Ongoing Works (Max Marks. 15)	Completed Works (Max Marks 25)	40
4	Capability	(Based on assessment in Annexure-VII)		Ongoing Works (Max Marks 6)	Completed Works (Max Marks 14)	20

Note:

I. Marks for values in between are to be determined by Straight line variation.

II. Eligibility Criteria for Revalidation of Enlistment will be minimum 60% in each parameter and minimum 70% marks as overall average of all parameters.

III. The agency should secure minimum 70% marks as mentioned at note No. II above in respect of each eligible work claimed for experience of works.

IV. Average marks obtained shall be rounded off to next full marks.

V. Litigation includes only Court cases and Arbitration.

VI. In case of eligible works being more than 1, then average scores obtained against Sl. No. 1 & 2, will be considered for purpose of qualification required at Sl. No. II above.

VII. In case of eligible completed works at Sl. No. 3 & 4 being more than one the maximum marks will be equal distributed among the eligible works.

5.0 Provisions in General Conditions of Contract

Clause 10B: Plant Machinery & Shuttering Material Advance

An advance for plant, machinery & shuttering material required for the work and brought to site by the Contractor may be given if requested by the contractor in writing within one month of bringing such plant and machinery to site. Such advance shall be given on such plant and machinery which in the opinion of the Engineer-in-charge will add to the expeditious execution of work and improve the quality of work.

Clause 11: Work to be Executed in Accordance with Specifications, Drawings, Orders etc.

The contractor shall execute the whole and every part of the work in the most substantial and workmanlike manner both as regards materials and otherwise in every respect in strict accordance with the specifications. The contractor shall also conform exactly, fully and faithfully to the design, drawings and instructions in writing in respect of the work signed by the Engineer-in-Charge and the contractor shall be furnished free of charge one copy of the contract documents together with specifications, designs, drawings and instructions as are not included in the standard specifications of Central Public Works Department specified in Schedule 'F' or in any Bureau of Indian Standard or any other, published standard or code or, Schedule of Rates or any other printed publication referred to elsewhere in the contract.

Clause 16: Action in case Work not done as per Specifications

All works under or in course of execution or executed in pursuance of the contract, shall at all times be open and accessible to the inspection and supervision of the Engineer-in - charge, his authorized subordinates in charge of the work and all the superior officers, officer of the Quality Assurance Unit of the Department or any organization engaged by the Department for Quality Assurance and of the Chief Technical Examiner's Office, and the contractor shall, at all times, during the usual working hours and at all other times at which reasonable notice of the visit of such officers has been given to the contractor, either himself be present to receive orders and instructions or have a responsible agent duly accredited in writing, present for that purpose. Orders given to the Contractor's agent shall be considered to have the same force as if they had been given to the contractor himself.

If it shall appear to the Engineer-in-charge or his authorized subordinates in charge of the work or to the Chief Engineer in charge of Quality Assurance or his subordinate officers or the officers of the organization engaged by the Department for Quality Assurance or to the Chief Technical Examiner or his subordinate officers, that any work has been executed with unsound, imperfect, or unskillful workmanship, or with materials or articles provided by him for the execution of the work which are unsound or of a quality inferior to that contracted or otherwise not in accordance with the contract, the contractor shall, on demand in writing which shall be made within twelve months (six months in the case of work costing Rs. 10 Lac and below except road work) of the completion of the work from the

Engineer-in-Charge specifying the work, materials or articles complained of notwithstanding that the same may have been passed, certified and paid for forthwith rectify, or remove and reconstruct the work so specified in whole or in part, as the case may require or as the case may be, remove the materials or articles so specified and provide other proper and suitable materials or articles at his own charge and cost. In the event of the failing to do so within a period specified by the Engineer-in- Charge in his demand aforesaid, then the contractor shall be liable to pay compensation at the same rate as under clause 2 of the contract (for non-completion of the work in time) for this default.

In such case the Engineer-in-Charge may not accept the item of work at the rates applicable under the contract but may accept such items at reduced rates as the authority specified in schedule 'F' may consider reasonable during the preparation of on account bills or final bill if the item is so acceptable without detriment to the safety and utility of the item and the structure or he may reject the work outright without any payment and/or get it and other connected and incidental items rectified, or removed and re-executed at the risk and cost of the contractor. Decision of the Engineer-in-Charge to be conveyed in writing in respect of the same will be final and binding on the contractor.

Clause 25: Settlement of Disputes &Arbitration

Except where otherwise provided in the contract, all questions and disputes relating to the meaning of the specifications, design, drawings and instructions here-in before mentioned and as to the quality of workmanship or materials used on the work or as to any other question, claim, right, matter or thing whatsoever in any way arising out of or relating to the contract, designs, drawings, specifications, estimates, instructions, orders or these conditions or otherwise concerning the works or the execution or failure to execute the same whether arising during the progress of the work or after the cancellation, termination, completion or abandonment thereof shall be dealt with as mentioned hereinafter:

(i) If the contractor considers any work demanded of him to be outside the requirements of the contract, or disputes any drawings, record or decision given in writing by the Engineer-in-Charge or if the Engineer in Charge considers any act or decision of the contractor on any matter in connection with or arising out of the contract or carrying out of the work, to be unacceptable and is disputed, such party shall promptly within 15 days of the arising of the disputes request the Chief Engineer/ CPM, or where there is no Chief Engineer/CPM, request the Additional Director General/Special Director General ,who shall refer the disputes to Dispute Reressal Committee (DRC) within 15 days along with a list of disputes with amounts claimed if any in respect of each such dispute. The Dispute Redressal Committee (DRC) give its decision within a period of 60 days extendable by 30 days by consent of both the parties from the receipt of reference from CE/CPM/ADG/SDG. The constitution of Dispute Redressal Committee (DRC) shall be as indicated in Schedule 'F'. Provided that no party shall be represented before the Dispute Redressal Committee by an advocate/legal counsel etc.

Clause 43: Compensation duringwarlike situations

The work (whether fully constructed or not) and all materials, machines, tools and plants, scaffolding, temporary buildings and other things connected therewith shall be at the risk of the contractor until the work has been delivered to the Engineer-in-Charge and a certificate from him to that effect obtained. In the event of the work or any materials properly brought to the site for incorporation in the work being damaged or destroyed in consequence of hostilities or warlike operation, the contractor shall when ordered (in writing) by the Engineer-in-Charge to remove any debris from the site, collect and properly stack or remove in store all serviceable materials salvaged from the damaged work and shall be paid at the contract rates in accordance with the provision of this agreement for the work of clearing the site of debris, stacking or removal of serviceable material and for reconstruction of all works ordered by the Engineer-in-Charge, such payments being in addition to compensation upto the value of the work originally executed before being damaged or destroyed and not paid for. In case of works damaged or destroyed but not already measured and paid for, the compensation shall be assessed by the Divisional Officer upto Rs.2,00,000/-- and by the next higher officer concerned for a higher amount. The contractor shall be paid for the damages/destruction suffered and for restoring the material at the rate based on analysis of rates tendered for in accordance with the provision of the contract. The certificate of the Engineer-in-Charge regarding the quality and quantity of materials and the purpose for which they were collected shall be final and binding on all parties to this contract.

6.0 Quality Assurance Circulars

भारतसरकार
केंद्रीय लोकनिर्माणविभाग
तकनीकीअनुप्रयोग एवंमानक एकाई
कमरा सं0 418 ए–विंग, निर्माणभवन
नईदिल्ली
http://cpwd.gov.in
टैलीफैक्स–011–23062339 ईमेल–delsetascsq.cpwd@nic.in

File No. 155/SE(TAS)/C&D waste/2018-19/ 04-TE Dated:-3 /01/2019

OFFICE MEMORANUDM

Sub:-Use of RMC only instead of concrete from batch mix plant in all construction work in Delhi (Including NCR) and other Metro cities: regarding.

As per the direction under Section 5 of The Environmental (Protection) Act. 1986 contained in Letter no. B-33014/40/2017-AQM/10720 dated 15.09.2018 issued from CPCB (Central Pollution Control Board), Govt. of India and as per the decision taken in the meeting dated 13.11.2018 headed by Secretary, MoHUA that batch mixing plants located at construction sites are not to be used and instead the required concrete shall be procured from RMC plants so that Air Pollution arising due to operation of batch mixing plants at sites is prevented.

Accordingly, hence forth the batch mix plants shall not be operated in Delhi (Including NCR) and other Metro cities as far as possible and also the items shall be included in future NITs.

This issued with the approval of DG, CPWD.

(DIVAKAR AGRAWAL)
Superintending Engineer (TAS)
CSQ. CPWD, Nirman Bhawan
New Delhi

(Through CPWD website)

1. All SDGs, ADGs and CEs and equivalent officers.
2. All SEs and EEs and equivalent officers

(DIVAKAR AGRAWAL)
Superintending Engineer (TAS)

CENTRAL PUBLIC WORKS DEPARTMENT

OFFICE MEMORANDUM

DG/New Product /12

ISSUED BY AUTHORTY OF DIRECTOR GENERAL, CPWD

NIRMAN BHAWAN, NEW DELHI DATED : 08.01.2018

Sub: Approval of RMC plants in CPWD

All the Zonal Chief Engineers/Chief Project Manager/Project Manager are competent to approve ISI/Non ISI products, accordingly they are competent to approve RMC plants too. Representations have been received on this subject from time to time. NIT approving authority may ensure that sufficient numbers of RMC plants are included in the NIT to ensure sufficient availability of RMC on the project.

This issues with the approval of DG, CPWD

8/1/2018

Superintending Engineer (TAS)
CSQ, CPWD, Nirman Bhawan,
New Delhi

F. No. CSQ/SE (TAS)/EE (TAD)/PA-I/2017-18/ 24-18 Dated 8/01/2018

Copy to

1. All the SDG/ADG/CEs/CPMs through CPWD and PWD (GNCTD) for information and necessary action please (Through CPWD website http://cpwd.gov.in)

Superintending Engineer (TAS)

भारतसरकार
केंद्रीय लोकनिर्माणविभाग
तकनीकीअनुप्रयोग एवंमानक एकाई
कमरा सं0 418 ए–विंग, निर्माणभवन
नईदिल्ली
http://cpwd.gov.in
टैलीफैक्स–011–23062339 ईमेल–delsetascsq.cpwd@nic.in

File No. 155/SE(TAS)/2018-19/ 33-EO Dated: 22/01/2019

OFFICE MEMORANUDM

Sub:- Ensuring Quality and Strength of Cement Concrete procured from RMC Plants.

In continuation to this office memorandum no. 155/SE(TAS)/C&D waste/2018-19/04 H dated 03.01.2019 vide which it was decided not to operate batch mixing plants as far as possible at construction sites in view of the rising air pollution. Further, all units of CPWD shall ensure that the quality and strength of cement concrete procured from RMC Plants is as per design requirement through a well defined quality control system, testing of samples, transportation of concrete (IS 4926 : 2003) and continuous analysis of results as per CPWD specifications and relevant Indian Standards.

This issues with the approval of DG, CPWD.

(DIVAKAR AGRAWAL)
Superintending Engineer (TAS)
CSQ. CPWD, Nirman Bhawan
New Delhi

(Through CPWD website)

1. All SDGs, ADGs and CEs and equivalent officers.
2. All SEs and EEs and equivalent officers.

(DIVAKAR AGRAWAL)
Superintending Engineer (TAS)

Govt. of India
(Technology Application and Development Unit)
Central Public Works Department
Room No.436B, A-Wing, Nirman Bhawan, New Delhi
Ph:- 23061753, Fax:- 011-23062339

F.No: 45/SE (TAS)/New Product /2019-20/262-120 Dated: 19 /06/2019

OFFICE MEMORANDUM

Subject: Guidelines for Multistage Centering- Reg.

Ref: JS & CVO Letter No. 10/V-14/(A-114)/2017-VS I dated. 16.11.2018.

Recently, some accidents have been reported in multistage centering/scaffolding work of different structures, where proper design and drawing of centering/scaffolding work was not found. Therefore, strong need is felt to issue some guidelines for proper handling the situation of multistage centering in buildings or where height of casting of concrete is higher than normal height of 3.5 M or where higher loadings are coming during casting of concrete or large span structures and in situations of casting of some special structures like Domes, Vaults etc.

In all situations, centering/scaffolding/staging for casting of these structures should be properly designed by a qualified and experienced person/agency having past experience in design of false work (centering) for concrete structures and should be proof checked by similar experienced person/agency and it should be properly approved and issued to contractor by Engineer-In-Charge. The provisions of clause 7 of IS:14687 may be referred for design of false work (centering).

A method statement for erection and dismantling of the centering/scaffolding/staging and process of concreting shall be prepared by contractor and submitted to Engineer-in-Charge for approval and the work shall be commenced only after approval of method statement by Engineer-in-Charge. The provisions of clause 9 of IS:14687 may be referred for erection of false work (centering), safety precautions and other site operations, pertaining to false work (centering).

Experienced form watcher shall be engaged during erection, concreting and dismantling for early detection of any movement or instability in the system. The field engineers shall ensure that CPWD specifications and provisions of BIS codes are strictly followed.

A detailed programme of field safety inspection of centering/scaffolding/form work of such structures during different stages should be chalked out and strictly followed.

Provision of safety net, fall arresting system including other safety gears, for workers, working over these structures shall be made in contract and should be followed strictly.

This issues with the approval of DG, CPWD.

Superintending Engineer (TAS)
CSQ, CPWD, Nirman Bhawan,
New Delhi- 110011.

Copy to:
1. All the Spl. DGs, ADGs, CEs, SEs& EEs of CPWD and PWD (GNCTD) for information and necessary action please (Through CPWD Website htpp://cpwd.gov.in).

Superintending Engineer (TAS)

7.0 Third Party Quality Assurance Circulars

CENTRAL PUBLIC WORKS DEPARTMENT
O/o Superintending Engineer, (QA)
CPWD, Room No- 419, A- Wing Nirman Bhawan,
New Delhi
Tel. (011) 23062340, 23062449

CPWD

No. CE(CSQ)/SE(QA)/G-3/ 651 Dated: 01.01.2015

Office Memorandum

Subject: ***3rd Party Quality Control/Assurance in various projects, executed by CPWD.***

It has been decided to adopt following Third Party Quality Control process in all projects costing 5 crores and above, executed by CPWD-

i. Social Audit of the projects is to be done by groups of students of nearby reputed Engineering College. These groups will conduct the audit and submit their report which will be uploaded on the CPWD website.

ii. Comprehensive Technical Audit will be conducted by a group of professors of nearby NIT/IIT or by Professional Bodies like CBRI, CRRI for all the projects above Rs. 5 crores. The report of this Audit will also be uploaded on the CPWD website.

iii. TPQA as per para (ii) above shall be engaged to check the work during execution for the following purposes:

- To ensure that the site is equipped with necessary documents like agreement, CPWD Specifications, BIS Codes, Guard file containing inspection reports, list of approved manufacturers, tools for checking quality of work & testing facilities.

- To ensure that sites records like inspection register, cement register, test register & site order book etc. are being maintained in prescribed forms and under continuous watch of higher officers.

- To ensure specific control on various process of execution by controlling various factors such as testing of material & developing check list of important items of work.

- Inspection of work during execution for two factors:

  (a) **Material aspect**- Quality & Testing of materials keeping in view the requirement of contract specifications, BIS Marked/CPWD approved products. The agency shall conduct independently at least 10% tests of the total tests as required as per mandatory tests/contract specifications/BIS/IRC/MORTH requirements.
  (b) **Workmanship aspects**- to ensure execution of work with sound engineering practice and lay down procedures.

- Test audit of R.A. bill to ensure proper procedure/lay down procedure adopted for making payment to executing agency.

2. The above mentioned aspects are to be prepared as per check list proforma as per ***Annexure-I attached***.

3. TPQA will develop minimum quality assurance plan considering all the provisions under Para 53.2 of CPWD Works Manual 2014 and get it approved from NIT approving authority. They will ensure that all the provisions of QA plan are being observed at site.

4. TPQA will ensure that all the tests should be conducted as detailed in QA plan.

5. TPQA will ensure that test should be carried out in field lab or outside lab as per provisions of the agreement.

6. TPQA will inspect the work as and when required, at least once a month and before making any payment to the executing agency. Further, the inspection is to be planned in such a way that the pre-requisite formalities such as testing of material and approval of resource plan for materials and labour is carried out well in advance so that work may be progressed as per milestones fixed in the agreement.

7. The inspection report shall be submitted within 15 days of inspection to the concerned Executive Engineer, Superintending Engineer and Chief Engineer.

8. TPQA shall check and certify the quality of the work and monitor the compliance of removal of defects, pointed out during inspection, before completion of the work.

9. TPQA shall monitor and ensure that defects are removed before making the payment of items of work having defects.

- If, it is observed by TPQA that defects are not removed by executing agency, this matter shall be reported to the concerned Chief Engineer & Superintending Engineer to take necessary action in the matter as per agreement clause.
- TPQA shall also recommend in reduction of rate in case of substandard work, to be accepted being structurally safe on the recommendations of concerned Superintending Engineer.

10. TPQA shall mention the details of defective work in inspection report, to be dismantled by executing agency.

11. TPQA shall mention details of defective material, brought at site, which is to be removed from the site immediately in inspection report.

12. The payment to the TPQA shall be made by the Executive Engineer who is not concerned with the work on the basis of the bills submitted by TPQA duly verified by the concerned field engineer. This Executive Engineer making payment shall be nominated by the Zonal CE. No advance payment shall be made to TPQA. Running payment shall be made on proportionate basis.

13. 5% of the due amount of TPQA during the month shall be deducted from TPQA for not carrying out inspection and preparation of details, required for work, in performa as per Annexure-I, mentioned at Sr. No.2 above, by TPQA.

14. The 3rd party quality assurance body shall report quality control test results and suggestions regarding remedial measures, if any, from time to time.

All Chief Engineers will inform as soon as, TPQA as per above guidelines is fixed as a report is to be sent to Hon'ble UDM for making a public statement.

These issues with the approval of DG,CPWD

Encl: As stated above.

(P. P Singh)
Superintending Engineer (QA)

Copy to:

1. All SDGs in CPWD/E-in-C, PWD, Delhi, for information and necessary action.
2. All ADGs in CPWD, for information and necessary action.
3. All Chief Engineers in CPWD/PWD, for information and necessary action.
4. Superintending Engineer (C&M) to incorporate the provision in Works Manual 2014.
5. Under Secretary (W.2), Ministry of Urban Development, New Delhi for information with reference to Note ID No. 15011/6/2014-W.2 dated 12.12.2014.

Superintending Engineer (QA)

Annexure-I

Government of India Quality Assurance (CSQ) CPWD, 436-A, Nirman Bhawan, New Dlhie-110011.		
1.0	**Particulars of work**	
1.1	(a)Name of work	
	(b)Description of work	
1.2	(a) Sub-Division and name of Assistant Engineer	
	(b) Division and name of Executive Engineer	
	(c) Circle and name of Superintending Engineer	
	(d) Zone and name of Chief Engineer	
1.3	Agency/Contractor	
	(a) Name	
	(b) Registration Class	
1.4	Agreement No.	
1.5	Stipulated time and date of start	
1.6	Stipulated time and date of completion	
1.7	(a) Estimated cost put to tender	
	(b) Schedule of rates applicable	
1.8	Accepted tendered cost with overall percentage	
1.9	Percentage progress at time of inspection vis a vis expected as per contract and reasons for delay, if any:	

1.10	Inspecting officers (Name & Designation)	
1.11	Officers and contractor present during inspection (Name & Designation)	
1.12	Date of Inspection and number	
2.0	Quality Control aids:	
2.1	Is site equipped with	
	(a) Copy of agreement	
	(b) CPWD Specification/along with (up to date) correction slips:	
	(c) List of ISI marked/approved materials to be used:	
	(d) Guard File containing inspection reports of CTE/QCTA/AE/QC)/CE/SE etc.	
	(e) Testing facilities to check conformations to acceptance criteria	
	(f) QACW Circulars on Quality Control	
2.2	Is field laboratory existing and well equipped?	
3.0	Departmental procedure aspects:	
3.1	Maintenance of Inspection register	
3.2	Highlights of inspection by CE, SE, AE(P) requiring compliance.	
3.3	Are Test Registers maintained in standard forms?	
3.4	Are test Register reviewed by EE/SE with dates?	

3.5	Cement Register:	
	(a) IS cement store checked by AE/EE periodically as stipulated?	
	(b) Comment on cement stock with reference to cement register:	
3.6	Site Order Book and Schedule of defects:	
	(a) Is Site Order Book Properly maintained?	
	(b) Is the Site Order Book reviewed by EE and SE? (Mention details)	
	(c) Have timely notices been issued to the contractor with the schedule of defects/damages and date of compliance? In case of failure to rectify defects/damages whether action under clause 14/17 initiated?	
4.0	Process control aspects:	
4.1	Is soil investigation done? (give brief details)	
4.2	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 (i.e after every 3 months) and found fit for use in works?	

4.3	Are 10% (25% for concrete) of all samples for testing taken in presence of EE as per DG(W)'s OMNo.28/7/86-WI(DG), Circular No. 9/87 dated 1.9.1987/6.10.1987?	
4.4	Are all mandatory tests carried out at stipulated frequency?	
4.5	Are materials approved by Engineer-in-charge? If so, are samples available at site?	
4.6	Are sample units/items completed and approved by EE before start of mass finishing work?	
4.7	Specific control on RCC work like centering/shuttering, proportioning with boxes: mixing by full bag capacity hopper fed mixer: control of slump: placing/compaction with vibrator:	
4.8	Any other particular comments on adequacy of process control:	
5.0	Site Inspection for observation and comments on Quality Control system in place:	
5.1		
5.2	Observation on floors slope (especially in Bath, WC, Kitchen, Terrace, Balcony etc.)	

5.3	Observation on QC for dampness/leakages prevention. If dampness/leakages noticed, then state locations and probable reasons.	
5.4	Samples collected by QC Core/Cell	
6.0	Observations on site material QC aspects. (Keeping in view the requirement of contract specifications: BIS marked/CPWD approved products etc.) (Attached separate sheet, if required)	
7.0	Observations on workmanship QC aspects. (attached separate sheet, if required)	
8.0	Test audit of RA bill: (Indicate RA bill no., gross amount, Vr. No. and date)	
8.1	deviation in Quantities. (Modified vide OM DG/MAN/290 dt 01.10.2013)	
	a) Whether deviation in quantities noticed?	
	b) If so, the reason there of and whether prior approval of competent authority has been obtained before allowing deviations?	
	c) Whether revised T/S is required due to these deviation? If yes, the action taken	
8.2	Items not conforming to specifications:	

	a) Whether notice was issued as specified in contact?	
	b) Whether approval in principle was obtained from competent authority before acceptance of sub-standard work?	
8.3	Extra/substitute items: (Modified vide OM DG/MAN/290 dt 01.10.2013)	
	a) Are justification of item in remark column of EI/SI proper?	
	b) Whether prior approval of competent authority for execution of EI/SI has been obtained before execution?	
	c) Whether sanction of competent authority issued?	
8.4	Part Rates- whether rates held back are adequate?	
8.5	Comments on secured advance paid with reference to materials lying at site.	
8.6	Test check by AE/EE	
	a) Critical item:	
	b) Hidden items:	
	c) Extent (whether satisfactory?)	
8.7	Any other observation? [The observation made about quality of material and workmanship relate to only what could be randomly seen at locations specified. Executive Engineer and supervisory staff shall thoroughly inspect the entire	

	work for such defects as observed as well as for other defects and take suitable remedial measures properly. The Executive Engineer shall be responsible for accepting any defective work that went unnoticed but pointed out during such inception.]	
8.8	Progress of work and programme chart (Modified vide OM DG/MAN/290 dt 01.10.2013)	
	a) Whether progress of work is as per stipulated milestone/approved revised milestone? If no action taken by EE.	
	b) Whether contractor has submitted the programme to complete various activities of work within stipulated date of completion as per contract condition duly accepted by EE?	
	c) Whether monthly progress report submitted by contractor as per programme submitted has been certified by JE/AE and reviewed by EE/SE?	
	d) Any notice under clause3(a),(b) or (c) for inordinate delays has been issued or not. If yes. The action taken by EE.	

CENTRAL PUBLIC WORKS DEPARTMENT

OFFICE MEMORANDUM

ISSUED BY AUTHORITY OF DIRECTOR GENERAL

CPWD, NIRMAN BHAWAN, NEW DELHI.

Sub: Modifications in guidelines for 3rd Party Quality Assurance issued (TPQA) vide O.M.even no.651 dated 01/01/2015.

The following provision of TPQA guidelines are modified as under:-

S.no.	Existing provision	Modified provision
1.	Para iii) TPQA as per para (ii) above shall be engaged to take the work during execution in the following purposes:- • Bullet Point No. 5 Test Audit of R.A. bill to ensure proper procedure / laid down procedure adopted for making payment to executing agency.	Para iii) TPQA as per para (ii) above shall be engaged to take the work during execution in the following purposes:- • Bullet Point No.(5) Deleted.
2.	Para 6: TPQA will inspect the work as and when required, at least once a month and before making any payment to the executing agency. Further, the inspection is to be planned in such a way that the pre-requisite formalities such as testing of material and approval of resource plan for materials and labour is carried out well in advance so that work may be progressed as per milestones fixed in the agreement.	TPQA will inspect the work as and when required, at least ones **in three months.** Further, the inspection is to be planned in such a way that the pre-requisite formalities such as testing of material and approval of resource plan for materials and labour is carried out well in advance so that work may be progressed as per milestones fixed in the agreement.
3.	Para 12: The payment to the TPQA shall be made by the Executive Engineer who is not concerned with the work on the basis of the bills submitted by TPQA duly verified by the concerned field engineer. The Executive Engineer making payment shall be nominated by the Zonal CE. No advance payment shall be made to TPQA. Running payment shall be made on proportionate basis.	**Advance payment limiting to 20% of total fee in two or more installments on production of bank guarantee of equal amount may be made to Govt. agencies. The 2nd installment will be released considering progress of TPQA agency.** Running payment shall be made on proportionate basis.
4.	Annexure-I Para 8.0 to 8.8 Test Audit of R.A.Bill	Deleted.

Superintending Engineer(QA)

Issued from file no.CE(CSQ)/SE(QA)/G-3/312 Dated: 07/08/2015

1. All Spl. DGs, ADGs, CPWD, E-in-C, PWD, Delhi Govt. They are requested to endorse a copy of this O.M. to all CEs, SEs & EEs.
2. File No. CSQ/CM/16(1)/2015

Superintending Engineer(QA)

सत्यमेव जयते

दिवाकर गर्ग
महानिदेशक

DIVAKAR GARG
Director General

CPWD

भारत सरकार
महानिदेशालय – केन्द्रीय लोक निर्माण विभाग
निर्माण भवन, नई दिल्ली – 110011
Government of India
Directorate General - C.P.W.D.
Nirman Bhawan, New Delhi-110011
Tel. : 23062556/1317, Fax : 23061884
E-mail : cpwd_dgw@nic.in

Letter No. DG/CE(CSQ)/SE(QA)/G-3/75 Dated : 11-02-2015

Third Party Quality Assurance has been made mandatory for all CPWD Works above 5 crores which has been communicated to all CPWD Officers vide OM No. CE (CSQ)/SE(QA)/G-3/651dt. 01/01/2015.

Hon'ble UDM during video conferencing with Senior Officers of CPWD on 20/1/2015 has again emphasized that social audit and Third Party Quality Assurance is made mandatory for all works more than 5 crores and no payment is to be made without compliance of the same w.e.f. 01/04/2015.

I reviewed the status of the implementation of this Directive of Hon'ble UDM in a meeting in my office on 04/02/2015 and it was observed that no serious efforts have been made on the issue and no feedback has been received from most of the Zonal Offices as requested vide OM No.CE (CSQ)/SE(QA)/G-3/02 dated 02/01/2015.

Comprehensive technical audit report is to be prepared in proforma given as per annexure-I of TPQA guidelines uploaded on CPWD website on 02/01/2015.

As some doubts have been expressed how to assign TPQA agency, the officers are directed to refer to para no.6.13(V) of CPWD Works Manual 2014. According to this Para, Third Party Quality Control of the work can be assigned to IITs, NITs, Govt. Engineering College, CBRI and other Central / state Govt. Institutes, without call of tenders.

It is once again emphasised that TPQA is a mandatory policy of MOUD, GOI and is to be implemented invariably. The CEs / CPMs are directed to make all out efforts to implement this Directive and meet the Directors of IITs, Principal of Engineering Colleges and HODs of other professional bodies for engagement of TPQA. In case any lapses are observed, the concerned CEs/CPMs shall be held personally responsible.

(DIVAKAR GARG)

To

All SDGs in CPWD, All ADGs in CPWD/PWD,
All CEs in CPWD.

Additional Director General (TD)
Central Public Works Department
Nirman Bhawan, New Delhi – 110 011

No. : DG/CE(CSQ)/SE(QA)/G-3/99 Dated : 24.02.2015

OFFICE MEMORANDUM

Subject : 3 Party Quality Control / Assurances in various Projects, executed by CPWD.

This has reference to letter No. DG/CE(CSQ)/SE(QA)/G-3/75 dt. 11.02.2015 vide which it was advised to all field Engineers to refer para No. 6.13 (v) of CPWD Works Manual – 2014 for assignment of 3rd Party Quality Control work to IITs, NITs, Govt. Engineering Colleges, CBRI & other Central / State Govt. Institutes without call of tenders.

In this connection, if there is any difficulty for assigning the work to these Central / State Govt. Institutes, 3rd Party Quality Assurance work may be assigned to other Empanelled agencies having working experience in the field of Quality Assurance work of the similar nature. Empanelment may be done by concerned Special DGs for their Regions after call of Expression of Interest.

It is, once again, emphasized that TPQA is mandatory policy of MoUD, GOI and is to be implemented invariably. All Special DGs are requested to look into the matter so that TPQA is engaged immediately, keeping in view the above mentioned provisions.

24/2/15
(Mukesh Vij)
ADG (TD)

To

All Spl. DGs in CPWD, All ADGs in CPWD, PWD.
All CEs in CPWD

केन्द्रीय लोक निर्माण विभाग
कार्यालय अधीक्षण अभियन्ता(गु0आ0)
कमरा सं0 419–ए विंग, निर्माण भवन, नई दिल्ली ।
टेली0(011)23062340, 23062449

CPWD

सं0सी0एस0क्यू/अ0अ0(गु0आ0)जी–3/57 दिनांक 9/04/2015

कार्यालय ज्ञापन

Third Party Quality Assurance has been made mandatory for all CPWD Works above 5 crores which has been communicated to all CPWD officers vide O.M. No. CE/CSQ/SE/QA/G-3/651 dt. 01-01-2015.

In this connection vide O.M. No. DG/CE/CSQ/SE(QA)G-3/99 dt. 24-02-2015, it was emphasized that TPQA is mandatory policy of MOUD, Govt. of India, and is to be implemented invariably and accordingly all the Spl. DG's, ADG's & CE's were requested to look into the matter so that TPQA may be engaged immediately.

In view of the above, it is requested to submit comments and status report regarding engaging TPQA firms in all works above 5 crores upto 31-03-2015 in your jurisdiction duly complied at Sub Regional level.

9/4/2015
(पी0पी0सिंह)
अधीक्षण अभियन्ता (गु0आ0)

To

All SDGs in CPWD,
All ADGs in CPWD/PWD.
All CEs in CPWD

सत्यमेव जयते

भारत सरकार
Government of India
अपर महानिदेशक (प्रौ.वि.)
Additional Director General (TD)
केन्द्रीय लोक निर्माण विभाग
Central Public Works Department
प्रथम तल, कमरा संख्या 118, ए–विंग, निर्माण भवन, नई दिल्ली–110011
First Floor, Room No. 118, A-Wing, Nirman Bhawan,
New Delhi-110011, Phone : 23063389, Fax : 23061608
E-mail : adgtd@nic.in

CPWD

File No. DG/CE(CSQ)/SE(QA)/G-3/203 Date : 19-05-2015

OFFICE MEMORANDUM

Sub.:- **3rd Party Quality Control/Assurance in various projects, executed by CPWD.**

It has been observed that field officers are endorsing the copy of note regarding fixing of TPQA charges to the Directorate.

In this connection, office memorandum no. DG/CE(CSQ)/SE(QA)/G-3/99 dated 24/02/2015 may be referred, vide which Special DGs have been empowered for empanelment of TPQA agencies for their regions.

As such SDGs, ADGs & CEs are requested to take necessary action regarding rate for TPQA as per manual provision & scope of work to be done. This office cannot vet the rates etc. approved by them, based on merits of each case.

In view of the above all field officers are hereby advised not to endorse any correspondence regarding fixing of TPQA agencies & rate thereof.

19/5/
MUKESH VIJ
ADG (TD)

Copy to :

1. All SDGs, ADGs of CPWD, PWD.
2. All CEs in CPWD.

CENTRAL PUBLIC WORKS DEPARTMENT

OFFICE MEMORANDUM
ISSUED BY AUTHORITY OF DIRECTOR GENERAL
CPWD, NIRMAN BHAWAN, NEW DELHI.

Office Memorandum

Sub: Modifications in the proposal for 3rd Party Quality Control / Assurance for various projects executed by CPWD.

In continuation of this Office Memorandum even no.651 dated 1/01/2015 & no. 312 dated 07/08/2015, it has been decided:-

1) CPWD shall adopt 3rd Party Quality Assurance in projects costing to Rs. 20 crores & above.

2) The payment of executing agencies has been delinked with 3rd Party Quality Assurance report. However, the Superintending Engineers / Project Managers concerned shall be responsible to check observations of TPQA before making payment to the executing agencies.

All Zonal Engineers are requested to submit monthly report showing engagement of TPQA agencies to submit the report to the MOUD.

30/9/2015

Superintending Engineer(QA)

Issued from file no.CE(CSQ)/SE(QA)/G-3/ 374 Dated: 30 /09/2015

1. All Spl. DGs, ADGs, CEs CPWD for information & necessary action. (through website)
2. Director(Works), Ministry of Urban Development, Works Division, Nirman Bhawan, New Delhi for information in response of MOUD ID no.15011/6/2014-W-II dated 01/06/2015.

30/9/2015

Superintending Engineer(QA)

Testing Criteria for Construction Materials in CPWD Specifications

LIST OF MANDATORY TESTS FOR BUILDING WORKS

(SH:-3.0 MORTAR of CPWD Specification)

Material	*Clause from CPWD specification*	*Test*	*Field/ Laboratory*	*Test procedure*	*Min. Qty of Material for Carrying out test*	*Frequency of Testing*
1	*2*	*3*	*4*	*5*	*6*	*7*
Water	3.1.1	(i) pH Value (ii) Limits of Acidity (iii)Limits of Alkalinity (iv) Percentage of solids (a) Chlorides (b) Suspended matter (c) Sulphates (d) Inorganic solids (e) Organic solids	Lab Lab Lab Lab Lab Lab Lab Lab Lab	IS 3025	-	Water from each source shall be got tested before the commencement of work and thereafter once in every three months till the completion of the work. Water from municipal source need be tested only once in six months. Number of Tests for each source shall be3
Cement	3.1.2	(a) Physical requirement (i) Fineness (ii) Soundness (iii)Setting time (Initial &Final) (iv) Compressive strength (v) Consistency of standard cement paste	Lab Lab Lab Lab Lab	IS4031 (Part II) IS4031 (Part III) IS4031 (Part V) IS4031 (Part VI) IS4031 (Part VI)	Each lot	Every 50 tonnes or part thereof. Each brand of cement brought to site shall be tested as per this frequency.
Sand	3.1.3.1	Organic impurities	Field	Appendix 'A'	20 cum	Every 20 cum or part thereof or more frequently as decided by Engineer-in-Charge
	3.1.3.2	Silt Content	Field	Appendix C	20 cum	-do-

Material	*Clause From CPWD specification*	*Test*	*Field/ Laboratory*	*Test procedure*	*Min.qty of Material for Carrying out test*	*Frequency of Testing*
1	*2*	*3*	*4*	*5*	*6*	*7*
	3.1.3.2	Silt Content	Field	Appendix C	20 cum	-do-
	3.1.3.4	Particle size distribution a, b, c, d & e	Field or Laboratory As decided by the Engineer-in-charge	Appendix B	40 cum	40 cum or part thereof
Sand	3.1.3.5	Bulking of Sand	Field	Appendix D	20 cum	Every 20 cum or part thereof or more frequently as decided by Engineer-in-Charge.
Fly Ash	3.1.5 & 3.1.5.1	Total chloride in percent by mass, max.	Lab	IS 12423	10 cum	Every 10 cum or part thereof or more
		Loss of ignition in percent by mass, max.	Lab	IS 1727	10 cum	Frequency as decided by Engineer-in-charge
		Fineness, specific surface in m^2/kg	Lab/ field	Blaine's permeability method	10 cum	-do-
		Compressive strengthat28 days in N/mm^2, Min.	Lab.	-	10 cum	Only in cases when fly ash is used as pozzolana in cement

(SH:- 4.0 Concrete Work of CPWD Specification)						
Stone aggregate	4.1.2.2	(a) Percentage of soft or deleterious material	Field or Laboratory- Test as required	IS 2386-Part II	As required by Engineer-in-charge	For all quantities
Material	*Clause From CPWD specification*	*Test*	*Field/ Laboratory*	*Test procedure*	*Min.qty of Material for Carrying out test*	*Frequency of Testing*
1	*2*	*3*	*4*	*5*	*6*	*7*
	4.1.2.3	Particle size	Field/ Lab	Appendix' A'	45 cum	
		For every 45 cum or part thereof for RCC Work only. For rest of items as decided by Engineer -in- charge				
	4.1.2.5	(a) Estimation of Organic impurities	Field/ Lab	IS 2386 - Part II	10 cum	For every 40 cum or part thereof
		(b) Surface moisture	Field/ Lab	IS 2386	10 cum	-do-
		(c) Determination of 10% fine value	Field/ Lab	IS 2386	10 cum	-do-
		(d) Specific gravity	Field/ Lab	IS 2386	10 cum	-do-
		(e) Bulk density	Field/ Lab	IS 2386	10 cum	-do-
		(f) Aggregate crushing strength	Field/ Lab	IS 2386	10 cum	-do-
		(g) Aggregate impact value	Field/ Lab	IS 2386	10 cum	-do-
Concrete	4.2.2	Slump test	Field	Appendix 'D'	10 cum	15 cum or part thereof

(SH:- 5.0 RCC Work of CPWD Specification)						
Material	*Clause From CPWD specification*	*Test*	*Field/ Laboratory*	*Test procedure*	*Min. qty of Material for Carrying out test*	*Frequency of Testing*
1	*2*	*3*	*4*	*5*	*6*	*7*
Reinforced cement concrete (Nominal Mix)	5.4.1	(a) Slump test	Field/ Lab	Appendix 'D' of Para 4	(i) 5 cum in case of column (ii) 20 cum for slabs, beams and connected columns (iii) 20 cum for other R.C.C. work for all other small items and Where R.C.C. done in a day is less than 5 cum test may be carried out as required by Engineer-in-Charge	(i) Every 5 cum of part thereof (ii) Every 20 cum or part thereof (iii) -Do-
	5.4.9.1	(b) Cube Test	Lab	Appendix 'A'	(i) 5 cum in case of column (ii) 20 cum for slabs, beams and connected columns (iii) 20 cum for other R.C.C. work for all other small items and where R.C.C. done in a day is less than 5 cum test may be carried out as required by Engineer-in-Charge	(i) Every 5 cum or part there of (ii) Every 20cumor part there of (iii) -Do-

	Material	*Test*	*Field/ Laboratory*	*Test procedure*	*Min. qty of Material for Carrying out test*	*Frequency of Testing*
1	*2*	*3*	*4*	*5*	*6*	*7*
Reinforced Cement Concrete (Design Mix)	Coarse Aggre-gates				50 cum or part thereof & also on each change of source	
	Fine Aggregates				50 cum or part thereof & also on each change of source	
	Cement				50 MT or on each change of source	
	Fresh Concrete	(a) Slump test	Field	Appendix 'D' of Para 4	10 cum	50 cum for R.C.C. work including in all other small location. R.C.C. done in a day is less than 50 cum test may be carried out as required by Engineer-in-Charge
	Fresh Concrete	(b) Cube Test	Lab	Appen- dix 'A'	10 cum or part thereof	50 cum or 10 batches of 5-7 cum each for R.C.C. work in all location taken together. R.C.C. done in a day is less than 50 cum test may be carried out as required by Engineer-in-Charge
Reinforced Cement Concrete (Ready Mix)	Coarse Aggre-gates				50 cum or part thereof & also on each change of source	
	Fine Aggre-gates				50 cum or part thereof & also on each change of source	
	Cement				50 MT or on each change of source	

	Material	*Test*	*Field/ Laboratory*	*Test procedure*	*Min. qty of Material for Carrying out test*	*Frequency of Testing*	
	2	*3*	*4*	*5*	*6*	*7*	
	Fresh Concrete	(a) Slump test	Field/Lab	Appendix 'D'of Para 4	10 cum	50 cum for R.C.C. work including inall other small location. R.C.C. done in a day is less than 50 cum test may be carried out as required by Engineer-in-Charge	
	Fresh Concrete	(b) Cube Test	Lab	Appen- dix 'A'	10 cum or part thereof	50 cum or 10 batches of 5-7 cum each forR.C.C. work in all location taken together. R.C.C. done in a day is less than 50 cum test may be carried out as required by Engineer-in-Charge	
Steel for Reinforced cement concrete	5.1.3	(A) Physical Test and chemical tests				(a) For consignment below 100 tonnes (i) under 10mm dia, one sample for each 25 tonnes or part thereof (ii) 10 mm to 16 mm dia one sample for each 35 tonnes or part thereof (iii) over 16 mm dia one Sample for each 45 Tones or part thereof	(b) For consignment over 100 tonnes (i) Under 10 mm dia, one sample for each 40 tonnes or part thereof (ii) 10mm to 16 mm, one sample for each 45 tonnes or part thereof (iii) over 16 mm dia, one sample for each 50 tonnes or part thereof

LIST OF MANDATORY TESTS

(SH:- 6.0 Brick Work of CPWD Specification)

Sl. No.	*Material*	*Clause from CPWD specifi caiton*	*Test*	*Field/ laboratory Test*	*Test Procedure*	*Minimum Qty. of material for carrying out test*
1	*2*	*3*	*4*	*5*	*6*	*7*
(i)	Bricks/ Brick Tiles	6.1.3, 6.1.4, 6.1.5	Testing of Bricks/Brick Tiles for dimensions, Compressive strength, Water absorption and efflorescence	Laboratory	Appendix A, B, C & D of Para6 of CPWD specification	As per Table 6.3 and 6.4 of CPWD specification
(ii)	Sewer Bricks	6.1.4	Dimensions, Compressive strength, Water absorption and Efflorescence	Laboratory	Appendix A, B, C &D of Para6 of CPWD specification	As per Table 6.3 and 6.4 of CPWD specification
(iii)	Burnt clay perforated building bricks	6.1.5	--do--	-- do --	-- do--	-- do--

LIST OF MANDATORY TESTS

(SH:- 7.0 Stone Work of CPWD Specification)

Material	*Clause from CPWD specification*	*Test*	*Requirement*	*Field/ laboratory Test*	*Test Procedure*	*Minimum Qty. of material for carrying out test*	*Frequency of Testing*
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
Stone	7.1.1 7.4 7.8 7.9	(i) Water absorption	Not more than 2.5% by mass for sand stone and as specified in IS 1123 for other stones.	Laboratory	IS 1124	50 sqm. for slabs and 10 cum in stone masonry	100 sqm/20 cum or part thereof or change of source as per direction of Engineer- in-Charge
		(ii) Transverse strength	Not less than 7 N/mm^2 (70 Kgf/cm^2) for sand stone and as specified in IS 1123 for other stones.	Laboratory	IS 1121 Part II	-do-	-do-
		(iii) Resistance to wear	Not greater than 2 mm on the average and 2.5 mm for any individual specimen for sand stone and as specified in IS 1123 for other stones.	Laboratory	IS 1706	-do-	-do-
		(iv) Durability	Shall not develop signs of spalling, disintegration or cracks for sand stone and as specified in IS 1123 for other stones.	Laboratory	IS 1126	-do-	-do-

LIST OF MANDATORY TESTS

(SH:- 8.0 Marble Work of CPWD Specification)

Material	*Clause from CPWD specification*	*Test*	*Field/ Laboratory Test*	*Test Procedure*	*Minimum quantity of material/ work for carrying out the test*	*Frequency of testing*
1	*2*	*3*	*4*	*5*	*6*	*7*
Marble	8.3 (Table 8.2)	(i) Moisture Absorption	Laboratory	IS 1124	50 Sq.m.	100 sqm. or part thereof.
		(ii) Hardness Test	-do-	Mho's Scale	-do-	-do-
		(iii) Specific Gravity	-do-	IS 1122	-do-	-do-
Granite		(i)Moisture	-do-	IS 1124	-do-	-do-
		(ii) Specific Gravity	-do-	IS 1122	-do-	-do-
(SH:- 9.0 Wood Work and PVC Work of CPWD Specification)						
Timber	9.1.6	Moisture content	Field (by moisture meter) laboratory test as required by Engineer-in-Charge	Appendix 'C'	1 cum	Every one cum or part thereof.
Flush door	9.7.10	End immersion Test knife test Adhesion Test	Laboratory	IS 2202 Appendix'F'	26 shutters	As per sampling andtesting specifiedin clause9.7.11

Mortice Locks	9.15.13	Testingof spring	Laboratory	IS 2209-Appendix 'G'	50 Nos	100 or part thereof.
(SH:- 10.0 Steel Work of CPWD Specification)						
Steel if arranged by the contractor	10.1.1	(a) Tensile strength (b) Bend test	Laboratory	IS 1599	20 tonne	Every 20 tonne or part thereof.
Steel tubular pipes	10.13	(a) Tensile Test (b) Bend Test (c) Flattening Test	Laboratory	IS1608 IS2329 IS2328	Every 8 tonne or part thereof	Every 8 tonne or part thereof

LIST OF MANDATORY TESTS

(SH:- 11.0 Flooring Work of CPWD Specification)

Material	*Clause from CPWD specification*	*Test*	*Field/ Laboratory Test*	*Test Procedure*	*Min. quantity of material for carrying out the test*	*Frequency of testing*
1.	*2.*	*3.*	*4.*	*5.*	*6.*	*7.*
Terrazzo Tiles	11.10.1 & 11.11.1	1. Transverse strength 2. Water absorption 3. Abrasion Atest	Laboratory	I S: 1237	5000 Nos. (no testing need be done if total number of tiles of all types of all sizes from all manufacturers used in awork is less than 5000Nos)	One test for every 10,000 Nos. or part thereof for each type and size from a single manufacturer. (One test to be done even if the number of terrazo tiles of any type and size from a single manufacturers is less than 5000 Nos. provided the total number of terrazo tiles of all types and sizes from all manufacturers used in a work exceed 5000 Nos.
Pressed ceramic tiles (for floor & wall)	11.4,11.5 & 11.16	1. Dimensions and surface quality 2. Physical properties 3. Chemical properties	Laboratory	I S: 13630	3000 Nos.	3000 Nos. or part thereof

LIST OF MANDATORY TESTS FOR ROAD WORKS

Material/ work	*Clause from CPWD specification*	*Test*	*Field/ Laboratory*	*Test procedure*	*Mini-mum quantity/ Value*	*Frequency of Testing*
1	*2*	*3*	*4*	*5*	*6*	*7*
Coarse Aggregate	16.1.1	1. Lost Angles	Laboratory	IS 2386 (Part IV)		Per 200 m^3
		2. Abrasion Value or Aggregate Impact Value		IS2386 (Part V) IS5640		
		3. Flakiness Index		IS 2386 (Part I)		
	16.1.1 Table 16.2	Grading requirement	Field	IS 2386 (Part I)	Nil	Per 100 m^3
Fine Aggregate	16.1.2	Deleterious materials	Laboratory	IS2386 (Part III)	Nil	As required by the Engineer-in-charge
Bitumen	16.1.5	As prescribed in IS 73	Laboratory	As prescribed in IS 73	Nil	As required by the Engineer-in-charge
Embankment under (O.M.C. conditions)	16.3.1	1. Moisture content 2. Density	Laboratory Field	IS2720 (Part II) IS2720 (Part XXVIII)	Nil	250m^3 250m^3
	16.3.4.4	3. Control test on borrow pits.	Laboratory			
		(a) Gradation	Laboratory	IS 2720 (Part IV)	Nil	One to Two tests per 8000 m^3
		(b) Plasticity	Laboratory	IS2720 (Part V)	Nil	-Do-
		(c) Proctor Test	Laboratory	IS 2720 (Part VIII)	Nil	-Do-
		(d) Deleterious content	Laboratory		Nil	As required by the Engineer- in -charge
		(e) Moisture contents	Laboratory	IS2720 (Part II)	Nil	250m^3
Bitumen Penetration Macadam	16.32	1. Binder	Field	IS 73	Nil	As required by the Engineer-in-charge.
		2.Aggregate Abrasion impact value or Los Angles Value	Laboratory	IS 2386 (Part IV)	Nil	Per 100 m^3 of aggregate as required by the Engineer-in-charge

		3. Flakiness Index	Laboratory	IS 2386 (Part I)	Nil	-Do-
		4. Stripping Value	Laboratory	IS 6241	Nil	-Do-
		5. Grading of Aggregate	Field or Laboratory	IS 2386 (Part I)		Two tests per day per plant
Bitumen Mastic Wearing Course	16.33	1. Los Angles Abrasion Value/Aggregate Impact value	Laboratory	IS 2386 (Part IV)	Nil	For every 100 m^3
		2. Flakiness Index	Laboratory	IS 2386 (Part I)		-Do-
		3. Stripping Value	Laboratory	IS 6241		-Do-
		4. Mix Grading	Field/ Laboratory	IS 2386 (Part I)		One set of test on individual constituents and mixed aggregate from dryer for each 100 tonnes of mix subject to minimum of two sets per plant per day.
Dense Bitumen Macadam	16.46	1. Quality of Binder	Laboratory	IS 73	Nil	As require
		2. Los Angles Abrasion Value/ Aggregate impact Value	Laboratory	IS 2386 (Part IV)	Nil	100 m^3
		3. Stripping Value	Laboratory	IS 6241	Nil	-Do-
		4. Water Absorption	-Do-	IS2386 (Part III)	-Do-	-Do-
		5. Flakiness Index	-Do-	IS2386 (Part I)	-Do-	One test for 100 cum.
		6. Sieve Analysis for filler	-Do-	IS 2386 (Part I)	-Do-	One test for each consignment subject to minimum one test per 5 cum.
		7. Mix Grading	-Do-	IS 2386 (Part I)	-Do-	One set of test on individual constituent and mixed aggregates from dryer for each 100 tonnes of mix subject to a minimum of two sets per plant per day

		8. Stability of Mix	-Do-	ASTM D 1559	-Do-	Three marshall specimen per 100 tonnes of mix, subject to a minimum of 2 sets being tested per plant, per day.
		9. Binder Content	Field		-Do-	One test for each 100 tonnes of mix subject to minimum of two tests per day per plant
		10. Thickness , Density of compacted layer	Field	Appendix 'B'	-Do-	One test of 3 samples per 500 sqm.
		Same as above except Test No. 6 & 7	Same as above	Same as above	Nil	Same as for Asphaltic concrete
Cement concrete pavement under controlled conditions	16.37.19	Coarse aggregate 1. Flakiness Index	Laboratory	IS 2386 (Part I)	-	Before approval of the quarry and every sub-sequent change in the source of supply and one test per 100 cum.
		2. Impact Value	-Do-	IS 2386 (Part IV)	-	-Do-
		3. Loss Angles abrasion Value	-Do-	-Do-	-	-Do-
		4. Deleterious material	-Do-	IS2386 (Part II)	-	Before approval of the quarry and at every subsequent change in the source of supply
		5. Moisture content	-Do-	IS2386 (Part III)	-	Regularly as required subject to a minimum of one test per day
		Fine Aggregate				
		1. Silt content	Field	As per CPWD specification Vol. .	-	One test per 15 cum.

		2. Gradation of sand	-Do-	IS2386 (Part II)	-	-Do-
		3. Deleterious material	-Do-	IS2386 (Part II)	-	Before approval of the quarry and at every subsequent change in the source of supply
		4. Moisture content	-Do-	IS2386 (Part III)	-	Regularly as required subject to a minimum of two tests per day
		5. Mix Aggregate	Field	IS 2386 (Part I)	-	One test per 15 cum of concrete
		6. Flextural strength	Laboratory	IS 526	-	One test consisting of 8 specimen for 30cum. of concrete

TEST FOR DIMENSIONAL TOLERANCE

(Clause 6.1.3.3)

A -1. Sampling

As per para 6.1.3.1 and 6.1.3.2.

A -2. Procedure

All the blisters, loose particles of clay and small projections shall be removed from the surface of bricks. Each specimen of 20 bricks shall then be arranged upon a level surface successively as indicated in Fig. A, B and C of para A-4 below in contact with each other and in straight line. The overall length of the assembled bricks (20 Nos) shall be measured with a steel tape sufficiently long to measure the whole row at one stretch.

A-3. Tolerance

The actual dimensions of bricks when tested as described in A-2 shall be within the following limits per 20 bricks.

Modular Bricks

Length 3720 to 3880 mm (3800 ± 80 mm)
Width 1760 to 1840 mm (1800 ± 40 mm)
Height 1760 to 1840 mm (1800 ± 40 mm) for 90 mm high brick
760 to 840 mm (800 ± 40 mm) for 40 mm high brick

Non-Modular Bricks

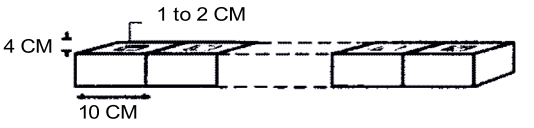
For class 10
Length (4520 to 4680) mm (4600 ± 80 mm)
Width (2240 to 2160) mm (2200 ± 40 mm)
Height (1440 to 1360) mm (1400 ± 40 mm) for 70 mm high bricks
(640 to 560) mm (600 ± 40 mm) for 30 mm high bricks

For other classes
Length (4320 to 4680) mm
Width (2130 to 2310) mm
Height (1340 to 1460) mm for 70 mm high bricks
(840 to 920) mm for 44 mm high bricks

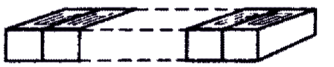
A-4. Criteria for Conformity

A lot shall be considered conforming to the requirements of dimensions and tolerances if all the groups of bricks are tested to meet the specified requirements.

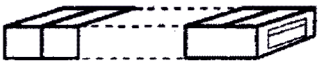
'A' Measurement of Length



'B' Measurement of Width



'C' Measurement of Height



APPENDIX B

ADDITIONAL TESTS FOR CONCRETE

(Clause 5.4.9.2)

B-0 In case the concrete fails when tested as per the method prescribed in Appendix A, one or more of the following check tests may be carried out at the discretion of Engineer-in-Charge to satisfy the strength of the concrete laid. All testing expenditure shall be borne by the contractor, the number of additional tests to be carried out shall be determined by the Engineer-in-Charge. He shall be the final authority for interpreting the results of additional test and shall decide upon the acceptance or otherwise. His decision in this regard shall be final and binding. For the purpose of payment, the Hammering test results only shall be the criteria. Some of the tests are outlined below:-

B-1 REBOUND HAMMER TEST

If a rebound hammer is regularly used by trained personnel in accordance with procedure described in IS 13311 (part II) and a continuously maintained individual charts are kept showing a large number of reading and the relation between the reading and strength of concrete cubes made from the same batch of concrete, such charts may be used in conjunction with hammer readings to obtain an approximate indication of the strength of concrete in a structure for element. If calibration charts are available from manufactures, it can be used. When making rebound hammer test each result should be the average of at least 12 readings. Reading should not be taken within 20mm of the edge of concrete members and it may be necessary to distinguish between readings taken on a trowled face and those on a moulded face. When making the tests on a precast unit, special care should be taken to bed them firmly against the impact of the hammer.

B-2 CUTTING CORES

This method involves drilling and testing cores from the concrete for determination of compressive strength. In suitable circumstances, the compressive strength of the concrete in the structure may be assessed by drilling cores from the concrete and testing. The procedure used shall comply with the requirements of IS 1199 and IS 516.

The points from which cores shall be taken shall be representative of the whole concrete and at least three cores shall be obtained and tested. If the average of the strength of all cores cut from the structure is less than the specified strength, the concrete represented by the cores shall be liable to rejection and shall be rejected if a static load test (B-5) either cannot be carried out or is not permitted by the Engineer-in-Charge.

B-3 ULTRASONIC TEST

If an ultrasonic apparatus is regularly used by trained personnel in accordance with IS 13311 (part I) and continuously maintained individual charts are kept showing a large number of readings & the relation between the reading and strength of cubes made from the same batch of concrete, such charts may be used to obtain approximate indications of the strength of concrete in the structures. In cases of suspected lack of compaction or low cube strength the results obtained from the ultrasonic test results on adjacent acceptable section of the structures may be used for the purpose of assessing the strength of concrete in the suspected portion.

B- 4 LOAD TESTS ON INDIVIDUAL PRECAST UNITS

The load tests described in this clause are intended as check on the quality of the units and should not be used as substitute for normal design procedure. Where members require special testing. Such special testing procedures shall be in a accordance with the specification. Test loads shall be applied and removed incrementally.

B-4.1 Non Destructive Tests

The unit shall be supported at its designed point of support and loaded for five minutes with a load equal to the sum of the characteristic dead load plus one and a quarter time the characteristic imposed

load. The deflection is then recorded. The maximum deflection after application of the load shall be in accordance with the requirements defined by the Engineer-in-Charge. The recovery is measured five minutes after the removal of the load and the load then reimposed. The percentage recovery after the second loading shall be not less than that after the first loading nor less than 90% of the deflection recorded during the second loading. At no time during the tests, shall the unit show any sign of weakness or faulty construction as defined by the Engineer-in-Charge in the light of reasonable interpretation of relevant data.

B-4.2 Destructive Tests

The unit is loaded while supported at its design point of support and must not fail at its design load for collapse, within 15 minutes of time when the test load becomes operative. A deflection exceeding 1/40 of the test span is regarded as failure of the unit.

B-4.3 Special Tests

For very large units or units not readily amenable to the above test e.g. columns, the precast parts of composite beams and members designed for continuity or fixity, the testing arrangements shall be agreed upon before such units are cast.

B-5 Load Test of Structures or Parts of Structures

The test described in this clause are intended as a check where there is a doubt regarding structural strength. Test loads are to be applied and removed incrementally.

B-5.1 Age at Tests

The test is to be carried as soon as possible after the expiry of 28 days from the time of placing of the concrete. When the test is for a reason other than the quality of concrete in the structure being in doubt, the test may be carried out earlier, provided that the concrete has already reached its specified characteristic strength.

B-5.2 Test Load

The test loads to be applied for the limit state of deflection and local damage are the appropriate design loads i.e., the characteristic dead and superimposed loads. When the limit state of collapse is being considered the test load shall be equal to the sum of characteristic dead load plus one and a quarter times the characteristic imposed load and shall be maintained or a period of 24 hours. In any of the test temporary supports of sufficient strength to take the whole load shall be placed in position underneath but not in contact with the members being tested. Sufficient precautions must be taken to safeguard persons in the vicinity of the structure.

B-5.3 Measurement During Tests

Measurements of deflection and crack width shall be taken immediately after applications of the load and, in the case of 24 hour sustained load test, at the end of 24 hour loaded period, after removal of the load and after 24 hour recovery period. Sufficient measurements shall be taken to enable side effect to be taken in account. Temperature and weather conditions shall be recorded during the tests.

B-5.4 Assessment of Results

In assessing the strength of a structure or a part of the structure following a loading test, the possible effects of variation in temperature and humidity during the period of the test shall be considered.

The following requirements shall be met:

(a) The maximum width of any crack measured immediately on application of the test load for local damage, is to be not more than 2/3 of the value of the appropriate limit state requirement.

(b) For members spanning between two supports the deflection measured immediately on application of the test load for deflection is to be not more than 1/500 of the effective span limits shall be agreed upon before testing cantilevered portions of structure.

(c) If maximum deflection in mm shown during 24 hour under load is less than $40L^2/D$ where L is effective span in mm and D is overall depth of construction in mm, it is not necessary for the recovery to be measured and the requirement (D) does not apply, and

(d) If within 24 hours of the removal of test load for collapse as calculated in clause (a) a reinforced concrete structure does not show a recovery of at least 75 per cent of the maximum deflection shown during the 24 hour under load, the loading should be repeated. The structure should be considered to have failed to pass the test if the recovery after second loading is not at least 75 per cent of the maximum deflection shown during the second loading.

B-6 DETERMINATION OF WATER SOLUBLE AND ACID SOLUBLE CHLORIDES IN CONCRETE

Determination of water soluble and acid soluble chlorides in Concrete shall be done as per method of test given in IS 14959 (Part 1) which covers volumetric method of test as described below :

(a) *Quality of Reagents*
Unless otherwise specified, pure chemicals of analytical reagent grade and distilled water (see IS 1070) shall be used in the test.

(b) *Nitric Acid (HNO_3) Concentrated (Specific Gravity 1.42)*
Prepare the solution, (6N (approximately), by diluting 38ml of concentrated Nitric acid to 100 ml with distilled water.

(c) *Ferric Alum($FeNH_4 (SO_4)_2$ 12 H_2O)*
Dissolve 10 g of ferric alum in 100 ml of distilled water and add 1 ml of Nitric acid.

(d) *Potassium Chromate 5% Solution*
Dissolve 5 g of potassium chromate ($K_2 CrO_4$) 100 ml of distilled water to form 5% Solution.

(e) *Nirabenzene*

(f) *Silver Nitrate ($AgNO_3$)Solution, 0.02 N*
Weigh 1.7 g of silver nitrate, dissolve in distilled water and dilute to 500 ml in a volumetric flask. Standardize the silver nitrate solution against 0.02 N sodium chloride solution using potassium chromate solution as indicator (5 percent *m/v*) in accordance with the procedure given in IS 3025 (Part 32).

(g) *Ammonium thiocyanate (NH_4 SCN) Solution*
Weigh 1.7 g of ammonium thiocyanate (NH_4 SCN) and dissolve in one litre of distilled water in a volumetric flask. Shake well and standardize by titrating with 0.02 N silver nitrate solution using ferric alum solution as an indicator. Adjust the normality exactly to 0.02 N.

(h) *Sodium chloride (NaCl) 0.02N*
Weigh 1.1692 g of sodium chloride (NaCl) dried at 105 +/- 2ºC, dissolve in distilled water and make upto 1000 ml in a volumetric flask.

(i) Use of Filter Paper

(j) In the methods prescribed in this standard, relative numbers of Watman filter paper only have been prescribed since these are commonly used. However, any other suitable brand of filter papers with equivalent porosity may be used.

(k) *Procedure for Water Soluble Chloride*
Weigh 1 000+/-5 g of fresh mortar or concrete sample in a 2 litre capacity beaker and add 500 ml of distilled water (chloride free). Stir the mixture vigorously for 15 minutes. After allowing the mixture to stand for 10 to 15 minutes for settling, decant about 200 ml of the supernatant solution

into a clean dry 250 ml capacity beaker. Immediately, filter the solution through Watman filter paper No.1 and collect the filtrate.

Pipette 50 ml of filtrate in a 250 ml capacity conical flask. Add 5 ml of 6 N Nitric acid. Add a known volume (X), preferably 25 ml of nitrobenzene. Shake vigorously to coagulate the precipitate. Titrate the excess silver nitrate with 0.02 N ammonium thiocyanate solution until a permanent faint reddish brown colour appears. Note down the volume (Y) of ammonium thiocyanate used.

(l) *Procedure for Acid Soluble Chloride*

Weigh about 1000 +/- 5 g of the fresh mortar or concrete sample in a 2 litre capacity beaker and add 50 ml of 6 N nitric acid and 450 ml of distilled water (chloride free) after stirring for few Minutes. Stir the mixture vigorously for 15 minutes. After allowing the mixture to stand for 10 to 15 minutes for settling, decant about 200 ml of the supernatant solution into a clean dry 250 ml capacity beaker. Immediately, filter the solution through Watman filter paper No.1 and collect the filterate.

Pipette 50 ml of filtrate in a 250 ml capacity conical flask. Add 5 ml of 6 N nitric acid. Add a known volume (X) preferably 25 ml of standard silver nitrate solution. Add 1 ml ferric alum and 5 ml of nitrobenzene. Shake vigorously to coagulate the precipitate. Titrate the excess silver nitrate with 0.02 N ammonium thiocyanate solution until a permanent faint reddish brown colour appears. Note down the volume (Y) of ammonium thiocyanate used.

(m) *Calculation*

Calculate the percentage of chloride(acid soluble/water soluble) by mass of mortar or concrete as follows:

Chloride, percent = 0.0007 1 (X – Y),

Where

X = volume of silver nitrate added, in ml; and

Y = volume of 0.02 N ammonium thiocyanate consumed.

Note: Interference of silver chloride particles (which are generated in situ) in titration by reacting with thiocyanants can be avoided by the addition of nitrobenzenes which forms a film on silver chloride particles.

9. Check for Quality Assurance

CHEK LISTS FOR EXAMINATION OF BUILDING WORKS(CIVIL)

I. EARTH WORK

1. Classification of soil
2. General quality of work, lines, levels, dressing of sides and bottom etc.
3. Whether levels made up by filling in beds of foundations.
4. Disposal and Leads.
5. Check up the place of disposal, if necessary.

II. CONCRETE WORK – (Generally in foundation & under floors.)

1. Quality and size of coarse aggregate, whether the metal is over size whether the same contains disintegrated or soft pieces. Whether it is mixed with earth or other foreign matter. Sieve analysis record to be seen.
2. Quality of sand. Record of fineness modulus and silt content.
3. Strength of concrete by physical examination or texture and resistance to picking by a sharp instrument.
4. Thickness of concrete by making trial pits.
5. General quality of work, lines, levels etc. Honey-combing of surface.
6. Curing arrangements.
7. Mixing of mortar / concrete, whether done by hand or by machine vis-à-vis the contractual provisions.

III R.C.C. WORK

1. Same as for concrete work (sub-head II above)
2. Cube tests register.
3. If agreement items provide for finishing the exposed surface, It is to be checked whether finishing has been done or deduction is made in lieu thereof.
4. Whether the concrete was mechanically vibrated.

5. Record of slump.
6. Finishing of expansion joints.
7. Hacking of the surface of R.C.C. work
8. Gauge of binding wire and whether it has been used al all intersection of reinforcement.
9. Spacings and hooks in reinforcing rods.
10. Overlaps in reinforcement. Whether suitably staggered and of required length.
11. Cover blocks at the bottom of reinforcement.
12. Whether reinforcement found exposed on removal of forms.
13. Classification of R.C.C. items.
14. Rigidity, evenness and lines and levels of the centering and shuttering for R.C.C. work.
15. Diameter of ballies used, cross-bracing wedging etc. for centering and shuttering.
16. In the case of multistoried buildings, whether lower floors were suitably supported while casting the roof of upper floors.
17. Whether the thickness of finishing on R.C.C. surface is excessive, trueness to design, dimensions and quality and quantity of mortar used for making up the trueness and consequent departure from design and dimensions.
18. Whether steel used for reinforcement tested.
19. Design of centering / shutting for floor height more then 3.50 m for safety.
20. In the case of controlled concrete whether special provision for it as per detailed specifications was kept in view while executing the work.
21. Whether throating, moulding and drips to chajjas provided.
22. Whether noising in steps provided.
23. Finish of RCC shelves with special attention to underside trueness, to dimensions, thickness uniformity, strength of rendering done, lines and levels.

IV. BRICK WORK

1. Quality of bricks

2. Strength of mortar
3. Quality of sand. Record of fineness modulus and silt content.
4. Mixing of mortar, whether, done by hand or by machine vis-à-vis the contractual provisions
5. Curing arrangements
6. Raking of joints
7. Soaking of bricks in tanks
8. General quality of works, lines, levels, thickness and trueness of joints etc.
9. Whether cut brick corners provided in brick-on-edge in top courses of plinths etc.
10. Whether joints of bricks were fully filled with mortar, specially the stretch or joints of 9" walls to be checked.
11. Type of scaffolding vis-à-vis the specifications.
12. Reinforcement in brick partitions
13. Whether cross walls properly bonded with long walls.
14. Whether thickness of joints excessive.

V. STONE WORK

1. Quality of stones.
2. Same as items 2,3,4,5,6,8 and 14 of S.H brick work above.
3. Whether joints fully filled with morta
4. Whether required number of bond stones provided and suitably marked.
5. Bushing in stones.
6. Height of individual stones as compared to the width on face or the depth inwards
7. Cramps and dowels provided(dimensions and material) for stone lining/venerring
8. Whether edges of marble lining table rubbed.
9. Whether the dressing of various types of stone work as per specifications, specially at jambs, corner sills etc
10. The extent of use of spalls in the joints.

vi. Wood Work.

1. Classifications of timber.
2. Timber to be free from cracks, shakes, dead-knots, etc. as laid down in the specifications for various classes.
3. If contract provides for kiln seasoning, whether this was done in an approved kiln. Name of kiln and order of Engineer–in-charge regarding prior approval thereof. Checking of moisture contents at site.
4. General quality of work, lines, levels, finish
5. Whether appropriate joints provided for joining various members neat and strong; whether joints are secured with bamboo / hardwood pins.
6. Whether dimensions of various members are within land down tolerance.
7. Whether portions of timber coming in contact with masonry treated with coaltar or some other wood preservative.
8. Size of hold-fasts in door and window frames.
9. Plaster rebates in door and window frames, where required.
10. Thickness and dimensions panel in door and window shutters.
11. Thickness of glass panes and quality of glass.
12. Fittings for doors and windows, hinges, aldrops, tower, bolts, locks, handles, door closer etc.
13. Size of screws for fixing of various fittings.
14. Whether glass panes fixed with wooden beading.
15. Whether layer of putty provided between glass panes and sash bars and between glass panes and beadings.
16. Quantity of putty-beading used.
17. Quantity of flush-door shutters, whether tested as per ISI quantity and dimensions of timber used for wooden frame; quality of plywood, quality of glueing; whether wooden strips glued to each other; whether peep holes and holes made in the factory and providing on the inside

of holes.

18. Quality of planning and sand papering prior to painting.

Vii --STEEL WORK

1. Quality of steel--- whether tested or untested.
2. Whether priming coat given on steel work is as per specification. Quality of primer used and reference to approval of the make and brand.
3. General workmanship, lines, levels, finish
4. Dimensions of various members.
5. Whether holes drilled or punched.
6. Shape of river heads.
7. Whether welding fillets well formed and filed
8. Thickness of sheets in collapsible doors etc
9. Whether steel doors and windows prepared from standard sections, both as regards size and make.
10. Whether metal beading in steel doors and windows provided where specified. In case where glass panes are to be fixed with putty, whether metal putty used and glazing clips provided. Quality of putty used.
11. Fitting of steel doors and windows.
12. Whether fixed and open able steel windows paid for separately and properly.
13. Whether bolts for steel work dipped in linseed oil.
14. Whether molten lead used round verticals of railings fixed in concrete if so specified.

viii.FLOORING

1. Quality of materials—some checks as for cement concrete and brick work.
2. Whether terrazzo tiles pre-tested for abrasion and strength
3. Strength of concrete used in floor.

4. Thickness of floors
5. Thickness of tiles or stone slabs where applicable
6. Sizes of panels.
7. Whether joints in panels continued through borders and skirting.
8. General workmanship, lines and levels and cracks.
9. Curing arrangements.
10. Special check of levels, thickness of joints and finish for costly floors, like terrazzo tiles flooring marble slab flooring, glazed tile flooring and kotah stone flooring.
11. Whether edges of kotah stone and marble slabs table rubbed.
12. Record of metallic concrete hardener where applicable.
13. Any hollow sound ,when tapped.
14. Proper slope in flooring.

IX. ROOFING AND CEILING

1. Quantity of various materials
2. General workmanship, lines and levels.
3. Thickness of sheets.
4. Fixing arrangements of sheets. Whether the screws and other fastenings are as per specifications.
5. Thickness of mud phuska, whether straw and gobre used in plaster over mud-phuska.
6. Slope in flat roof terraces.
7. Strength of mortar in tile brick flooring on roof terraces.
8. Strength in mortar in gola and drip course
9. Size and quantity of brick ballast used in lime concrete terraces.
10. Whether lime putty used in lime concrete terrace. Quality of lime-grade and tests of lime-putty for carbonation(when loss of strength of mortar is noticed.)

11. Size of rain water pipes.

12. Whether rain water pipes painted from inside.

13. Weight of quantity of bitumen felts for water proofing work; tests of samples, for comparison with ISI for larger works.

X FINISHING

1. Quality of materials, fineness modulus of sandl

2. Thickness of plaster

3. Strength of mortar

4. Whether mortar mixed by hand or by machine, vis-à-vis the provisions of the contract.

5. General quality of work, lines, levels and surface finish.

6. Glazed tile dados—modular co-ordination of broken tiles to fix fittings.

7. Types of paints—whether they conform to specifications or brands approved by the Department.

8. Paint register and account of empty tins.
9. Whether lime putty used in case of lime plaster.

10. Whether surface properly prepared before painting.

XI WATER SUPPLY AND SANITARY INSTALLATIONS

1. Sanitary fixtures—dimensions, approval of brand, compliances with ISI specifications.

2. HCL and CI pipes—dimensions, weights, makes, standard of finish, whether pipes coated with approved anti-corrosive treatment at the factory, class of CI pipes.

3. GI pipes—class, sizes, weight, makes, standard of finish.

4. Water supply fittings, weights, makes, standard of finish compliance with ISI specifications.

5. Lead connection pipes—sizes, weights etc.

6. Flushing cisterns—whether floats made of copper, if so specified, whether cisterns painted with bitumastic pain on the inside.

7. Sizes of brackets for wash basins, sinks and flushing cisterns.
8. MS clamps for fixing HCL pipes-size of MS flat and whether clamps fixed in cement concrete blocks.
9. Whether traps provided with in wash-hand basins and sinks.
10. Quantity and quality of lead in pipe joints.
11. Dimensions of trenches for laying pipes; and filling/bedding.
12. Water storage tanks- thickness of sheet, sizes of tanks, sizes of various fittings, whether covers are mosquite proof, whether tanks painted with a priming coat lead on the outside and with two coats of bitumastic paint on the inside.
13. Quantity and quality of concrete under and around sewer lines—same checks as for cement under sub-head II above.
14. Quantity and quality of brickwork and plaster in manhole chambers-same checks as for sub-head IV and X above.
15. Quantity of RCC work-same as for sub-head III above.
16. Manhole covers. road gully gratings etc. weights, make and finish.
17. Hume pipes, class, makes, and finish-whether they conform to ISI specifications.
18. Stone-ware pipes; makes dimensions and finish-whether they conform to IS specifications.
19. Testing of joints of water lines, sewers etc.
20. Whether tarred gasket of hemp yarn soaked in thick cement slurry used in joints of stone ware pipes.
21. Refilling of trenches of pipes –consolidation of earth.
22. Depth of channels and benching in manholes.
23. General quantity of work, lines, levels etc.
24. Earthwork in saturated soil—data regarding sub-soil water conditions.
25. Record of pumping hours when work done under water.
26. Record regarding use of water-proofing compound.

27. Tests; checking of inverts: checking of chokages: reduced flow etc.-checking of water-tightness of joints and manholes where work done under sub-soil water conditions.

XII GENERAL INFORMATIONS

Any major substitutions? whether substitutions worked to the advantage of contractor. Last running bill may be examined for this purpose.

1. Whether supervisory staff employed by the contractor as per terms of the contract.
2. Whether various items of the agreement overlap each other.
3. Whether all the provisions in various items(specially lump-sum items) of the contract kept is views, while executing the work.
4. Whether the progress of work as per time schedule laid down in clause 2; if not, the reasons therefor.
5. Any cracks noticed in slabs, beams, brickwork, plaster, flooring etc.

10. Common observations/ issues

SALIENT POINTS

Earth work

2.0 The earth work is normally classified as of ordinary-soil, hard-soil, soft-rock and hard-rock.The ordinary soil is a soft variety, whereas hard-soil, requires application of pick-axe, at close intervals. In a contract it was seen that the quality of excavation in hard-soil had unduly increased with a corresponding reduction in case of ordinary soil. However, no record was maintained to show how the classification of soil was done and by whom. This precaution of properly classifying soil is very much necessary as the contractors stand to gain when the soils are not properly classified.

2.1 In a work, most of the hard-rock obtained from excavation was paid as removed and disposed off. However, no record to indicate where and how much quality was disposed off was maintained. It was found out later that the contractor had installed a crusher very near the site where the rock in excavation was transported and rushed and the aggregate so obtained was utilized by the contractor in the work. The remedy in such matter would be that the site staff has to be vigilant. It should take necessary action to see that any rock which is paid as disposed off is really disposed off by the contractor and not mis-appropriated.

2.2 In one of the bridge works, it was seen that the area for sinking wells of 30 to 40 sq. m. was indicated in the schedule of quantities. In the actual contracts, the area was 25 to 30 sq. m. It is necessary that whenever any specific dimensions are mentioned, in the contract, agreement, all the supporting conditions should be in consonance with the contract conditions.

Cement Concrete Work

3.0 Cement concrete flooring as laid sounded hollow at corners and at junctions. Reasons for the hollow sound is obviously some portion of the flooring being separated out from its base.

3.1 In the case of RCC in cup-board, shelves, normally the underside is not finished smooth.

3.2 It was observed that bed block which were intended to be provided in the RC beam had width equal to that of the beam. This mistake indicate ignorance on the part of site staff in as much as there is no reason to provide bed block of equal width of the beam. The basic function of a bed block is to be spread the load from the beam over a large area of the masonry. With a bed block of width equal to that of the beam this basic function is vitiated.

3.3 Contract stipulated use of mechanical mixer and vibrator for the concrete work. There was no record to show that these plants were brought by the contractor at site and utilized for the work. Mechanically mixed concrete is much better than hand-mixed concrete. As such it is necessary that such stipulation of use of mechanical means for mixing and placement of concrete are insisted upon.

3.4 In a work, water for construction and chemical for anti-termite treatment was not tested. This is fraught with danger as water for construction might be absolutely unsuitable for concrete work and chemical might not be proper.

3.5 In the case of chajjas and other projecting structures, the projection provided for throating should be made in concrete. In place of making the projection in the concrete, the same was provided by plaster. Making throating by plaster will not be long-lasting and it is necessary that the throating is prepared in concrete itself while casting.

3.6 In the concrete, gravel/shingle was utilized in place crushed stone specified. A part from the strength characteristics, shingle requires less cement to be utilized in the concrete, compared to the crushed stone aggregate. This salient aspect was forgotten and the cement constants normally used for calculation of cement consumption in case of concrete with Crushed stone aggregate were also adopted in the case of concrete with shingle.

R.C.C. Work

4.0 It was observed that mild-steel railing in stair-case had been done by casting bottom end of the rod in a separate concrete block. There was no bond between the concrete block and the R stair-case; the stair case railing had separated out.

4.1 RCC beam was found to be sagging and the slope provided in the balcony was reverse.

4.2 The steel reinforcement for RCC column was not in proper position and the entire case work was found twisted and not equidistant from the shuttering surface.

4.3 It was observed that the RCC work had the following defects :

(1) The sections of the RCC were less when compared to the sections as indicated on the structural drawing.

(2) The cover on the reinforcement was not of uniform width.

(3) The shape of the beam with its junction with column was not of uniform shape and the junction point between the column and the beam was found to be hollow to a large extent and the reinforcement was exposed.

4.4 During detailed inspection of the work, it was seen that ground floor columns in the foundations below were not rendered. On an impression that these columns would not be seen, no proper shuttering was done.

4.5 Balcony parapet in the railings was not in line and levels and beams had bulged.

4.6 RCC water tank which is cast at site was not cast with outlet and drain pipe pieces. These pipes were being fixed at site later on, which would be a constant source of leakage and trouble.

4.7 In a foundation work, piles, were to be utilized and a record of the cement-concrete utilized individual pile wise was to be kept. Such record was not kept with the result that in many piles necking had occurred which could not be detected till the piles failed.

4.8 In the specifications for RCC work, centering to the lower slabs when upper slabs have to be cast was provided for. However, this condition was not adhered to in practice. This precaution is necessary especially when the lower slab on which centering / shuttering rests is not mature enough to take the load of the wet concrete shuttering / centering people working on the concrete job etc.

4.9 The support provided for centering / shuttering was short in length and smaller in diameter compared to the provisions made in the specifications. The RCC work requires intense supervision.

Brick Work

5.0 In a work, bricks were not tested for efflorescence test. Large amount of efflorescence action was noticed in the brick work. Efflorescence on a brick work can be harmful to the brick work as well as to the plaster work etc. on account of salt content, if action is not taken in right time.

5.1 The following defects were noticed in a work :

(1) Joints in the brick work were thicker than specified.

(2) Brick-course at the top of the plinth, cill and at the top of the wall below the roof slab were required to be set with brick on edge. This was not done.

(3) Raking of joints in brick work was not done properly.

(4) Joints in the brick work below the ground level were not finished flush as work proceeded.

(5) There were gaps between the door and window frames and the brick work.

The above defects indicate that much closer supervision is needed to be done when the brick work is in progress.

5.2 The half-brick work was required to be reinforced by hoop iron reinforcements. The same was not done. Un-reinforced half-brick wall can be utilized only upto certain dimensions, after which it requires to be reinforced. Hence non-reinforcing of the half-brick work is structurally incorrect.

5.3 In a brick work, the following defects are frequently noticed:

(1) The bricks used are of substandard quality.

(2) The mortar used in the brick work is not fully filled in the vertical joints.

(3) Mortar has not attained strength.

(4) Mortar for brick work is mixed manually in lieu of using a mechanical mixer as specified.

(5) Soaking of bricks in water is not done properly and water is only lightly sprinkled on stack of bricks.

(6) Efflorescence damage on the brick work is seen.

(7) Brick layers are not laid in level.

Stone Masonry

6.0 During examination of the contract, the following defects were seen :

(1) Joins in the stone masonry below the ground level were not finished flush as the work preceded. Many of the joints are left hollow.

(2) Percentage of chips utilized in the hearting of random rubble and course masonry was much in excess of those specified in the specifications. No attempt was made by the staff to regulate use of these chips.

(3) Joints on the face of the wall were much more than the maximum width of the joints specified in the contract.

(4) The joints of quoins and jamb were not dressed as specified.

(5) The bushing were much in excess of the allowable limit.

6.1 The surface undulations of the exposed face of chisel-dressed stone work in Plain Ashlar Cyclopean were more than the permissible limit of 1 mm. as specified in the agreement. It was stated by the site formation that with the workmen available, it was not possible to stick to the limit as specified in the agreement. Better way would have been prepare sample pieces of stone work and get it approved instead of embarking on a large scale stone dressing programer.

Wood Work

7.0 The thickness of the shutters provided for doors and windows was found to be generally less than specified.

opening out, sockets had not been provided for sliding and tower bolts. A gap existed between the window frame and the lintel soffit which was filed in by a plaster. Grills were not fitted properly in the wooden frame.

7.2 In a building under construction, the door frames had not been fixed earlier to the raising of the brick work. On account of this, it was observed that there were gaps upto 75 mm. width between door frame and the brick work. These gaps were filled up with brick bats and mortar which is not correct.

7.3 In one of the works inspected, it was found that the contractor had used some bad, knotty and rotting wooden planks for platform work and covered the defects up from vision with plank pieces from bottom nailed up. The departmental staff had not exercised thorough check up as the planking erected at site presented a good look on the top surface.

7.4 In the item of wood work shutters, it is normally specified that cleats and blocks which are utilized for keeping the shutter in position and for avoiding banging of shutter at the rear side on the wall are included in the rate. Therefore, if any other arrangement is utilized, necessary cost adjustment has to be made.

7.5 For the grill, M.S. bar with flat was specified. However, the welding was not proper and it looked rough and ugly. Excess weld were not removed.

7.6 In the case of flush door, it was seen that the core members were not bonded with synthetic resin and lipping as was mentioned in the agreement.

This is a case of improper and bad manufacture.

7.7 Tower bolts, bow-handles, peg-stays were found to be under-size. This is a defect, which arises out of improper purchase of fittings by the contractor for which prior approval of the sample by the engineer is the only remedy.

7.8 The contract stipulated that the timber required for the work shall be kiln-seasoned. During site examination, it was observed that neither the testing with regard to the moisture content had been carried out nor the site staff got a certificate from the seasoning kilns that seasoning of timber was done for the contract.

The availability of timber is very poor now-a-days. As such secondary species of timber are utilized. These timbers are not stable without proper seasoning. Hence, it is very much necessary that while utilizing these timber, proper care is taken.

7.9 Instead of 64 to 85 mesh per sq. in mesh wire gauge coarse wire-gauge of 48 meshes per sq. inches were utilised.

7.10 With the scarcity of good seasoned timer, secondary species timber is being used extensively. Specifications to the contract indicates that the timber should have specified moisture content.

In spite of very clear cut provision for moisture content of the timber, the site staff was not in possession of moisture meter for measuring moisture content. In many cases, the moisture metres were not in working order. Stipulation in a contract without proper machinery to get it executed and checked is of little use.

7.11 Sockets of Mortise plates were not provided where shoots of the board entered wood-work/brick work. The iron mongery was not oxidized even though specified.

Wire gauge fixed for wire-gauge shutters was not of the specified mesh.

Butt hinges were shorter in width and of thinner gauge.

It is very necessary that the fittings which are specified in the contract are duly approved before use. There are many types of fittings available in the market and due care by the site staff in selection of fittings in terms of contract is necessary.

7.12 In the doors, angle iron frames were utilized. This frames were out of plump by almost 1 cm. The steel frame being a thin member, it is necessary that due care is taken while fixing the same. If due care is not taken, the frame is likely to get out of shape and the door frame is likely to crack on this account.

7.13 Putty was not provided or was provided in patches while fixing glass. This gave rise to rattling of window panes. Detailed supervision is necessary.

7.14 The wire gauge shutters were stipulated. However, the wire gauge in the panels had not been fixed by way of double fold as required under the specifications. A single fold wire gauge is likely to come out when pressed.

7.15 In a work, cellular core flush door of 38 and 28 mm. thickness were to be provided for the cupboards. Before installation of these doors, necessary test according to Indian Standards was not carried out. During the test, the shutter failed in respect of adhesion test.

It is very much necessary that test to check whether the manufactured article conformed to relevant I.S. should be done before they are utilized.

Steel Work

8.0 It was observed that the grills were not of proper shaped uniform geometrical pattern. Proper welding was also not done.

8.1 Steel windows of standard sections were specified. The steel windows provided at site were of non-standard sections which were thinner than the requisite standard. Thinner sections of the leaf are likely to have lesser life when compared to thicker sections.

8.2 The contract indicated that the steel windows shall conform to IS-1038/1968. It was noticed that the IS provisions were not followed.

8.3 Hidden surface in steel trusses were not found to be painted before fabrication.

In the manufacture of the steel members, it is necessary that all surfaces are given a coat of paint before they are fabricated. It is impossible to paint these surfaces once the members are fabrication as the surfaces a butting each other cannot be painted later on. Painting of a steel surface is a Science by itself and knowledge has to be gained by the site-staff in understanding the intricacies of steel painting.

Flooring

9.0 The terrazzo-flooring, dado and skirting were not polished properly thereby giving a dull appearance. For polishing of the floors, the correct practice of using finer and finer grades of carborandom stones has to be followed with the repair of the surface. If the final surface contains many scratches, dust settles in these scratches and the entire appearance is dull.

9.1 The special type of acid-resisting flooring was specified. The tiles used in the flooring were found to be of interior quality and were functionally not suitable. Any specific requirement which is technically necessary is required to be carefully seen by the site-staff before executing work.

9.2 In the terrazzo-tile following, the abrasion value of the terrazzo tile was not found out. Abrasion resistance of a terrazzo tile floor is one of the important qualities expected.

Roof Work

10.0 The drip course in brick was found mostly broken and no throating was provided in the brick.

10.1 The following defects were noticed in A.C. sheet roofing:

(1) Old J-bolts were used instead of new ones.

(2) Bitumen washers used in the AC sheet roofing were of lesser diameter and J-washers were thinner.

(3) Holes in the AC sheets were punched instead of drilling.

Proper drilling of the AC sheets roofing has to be followed; otherwise leakages occur.

10.2 Rain water pipe in the iron rain water pipe joints, spun yarn soaked in bitumen were not used for jointing. This is likely to give rise to a defective joint. Lead caulked joints for these pipes lines were found to be deficient in lead. These defects require intense supervision.

10.3 The work consisted of providing water proofing with tarfelt.

During inspection it was observed that the felt was not properly embedded in the vertical walls. It was also not laid properly in rain water pipes / spouts and in many places the work done was not in one plane and lot of depressions were visible in which water could stagnate. As a result of these in spite of providing water-proofing layer, leakages were observed.

10.4 Water proofing felt is required to be properly inserted in a chase in the vertical face of the wall. This was not done in many places which resulted in a clear joint between the vertical face of the wall and the horizontal face of the roof. The water leakage is observed.

Proper attention to details is absolutely necessary.

10.5 Roofing provided was of mud phuska with broken tiles were utilized on the terrace thereby increasing the width of the joint and the number of joints. This is not a good practice and strict supervision is called for.

Painting

11.0 The following items are normally seen as not painted.

(1) Top and bottom edges of shutters;

(2) Fan hooks in ceiling;

(3) Rebuts in jointing and unexposed surface of beads in glozing.

(4) Wind ties. The surface of wood work are also not sand paper smooth before painting.

(5) General finish of the plaster work was poor and many columns and beams were not in line and level.

Road Work

12.0 During the inspection of a road work, it was seen that the cross sections for the original ground level were not plotted and whatever plotting was done was only in pencil. There was no level book

properly authorized and the note book which was being utilized for entering ground level was not authorized by the Executive Engineer. There were no level and alignment piers provided. The toe-line of the embankment was not marked properly.

12.1 In a road work, the overall thickness of the water-bound macadam including sub-base was less than the specified minimum thickness required for the work. Whenever thickness of the road crust is mentioned, it is very much necessary that this thickness of the road curst with the proper density is obtained. Otherwise, the road is likely to have a failure earlier than it would have been normally projected.

12.2 In a work of a water-bank macadam, without rolling the loose stone aggregate, the screenings were spread. It was also observed that specified number of rolling operations were not carried out even after application of screening.

12.3 In a water bound macadam layer, compacted thickness of water bound macadam layer was more than specified. This is indicative of insufficient compaction.

12.4 The pre-mixed carpet thickness is always indicated in the contract documents. For example, laying of 40 mm. thick pre-mix bitumen on concrete road. The site-examination revealed that the thickness was less at many place thereby indicating that proper care was not taken to find out the extent of compression which occurs when the bitumen carpet is rolled. It shows how a contractor can derive undue benefit by providing substandard work.

12.5 In a case of road-work, were dense asphalt concrete was specified to be used as a wearing course, the mix was designed. The bitumen / asphalt percentage was expected to be 5% of the total weight of the mix. The India Road Congress Code allows for 0.3 variation in the percentage of asphalt on account of variation in the mixing process and laying process. The contractor had, however, adjusted the mix at 5(-) 0.3 = 4.7 in the mechanical plant; thereafter at site when the mix was checked, it was found that it contained asphalt content of 4.1% or 4.2%. The contractor intended to get substantial benefit by way of less use of asphalt.

12.6 During inspection of work, it was observed that there were no alignment or control line pillar for the bridge as well as for the well foundations under sinking.

The gauge marks on the well foundations were not properly marked nor were they visible. Improper gauge marks will lead to inaccurate assessment of tilt and shift of the well. The earth work which was carried out for excavation in placing of well kerb was placed from cross-sections, which contained usual position of wells. Whenever cross sections of earth work is the basis of payment, it is necessary that the records are properly made.

12.7 In the case of road work, the materials were not tested for impact value and flakiness index. These

are very important tests for any aggregate which is utilized in a road work.

12.8 Sometimes the contract provides for the arrangement of bitumen to be made by the contractor directly from various stockiest / suppliers. In a number of cases fictitious vouchers are produced for purchase of the bitumen. In many cases vouchers are not produced. This indicates laxity on the part of the site staff.

Water Supply / Plumbing / Sanitary Work

13.0 The following defects were noticed:-

(1) Clamps for fixing pipes are under-weight.

(2) Lead connections of wash-basins were under-weight.

(3) Less quantity of pig-lead utilized in the joints of pipes. Salt-glazed stone ware pipes were not of class A' or 'AA' as needed.

(4) Ball valves provided are under-weight.

(5) Mosquito proof coupling are not provided to overflow pipe.

(6) G.I. pipe utilized are of light grade or off grade.

(7) Soil waste, vent pipes are not fixed with holder bat clamps.

(8) Bib-cocks and stop-cocks are under-weight

(9) Cowls are simply placed over vent pipes and they are not jointed.

13.1 Holder-bat clamps were not provided for fittings and where these were provided, they were not of proper weight.

G.I. pipe lines were not provided with unions near stop-cocks.

The shower rose provided were of sheet brass instead of cost-brass heavy pattern.

G.I. pipes were not tested.

Cement mortar was not provided upto full depth in joints or pipes and fittings.

Concrete for fixing gully trap was less in depth.

13.2 For proper function of the floor trap, a seal of water not less than 50 mm. is stipulated. In many cases, of the floor traps, such seal was not checked before installation. As such many fittings with 0 to 10 mm. seal were seen.

13.3 Gutties and plugs fixed to the wall were not set in mortar although specified. This makes the gutties shaky in course of time. Proper size of the gutties and the shape of the gutties was also not insisted upon. This defect indicates incompetent supervision.

13.4 Water from over-flow of the tank was not properly led to the outlet. As such it had damaged the water proofing treatment. It had further caused seepage from the underside of the roof slab on the top floor.

Do's and Don'ts for Field Engineers

Sub Head	DO's	Don'ts
1.0	**FOUNDATION AND EARTHWORK:**	
1.1	Have a permanent Bench mark at site w.r.t. G.T.S.	
1.2	Record Initial Ground levels w.r.t. G.T.S.	
1.3	Level plan to be acknowledged by contractor and E.E.	Do not test check levels jointly.
1.4	Stack, earth minimum 1 M or ½ of depth of foundation away from trench whichever is more.	
1.5	Before actual execution, make trial pits to ensure that roughly soil condition compares with soil investigation report.	
1.6	Check water table & compare with soil investigation report and in case of difference, take advice of Designer.	
1.7	Transfer level to trench bottom.	
1.8	Walk through trench before laying lean concrete to detect weak pockets.	
1.9	Do not change depth of excavation on your own. In case of abnormal situation, refer to structural Engineer.	
1.10	Decide soil classification before measurement.	Do not allow contractor to take away ordinary rock from site of his own. Do not resort to blasting in habituated area.
1.11	Do prepare lead chart for borrowing/disposal of earth.	Do not forget to take levels of place where earth is disposed.
1.12	Payment for disposed earth to be made with levels only restricted to lower of the quantity as assessed from excavation and from place where earth is disposed. Overall requirement/disposal of earth in a pocket to be reviewed by S.E.	Do not forget to deduct voids before making paying payment for supply of earth. Do not make payment for earth work by truck load measurements.
1.13	Keep minimum depth of excavation from Ground level as per structural drawing.	

1.14	Filling inside and outside to be done simultaneously.	Do not fill plinth till outside filled up to finish ground level approximately.
1.15	Fill loose pocket/extra excavation done by mistake with lean concrete only.	
1.16	Do full course antitermite treatment.	Do not do part operation.
1.17	For deep excavation, cutting slopes/benching to be got approved from S.E.	
1.18	Record water table before dewatering and get acknowledgment from the contractor on M.B.	
1.19	For earth filling in pond, adopt only stack measurement with 20% void deduction.	
1.20	Maintenance proper account of receipt and issue of the materials like hard rock.	
1.21	To ensure refilling in proper layers, mark layers depth on foundation wall and ensure filling for full block upto one level. Mark first and then for 2^{nd}, 3^{rd} and so on after previous layer is properly watered and compacted.	Do not resort to RIS for filling specially under floors. Do not keep flooring over soft rock filling/or organic material, building rubbish filling.
1.22	In sloping ground keep horizontal distance between two footings equal to twice the level difference. For wall along the slope, keep overlap of 3 cm.	
	PILE FOUNDATION:	
1.23	For pile work, do all work with reduced levels w.r.t. cut off level.	
1.24	Pile register to give details of size, Bulb, length water table, mix, slump, actual cement consumption for each pile.	
1.25	In case of controlled concrete, get the mix design done from reputed lab.	Do not forget to test subsoil water and earth for SO3. Do not change pile length at site due to filling. Structural drawing must indicate final length below cut off level.
1.26	Remove top loose concrete, Anchor 5cm in the cap/grade beam.	Do not cut reinforcement for routine load test.
1.27	Take one cube set for reach 5 Cum.	
1.28	Have proper control on slump.	
1.29	Must use Tremie if concreting done under sub-soil water.	
	RCC STRIP FOUNDATION:	
1.30	Take care of proper cover and side shuttering.	

	BRICK FOUNDATION:	
1.31	For brick work, refer subhead brick work.	
2.0	**CONCRETE:**	
2.1	Stack OPC/PPC cement separately and keep separate accounts.	
2.2	Cement bag not to weigh less than 49 Kg.	
2.3	Check quality and grading of coarse aggregates (deleterious material limit 5%) after blending aggregates of different gauges in proper proportion.	
2.4	Check silt content (Permissible 8%) and grading zone for sand.	
2.5	Screen the sand for earth lump.	
2.6	Use only hopper mixture.	Do not use lean concrete with brick ballast in depressed portion of floors of upper floors.
2.7	Use only Standard measuring boxed of size 40*35*25 cm.	Do not use excessive course sand to cover up improper grading.
2.8	Keep mixing time 1 ½ to 2 minutes.	
2.9	Have proper container for measuring water.	
2.10	Flooring or masonary on concrete should be started only after 48 hours.	
2.11	Repair honey combing immediately when the concrete is green.	Do not use extra mortar on concrete surface.
2.12	Use icon rammer of proper weight (5 Kg.) for compaction of lean concrete.	
3.0	**FORM WORK:**	
3.1	Check verticality.	Do not allow height of centring, shuttering in colur more than 1.5m for one casting.
3.2	Check location of steel and cover for columns use 4X4cm cover blocks of same mortar mix as concrete.	
3.3	Check spacing 1.2 meter maximum.	Do not use inclined props .

3.4	Check centring, shuttering for rigidity by providing diagonal and horizontal bracing.	Do not allow casting of floor slab without approval centring and shuttering by Executive Engineer.
3.5	Brick pillar to be in Mud mortar.	Do not support props over dry brick pillar. No brick pillar is to be of height more than 40 cm.
3.6	Use double wedges below props	
3.7	Double height centring/shuttering to be approved by engineer - charge	
3.8	Check level of shuttering with levelling instrument. Poor lines & level of shuttering is bound to spoil RCC.	Do not cut bearing plaster to accommodate shuttering plate. The bearing plaster has to be in Cement Mortar 1:3, curved for 3 days and has to have thick coat of line wash over neat cement punning. Do not remove shuttering before 7 days if slab span is upto 4.5 m and before 14 days if more than 4.5 m.
3.9	Ensure, drawing indicates proper depression for sunken portion.	Do not forget to provide level difference for depressed RCC portion.
3.10	For beam, support side shuttering on bottom place.	Do not remove shuttering before 14 days if span is upto 6m and after 21 days if span is upto 9M & for higher span than 9M, 28 days for beams. Do not remove shuttering for cantilever before counter weight is there.
3.11	Provide additional stripping time for shuttering if PPC is used	
3.12	Support lower floor before concreting on upper floor.	Do not use undulated/damaged plates.

3.13	For beams & cantilever, support lower two floors.	Check and then apply proper shuttering oil after cleaning the shuttering place for each use.
3.14	Take extra care for shutter finish shuttering in respect of water tightness, surface pattern and stiffness.	Do not accept shutter finish shuttering at reduced rate, either it is shutter finish or ordinary.
4.0	**STEEL REINFORCEMENT:**	
4.1	Ensure structural drawing signed by competent authority.	Do not forget to provide proper chair specially for cantilever.
4.2	Check reinforcement as per structural drawing.	Do not forget to check continuity of reinforcement at L & T sections as well as over opening for lintel bands.
4.3	Use spacers where more than one layer bars or where reinforcement is congested.	Do not leave reinforcement short of support.
4.4	Stagger laps.	Do not forget to leave dowels for railing in balcony and waist slab/landing.
4.5	Put proper cover blocks.	Do not provide stirrups/rings of improper size reducing cover.
4.6	Record measurements in MB before allowing concreting.	
4.7	Check lap length which is different for different mix.	Do not forget to check that all column reinforcement bars are projecting at different level as required.
4.8	Bars to be cleaned of rust before putting in position.	No bar to be used if section reduced due to rust.
5.0	**R.C.C.**	
5.1	Materials – Refer to subhead “Concrete”.	Do not use sand falling in zone IV & V. Do not use old cement.
5.2	Ensure structural drawing signed by competent authority and numbered.	

5.3	Considering weather and nature of work, use minimum water.	
5.4	Concrete to be properly vibrated.	
5.5	Use slump: Beams, slabs, column – 25 to 40 mm). Raft - 10 to 25mm) Try to have Piles - 150 to 200mm) minimum slump.	
5.6	To have proper control on cement/water ratio, identity one person of the contractor to control mixed permanently for project life.	
5.7	Use water with PH value 6 to 8. In case of excessive alkalinity compare 28 days strength on cubes cast with distilled water & those cast with water used in the work and difference not to be more than 10%.	Do not use water having chloride and sulphates. Do not add acid to naturalise alkalinity of water for use in RCC work.
5.8	To avoid labour movement directly over reinforcement, provide Jalies supported over angle iron chairs.	
5.9	Ensure proper depth of concrete with depth gauge.	Do not keep time lag more than 30 minutes between final vibration of concrete and its initial mixing.
5.10	Leave holes for services before casting of R.C.C. to avoid cutting of reinforcement and R.C.C.	Do not cast column upto beam level. Leave it 45 cm below soffit of beam and cast with the beam only.
5.11	Provide proper construction joint as given in C.P.W.D. specification.	Do not forget to ensure trowel finishing of RCC slab on top.
5.12	For vertical joints slurry is to be applied on the surface. For horizontal joints the surface shall be covered with a layer of mortar 10 to 15 mm thick of the same ratio as of concrete.	Do not forget to ensure trowel finishing of RCC slab on top.
5.13	Put date of casting to ensure that the curing is started within 24 hours after casting of the slab and surface is kept wet atleast or 10 days.	Do not provide box type fan clamp for Roof slab. Use M.S. fan book and not Tor steel hook.
5.14	Repair honey-combing immediately after removal of form work.	
5.15	Ensure hacking (depth 3mm) immediately after removal of form work.	
5.16	Check the quality of concrete by hammering. In case of double of strength, take core.	

5.17	Ensure number of CC cubes required with reference to quantity of R.C.C. done.	28 days test to bd got done from the same Lab where 7 days test got done.
5.18	Cubes should bear name of work, mix, date, block and signature of JE/AE taking the cube	
5.19	Check bearing of lintels at ends.	Do not provide bearing of lintels less than 15 cm.
5.20	If sulphate is there in sub-soil water and earth, take specific design from designers for the foundation.	
5.21	For precast members do mark top and bottom surface.	
6.0	**BRICK WORK**	
6.1	Check, if mandatory tests like compression strength, water absorption, size and efflorescence done for bricks.	
6.2	Ensure Brick work in horizontal layers/even thickness of joints. Check distribution of courses done on a vertical plane with measuring rod (Kainda).	Do not allow out of plumb Brick if more than 6mm in 3meter height.
6.3	Soak bricks in plenty of water on previous evening for use next day.	Do not allow outer Brick work without external scaffolding.
6.4	Do check use of queen closer at junction of walls.	Do not allow toothing. Ensure brick work in full block at cut off levels like sill level and lintel level before further brick work is allowed. If necessary, provide stitching blocks at junctions at cut off levels during construction itself.
6.5	Check if joints staggered by 4 ½ " or not in case of half brick wall.	Do not leave vertical construction joint. Always rake back at 45 to have proper bond with subsequent Brick Work.
6.6	Check if size of opening for doors and windows is not excessive.	Do not fill excessive gap around door/window openings with cement mortar. Use micro concrete.

6.7	Put date to watch curing to be done for 7 days.	
6.8	Do not carry out more than 1M ht. of Brick work on a day.	
6.9	Do have Brick on edge in plinth, below RCC slab and top of parapet with proper Marucona.	Do not make cost adjustment of Marucona Alternatively provide Cement Concrete block.
6.10	Fil vertical joints with trowel.	Do not believe in grouting of vertical joints.
6.11	Use bed block under beams.	
6.12	Check mortar strength and filling of joints by scratching with sharp instrument like screw driver.	Do not mix brick stacks of different class designatiou. Stack them separately. Do not allow mortar mixing without Mechanical Mixer and proper plat form. Do not use tokries for measurement. Do not forget to get joints raked for 15 mm depth on both sides, when mortar is green.
6.13	Check specially cup board openings for trueness at right angles.	
6.14	At the end of day check that frog in brick work in top layer are not filled with mortar.	Do not use fallen mortar for joint filling. Take it to mixer & use after mixing adequate quantity of cement. For balcony railing in half brick wall do not forget to provide vertical RCC posts with horizontal RCC band.
6.15	Check bearing plaster done or not before centering, shuttering is started.	
6.16	Height of brick masonary in foundation should be measured @ 15 cm. for 2 bricks height and difference, if any, w.r.t. structural drawing should be accounted for in 230 mm brick wall (Top courses).	Do not join yard wall with main load bearing wall. Do not raise partition wall beyond lintel level till roof is cast.

6.17	Check provision of expansion joint before start of brick work.	Do not provide expansion joint from lean concrete level. It is required from ground level.
6.18	Allow filling of scaffolding holes with properly soaked bricks buttered with mortar on all four faces only.	Do not leave scaffolding holes in stretcher courses. Keep their numbers minimum. Do not allow horizontal chasing in load bearing walls for series for more than 60 cm.
7.0	**STONE MASONARY:**	
7.1	Wet stone before use.	
7.2	Mark bond stone for identification.	Do not forget to provide bond stone whether it is R.R. masonary or course rubble masonary.
7.3	Overlap bond stone by 15cm if wall thickness is more than 60 cm and bond stone of full length is not available.	
7.4	Ensure proper curing of masonary for 7 days.	Do not forget to put construction date.
7.5	Fill scaffolding holes with Cement Concrete 1:3:6.	
7.6	Ensure overlapping of stones for braking joints.	Do not rack joints of pointing is not be done and finish joints flush.
7.7	Use chips for levelling in joints.	Do not allow use of more than 20% chipping.
7.8	Size of stone used should be with length not less than 3 times heights and Breadth on base should not be more than 3/4th of wall thickness or less than 15 cm.	Do not allow use with bushing more than 4 cm.
7.9	Pointing should be along the mortar joint and not over the stone.	
8.0	**WOOD WORK:**	
8.1	Check wood for sap, moisture content and excessive knots/size of knots/quality of knots.	

8.2	Check joinery w.r.t. drawing for dimensions and joints.	Do not accept readymade shutters form other than approved firms.
8.3	In toilet and bath provide only one tower bold at mid height of door on inside surface.	Do not provide tower bolt inside of kitchen door.
8.4	For aluminium fittings use C.P. brass screws and check fittings for proper anodising.	Do not hammer screws.
8.5	Check size of wire and mesh number for jail shutters. It is galvanised 85G and of dia 0.56 mm?	
8.6	Wire mesh to be folded under beading.	
8.7	Wire mesh jail to be tight fixed.	
8.8	Use only I.SI. mark door hinges.	
8.9	Mortice and tenon joints in wood work should fit in fully and accurately.	Do not allow painting on wood work till it is approved by the competent authority.
8.10	Tenon should pass atleast three-fourth of the style.	Do not allow wedging or filling in joints.
8.11	Ensure that the joints are glued and put together and pinned with hard wood or bamboo pin.	Do not use nail for joints.
8.12	Members of doors and window shutters should be straight without any warp.	Do not allow use of unseasoned timber.
	FLUSH DOOR SHUTTERS:	
8.13	Accept only I.S.I. mark shutters.	Do not forget to take purchase vouchers (challans).
8.14	Collect samples for testing from the lots as per I.S.I. Code No. 2202.	Do not apply primer on the corners where I.S.I. stamp is fixed.
8.15	If I.S.I. mark sample fails report to Director (marking), B.I.S. through RAD with purchase vouchers and test results besides rejecting the lot.	Do not cut shutter to match with frame cut frame to match with the shutter.
9.0	**STEEL WORK:**	
9.1	Prepare drawing for openings in Brick work for Doors/windows.	Do not fill excessive gap with mortar. Use micro concrete.
9.2	Ensure welding for full contact length.	Do not forget to get grinded all excess welds including

		sharp edges/projections of welding. Do not ignore line and levels of grill members.
9.3	Use of approved primer on steel work (red oxide zinc chromate).	Do not apply primer on rusted surface without proper cleaning.
9.4	Doors/Windows along column to be fixed with rawl plugs.	Do not cut column/RCC member to accommodate hold fast.
9.5	Check fixing of window/s/doors at top and bottom as required under specifications.	
9.6	Use only I.S.I. mark sections for window and doors frames.	
9.7	Do check that doors and windows fabrication is at true right angles.	Do not break tie of door frames to accommodate level.
9.8	Ensure proper thickness of glass panes depending upon size of opening	
9.9	Ensure welding of hinges for full length unless specified otherwise.	
9.10	Ensure grill welding for full contact length.	
9.11	Make payment for M.S. grill for lesser of two weight i.e. theoretical and actual.	
9.12	For running meter items of stair case/balcony railings do compare it with approved drawing/nomenclature meticulously.	Do not use item of window grill for payment to Railing.
9.13	Ensure brass striking lock plate in window sections.	
9.14	Check for window shutters, if provided with projecting hinges or not. The hinge pin should be of galvanised steel.	Do not accept wort at reduced rates if hinge pin is not electro galvanised.
9.15	Check sizes and thickness of hold fast and their number required as per specifications.	
9.16	Check length, weight of stays and handles.	Do not forget to check location of holes in stay w.r.t. locking bracket/pin so that full window shutter can be

		opened and locked in that position.
9.17	Check all door and windows for proper closing and locking.	Do not assume that putty is substitute for fixing clips. Both are must.
9.18	Railing height of staircase should be one metre uniformly.	Do not forget to paint putty within 2-3 days of fixing to avoid cracking.
9.19	Ensure that steel sections sash bars are connected properly to the styles by making a slot and thereafter welding.	Do not propose deduction for common blocks for two hold fast.
	PRESSED STEEL DOOR FRAME:	
9.20	Check thickness and quality of M.S. sheet conforming to I.S. 226.	Do not forget to provide base tie. Do not forget to check frame for trueness of right angles by diagonal measurements.
9.21	Ensure that mortar guards, lock strike plate and shock absorber are provided as per sketch given in CPWD specification (Fig. 47).	Do not make extra payment for mortar guards, lock strike place, shock absorber.
9.22	Ensure that surface is thoroughly cleaned before applying primer.	Do not forget proper concreting in frames in yards itself before fixing but after priming on all faces i/c internal face.
9.23	Check the filling of frames with concrete by tamping.	
	ROLLING SHTUTTERS:	
9.24	Check the dimension of all components of rolling shutter conforming to I.S. 6341	Do not forget to ensure primer application before fixing of shutters.
9.25	Check the quality of spring tested for tensile strength.	Do not forget to check shutters for smooth closing/opening.
9.26	Check the quality and make of Ball bearing.	

	DOOR/WINDOW FITTING:	
9.27	Use only I.S.I. mark fittings.	
10.0	**FLOORING:**	
10.1	Check compaction of subgrade, sand filling and lean concrete.	
10.2	Check slope and levels of subgrade of wet areas/balcony to achieve tuck of 15mm after final finish.	Do not forget to provide 15 mm tuck for wet areas.
10.3	Provide vertical D.P.C. for excessive drops in floor finish.	Do not provide Ground Floor flooring higher than D.P.C. level.
10.4	Check level of glass strips for proper floor levels.	Do not provide cross at junction of glass strips. Provide T junctions.
10.5	For Cement Concrete flooring start finishing with neat cement immediately after proper beating of concrete and allowing moisture to disappear from surface.	Never put mortar to cover honey combing and to absorb excess moisture.
10.6	Ensure curing for 10 days by ponding.	Do not start flooring till all traps are slugged.
10.7	Cement concrete flooring to be laid in alternate panel, if separating strips not allowed.	Do not exceed size of panel more than 2 sq. mtr.
10.8	Use thick slurry before laying the flooring on R.C.C. slab after cleaning the surface property.	Do not forget to clean R.C.C. surface with wire brushes of all loose mortar/dropping etc. For dado do not forget to prepare surface as mentioned under glazed tile dado. Keep water cement ratio minimum to avoid shrinkage cracks and keep surface wet for 10 days minimum.
	TERRAZO FLOORING:	
10.9	For laying under layer of specified mix and thickness refer sub-head cement concrete flooring, which should be roughened with wire brushes and allowed to harden.	Do not delay laying of topping beyond 24 hours after laying of under layers.

10.10	Ensure that the proportion of the marble chips to binder mix is as specified.	Do not use marble chips of size more than 75% thickness of terrazzo topping.
10.11	Wash marble chips before use.	
10.12	Ensure mix of cement and marble powder in proportion of 3:1 weight.	
10.13	Use minimum water for topping mix. For smooth surface have better tapping than adding more water.	
10.14	Cement to be used for terrazzo flooring should be stacked separately for having uniform colour.	Do not cast part flooring of any room on a day to avoid colour change in flooring.
10.15	Ensure first grinding with machine after 36 hours of laying of terrazzo toping with 60 No:carborandum stone.	Do not keep the traps open when grinding is in progress.
10.16	Start second grinding after curing 5 to 7 days with carborandum stone 120 No. and cure again for 3 to 5 days after proper repairing.	Do not forget to do handgrinding of skirting just after 24 hours of laying. So put dates.
10.17	Do final grinding with 320 No. carborandum stone, and finally use oxalic acid @ 33 gm/m2 diluted with water and rubbed hard with Namdah blocks (pad of wooden rags).	Do not use more than 6mm terrazzo topping where hand grinding is to be done.
	TERRAZO SKIRTING:	
10.18	Ensure that skirting and dado properly finished with smooth surface.	Do not forget rounding of junction of floor and skirting.
10.19	The under layer should be made rough with a scratching tool to form a key for terrazo layer which should be applied after 24 hours of 1st layer.	Do not accept architects view not to provide skirting on upper floors. Insist for it. In case of difference, take decision of Chief- Engineer.
10.20	Use glass strips in terrazzo plaster in toilet kitchen and W.C.	Do not use forested glass strips.
	TERRAZO TILE FLOORING	
10.21	Terrazo tiles shall conform to IS:1237.	Do not forget to get to get tiles tested for water absorption transverse strength and .....
10.22	Tiles fixed in floor adjoining the wall shall enter 12mm under the plaster/ skirting dado.	Do not break tiles, get them sawn for cut tiles.

10.23	Do clear joints of excess mortar / slurry after tiles are fixed.	Do not keep thick joints. Keep it minimum but not more than 1.5mm. Do not forget to lay honey like consistency cement slurry over base mortar for fixing of terrazo tile and tamping it with wooden mellet.
	GLAZED TILE DADO	
10.24	Check quality and thickness of tiles as specified.	
10.25	Ensure that joints of masonary are raked to a depth of 15mm while masonaryis being laid. In case of concrete the surface shall be roughened with wire brushes.	
10.26	Ensure that surface is thoroughly cleaned and washed with water and should be kept wet.	
10.27	Provide under layer cement mortar plaster as specified which shall be roughenedwith wire brushes.	Time lag between under – layer and tile laying should not be more than 24 hours.
10.28	Soak the tiles in water/ washed cleaned and coat of cement slurry applied liberally at the back of tiles and set in bedding mortar at the time of fixing.	Do not forget to use tiles with chamfered edges at projecting concerns.
10.29	The tiles joint should be butt joint.	Don't provided thick joints.
10.30	Skirting and dodo shall rest on top of flooring in Ground Floor and on skirting on upper floors.	
10.31	Fill the joints with white cement on pigment as required.	Do not fix cut tiles is top layer and at projecting edges. Do not forget to check tiles id sounding hollow.
10.32	Check if tiles fixed are in one plane or not.	Do not forget to check tiles if sounding hollow.
	KOTA STONE FLOORING	
10.33	The thickness of stone shall be as specified.	Don't accept stone with tolerance beyond # 2mm in thickness and # 5mm in respect of length and breadth.
10.34	Stones of varying thickness should not be put togetter	

	RED SAND STONE FLOORING	
10.35	Thickness of slab shall be as specified.	Don't accept stone with tolerance beyond #3% in thickness
10.36	Check quality and classification. Tolerance in thickness allowed is = 2mm.	Do not confuse Raj Nagar Stone with Makrana stone.
11.00	**ROOFING:**	
11.1	Prepare mud phaska slope plan approved by Executive Engineer and keep a copy of it at site (slpe allowed 1:48)	
11.2	After proper painting of roof with bitumen provide 400 micron P.V.C. sheet 1M X 1M for khurra at R.W.P. location extending upto R.C.C. slab edge.	Do not raise parapet before laying khurra concrete. Do not accept P.V.C. sheet of lesser thickness. Do not accept 2 or 3 numbers of thinner P.V.C. sheet.
11.3	Provide Cement Concrete flooring under water tanks.	
11.4	Tile should over lapkhurra concrete coping over parapet. Keep coping sloping towards roof.	
11.5	Provide Cement Concrete coping over parapet. Keep coping sloping towards roof.	Do not provide thick mortar over Cement Concrete coping.
11.6	Check R.W.P. out let mouth level w.r.t. to khurra level.	Do not provide use of departmentally issued S.C.I. pipe for R.W.P.
11.7	Keep tile joints thickness 6 mm to 12 mm. Thinner joints and wider joints both are unacceptable	Avoid use of broken tiles.
11.8	The brick tiles/Mud phuska should go right upto parapet wall and gola should come over that.	Do not forget to provide bhusa @ 35 kg. M3 of soil in mud.
11.9	Provide mud phuska and gola in area around water tanks before casting tank beams/slab.	
11.10	Do rendering of tank supporting beams at bottom.	In case of precast beams do not forget to mark top and bottom of beam.

11.11	R.W.P. shoe should not be left much above the pavement level. It should just touch it.	Do not confuse R.W.P. clamp with M.S. holder bat clamps for S.C.I. pipe. Do not render RCC water tank.
11.12	Use only ISI mark AC Rain water pipe and specials conforming to I.S.S. (ISI marked AC pipes are available in plenty in market).	
11.13	Add water proofing compound ISI mark 2% by weight in cement mortar for grouting.	
11.14	Plaster gola simultaneously with parapet plaster.	Do not forget to cut chase of proper size for gola. Do not forget to provide Expansion joints in Gola and parapet coping and its filling with bitumen filler.
11.15	Check hardness of brick tile Grouted joints with screw Driver.	
11.16	Check that all the Brick tiles are fully clear of dead mortar etc.	
12.0	**FINISHING:**	
	PLASTERING:	
12.1	Prepare the surface by brushing with wire brushes to remove all dead and loose mortar after cutting superfluous projections. Remove all efflorescence by dry brushing or proper treatment.	Do not plaster till all conduiting and electrical piping is done. Do not allow for plastering till all doors, windows R.C.C. jail ventilators re fixed.
12.2	Do profuse watering of the surface after it is ensured that all defects of Brick Work and Cement Concrete/R.C.C. have been properly rectified.	Do not forget that Pre-curing is as important as post curing.
12.3	Line and levels in plaster are very important.	
12.4	Put (15 cum x 15cm)bunda at every 2M (Horizontally and vertically) to serve as gauges.	

12.5	Start with ceiling plaster first.	Do not do ceiling plaster till next floors slab is cast.
12.6	Provide uniform Groove at junctions of wall plaster and ceiling plaster.	Do not do ceiling of top roof till terracing is completed.
12.7	Avoid excessive trowelling.	Do not leave jambs, soffits for plaster, later on. These have to be plastered alongwith wall for proper curing and strength.
12.8	At the end of days work leave plaster on the body of wall and not on corners.	
12.9	To avoid leakages do not leave horizontal joint on parapet wall tops.	Do not leave plaster in patches. It creates weak spots/shaby appearance.
12.10	Provide vertical groove where R.C.C. column and Concrete Wall abut the Brick work.	
12.11	Use 2.5 M long aluminium straightedge and plumb bob to check verticality and eveness of surface frequently.	Do not forget to check soffit level of various doors and windows opening in a room. These should be at same level.
12.12	Put date of plastering to ensure 7 days curing.	Do not forget to start curing just after 24 hours of hardening of plaster surface.
12.13	Check openings specially cupboards for finishing at right angles.	Do not allow plaster to get dry during curing period.
12.14	For R.C.C. Projections provide proper moulding /drip.	Do not accept work with groove. Drip is must
12.15	For rough cast plaster, the under layer must be kept rough for proper bonding and kept wet before top layer is applied.	Do not give a gap of more than 2 days between under layer and top layer.
12.16	Sample of rough cast plaster must be approved by Superintending Engineer before further work is taken up.	
12.17	While doing external plaster ensure that upper and lower plaster at D.P.C. level is separated as per Engineer Member circular No. 339.	Do not plaster D.P.C. let it remain in groove or projected.
12.18	Plaster below D.P.C. to ben in CM 1:4 (1 Cement: 4 Coarse sand).	Do not forget to take plaster 5cm. below plinth protection.

12.19	Any plaster more than 15mm thick to be done in 2 layers.	
	WHITE WASHING:	
12.20	Use 40 gm of gum dissolved in hot water for 10dm^{3}of slake lime, 3 gm of Indigo per Kg. of lime and water @ 5 litre per Kilogram of lime.	Do not forget to screen the lime before use.
12.21	One coat means brush applied from top down wards, bottom up wards left to right and right to left.	Do not apply second coat till first coat is dry.
	CEMENT PAINT:	
12.22	Use only ISI mark cement paint.	
12.23	Wet the surface after cleaning of any algae formation, grease, other foreign matter and loose mortar drippings dust etc.	
12.24	Mixing of cement paint to be done in two stages. First mix two parts of cement paint and one part of water.	Do not add water to cement paint but add cement paint to water.
12.25	Stir thoroughly and allow to stand for 5 minutes. In 2and stage add one part water & sir thoroughly to obtain the mix 1:1 (1 Cement paint 1 Water).	Do not use mix after one hour of mixing.
12.26	Water the surface at the end of days work.	Do not apply 2nd coat within 48 hours of 1st coat. Do not wet the previous surface for 2nd coat/3rd coat.
12.27	Keep painted surface wet for 2-3 days. (Ist coat only).	Do not forget to keep account of cement paint.
12.28	Prefer application of cement paint is shadow.	Do not forget to clean glass panes on external faces of all paint droppings side by side because otherwise jhulla/scaffolding will be needed again for that.
12.29	Ensure application of paint on surfaces which are normally off the view like soffits, behind SCI/GI/RWP etc.	
12.30	All drips should be painted are per the colour scheme for vertical surface.	Do not agree for use for colour shades which are not in standard shade cards to avoid maintenance problems.
	PAINTS:	
12.31	Before application of primer see that surface is properly prepared. Check that all holes, cracks or other defects are properly filled and smoothened. All dust, scales, oil,	

	grease, moisture and loose particle should be removed and surface cleaned before application of primer.	
12.32	Use only ISI mark paint.	Do not forget to keep account of primer and paint. Do not remove empties from site without permission of Engineer-in-Charges. Do not forget that for steel work, zinc chromate red oxide primer is specified. Do not add thinner till prescribed by manufacturer.
12.33	Check application of each coat for uniformity of thickness.	No hair marks form brush or clogging of paints, puddles in corner of panels, angles of moulding etc. should be left.
12.34	The painted surface should be free form paint drips, waves and uniform in colour, texture and finish.	Do not paint on humid or on rainy days or when it is too cold.
12.35	Check application of paint on places that are difficult to reach such as edges, corners, crevices, welds, bolts and nuts, top and bottom edges of shutters.	
12.36	One coat of paint amounts to crossing and laying off.	Do not apply final coat of paint till final coat of snowcem/white washing done.
12.37	Clean all fitting/glass panes of paint marks.	
	STONE VENEERING (CLADDING):	
12.38	Check quality of stone. It should be free from cracks/decay weathering defects etc.	
12.39	Dressing of stone on exposed surface only.	Do not forget permissible tolerance is only +2mm in thickness.
12.40	Use cramps and pins as specified.	Do not use cramps and pins of metal prone to corrosion.
12.41	Use stone of length not less than $1^{1/2}$times height and width not less than 20 cm unless specified.	Do not use forget to wet stones before laying.
12.42	Provide uniform staggered joints. Provide horizontal angle iron support at soffit of all openings and at interval of	

	maximum 3.5M vertical. Backing of stone shall be carried out simultaneously with face work.	
	MISCELLANEOUS:	
12.43	Ensure that the expansion joint is clean and free form malba/dead mortar.	
12.44	Expansion joint should be covered at top with precast Cement Concrete slab, freely kept	Do not forget to cover expansion joint with rope while executingBrick work on Expansion joint.
12.45	Vertical faces expansion joint should be covered with one end fixed screws and other end with oval shape cut fitted with screws. Screws should be staggered.	
12.46	To have proper control, a sample that must be made ready in all respect and be got approved from Superintending Engineer/Chief Engineer to avoid repetition of mistake and to have proper quality control.	
13.0	**SANITARY WORK:**	
13.1	Get drawing for plumbing system approved from Superintending Engineer and keep a copy at site.	
13.2	Plaster shaft surfaces before plumbing work in shafts.	Do not forget to plan drainage arrangement for shaft.
13.3	Check licenses of plumber and keep note of it.	Storm water should not go ni G.T. or manhole provided for sewerage.
13.4	Use only ISI mark SCI pipes and fittings. Match SCI fittings and pipes. They should confirm to same IS code	Do not use SCI pipes of dia less than75 mm.
13.5	Depressions in I. W.C. and bath/kitchen should be 500 and 300 mm respectively. All RCC work around depressed portion should be with RCC 1 1 ^{½}: 3. Depressions for EWC be kept 300 mm.	Do not forget to treat depressed portions as per circular No. 108(QCC). This treatment should be in two operations i.e. Ist for horizontal surface before piping and 2nd for vertical surface after piping and repairs of openings.
13.6	Get lead tested from each lot for purity before use. (Permissible 99.80% purity).	Do not use excess of yarn in joints to avoid use of lead in proper Quantity.
13.7	Prefer single stack system for economy.	Do not allow covering of joint under floors without smoke test.

13.8	Ensure that access doors are so located that they can be easily opened and closed.	Do not forget to check quantity of lead used w.r.t. theoretical requirement daily.
13.9	Floor trap used should be of self cleaning type.	Do not use constriction type floor trap.
13.10	Keep slope of 1 in 50 for “horizontal SCI pipes.”	Top of floor trap should not be more than 10 mm below finished floor level.
13.11	The fittings shall be as close as possible to the vertical stack.	
13.12	Avoid collar joints under floors.	Do not use floor traps with water seal less than required even at reduced rate.
13.13	Fix levels and positions of floor traps/P traps by laying false pipe line first as per Chief Engineer (QC) circular 108.	Do not forget to check that W.C. seat mouth has properly gone into P trap mouth. Keep record as per circular No. 289 of Engineer Member.
13.14	For vertical stacks prefer Y junctions to T or L junctions.	Do not fix holder bat clamps with brick bats/mortar.
13.15	For European seat socket of SCI bend should be above final finished floor level by about 40 mm.	
13.16	Use S.W. pipes of I.S.I. mark only.	
13.17	Check weight of G.T. cover and frame.	Do not forget that cover and frame to have specified weight separately.
13.18	Check weight of manhole cover and frame.	
13.19	Provide access door fitting before connecting to main stack to facilitate cleaning.	Do not forget to provide rubber insertion in access door.
13.20	All fittings M.S. stays and clamps should be got painted before fixing in position.	Do not forget to check height of stay and its fixing in concrete block.
13.21	The complete stack stack should be tested by smoke test and checked by Assistant Engineer/Executive Engineer. A record to be kept.	
13.22	Provide alternate items of C.I. and S.C.I. fittings and piper for internal; sanitary installations.	

14.0	**WATER SUPPLY LINES:**	
14.1	Check if plumber employed is licenced plumber or not.	Do not forget to keep note Licence No. of plumber.
14.2	Prepare plan for G.I. piping system and get approved from Superintending Engineer.	Do not forget to keep level of taps in W.C. bath and kitchen at specified heights as per sample flat.
14.3	Use only ISI mark fittings.	
14.4	Maintain proper line and levels for exposed G.I. pipe work.	Do not forget to paint fittings when used in painted lines. Do not cut horizontal chases in Brick work to accommodate G.I. line at one level for more than 60 cm. No chase in half Brick work.
14.5	Provide clamps at every 2.5 M for vertical and at 2 M for horizontal 15 mm dia G.I. piping on walls. For 20 mm dia pipes the spacings of camps shall be 3 M and 2.5 M respectively.	
14.6	Check the lines under required pressure before covering.	Do not forget to maintain proper record of testing.
14.7	Avoid joints in under floor piping.	
14.8	Check provision of union near every stop cock. Check overflow pipes and mosquito proof coupling provided in storage ranks and flushing cistern.	Do not cast overhead storagetanks on roof terrace.
14.11	Check provision of G.I. nipples at the time of casting RCC storage tanks.	Do not keep tanks empty. Do not accept repaired water tanks.

		Do not render water tank.
14.12	Check size of brackets for washbasin sink, and flushing cistern.	
14.13	Use only ISI mark wash basin, sink pan, cistern, Bib cocks, stop cocks, wheel valves etc.	
14.14	Check lead connections pipes PVC connections pipes for size and quality.	
14.15	Check weight and dimension of PCC water storage tanks as per IS code.	Do not forget to get it tested for conforming to IS code 12701.
	DOCUMENTATION:	
	Maintain following records at site: -	
1.	Copy of technical Sanction.	
2.	Copy of Soil Investigation Report.	
3.	Copy of Agreement.	
4.	Master Register duly issued by E.E. for mandatory tests and Cement account.	
5.	Pile Register.	
6.	Higher Officer's Inspection Register.	
7.	All approved structural and Architectural Drawings i.e. approved plinth levels. Walls with bricks of different compressive strength/mortar tobe distinctly coloured on plans.	
8.	Water sample test report. Repeat test every three months.	
10.	Shuttering approval Register.	
11.	Drg. Showing Door/Window openings to be left in Brick work.	
12.	Approved drawing for plumbing/G.I. network.	
13.	Approved service plans from local body.	
14.	Steel weight Register (actual).	
15.	W.C. joints checking Register (EM's circular 289).	

16.	M.A.S. register of materials like Aldrin. Paint. Primer, Water proofing cement paint, water proofing cement compound, Bitumen, Lead etc.	
17.	Site Order Book.	
18.	Hindrance Register.	
19.	Initial and Routine Load test register for piles.	
20.	For important projects, make micro film of the drawings and preserve them.	

Sub Head	DO's	Don'ts
1.0	**EXTERNAL WATER SUPPLY:**	
1.1	Check if scheme approved by local body if required	Do not take up work only with technically sanctioned estimate though T.S. is must.
1.2	Do keep a plan showing location of pipe to be laid w.r.t. 'its' depth & distance from permanent feature.	Do not forget to cut sufficient offset in excavation to receive the sockets.
1.3	Check license of plumber.	
1.4	Check if suitable cushion available or not, (60 cm on road berms & 120 cm on road).	Do not pass Water supply line through drain or sewage manhole with joints in sewer Storm Water line.
1.5	Check if suitable distance available between Water supply & Sewer Storm Water line.	For economy do not use CI pipe more than 450 mm -------- use PSC pipes.
1.6	Use only ISI mark pipes and fittings.	Do not forget to keep record of weight and dimensions fitting.
1.7	Take initial ground levels for proper execution control. Check pipes and fittings physically for visible defects, if any.	
1.8	Lead joints got done in presence of JE ------- and daily consumption record kept.	Do not forget to soak spun yarn in bitumen before use.
1.9	Check quality of lead as per IS: 782 for each lot.	Do not forget to make comparison with daily theorit---- requirement.
1.10	Check depth of lead joint with Kenda (Gauge).	
1.11	Fittings/specials should be provided simultaneously with laying of pipes.	Do not forget to lay concrete below SV/FH before their fixing as per fig. 91&92 of CPWD specification Vol. II.
1.12	Pipes to be laid in continuation, not patch laying.	
1.13	Water supply pipes should not be just slided in trench but should be lifted and lowered.	Do not forget to keep socket against direction of flow (water enters pipe through socketed end and goes through spigot end).
1.14	For PSC pipes use hydraulic jack for pushing pipes into socket with good quality tings.	Do not forget to test quality of rubber rings.

1.15	Provided proper thrust blocks at bends (ref. CPWD specification)	Do not forget to close open end of pipe at the end of days work.
1.16	Take precautions as per CPWD specification local body norms when pipes are laid below 4raods/culvers.	Do not forget to level the base when Water Supply line is laid in rocky strata.
1.17	Do check line under required pressure after back fill and leaving joints exposed.	Do not forget that pipe line has to be load true to line.
1.18	Do provide scour valve for scouring of pipe where needed.	Do not forget to disinfect the line before actual supply of water for drinking.
1.19	For Water Supply line to be laid under foul conditions follow special precautions given in CPWD specification	
1.20	Change in dia of pipe should be gradual and not abrupt.	
1.21	Top avoid accidents due to collapse of excavated trenches follow EM's circular No. 205.	
1.22	For under ground tanks provide fittings alongwith casting of R.C.C.	Do not forget to clean underground tank from tot time.
1.23	Provide air valve at highest point when there is change in gradient.	
2.0	**SEWARAGE:**	
2.1	Check if scheme approved local body if required	Do not take up work only with Technical sanction, though Technical sanction is must.
2.2	Check soil mechanics of the soil for deep sewers to decide mode of excavation.	Do not forget to get the excavation plan approved from S.E. Do not forget to provide barricading as per EM's circular 181 to avoid accidents. Do not forget to lay RCC pipes with ISI mark on top. Do not forget to get the quality of rubber rings tested Do not forget to take up the work from down stream end. Do not forget to excavate offsets to receive the sockets.
2.3	Use only ISI mark pipes.	

2.4	Use S & S. RCC pipes only.	
2.5	Check all levels w.r.t. G.T.S. only.	
2.6	Ensure all pipes having marking as peer IS-458.	
2.7	Construct masonary pillars away from the edge of excavation and parallel to the alignment as intervals of manholes with I.L. marked on their top.	
2.8	Ensure that the excavated earth is dumped away from the edge of the excavation, as approved by SE (minimum half of the depth away from the edge).	
2.9	Ensure that record of sub-soil water levers is maintained in M.B. for the purpose of making additional payments to the contractors for executing work under water, duly signed by AE/EE and contractor.	
2.10	For bigger pipes not bearing ISI mark, ensure tests are per IS-458.	
2.11	Decide use of NP-2/NP-3 pipe as per loading conditions.	Do not provide concrete encasement. Provide concrete cradle as per local body norm.
2.12	Ensure that construction of manhole is taken up simultaneously with the laying of RCC pipes.	Do not forget to fix foot rests alongwith brick work of manhole and embedded in Cement concrete block and painted.
2.13	Ensure that the pipe is provided upto full thickness of manhole wall.	Do not leave pipe projecting in the manhole.
2.14	Provide stone soling under bed concrete in poor soil/under S.S.W.L. as per MCD norms	
2.15	Ensure concrete core in manhole wall under SSWL and bottom slab RCC as per MCD norm.	
2.16	Provide Arch masonary over the pipe in circular manhole with C.M. 1:3.	Do not forget to plug open free end of pipe.
2.17	Test SFRC over to conform to IS- 12592 Pt, I	
2.18	Provide drop connection as per specification where the drop is more than 60 cm.	

2.19	Start back filling of the trenches as per CPWD specification, after the reach is completed, inspected and approved by the Department.	
2.20	Ensure testing of joints	
2.21	Ensure that the sewer line is not laid within the distance of 10mt. from the building in case of roads and in case of service lanes the sere line shall be laid in the centre of the road or in alignment as approved by local body	
2.22	Maintain proper record for disposal, of surplus excavated earth at specific disposal point (Lead chart and computation of quantity be done through levels duly checked by the AE/EE separately).	Do not make payment of disposal of earth on truck basis. It has to be based on levels taken at the point of excavation and disposal, whichever is less.
3.0	**STORM WATER DRAIN:**	
3.1	Check if the scheme is approved from local body	Do not take up the work without Technical Sanction.
3.2	Check all levels w.r.t. G.T.S. only.	
3.3	If local body approval differ from T/S take approval of T/S authority before execution. Construct Masonary pillars at an internal of 30 m or as required as per site condition with I.L. marked (written) on top parallel to the drain away from the edge of the excavation.	Do not make any change at site.
3.4	Take necessary precautions if electric cables, Water supply line, and sewer line passing through the drain. Consult design office.	
3.5	Ensure barricading	
3.6	Check that the section of drain wall & culvert as approved by Technical sanction authority.	Don't forget sot start the work from down stream end.
3.7	Provide proper staggered weep holes in drain walls as per design.	
3.8	Provide expansion joint in RCC & brick work as per design.	
3.9	Ensure RCC slab is supported on minimum 34.5 cm brick wall.	Do not forget to render bottom of RCC slab.
3.10	For cleaning, put precast slab in richer mix $1:1^{1/2}$: 3.	
3.11	Ensure brick on edge for top course of single brick wall.	

3.12	Provide footrest and manhole covers in covered drain as per local body norms	Don't forget to construct cunet in bigger drain or as specified in approval.
3.13	For storm water pipe drain follow specification as per Subhead- "Sewage".	Don't forget to get the design of chamber approved by Technical sanction authority and local body Don't forget that the minimum dia of R.C.C. pipe for S.W. drain is 300 mm as per local body norms.
3.14	Edges of concrete flooring should be rounded off with wall.	
3.15	Provide bearing poster where ever RCC slab is to be cast for covering of rain.	
3.16	Put separate item for flooring and not as "concrete in foundation". For neat cement finish, follow CC flooring details.	
3.17	For covering with RCC, put vertical centring and not cross ballies on the walls.	
4.0	**ROADS**	
4.1	**EMBANKMENT:**	
4.1.1	Record Initial G.L. with respect to G.T.S. duly test checked by A.E. & E.E. separately.	Do not forget to transfer B.M. with respect to G.T.S. at work site.
4.1.2	Get the L. Section/X-Section of proposed road approved by Technical Sanction Authority.	
4.1.3	In case of road in embankment fix pegs at 15 mtr. interval to indicate the limits of side slope.	Do not forget to roll and water the ground before filling after removing stumps, roots etc.
4.1.4	Fill the earth in 20 cm. layers and consolidate with roller as per item.	Where road is in cutting. Do not forget to construct side drain simultaneously.
4.1.5	Ensure that material used for filling is earth, moorum and gravel or a mixture of these.	Avoid expansive clay in filling.
4.1.6	Soil shall have dry lab density under OMC not less than 1.44 gm/CC for embankment upto 3 M ht. and 1.52 gm/cc for more than 3 M height.	

4.1.7	In case of earth-work under OMC condition, the density to be achieved should not be less the density to be achieved should bot be less than 95% of the density obtained in laboratory (Proctor method). Top 40 cm should have 100% density below subgrade level.	Do not forget to test each compacted layer for field density with proper record location wise before allowing next layer.
4.1.8	Ensure measurement of density for each compacted area of 500 sqm. Or as decided by Engineer Incharge.	
4.1.9	Whether it is not convenient to take measurements at excavation, quantity shall be measured at filling. The quantity at filling shall be reduced by 10% in case of consolidated fill, by 5% in case of consolidation by mechanical machinery. No deduction where filling done under OMC.	
4.1.10	Surface of formation for width of sub base, which shall be 15 cm. more on either side of base course, shall first be cut to a depth equal to the combined depth of sub based and surface course below the finished level.	
4.1.11	Roll the sub-grade atleast five times with power road roller 8 to 12 Tonne capacity.	Do not forget that subgrade is finished to the specified camber and super elevation at curves.
4.1.12	Check the levels of Sub-grade.	Do not think can be corrected in sub base or course.
4.1.13	Embankment should be made upto final formation level of road and then cutting for sub-grade should be made as said above.	Do not forget to check final sub-grade surface with template.
4.2.0	W.B.M.	
4.2.1	Coarse aggregates (crushed and brokenstone) should confirm the physical requirements/gradation as given in CPWD Specification Vol. II.	See that deleterious material is not more than 5%.

4.2.2	Binding Material: Binding material consists of good earth/morrum and red bajari. It should have plastic index four to six when the W.B. surface is to be used or bituminous surfacing.	
4.2.3	Stone screening: It shall conform to grading as in CPWD specifications.	
4.2.4	Stack the required quantity of aggregate reachwise at regular interval by comparing with Theoretical quantity.	Do not forget to give stack nos' with paint. Do not allow spreading before taking full supply of materials duly measured for a reach.
4.2.5	Stack required quantity of stone screening allowing spreading of stone metal.	Do not forget to maintain the proper record of daily consumption of stone metal alongwith area covered in RMS register.
4.2.6	Mention stack no. on the samples taken for testing.	
4.2.7	Stack required quantity of good earth and red bajri to be used as bindingmaterial.	
4.2.8	Spread the coarse aggregate uniformly.	
4.2.9	Use template tot spread the aggregate to proper profile and depth.	
4.2.10	Rolling of aggregate to be done from edges till it is partially compacted with sufficient voids to permit application of screening.	
4.2.11	Apply screening gradually over the surface to fill the voids (In 1st phase of spread 50%(approx..) quantity of screening.).	Do not forget that rolling started from low edges and progress gradually to higher points.
4.2.12	Continue dry rolling and brooming while to ensure filling of all voids by three or more application of screening.	Do not dump the screening in piles but spread it in thin layers by twisting motion.
4.2.13	Sprinkle water in good quantity for wet rolling.	Do not use wet screening.

4.2.14	Then apply binding material in similar fashion as that of screening.	Do not forget to seep the wet screening into the voids Do not forget to maintain the proper account of road roller hours and compare it with theoretical requirement.
4.2.15	Water the surface and roll, sweep the surface with broom until slurry is formed ahead of wheel.	Do not forget to keep the roller wheel wet and clean during rolling with water.
4.2.16	Consolidated thickness of 40-90 mm aggregate shall be 100 mm and that of 40-63 and 20-50 mm shall be 75 mm. in one layer. Curst thickness to be decided accordingly.	Do not allow traffic till W.B.M. is dry and set.
4.2.17	When W.B.M. to be laid on existing metalled surface, 50 x 50 mm furrows to be cut at one meter interval at 45 degree to the centre lineof the carriage way.	
4.3.0	CARPETTING:	
4.3.1	Clean the W.B.M. surface with wire brushed to expose the metal about 10 mm depth and surface should be mode dust free.	
4.3.2	Stack the stone aggregate of required grade and physical requirement reach-wise as per theoretical requirement.	Do not forget to keep a record of the measurement of stone aggregate in M/B. brought by the agency.
4.3.3	Stone aggregate shall confirm CPWD specifications Vol. II	
4.3.4	Use paving asphalt 30/40 or 80/100 grade. Heat the binder to required temperature 149°C to 177°C.	Do not forget to keep a thermometer at site to check the temperature at regular intervals.
4.3.5	Maintain proper account of binder/bitumen as per CPWD specification Vol. II.	
4.3.6	Proper measuring Box to be used for mixing.	No tokri to be allowed.
4.3.7	Bitumen container to have hole at predetermined level.	
4.3.8	Tack coat to be spread by spraying machine.	

4.3.9	Just after rolling check the profile with straight edge as per para 17.9, 6.4 of CPWD specification Vol.II and make good deficiencies when carpet is green.	
4.3.10	Normally provide 2% camber.	
4.4.0	**BITUMEN MACADAM:**	
4.4.1	Stone Aggregate shall confirm to CPWD specification Vol.II.	
4.4.2	Grading of stone aggregate to be used as per CPWD specification Vol. II.	
4.4.3	The binder content should be worked out by percentage weight of stone aggregate by job mix design in laboratory.	
4.4.4	The binder shall be straight run bitumen confirming to IS:73.	
4.4.5	The mix will be prepared in Hot mix plant and will be load by paver.	Do not forget to check aperture opening as required at plant for proper proportion of mixing.
4.4.6	The temperature of mix at laying should be between 121°C to 163°C.	
4.4.7	The field density shall not be less than 95% of lab density.	
4.4.8	Maintain daily out turn and bitumen consumption as per CPWD specification Vol. II.	
4.4.9	Quantity Control tests shall be done as per CPWD specifications Vol. II except Marshal stability.	
4.4.10	Finished surface should not have undulation more than 6 mm in longitudinal direction and 4f mm in transverse direction when checked with 3 M. long straight edge. Make good when it is green.	
4.4.11	Provide 1.7 to 2% camber.	
4.4.12	Measure quantity for payment as per levels.	
4.4.13	One field density test for every 500 sqm. Or part shall be done.	Do not forget to keep record of weight of each truck load of the mix brought as site.
4.5	**ASPHALT CONCRETE:**	

4.5.1	Stone aggregate shall conform CPWD specification Vol. II.	
4.5.2	Gradation shall be as per CPWD specification Vol. II.	
4.5.3	Binder shall be straight run bitumen conforming it IS-73.	
4.5.4	Mix shall be designed as per Marshal job mix design.	
4.5.5	Mixing to be done in a plant and laid at side with paver.	Do not forget to check aperture opening at plant for proper proportion of mixing.
4.5.6	Temperature at the time of laying to be 121°C to 163°C.	
4.5.7	Quality Control tests as per CPWD specifications Vol. II.	
4.5.8	Surface correctness same as macadam.	
4.5.9	Camber same as macadam.	
4.5.10	Measurement same as macadam.	
4.5.11	Field density to be achieved 98% of lab density.	
4.5.12	One filed density test for every 500 sqm. Or part shall be done.	
4.6.0	**CONCRETE KERB:**	
4.6.1	Kerb to be of precast concrete.	
4.6.2	No rendering.	
4.6.3	Mortar joints to have groove and check for straightness.	
4.6.4	Height above finished road surface – 25 cm.	

C.T.E.'s Circulars

ANNEXURE-I

No.3L PRC 1
Government of India
Central Vigilance Commission

No.3,Dr.Rajendera Prasad Road,
New Delhi,dt.12.11.1982

To

All Chief Vigilance Officers of all Public Enterprises/Nationalised Banks.

Sub: Irregularities/lapses observed in the construction works undertaken by Public sector undertakings/banks.

The Chief Technical Examiner's Organization under the Commission has had occasion to examine and comment upon the works undertaken by Public Sector Undertakings, Banks etc. under the guidance of consultants. Common lapses noticed as a result of these inspections are enumerated below:-

i) Employment of consultant without verifying his credentials and capacity or capability to do the work assigned to him.

ii) Inadequate planning of work and incorrect preparation or non-preparation of detailed estimates by consultants.

iii) Non-preparation of justification statement for the rates quoted in tender, resulting in contract being awarded at very high rates.

iv) Rejection of the lowest tender without adequate justification, on the ground that the contractor is not reliable or lacks capacity to execute the work, even though he was included in the original pre-qualification list.

v) Improper evaluation of tenders, leading to allotment of works wrongly with ultimate loss to the public undertaking.

vi) Allowing upward revision of rates in some cases by contractors on very flimsy grounds during the process of negotiations, so that the lowest tenderer manages to make up the difference of cost between his quotation and the second lowest quotation.

vii) Payment of money to contractors outside the terms of contract. For example, in a large number of cases contract is for fixed price, but substantial payment is made on the ground of escalation of prices.

viii) Use of inferior material in the construction, while payment is made at full rates on the approval of the consultant without making any financial adjustment.

ix) Substitution of low-rated items by higher-rated items beneficial to contractor.

x) Lack of proper supervisory arrangement by the undertakings placing total reliance on the consultant for even preparation of the bill which leads to incorrect measurement of works and payment for the items of work not done.

In view of these factors, it is recommended that while consultants may be engaged for the purposes of original planning and designing, scrutiny of tenders and execution of work should, as far as possible, be done by technical officers directly and fully answerable to the public undertaking/banks etc. concerned. For this purpose, engineers may be taken on deputation from Government departments, such as the CPWD. To the extent a consultant is engaged, it is also necessary to ensure that the relationship between the undertaking and the consultant is correctly defined so that the consultant can be held legally and financially responsible for the work entrusted to him.

It is requested that suitable arrangements may be made for properly awarding works and exercising effective supervision and control in their execution with a view to ensure timely and systematic completion. Care may also be taken to guard against the types of irregularities indicated above.

Sd/-
(D.C. Gupta)
Director

No. 2EE-1-CTE-3
Government of India
Central Vigilance Commission
(CTE's Organization)

Satarkta Bhavan, Block-A,
GPO Complex, INA,
New Delhi-110023
Dated- 15.10.2003

OFFICE MEMORANDUM

Sub: Tender Sample Clause

The Commission has received complaints that some organizations, while procuring clothing and other textile items insist on submission of a tender sample by the bidders though detailed specifications for such items exist. The offers are rejected on the basis of tender samples not conforming to the requirements of feel, finish and workmanship as per the 'master sample' though the bidders confirm in their bids that supply shall be made as per the tender specifications, stipulated in the bid documents.

2. While it is recognized that samples may be required to be approved to provide a basis in respect of indeterminable parameters such as shade, feel, finish & workmanship for supplies of such items but system of approving/rejecting tender samples at the time of decision making is too subjective and is not considered suitable, especially for items which have detailed specifications. The lack of competition in such cases is also likely to result in award of contracts at high rates.

3. It is thus advised that Government Departments/Organizations should base their procurement of such items on the basis of detailed specifications. If required, provision for submission of an advance sample by successful bidder(s) may be stipulated for indeterminable parameters such as, shade/tone, size-up, feel, finish and workmanship, before giving clearance for bulk production of the supply. Such a system would not only avoid subjectivity at the tender decision stage but would also ensure healthy competition among bidders and thus take care of quality aspect as well as reasonableness of prices.

4. It is requested that these guidelines may be circulated amongst the concerned officials of your organization for guidance. These are also available on the CVC's website, http://cvc.nic.in.

Sd/-
(A.K. Jain)
Technical Examiner
for Chief Technical Examiner

To

All CVOs of Ministries/Departments/PSUs/Banks/Insurance Companies/Autonomous Organizations/Societies/UTs.

F.No. 010/VGL/066
Central vigilance commission

Satarkata Bhawan,
Block A, GPO Complex,
INA, New Delhi – 110023
Dated 07-10-2010

Circular No. 34/10/10

Subject: Design Mix Concrete

During inspection of works of many organisations, it has been observed that provisions of IS 456:2000 are neither being followed for designing the concrete mix nor for acceptance criteria. Instances of acceptance of concrete on basis of false certification and without actually testing the cubes for 28 days strength have also been observed. The following deficiencies are brought to the notice of all organisations for immediate corrective action:

1. Minimum cement content, maximum water cement ratio and minimum grade of concrete for different exposures are not adopted as per the details given in Table 5 of above code.
2. Value of standard deviation is not being established on the basis of results of 30 samples as provided in Table 11 of the above code even for works where more than 30 samples have been tested.
3. For acceptance criteria mean of a group of 4 non overlapping consecutive test results is not being calculated.
4. The samples where individual variations are more than ± 15% of average of three specimens are not declared invalid as per the provisions of clause 15.4 of the Code.
5. The concrete is being declared meeting the acceptance criteria which is not in conformity of codal provisions.

Most of the organisations are not even aware about the amendment No. 3 of 2007 modifying clause 15.1.1 of IS 456:2000. All organisations are directed to ensure that provisions of IS 456:2000 read with amendment No. 3 should be followed scrupulously for cement concrete and reinforced cement concrete. Non compliance of the provisions shall be viewed seriously.

7.10.10

(V.K. Gupta)
Chief Technical Examiner

All CVOs

No.98-VGL-25
Government of India
Central Vigilance Commission
(CTEO)

Satarkta Bhawan, Block-A
INA, GPO Complex,
New Dellhi:110023

OFFICE MEMORANDUM

Circular No. 14/4/07

Sub: Use of Products with standard specification.

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A case has come to the notice of the Commission that the user department one organization requisitioned an item of non-standard size. Requisitioning of item with non-standard size resulted in issue of `Non-availability certificate' by the stores keeper although the same item of standard size was already available in the stock. Citing urgency, the item was procured by the user department at 10 times the cost of the standard item by inviting limited quotations.

2. In order to avoid such occurrences, it is reiterated that the items with standard specifications only should be stipulated in the bid documents. In case, items with non-standard specifications are to be procured, reasoning for procuring such items may be recorded and reasonability of rates must be checked before placing order.

P. Varma
26/4/07

(Smt. Padmaja Varma)
Chief Technical Examiner

To

All CVOs of Ministries/Departments/PSUs/Banks/Insurance Companies/Autonomous Organizations/Societies/Hts

सत्यमेव जयते

Government of India
Ministry of Housing and Urban Affairs

CENTRAL PUBLIC WORKS DEPARTMENT

CPWD

