The Singareni Collieries Company Limited
(A Govt. Company)

CIVIL ENGINEERING DEPARTMENT

QUALITY CONTROL CELL

FOREWORD

The Civil Engineering Department is one of the very important discipline in SCCL in as much as every project starts with the activities of Civil Engineering department and even closes with the involvement of Civil Engineering department. Even the Mine opening starts with open excavation and side wall, R.C.C. Roof etc., being executed by Civil Engineering Department and then only driving of tunnel starts progressing.

Residential quarters are constructed for all sections of employees under each Mining Project, with other amenities like internal roads, water supply, sanitation, ETPs & STPs, Parks, Community Halls, Recreation clubs, Stadium/ Playground etc. Further, for processing and transportation of the produced coal, coal handling plants and Railway sidings including bridges on the Railways line are executed by the Civil Engineering Department.

Apart from Construction of Townships, Mine Openings and other allied structures, roads etc., maintenance and repairs of the existing structures is also a major activity of Civil Engineering Department.

In view of the above, quality, monitoring during execution of the works, is essential. In order to have an impartial and fool-proof mechanism of quality control of works, uniformly in all the areas of the SCCL, the Quality Control Manual has been brought out and procedures laid down therein shall be strictly followed by Field Engineers as well as Quality Control Cell Engineers.

An exhaustive and detailed exercise has been carried out by the Civil Engineering Department in bringing of this Quality Control Manual and all the concerned who are associated with this exercises deserve appreciation.

We hope and wish that this Quality Control Manual is well utilised in the day-to-day construction and Inspection activities by all the concerned Civil Engineers and produce high quality construction in the SCCL.

Sd/-
DIRECTOR(OPERATIONS)

Sd/-
DIRECTOR (PA&W)

THE SINGARENI COLLIERIES COMPANY LIMITED
(A GOVERNMENT COMPANY)
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CIVIL ENGINEERING DEPARTMENT

QUALITY CONTROL MANUAL

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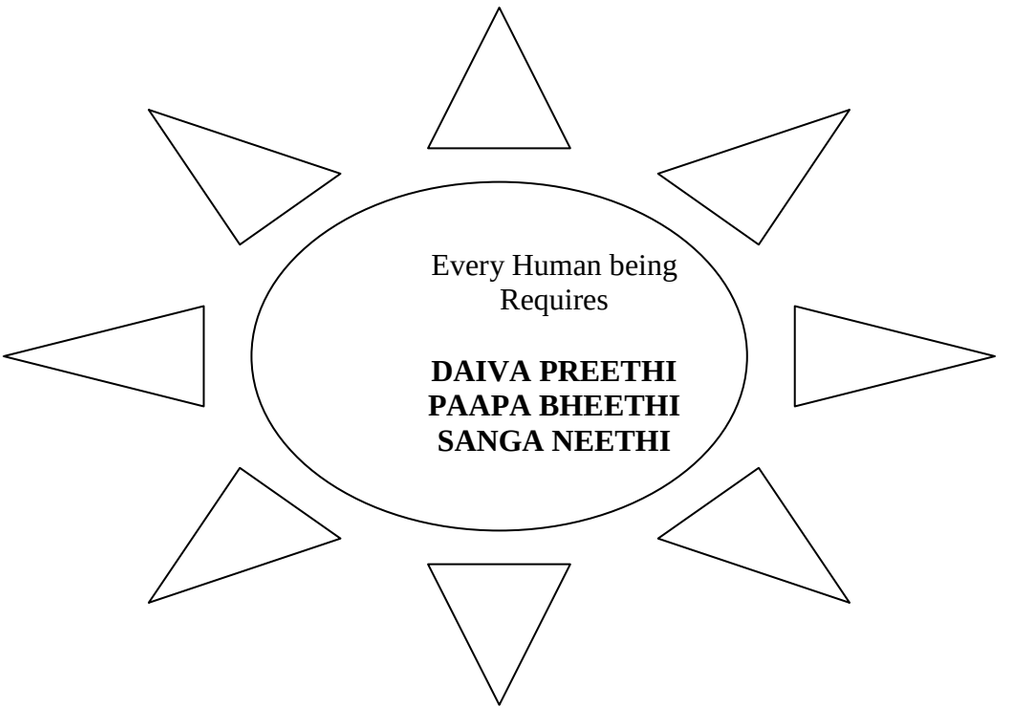


QUALITY MANAGEMENT
IN
CIVIL ENGINEERING

Q	-	Quality
U	-	Universally
A	-	Always
L	-	Locate
I	-	Irregularities
T	-	Think / Thank
Y	-	Your Self

INTRODUCTION

THE SINGARENI COLLIERIES COMPANY LIMITED

DEPARTMENT OF CIVIL ENGINEERING DEPARTMENT

QUALITY CONTROL MANUAL

1.0 INTRDUCTION:

This Manual standardises quality of works executed pertaning to Civil Engineering in SCCL at large.

1.1 QUALITY:

The quality can be defined as the totality of the attributes that contributes to the ability of a product to satisfy a given need with the basic aim of “Prevention is better than Cure”.

1.2 QUALITY CONTROL:

A system of inspection, analysis and action applied to a process or operation so that by inspecting a small portion of the product an estimate of the overall quality of the product can be made to determine what, if any, changes can be made in the operational system to achieve the required level of quality.

1.3 INSPECTION:

Critical examination of a product to determine its conformance to applicable quality standards or specifications is inspection. As a result of inspection, products are rejected or accepted, depending upon the degree of conformance to applicable quality standards.

1.4 CONTROL:

It is the action taken on the basis of Inspection to improve or maintain the quality of products. Control also functions to prevent the production of products out side the quality of applicable standards.

Progress with Quality is desirable.
Progress without quality is disastrous/deplorable

1.5 The Inspection and control are part of the system of quality control. Quality Control is never meant to be postmortem exercises. The principal prerequisites for Quality Control are;

(i) A clear management policy
(ii) Preference to the quality over quantity.
(iii) Specifying the quality standards clearly
(iv) Uniformity of concept quality standards among the field engineers and quality control cell.

1.6 The phrases “Quality Check” and the “Quality Control” are part of assurance, which is the main object for a finished structure that should possess.

(i) Adequate strength and durability

(ii) Should be totally free from any defects

(iii) Should serve satisfactorily during its designed life span

(iv) All the materials, used should be of specified quality to achieve this object .

1.7 This quality assurance of a finished product or a structure broadly constitutes two aspects;

i) Supply of standard materials and

ii) Workmanship with good Civil Engineering practices, following standard specifications.

2.0 **<u>Supply of materials</u>**: The materials supplied for use in the Construction of CivilEngineering works will play a vital role based on their most suitability of their requirement in their standards of naturally available items or standard marketed products for incorporation in the civil works for the safety and life of the structures and nevertheless, very important aspect of durability.

2.1 **<u>That means all the materials should be</u>**;

i) As per Indian Standard Specifications

ii) IRC Specifications or Indian Railway standards as may be the case.

iii) From reputed and approved manufacturers.

iv) The naturally available materials should be of durable quality with good strength as specified in Andhra Pradesh Detailed Standard Specification and any such standard specifications brought out by other Government bodies accepted in SCCL.

3.0 **<u>Workmanship</u>**: The workmanship and the skill of the labour are equally more important and that should be as per Andhra Pradesh Detailed Standard Specifications of Government of Andhra Pradesh for Civil engineering works and are as specified in Indian standard specifications as specified by Engineer in Charge.

4.0 **<u>Responsibility</u>**: The basic responsibility for an assured quality check lies with the Area Engineer in Charge or his authorised representative in its totality to achieve quality in execution of work and as well on their field staff.

4.1 However, the Quality Control Cell Engineering team will inspect the work during execution and will conduct random checking for certain portions and items of works. In their observations they will advise suitably for correcting steps, if any in the workmanship and at times for the quality of materials. The defective work and substandard materials will be asked for rejection in case if it is not possible for rectification are redressal or acceptable with acceptable tolerances.

4.2 During checking of the works with MBs the concerned field officer should make themselves available for verification along with the contractor's technical person/Contractor. The quality control staff and field staff will sign on the observations noted on the spot itself.

4.3 The field engineers should maintain site record and furnish the same during inspection of QCC. The test reports if any for the cement concrete works, the bricks, steel, aggregate if any should also be furnished with in the time of QC Inspection. Copies of the estimates, tender schedules shall have to be produced before QC Cell.

Timely Inspection and Timely corrective action is a must in Quality Achievement

4.4 In case of Cement concrete works and other such type of works, where quality checking will be difficult afterwards and therefore, for such works prior intimation need to be given to QCC in advance for their verification and such works during execution time. In absence of such arrangement to be done by the Area engineers, the QCC can make their inspection at post construction stage, mainly with reference to the M/Book recordings, and with the visual observations, test reports available, if any, shall propose suitable rectifications of recoverable amounts towards defective/deficiency in the works as may be the case.

4.5 All the site engineers are primarily responsible for execution of 100% quality works strictly in accordance with the tender provisions and codal provisions.

4.6 They must satisfy themselves with every aspect of quality work and carryout necessary tests as deemed fit with equipments available with them/QC Lab to ensure quality.

4.7 The QCC will check the works only at random and they are responsible to the extent of the particular sample and to that affected quantity only and their report can not be utilised for regulating the payment of total work.

4.8 All the Area engineers are required to be provided with basic testing equipments like Compressive strength testing machine, moulds, bitumen extractor, balance, gauges etc. The field engineers have the responsibility to carry out the quality tests at their level, satisfy themselves with the work before making payment. They shall maintain the record of their tests carried outby them. The field officer shall take trial pits at regular intervals for B.T.roads, WBM roads and for such like works and satisfy themselves fully before making payments. In case of any doubts, the field engineer in Charge can demand any special Q.C.test through QCC or any outside reputed agency, with the approval of General Manager (Civil) in presence and the cost of the contractor.

5.0 **Devaluation of work:** In view of rejection of the work done or materials supplied not in confirmity with the contract agreement/work order/approved samples, then the Engineer in Charge or any other officer nominated by the company for the purpose, may allow such work or materials to remain, provided the Engineer in charge/the officer nominated by company is satisfied with the quality of any materials and with the structural safety of the work and in the case shall make such deductios for the difference in value, as in his opinion, may be reasonable. The engineer in charge/QCC may also effect recovery in accordance to provisions given in Appendix 'A' or for such items of work of schedules as decided by G.M.(Civil) from time to time. However nothing in this para supersedes PS 29 of APSS.

6.0 **Defects appearance after acceptance:** Any defects which may appear in the defective liability period and arising, in the opinion of the engineer in charge/QCC

from lack of conformation with the drawings and specifications shall, if so required, by the engineer in charge in writing be remedied by the contractor at his own cost within the time stipulated by the engineer in charge/QCC. If the contractor fails to comply, the engineer in charge may employ other persons to rectify the defects and recover the cost thereon from the dues of the contractor.

7.0 **Samples of Testing materials:** All the materials to be procured by the contractor and to be used in the work shall be approved by engineer in charge in advance and shall pass the test and analysis required by them which will be as specified in the specifications of the item concerned and are as specified by the APDSS, BIS or the IRC standard specifications or Indian Railways standards acceptable to the engineer in charge. The method of sampling and testing shall be as per APDSS, BIS or the IRC standard specifications or Indian Railways standards and other relevant standards and practices.

8.0 **Mode and frequency of Inspection by QCC:** All the civil engineering works bills (Part bills or final bills) pertaining to Capital and Revenue nature of works whose awarded value exceeds Rs.50,000/- will be paid only after checking and clearance by QCC.

8.1 For M&R works for which tenders are called on time frame basis and works taken up by placing local work orders on piece meal method with the approval of concerned G.M./any competent authority where the individual value does not exceed Rs.50,000/- each time, can be cleared by Area engineers without insisting clearance by QCC. However, QCC checks at random can be made now and then and rectifications/deductions if any can be suggested which are to be attended to by the Area Civil Engineers.

8.2 For Pit materials like supply of sand, metal, CR stone, Fly ash bricks, CC hollow blocks etc., which are directly done by the contractors at the Mines and utilised and certify by the mines authorities, the QCC, will make random checks and can suggest rectifications/deductions if required. The same are to be attended to by the mine authorities and compliance to be reported. QCC clearance is not required for every bill before releasing payment.

8.3 For Filterbeds, OC washing platform, maintenance work, supply of drinking water, clearance of spillage coal etc., which are taken up on time frame basis, payment will be after due checking by Area engineers/mine authorities without insisting for QCC clearance. However, QCC can make random checks and suggest rectifications/deductions required if any. The same are to be attended by Area Civil Engineers/Mine authorities and to report compliance.

8.4 Notwithstanding to the above, the QCC can make surprise checks even in the absence of field engineers/contractors and make their observations for effecting rectifications etc.

8.5 In normal circumstances, inspections shall be made by QCC in the presence of the field officers and contractors and their frequency shall depend on the physical progress of the work and on the agreement value of the work and on need basis.

8.6 In case of difference of opinion arises between the area engineers and the QCC with respect to imposition of penal recoveries and observations of defective works such matter shall be referred to GM(C), who can demand any special QC test departmentally or through any external reputed agency or can make a final decision with his observations which will be final and binding on all.

9.0 **3rd party quality check:** In addition to the SCCL checking, depending on the importance and value of the works, GM(C) may ask/refer to 3rd agency for checking of the work in respect of quality. Normally, the 3rd party checking can be made as a provision in the agreement of the contract for such works costing more than Rs.1.00 Crore. The following are some of the 3rd parties, may be referred to for quality checks.

i) JNTU (BICARD)
ii) Osmania University
iii) National Institute of Technology (REC), Warangal
iv) Any other Govt. of India/Govt. of A.P organisations/ professional bodies.

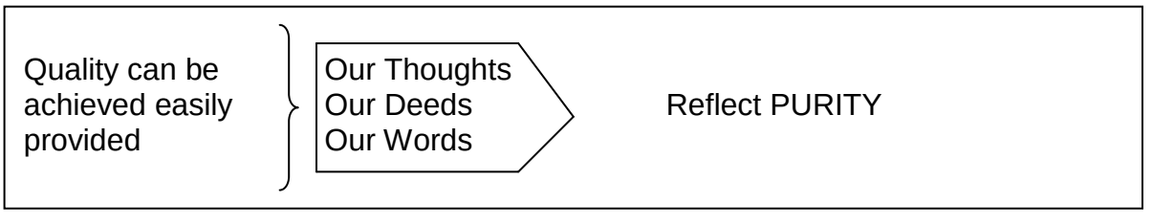
10.0 Procedure for devaluation/deductions towards defective/bad quality works:

In general the procedure is required to be evaluated for devaluation/deductions in view of the following reasons.

10.1 In any case it is highly desirable that the work should be done to the best quality and rectifications preferably to be done in any case and where such redressals are not possible then only, the devaluation, penal recoveries to be made.

10.2 To maintain uniformity in the devaluation/deductions of the works based on the observations made by the concerned engineer-in-charge/QCC, the following provisions are hereunder made.

i) This is to narrow down the margin of the discretion.
ii) To evolve a uniform standard procedure to such deductions/penalties.
iii) To devalue for the works which may be accepted in the opinion of SCCL with all its shortcomings.



ANNEXURS/PROFORMAS

ANNEXURE-I

Acceptance Criteria pertaining material supplied by the contractor/incorporated in the works based on sampling as per the agreement clauses/relevant STANDARDS

1.0 C.T.WOOD DOORS/WINDOWS (IS 4021/1895):

C.T.wood doors and windows/factory made chemically teated, seasoned doors and windows.

a) The finished dimensions of the timber, sections in frames for doors, windows and ventilators shall be subjected to a tolerance of +3, -0.

b) The number of frames to be selected at random from a lot of sizes.
Lot : In a consignment of the frames of the same type, sizes and manufactured from the same species of wood under similar conditions of production shall be grouped together to constitute a lot.

Lot size	Sample size	Permissible No. of defectives.
No. of frames upto 50	8	Nil
51 to 100	13	1
101 to 150	20	2
151 to 300	32	3
301 to 500	50	5
501 and above	80	7

c) The face of the frame abutting the wall and lintel shall be given a coating of coal tar.

d) The depth of rebate in frames for housing the shutter shall in all classes be 1.5 cm.

1.1 Timber panelled/Glazed shutters: (IS 1003 part – 1/1977)

a) Timber panels : Minimum width 150mm
Thickness – 15mm

b) Rebating : In case of double leafed shutters styles shall be rebated by 1/3rd the thickness of the shutter. Rebate may be splayed or square type.

c) Tolerance : i) Styles/rails : ±3mm
ii) Shutter frame/panel thickness: ±1mm

d) Hinges : Minimum 3 hinges – One at center, two at 20cm

from top and bottom to be provided for each door shutter.

e) Glazing : The glasses used for panels shall not be less than 7.5 Kg/$m_2$of specified quality brand, type etc.

1.2 **Sampling of shutters and criteria for conformity:**

Lot size	Sample size	Permissible No. of defectives
0 to 25	All samples	Nil
26 to 50	5	Nil
51 to 100	8	Nil
101 to 150	13	1
151 to 300	30	2
301 to 500	32	3
501 to 1000	50	5
1000 and above	80	7

2.0 Solid Core Flush doors:

i) Moisture content: Should not be more than 12% when tested according to IS 1708/1969. The normal thickness of shutters shall be 25mm to 30mm and 35mm.

ii) Tolerance: Tolerance on nominal width and height shall be ±3 to –0mm and tolerance on nominal thickness shall be ±1.2mm. The thickness of door shutters shall be uniform throughout with a permissible variation of not more than 0.8mm, when measured at any point/points.

iii) Materials: The species of timber suitable for the use in the core of flush door shutters shall be from among the species specified in appendix 'A' of IS – 2002.

2.1 TESTS: i) End immersion test: Door shutters shall be tested for resistance of their base to immersion in water as follows:-

The door shutters shall be immersed vertically to a height of 30cm in water, at room temperature, for 24 hours and then allow it to dry for 24 hours at 27 ±2° C and relative humidity of 65 ±5 percent. The cycle shall be repeated 8 times. There shall be no de-lamination at the end of the test.

Develop Love and Respect to our Noble Profession,
Lest our downward slide continues.

2.2 Glue Adhesion Test**:** Two square sections 150mm x 150mm shall be cut from the corners of the door. These corner sections, as cut from the door shall be immersed in boiling water at 100° C for 4 hours, then dried at 27°C ± 2 and related humidity of 65 ± 5% for 24 hours. At the end of drying period, the samples shall be examined for de-laminated. Glue lines in all the four exposed edges of the plywood on both faces of a specimen and the glue lines between the ply wood faces and the style and rail shall be examined for de-lamination.

2.3 Sampling and criteria for conformity:

a) Lot: In any consignment, all the shutters of the same grade and type and manufactured under similar conditions of production shall be grouped together to constitute a lot.

b) The number of shutters to be selected at random from a lot depend upon its size and shape in accordance with the column No.1&2 of the table below produced.

Lot size	Sample size	Permissible No. of Defective	Sub sample size
(1)	(2)	(3)	(4)
26 to 50	8	0	1
51 to 100	13	1	2
101 to 150	20	1	2
151 to 300	32	1	3
301-500	50	2	4
501 and above	80	2	5

3.0 Glazing:

(a) Glazing shall be good in glass panes not less than 3mm thickness and in accordance with the size as specified. The glass panes shall be cut as to fit slightly loose in the rebates, of sashes. In doors, windows and ventilators of bath and W.C., translucent glass panes or louvers shall be used. The panes shall be fixed with plain face on the outer side. Glass panes shall be fixed by wooden beading having mitered joints. A thin layer of putty shall be applied between glass panes and sashes and also between glass panes and the beading. Putty shall be prepared by mixing one part of white lead with three parts of Linseed oil to the mixture to form into a stiff paste.

(b) Where dry glazing is specified glass shall be held in place by moulded wooden pillets fixed with brass screws.

(c) Glazing shall not be considered complete unless all stains and marks have been removed from the surface of the glass.

3.1 Glazing shutters/Glazing in general: (IS-1761/1960)

The glass shall have uniform thickness and shall be free from air-holes, bubbles, scratches, flaws and spects and other defects. The following shall be the specifications for different kinds of glasses, generally used.

Size of glass panes	Minimum required thickness
Upto 600x600mm	3mm
From 600x600mm to 900x900mm	4mm
900x900mm to 1200x1200mm	5mm
For the panes above 900x900mm To 1200x1200mm	As decided by Engineer-in-Charge

3.2 Tolerances in thickness:

Thickness in mm	Tolerance in mm
2 to 4mm	± 0.2mm
5mm	± 0.3mm

3.3 Wired glass:

In this type of glass wire netting is embedded in sheet glass. Electrically welded 13mm square mesh or 22mm hexagonal mesh is inserted during rolling. The thickness of the glass shall not be less than 6mm unless otherwise specified. The putty to be used for fixing the glass in wooden frames shall conform to IS-419/1974. The putty may be coloured to suite the colour of the door or window etc.

3.4 Fixtures and fastenings:

For all doors and windows specifications shall be as follows, unless otherwise specified separately:-

IS – 204/1974 – Specification for Tower Bolts.

IS – 205/1966 – Specification for non-ferrous metal butt hinges.

IS – 206/1973 – Specification for strap hinges.

IS – 207/1964 – Specification for gate and shutter hooks and eyes.

IS – 208/1972 – Specification for door handles

IS – 281/1973 – Specification for sliding door bolts, mild steel for use with pad locks.

IS – 362/1975 – Specification for parliament hinges.

IS – 363/1970 – Specification for hasps and staples.

4.0 **Salt glazed stoneware pipes and fittings: (IS 651/1980):**

Glaze of pipes and fittings shall be free from crazing and shall give a sharp, clear note when struck with a light hammer. The glaze shall be Ceramic glaze.

4.1 Crushing strength : Minimum 16 KN/mtr. Length.

Internal dia of pipe in mm	Permissible deviation from dia in mm
100	3
150	5

4.2 Permissible variation in thickness of barrel and socket will be 2mm per pipe upto 450mm dia.

4.3 **Length:** (a) Permissible tolerance in length shall not be more than ±10mm for pipes of 600 and 750mm length ±15mm for pipes of 900 length.

(b) Permissible deviation from straightness of the barrel of pipe measured on the inside of the curve.

For all dia of pipes
5mm - for pipes of 600mm length
6mm - for pipes of 750mm length
7mm - for pipes of 900mm length

Those who abide to Quality Standards will give no scope to mistakes and will not kneel down for pardon.

5.0 Barbed wire for fencing: (IS 278/1962)

The barbed wire shall be formed by twisting together two line wires, one containing the barbs. The size of line and point-wire and barbs spacing shall be as given below:

	Nominal dia of wire		Nominal distance between two barbs
	Line Wire	Point Wire	
Type 1	2.50mm	2.24mm	75mm
Type 1	2.50mm	2.24mm	150mm
Type 1	2.24mm	2.24mm	75mm
Type 1	2.24mm	2.24mm	150mm

Tolerances: The permissible deviation from the nominal diametre of the line-wire and the point-wire shall not exceed ±0.08mm.

6.0 Unplasticized PVC Pipes for water supply: (IS-4985/1968)

Physical properties:

Outer dia (OD)	Tolerance on OD	WALL THICKNESS FOR WORKING PRESSURE							
		2.5 Kg/CM^2		4.0 Kg/CM^2		6.0 Kg/CM^2		10.0 Kg/CM^2	
		Min	Max	Min	Max	Min	Max	Min	Max
16	+0.3	..	..	..	..	..	..	1.1	1.5
20	+0.3	..	..	..	..	..	..	1.1	1.5
25	+0.3	..	..	..	..	..	..	1.4	1.8
32	+0.3	..	..	..	..	..	..	1.8	2.2
50	+0.3	..	..	..	..	1.7	2.1	2.8	3.3
63	+0.3	...	..	1.5	1.9	2.2	2.7	3.5	4.1
110	+0.4	1.6	2.0	2.5	3.0	3.7	4.3	6.1	7.0
140	+0.5	2.0	2.4	3.2	3.8	4.8	5.3	7.7	8.7
160	+0.5	2.3	2.8	3.7	4.3	5.4	6.2	8.8	9.9
180	+0.6	2.6	3.1	4.2	4.9	6.1	7.0	9.9	11.1

Note: For other diametres and details, code may be referred.

6.1 Colour of pipes:

2.5 Kg/CM^2	;	Red
4.00	;	Blue
6.00	;	Green
10.00	;	Brown

6.2 The PVC pipes should contain manufacturers name or trade mark, the outside dia, maximum working pressure and ISI mark. The manufacturers should certify the test pressures conducted as per the sampling provision made in the code at the factory premises and to furnish along with the consignment.

7.0 Unplasticized Poly Vinyl Chloride (UPVC) pipes for soil and waste dischrge : (IS – 13592 / 1992)

(a) Colour : The colour of the pipes shall be dark shade of Grey

(b) Length : Tolerance on specified length +10mm – 0mm

7.1 PHYSICAL PROPERTIES:

Nominal Outside diametre	Mean outside diametre		Outside diametre at any point		WORKING PRESSURE MPa								
	Min	Max	Min	Max	Class 3 0.60			Class 4 0.80			Class 5 1.00		
					Average Max	Min	Max	Average Max	Min	Max	Average Max	Min	Max
1	2	3	4	5	6	7	8	9	10	11	12	13	14
20	20.0	20.3	19.5	20.5	--	--	--	--	--	--	1.5	1.1	1.5
25	25.0	25.0	24.5	25.5	--	--	--	1.6	1.2	1.6	1.8	1.4	1.8
50	50.0	50.3	49.4	50.6	2.1	1.7	2.1	2.8	2.3	2.8	3.3	2.8	3.3
63	63.0	63.3	62.2	63.8	3.7	2.2	2.7	3.3	2.8	3.3	4.1	3.5	4.1
110	110.0	110.4	108.6	111.4	4.3	3.7	4.3	5.6	4.9	5.6	7.0	6.1	7.1
160	160.0	160.5	158.0	162.0	6.3	5.4	6.2	8.2	7.2	8.3	9.9	8.8	10.2
200	200.0	200.6	197.6	202.4	7.2	6.8	7.9	10.0	8.9	10.3	12.3	11.0	12.7

Note 1: The table is based on metric series of pipe dimensions given in ISO 161/1 in respect of pipe dimensions and ISO DIS 4422.

2: The wall thickness of pipe is based on a safe working stress of 8.6 Mpa at 27° C and the working pressure gets reduced at sustained higher temperatures. Occasional rise in temperature as in summer season with concurrent corresponding reduction in temperature during nights as no deleterious affect on the life working pressure of pipes considering the total life of the pipes.

For Class-I, II & III of all sizes this requirement need not satisfy as the ratio of minimum wall thickness to nominal outside diameter does not exceed 0.035 in these cases.

3. For other diameters of pipes and details, the code may be referred.

8.0 Concrete masonry units (hollow and solid concrete blocks): (IS 2185 part-I/1979)

(a) Sampling : For compressive strength after 28 days curing 8 blocks shall be tested for every 5000 blocks.

(b) 20 blocks shall be checked for dimensions and inspected for visual defect (for every 5000).

Out of the above,

3 blocks for block density
8 blocks for compressive strength, as per (a) above
3 blocks for water absorption
3 blocks for drying, shrinkage and moisture movement
3 blocks for reserved for retests for drying, shrinkage and moisture movement if a need arises.

8.1 <u>Acceptance criteria for compressive strength:</u>

Type & Grade	Minimum compressive strength		Minimum average water absorption with Over-Dry Mass of Concrete	
	Average of 8 Units Min.	Individual Unit Min.	Less than 1360	Less than 1600
	N/mm^2	N/mm^2	Kg/M^2	Kg/M^2
1	2	3	4	5
Hollow, Load bearing: Grade 'A'	7.0	5.5	--	290
Grade 'B'	5.0	4.0	320	--
Hollow, Non-Load bearing:	4.0	3.5	--	--
Solid, Load bearing: Grade 'A'	12.5	10.8	--	290
Grade 'B'	8.5	7.0	320	--

Note: In case of small quantities of supply minimum three samples t be tested for compressive strength for every 1000 or part thereof.

9.0 Clay burnt bricks: (Non-modular bricks)

a) Compressive strength: The bricks when tested in accordance with the procedures shall have minimum average compressive strength as specified.

b) The compressive strength of any individual bricks tested shall not fall below the minimum average compressive strength specified, by more than 20%.

c) Water absorption: The bricks when tested in accordance with the procedures laid out in IS 3495, after immersion in cold water for 24 hours, the average water absorption shall not be more than 20% by weight.

d) Dimension tolerances: When tested in accordance with the clause-5 of IS 1077 percentage tolerance will be ±4% per group of 20 Nos.

10.0 FLY ASH BRICKS:

The specifications for fly ash bricks are as follows:

a) The size of the bricks maybe 230x110x75mm (average) or may be as per specified size.

b) Crushing strength: From 60 Kg/Sq.cm to 100 Kg/Sq.cm as specified and strength of individual blocks shall not fall below the minimum average compressive strength specified, by more than 20%.

c) Water absorption: Not more than 20% by mass.

d) Sampling: Same as per clause 8.0 for CC solid and hollow blocks.

11.0 GI PIPES:

a) Galvanized Iron pipes/tubes : (IS-1239 part-1/1968)

b) All screwed pipes and sockets with pipe threading as per IS 554/1964.

Note: The pipes supplied should have screwed with taper threads and sockets with parallel threads.

c) Galvanizing should be with zinc coating on steel tubes in accordance with IS-473/1962 (Hot dip zinc coating). Pipes should be galvanized before screwing.

11.1 DIMENSIONS AND NOMINAL MASS OF STEEL TUBES-MEDIUM (IS 1239 PART-I/1990)

Dia	O.D. Dia of pipe		Dia of socket		Length	Wt/RM of pipes
	Max.	Min.	Thickness	Min.		
15 dia	21.8	21.0	2.65	27mm	37mm	1.22 Kg
20 dia	27.3	26.5	2.65	32.5mm	39mm	1.58 Kg
25 dia	54.2	33.3	3.25	39.5mm	46mm	2.44 Kg
50 dia	60.8	59.7	3.65	68mm	60mm	5.10 Kg
100 dia	115.0	113.1	4.50	124mm	87mm	12.10 Kg
150 dia	166.5	163.9	4.85	178mm	96mm	19.20 Kg

11.2 Tolerance for Pipes :

a)	Thickness:	Medium pipe (Butt welded)	+ Not limited - 10%
		Medium pipe (Seamless)	+ Not limited - 12.5%
b)	Weight	Medium pipe (Single tube)	± 10%
		Medium pipe (For quantities of 150m and above of one size)	± 4%

11.3 Hydraulic Test Certified at Manufacturers end upto 50 Kg.

12.0 RCC Non-pressure Pipes (NP2, NP3 etc.):

The specifications of physical dimensions such as lengths, outer, inside dia, thickness, longitudinal and spiral reinforcement are all should be in accordance with relevant IS – 458/1971. Also, the test of specimen should be in accordance to the same code. The relevant code for NP2, NP3 pipes generally used are furnished hereunder.

12.1 Design and Strength test requirements of concrete pipes Class-NP2-Reinforced concrete, light duty, non-pressure pipes (IS 458-1988)

Internal Diameter of Pipes		Barrel thick-ness	Collar dimensions			Reinforcement				Strength Test requirements for three Edge bearing test	
Nomi-nal	Actual		Min Caul-king	Min thick-ness	Min length	Longitudinal Mild steel or hard drawn steel		For pipe	For collar	Load to produce 0.25mm crack	Ultimate Load
1	2	3	4	5	6	7	8	9	10	11	12
Mm	Mm	Mm	Mm	Mm	Mm	Min No.	Kg/ Linear metre	Kg/ Linear metre	Kg/ No.	KN/ Linear Metre	KN/ Linear metre
150	150	25	30	25	150	6	0.33	0.24	0.19	10.79	16.19
300	300	30	16	30	150	8	0.78	0.79	0.71	13.48	20.22
450	450	35	19	35	200	8	0.78	1.97	1.48	16.18	24.27
600	590	45	19	40	200	8	0.78	3.47	1.89	18.88	28.32
900	890	55	19	50	200	8	1.22	9.25	3.26	22.80	34.20

Note: 1) If mild steel is used for spiral reinforcement, the weight specified under column No.9 and 10 shall be increased to 140/125.

2) Soft grade mild steel wire for spirals may be used for pipes of internal diametres 150mm only by increasing weight to 140/84.

3) The Longitudinal reinforcements given in this table is valid for pipes upto 2 metres effective length for internal diametre of pipes upto 250mm, and upto 3.00 metres effective length for higher diametre of pipes.

4) For other diametre of pipes and details, code may be referred.

12.2 Design & strength test requirements of concrete pipes of Class NP3- Reinforced concrete, Medium duty, Non-pressure pipes (IS 458-1988)

Internal Dia of Pipes	Barrel thickness	Reinforcement steel			Strength test requirements for three Edge Bearing Test	
		Longitudinal Mild steel or Hard drawn steel		Spiral Hard drawn steel	Load to produce 0.25mm crack	Ultimate Load
1	2	3	4	5	6	7
Mm	Mm	Min No.	Kg/Linear metre	Kg/ Linear metre	KN/ Linear Metre	KN/ Linear Metre
150	25	6	0.33	0.46	13.70	20.55
300	40	8	0.78	1.80	15.50	23.25
450	75	8	0.78	3.79	21.56	32.34
600	85	6+6	1.18	7.01	28.74	43.11
900	100	6+6	2.66	18.30	43.11	64.67

Note: 1) The actual diameter is to be declared by the manufacturer and the tolerance is to be applied on the declared diameter.

2) Minimum thickness and Minimum length of collars shall be the same as that for the next higher size available in NP2 class pipes corresponding to the calculated inner diameter of collars.

3) The longitudinal reinforcement given in the table is valid for pipes upto 2 metre effective length for internal diameter of pipe upto 250mm and upto 3 m effective length for higher diameter pipes.

4) Concrete for pipes above 18mm nominal diameter shall have a minimum compressive strength of 35N/mm^2 at 20 days and a minimum cement content of 400 Kg/m^3 .

5) If mild steel is used for spiral reinforcement the weight prescribed in column shall be increased to 140/125.

6) For other diameter of pipes and details, code may be referred.

13.0 A.C.PRESSURE PIPES: Conforming to IS – 1592/1970.

For Cast iron fittings/specials foruse in AC Pressure Pipes in accordance with the IS-1531/1969.

14.0 S A N D: Silt and clay content deleterious materials shall be;

i)	Coal and Lignite	:	1%
ii)	Clay lumps	:	1%
iii)	Materials finer than 75 microns ISC	:	3%
iv)	Soft fragments	:	Nil
v)	Shale	:	1%

	Total:		6%

Note: But overall percentage shall not be more than 5%

14.1 Fineness Modulous:

i)	Coarse sand	:	Shall not be less than 2.5
ii)	Fine sand	:	Shall not be less than 1

14.2 Particle size distribution:

IS Sieves	Percentage passing for			
	Zone-I	Zone-II	Zone-III	Zone-IV
10mm	100%	100%	100%	100%
4.75mm	90-100%	90-100%	90-100%	95-100%
2.38mm	60-90%	75-100%	85-100%	95-100%
1.18mm	30-70%	55-90%	75-100%	90-100%
600 microns	15-34%	35-59%	60-79%	80-100%
300 microns	5-20%	8-30%	12-40%	15-50%
150 microns	0-10%	0-10%	0-10%	0-15%

Zone-I &II for concreting and Zone-III &IV for plastering.

14.3 Bulking of sand: Damp sand increases in volume (bulking) Depending upon moisture content.

Moisture content percentage by Weight	Bulking percentage (Volume)
2	15
3	20
4	25
5	30

Quality must be given preference always over speed (Progress) and Economy

15.0 Stone aggregate: Percentage of soft or deleterious materials:

a)	Coal and Lignite	:	1%
b)	Clay lumps	:	1%
c)	Materials finer than 75mm microns IS Sieves	:	3%
d)	Soft fragments	:	3%
e)	Shale	:	Nil

			8%

Note: Total percentage of deleterious materials should not be more than 5%.

15.1 Particle size distribution:

Acceptance criteria of percentage valuefor coarse aggregates:

a) Crushing Value

i.	For other than wearing surface	:	Not more than 45%
ii.	For wearing surfaces such as payvement, roads, runways.	:	Not more than 30%

b) Impact value

i.	For other than wearing surface	:	Not more than 45%
ii.	For wearing surfaces such as pavement, roads, runways.	:	Not more than 30%

c) Loss Angeles abrasion value (IS 2386 Part-IV-1963):

i.	For aggregate to be used in concrete other than wearing surfaces etc.	:	Not more than 50%

ii. For aggregate to be used in concrete for wearing surfaces such as pavements, roads and runways. : Not more than 30%

d) Flakiness Index test (IS 2386 – Part-I-1963):

i. For aggregate to be used in concrete other than wearing surfaces etc. : Not more than 15%

ii. For wearing surfaces such as roads, pavements, runways and foot paths. : Not more than 15%

16.0 STEEL (Reinforcement bars if arranged by contractor)

16.1 Chemical composition: The ladle analysis of steel when made as per relevant parts of IS 228 shall be as follows:

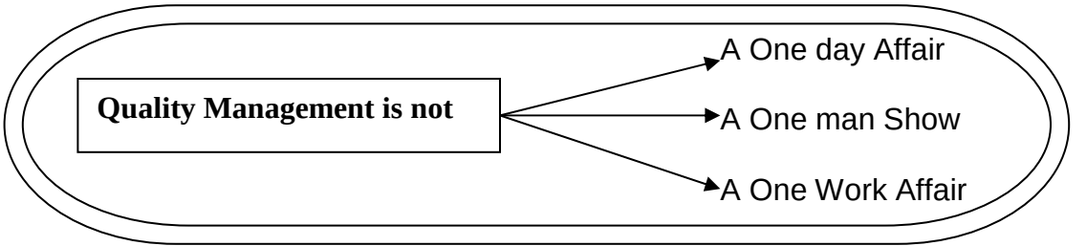
Constituent	Percent Maximum		
	Fe-415	Fe-500	Fe-550
Carbon	0.399	0.300	0.300
Sulfur	0.360	0.055	0.055
Phosphorous	0.060	0.055	0.055
Sulfur and Phosphorous	0.110	0.105	0.100

16.2 In case of product analysis, the permissible variation from the limits specified above, shall be as follows:

Sl.No.	Variation over specified maximum limits	
	Constituent	Limits max. percent
1	Carbon	0.020
2	Sulfur	0.005
3	Phosphorous	0.005
4	Sulfur and Phosphorous	0.010

16.3 Mechanical properties of High strength deformed bars and Wires:

Sl. No.	Property	Grade Fe-415	Grade Fe-500	Grade Fe-550
1	0.20 percent proof stores/yield stress, Minimum N/mm^2	415 N/mm^2	500N/mm^2	550N/mm^2
2	Elongation, percent min. on gauge length 5.65/A, where A is the cross sectional area of the test	14.5N/mm^2	12.0N/mm^2	8.0N/mm^2
3	Tensile strength Min.	10 percent more than the actual 0.20 percent proof stress but not less than 485 N/mm^2	8 percent more than the actual 0.20 percent proof stress but not less than 545 N/mm^2	6 percent more than the actual 0.20 percent proof stress but not less than 585 N/mm^2



ANNEXURE.II

Acceptance Criteria for Workmanship during execution

1.0. FORMATION OF EARTH WORK EMBANKMENT: While forming the earthen layers the thickness of layers shall not exceed 150mm before compaction. The layers shall be compacted to at least 90% proctors density unless otherwise specified in case non power driven rollers or by manual labour rolling tamping etc. Any loose soil shall be removed by bringing the profile to the required section. In case of power roller, it should be compacted in layers to achieve the dry density not less than 98% (standard proctor) unless otherwise specified. It should be achieved by use of the smoothful rollers pneumatic tyre rollers, sheeps foot rollers, vibrating plates programmers, power rammers as specified. The number of passes shall be those at which the required compaction is achieved. The rolling shall be commenced at edges and progress towards the center longitudinally.

1.1 Moisture Content: The moisture content in soil for embankment shall be determined by tests in accordance with IS 2720. If it is below optimum moisture content for the given compaction then water shall be added by sprinkling and soil be compacted. If the moisture content is more than the optimum in the soil, then it shall be allowed for drying and then compacted. The moisture content shall be uniform through the thickness of the layers.

1.2 Excavation of foundations: Excavation of foundation shall be done to the extent of dimensions as specified or as directed by engineer-in-charge.

In firm soil the sides of trenches shall be kept vertical upto a depth of 2m and for a greater depth, the excavation shall be widened by allowing space of 500mm on either side at every 2m depth where the soil is soft, loose or slushy. The width and depth of the space shall be suitably altered or the sides sloped or shored as directed. It shall be the responsibility of the contractor to take complete instructions in writing from the engineer-in-charge regarding spacing, sloping to be done for excavation/deeper than 2m.

2.0 BRICK WORK: JOINTS IN BRICK WORK:

The thickness of joints in case of masonry with first class bricks shall not be more than 10mm and in case of masonry with second class bricks shall not be more than 12mm.

2.1 The bricks required for masonry in cement shall be thoroughly soaked in clean water for atleast an hour. The cessation of bubbles when the bricks are immersed in water is an indication of thorough soaking of bricks.

2.2 The bricks shall be laid so that all joints are quite full or mortar. The face joints shall be racked to a minimum depth as specified by jacking tool daily during the progress of the work when the mortar is still green so as to provide proper key for the plaster or pointing to be done.

2.3 The wall construction shall be taken up by truly plumb. All courses shall be laid truly horizontal and all vertical joints shall be truly vertical. The joints in alternative courses shall come directly and vertically one over the other. The thickness of brick course shall be kept uniformly and with their frogs kept upward. A set of tools comprising of wooden straight edge, masons spirit level, square ½ m (half metre) rule line and pins, string and plumb shall be kept on site of the work.

3.0 STONE MASONRY – COURSED RUBBLE STONE MASONRY:

The work shall consist of facing of selected stones, hammer dressed at faces and joints with only a small proportion of smaller stones in the hearting. The face stones shall be squared on all joints with beds horizontal as directed by engineer-in-charge and shall be set in regular courses of uniform thickness from bottom to top throughout. Each course shall be the height of each stone in the course that means different depth stones are not to be used and leveled off at certain heights.

3.1 No face stone shall be less width in plan than 150mm for walls of 400mm thick, 200mm for walls of 450mm thick and 250mm for walls of 600mm thick and above. The face stones shall be laid headers and stretchers alternatively so as to break joints by atleast 78mm and headers shall project atleast 100mm beyond the stretches. The stones shall be solidly bedded, setful in mortar with joints not exceeding 12mm in thickness and shall extend well back into the hearting. The height of the stone shall not exceed breadth at face nor the length inwards. The backs shall be left rough as squared the bed and vertical joints being hammer

3.2 Through stones and headers: In all the works upto a width of 600mm bond stones running through the wall shall be provided at an intervals of 2 mtrs clear in every course. For walls thicker than 600mm, a line of headers each header overlapping the other by 150mm or more shall be provided from front to back at 2m intervals in each course. The position of the stones shall be marked on both the faces for identification.

3.3 Hearting:

All stones, chips, spills etc., shall be washed clean with water before use so as to ensure a clean surface for the mortar to adhere. They shall be sprinkled with water before actual placing in work to prevent the absorption of water from the mortar. This is specially necessary in case of sand stones and other highly water absorbent stones. The floor shall be filled in with good flat bedded stones set as close as possible, well furnished in mortar. Care should be taken that no dry areas of work or hollow space shall be left anywhere in the masonry.

4.0 UNCOURSED RUBBLE STONE MASONRY DRESSING:

The face stone shall be hammer dressed on the face, sides and the beds to enable it to come into close proximity with the neighbouring stone. The bushy objects in the faces shall not project more than 40mm on the exposed face and 12mm on the face to be plastered.

4.1 Face Stones: The stones shall be not less width in plan than 150mm for walls 400mm thick, 200mm for walls 450mm thick, 250mm for walls 600mm or more. No stones less than 150mm in height shall be used on faces.

4.2 Bond stones: Shall be built in the wall at an interval of 2 mts in length and 600mm in height and shall run throughout the wall if the wall is not less than 600mm thick. If the wall is more than 600mm, a line of headers shall be laid from face to back each header overlapping the other by atleast 150mm. The bond stones shall be clearly marked on both the faces.

4.3 Hearting: So much as in CRS masonry.

5.0 PLASTERING WITH CWEMENT MORTAR:

General Note: The mortar us3ed for plastering shall be still enough to cling and hold when laid. For ceiling the mix is required to be stiffer than that used for walls.

5.1 To ensure even thickness and a true surface plaster shall be applied in patches of 150mm x 150mm of required thickness at not more than 2 mts intervals horizontally and vertically over the entire surface to serve as guides. The surface of these guides shall be truly in the plain of the finished plastered surface and truly plumb. The mortar shall then be applied to the surface to be plastered between the guides with trowel.

5.2 Each trowelful of mortar shall overlap and sufficient pressure shall be used to force it into thorough contract with the surface. The surface shall be periodically checked, during plastering, with considerable stretch across it. For obtaining true surface a long wooden float and a small wooden float shall be used.

6.0 FORM WORK: (IS – 456/2000, Clause No.11)

The tolerance on lines and dimensions shown in the drawing and shall be within lthe limits as given below:-

a) Deviations from specified dimensions of cross : + 12mm
Sections of columns and beams : - 6mm

b) Deviation from dimensions of footing:

i) Dimensions in plan : +50mm
-12mm

i) Eccentricity: 0.02 times the width of the Footing in the direction of deviation but Not more than 50mm.

ii) Thickness: +0.05b times but specified thickness

6.1 Stripping time: (Clause No.11.3)

Type of form work		Minimum period before striking from work
a)	Vertical form work to columns, beams	16 to 24 hours
b)	Soffit form work to slabs (props to be fixed immediately after removal of form work)	3 days
c)	-do-	7 days
d)	Props to slabs 1. Spanning upto 4.5 mts 2. Spanning over 4.5 mts	 7 days 14 days
e)	Props to beams and arches 3. Spanning upto 6 mts 4. Spanning over 6 mts	 14 days 21 days

Note: The number of props left any, their sizes and disposition shall such as to be able to fully carry the dead load of the slab beam or arch as the case may be to come with any live load likely to occur during curing of further construction.

7.0 SAMPLING OF REINFORCEMENT: (Clause No.12.31 of I.S 456 – 2000)

Tolerance on placing of reinforcement:

Unless and otherwise specified by engineer-in-charge, the reinforcement shall be placed within the following tolerances.

a) For effective depth of 200mm or less : ±10

b) For effective depth of more than 200mm or less : ±15mm

7.1. Tolerances for cover: Unless specified otherwise actual concrete cover should not deviate from the nominal cover by +10mm, -0mm.

7.2. Nominal cover (Clause No.26.4.2)

To meet the durability requirement shall not be less than the dia of the bar and as given below:-

Exposure	Nominal concrete cover in work not less
Mild	20mm
Moderate	30mm
Severe	45mm
Very Severe	50mm
Extreme	75mm

For longitudinal reinforcement beam and columns shall not be less than 40mm or less than the dia of such bar. For small dimensional columns of 200mm where the longitudinal reinforcement bars do not exceed 12mm nominal cover of 25mm may be used. For footings the minimum cover shall be 50mm.

Note: 1. For…. reinforcement upto 12mm dia bar for lightly exposure the nominal cover may be reduced by 5mm.

2. Unless specified otherwise, the actual concrete cover should not deviate from the required nominal cover by +10mm -0mm.

8.0 PLACING OF CONCRETE:(IS – 456/2000 Clause No.13.2)

The concrete shall be deposited as nearly as practicable in its final position to avoid much handling. The concrete shall be placed and compacted before initial setting of concrete and should not be subsequently disturbed. There should not segregation or displacement of reinforcement from work. Generally, the maximum free fall permissible may be taken as 1.5 mts.

8.1 Compaction: (Clause No.13.2)
Concrete shall be compacted using maximum vibrations. Over vibration and under vibration are harmful and should be avoided. Vibration of very wet mix should also be avoided.

9.0 CEMENT CONCRETE:

Slump test : (Vide Clause No.7 IS 456/2000)

a) Concreting of lightly reinforced sections with or without vibrations, mass concreting lightly reinforced sections and slabs, beams, walls, columns, floors etc., with very low and low degree of workability. The slump to be between 25 to 75mm.
b) Concreting with heavily reinforced sections in slabs, beams, walls, columns, slip from work, pumped concrete etc., with medium degree of workability to be between 50 to 100 or 75 to 100 as directed by Engineer-in-charge.

9.1 Frequency of sampling and test results:
(Clause No.15, IS-456/2000)

(a) Sampling procedure: The random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested i.e., sampling should be spread over the entire period of concreting and cover all mixing units.

(b) The minimum of frequency of sampling of the concreting of each grade shall be as follows:

Quantity of concrete in the work (in Cu.m)	No. of Samples
1 to 5	1
6 to 15	2
16 to 30	3
31 to 50	4
51 and above	4+ one additional sample of each additional 50 Cu.m. or part thereof.

(c) Test specimen: 3 test specimens shall be made for each sample for testing at 28 days. Additional samples may be required for various purposes such as to

determine the strength of concrete at 7 days or at the time of striking the work or to determine the duration of curing or to check the testing error.

(d) Test results of the samples shall be the average of the strength of 3 specimens. The individual variation should not be more than ±15% of the average. If more, the test results of the sample are invalid.

9.2 Clause No.16:

Concrete of each grade shall be assessed separately. Concrete is liable to be rejected if it is coarse or honey comb. Its placing has been interrupted without providing a proper construction joint. The reinforcement has been displaced beyond the tolerances specified or construction tolerances have not been met. However, the hardened concrete may be accepted after carrying out suitable remedial measures to the satisfaction of engineer-in-charge.

9.3 ACCEPTANCE CRITERIA – Compressive strength vide Clause No.16:

The concrete shall be deemed to comply with the strength requirements when the following conditions are met.

a) The mean strength determined from any group of 4 consecutive test results comply with the appropriate limits in column No.2 of table 11.
b) Any individual test results comply with the appropriate limits in column No.3 of table No.11.

10.0.**ROAD WORKS** : Specifications:

All works performed shall conform to the line, grade and sections shown in the drawings or as directed by engineer-in-charge subjected to permissible tolerances as given below:

10.1 Horizontal alignment: The horizontal alignment shall be reckoned with respect to the center line of the carriage way as shown in the drawing. The edges of the carriage way shall be concreted with a tolerance of ±40mm.

10.2 Longitudinal profile: (a) The levels of the sub grade and different pavement courses as constructed shall not vary from those calculated beyond tolerances as given below:-

Sub-base	:	±25mm
Base course	:	±15mm
Wearing course	:	±10mm
CC pavement	:	±10mm

(b) Provided that the negative tolerance for wearing course shall not be permitted in conjunction with the positive tolerance for base course, if the thickness of the former is therby reduced by more than 6mm.

(c) The longitudinal profile shall be checked with 3 mts long straight edge at the middle of each traffic lane parallel to centre line of the road. The transverse profile shall be checked with a test of 3 chambers at intervals of 10 mtrs.

10.3 Surface regularity of sub base and pavements courses:

Permitted tolerances are as follows:-

Sl. No.	Type of construction	Longitudinal profile	Cross profile
1	Sub base	18mm	10mm
2	WBM for base course	15mm	12mm
3	WBM for wearing course	12mm	8mm
4	Built up spray grout	12mm	8mm
5	Bituminous mecadam	6mm	6mm
6	Surface dressing over BM	6mm	6mm
7	Bitumen renewal coat by hot mix	6mm	6mm
8	Asphaltic concrete	3mm	4mm
9	CC pavement	3mm	4mm

10.4 Rectifications:

WBM Base: When the surface is high or low the top 75mm shall be scarified, reshaped with added material wherever necessary and re-compacted. The area treated at a place shall not be less than 5 mtrs long and 2 mtrs wide.

10.5 BITUMINOUS CONSTRUCTION: For bituminous constructions other than wearing course where the surface is low, the defects shall be concreted by adding fresh material and re-compacting to conform to specifications. Where the surface is high, the full depth of the layer shall be removed and replaced with fresh material and compacted.

10.6 For wearing course where the surface is high or low, the full depth of the layer shall be removed and replaced with fresh material, compacted to specifications. The area to be treated shall not be less than 5 mtrs long and one lane width.

107 CEMENT CONCRETE PAVEMENT: Any high spots shall be cut down and refinished. Depressions shall be enlarged to above 80 to 100mm and fill with fresh concrete, compacted and finished.

11.0 **WATER BOUND MACADAM**

Description: (a) WBM shall consist of clean aggregates mechanically interlocked by rolling, and bonded together with screenings / filler material with the help of water laid on a prepared subgrade, sub-base, base or existing payment as the case may be and to be finished in accordance with the requirements of these specifications and in conformity with the lines, grades and cross sections shown on the drawing.

(b) The Coarse aggregate shall confirm to S.R.Specifications / APDSS as applicable.

11.1 **FILLER / MINDING MATERIALS:** Where the single size aggregate is used, murram shall be used to fill the voids where graded aggregates are used, screenings preferably of the same material as the coarse aggregates shall be used.

11.2 **PREPARATION OF BASE:** (a) Sub-grade / sub-base to receive the WBM course shall be prepared to the specified grade and camber and made free of dust, other extraneous material. Where renewal of WBM is to be done, the entire existing surface shall be picked up and useful material shall be re-used. Where WBM is to be laid over an existing black topped surface 50mm x 50mm furrows shall be cut an at angle of 45° to the central line of the road at One metre intervals in the latter before laying the coarse aggregate. Any ruts for soft yielding places shall be corrected in an approved manner and rolled until the sub-grade / surface to be renewed is firm.

(b) WBM coarse shall be normally constructed in layers of not more than 75mm compacted thickness. No segregation of large or fine particles shall be allowed.

(c) Soling should not be laid in two layers as the top of the bottom layer has generally an uneven surface and the upper layer is likely to rock under traffic.

11.3 **Rolling:** (a) Immediately following the spreading of coarse aggregate rolling shall be started with Road Roller 8 to 10 Tons capacity or vibtrator roller of approved type. First the edge shall be compacted with roller running forward and backward. The roller shallthen move inwards parallel to the central line of the road in successive passes uniformly following proceeding tracks by atleast One-half width.

(b) After partial compaction of the aggregates with sufficient void space in them the rolling shall be discontinued to permit the application of the binder. During rolling, slight sprinkling of water shall be done. When sub-grade / sub-base course causes a wave like motion, rolling shall not be done. The filler materials shall be applied at uniform rate so as to ensure filling of all voids. Rolling and brooming shall continue with the spreading. These operations will continue until no filler material can be forced into voids of the coarse aggregate.

11.4 **SETTING AND DRYING:** After final compaction of WBM coarse the road shall be allowed to dry over night. Next morning hungry spot shall be filled with filler material and lightly sprinkled with water if necessary and rolled. No traffic shall be allowed on the road until the macadam has set.

12.0 **BUILT UP SPRAY GROUT BASE: (SEMI GROUT):** (a) The specifications in intended as an alternative to conventional WBM, where the construction may otherwise be difficult, such as when strengthening of an existing road is involved, which cannot be closed to traffic.

(b) Built up spray grout shall consists of a two layer composite construction of compacted coarse aggregates with application of bituminous binder of each layer for bonding and finishing with key aggregates at the top of 2nd layer so as to yield a thickness not exceeding 75mm in accordance with the requirements of these specifications and conformity with the lines, grades and cross sections shown in the drawing or as directed by Engineer-in-Charge.

(c) Built up spray grout shall not be constructed when the atmospheric temperature in shade is below 16° C or when pavement is damp for the whether is foggy or rainy.

12.1 **PREPARATION OF BASE:** (a) The underlying coarse on which the built up spray grout base is go be laid, shall be prepared by patching up pot holes and bringing the surface to the specified lines, grades and cross sections. (through a levelling course where necessary). The underlying course may be an existing WBM coarse or black top surface.

(b) After the under lying surface is prepared the tack coat shall be supplied preferably with a sprayer.

12.2 **SPREADING AND COMPACTING THE FIRST LAYER OF COARSE AGGREGATE:** (a) Immediately after application of track coat the coarse aggregate shall be spread and hand packed @ 0.5 Cu.mts. per 10 Sq.mtrs to an uniform depth true to the required alignment and profile.

(b) Surface of the layer shall be carefully checked with templates and all high and low spots remedied by removing or adding aggregate as may be required.

(c) The entire surface shall be done / be compacted with a 8 to 10 Tons smooth wheel roller as per standards. After initial rolling, the surface shall be checked transversely and longitudinally with templates and if there are any irregularities shall be corrected. Too-much rolling shall not be done as the closing of the voids in the aggregate later prevents free and uniform penetration of the binder to be sprayed successively in the next operation.

(d) Application of binder (first spray) the binder shall be heated to the temperature appropriate to the grade of the bitumen used and then applied on the aggregate layer at the road @ 12.5 Kgs. per 10 Sq.mtrs. uniformly, preferably with sprayer. Then the 2nd layer of coarse aggregate should be spread soon after application of the binder on first layer and rolled as per the standard norms. The 2nd aggregate layer shall then be given a binder spray @ 12.5 Kg per 10 Sq.mtrs. When this 2nd spray of binder is till hot, key aggregates (12mm granite chips) in a clean and dry state shall be immediately spread uniformly @ 0.13 Cu.mtrs per Sq.mtrs, so as to cover surface completely. If necessary, the surface shall then be broomed to ensure uniform application of the key aggregate. The entire surface shall then rolled with 8 to 10 tonnes smooth wheeled roller. Wherever need arises, additional key aggregate may be spread by hand and rolling continues for the entire course so as to ensure thorough compaction with key aggregates to be firmly in position.

13.0 **BITUMINOUS MACADAM:** This work shall consists of open graded construction in a single course of 50mm / 75mm thickness of compacted crushed aggregates pre-mix with a Bituminous binder laid immediately after mixing on a base prepared previously in accordance with the requirements of these specification and in conformity with the lines, grades and cross sections shown in the drawing or as directed by the Engineer-in-Charge.

13.1 **It shall not be used as wearing course as such** The binders shall be as specified. The aggregates shall be as specified in the SR /Schedule etc. The physical requirement of

the aggregates should satisfy the strength aspects and other as specified in S.R with their limits, such as abbression test value, aggregate impact value, crushing strength value, flakiness index etc. After proper preparation of the base as in the case of built up spray grout etc., a tack coat shall be applied witht the quantities as specified over the base course.

13.2 (a) Hot mix plant of adequate capacity shall be used for preparing the mix. The temperature of the binder at the time of mixing shall be in the range of 160° to 180° C and with all aggregates shall be in the range of 155° to 165° C. Provided, also that, at no time shall the difference in temperature between the aggregates and the binder exceeds 15° C.

(b) The mixing shall be thorough to ensure that a homogeneous mix is obtained in which all particles of the aggregates are coated uniformly. The same shall be transported from the mixing plant to the point of use in suitable vehicle.

(c) The mix shall be spread immediately after mixing by means of self propelled mechanical paver with suitable screeds capable of spreading, tamping and finishing the mix to the specified lines, grades and cross sections. However, in restricted location narrow widths, where available plants cannot operate in the opinion of Engineer-in-Charge, he may permit manually of the mix. The temperature of the mix at the time of laying shall not be less than 120° C.

13.3 Longitudinal joints and edges shall be constructed true to the delineate lines parallel to the centre line of the road. All joints shall be cut vertical to the full thickness of the previously laid mix and surface paited with hot bitumen before placing fresh material.

13.4 **ROLLING:** Immediately after spreading of the mix, rolling shall be done by 8 to 10 tones power roller and shall be carried out as per standard methods. The high spots and depressions shall be corrected by removing or adding afresh material. The rolling shall be continued till the entire surface has been rolled to fully compaction and there shall not be any crushing of aggregate.

14.0 FREQUENCY OF TESTS FOR SU-BASE AND BASES (EXCLUDING BITUMEN BOUND BASES)

Type of construction	Test	Frequency	Procedure
Murram Surface	Gradation	1 test for 300 Cu.m	IS-2274 4 / 1975
	Natural moisture	1 test for 300 Cu.m	IS-2274 4 / 1975
	Natural moisture content/moisture content prior to compaction, density of compacted layer	1 test for 250 Cu.m	IS-2270 2/1973
	CBR test (One set of 3 specimens)	As required	IS-2720 16/1975
Mechanically compacted	Gradation	1 test for 200 Cu.m	IS-2385 4/1963
	P.I. of mixed Material	1 test for 100 Cu.m	
	Moisture content prior to compaction	1 test for 250 Cu.m	
	Dry density of compacted layer	1 test for 500 Sq.m	
	CBR test at site	1 test	

14.1. WBM Surface	Los Angeles Abrasion test	1 test for 200 Cu.m	IS-2386 part-4
	Crushing of aggregate and scraping	1 test for 100 Cu.m	
	Flakiness	1 test for 200 Cu.m	
	P.I. of binding Material	1 test for 25 Sq.m	

14.2 Bitumen renewal coat by hot mix process

	Quality of binder	As required	IS-73/1961 IS-215/1961 IS-217/1961 IS-454/1961 as Required
	Los Angeles Abrasion test	1 test for 50 Cu.m	
	Crushing of aggregates	1 test for 25 Cu.m	

Temperature of binding during application: Regularly

	a) Binder content	2 tests for per day
14.3. Bitumen Macadam	Quality of Binder	as required
	Los Agneles Abrasion test	1 test for 50 to 100 Cu.m
	Flakiness	-do-
	Mix gradient	2 tests per day
	Control of tempe-rature of binder and aggregate and the mix at the time of laying	Regular
	Control of binder content and aggregate gradation in the mix	Periodically subjected to minimum of 2 tests per day per plant

Note: Variation in binder content should not be more than ±3% by weight of total mix.

14.4. Built up spray grout

	Loss Angeles abrasion	1 test for 200 Cu.m
	Aggregate	1 test for 100 Cu.m
	Flakiness	1 test for 200 Cu.m
	Quality of binder	1 test for 200 Cu.m
	Rate of spread of binder	As required
	spread of aggregates	Regular
	temperature of binder, curing, application, cambre, checking, thickness, surface finish etc.	
14.5 Asphalting concrete		
	Quality of binder	As required
	Los Angeles test	50 to 100 Cu.m
	Water absorption of aggregates	50 to 100 Cu.m
	Flakiness	50 to 100 Cu.m
Sieve analysis for	1 test on individual constituent and mix aggregate from the drier for each 100T of mix subjected to minimum of 2 sets of tests per plant per day.	
Control of Temerature of Binder in boiler, aggregate in the drier and in mix during laying and rolling per each 100T		
	Binder content and gradation in the mix	One set for each 100T of mix subject to minimum of 2 tests per day per plant.
	Thickness and density of compacted layer	1 test for 500 Sq.m

15.0 **PAINTINGS AND WARNISHINGS:**

15.1 **Paint remover:** Patent paint removers shall consists of volatile organic liquids thick end with waxes and other ingredients to retard the evaporation of the liquid and to enable a substantial layer of remover to be applied to the surface. This shall be of specified brand and make.

15.2 **Application:** Paint remover shall be used where burning off with blow lamp is not suitable. This shall be applied liberally with a brush and allowed to remain on surface for specified period as per the manufacturer and depends on the thickness of the Old paint to be removed. When the paint film lips and wrinkles under the action of the remover it shall be stripped with a sharp instrument. As per the need second coat of remover may be applied for complete removal of the old painting. The surface then shall be washed down with mineral turpentine to remove all traces of parfin wax, which forms one of the ingredients of patent paint remover and which if left in place will prevent the paint from drying. The cleaned surface shall be suitably prepared for application of the Painter other finish.

15.3 **Removing Old Paint with Castic Soda solution:**

Method: The Castic Soda dissolved in 48 times its volume of water shall be applied to the old paint with a brush and when the paint film lifts, wrinkles it shall be thoroughly scrapped off. After the surface has been stripped thoroughly it shall be rinsed with several times with clean water to remove all traces of Alkali which if allowed to remain will liable to spoil the new paint applied over it. A little acetic Acid or Venigar added to the final change of rinsing water, helps to neutralize any remaining Alkali.

16.0 **SPECIFICATION FOR COAL TARING AND ITS PREPARATION:**

COAL tar of approved quality and grade shall be used the Tar to every litre of which 200 grams of unslacked lime has been added shall be heated till it begins to boil. It shall then be taken off the fire and Kerosene Oil added to it slowly at one part of the Kerosene Oil to 6 to 16 parts of Coal tar by volume and sturd thoroughly. The addition of lime is for preventing the coal Tar from running. This is normally appllied on back side / hidden surfaces on wood, steel sections abetting to the jambs of door opening.

ANNEXURE.III

LIST OF PRINCIPAL MAKES / BRANDS OF VARIOUS MATERIALS

1. Materials used in the works in SCCL should be from the following list of Manufacturers / Brands.
2. Incase of non-availability of these brands the General Manger (Civil) shall allow materials as approved by BIS/ISI Monogram at part with Principal Maker.
3. The brands specified below will supersede {and as approved by G.M(Civil)} over to such specified brands in SCCL Schedule and in case of ambiguity, if any, arises in interpretation of the item.
4. For some materials where BIS/ISI Certification may not be available the same have to be got approved by G.M(Civil).

i. G.I.PIPES:

a) Zenith
b) Bharat Steel Tubes
c) Jindal
d) Appolo
e) Tata

ii. GATE VALVES/SLUICE VALVES/GLOBE VALVES:

a) Zolto
b) Annapurna
c) Harrison
d) SSF
e) Orient
f) Kirloskar

iii. C P BIB TAPS/STOP TAPS:

a) SRS
b) Hindko
c) HMP
d) Metro
e) ESSCO
f) MESSCO
g) ARIC
h) L & K
i) Jaguar

Quality can be maintained only with constant pursuance of good efforts

iv. VITRIOUS SANITARY WARE LIKE WASH BASIN, URINALS, WC PANS, PEDESTALS, SQUATTING, FLUSHING SYSTEM, SINKS etc.

a) Hindustan Sanitary Ware (Hind Ware)
b) Parryware
c) Nycer

Note: In case of variation in sizes against specified, the same can be allowed with the prior written approval of G,M(Civil)

v. WATER PROOFING COMPOUNDS:

a) Impermp (2% by weight of cement) M/s Snowcem India Ltd.
b) CICO (3% by weight of cement) M/s Structural Water proofing.
c) ACCO proof (2% by weight of cement) M/s.ACC.
d) Fosroc Chemical as specified by Manufacturers.
e) Scot No.1 – M/s.Pegaus Ltd.
f) Lilax (3% by weight of cement) M/s.Sahara Chemicals.

vi. CEMENT PAINTS/TEXTURED/OBD:

a) Snowcem (Killic Mixor)
b) Berger Paints
c) Asian Paints
d) Jenson & Nichlson
e) Nerolac
f) Garware

vii. PAINTS/PRIMERS FOR WOOD WORK, IRON AND STEEL ETC.:

a) Goodlass Nerolac
b) Jenson & Nichlson
c) Asian Paints
d) Berger Paints
e) Garware Paints

viii. PVC (UNPLASTICISED PIPES & FITTINGS):

a) Sudhakar
b) Supreme
c) Prince
d) Chemplast
e) Wavin
f) Finolex

ix. LOW LELVEL PLASTIC FLUSHING:

a) Commander – Champion
b) Commander – Water Bird
c) Fordham
d) Everlass
e) Parryware – Slimline

x. CERAMIC GLAZED TILES:

a) Spartek
b) Regency
c) Parryware
d) Somany
e) Naveen
f) Khajaria

xi. PLYWOOD, BLOCK BOARDS, PARTICLE BOARD & MDF BOARDS:

a) Swastic Plywood
b) Sudarshan Plywood Industries Ltd.
c) Kitply
d) Kutty
e) Bhusan Boards
f) Duraty
g) New Wood
h) Novopan

xii. WATER TANKS (FDA approved grade of Low density polyethylene/ HDPE/LLDPE Water Storage Tanks:

a) Sintex
b) G & P
c) Infra
d) Fusion
e) Polycon

xii. GLASSES:

a) Indo-Ashai Glass Company
b) Triveni Sheet Glass Work
c) Saint Gobain
d) Vallabh Glass Works Ltd.
e) Modi Guard
f) Tata
g) Atul

Recycling is a Best option of Waste Disposal

xiv. ALUMINIUM EXTRUDED SECTIONS FOR DOORS, WINDOWS AND VENTILATORS:

a) Indal
b) Hindal
c) Jindal

xv. FLUSH DOOR SHUTTERS & PANEL DOOR SHUTTERS:

a) Myso Board
b) Indian Plywood
c) Swastic (Kitply)
d) Kutty Flush Boards.

xvi. Cement bonded particle Boards:

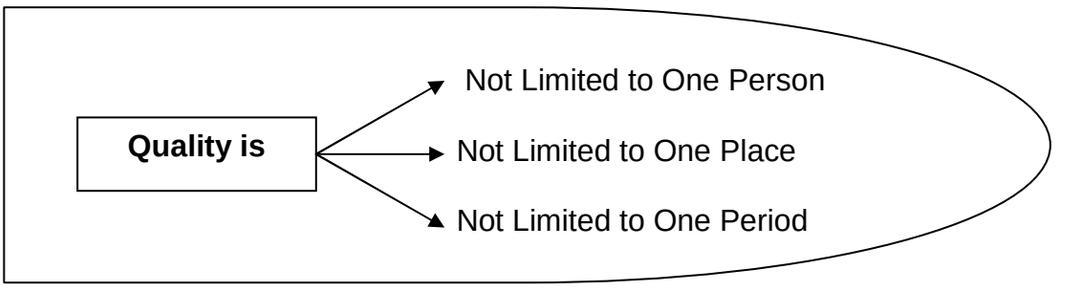
a) Bison or equivalent as approved by G.M(Civil)

PHOTOGRAPHS OF WORKS:

The contractor shall submit three sets of the prints with negatives of the photographs size 5” x 7” to SCCL on the following stages of work :-

1. Foundation work before plinth.
2. Shuttering and reinforcement details before laying concrete.
3. Masonry work before plastering.
4. Before painting work.
5. Completion before handling.

One or more photographs can be taken with completed view of the work.



ANNEXURE-IV

THE SINGARENI COLLIERIES COMPANY LIMITED
(A GOVERNMENT COMPANY)
******

CIVIL ENGINEERING DEPARTMENT
QUALITY CONTROL CELL/BPA REGION
****

ACTION TAKEN REPORT

Ref:No. Date:_____
Time:_____Hours.

01	Name of the work / Agency			
02	Estimated Cost/Amount of Contract			
03	Q.C.Ref.No. & Date			
04	Details of action taken by Area Engineer			
	Sl.No.	**Details of Deficiency with Area/Volume**	**Action Taken: Rectification done / Amount of Penalty imposed**	**Remarks**
05	Penal Action proposed if any			

Dy.G.M(Civil)/S.E(Civil)
_____Area.

REMARKS OF QUALITY CONTROL CELL:

1) Action taken by Area Engineer is sufficient / not sufficient.
2) Action taken by Q.C.C (if any)_____.

Dy.G.M(Civil)/S.E(Civil)/QC
KGM/BPA/RG

CC to: G.M(Civil)
AGM(Civil)/KGM/BPA/RG.

ANNEXURE-V

THE SINGARENI COLLIERIES COMPANY LIMITED
(A GOVERNMENT COMPANY)
******

CIVIL ENGINEERING DEPARTMENT
QUALITY CONTROL CELL/KGM/RGM/BPA
****

INSPECTION REPORT

Ref:No. Date:_____

Time:____Hours

1	Name of the Work	
2	Estimated Cost/Amount of contract	
3	Locality	
4	Name of the Engineer in Charge	
5	Name of the Agency	
6	Stage of work (i.e. item of work in progress)	

7 **OBSERVATIONS:**

J.E(Civil)/A.E(Civil) **E.E(Civil)/S.E(Civil)** **Dy.G.M(Civil)QC/Kgm: S.E(Civil)/QC:BPA/RGM**

ANNEXURE-VI

THE SINGARENI COLLIERIES COMPANY LIMITED
(A GOVERNMENT COMPANY)
CIVIL ENGINEERING DEPARTMENT
QUALITY CONTROL CELL/KGM/RGM/BPA
****

C.C HOLLOW BLOCKS/FLY ASH SOLID BLOCK COMPRESSIVE TEST REPORT

Ref:No. Date:

01	Name of the Mine						
02	Date of Collection of smaples						
03	Samples collected by						
04	Samples collected in the presence of						
05	Number of Blocks Collected	**No. of Lots**	**Number of Samples Collected**				
		Lot 1:	1				
			2				
			3				
		Lot 2:	1				
			2				
			3				
		Lot 3:	1				
			2				
			3				
06	Date of receipt of Blocks at Lab						
07	Date of Testing						
08	Results	**Lot No.**	**Samples**		**Strength**		
		Lot 1:	1			Kg/Cm^2	
			2			Kg/Cm^2	
			3			Kg/Cm^2	
		Lot 2:	1			Kg/Cm^2	
			2			Kg/Cm^2	
			3			Kg/Cm^2	
		Lot 3:	1			Kg/Cm^2	
			2			Kg/Cm^2	
			3			Kg/Cm^2	
09	Strength specified in the Tender	**Lot No.**	**Passed the test/failed**		**Recommended for acceptance**		
		Lot 1:					
		Lot 2:					
		Lot 3:					

Lab Incharge J.E(Civil) Dy.G.M(Civil)/QC/Kgm:
S.E(Civil)/QC:BPA/RGM

ANNEXURE-VII

THE SINGARENI COLLIERIES COMPANY LIMITED
(A GOVERNMENT COMPANY)
******

CIVIL ENGINEERING DEPARTMENT
QUALITY CONTROL CELL/KGM/RGM/BPA
****

CC. MIX TEST REPORT

Ref:No. Date:_____
Time:____Hours

01	Name of the Work/Agency				
02	Estimated Cost/Amount of Contract.				
03	Source of Sample				
04	Date of Sample				
05	Date of Testing For 3/7/28 days curing period test of				
	Sl.No.	**Size of Sample**	**Load in Tons**	**Compressive Strength in Kgs/Cm^2**	**Remarks**

Average value_____Kgs/Cm^2 as against _____Kgs/Cm^2 .

The Results are_____

Conditions:

1) Results given above are representing the _____m^3 of concrete.

Lab Incharge **J.E(Civil)** **Dy.G.M(Civil)/QC/Kgm:**
S.E(Civil)/QC:BPA/RGM

ANNEXURE.VIII

THE SINGARENI COLLIERIES COMPANY LIMITED
(A GOVERNMENT COMPANY)
******

CIVIL ENGINEERING DEPARTMENT
QUALITY CONTROL CELL/KGM/RGM/BPA
****

B.T. MIX TEST REPORT

Ref:No. Date:_____
Time:____Hours

01	Name of the Work/Agency	
02	Weight of Sample	
03	Date of Collection of Samples	
04	Identification Mark	
05	Type of Mix	

BITUMEN EXTRACTION TEST

1) Initial weight of the sample: (W1) = gms.

2) Final Weight of Sample after Extraction of bitumen : (W2) = gms.

3) Bitumen content (W1 – W2) gms. = gms.

4) Percentage of Bitumen content = $\frac{W1 - W2}{W1} \times 100$ = %

Comments:

The Bitumen content in _____ is of _____% as against _____%.

Hence satisfactory/unsatisfactory.

Conditions:

Results given above are for samples collected only.

Lab Incharge **J.E(Civil)** **Dy.G.M(Civil)/QC/Kgm: S.E(Civil)/QC:BPA/RGM**

PENAL PROVISIONS

PENAL PROVISIONS

SL NO	Name of Item of work	Type of defect	Action proposed (Deduction/Penalty)
1	**C.C. roads, Platforms, Hardening**	1) Metal exposed	Affected area of CC road to be rejected and amount to be deducted
		2) Surface damaged	Affected area of CC road to be rejected and amount to be deducted +50% of above amount as penalty.
		3) Water stagnation	Rectification to be got done to the affected area OR to be reconstructed.
		4) Improper curing	5% of cost of item of the identified quantities/area.
		5) Unprotected edges	Rectification.
		6) Measuring boxes not used	Rs.1000/- penalty per day of concreting.
		7) Failure of CC cubes	Rejection of area of CC from where the sample is taken.
		8) Less thickness of rich mix up to 10% (average at cross-section)	Proportionate recovery of affected area + 100% extra as a penalty.
		9) Less thickness of rich mix above 10%	Redoing the surface + penalty of Rs.5000/-.
		10) Progressive surface damage	Withholding of payment of the area until defect liability period.

No special knowledge OR skill is required to comment about a poor Quality work in Civil Construction. Even a Layman OR an illiterate can do so.

2.	**B.T.Roads**	1) Less thickness up to 10%	Deduction of less thickness
		2) Less thickness between 10% to 20%.	Deduction of less thickness + 50% of above amount as penalty.
		3) Less thickness above 20%	Rejection of work in that reach. No payment for the work.
		4) Less BT content upto 0.3%.	Recovery of cost of BT for reduced quantity.
		5) B.T.Content variation more than ±0.3% by weight	Rejection of work. No payment to be made.
		6) Water stagnation point	Withholding of payment until rectification is carried out / Rejection of 5 times the area.
		7) Oversize metal upto 10%	No recovery.
		8) Oversize metal 10% to 20%.	Recovery of 25% of difference of cost between the size metal and next higher size metal.
		9) Oversize metal between 20% to 30%.	Recovery of 50% of difference of cost between the size metal and next higher size metal.
		10) Oversize metal above 30%.	Rejection of metal.
		11) Improper compaction and consolidation.	50% of cost of spreading item for affected quantity.

3.	**WBM roads & other metal works.**	1) Density of metal less upto 10%	Single recovery for less used by volume.
		2) Density of metal less between 10% to 20%	1½ times recovery of less metal used by volue.
		3) Density of metal less than 20%	Rejection of work / Redoing the work within a month / No payment and with penalty of 50% of the item of cost of rejection.
		4) Oversize metal upto 10%	No recovery
		5) Oversize metal 10% to 20%	Recovery of 25% of difference of cost between the size metal and next higher size metal.
		6) Oversize metal between 20% to 30%.	Recovery of 50% of difference of cost between the size metal and next higher size metal.
		7) Oversize metal abovwe 30%.	Rejection of metal.
		8) Less thickness	Proportionate recovery.
		9) Improper wetting.	50% of cost spreading item for affected quantity.
		10) Improper compaction and consolidation.	50% of cost of spreading item for affected quantity.

We must learn from mistakes we make during construction. Mistakes should not be allowed to be repeated.

4.	**SS Flooring**	1) Improper pointing	2% of cost of item as penalty.
		2) Bad workmanship or not in mud mortar	Rejection of bad workmanship + 5% of cost of item as penalty.
5.	**RCC works**	1) Failure of cube sample in compressive strength.	Rejection of the specified portion and redoing of the same.
		2) Improper curing	Penalty at 5% of the cost of item of quantity applicable.
		3) Weak proportion	Rejection and rectification.
		4) Bad Workmanship.	Rejection + Penalty at 2% of the cost of item.
		5) Honey – combs	Dismantling of honeycombed area and redoing or rectification to be carried out at that place + penalty at 1% of cost of item.
		6) Excess water / cement ratio.	Penalty at 1% of cost of item.
		7) Improper centering	100% deduction in centering charges of that portion + 25% penalty on the same.
6.	**CC Bed Blocks**	1) Improper size	Rejection of item + 10% cost of item as penalty.
		2) Bad workmanship	Rejection or + 10% cost of item as penalty.
		3) Holding down bolts for purlins/bed blocks if not provided.	Rejection of bed blocks cost + 50% of cost of item as penalty.

7.	**<u>Supply of Pit materials.</u>** **a) <u>Sand:</u>**	Beyond admissible limit of 4% with ± 3% of silt and deleterious material.	Rejection.
	b) <u>CR Stone</u>	If material supply is not as per specification; a) Under size b) Irregular shape	 a) proportionate recovery/rejection. b) 10% of cost of item.
	c) <u>Metal</u>	1) Oversize metal up to 10%	No recovery
		2) Oversize metal 10% to 20%	Recovery of 25% of difference of cost between the size metal and next higher size metal.
		3) Oversize metal 20% to 30%	Recovery of 50% of difference of cost between the size metal and next higher size metal.
		4) Oversize metal above 30%	Rejection of metal.
8.	**UCRS masonry/ CRS masonry work**	1) Weak proportion of mortar	Dismantling & reconstruction + 20% of cost as penalty for the portion applicable.
		2) Headers nor provided.	Dismantling & reconstruction.
		3) Improper Hearting (Mix & stone)	Penalty at 5% of cost of item of applicable quantity.
		4) Improper Curing.	2% of estimate cost as penalty.
		5) Improper jointing	2% of estimate cost as penalty + Payment of item in appropriate Category.
		6) Bad workmanship (Line & Plumb)	2% of estimate cost as penalty.

Good Quality Construction cannot be carried out using poor Quality Material.
It is often possible that poor construction is done using good Quality Materials.

9.	**Murram Filling**	1) Less thickness	Proportionate recovery
		2) Any Foreign material mixed	Yes. 5% of the estimate cost of item as Penalty.
		3) Improper consolidation.	Yes. 2% of the estimate cost of item as penalty.
10.	**Earth work for embankment formations.**	1) Defective side slopes and improper formation	Rectification + 10% of cost of item as penalty for the quantum of work applicable.
		2) Defective consolidation and improper watering.	Rectification + 10% of cost of item as penalty for the quantum of work applicable.
11.	**Debris/Quarry dust sand/any other filling material**	1) Less thickness	Proportionate recovery + 5% of the estimate cost of item as penalty for the quantity applicable.
		2) Improper consolidation.	2% of the estimate cost of item as penalty for the quantity applicable.
12.	**Masonry drains**	1) Less thickness	Proportionate recovery.
		2) Improper slopes	5% of the estimate cost of item as penalty and rectification.
		3) Failure of cube sample in compressive strength	Rejection of the specified portion and redoing of the same.
		4) Improper curing	Penalty at 1% of the cost of the item.
		5) Weak proportion	Rejection and rectification.
		6) Bad workmanship.	Penalty at 5% of the cost of item of work.

13.	**RCC pipe drain**	1) Less Diameter	Proportionate recovery.
		2) Less thickness of pipe up to 10%	Proportionate recovery.
		3) Less thickness of pipe more than 10%	Rejection and redoing.
		4) Insufficient cushion	Rectification by bedding and cradling.
		5) Improper jointing	Rectification.
		6) Improper Alignment	Rectification.
		7) Improper Gradient	Rectification.
		8) Damage to Pipe	1½ times the cost of pipes as penalty for the damaged portion are redoing.
14.	**DPC**	1) Less thickness	Rejection and redoing.
		2) Bad workmanship / finishing	Rectification or 5% of cost of item as penalty.
		3) Poor bitumen coat	Rejection Tar coat.
15.	**AC Sheet / GI sheet roofing**	1) Improper overlaps	Rejection and redoing.
		2) Less number of 'J' bolts, GI and bitumen washers.	Rejection and providing required number as per standards + 5% of total cost of item as penalty.
		3) Less in thickness / length of bolts.	Rejection and providing required number as per standards + 5% of total cost of item as penalty.

Those who abide to Quality Standards will give no scope to Mistakes and will not kneel down for pardon

16.	**Water supply and sanitary items**	If not as per specifications.	Rejection and replacement or redoing.
17.	**Railway Sidings.**	Maintenance of Improper gauge of track	10% of cost of maintenance of track per month for the length applicable.
		Improper maintenance of ballast and its packing.	10% of cost of maintenance of track per month for the length applicable.
		Non replacement of broken sleepers/rails/ fish bolts etc.	5% of cost of maintenance of track per month for the length applicable.
18.	**Marble / Terrazo tile / Cuddappah slabs / CC / Tiled flooring & insitu Flooring**	1) Improper thickness	Proportionate recovery + 50% of the above amount as penalty.
		2) Improper jointing.	5% of cost of item
		3) Improper base material (Cement mortar base and other)	Proportionate recovery + 50% of Estimate cost.
		4) Bad workmanship.	Rectification + Penalty of 5% of Estimate cost.
		5) Improper levels	Rectification or recovery at 5 times the estimate cost of the item as pernalty.
19	**Soling**	1) Improper thickness; a) upto 10% b) More than 10%	 a) Proportionate recovery. b) Rejection / Rectification.
		2) Improper Packing	Rectification and 25% of soling cost as penalty.
		3) Improper consolidation.	2% of estimate cost of the item as penalty.

20.	**Revetment Stone / Pitching stone**	1) Improper size of stone: a) Variation upto 10% b) Variation more than 10%	 a) Proportionate recovery. b) Rectification or recovery at 5 times the estimate cost of the item as penalty.
		2) Improper packing	Rectification of 25% the estimate cost of the item as penalty.
		3) Improper pointing	Rectification or proportionate recovery.
		4) Bad workmanship	Rectification or 2% of item cost as penalty.
21.	**M.S Fabrication works**	1) Improper size of steel sections.	Proportionate recovery + 50% of the above amount as penalty.
		2) Improper workmanship.	2% of item cost as penalty.
22.	**Brick masonry/ Hollow Block masonry**	1) Poor quality bricks	Rejection.
		2) Poor quality of cement mortar	Rectification or proportionate recovery + 100% of the above amount as penalty.
		3) Improper jointing	Rectification.
		4) Improper thickness of masonry.	Proportionate recovery + 50% of the above amount as penalty for the quantity applicable.
		5) Improper curing.	2% of the estimate value of the item as penalty for the quantity applicable.
		6) Bad workmanship.	Rectification and 2% of item cost as penalty.

23.	**Plastering or impervious coat.**	1) Improper thickness	Proportionate recovery + 50% of the above amount as penalty for the quantity/area applicable.
		2) Poor quality of cement mortar.	Proportionate recovery + 100% of the above amount as penalty for the quantity applicable.
		3) Improper curing	2% of total item cost as penalty
		4) Bad workmanship	Rectification and 2% of total item cost as penalty.
24.	**CC Lean mix**	1) Less thickness up to 10% (average at cross-section)	Proportionate recovery of affected area.
		2) Less thickness above 10%	Proportionate recovery of affected area + 100% extra as a penalty.
		3) Poor quality of proportion.	Dismantling & reconstruction.
		4) Improper curing	5% of cost of item
		5) Oversize metal upto 10%	No recovery.
		6) Oversize metal 10% to 20%	Recovery of 25% of difference of cost between the size metal and next higher size metal.
		7) Oversize metal between 20% to 30%	Recovery of 50% of difference of cost between the size metal and next higher size metal.
		8) Oversize metal above 30%	Rejection of metal.
		9) Improper compaction	Proportionate recovery.

25.	**Pointing to CRS masonry**	1) Poor quality of C.M proportion.	Proportionate recovery + 50% of the above amount as penalty.
		2) Improper curing	2% of estimate cost of item as penalty of quantity applicable.
		3) Bad workmanship.	3% of estimate cost of item as penalty of quantity applicable.
26.	**Chain link fencing**	1) Improper gauge	Proportionate recovery + 50% of the above amount as penalty.
		2) Improper spacing	Proportionate recovery + 50% of the above amount as penalty.
		3) Bad workmanship	Rectification + 1% of item cost as penalty.
27.	**Painting, Distempering, Snowcem washing, white/colour washing etc.**	1) Improper material	Rejection & redoing + 5% of Estimated cost of Item as penalty.
		2) Improper cleaning	Rejection & redoing + 5% of Estimated cost of Item as penalty.
		3) Non-uniform painting	Rectification + 5% of Estimated cost of Item as penalty.
		4) Bad workmanship	Rectification + 5% of Estimated cost of Item as penalty.
28.	**Glazed Tiles**	1) (a) Change of size / brand (b) Improper thickness	1 (a) Acceptable with prior written approval of GM(Civil) (b) Proportionate recovery + 100% of above amount as penalty.
		2) Improper Cladding / Jointing / Plumb	Rejection or 5 times the item cost as penalty
		3) Bad quality of Tile	Rejection or 5 times the item cost as penalty.
		4) Bad workmanship	Rejection or 5 times the item cost as penalty.

Quality is only possible with undeterred efforts put by one and all.
Quality can be maintained only with constant pursuance of good efforts.

29.	**Wood work**	1) Bad Quality of wood	Proportionate recovery + 100% extra of above amount as penalty.
		2) Improper size beyond approved limits as per relevant IS - 003, Part-I and IS – 4021.	Proportionate recovery + 100% extra of above amount as penalty.
		3) Bad workmanship	Proportionate or 10% of estimate cost of item as penalty.
		4) For improper seasoning	10% of cost of item as penalty.
		5) Improper chemical treatment	20% of cost of item as penalty.
		6) Improve Joinery / fabrication of Shutters/frames.	Rectification OR 10% of cost of item as penalty.
		7) Inadequate and improper species of nailing	Rectification OR 5% of cost of item as penalty.
		8) Not using synthetic resin in joinery	Rectification OR 5% of cost of item as penalty.
		9) Incorrect size and quality of fitting.	Rejection and recovery of cost of fittinjgs.
		10) Improper application of anti corrosive / anti termite paint for chowakets (of doors/ window frames) of wood / CR / MS etc.	Rectification OR 5% cost of item as penalty.

JAI HIND