







Energising Quality

VCS Quality Services Pvt Ltd

**STANDARD SPECIFICATION
FOR
MISC. CIVIL & STRUCTURAL WORKS FOR UNDERGROUND
SERVICES**

VCS-SS-CS-6011

					
03	31.01.2022	NV	GDS	HK	GW
02	25.02.2020	NV	GDS	RKB	SK
01	16.10.2019	MA	MO	AD	SK
00	05.07.2017	MA	MO	AD	SK
Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By

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Rev No : 03**

REVISION RECORD						
Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description
00	05.07.2017	MA	MO	RKB	AD	Issued for use as Standard
01	16.10.2019	MA	MO	RKB	SK	
02	25.02.2020	NV	GDS	RKB	SK	New revision system updated
03	31.01.2022	NV	GDS	HK	GW	VCS QMS Integration



ABBREVIATION

m	Metre
mm	Millimetre
cm	Centimetre
IS	Indian Standard
m ²	Square metre
U/G	Underground
CI	Cast Iron
M.S.	Mild Steel



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1.0 SCOPE

This specification covers the material and construction details for various civil works as given below:

- a. All earthworks except for Site Grading and U/G Piping.
- b. Plain and reinforced cement concrete work in catch pits clean outs manholes, pipe supports, water monitors, hydrant pedestals, Thrust block etc.
- c. Brick work for various structures such as Manholes, Catch basins, Valve Chambers, instrument tapping chambers, Flushing chambers, etc
- d. Plastering for the above structures as applicable.
- e. Manhole frames, manhole covers, ladder rungs etc. for the above structures as applicable.
- f. Miscellaneous structure steel work such as ladders, platforms, chequered plate covers, gratings etc.

The work shall include supply of various materials as per relevant standards, required for the execution of work except for those items designated as Owner's scope of supply in the special conditions of contract or elsewhere in the contract documents. Contractor shall transport from Owner's stores those materials which are a part of owner's supply.

All materials not fully specified herein and which may be used in the WORK shall be of quality approved by the Engineer-in-charge and he shall have the right to determine whether all or any of the materials offered or delivered for use in the WORK are suitable for the purpose. CONTRACTOR shall give the samples of material to the Engineer-in-charge and shall get it approved before procurement and use.

2.0 REFERENCES

2.1 BIS CODES

- IS: 5455 Cast Iron Steps for man holes
- IS: 3502 Steel Chequered Plates
- IS: 2062 Hot Rolled medium and High tensile structural steel
- IS: 1726 Cast Iron Manhole covers and frames
- IS: 1239 Specification for Steel tubes, Tubulars and Other wrought steel fittings

2.2 SPECIFICATIONS

VCS-SS-CS-6002, VCS-SS-CS-6003, VCS-SS-CS-6022 Earth work

VCS-SS-CS-6023 Plain and Reinforced Cement Concrete



VCS-SS-CS-6027 Brick Masonry

VCS-SS-CS-6043 Plastering & Pointing

3.0 EARTHWORK & BACKFILLING

3.1 Refer specification no VCS-SS-CS-002, VCS-SS-CS-003 & VCS-SS-CS-022

4.0 PLAIN AND REINFORCED CEMENT CONCRETE

4.1 Refer specification No. VCS-SS-CS-6023

5.0 BRICK WORK

Refer specification no. VCS-SS-CS-6027

6.0 CEMENT PLASTERING

6.1 MATERIALS

The specifications for cement, sand and water shall be as given in spec. No. VCS-SS-CS-6021 Cement mortar shall be of grade and thickness specified in drawing or as directed by the Engineer-in-Charge, if not specified. The surface on which plastering is to be done shall be thoroughly cleaned from dust, dirt, oil, etc. It should be washed properly and watered for 4 hours before plastering. The joints of brick work shall be raked out to a depth of at least 12mm when plastering has to be done. On cement concrete surface, the surface shall be scarified by lines with trowel when it is still green or hacked if concrete is hard as directed by Engineer-in-Charge.

6.2 Plaster shall not in any case, be thinner than specified. It shall have uniform specified thickness. Any extra thickness of plaster done by contractor will not be paid for. When smooth finishing is required the cement plaster shall be floated over with neat cement within 15 minutes of the application of the final coat.

During the process of plastering all corners shall be rounded to a radius of 25mm unless otherwise specified.

6.3 The plaster shall be protected from sun and rain by such means as the Engineer-in-Charge may approved. The plaster shall be cured for 7 days.

6.4 Construction joint shall be kept in plastering work at places approved by Engineer-in-Charge.

6.5 PAYMENT

This clause shall apply to item rate tender only.

6.5.1 Payment for plastering shall be made on basis of the area of surface plastered, measured before plastering. All Measurements shall be separately made for each face of walls.



- 6.5.2 The rate of plastering shall include cost of scaffolding, swings, cleaning the surface, raking out joints, hacking concrete surfaces, etc. needed for carrying the work and shall cover the extra labour for plastering the jambs, sills, and soffits or opening except for plastering bands, cornices and skirting up to 30 cm width.

7.0 M.S. RUNGS/C.I. STEPS

The rungs for valve pits/manholes shall be of M.S. conforming to Indian Standard and to the shape and size as shown drawings. C.I. steps for manholes if used shall be as per IS: 5455. M.S. Rungs or CI steps shall be coated with 2 coats approved bituminous paint.

Payment for steps/rungs shall be made per number and the rate shall include supply and fixing, finishing the wall etc. complete.

8.0 CHEQUERED PLATES & STRUCTURAL STEEL WORKS

Chequered plates shall be 6mm (7mm moreover chequers and shall conform to IS: 3502). Steel for chequered plate shall conform to IS: 2062 and shall be clearly rolled and free from harmful surface defects such as crack surface flaws etc. The plate shall be cut to shape and fixed to the bearing members as shown in relevant drawings and as directed by Engineer-in-Charge. The edges shall be made smooth, no burrs or gagged ends shall be left. The plates may be spliced with prior consent of the Engineer-in-Charge. But in that case care should be taken so that there is continuity in the pattern of the plates between the portions. Lifting arrangements shall be provided including lifting rods.

Grating shall be fabricated out of M.S flats, angles and rounds etc., as per drawings and as approved by Engineer-in-Charge. Steel for grating plates shall conform to IS: 2062 of general weldable quality and shall be clearly rolled and shall be free from harmful surface defects.

Payment shall be made on the basis of weight of M.S Gratings/chequered plate and supporting frame actually laid. The rate shall include supply of all necessary, steel materials cutting to size, fabricating, smoothening edge if necessary, transporting and fixing at all positions and providing lifting arrangements. Full deductions shall be made for all opening above 30mm square and the rate shall include making of opening of all sizes and supplying and painting 2 coats of anticorrosive paint over a coat of red oxide zinc chromate primer. The exposed surface of grating and frame shall be painted with two thick coats of coal tar. The rate shall include providing and laying M.S grating and frame, breaking and making good existing concrete/brick masonry surface if necessary finishing, painting etc. complete with all labour and materials. Payment shall be on number basis.

9.0 C.I. MANHOLE FRAME AND COVER

C I manhole frame and covers shall conform to IS: 1726 with size and grade as shown in drawing.



10.0 VENT PIPES

These shall be M.S. Black Steel Tube conforming to IS: 1239 Medium grade or as specified in drawing. The pipe bends shall be embedded in 1:3:6 grade cement concrete or as shown in drawing.

All pipes shall be 25mm clear of wall or column with M.S. holder bat clamp as per instructions of the Engineer-in-Charge. All holes in walls and column shall be made good by 1:2:4 grade cement concrete. All pipes and clamps shall be painted with two coats of paints of approved make.

Payment shall be made on running meter basis and the rate shall include supply of all materials, cutting, edge preparation, jointing by welding, fixing in concrete block, cutting of walls or concrete and making good the same, painting with 2 coats of anticorrosive paint necessary scaffolding etc. complete.

The rate shall also include excavation and backfilling if any.

11.0 FUNNELS, CLEAN OUTS, PLUGS

These shall be fabricated from M.S Plates, pipes chequered Plates, rounds, angles etc., to be supplied by the contractor. The fabric action shall be in accordance with the approved drawing.

Payment for these items shall be made on weight basis and rate shall include fabrication, erection, welding jointing and painting etc. all complete.

12.0 BRICK BAT FILL

- 11.1 The brick bats used as filling in valve pits shall be from common burnt clay building bricks. A sample of brickbats used shall be got approved from Engineer-in-charge.
- 11.2 The compaction of the layer of brick bats shall be proper so that brickbats are not disturbed and do not sink in the soil.
- 11.3 The payment for brick-bat fill shall be made on m2 basis as shown in drawing and the rate shall include supply, laying, compacting etc. complete with all materials & labour.







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**STANDARD SPECIFICATION
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PLUMBING AND DRAINAGE**

VCS-SS-CS-6012

					
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02	25.02.2020	NV	GDS	RKB	SK
01	16.10.2019	MA	MO	AD	SK
00	05.07.2017	MA	MO	AD	SK
Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By

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**DOC NO: VCS-SS-CS-6012
Rev No : 03**

REVISION RECORD						
Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description
00	05.07.2017	MA	MO	RKB	AD	Issued for use as Standard
01	16.10.2019	MA	MO	RKB	SK	
02	25.02.2020	NV	GDS	RKB	SK	New revision system updated
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ABBREVIATION

m	Metre
mm	Millimetre
CM	Cement Motar
IS	Indian Standard
CP	Chrome Plated
M.S.	Mild Steel
G.I.	Galvanised Iron
Kg	Kilogram
Kg/cm ²	Kilogram Per Square Centimetre
Psi	Pounds Per Square Inch
HCI	Heavy Cast Iron
CI	Cast Iron



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1.0 SCOPE

- 1.1 This specification is intended to establish and define the materials and constructional requirements for plumbing & building drainage work.
- 1.2 All materials, fixtures and workmanship shall be in accordance with the relevant Indian Standard, specifications and codes of practices.

2.0 REFERENCES

2.1 BIS CODES

IS: 269	:	Ordinary Portland cement, 33 grade
IS: 554	:	Dimensions for pipe threads where pressure-tight joints are made on threads
IS: 651	:	Specification for Glazed Stoneware pipes and fittings
IS: 778	:	Copper alloy gate, globe and check valves for water works purposes
IS: 782	:	Specification for Caulking lead
IS: 1239	:	Mild steel tubes, tubulars and other wrought steel fittings
IS: 1726	:	Cast iron manholes covers and frames
IS: 1729	:	Cast Iron/Ductile Iron drainage pipes and pipe fittings for Over ground non pressure pipeline and spigot series
IS: 2470	:	Code of practice for installation of septic tanks
IS: 3486	:	Cast iron spigot and socket drain pipes
IS: 3950	:	Surface boxes for sluice valves
IS: 3989	:	Centrifugally cast (spun) iron spigot and socket soil, waste and Ventilating pipes, fittings and accessories
IS: 5455	:	Cast iron steps for manholes

2.2 VCS SPECIFICATIONS

VCS-STD-CS-6003	Details of Soak Pit
VCS-STD-CS -6004	Details of Septic Tank

NOTE: - Latest Edition of all Codes and Standards shall be followed.



3.0 H.C.I. NAHNI TRAP (FLOOR TRAP)

Nahni trap shall be of heavy cast iron as per IS: 3989 with 100mm inlet and 80/100mm outlet with CP pressed steel grating. It shall be of self-cleaning design. Grating shall be of either hinged or screwed down type.

It shall be fixed in cement mortar 1:2, as directed by Engineer-in-Charge.

4.0 STONEWARE GULLY TRAP CHAMBER

The square mouth gully trap shall be of 100mm dia, conforming to IS: 651, of specified and/ or approved quality stoneware, complete with cast iron grating, and shall be got approved from Engineer-in-Charge. The size of CI frame and cover shall be of 300 x 300mm. It shall be properly fixed, as directed by the Engineer-in-Charge.

The size of the chamber shall be 300 x 300 x 675mm (internal). It shall be constructed of brick masonry walls, 125mm thick, in 1:4 cement mortar and M-20 concrete foundations. Inside & outside faces of the masonry walls shall be plastered with 1:3 cement mortar. The top of the chamber shall be provided with CI cover and frame.

5.0 VALVE CHAMBER, INSPECTION CHAMBER & MANHOLES

The size and type of construction of valve chamber, inspection chamber and manholes shall be as specified in the drawings or items.

6.0 C.I. SOIL / WASTE PIPES

CI pipes shall be socket and spigot of standard quality conforming to IS: 1729. The supply shall include all necessary accessories e.g. bends, Y- Junction, T- Junction, including plugs, shoes, cowls etc. complete.

CI soil / waste pipe below ground or floor shall be encased with 50mm thick PCC M20 concrete.

The spigot of the pipe shall be placed fully resting inside the socket and hemp caulked home to leave space for lead depth as specified. Lead conforming to IS:782 in molten state shall then be poured into the joint filling the same in one pouring. The lead shall be caulked by proper tools to make it even all round. Depths of lead in the joints from the top of the socket shall be 37mm for 150mm dia pipes, 25mm for 100 mm and 50mm dia pipes. All pipes shall be fixed 25mm clear of the wall with MS bat clamps or as approved by the Engineer - in Charge. All holes in walls and floors shall be made good by cement concrete M-15 grade and should be leak proof. All soil and waste pipes shall be tested for leakage by hydraulic test.

All CI pipes shall be painted with two coats of paint of approve make and shade over a coat of primer. Earthwork in excavation, backfilling and removal of surplus earth/ debris shall be considered as a part of the work. No separate payment shall be made for the same.



7.0 C.I. SOIL / WASTE VENT PIPES

CI pipes shall be standard quality conforming to IS: 1729. The supply shall include all necessary accessories e.g. bends, Y- Junction, T- Junction, including plugs, shoes, cowls etc. complete.

Jute yarn gasket of suitable diameter shall be used as required to support the spigot of the pipe at the proper grade and make truly concentric joints. Single piece of sufficient length shall be used to pass around the pipe and lap at the top and shall be thoroughly saturated in bitumen. This gasket shall be laid in the socket for lower third of the circumference of the joint and covered with cement mortar. The spigot of the pipe thoroughly cleaned with wet brush, inserted and carefully driven home after which a small amount of cement mortar (1:2) shall be inserted in the annular space around the entire circumference of pipe and solidly rammed into the joint with caulking tool. The joint shall then be completely filled with mortar and beveled off at angle of 45° with outside of the pipe. Cement used to join shall conform to IS: 269.

All holes in walls and floors shall be made good by cement concrete M- 15 grade. all soil and waste pipes shall be tested for leakage by hydraulic test.

All CI pipes shall be painted with two coats of anticorrosive bituminous paint externally.

8.0 GI PIPES AND FITTINGS

8.1 All G.I. pipes and fittings shall conform to IS: 1239 and shall be of heavy grade for water supply system.

All screwed tubes and sockets shall have pipe threads in accordance with the requirements specified in IS: 554. Unless specified otherwise, pipes shall be supplied screwed with taper threads and sockets with parallel thread.

All fittings shall be malleable galvanized iron, approved by the Engineer-in-Charge. Fittings in G.I. line shall include all couplings, elbows, tees, bends, unions, nipples, reducers, flanges with nuts, bolts and rubber insertions, bushes and all other fittings to make a complete job.

Screwed G.I. pipes shall be jointed with screwed socket joints using screwed fittings. Care shall be taken to remove any burr from the end of the pipes after threading. White lead with a few strands of fine hemp shall be applied while tightening. Compounds containing red lead shall not be used.

All pipes above ground shall be fixed with G.I. holder bat clamps, clear off the wall, at 1.2 in centre to center. If the pipes are encased or embedded in wall, they shall be secured in position by iron hooks at 1.2 in centre to center. All visible pipes and clamps within and outside building shall be painted with two coats of white paint or aluminium paint as directed by the Engineer-in-Charge. No extra payment shall be made for clamps, hooks, cutting holes in walls, chasing and making good the same.

All underground pipes shall have a minimum earth cover of 600mm or as directed by the Engineer-in-Charge. No extra payment shall be made for excavation in trenches,



backfilling the same and removal of surplus earth. Before any pipes are painted or covered up, they shall be tested to a hydrostatic pressure of minimum 6 kg/ Sqcm. or 1.5 times of Design Pressure.

8.2 TESTING

Testing of GI pipes shall be done in accordance with IS: 1239 (Part 1).

9.0 GUN METAL VALVE

All full way and globe valves shall be of heavy gunmetal and tested at 300 psi and shall be approved by the Engineer-in-Charge. Valves shall conform to IS: 778. Size of valve chamber shall be as per item description. Construction of valve chamber shall be carried out as per clause 5.0 above. Valve chamber shall be provided & fixed with heavy duty C.I. surface box conforming to IS: 3950. The surface box shall be hinged pin open type & shall be fixed in the chamber slab. It shall have a hole for opening.

10.0 M.S. RUNGS/ C.I. STEPS

The rungs for pits, manholes and septic tanks etc. shall be made out of M.S. bars conforming to Indian Standard and to the shape and size as shown in drawings.

CI steps for manholes, if needed shall be as per IS: 5455

M.S. rungs shall be coated with 2 coats of approved bituminous paint.

11.0 SOAK PITS

All earthworks in excavation, brick work etc. shall conform to relevant I.S. standard.

The brickbats should preferably be slightly over burnt or thoroughly well burnt, deep red in colour with some proportion of deep blue or black veins. Spongy or vitrified material, as a result of excessive over burning, is useless and shall be rejected. Brickbats bigger than specified size shall be reduced to required size (40 to 50mm) before filling in soak pit and no extra payment shall be made for this. It shall be stacked at site as directed by Engineer-in-Charge. Soak pit & septic tank shall be connected with required piping.

12.0 SEPTIC TANK

Septic tanks shall be provided as per drawings and directions of Engineer-in-Charge. The sizes shall vary depending on the no. of users.

Alternatively, readymade RCC pipe septic tank, consisting of sewage receiving chamber, inspection door, vent pipe, inlet & outlet connections, manhole cover, C.I. steps etc. shall be used.

Design, testing & commissioning shall conform to IS: 2470 Part-I.

Access opening shall be provided for desludging & inspection.



The ventilating pipe shall be provided with pipe of at least 50mm dia extended 2 meters above the nearest working platform level.

In case where water table is shallow and soak pits are not recommended, up-flow filters, as per drawings shall be provided.

13.0 PAYMENT

This clause shall apply to item rate tender only.

13.1 H.C.I. NAHNI TRAP (FLOOR TRAP)

Payment shall be made per number basis. The rate shall include supplying and fixing Nahni trap, including cement mortar, cutting walls and floors and making good the same, providing and fixing chromium plated pressed steel grating etc. all complete.

13.2 STONEWARE GULLY TRAP CHAMBER

Payment shall be made on per number basis. The rate shall include supplying and fixing of stoneware gully trap, CI grating, construction of masonry chamber, providing and fixing CI frame and cover, earthwork in excavation, foundation concrete, backfilling and removal of surplus earth up to a lead of 30m and labour and material etc. all complete.

13.3 VALVE CHAMBER, INSPECTION CHAMBER & MANHOLES

Payment shall be made as per number basis including excavation, backfilling, removal of earth, construction of the valve chamber, inspection chamber and manhole, making connections of pipes through the walls including grouting, cost of M.S. rungs, cover slab, cost of CI cover and frame etc. as per specifications and directions of the Engineer-in-Charge.

The rate shall include breaking concrete or brick masonry work and making good the same with 1:4 cement mortar if necessary, finishing, painting, etc. as per directions of Engineer-in-Charge.

13.4 C.I. SOIL / WASTE PIPES

The payment shall be on running meter basis of pipes laid with fittings as required on site. The rate shall include supplying and fixing of pipes and necessary specials including cowl with hemp and lead, jointing & testing, bat clamps, fixtures, painting, cutting of walls, floor and making good the same and necessary scaffolding, encasing of pipes below ground or floor with 50mm thick PCC M20 concrete earth work in excavation, backfilling & removal of surplus earth etc. complete.

13.5 C.I. SOIL / WASTE VENT PIPES

The payment shall be on running meter basis of pipes laid. The rate shall include supplying and fixing pipes, jute gaskets dipped into bitumen and cement mortar and necessary specials including jointing with clamps, painting, cutting of walls, floor and making good the same, necessary scaffolding etc. complete.

**13.6 GI PIPES AND FITTINGS**

Payment shall be made on running meter basis of actual pipeline laid. In addition to the sectional testing of water supply piping, the contractor shall test entire installation on completion of the job, to the entire satisfaction of the Engineer-in-Charge. No extra payment shall be made for testing. The contractor shall make his own arrangement for supply of water for testing, at his own cost. The rate for this item shall include supply and laying of G.I. pipes with necessary fittings, cutting of pipes to required lengths, threading, making holes in walls and floors and making good the same, jointing, painting, excavation and refilling including testing as directed by the Engineer-in-Charge.

13.7 GUN METAL VALVE

The payment shall be made per number basis, including surface box. The rate shall include, supplying and fixing valve & surface box in position, as per drawings and directions of Engineer-in-Charge.

13.8 M.S. RUNGS/ C.I. STEPS

Payment for rungs shall be made on per number basis and the rate shall include supply, fixing, finishing the walls, painting etc. all complete.

13.9 SOAK PITS

Payment of soak pit/ up flow filter shall be made per number basis. Rate quoted shall include brick masonry work, providing & filling brick bats, earthwork in excavation, backfilling, making inlet connection with pipe and connecting the same to septic tank etc. complete as shown in drawing.

13.10 SEPTIC TANK

Payment of septic tank shall be made per number basis & rate shall include all accessories like inlet, outlet, vent pipe, manhole cover & C.I. steps, earthwork in excavation & back filling, removal of surplus earth etc. all complete.







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**STANDARD SPECIFICATION
FOR
CHAIN LINK FENCING**

VCS-SS-CS-6013

					
03	31.01.2022	NV	GDS	HK	GW
02	25.02.2020	NV	GDS	RKB	SK
01	16.10.2019	MA	MO	AD	SK
00	05.07.2017	MA	MO	AD	SK
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**STANDARD SPECIFICATION
FOR CHAIN LINK FENCING**

DOC NO: VCS-SS-CS-6013
Rev No : 03

REVISION RECORD						
Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description
00	05.07.2017	MA	MO	RKB	AD	Issued for use as Standard
01	16.10.2019	MA	MO	RKB	SK	
02	25.02.2020	NV	GDS	RKB	SK	New revision system updated
03	31.01.2022	NV	GDS	HK	GW	VCS QMS Integration



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ABBREVIATION

m	Metre
mm	Millimetre
IS	Indian Standard



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1.0 SCOPE

This specification specifies the requirements of chain link fence for security purposes. The height of the fence shall be approximately 2.0 m to the top of the chain link fencing at the posts and approximately 2.5 m in vertical height at the top line of barbed wire attached to the cranked tops of the posts.

2.0 REFERENCES

IS: 278	Specification for galvanized steel barbed wire for fence fabric
IS: 383	Specification for coarse and fine aggregates for concrete
IS: 456	Plain and Reinforced Concrete - Code of Practice
IS: 2721	Specification for Galvanized Steel Chain Link Fencing

NOTE: - Latest Edition of all Codes and Standards shall be followed.

3.0 REFERENCE OF SPECIFICATIONS / STANDARDS

Following standard specification shall be enclosed as part of the job specifications.

Technical Specifications - Civil and Structural Works

General Scope	VCS-SS-CS-6020
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Technical Specifications - Civil and Structural Works

Material	VCS-SS-CS-6021
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Technical Specifications - Civil and Structural Works

Earth work in Foundation	VCS-SS-CS-6022
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Technical Specifications - Civil and Structural Works

Plain & Reinforcement Cement Concrete	VCS-SS-CS-6023
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Technical Specifications - Civil and Structural Works

Structural Steel Works	VCS-SS-CS-6024
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Technical Specifications - Civil and Structural Works

Earthwork in Site Grading	VCS-SS-CS-6002
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Details of Chain Link Fencing	VCS-STD-CS-6002
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4.0 CEMENT CONCRETE FOR FOUNDATION & SILL

Refer specification no VCS-SS-CS-6023



5.0 CEMENT CONCRETE IN PRECAST POSTS/STRUTS

(Straining posts, intermediate posts and struts)

- 5.1 Pre-Cast Cement concrete shall be of M25 grade for moderate environment exposure condition and M30 grade for severe environment exposure condition with 20mm and down size crushed stone aggregates conforming to IS: 383.
- 5.2 The work shall be carried out as per IS: 456 in all respects.
- 5.3 Necessary moulds shall be provided for casting the concrete posts and the same shall be smooth finished with 1:3 cement sand mortar as directed by the Engineer-in-Charge.

6.0 REINFORCEMENT

Refer specification No. VCS-SS-CS-6023

6.1 MATERIALS

6.1.1 CHAIN LINK FENCING

The material requirement shall conform to IS: 2721 latest edition. The chain link fencing shall be woven from 3.15 mm dia wire with mesh size of 75 sq mm. The mesh wire shall not vary from the specified dia by more than ± 0.05 mm.

6.1.2 GALVANIZED WIRES

- a. All steel wires shall be hot dipped galvanized wire and dia of the wire shall be 3.15 mm over the galvanized coating.
- b. The line wire shall be 4.0 mm dia Mild Steel.
- c. The stirrup wire for securing the line wires to the concrete intermediate posts shall be 3.15 mm diameter Mild Steel.
- d. The tying wire for securing the chain link fencing to the line wire shall be 2.50 mm diameter Mild Steel.
- e. Hair pin staples for fastening down the bottom of galvanized chain link fencing to the concrete sill shall be of 3.15 mm wire. The ends shall be bent outwards to secure anchorage.

- 6.1.3 Cleats for eye bolts shall be of uniform size and shall consist of Mild Steel angle of 75 x 50 x 6mm.

6.1.4 EYE BOLT STRAINERS

- a. The eye bolt strainer shall consist of bolts with welded eye sufficiently threaded and fitted with a nut and washer.



- b. Two-way eye bolt strainer shall have suitable ring nuts, fitted after wires have been strained on one side.
- 6.1.5 Stretcher bar shall consist of Mild Steel flats 25 mm x 4.75 mm. They shall be secured to the cleats by steel bolts.
- 6.1.6 Droppers for barbed wire shall be of Mild Steel not less than 25mm x 4.75 mm thick with 38mm x 4.85mm half round staples for fastening the barbed wire to them.
- 6.1.7 **BARBED WIRE**
 - a. Barbed wire shall conform to IS: 278. The galvanized barbed wire shall be manufactured from galvanized Mild Steel wire conforming to IS: 280. The coating on the wire shall be smooth and relatively free of lumps, globes or points, wires with excessive roughness, blisters, Sal ammoniac spots shall be rejected. A galvanized steel barbed wire of Type A-1 IS: 278 shall be made from two strands of galvanized, twisted 2.5 mm steel wire with 4 points of barbs. Each barb shall have two turns tightening around both line wires making altogether four complete turns. The barbs shall be so finished that four points are set and looked at right angles to each other.
 - b. Bracing of the rows of barbed wire shall be as shown in Standard drawing.
 - c. The barbs shall have a length of not less than 13mm and not more than 18mm.
- 6.2 **ERECTION**
 - 6.2.1 Straining posts shall be provided at all ends and corners of fences, at changes in direction or acute variations in level and at intervals not exceeding 60m on straight lengths of fence. Intermediate posts shall be spaced at regular intervals not exceeding 3M.
 - 6.2.2 Struts shall be fitted to all straining posts behind the chain link fabric in the direction of the line of fence.
 - 6.2.3 **FIXING CHAIN LINK FENCING**
 - a. There shall be four evenly spaced rows of line wire. The top wire shall be doubled, making five line wires in all. The bottom wire shall be close to the ground.
 - b. Each line wire shall be strained tightly by means of eyebolt strainers or winders at each straining point.
 - c. Each line wire shall be secured to each intermediate post by a wire stirrup passed through a hole in the posts and secured to the line wire by three complete turns on each side of the post.
 - d. The chain link fencing shall be strained between each pair of straining posts and secured to each straining post by means of a Stretcher bar. One of the top line wires shall be threaded through the appropriate adjacent rows of mesh, care being taken that no meshes in the rows are bypassed by the line wire except where deviation is necessary at the straining posts. The second top line wire shall



be strained in front of the fencing. The fencing shall be attached to the top and bottom line wire by wire ties spaced 150mm apart and to the other line wires by wire ties spaced 450 mm apart.

- e. The bottom of the fencing shall be treated as follows:

Continuous concrete sill 230 mm wide x 300 mm high for full length between posts shall be cast with the top 25 mm above G.L. and 25mm below the chain link fencing. Hair pin staples shall be threaded through the bottom row of mesh at 0.75 m c/c and set in the sill to a depth of 150 mm.

6.2.4 FIXING BARBED WIRES FOR ANTICLIMBING DEVICE.

- a. Three lines of barbed wire shall be provided as shown in drawing . The wires shall be attached by eye bolts to the cranked tops of the straining posts. On concrete intermediate posts they shall be secured to cranked tops with stirrup wires. The barbed wire shall be fitted with one dropper at the centre of each bay, secured to the wires so that they cannot be bunched together

7.0 PAYMENT

This clause shall apply to item rate tenders only.

7.1 EARTHWORK

Payment for earthwork shall be made on cubic meter basis

7.2 CEMENT CONCRETE (CAST-IN-SITU AND PRE-CAST)

Payment shall be made on cubic meter basis and the rate shall include labour, materials, mixing placing, leaving pockets, fixing chain link fencing, line wires, barbed wires inserts in concrete post while casting as shown in the drawing or as per the directions of Engineer-in-Charge, keeping the concrete post in the proper position while concreting, scaffolding, all moulds, curing etc. complete including handling & transportation from pre-casting yards to place of fixing, preparation of pre-casting yards etc. but excluding cost of reinforcement.

7.3 REINFORCEMENT

Payment for reinforcement shall be made on metric ton basis including transportation of steel to site of work, straightening, cleaning, cutting, bending to required shapes and lengths, placing, binding with soft annealed wire as per drawings, specifications and instruction of Engineer-in-Charge.

7.4 CHAIN LINK FENCING

Payment for chain link fencing shall be made on running meter basis for bottom 2.0meter height of the total height including supply of chain link fencing in 1.9meter width roll, fixing in position true to line and as per drawing. The rate shall also include supplying and fixing necessary galvanized line wires, stirrup wires, tying wires, hair pin staples for fixing the fence in cons sill, etc. tensioning the line wire and fencing, all materials and labour etc. required to complete the job as per drawings and direction of Engineer-in-Charge.



7.5 BARBED WIRE FENCING

Payment for barbed wire shall be made on running meter basis. The rate shall included supply and fixing necessary droppers, straining bolts tensioning the barbed wire etc. and all materials and labour etc. required to complete the job.







Energising Quality

VCS Quality Services Pvt Ltd

**STANDARD SPECIFICATION
FOR
GENERAL SCOPE**

VCS-SS-CS-6020

					
03	31.01.2022	NV	GDS	HK	GW
02	25.02.2020	NV	GDS	RKB	SK
01	16.10.2019	MA	MO	AD	SK
00	05.07.2017	MA	MO	AD	SK
Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By

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CONTROLLED COPY : If in soft and signed



REVISION RECORD						
Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description
00	05.07.2017	MA	MO	RKB	AD	Issued for use as Standard
01	16.10.2019	MA	MO	RKB	SK	
02	25.02.2020	NV	GDS	RKB	SK	New revision system updated
03	31.01.2022	NV	GDS	HK	GW	VCS QMS Integration



Energising Quality

**STANDARD SPECIFICATION
FOR GENERAL SCOPE**

**DOC NO: VCS-SS-CS-6020
Rev No : 03**

ABBREVIATION

IS Indian Standard



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1.0 SCOPE

These specifications establish and define the material and constructional requirements for CIVIL and STRUCTURAL WORKS.

2.0 REFERENCE

IS: 1200

- 3.0 Methods of measurements are indicated in these specifications; where not so specified, latest revision of IS: 1200 shall be applicable.
- 4.0 Providing and operating all necessary measuring and testing devices including all materials and consumables are included in the scope of work. No separate measurement or payment for testing the quality of work and materials shall be made, but rates quoted for various items shall be deemed to include the cost of such tests which are required to ensure achievement of specified quality.
- 5.0 All materials shall be of standard quality, manufactured by renowned concerns conforming to Indian Standards or equivalent, and shall have IS mark as far as possible unless otherwise approved by the Engineer-in-Charge. The Contractor shall get all materials approved by the Engineer-in-Charge prior to procurement and use. The Contractor shall furnish manufacturer's certificates for the materials supplied by him when asked for. Further to that he shall get the materials tested from an approved test house if asked for by the Engineer-in-Charge. The cost for all the tests and test certificates for the material procured by the Contractor shall be borne by the Contractor. No separate payment shall be made for the testing. The Engineer-in-Charge shall have the right to determine whether all or any of the materials are suitable. Any materials procured or brought to site and not conforming to specifications and satisfaction of the Engineer-in-Charge shall be rejected and the Contractor shall have to remove the same immediately from site at his own expense and without any claim for compensation due to such rejection.
- 6.0 Wherever referred to in the tender document, only the latest revision of Specifications, Codes of Practice and other publications of Bureau of Indian Standards shall be applicable.
- 7.0 Wherever the Contractor executes civil and structural works involving buildings, equipment foundations, supporting structures, pipe racks, etc., the following works are deemed to have been included in the quoted rates for various works.
- a. Marking of centre lines of foundations etc.
 - b. Establishing layout and levels of foundations and superstructure etc., including establishment of reference lines, bench marks on various floors, platforms etc.
 - c. General upkeep of the plant site.
 - d. Preparation of "As-Built" scheme of structural drawings indicating constructed details including levels, centre lines, layouts, member sizes etc. complete.



- 8.0 The provisions of schedule of rates, specifications and drawings shall be read in conjunction with each other and in case of conflict amongst them, clarification shall be obtained from the Engineer-in-Charge whose decision shall be final and binding. However, the following procedure may generally be followed.
- a. Description of items in schedule of rates shall be followed when provisions therein are different from those in specifications.
 - b. Where the description of item does not call for some specific requirement but the same is given in specifications, the specifications shall be followed in addition to the requirement given in description of item.
 - c. Where drawings call for requirements different from or additional to those given in item description and specifications, the decision of the Engineer-in-Charge shall be obtained as to what shall be followed.







Energising Quality

VCS Quality Services Pvt Ltd

**STANDARD SPECIFICATION
FOR
MATERIALS**

VCS-SS-CS-6021

					
03	31.01.2022	NV	GDS	HK	GW
02	25.02.2020	NV	GDS	RKB	SK
01	16.10.2019	MA	MO	AD	SK
00	05.07.2017	MA	MO	AD	SK
Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By

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REVISION RECORD						
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00	05.07.2017	MA	MO	RKB	AD	Issued for use as Standard
01	16.10.2019	MA	MO	RKB	SK	
02	25.02.2020	NV	GDS	RKB	SK	New revision system updated
03	31.01.2022	NV	GDS	HK	GW	VCS QMS Integration



ABBREVIATION

M	Metre
mm	Millimetre
IS	Indian Standard
MS	Mild Steel
PVC	Poly Viny Chloride
mm ²	Square Millimetre
RCC	Reinforced Cement Concrete
PCC	Plain Cement Concrete
BIS	Bureau of Indian Standard



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1.0 SCOPE

- 1.1 This specification establishes and defines the requirements of various materials to be used in Civil and Structural works.
- 1.2 Whenever any reference to BIS Codes is made, the same shall be taken as the latest revision (with all amendments issued thereto) as on the date of submission of the bid.
- 1.3 Apart from the BIS Codes mentioned in particular in the various clauses of this specification, all other relevant codes related to specific job under consideration regarding quality, tests, testing and/or inspection procedures shall be applicable. Reference to some of the Codes in the various clauses of this specification does not limit or restrict the scope of applicability of other referred or relevant codes.
- 1.4 In case of any variation/contradiction between the provision of BIS Codes and this specification, the provision given in this specification shall be followed.
- 1.5 All materials shall be of standard quality and shall be procured from renowned sources/manufacturers approved by the Engineer-in-Charge. It shall be the responsibility of the Contractor, to get all materials/ manufacturers approved by the Engineer-in-Charge prior to procurement and placement of order.
- 1.6 Whenever called for by the Engineer-in-Charge all tests of the materials as specified by the relevant BIS Codes shall be carried out by the Contractor in an approved laboratory and test reports duly authenticated by the laboratory, shall be submitted to the Engineer-in-Charge for his approval. If so desired by the Engineer-in-Charge, tests shall be conducted in the presence of the Engineer-in-Charge or his authorized nominee.
- 1.7 Quality and acceptability of materials not covered under this specification shall be governed by the relevant BIS Codes. In case BIS code is not available for the particular material, other codes e.g. BS or DIN or API/ASTM shall be considered. The decision of Engineer-in-Charge, in this regard, shall be final and binding on the Contractor.
- 1.8 Whenever asked for, the Contractor shall submit representative samples of materials to the Engineer-in-Charge for his inspection and approval. Approval of any sample does not necessarily exempt the Contractor from submitting necessary test reports for the approved material, as per the specification/relevant BIS Codes.
- 1.9 The Contractor shall submit manufacturer's test reports on quality and suitability of any material procured from them and their recommendation on storage, application, workmanship etc. for the intended use. Submission of manufacturer's test reports does not restrict the Engineer-in-Charge from asking fresh test results from an approved laboratory of the actual material supplied from an approved manufacturer/source at any stage of execution of work.
- 1.10 All costs relating to or arising out of carrying out the tests and submission of test reports and or samples to the Engineer-in-Charge for his approval during the entire tenure of the work shall be borne by the contractor and included in the quoted rates.



- 1.11 Materials for approval shall be separately stored and marked, as directed by the Engineer-in-Charge and shall not be used in the works till these are approved.
- 1.12 All rejected materials shall be immediately removed from the site by the Contractor at his own cost

2.0 REFERENCES

As mentioned in the respective clauses.

3.0 WATER

- 3.1 Water used in construction for all civil & structural works shall be clean and free from injurious amount of oil, acids, alkalies, organic matters or other harmful substances which may be deleterious to concrete, masonry or steel. The pH value of water sample shall be not less than 6. Potable water shall be considered satisfactory. Underground water can also be used with the prior approval of Engineer-in-Charge, if it meets all the requirements of IS: 456.
- 3.2 Tests on water samples shall be carried out in accordance with IS: 3025 and they shall fulfill all the guidelines and requirements given in IS: 456.
- 3.3 The Engineer-in-Charge may require the Contractor to prove, that the concrete prepared with water, proposed to be used, shall have average 28 days compressive strength not lower than 90% of the strength of concrete prepared with distilled water.
- 3.4 The Engineer-in-Charge may require the Contractor to get the water tested from an approved laboratory before starting the construction work and in case the water contains any oil/organic matter or an excess of acid, alkalies or any injurious amount of salts etc., beyond the permissible maximum limits given in IS: 456, the Engineer-in-Charge may refuse to permit its use. In case the water is supplied by the owner, contractor shall get himself satisfied regarding its quality before using the same in his works at his own expense. In case there is any change in source of water, water samples shall be tested again to meet the specified requirements.
- 3.5 Water shall be stored in tin barrels, steel tanks or water-tight reservoirs made with bricks / stone or reinforced concrete. Brick/stone masonry reservoirs shall have RCC base slab and shall be plastered inside, with 1 part of cement and 4 parts of sand and finished with neat cement punning. These reservoirs shall be of sufficient capacity to meet the water requirement, at any stage of construction.
- 3.6 Water for curing shall be of the same quality as used for concreting and masonry works. Sea water shall not be used for preparation of cement mortar, concrete as well as for curing of plain/reinforced concrete and masonry works. Sea water shall not be used for hydro testing and checking the leakage of liquid retaining structures also.

4.0 AGGREGATE

4.1 GENERAL



- 4.1.1 Coarse and fine aggregates for Civil and Structural Works shall conform in all respects to IS: 383 (Specification for coarse and fine aggregates from natural sources for concrete). Aggregates shall be obtained from an approved source known to produce the same satisfactorily. Aggregates shall consist of naturally occurring (crushed or uncrushed) stones, gravel and sand or a combination thereof. These shall be chemically inert, hard, strong, dense durable, clean and free from veins, adherent coatings, injurious amount of alkalis, vegetable matter and other deleterious substances such as iron pyrites, coal, lignite, mica, shale, sea shells etc.
- 4.1.2 Source and type of aggregates shall be got approved by the Engineer-in-Charge prior to procurement. Change in source and type of aggregates, at later stage, shall not be generally permitted; but under specific circumstances, Engineer-in-Charge can allow a change in source and type of aggregate. Contractor shall produce necessary test certificates from approved laboratories regarding the quality and suitability of the proposed aggregates and submit fresh mix design for approval of the Engineering-Charge. Any such change, if permitted by the Engineer-in-Charge, shall be without any time and cost implication to the owner.
- 4.1.3 Aggregates which may chemically react with alkalis of cement or might cause corrosion of the reinforcement shall not be used. If so desired by the Engineer-in-Charge, the Contractor shall carry out alkali reactivity tests and submit the results to him for approval.
- 4.1.4 The maximum quantities of deleterious materials in the aggregates as determined in accordance with IS: 2386 - Part II (Methods of Test for aggregates for concrete), shall not exceed the limits defined in IS: 383. No special test is required to prove the absence of such deleterious matters if the aggregates are from a known source with satisfactory prior data on the properties of concrete made with them. In case of newly developed quarry sites, the contractor shall submit necessary test results as per IS: 383 and IS: 2386 to the Engineer-in-Charge prior to his acceptance and approval. The method of Sampling shall be in accordance with the requirements given in IS: 2430.
- 4.1.5 Coarse and fine aggregates shall be batched separately. All-in-aggregate shall be used only where specifically permitted by the Engineer-in-Charge.
- Separate sieve analysis and grading curves shall be prepared by the Contractor for any/all batches of coarse and fine aggregates, and submitted to the Engineer-in-Charge, whenever asked for, to ensure conformity with those submitted along with the mix design.
- 4.1.6 Whenever required by Engineer-in-Charge, the aggregates(coarse/fine) shall be washed and/or sieved by the contractor before use in the works to obtain clean and graded aggregate at no extra cost to the owner.
- 4.1.7 Aggregates not in conformity with the specifications shall be rejected and the Contractor shall immediately remove them from the site of work.
- 4.2 COARSE AGGREGATES



- 4.2.1 Coarse aggregates are the aggregates, which are retained on 4.75mm BIS Sieve. It shall have a specific gravity not less than 2.6 (saturated surface dry basis).
- 4.2.2 These may be obtained from crushed or uncrushed gravel or stone as per clause 3.1 and may be supplied as single sized or graded. The grading of the aggregates shall be as per IS: 383 or as required by the mix design, to obtain densest possible concrete. For this purpose, the contractor shall submit to the Engineer-in-Charge at least three sets of mix design and test results, each with different grading of coarse aggregates, proposed to be used. The Engineer-in-Charge may allow "All-in-aggregates" to be used provided they satisfy the requirements of IS: 383.

4.3 FINE AGGREGATES

- 4.3.1 Fine aggregates are the aggregates which pass through 4.75mm BIS sieve but not more than ten percent (10%) pass through 150 micron BIS sieve. These shall comply with the requirements of grading zones I, II and III of IS: 383. Fine aggregates conforming to grade zone IV shall not be used for reinforced concrete works.
- 4.3.2 Fine aggregates shall consist of material resulting from natural disintegration of rock and which has been deposited by streams or glacial agencies, or crushed stone sand or gravel sand. Sand from sea shores, creeks or river banks affected by tides, shall not be used for filling or concrete works.

4.4 SAMPLING AND TESTING

The Contractor shall carry out all tests including mix designs of concrete, at his own expense, at the start of work as well as during any stage of construction as required by the Engineer-in-Charge. Test shall be carried out in accordance with IS: 516-Methods of test for strength of concrete and IS: 2386-Methods of test for aggregates for concrete. Testing shall be carried out from laboratories approved by the Engineer-in-Charge. The method of sampling shall be in accordance with the requirements given in IS: 2430.

4.5 STORAGE OF AGGREGATES

- 4.5.1 Storage of all types of aggregates at site of work shall be at contractor's expense and risk and shall be stored as specified in IS: 4082. Aggregates shall in no case be stored near to the excavated earth or directly over ground surface.
- 4.5.2 The Contractor shall maintain sufficient quantities of aggregates, near to the place of work, required for the continuity of the work. Each type and grade of aggregate shall be stored separately on hard, firm surface having adequate slope for drainage of water.
- 4.5.3 Aggregates delivered at site in wet condition or becoming wet due to rain or any other means, shall not be used for at least 24 hours. The Contractor shall obtain prior approval of the Engineer-in-charge for the use of such aggregates and shall adjust the water content in accordance with IS: 2386 to achieve the desired mix. In the absence of test results, and to allow variation in mass of aggregates and water content on account of moisture content, the Contractor can make suitable adjustment in the masses as per IS: 456, for preparation of nominal mix concrete only.



5.0 SAND

5.1 SAND FOR MASONRY MORTARS

- 5.1.1 The sand shall consist of natural sand, crushed stone sand or crushed gravel sand or a combination of any of these. The sand shall be hard, durable, clean and free from adherent coatings and organic matter and shall not contain the amount of clay, silt and fine dust more than specified in IS: 2116.
- 5.1.2 The sand shall not contain any harmful impurities such as iron pyrites, alkalis, salts and coal or other organic impurities, mica, shale or similar laminated materials, soft fragments, sea shells in such form or in such quantities as to affect adversely the hardening, strength or durability of the mortar.
- 5.1.3 Unless found satisfactory as a result of further tests as may be specified by the Engineer-in-Charge, or unless evidence of such performance is offered which is satisfactory to him, the maximum quantities of clay, fine silt, fine dust and organic impurities in the sand, when tested in accordance with IS: 2386, shall not be more than 5% by mass in natural sand, or crushed gravel sand or crushed stone sand. For organic impurities, when determined in accordance with IS: 2386, colour of the liquid shall be lighter than that indicated by the standard solution specified in IS: 2386.

5.1.4 GRADING OF SAND

The particle size grading of sand for use in mortars shall be within the limits as specified below:

GRADING OF SAND FOR USE IN MASONRY MORTARS

IS SIEVE DESIGNATION	PERCENTAGE	REF.TO
IS: 460(PART I)	PASSING BYMASS	METHOD OF
4.75 mm	100	IS: 2386(Part I)
2.36 mm	90 to 100	
1.18 mm	70 to 100	
600 micron	40 to 100	
300 micron	5 to 70	
150 micron	0 to 15	

In case of a sand whose grading falls outside the specified limits due to excess or deficiency of coarse or fine particles, this shall be processed to comply with the standard by screening through a suitably sized sieve and/or blending with required quantities of suitable sizes of natural sand particles or crushed stone screenings which are by themselves unsuitable. Based on test results and in the light of practical experience with the use of local materials, deviation in grading of sand may be



considered by the Engineer-in-Charge. The various sizes of particles of which the sand is composed shall be uniformly distributed throughout the mass.

5.1.5 SAMPLING AND TESTING

The method of sampling shall be in accordance with IS: 2430. The amount of material required for each test shall be as specified in relevant parts of IS: 2386. Any test which the engineer-in-charge may require in connection with this shall be carried out in accordance with the relevant parts of IS: 2386.

If further confirmation as to the satisfactory nature of the material is required, compressive test on cement mortar cubes (1:6) may be made in accordance with IS: 2250 using the supplied material in place of standard sand and the strength value so obtained shall be compared with that of another mortar made with a sand of acceptable and comparable quality.

5.2 SAND FOR FILLING

Sand for filling shall meet the requirements of IS: 383 and shall be natural sand, hard, strong and free from any organic and deleterious materials. Any sand proposed for filling, shall be used only after it is approved by the Engineer-in-Charge. Sand obtained from sea shores, creeks or river banks affected by tides shall not be used for filling. Fine aggregates suitable for concreting works shall be suitable for filling also. No sand below grading zone-III as per IS: 383 shall be allowed for filling.

6.0 CEMENT

Cement to be used for civil and structural works shall be one of the following. Specific requirement for the type of cement to be used shall be as shown in the drawings or as specified in the contract or as directed by the Engineer-in-Charge.

Specification for 33 grade ordinary Portland cement	IS: 269
Specification for Portland slag cement	IS: 455
Specification for Portland pozzolana cement (fly ash based)	IS: 1489 Pt.1
Specification for Portland pozzolana cement (calcined clay based)	IS: 1489 Pt.2
Specification for Masonry Cement	IS: 3466
Specification for high alumina cement for structural use	IS: 6452
Specification for rapid hardening Portland cement	IS: 8041
Specification for 43 grade ordinary Portland cement	IS: 8112
Specification for 53 grade ordinary Portland cement	IS: 12269
Specification for Sulphate Resisting Portland cement	IS: 12330



6.1 STORAGE AT SITE

6.1.1 The storage of cement (lifted from the Owner's godown or procured by the Contractor himself) at the site of work shall be at contractor's expense and risk and shall meet the requirements of IS: 4082. The cement shall be stored above ground in a suitable weather tight building or godown and in such a manner as to permit easy access for proper inspection and also to prevent deterioration due to moisture. In the event of any damage occurring to the quality of cement due to faulty storage or on account of negligence on the part of the contractor, such damages shall be borne by the contractor himself.

6.1.2 All approved cement shall be arranged in batches with type, brand and date of receipt tagged on them. A maximum of eight bags shall be stacked one over the other. Cement bags shall be used in the same order as received from the manufacturer/owner. The contractor shall maintain a register, on day to day basis, giving the details of the receipt/consumption, source of supply and type of cement etc. The register shall always be accessible to the Engineer-in-Charge for verification.

6.2 TESTS AFTER DELIVERY

Each consignment of cement supplied by Owner or contractor, shall, after delivery at site and at the discretion of the Engineer-in-Charge, be subjected to any or all of the tests and analyses, required by the relevant Indian Standard Codes. In case the cement is supplied by the owner, the contractor shall get himself satisfied regarding its quality before using the same in his works at his own expense. The contractor shall carry out and bear the cost of all tests and analyses required to ensure quality of cement before using in actual works, irrespective of the fact whether the cement is supplied by the Owner or procured by him.

6.3 REJECTION

The Engineer-in-Charge may reject at his discretion any cement, notwithstanding the manufacturer's certificate or failing to meet the requirements of relevant BIS Codes for testing of cement. He may similarly reject any cement which has deteriorated owing to inadequate protection from moisture or due to intrusion of foreign matter or any other cause. Any cement which is considered defective shall not be used and shall be promptly removed from the site by the contractor.

7.0 STEEL

7.1 GENERAL

All steel bars, sections, plates, and other miscellaneous steel materials, etc shall be free from loose mill scales, rust as well as oil, mud, paint or other coatings. The materials, construction specifications such as dimensions, shape, weight, tolerances, testing etc, for all materials covered under this section, shall conform to respective BIS Codes.

7.2 REINFORCEMENT BARS



Reinforcement bars, to be used for civil and structural works shall be one of the following or in combination thereof.

Specification for mild steel and medium tensile steel bars and hard

drawn steel wire for concrete reinforcement (grade I). IS: 432

Specification for hard drawn steel wire fabric for concrete

reinforcement. IS: 1566

Specification for High strength deformed steel bars and wires for

concrete reinforcement. IS: 1786

Steel for general structural purposes (Grade A). IS: 2062

7.3 STRUCTURAL STEEL

Structural steel to be used for general structural purposes shall be one of the following or in combination thereof.

Structural steel sections shall conform to following BIS Codes.

Steel tubes for structural purposes. IS: 1161

Mild Steel Tubes, tubulars and other wrought steel fittings. IS: 1239

Steel for general structural purposes (Grade A). IS: 2062

Hollow steel sections for structural use. IS: 4923

7.4 MISCELLANEOUS STEEL MATERIALS

Miscellaneous steel materials shall be conforming to the following BIS Codes.

Specification for mild steel and medium tensile steel bars and hard drawn

steel wire for concrete reinforcement (grade I) (For mild steel bars of anchor bolts, rungs, metal inserts, grating etc.) IS: 432

Hexagonal head bolts, screws & nuts of product grade C. IS: 1363

Technical supply conditions for threaded steel fasteners. IS: 1367

Plain washers IS: 2016

Steel wire ropes for general engineering purposes IS: 2266

Mild Steel Tubes, tubulars and other wrought steel fillings.

(For Hand rail tubular sections). IS: 1239



Steel chequered plates. IS: 3502

Hexagonal bolts and nuts (M42 to M150). IS: 3138

7.4.1 ANCHOR BOLTS

Material for Anchor Bolts such as MS bars, washers, nuts, pipe sleeves and plates etc. shall be as per relevant BIS Codes mentioned above.

7.5 STORAGE

The storage of all materials at site of work shall be at the contractor's expense and risk and shall be done as per the requirements given in IS: 4082. The contractor shall maintain the proper records of receipt/consumption. The records shall always be accessible to the Engineer-in-Charge for verification.

The reinforcement bars, structural steel sections and other miscellaneous steel materials etc, shall be stored in such a way as to avoid and prevent deterioration, corrosion, bending, twisting and wrapping. In case of any damage occurring to the material on account of faulty storage or negligence by the contractor, same shall be borne by the contractor himself.

7.6 TESTS AFTER DELIVERY

Materials supplied by the Owner or Contractor, shall, after delivery at site and at the discretion of Engineer-in-Charge, be subjected to any or all of the tests, required by the relevant BIS Codes. The Contractor shall carry out and bear the cost of such tests irrespective of the fact whether the material is procured by the Owner or the contractor. In case steel is supplied by the Owner, the Contractor shall get himself satisfied regarding its quality before using the same in his works at his own expense.

7.7 REJECTION

The Engineer-in-charge may reject at his discretion any material, notwithstanding the manufacturer's certificate or failing to meet the requirements of relevant BIS Codes for testing of materials. He may similarly reject any material, which has deteriorated or corroded etc., due to improper storage, handling or transport. Defective materials shall not be used and removed from the site by the contractor at his own expense.

8.0 BRICK

8.1 GENERAL

Bricks for masonry works shall conform to IS: 1077 - Specification for common burnt clay building bricks and shall be of class 5.0 (with minimum compressive strength of 5.0N/mm²). Specific requirement for any other class of bricks shall be as shown in drawings or as described in the contract for a particular site or type of work. Physical requirements, quality, dimensions, tolerances etc. of common burnt clay building bricks shall conform to the requirements of IS: 1077.



Bricks shall be hand - moulded or machine moulded and shall be made from suitable soils. The bricks shall have smooth rectangular faces with sharp corners and shall be well burnt, sound, hard, tough and uniform in colour. These shall be free from cracks, chips, flaws, stone or humps of any kind.

8.2 TESTS AFTER DELIVERY

The Contractor shall take samples of each type of brick as directed by the Engineer-in-Charge as per the requirements of IS: 5454 and tests shall be carried out as per IS: 3495. The cost for carrying out any or all the tests shall be borne by the Contractor. The bricks, when tested, as per IS: 3495 shall have a minimum average compressive strength, as given in the Code, for a particular class of brick. Water absorption shall not be more than 20% by its dry weight, when soaked in cold water for 24 hours.

Brick samples so approved, shall be deposited with the Engineer-in-Charge. All subsequent deliveries shall be up to the standards of the approved samples.

8.3 STACKING OF BRICKS

Bricks shall be stored at site as per the requirements given in IS: 4082 and shall not be dumped at site. They shall be unloaded from trucks to a place on a leveled surface near to the work site. They shall be stacked in regular tiers even as they are unloaded, to minimize breakages and defacement of bricks. The supply of bricks shall be so arranged that as far as possible, at least two days' requirements of bricks are available at site at any time. Bricks, of different class, shall be stacked separately.

8.4 LOCAL BRICKS/CLASS 3.5 BRICKS.

Where shown on drawings, locally available bricks of nonmodular size (230mm x 115mm x 75mm) in place of bricks of modular size (190mm x 90mm x 90mm) can be used in case the bricks satisfy the other requirements of IS: 1077. Minimum compressive strength of these bricks shall not be less than 3.5N/mm².

9.0 STONE

9.1 GENERAL

All Stones used for masonry works shall conform to the requirements of following BIS Codes.

Method of identification of natural building stones.	IS: 1123
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Recommendations for dimensions and workmanship of natural building stones for masonry work.	IS: 1127
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Recommendations for dressing of natural building stones.	IS: 1129
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9.2 QUALITY OF STONES



Stones shall be of approved quality, hard, dense, strong, sound, durable, clean and uniform in colour. They shall also be free from veins, adherent coatings, injurious amount of alkalies, vegetable matters and other deleterious substances such as iron, pyrites, coal, lignite, mica, sea shells etc. Unless otherwise approved, stones from one single quarry shall be used for any one work. The strength of stones should be adequate to carry the imposed load and shall meet all the requirements of IS: 1905, taking into account the appropriate crushing strength of stone and type of the mortar used. The percentage of water absorption, when tested in accordance with IS: 1124 shall not exceed 5 percent.

Stones normally used, shall be small enough to be lifted and placed by hand. The length of the stone shall not exceed 3 times the height. Width of stone on base shall not be less than 150 mm and in no case exceed 3/4th thickness of the wall. Height of the stone shall not be more than 300mm.

9.3 UNLOADING/STACKING

The stones shall be unloaded from the trucks to a site near to the place of work as defined in IS: 4082 and shall be stacked on a firm ground having adequate stop for drainage. The supply of stones shall be so arranged that as far as possible, at least two days' requirements of stone are available at site at any time.

10.0 ADMIXTURES

10.1 GENERAL REQUIREMENTS FOR ADMIXTURES

10.1.1 All concrete admixtures shall in general comply with the following BIS Codes unless otherwise stipulated in this specification.

Specification for integral cement water proofing compounds. IS: 2645

Specification for other admixtures for concrete. IS: 9103

10.1.2 Generally, admixtures shall have ISI certification marks. However, even in case of BIS certified admixtures, Engineer-in-Charge may require the Contractor to carry out and submit any or all the tests (as specified in relevant BIS Codes), from approved laboratories, over and above the manufacturer's test certificate, before giving his final approval.

In case, admixtures certified by BIS are not available, the contractor shall submit to the Engineer-in-Charge the type and/or proprietary brand of the admixture from only reputed manufacturers along with necessary test certificates from recognized and approved laboratories or any other document directed by Engineer-in-Charge for the latter's final approval. In such cases, names of at least two manufacturers shall be submitted to the Engineer-in-Charge for his selection. In case, both the names are rejected, the contractor shall submit a fresh list of two manufacturers for approval by the Engineer-in-Charge.

The Engineer-in-Charge may direct the contractor to submit test results as required by IS: 2645 or IS: 9103 for any admixture proposed to be used in the concrete in any



approved laboratory at his discretion at any stage of the work. The cost of any/all tests required to satisfy compliance with this specification shall be borne by the Contractor.

In case of non-availability of any BIS code for testing and acceptability criteria, relevant American, British or German Code shall be applicable.

- 10.1.3 Prior approval of the Engineer-in-Charge shall be obtained while using water reducing admixtures in the concrete (PCC/RCC) or mortar. Other type of admixtures such as accelerating admixtures, retarding admixtures or air entraining admixtures, shall not be used unless specified on the design drawings or prior approval taken from the design approving authority. Once approved, utmost care shall be exercised, at site by the Contractor to maintain the consistency in the quality of admixture and the concrete/ mortar so produced.
- 10.1.4 The suitability and effectiveness of any admixture shall be verified by trial with the designed concrete mixes using cement, aggregates together with any other materials to be actually used in the works as per the direction of Engineer-in-Charge. If two or more admixtures are to be used simultaneously in the same concrete mix, the Contractor must submit necessary test results from an approved laboratory to show their interaction and compatibility. Any/all tests specified in BIS Codes shall be carried out only with the type of material and mix design, to be actually used in the work site.
- 10.1.5 No admixture shall impair the durability of the concrete nor combine with the ingredients to neither form harmful compounds nor increase the risk of corrosion of reinforcement. Use of admixtures shall not reduce the dry density of concrete. Once the proportion of admixture has been established, strict check shall be maintained not to alter the proportions of ingredients and water-cement ratio of the Design Mix during execution.
- 10.1.6 The chloride contents in admixtures shall not exceed 2% by mass of the admixture or 0.03% by mass of the cement.
- 10.1.7 Admixtures which do not meet the requirements stipulated in this specification shall be rejected and shall not be used.
- 10.2 WATER PROOFING COMPOUNDS
 - 10.2.1 Water proofing compounds shall be mixed with only ordinary Portland cement of grade 33, conforming to IS: 269.
 - 10.2.2 The permeability of the specimen with the admixture shall be less than half of the permeability with similar specimen without the use of these compounds. These compounds shall be used in such proportion as recommended by manufacturer but in no case it shall exceed 3% by weight of cement.
 - 10.2.3 The initial setting time of the cement with the use of these compounds shall not be less than 30 minutes and final setting time shall not be more than 10 hours. Test shall be carried out in accordance with IS: 4031.



- 10.2.4 Compressive strength of specimen at 3 days shall not be less than 160kg/sq.cm nor 80% of the 3 days compressive strength of mortar cubes prepared with same cement and sand only, whichever is higher. Similarly compressive strength at 7 days shall not be less than 220 kg/sq.cm nor less than 80% of the 7 days compressive strength prepared with the same cement, and sand only, whichever is higher. The test to determine the compressive strength shall conform to IS: 4031.

11.0 WATER BARS (WATER STOPS)

- 11.1 PVC water bars shall be used in reinforced concrete construction of liquid retaining structures or any other structure to safeguard them from hydrostatic pressure and water leakage and any relative movement between two parts of the structure due to thermal loading shrinkage or differential movement of foundations. Wherever desired or shown in the drawings, they shall be used at expansion/contraction/construction joints. These shall be pre-formed and shall provide a permanent water tight seal along the entire joint in the poured concrete structures. These shall also be flexible enough to withstand deflection/displacements at joints arising due to variation of temperatures or settlement of foundations. The minimum thickness of water bar shall be as shown on drawings or described in the schedule of rates and unless otherwise mentioned, these shall be able to withstand a water head of at least 12 meters.
- 11.2 Performance requirements of P V C water bars shall meet the requirements of IS: 12200. These shall be of approved make and of ribbed/serrated/plane type with a bulb at the centre. The thickness and width of water bars shall be as per schedule of rates/drawings but in no case the thickness shall be less than 5mm and width less than 150mm. The joining of the water bars shall be carried out by vulcanising strictly as per the manufacturer's specifications. Lapped joints shall not be allowed under any circumstances.

12.0 BITUMEN/BITUMINOUS MATERIALS

Bitumen to be used for various types of work shall meet all the requirements of relevant BIS Codes as given below:

Specification of Paving Bitumen.	IS: 73
Specification for bitumen mastic for flooring.	IS: 1195
Specification for Bitumen felts for water proofing and damp proofing.	IS: 1322
Specification for Bituminous compounds for water proofing and caulking purposes.	IS: 1834
Specification for preformed fillers for expansion joint in concrete pavements and structures.	IS: 1838



Specification for bitumen mastic for use in water proofing of roofs. IS: 3037

Specification for bitumen primer for use in water proofing and
damp proofing. IS: 3384

Specification for Bitumen Mastic for Tanking and Damp proofing. IS: 5871

Specification for Glass fibre base coal tar pitch & bitumen felts. IS: 7193

Code of practise for damp proofing using bitumen mastic. IS: 7198

Specification for bitumen Mastic, Anti Static and
electrically conducting grade. IS: 8374

The type and grade shall be as shown on the drawings or as indicated in schedule of quantities or as directed by Engineer-in-Charge. Tests and acceptable criteria shall be as per relevant BIS Codes.

13.0 PVC PIPES

PVC Pipes shall conform to the requirements of IS: 4985.

14.0 WOOD/TIMBER

14.1 Wood recommended for platforms of cold vessels or below cold vessels/ exchangers shall be hard and shall be of group A, grade I, and shall have safe permissible stress of 7N/mm² in compression, perpendicular to grains on outside location as per IS:883. General characteristics like durability, treatability etc. shall conform to IS: 883 and IS: 3629.

14.2 Timber required to be used for formwork shall be fairly dry before use. It should maintain its shape during the use and even when it comes into contact with moisture from the concrete. Storage of Wood/Timber shall be as per the requirements of IS: 4082.

For proper identification and selection of suitable timber for formwork, following codes shall be referred.

Classification of commercial timbers and their zonal distribution IS: 399

Specification for ballies for general purposes. IS: 3337

Specification for Ply wood for concrete shuttering work. IS: 4990



15.0 ANTITERMITE COMPOUNDS

- 15.1 Chloropyrifos emulsifiable concentrates (1%) conforming to IS: 8944 shall be used for treatment of soil for protection of buildings against attack by subterranean termites.

16.0 POLYSULPHIDE SEALANTS

- 16.1 Polysulphide Sealants shall conform to IS: 12118 and be of approved make. Test conditions and requirements shall be as given in the above referred BIS code.







Energising Quality

VCS Quality Services Pvt Ltd

**STANDARD SPECIFICATION
FOR
EARTHWORK IN FOUNDATIONS**

VCS-SS-CS-6022

					
03	31.01.2022	NV	GDS	HK	GW
02	25.02.2020	NV	GDS	RKB	SK
01	16.10.2019	MA	MO	AD	SK
00	05.07.2017	MA	MO	AD	SK
Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By

UNCONTROLLED COPY	:	If printed
CONTROLLED COPY	:	If in soft and signed



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**STANDARD SPECIFICATION
FOR EARTHWORK IN FOUNDATIONS**

**DOC NO: VCS-SS-CS-6022
Rev No : 03**

REVISION RECORD						
Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description
00	05.07.2017	MA	MO	RKB	AD	Issued for use as Standard
01	16.10.2019	MA	MO	RKB	SK	
02	25.02.2020	NV	GDS	RKB	SK	New revision system updated
03	31.01.2022	NV	GDS	HK	GW	VCS QMS Integration



ABBREVIATION

m	Metre
mm	Millimetre
Cm	Centimetre
m ²	Square metre
m ³	Cubic metre
CNS	Cohesive Non Swelling



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1.0 SCOPE

This specification deals with earth work in excavation and filling.

2.0 REFERENCES

2.1 SPECIFICATIONS

VCS-SS-CS-6002 Earthwork in Site Grading

VCS-SS-CS-6003 Earthwork for underground piping

3.0 CLASSIFICATION OF SOIL

3.1 SOFT / LOOSE / HARD / DENSE SOIL AND MUD

Generally any soil which yields to the application of pick and shovel or to phawra, rake or other, ordinary digging implement such as vegetable or organic soil, turf, gravel, sand, silt, loam, clay, peat, cobble stone, mud etc.

3.2 SOFT / DISINTEGRATED / WEATHERED ROCK (NOT REQUIRING BLASTING)

Rock or boulder which may be quarried or split with crowbar. This will also include laterite and hard conglomerate.

3.3 HARD ROCK (REQUIRING BLASTING)

Any rock or boulder for the excavation of which blasting is required.

3.4 HARD ROCK (BLASTING PROHIBITED)

Hard rock requiring blasting as described under cl. No. 3.3 above, but where blasting is prohibited for any reason(s), breaking up of rock shall be done by chiselling, wedging or by using Hydraulic Splitter and chemical substances mixed in an appropriate proportion.

4.0 BACKFILLING MATERIAL

4.1 Backfilling material shall be as approved by the Engineer-in-Charge.

4.2 Backfilling of excavation in trenches, foundations and elsewhere shall consist of one of the following materials as shown on drawing, or directed by the Engineer-in-Charge.

a. Soil

b. Selected earth from heaps or brought from borrow areas.

4.3 In case a. or b. are not available, the Engineer-in-Charge may approve use of any of the following: Stone/gravel

c. Sand



d. CNS material.

- 4.4 The material shall be free from rubbish, roots, hard lumps and any other foreign organic material

5.0 SETTING OUT

- 5.1 The Contractor shall be responsible for the true and proper setting out of the work in relation to original point's lines and levels of reference and for the correctness of the levels, dimensions and alignment of all parts of the work. If at any time during progress of the work any error appears or arises in the position of level, dimension, or alignment of part of the work, the Contractor at his own expense shall rectify such errors to the satisfaction of the Engineer-in-Charge. The checking of any line or level by the Engineer-in-Charge shall not in any way relieve the Contractor of his responsibilities.
- 5.2 The Contractor shall lay out and construct one or more permanent bench marks in some central place before the start of the work, from which all important levels for the excavations will be set.
- 5.3 These permanent bench marks shall consist of masonry pillars with top neatly plastered and levelled as per the directions of the Engineer-in-Charge. Bench marks shall be well connected with triangular grid system or any other bench mark approved by the Engineer-in-Charge.

6.0 EARTHWORK IN EXCAVATION

- 6.1 Excavation shall be carried out in any material met on the site to the lines, levels and contours shown on the detailed drawings and the Contractor shall remove all excavated materials to spoil heaps on site or transport for use in filling on the site or stack them for reuse as directed:
- 6.2 Excavated material shall not be deposited within 1.5m from the top edge of the excavation.
- 6.3 The sides of the excavation may be cut sloping, or shored and strutted to hold the face of earth as per site requirements and as directed by the Engineer-in- Charge.
- 6.4 Foundation pits/trenches shall not be excavated to the full depth unless construction is imminent. The last fifteen (15) cm depth of the excavation shall not be done until concreting work is imminent. The full depth may at the discretion of the Engineer-in-Charge be excavated and the bed covered with a fifty (50) mm (minimum) thick (or as indicated on drawing) layer of lean concrete 1:5:10 mix (1 cement: 5 coarse sand: 10 crushed stone aggregate) or as specified in schedule of rates/shown on drawing, after watering if required, and consolidating the bed.
- 6.5 If the bottom of any excavation has been left exposed by the Contractor and in the opinion of the Engineer-in-Charge, that has become badly affected by the atmosphere or by water, then the Contractor shall remove such portions of the deteriorated material as the Engineer-in-Charge may direct and shall make good with lean concrete



- 1:5:10 mix (1 Cement: 5 Coarse Sand: 10 Crushed Stone Aggregate). All expenses for such additional concrete and excavation shall be borne by the Contractor.
- 6.6 Where excavation is made in excess of the depth required, the Contractor shall, at his own expense, fill up to required level with lean concrete 1:5:10 mix (1 Cement : 5 Coarse Sand : 10 Crushed Stone aggregates) or as decided by Engineer-in-Charge.
- 6.7 The Contractor shall provide suitable drainage arrangement to prevent surface water from any source entering the foundation pits at his own cost.
- 6.8 The Contractor shall make all arrangements for dewatering during excavation and subsequent works, the accumulated water from any source (including subsoil water) in the excavated pits/trenches and keeping the excavated pits/trenches dry for subsequent works.
- 6.9 The Contractor shall make necessary arrangements for lighting, fencing and other suitable measures for protection against risk of accidents due to open excavation.
- 6.10 Where the excavation is to be carried out below the foundation level of an adjacent structure, the precaution to be taken such as under pinning, shoring and strutting etc. shall be determined by the Engineer- in-Charge. No excavation shall be done unless such precautionary measures are carried out as per directions of the Engineer-in-Charge. The payment for such precautionary measures shall, however, be made separately.
- 6.11 Loose or soft bed ground encountered in excavation at the required depth shall on the Engineers-in-Charge's instructions be excavated to a firm bed and difference made up to the required level with lean concrete 1:5:10 mix (1 Cement: 5 Coarse Sand: 10 Crushed Stone Aggregates).
- 6.12 In those cases where during excavation, side slips occur for reasons not attributable to the Contractor (e.g. side slips which take place on their own but not due to surcharge of earth kept near the edge of excavation and cracking of excavation top strata due to clay drying out leading to collapse of excavation sides), the Engineer-in-Charge shall admit payment at his discretion.
- 6.13 Any obstacle encountered during excavation shall be reported immediately to the Engineer-in-Charge and shall be dealt with as instructed by him. Removal of buried pipes or cables shall not be done without prior permission of the Engineer-in-Charge and the Contractor shall provide all measures to protect the same. Costs of such protective measures are deemed to be included in the rates for various items of excavation.
- 6.14 The Contractor shall not undertake any concreting in foundation until the excavation pit/trench is approved by the Engineer-in-Charge.
- 6.15 The specification for earth work shall also apply to excavation in rock in general.
- 6.16 In case of hard rock requiring blasting, the provisions mentioned below shall be strictly followed.



6.16.1 GENERAL

Where hard rock is met with and blasting operations are considered necessary, the Contractor shall intimate about the same to the Engineer-in-Charge, and obtain his approval in writing for resorting to blasting operation.

The Contractor shall obtain license from the district authorities for undertaking blasting work as well as for obtaining and storing the explosive as per Explosive Rules 1983, corrected up to date. He shall purchase the explosives, fuses, detonators etc. only from a licensed dealer. He shall be responsible for the safe custody and proper accounting of the explosive materials. The Engineer-in-Charge or his authorized representative shall have the access to check the Contractor's store of explosive and his accounts.

In case where explosives are required to be transported and stored at site, relevant clauses of the Explosive Rules, 1983 as amended subsequently, shall apply.

The Contractor shall be responsible for any accident to workmen, public or property, due to blasting operations.

6.16.2 PRECAUTIONS

Blasting operations shall be carried out under the careful supervision of a responsible, authorized and licensed blaster of the Contractor (referred subsequently as "blaster" only) during specified hours, as approved in writing by the Engineer-in-Charge. The blaster shall be fully conversant with the rules of blasting.

Proper precautions for safety of persons shall be taken. Red flags shall be prominently displayed around the area to be blasted and all the people on the work except those who actually light the fuses shall withdraw to a safe distance of not less than 200 meters from the blast. Precautions as per Explosive Rules 1983 with amendment shall be followed.

6.16.3 FUSES

All fuses shall be cut to the lengths required before being inserted into the holes. Joints in fuses shall be avoided. Where these are unavoidable, a semicircular niche shall be cut in one piece of fuse about 2 cm. deep from the end and the end of other piece inserted into this niche, and the two pieces then wrapped together with a string. All joints exposed to dampness shall be wrapped with rubber tape. Fuse and detonators shall be kept separated from the explosives.

6.16.4 BLASTING WITH GUN POWDER

Blasting shall normally be done with gun powder. Dynamite, gelatine or any other high explosive shall only be used in special cases with the written permission of the Engineer-in-Charge.

In case of blasting with gun powder, the position of all bore holes to be drilled shall be marked out in circles with white paint. The bore holes shall be jumped or drilled in the rock face. The depth of bore hole shall be about the same as that of the line of least



resistance and its size shall be such that the cartridges can easily pass down to the bottom. The bore holes must be dried before being charged and these shall be inspected by the Contractor's agent.

Gun powder may be used in the form of pellet blasting cartridges or as powder or granules. Cartridges are provided with tapered central hole. One end of fuse is passed through the narrow end of the hole and a sufficient length of the fuse is doubled back so that when the fuse is pulled, it is held tight in the tapered hole of the cartridge. Other cartridges are then inserted in the fuse to make up the required charge. The cartridge along with the fuse is lowered down in the bore hole, placed in position and gently filled and pressed home with dry hay or turf. The rest of the bore shall then be filled with dry clay, which shall be tamped with copper or brass rod until it becomes compact. Care shall be taken to avoid any possibility of an air space around the fuse. The safety fuses shall be taken to the required distance so as to allow the blasting to take place after the person lighting the fuse has withdrawn to a safe distance.

Where gun powder is used in the form of powder or granules it shall be introduced in the bore hole by means of funnel or copper tube. The bore holes shall be loaded with two thirds of the quantity of charge required, and safety fuse then directly introduced over the charge. Remaining one third charges shall then be introduced, and gently filled and pressed home with dry hay or turf. The rest of the bore hole shall be filled with dry clay in the same way as for cartridges, and the safety fuse taken to the required distance.

The charges shall be fired by igniting the fuse. The number of charges to be fired and the actual number of shots heard shall be compared, and the Contractor's blaster shall satisfy himself by examination that all the charges have exploded, before workmen are permitted to approach the site. The charge which has not exploded shall not be permitted to be withdrawn.

The tamping and charge shall be flooded with water and the holes marked with a red cross (X) over it. Another hole shall be jumped at a distance of about 45 cm from the old hole and fired in the usual way. This operation shall be continued, till the original and any subsequent unfired charges are exploded.

6.16.5 BLASTING WITH DYNAMITE OR ANY OTHER HIGH EXPLOSIVE

In case of blasting with dynamite or any other high explosive the position of all bore holes to be drilled shall be marked out in circle with white paint. These shall be inspected by the Contractor's blaster. Bore holes shall be of a size that the cartridge can easily pass down. After the drilling operation, the blaster shall reinspect the holes to see that the holes marked out by him have been drilled. He shall then prepare all charges necessary for the bore holes. The bore holes shall be thoroughly cleaned before a cartridge is inserted. Wooden tamping rods (not pointed but cylindrical throughout) shall be used, in charging holes. Metal rods shall never be used for tamping. One cartridge shall be first placed in the bore hole, gently pressed and not rammed down. Other cartridges shall then be added as may be required to make up the necessary



charge for the bore hole. The top most cartridges shall be connected to the detonator which shall in turn be connected to the safety fuse of required length.

The maximum of eight bore holes shall be loaded and fired on each occasion. The charges shall be fired successively and not simultaneously.

Immediately before firing a blast, due warning shall be given and the blaster shall see that all persons have retired to a place of safety. The safety fuses of the charged holes shall be ignited in the presence of the blaster, who shall see that all the fuses are properly ignited.

Careful count shall be kept by him and others of each blast as it explodes. After the blast the blaster shall inspect the work and ascertain that all the charged holes have been exploded. In case of misfired holes, he shall inspect the same after half an hour and mark red crosses (X) over the holes. During this interval of half an hour, no body shall approach the misfired holes. None of the drillers shall work near such holes, until one of the two following operations has been done by the blaster.

- a. Either the Contractor's blaster shall very carefully (when the tamping is of damp clay) extract the tamping with a wooden scraper and withdraw the fuse, primer and detonator, after which a fresh detonator, primer and fuse shall be placed in the misfired holes and fired.

OR

- b. The hole shall be cleaned for 30 cm of tamping and its direction ascertained by placing a stick in the hole. Another hole shall then be drilled 15 cm away and parallel to it. This hole shall be charged and fired. The misfired hole should also explode along with the new one

Before leaving the work, the blaster of one shift shall inform another blaster relieving him for the next shift, of any cases of misfire, and shall point out their positions denoted by red crosses and also state the action, if any, to be taken in the matter.

The Engineer-in-Charge shall also be informed by the blaster of all cases of misfire, their causes and steps taken in that connection.

6.16.6 CONTROLLED BLASTING

Whenever required by the Engineer-in-Charge, rock blasting shall be carefully controlled so that vibrations generated during the blasting do not cause damage to the buildings and installation around. Similarly, the rock pieces should not fly off and endanger the buildings and installations around. Apart from the general precautions mentioned in the preceding paragraphs, following protective measures and limits for use of explosive are suggested as guidelines. Tenderers are requested to carefully check the site conditions and submit details of the scheme they propose to adopt for controlling the blast.

Following protective measures shall be adopted while carrying out blasting operations.



The hole shall be covered with mild steel plate of minimum 12mm thickness.

Reinforcement rod meshes not less than 20mm dia. at 150mm centre in both directions shall be placed over the steel plates.

Steel plate and reinforcement shall be inspected after every blasting operation and all twists shall be removed before reuse to the satisfaction of the Engineer-in- Charge.

Sand filled bags of 6 to 8 layers shall be placed over the mesh suitably covering the whole region under blasting operation.

The thickness of covering plate and the kind of dead weight is to be duly approved by the Engineer-in-Charge.

- 6.16.7 Hard rock requiring blasting as described under cl.no. 2.3 above, but where blasting is prohibited for any reason(s) breaking up of rock can be done by using Hydraulic Splitter and chemical substances of approved manufacturer (Lifton or equivalent) mixed in an appropriate proportion. The method involves drilling holes into rock and then inserting/injecting hydraulic splitter/chemical solvents into the holes. The breaking-up of rock takes place in a controlled fashion without much noise and spark.

6.17 PAYMENT

This clause shall apply to item rate tenders only.

- 6.17.1 Payment for earth work in excavation shall be made on cubic meter (m³) basis on the measurement of volume of pit/trench of excavation with working space as per relevant Indian Standards (IS: 1200) and slopes/stepping as permitted by the Engineer-in-Charge. The rate shall include cost of all the operations of blasting with explosives & accessories, making of all arrangements for dewatering the accumulated water from any source in the excavated pit or trench, removal and disposal of surplus excavated soil within a lead of 100m from construction areas. The rate shall also include setting out and line out work required for the excavation.

- 6.17.2 The following works shall not be measured separately and allowance for the same shall be deemed to have been made in the description of main item:

- a. Setting out works, profiles, etc.;
- b. Site clearance, such as cleaning grass and vegetation;
- c. Unauthorized battering or benching of excavation;
- d. Forming (or leaving 'dead men' or 'tell-tales' in borrow pits and their removal after measurements;
- e. Forming (or leaving) steps in sides of deep excavation and their removal after measurements;
- f. Excavation for insertion of planking and strutting;



- g. Unless otherwise specified, removing slips or falls in excavations;
 - h. Baling out or pumping of water in excavation from rains;
 - i. Baling out or pumping of water in excavation from sub-soil water, and
 - j. Slings or supporting pipes, electric cables, etc, met during excavation.
- 6.17.3 Special pumping other than what is included in 6.17.2 (h and i) and well point dewatering where resorted to, shall each be measured separately, unless otherwise stated, in kilolitres of water against separate specific provision(s) made for the purpose.
- 6.17.4 The Contractor shall intimate to the Engineer-in-Charge as soon as different classification of soils are met with. The measurements of various soil classifications then shall be worked out by either of the following alternatives in the order of their decreasing importance.
- a. Joint levels shall be taken as to the levels of different soil classifications and volume worked out on the basis of levels only.
 - b. Where levels of different strata cannot be clearly marked and defined, the Contractor shall stack different soils of various classifications separately for measurement purpose and then dispose it off.
 - c. If the quantum of work involved in (b) above is extensively large & time consuming, then the total area may be divided into various zones and reasonably representative samples as in (b) above may be taken and quantities of soils of various classifications finalized for the entire zone based on the representative.

If soil of any classification other than that specified in the Schedule of Rates is met with during excavation, the decision of the Engineer-in-Charge as to the classification of soil, levels of the strata of different classifications and their location shall be binding.

In above case, the total quantity of excavation shall be computed from the measurement of the pit/trench excavated. The hard rock and soft rock shall be measured separately from the relevant stacks and each shall be reduced by fifty percent for voids, and paid under the relevant items. The balance, that is the total quantity of excavation minus the reduced (for voids) quantity of excavation for rocks shall be paid as soft/hard soil as per the direction of the Engineer-in-Charge (However, the maximum payment shall be limited to the volume of the excavated pit/trench as approved by Engineer-in-Charge).

7.0 SHORING AND STRUTTING:

- 7.1 The shoring and strutting of the sides to withhold the face of excavation pits/trenches shall be done when approved or directed by the Engineer-in-Charge.
- 7.2 The shoring shall be of close or open timbering type depending upon the site requirements and as directed by the Engineer-in-Charge whose decision shall be final and binding as to the type of shoring to be used.



7.3 The arrangement of the shoring and strutting shall be sound and safe and shall be got approved from the Engineer-in-Charge before installation. The approval shall not absolve the Contractor of his responsibilities of safety and any other requirements of the contract.

7.4 The shoring and strutting shall be kept in position till all the relevant work in the excavated area is completed and approved. It shall be dismantled and removed only after the permission to do so is obtained from the Engineer-in-Charge.

7.5 PAYMENT

This clause shall apply to item rate tenders only.

Payment for shoring and strutting by close and open timbering shall be made on square meter (m²) basis as separate items. In both the cases, the measurement shall be done on the basis of the surface area of the sides of the excavation actually shored and strutted.

The rate shall include all labour, materials, erection of the poling boards, wales, struts, ballies etc., fixing and keeping the same in position as required, dismantling and removing the same after the work is over as directed.

8.0 BACK FILLING AROUND FOUNDATIONS AND IN PLINTH

8.1 Back filling around completed foundations, structures, trenches and in plinth shall be done to the lines and levels shown on the drawings including any trimming of the surfaces, as may be necessary. This shall be done with selected and approved earth from excavation or otherwise with materials described under clause 3.2 as directed by the Engineer-in-Charge. Where sufficient suitable material is not available from the excavation, the Engineer-in-Charge may direct to import suitable earth from other sources. The filling shall be done in layers of thickness not exceeding 15 cm with watering, rolling and ramming by manual methods/mechanical compactors to grade and level as shown on drawings to obtain 90% laboratory maximum dry density.

8.2 The Contractor shall not commence filling in and around any work until it has been permitted by the Engineer-in- Charge.

8.3 Backfilling around liquid retaining structures and pipes shall be done only after approval of the Engineer-in- Charge is obtained.

8.4 PAYMENT

This clause shall apply to item rate tenders only.

Payment for backfilling with earth shall be based on volume in cubic meters (m³) of consolidated fill. This volume shall be derived from the difference between the volume of excavation and the structure or trenches as the case may be. The rate shall include cost of extracting suitable approved earth from available excavated soil from spoil heaps within a lead of 100m, placing, watering, rolling, ramming compacting in layers,



trimming and dressing finished surface and disposal of surplus material up to a lead of 100m.

However, backfilling done with materials other than earth shall be paid separately under relevant items.

9.0 TRANSPORTATION OF SURPLUS EARTH

9.1 Surplus earth and soil from excavation shall be removed from construction area to the area demarcated by the Engineer-in-Charge.

9.2 PAYMENT

This clause shall apply to item rate tenders only.

9.2.1 Payment shall be made only for the lead beyond initial 100m from construction area. Rate shall include re- excavation, loading, transportation, dumping, stacking or spreading (as per directions of the Engineer in Charge) the surplus earth and the soil in the area demarcated by the Engineer-in-Charge Payment shall be made on cubic meter (m³) basis on the difference of measurements of the volume of the excavated pits and the measurement of the back filling. Quantity generated due to voids in back filled volume of earth shall also be removed by the Contractor at no extra cost and this disposal of earth shall not be measured and paid under any item.

9.2.2 In exceptional circumstances the Engineer-in-Charge may direct the Contractor to remove surplus earth, concrete debris or any other waste material from site to the areas of disposal on the basis of truck measurement. In such cases volume of material shall be calculated on the basis of truck volume reduced by 30% for voids in case of soft/hard soils and 50% for soft/hard rock. All other provisions of disposal such as spreading, levelling, grading shall apply in this case also.







Energising Quality

VCS Quality Services Pvt Ltd

**STANDARD SPECIFICATION
FOR
PLAIN AND REINFORCED CEMENT COCNETE**

VCS-SS-CS-6023

					
03	31.01.2022	NV	GDS	HK	GW
02	25.02.2020	NV	GDS	RKB	SK
01	16.10.2019	MA	MO	AD	SK
00	05.07.2017	MA	MO	AD	SK
Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By

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Energising Quality

**STANDARD SPECIFICATION
FOR PLAIN AND REINFORCED CEMENT
CONCRETE**

**DOC NO: VCS-SS-CS-6023
Rev No : 03**

REVISION RECORD						
Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description
00	05.07.2017	MA	MO	RKB	AD	Issued for use as Standard
01	16.10.2019	MA	MO	RKB	SK	
02	25.02.2020	NV	GDS	RKB	SK	New revision system updated
03	31.01.2022	NV	GDS	HK	GW	VCS QMS Integration



ABBREVIATION

m	Metre
mm	Millimetre
m ²	Square metre
m ³	Cubic metre
Kg/m ²	Kilogram per Square Metre
Kg/m ³	Kilogram per Cubic Metre
IS	Indian Standard
BIS	Bureau of Indian Standards
BS	British Standard
PVC	Poly Vinyl Chloride



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1.0 SCOPE

This specification is applicable for Concrete Grade up to M55 and establishes the requirements of materials, mix proportioning, placing, curing, etc. of all types of cast-in-situ and precast concrete used in foundations, underground and over ground structures, floors, pavements etc. Any special requirements as shown or noted on the drawings shall supersede over the provisions of this specifications.

2.0 REFERENCE

Apart from this specification, construction of plain and reinforced concrete works shall be in accordance with the Indian Standard Code of Practice for "Plain and Reinforced Concrete" IS: 456 and other relevant codes mentioned therein.

- 2.1 For Liquid Retaining Structures relevant Specification shall be applicable.
- 2.2 For Structural Steel works Specification No. VCS-SS-CS-6024 & 6026 shall be applicable.
- 2.3 In case of conflict between the clauses mentioned in this specification and those in the Bureau of Indian Standards (BIS), this specification shall govern.

3.0 MATERIALS

- 3.1 Materials for concrete viz. cement, Pozzolanas, Fly Ash, Ground Granulated Blast Furnace Slag, sand, coarse aggregate, water, etc. shall be as described in Specification No. VCS-SS-CS-6021.
- 3.2 Materials for all reinforcements, embedment, inserts, water bars etc. shall conform to Specification No. VCS-SS-CS-6021.
- 3.3 Materials suggested to be used as additive to concrete shall conform to Specification No. VCS-SS-CS-6021.

4.0 GRADES OF CONCRETE

Characteristic Compressive strength for different grades of concrete shall be as per Table-1.

TABLE – 1	
GRADES OF CONCRETE	
Grade Designation	Specified Characteristic Compressive Strength of 150 mm cube at 28 days (N/mm ²)
M 15	15
M 20	20
M 25	25
M30	30
M35	35



M 40	40
M 45	45
M 50	50
M 55	55

Note for Table - 1: The characteristic strength is defined as the strength of material below which not more than five (5) percent of the test results are expected to fall.

5.0 TYPE OF CONCRETE MIX

5.1 Unless otherwise noted on drawings, all lean/plain and reinforced concrete shall be nominal mix and design mix types, respectively.

5.2 NOMINAL MIX CONCRETE

This concrete shall be made (without preliminary tests) by adopting nominal concrete mix with proportions of materials as specified in clause no. 9 of IS: 456.

5.3 DESIGN MIX CONCRETE

The mix shall be designed as per IS: 10262 & SP: 23 to produce the grade of concrete having the required workability and characteristic strength not less than appropriate values given in Table-1. The target mean strength of concrete mix shall be equal to the characteristic strength plus 1.65 times the standard deviation.

As long as the quality of materials does not change, a mix design done earlier but not prior to one year may be considered adequate for later work. However, in case the quality of materials changes or there is a break in the continuity of construction and the same work is allocated to a new contractor, the Engineer-in-Charge shall ask for a new design mix.

Irrespective of the grade of concrete required to be produced as per characteristic strength criteria, the minimum cement content and maximum free water cement ratio in the design concrete shall be strictly maintained as stipulated in Table 2 for the corresponding grade of concrete.

6.0 CONCRETE MIX PROPORTIONING

Proportioning, as used in this specification, shall mean the process of determining the proportions of the various ingredients to be used to produce concrete of the required workability when fresh/green and strength, durability and surface finish, when hardened. The following information shall be collected prior to design of the concrete mix:

- Grade designation.
- Type of cement.
- Maximum nominal size of aggregate.



- d. Minimum cement content.
- e. Maximum free water cement ratio
- f. Workability requirements.
- g. Exposure condition as per Table 3 & Table 4 of IS: 456
- h. Maximum temperature of concrete at the time of placing.
- i. Method of Placing.

The Engineer-in-Charge shall verify the strength of the concrete mix, before giving his sanction of its use. However, this does not absolve the Contractor of his responsibility as regards achieving the prescribed strength of the mix. If during the execution of the work, cube tests show lower strengths than required, the Engineer-in-Charge shall order fresh trial mixes to be made by the Contractor. No claim to alter the rates of concrete work shall be entertained due to such changes in mix variations. Any variation in cement consumption shall be taken into consideration for material reconciliation. Preliminary mix designs shall be established well ahead of start of work.

6.1 MAXIMUM DENSITY

Suitable proportions of sand and the different sizes of coarse aggregates for each grade of concrete shall be selected to give as nearly as practicable the maximum density. This shall be determined by mathematical means, laboratory tests, field trials and suitable changes in aggregate gradation. The contractor shall submit to the Engineer-in-Charge at least three sets of mix design and corresponding test results after varying the mix proportions and / or grading of aggregate so as to establish the maximum density of any particular grade of concrete.

6.2 CONSISTENCY

The concrete shall have a consistency such that it shall be workable in the required position and when properly vibrated it flows around reinforcing steel, all embedded fixtures, etc.

6.3 WORKABILITY

"Workability of Concrete" shall be as per clause no. 7 of IS: 456.

6.4 DURABILITY

For achieving sufficiently durable concrete, strong, dense aggregates, low water-cement ratio and adequate cement content shall always be used. Workability of concrete shall be such that concrete can be completely compacted with the means available. Leak-proof formwork shall be used so as to ensure no loss of cement-slurry during pouring and compaction. Cover to reinforcement shall be uniform and as shown on drawings. Concrete mix design shall always take into account the type of cement, minimum cement content irrespective of the type of cement and maximum free water



cement ratio and minimum grade of concrete conforming to the exposure conditions as given in Table-2.

TABLE-2 MINIMUM CEMENT CONTENT, MAXIMUM FREE WATER CEMENT RATIO AND MINIMUM GRADE OF CONCRETE FOR DIFFERENT EXPOSURE CONDITIONS						
Exposure	Plain Concrete			Reinforced Concrete		
	Minimum Cement Content (kg /m ³)	Maximum Free Water Cement Ratio	Minimum Grade of Concrete	Minimum Cement Content (kg / m ³)	Maximum Free Water Cement Ratio	Minimum Grade of Concrete
Mild	220	0.6	M 15	300	0.55	M 20
Moderate	240	0.6	M 15	300	0.50	M 25
Severe	250	0.5	M 20	320	0.45	M 30
Very Severe	260	0.45	M 20	340	0.45	M 35
Extreme	280	0.4	M 25	360	0.4	M 40

Note: Cement prescribed in this table is irrespective of grade of Cement and it is inclusive of pozzolanas, Fly Ash, Ground Granulated Blast Furnace Slag may be taken into account in the concrete composition within respect to the cement content and water-cement ratio if the suitability is established and as long as the maximum amounts taken into account do not exceed the limit of pozzolona and slag specified in IS: 1489 (part-1) and IS: 455 respectively.

Generally, the following types of cement shall be used for Plain and Reinforced concrete works:

- a. 33 Grade Ordinary Portland Cement conforming to IS: 269.
- b. 43 Grade Ordinary Portland Cement conforming to IS: 8112.
- c. Rapid hardening Portland Cement conforming to IS 8041.
- d. Portland Slag Cement conforming to IS: 455.
- e. Portland Pozzolana Cement (fly ash based) conforming to IS: 1489(Part 1)
- f. Portland Pozzolana Cement (calcined clay based) conforming to IS: 1489(Part-2).
- g. Sulphate Resisting Portland Cement conforming to IS: 12330

Sulphate Resisting Portland Cement shall be used only for specific requirements depending on environmental and process exposure conditions to which the structures may be subjected to like high sulphate concentrations, processes involving sulphur handling etc.



6.4.1 FREE WATER CEMENT RATIO

Once a mix, including its free water cement ratio, has been determined and approved for use by the Engineer-in-Charge, that free water cement ratio shall be maintained. The Contractor shall determine the water content of the aggregates frequently as the work progresses, and the amount of mixing water shall be adjusted so as to maintain the approved free water cement ratio. Maximum free water-cement ratio shall be as per Table-2 for different exposure condition.

The minimum cement content as mentioned in Table-2 shall be adjusted for aggregates other than 20mm nominal maximum size. The minimum cement content in the concrete mix shall be increased by 40kg/m³ and decreased by 30 kg/m³ for 10mm and 40mm nominal maximum size aggregates respectively.

For maximum cement content refer clause no. 8.2.4.2 of IS: 456.

6.5 LIMITS TO DELETERIOUS CONSTITUENTS

Careful selection of the mix and the constituent materials shall be made to limit the presence of deleterious constituents in concrete. The total acid soluble chloride content calculated from the mix proportion and the measured chloride content of each of the constituents shall not exceed 0.6 kg/m³ at the time of placing of concrete. The total water soluble sulphate content of the concrete mix shall not exceed 4 percent by mass of the cement in the mix.

7.0 BATCHING

Refer clause no. 10.2 of IS: 456.

8.0 CONCRETE MIXING

- 8.1 The mixing of concrete shall be strictly carried out in an approved type of mechanical concrete mixer. The mixer shall be fitted with water measuring devices. The mixing shall be continued until there is a uniform distribution of the material and the mass is uniform in colour and consistency. If there is segregation after unloading from the mixer, the concrete shall be remixed.

Use of Ready Mixed Concrete supplied by Ready Mixed Concrete Plants or from on/off-site batching plants (IS: 4926) shall be preferred for structural concrete.

All records and charts for the batching and mixing operations shall be prepared and maintained by the contractor as per the instructions of Engineer-in-Charge.

8.2 MIXER

- 8.2.1 Mechanical Mixers shall comply with IS: 1791 and 12119 and shall be maintained in satisfactory operating condition. These shall be used only for producing lean/ plain concrete and/ or nominal mix concrete wherever permitted.

8.2.2 MIXING TIME



Mixing time shall be as indicated in the following table. Excessive mixing requiring additions of water shall not be permitted. Time shall start when all solid materials are poured in the revolving mixer drum, provided that all of the mixing water shall be introduced before one-fourth of the mixing time has elapsed. The Engineer-in-Charge may, however, direct a change in the mixing time, if he considers such a change necessary.

MINIMUM MIXING TIME FOR MIXERS

Capacity of mixer	Minimum mixing time
2 m ³ or less	2 minutes
Above 2 m ³	3 minutes or as recommended by the mixer manufacturer.

8.3 HAND MIXING

Hand mixing of concrete shall not be permitted. However, for non-critical applications namely foundations for crossovers, isolated operating platforms etc., using concrete of maximum grade M20 and located at far away isolated places, this may be permitted by the Engineer-in-charge as a special case. Ten percent (10%) extra cement shall be added to the design proportion. Mixing shall be carried out on a water tight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency. No extra payment shall be made to the Contractor for mixing by hand or for using extra cement due to hand mixing.

8.4 ADDITIVES

Additive in concrete shall be used only with the prior approval of the Engineer-in-Charge and shall comply with clause no. 5.5 of IS: 456. Any additive used for obtaining proper workability or leak-proofness of concrete or repair/rendering works of concrete due to non-conformance to the specifications, shall not be measured and paid for. All costs relating to such usage shall be borne by the Contractor.

9.0 TRANSPORTATION, PLACING AND COMPACTION**9.1 GENERAL**

The entire concrete placing programme including transportation arrangements, deployment of equipment, layout, proposed procedures and methods, shall be submitted to the Engineer-in-Charge 24 hours prior to concreting for approval. No concreting shall be placed until his approval has been received. Approval of the Engineer-in-Charge for pouring concrete shall be taken as 'conveyed', when the concrete pour card is signed by him.

9.1.1 CHUTING

The use of long troughs, chutes and pipes for conveying concrete from the mixer to the forms shall be permitted only on written authorization from the Engineer-in-Charge. In case an inferior quality of concrete is produced by the use of such conveyors, the



Engineer-in-Charge may order discontinuance of their use and the substitution of a satisfactory method of placing the concrete. Open troughs and chutes shall be equipped with baffles and be in short lengths to avoid segregation. Chutes shall be designed so that the concrete is, to some extent, remixed at the lower end by passing down through a funnel shaped pipe or drop chute. Alternatively, they shall discharge into a storage hopper from which the concrete shall be transported to the point of placing by wheel barrows or other means. Where drop chutes are used, a sufficient number of these must be provided, so that the concrete discharged from the chute is not required to flow laterally more than 1.0 metre. Where a drop chute is swung from the vertical, the bottom two sections must be maintained in a vertical position to avoid segregation. The addition of water at any point in the system of transportation, to facilitate the movement of concrete shall not be permitted. All chutes, troughs and pipes, shall be kept clean and free from coatings of hardened concrete by thoroughly flushing them with water after each run; water used for flushing shall be discharged clear of the structure. Concrete shall not be normally permitted to fall freely from a height of more than 1.5 metre nor to strike the forms at an angle. However, a deviation from this normal practice may be allowed provided proper precaution is taken, while placing concrete into the forms to avoid segregation, to the satisfaction of the Engineer-in-Charge.

9.1.2 VIBRATORS

- a. Concrete shall be compacted with mechanical vibrating equipment supplemented, if necessary to obtain consolidation, by hand spreading, rodding and tamping. The vibrators shall be of immersion type with operational frequency ranging between 8,000 to 12,000 vibrations per minute. All vibrators shall comply with IS: 2505. Screed board concrete vibrators or concreting vibrating tables or form vibrators conforming to IS: 2506, 2514 and 4656, respectively, shall be used where specifically required and directed by Engineer-in-Charge.
- b. Immersion type vibrators shall be inserted in a vertical position at intervals of about 600mm, depending upon the mix, the equipment used, and experience on work. The vibrators shall be withdrawn slowly. The spacing shall provide some overlapping of the area vibrated at each insertion. In no case shall vibrators be used to transport concrete inside the forms. Over vibration or under vibration shall not be permitted as both are harmful. Hand tamping in some cases may be allowed subject to the approval of the Engineer-in-Charge.
- c. In placing concrete in layers which are advancing horizontally as the work progresses, great care shall be exercised to ensure adequate vibration, bonding and moulding of the concrete between the succeeding batches.
- d. The vibrator shall penetrate the layer being placed and also penetrate the layer below while the under layer is still plastic to ensure good bond and homogeneity between the two layers and prevent the formation of cold joints.
- e. Care shall be taken to prevent contact of vibrators against all embedded reinforcing steel or inserts. Vibrators shall not be allowed to come in contact with forms.



- f. The use of form vibrators shall not be permitted for compaction of in-situ concrete without specific authorization of the Engineer-in-Charge.
- g. The use of surface vibrators of screed board type shall not be permitted for consolidation of concrete under ordinary conditions. However, for thin slabs (of thickness less than 200mm) surface vibration by such vibrators may be permitted, upon approval of the Engineer-in-Charge.
- h. Whenever vibration has to be applied externally, the design of formwork and the disposition of vibrators shall be carefully planned to ensure efficient compaction and to avoid surface blemishes.

9.2 TRANSPORTATION

- 9.2.1 All concrete shall be conveyed from the mixer to the place of final deposit such as formwork as rapidly as possible using suitable buckets, dumpers, pumps, transit mixers containers or conveyors which shall be mortar leak tight. Care shall be taken to prevent the segregation or loss of the ingredients and maintaining the required workability. For structural concrete produced from Ready Mixed Concrete Plants as per clause no. 8.1, concrete shall be transported from the plants to the sites only by transit mixers.
- 9.2.2 During hot or cold weather, concrete shall be transported in deep containers. Other suitable methods to reduce the loss of water by evaporation in hot weather and heat loss in cold weather may also be adopted. All equipment used for transporting and placing of concrete shall be maintained in clean condition. All buckets, hoppers, chutes, dumpers and other equipment shall be thoroughly cleaned after each use.

9.3 PLACING AND COMPACTION

- 9.3.1 Before placing concrete, all soil surfaces upon which or against which concrete is to be placed shall be well compacted and free from standing water, mud or debris. Soft or yielding soil shall be removed and replaced, with lean concrete or with selected soils/sand and compacted to the density as directed by Engineer-in-Charge. The surface of absorptive soil (against which concrete is to be placed) shall be moistened thoroughly so that moisture is not drawn from the freshly placed concrete. Similarly, for concrete to be placed on formworks, all chippings, shavings and sawdust etc. shall be removed from the interior of the forms before the concrete is placed.
- 9.3.2 Concrete shall not be placed until the formwork, the placement of reinforcing steel, embedded parts; pockets etc. have been inspected and approved by the Engineer-in-Charge. Any accumulated water on the surface of the bedding layer shall be removed by suitable means before start of placement. No concrete shall be placed on a water covered surface.
- 9.3.3 Concrete shall be discharged by vertical drop only and the drop height shall not normally exceed 1.5 metre throughout all stages of delivery until the concrete comes to rest in forms. For continuous concreting operation windows of suitable size shall be kept in the formwork or chutes shall be used to avoid segregation of concrete.



- 9.3.4 Concrete shall be deposited as near as practicable in its final position to avoid rehandling. Concrete shall be placed in successive horizontal layers. The bucket loads, or other units of deposit, shall be placed progressively along the face of the layer with such over-lap as will facilitate spreading the layer of uniform depth and texture with a minimum of hand shoveling. Any tendency to segregation shall be corrected by shoveling coarse aggregates into mortar rather than mortar on the coarse aggregates. Such a tendency for segregation shall be corrected by redesign of mix, change in process or other means, as directed by the Engineer-in-Charge.
- 9.3.5 All struts, stays and braces (serving temporarily to hold the forms in correct shape and alignment pending the placing of concrete at their locations) shall be removed when the concrete placing has reached an elevation rendering their service unnecessary. These shall not be buried in the concrete. Concrete shall be thoroughly compacted with vibrators and fully worked around the reinforcement, embedded fixtures and into corners of formwork before setting commences and shall not be subsequently disturbed. Methods of placing shall be such as to preclude segregation and avoid displacement of reinforcement or formwork. The formation of stone-pockets or mortar bondage in corners and against face forms shall not be permitted. Should these occur, they shall be dug out, reformed and refilled to sufficient depth and shape for thorough bonding as directed by the Engineer-in-Charge. Care shall be taken to avoid displacement of reinforcement and embedded inserts or movement of formwork.
- 9.3.6 Unless otherwise approved, concrete shall be placed in single operation to the full thickness of foundation rafts, slabs, beams and similar members. Concrete shall be placed continuously until completion of the part of the work between approved construction joints or as directed by the Engineer-in-Charge.
- 9.3.7 The method of placing and compaction employed in any particular section of the work shall be to the entire satisfaction of the Engineer-in-Charge.
- 9.3.8 During hot weather (atmospheric temperature above 40 degree Celsius) or cold weather (atmospheric temperature less than 5 degree Celsius, the concreting shall be done as per the procedure set out in IS: 7861).
- 9.3.9 Concrete that has set standing and becomes stiffened shall not be used in the work.
- 9.4 ITEMS EMBEDDED IN CONCRETE
- 9.4.1 Concreting shall not be started unless the electrical conduits, pipes, fixtures etc., wherever required, are laid by the concerned agency. The Contractor shall afford all the facilities and maintain co-ordination of work with other agencies engaged in electrical and such other works as directed by the Engineer-in-Charge.
- 9.4.2 Before concreting, the Contractor shall provide, fabricate and lay in proper position all metal inserts, anchor bolts, pipes etc. (which are required to be embedded in concrete members) as per relevant drawings and directions of Engineer-in-Charge.
- 9.4.3 All embedment, inserts etc. shall be fully held and secured in their respective positions by the concerned agencies to the entire satisfaction of Engineer-in-Charge so as to



avoid any dislocation or displacement during the concreting operations. The Contractor shall take all possible care during concreting to maintain these embedment/inserts in their exact locations

10.0 CONSTRUCTION JOINTS

- 10.1.1 Construction joints shall be provided in position as shown or described on the drawings or as directed by the Engineer-in-Charge. Such joints shall be kept to the minimum. These shall be straight and at right angles to the direction of main reinforcement and shall be placed at accessible locations to permit cleaning out of laitance, cement slurry and unsound concrete. Construction joints shall comply with IS: 11817
- 10.1.2 In a column, the joint shall be formed about 100mm to 150mm below the lowest soffit of the beams framing into it. Concrete in a beam and slab shall be placed throughout without a joint but if the provision of a joint is unavoidable, the joint shall be vertical and located within $\frac{1}{3}$ to $\frac{1}{4}$ of the span, unless otherwise shown on the drawings.
- 10.1.3 When stopping the concrete on a vertical plane in slabs and beams, an approved stop board shall be placed with necessary slots for reinforcement bars. The construction joints shall be keyed by providing a triangular or trapezoidal fillet nailed on the stop board. Inclined joints shall not be permitted. Any concrete flowing through the joints of stop board shall be removed soon after the initial set. When concrete is stopped on a horizontal plane, the surface shall be roughened and cleaned after the initial set and a triangular or trapezoidal groove shall be provided for keying with the new concrete later.
- 10.1.4 When the work has to be resumed on a surface which has hardened, such surface shall be cleared of any foreign materials and roughened to expose the tips of the coarse aggregate. This may be done by manual chipping of concrete, with a high pressure water jet or by any other appropriate means as per Engineer-in-Charge's directions. It shall then be swept clean and thoroughly washed and wetted before any new concrete is poured. Any set mortar or concrete sticking to the exposed reinforcing rods in and around such joints shall be thoroughly removed. The reinforcements shall be wire brushed and washed just before pouring any cement slurry or mortar. For vertical joints neat cement slurry shall be applied on the surface before it is dry. For horizontal joints the surface shall be covered with a layer of mortar about 10 to 15mm thick composed of cement and sand in the same ratio as the cement and sand in concrete mix. This layer of cement slurry or mortar shall be freshly mixed and applied immediately before placing new concrete.
- 10.1.5 Where the concrete has not fully hardened, all laitance shall be removed by scrubbing the wet surface with wire or bristle brushes, care being taken to avoid dislodgement of particles of aggregate. The surface shall be thoroughly wetted and all free water removed. The surface shall then be coated with neat cement slurry. On this surface layer of concrete not exceeding 150mm in thickness shall first be placed and shall be well rammed against old work, particular attention being paid to corners and close spots; work thereafter shall proceed in normal way.

**11.0 SEPARATION JOINT**

- 11.1 Separation joint shall be obtained by using an approved alkathene sheet stuck on the surface against which concrete shall be placed. Adequate care shall be taken to cause no damage to the sheet.

12.0 EXPANSION JOINTS/ISOLATION JOINT

- 12.1 Expansion/ isolation joints in structures shall be formed in the positions and to the shapes shown in the relevant drawings. Joints shall be filled with joint filling material as stipulated in the drawings/schedule of rates. Isolation joints shall be provided around all equipment foundations, columns, pedestals, trenches etc. on grade.

13.0 WATER STOPS

PVC water stops as per Specification No. SS-CV-021 for materials shall be accurately cut, fitted and integrally joined as per manufacturer's specifications to provide a continuous, watertight diaphragm at all points.

The water stops shall be located and embedded at expansion/contraction/ construction joints as indicated in the drawings or directed by the Engineer-in-Charge.

Adequate provision shall be made for the support and protection of water stops during the progress of the work. Damaged water stops shall be replaced and/or repaired as directed.

14.0 PROTECTION OF FRESHLY LAID CONCRETE

- 14.1 Newly placed concrete shall be protected, by approved means, from rain, sun and wind. Concrete placed below the ground level shall be protected from falling earth during and after placing. Surface shall be kept free from contact with such ground or with water draining from such ground during placing of concrete for a period of at least 3 days, unless otherwise directed by the Engineer-in-Charge. The ground water around newly poured concrete shall be kept to an approved level by pumping or other approved means of drainage and adequate steps shall be taken to prevent floatation and flooding. Steps shall be taken to protect immature concrete from damage by debris, loading, vibration, abrasion, mixing with deleterious materials that may, in the opinion of the Engineer-in-Charge, impair the strength and/or durability of the concrete.



15.0 CURING

- 15.1 Concrete shall be cured by keeping it continuously moist wet for the specified period of time to ensure complete hydration of cement and its hardening. Curing shall be started after 8 hours of placement of concrete in normal weather, and in hot weather after 4 hours. The water used for curing shall be of the same quality as that used for making of concrete.

Curing shall be assured by use of an ample water supply under pressure in pipes, with all necessary appliances such as hose, sprinklers etc. A layer of sacking, canvas, hessian, or other approved material, which will hold moisture for long periods and prevent loss of moisture from the concrete, shall be used as covering. Type of covering which would stain, disfigure or damage the concrete, during and after the curing period, shall not be used. Only approved covering shall be used for curing.

Exposed surfaces of concrete shall be maintained continuously in a damp or wet condition for at least the first 7 days after placing of concrete.

The Contractor shall have all equipment and materials required for curing on hand and ready to use before concrete is placed.

For curing the concrete in pavements, floors, flat roofs or other level surfaces, the ponding method of curing shall be used. For the first 24 hours after concreting the concrete shall be cured by use of wet sacking, canvas, hessian etc. The minimum water depth of 25mm for ponding shall be maintained. The method of containing the ponded water shall be approved by the Engineer-in-Charge. The ponded areas shall be kept continuously filled with water, and leaks, if any, shall be promptly repaired. Areas cured by ponding method shall be cleared of all debris and foreign materials after curing period is over.

Alternatively, membrane curing may be used in lieu of moist curing with the permission of the Engineer-in-Charge. Such compounds shall be applied to all exposed surfaces of the concrete by spraying or brushing as soon as possible after the concrete has set. Minimum film thickness of such curing compounds shall be as per the recommendation of the manufacturer so as to obtain an efficiency of 90% as specified by BS-8110. This film of curing compound shall be fully removed from the concrete surface after the curing period specified earlier. Engineer-in-Charge may not allow curing by curing compounds for those surfaces where use of curing compound may be detrimental to application of future finishes over the concrete. Impermeable membranes such as polyethylene sheeting closely covering the concrete surface may also be used.

- 15.2 For concretes containing Portland Pozzolana cement or Portland slag cement, the curing period as given in clause no. 15.1 shall be doubled. Curing by ponding shall, however, commence after the first 24 hours of concreting.

16.0 FIELD TESTS

16.1 Grading Test



Grading test on fine and coarse aggregates shall be carried out as per IS: 2386 at intervals specified by the Engineer-in-Charge.

The mandatory tests and their frequencies shall be done on sand and stone aggregates as given in Table-3

**TABLE - 3
MANDATORY TESTS ON SAND & STONE AGGREGATES**

S.No	MATERIAL	TEST	FIELD/LAB TEST	MIN. QTY. OF MATERIAL/WORK FOR CARRYING OUT THE TEST	FREQUENCY OF TESTING
1.	Sand	(a) Bulking of sand	Field	20 m ³	Every 20 m ³ or part thereof or more frequently as decided by the Engineer-in-Charge
		(b) Silt content	Field	20 m ³	
		(c) Particle size distribution	Field or Lab as decided by the Engineer-in-Charge	40 m ³	1) Every 40 m ³ of fine aggregate/sand required in RCC works only 2) Every 80 m ³ of fine aggregate/sand required for other items
2.	Stone aggregate	a) Percentage of soft or deleterious materials	General visual inspection, laboratory test where required by the Engineer-in-Charge or as specified	As required by Engineer-in-Charge	For all quantities
		b) Particle size	Field or lab. as required by Engineer-in-Charge	45 m ³	For every 45 m ³ or part thereof as decided by Engineer-in-Charge
		c) Ten percent value	Laboratory	45 m ³	Initial test and subsequent test as & when required by Engineer-in-Charge

**16.2 VEE-BEE TEST/SLUMP TEST OF CONCRETE**

16.2.1 For structural quality concrete (excluding pavements, flooring etc.) at least one Slump Test shall be made for every compressive strength test carried out. More frequent tests shall be made if there is a distinct change in working conditions or if required by the Engineer-in-Charge.

16.2.2 For structural quality concrete for pavements & floorings, measurement of workability shall be by determination of compacting factor. Value of compacting factor of 0.75 to 0.8 shall generally be acceptable.

16.3 STRENGTH TEST OF CONCRETE

16.3.1 Samples from fresh concrete shall be taken as per IS: 1199 and cubes shall be made, cured and tested at 28 days in accordance with IS: 516.

16.3.2 In order to get a relatively quicker idea of the quality of concrete, optional tests on beams for modulus of rupture at 72 ± 2 hours or at 7 days, or compressive strength tests at 7 days may be carried out in addition to 28 days compressive strength tests. For this purpose, the values shall be arrived at based on actual testing. In all cases, the 28 days compressive strength specified in Table-1 shall alone be the criterion for acceptance or rejection of the concrete.

16.3.3 PROCEDURE

A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested, that is the sampling should be spread over the entire period of concreting and cover all mixing units.

16.3.4 FREQUENCY OF SAMPLING

The minimum frequency of sampling of concrete for each grade shall be in accordance with Table-4.

**TABLE - 4
FREQUENCY OF CONCRETE SAMPLING**

Quantity of concrete in the work in m^3	Number of samples
1-5	1
6-15	2
16-30	3
31-50	4
51 & above	4 plus one additional sample for each additional $50m^3$ or part thereof.



At least one sample shall be taken from each shift. Where concrete is produced at continuous production units such as ready mixed concrete plants, frequency of sampling may be agreed upon mutually by Engineer-in-Charge.

16.3.5 TEST SPECIMEN

Three test specimens shall be made from each sample for testing at 28 days. Additional cubes may be required for various purposes such as to determine the strength of concrete at 7 days or at the time of striking the formwork or to check the testing error. Additional samples may also be required for testing samples cured by accelerated methods as described in IS: 9013. The specimen shall be tested as described in IS: 516.

16.3.6 IDENTIFICATION MARK ON CONCRETE TEST CUBES:

The following numbering system shall be adopted on each 150mm cube:

First line: ZZ (Alpha code assigned by the Engineer -in-Charge to the

Contractor for a particular contract starting with AA and progressing to AB, AC and so on).

Second line: XXXX (Unique integer in ascending order starting from 1).

Third line: DD-MM-YY (Date of casting of cube).

16.3.7 TEST RESULTS OF SAMPLE

The test results of the sample shall be the average of the strength of three specimens. The individual variation should not be more than ± 15 percent of the average. If the individual variation is more than ± 15 percent, the test results of the sample shall be considered invalid.

16.3.8 STANDARD DEVIATION

- a. Standard deviation based on test results of samples:
 - i. The total number of test samples required to constitute an acceptable record for calculation of standard deviation shall be not less than 30. Attempts shall be made to obtain the 30 samples, as early as possible, when a mix is used for the first time.
 - ii. For design of mix in the first instance, the value of standard deviation given in Table-8 of IS: 456 may be assumed.
 - iii. As soon as sufficient results of samples are available, actual calculated standard deviation shall be used and the mix design revised/ updated.

16.3.9 ACCEPTANCE CRITERIA

- a. Compressive Strength



The concrete shall be deemed to comply with the strength requirement when both the conditions as given in Table-11 of IS: 456 for that particular grade of concrete are simultaneously met. For working out standard deviation compressive test result of date wise serially logged 30 sample test result will be used.

b. Flexural Strength

The concrete shall be deemed to comply with flexural strength requirements when both the following conditions are simultaneously met:

- i. The mean strength determined from any group of four consecutive test results exceeds the specified characteristic strength by at least 0.3 N/mm².
- ii. For non overlapping consecutive compressive test result any one alternate set of four samples shall be used for verification of compliance to clause no 16.1.a of IS 456.
- iii. The strength determined from any test result is not less than the specified characteristic strength less 0.3 N/mm²

c. Quantity of Concrete Represented by Strength Test Results

The quantity of concrete represented by group of four consecutive test results shall include the batches from which first and last samples were taken together with all intervening batches. Acceptance of concrete shall be applicable for serially logged 30 samples. In case serially logged samples are less than 30 then standard deviation of adjoining previous sample sets standard deviation will be used for establishing acceptance criteria as per clause no 16.1.a of IS 456.

For the individual test result requirements given in Table 11 of IS: 456 or in item (ii) of 16.3.9 (b), only the particular batch from which the sample was taken shall be at risk.

Where the mean rate of sampling is not specified, the maximum quantity of concrete that four consecutive test results represent shall be limited to 60m³.

- d. If the concrete is deemed not to comply pursuant to 16.3.9 (c), the structural adequacy of the parts affected shall be investigated and any consequential action as needed shall be taken (Refer clause no. 17.0 & 18.0).
- e. Concrete of each grade shall be assessed separately.
- f. Concrete is liable to be rejected if it is porous or honey-combed, 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 and tests to the fullest satisfaction of the Engineer-in-Charge.

17.0 INSPECTION AND TESTING OF STRUCTURES

17.1 INSPECTION



To ensure that the construction complies with the design, an inspection procedure shall be set up by the contractor and duly approved by Engineer-in Charge covering materials used, receipt of materials, their test results, records, workmanship and construction etc.

- 17.2 Immediately after stripping the formwork, all concrete shall be carefully inspected and any defective work or small defects either removed or made good before concrete has thoroughly hardened.

17.3 TESTING

In case of doubt regarding the grade or soundness of concrete used, either due to poor workmanship or based on results of cube strength, compressive strength tests of concrete on the basis of clause no. 17.4 and/or load test as per clause no. 17.6 of IS: 456 shall be carried out.

The Engineer-in-Charge shall be the final authority for interpreting the results of all tests and shall decide upon the acceptance or otherwise. The decision of the Engineer-in-Charge shall be final and binding on the contractor. In case the results of the tests are unsatisfactory, the Engineer-in-Charge may instruct the contractor to demolish and reconstruct the structure or part thereof without any extra cost to the Owner.

17.4 MEMBERS OTHER THAN FLEXURAL MEMBERS

Members other than flexural members like columns etc. shall be referred to the designer to investigate the structural adequacy. The decision of the designer shall be final and binding on the contractor.

17.5 NON - DESTRUCTIVE TESTS

Non-destructive tests using Ultrasonic Pulse Velocity and Rebound Hammer methods shall be resorted to for checking the soundness of concrete placed and shall be as per the directions of Engineer-in-Charge. The testing shall be based on IS: 13311, Part-1. However, the Rebound Hammer test (IS: 13311, Part-2) shall only be used in combination with other tests (Destructive or Non-Destructive) for checking the concrete quality.

18.0 FINISHING OF CONCRETE

- 18.1 On striking the formwork, all surface defects such as bulges, ridges and honey-combing etc. observed shall be brought to the notice of the Engineer-in-Charge. The Engineer-in-Charge may, at his discretion allow rectification by necessary chipping and packing or grouting with concrete or cement mortar. However, if honey-combing or sagging is of such extent as being undesirable, the Engineer-in-Charge may reject the work totally and his decision shall be binding. No extra payment shall be made for rectifying these defects, demolishing and reconstructing the structure. However, quantity of cement actually used for this purpose may be considered for reconciliation of materials. All burrs and uneven faces shall be rubbed smooth with the help of carborundum stone.



The surface of non-shuttered faces shall be smoothened with a wooden float to give a finish similar to that of the rubbed down shuttered faces. Concealed concrete faces shall be left as from the formwork except that honey-combed surface shall be made good as specified above. The top faces of slabs not intended to be covered shall be levelled and floated to a smooth finish to the rises or falls shown on the drawings or as directed. The floating shall not be executed to the extent of bringing excess fine materials to the surface. The top faces of slabs intended to be covered with screed, granolithic or similar finishes, shall be left with a rough finish.

18.2 REPAIR AND REPLACEMENT OF UNSATISFACTORY CONCRETE

- 18.2.1 Repair shall be made as soon as possible after the forms are removed and before the concrete becomes too hard with prior permission from the Engineer-in-Charge, in writing. Stone pockets, segregation patches and damaged areas shall be chipped out and the edges undercut slightly to form a key. All loose material shall be washed out before patching. No excess water shall be left in the cavity, but the concrete shall be damp. A good bond between the patch and parent concrete shall be obtained by sprinkling dry cement on the wet surface or by throwing mortar with force on to the wetted concrete, or by brush in a coat of thick cement grout of about 1:1 (1 cement: 1 sand) just before applying the patching material. Before this has dried, the remainder of the patch shall be filled with mortar or concrete, depending on the extent of the repair.
- 18.2.2 Cement concrete/mortar used in repair of exposed surfaces shall be made with cement from the same source as that used in concrete and blended with sufficient amount of white Portland cement to produce the same colour as in the adjoining concrete. The proportions of ingredients shall be same as those used in parent concrete. The mortar shall be as dry as possible and well compacted into the cavity. All filling shall be tightly bonded to the concrete and shall be sound, free from shrinkage cracks after the filling has been cured and dried.
- 18.2.3 For larger repairs to hardened concrete, necessary formwork bearing tightly at the edges of the cavity shall be provided. Concrete shall be chipped out to a depth of at least 100mm and preferably 150mm. Mortar shall be scrubbed into all surfaces with a wire brush before placing the concrete. Damaged reinforcement shall be adequately spliced with new steel so as to maintain the original strength. Additional reinforcement, if required in the patch, shall be provided as per the instructions of Engineer-in-Charge.
- 18.2.4 In case in the opinion of the Engineer-in-Charge defects in the concrete is excessive or beyond repair, the contractor shall either redo the structure or take other remedial measures as instructed by the Engineer-in-Charge. The decision of the Engineer-in-Charge shall be final and binding to all in this respect.
- 18.2.5 Approved epoxy formulation for bonding fresh concrete used for repairs with already hardened concrete shall be used by the Contractor if asked by the Engineer-in-Charge. Epoxy shall be applied in strict accordance with instructions of the manufacturer.
- 18.2.6 All repair works due to non-conformance or non-adherence to specification, if allowed by the Engineer-in-Charge, shall be carried out free of cost to the owner.



18.3 CURING OF PATCHED WORK

Immediately after patching is completed, the patched area shall be covered with an approved non-staining water saturated material which shall be kept wet and protected against sun and wind for a period of 12 hours. Thereafter, the patched area shall be kept continuously wet by a fine spray or sprinkling for not less than 10 days.

19.0 CEMENT WASH

If not otherwise provided with protective coating due to architectural and/ or geo-technical requirements, all concrete elements (whether cast-in-situ or precast) exposed to atmosphere shall be provided with three coats of cement based waterproof paint as per IS: 5410. Prior to application of the paint, the surface shall be prepared to remove all foreign particles, loose materials, extra deposited concrete lumps, etc. using appropriate mechanical/ manual means.

20.0 FORM WORK

20.1 General

20.1.1 Forms for concrete shall be of plywood conforming to IS: 6461 or steel or as directed by the Engineer-in-Charge and shall give smooth and even surface after removal thereof.

20.1.2 If it is desired by the Engineer-in-Charge, the Contractor shall prepare, before commencement of actual work, design and drawings for formwork and get them approved by the Engineer-in-Charge. For details regarding design, detailing etc., reference may be made to IS: 14687.

20.1.3 Form work and its supports shall maintain their correct position and be to correct shape and profile so that the final concrete structure is within the limits of dimensional tolerances specified below, unless required otherwise, for functional/aesthetic reasons. The decision of the Engineer-in-Charge shall be final and binding in this regard.

- a. Deviation from specified dimensions of cross section of columns and beams. - 6mm to +12mm
- b. Deviation from dimensions of footings (see Note below)
 - i. Dimensions in plan -12mm to +50mm
 - ii. Eccentricity 0.02 times the width of the footing in the
 - 1. direction of deviation but not
 - 2. More than 50 mm.
 - iii. Thickness ± 0.05 times the specified thickness.

Note: These tolerances apply to Cast-in-situ concrete dimensions only, not to positioning of vertical reinforcing steel or dowels.



- c. Deviation in length (major dimension of single unit)
- | | |
|---|-------|
| up to 3m | ±6mm |
| 3m to 4.5m | ±9mm |
| 4.5m to 6m | ±12mm |
| Additional deviation for every subsequent 6m. | ±6mm |
- d. Deviation in straightness or bow (deviation from specified line) for a single or continuous member) e.g. beam, column or slab edge.
- | | |
|-------------------------------------|-------|
| Up to 3m | 6mm |
| 3m to 6m | 9mm |
| 6m to 12m | -12mm |
| Additional for every subsequent 6m. | -6mm |
- e. Deviation in squareness shall be measured taking the longer of two adjacent sides as the base line.
- The shorter side shall not vary in its distance from a perpendicular so that the difference between the greatest and shortest dimensions exceeds 6mm. For this purpose, any error due to lack of straightness shall be ignored. Squareness shall be checked with respect to the straight lines that are most nearly parallel with the features being checked. When the nominal angle is other than 90 degree, the included angle between check lines shall be varied accordingly.
- f. Deviation in twist shall be within a limit such that any corner shall not be more than the limit given below from the plane containing other three corners:
- | | |
|-----------------------------|------------------|
| Up to 600mm wide and up to | 6m in length-6mm |
| Over 600mm wide and for any | length -12mm |
- g. Maximum deviation in flatness from a 1.5m straight edge placed in any position on a nominally plain surface shall not exceed 6mm.
- h. The tolerance limits for concrete columns/pedestals shall be same as given in part A of ANNEXURE-A of Specification No. VCS-SS-CS-6024.

20.2 FORM REQUIREMENT:

- 20.2.1 The formwork shall be true, rigid and adequately braced both horizontally as well as diagonally. The forms shall have smooth and even surface and be sufficiently strong to carry, without deformation, the dead weight of the green concrete, working load, wind load and also the side pressure exerted by the green concrete. As far as practical, clamps shall be used to hold the forms together. Where use of nails is unavoidable



minimum number of nails shall be used. Projected part of nail shall not be bent or twisted for easy withdrawal.

- 20.2.2 Where through tie rods are required to be put to hold the formwork and maintain accurate dimension, they shall always be inserted through a precast concrete block (of same mix proportion as is to be used for concreting) with a through hole of bigger diameter. The Precast block shall tightly fit against in inner faces of formwork. The holes left after the withdrawal of tie rods shall be fully grouted with cement-sand mortar of same proportion as that used for concrete. However, use of such precast block shall in no case impair the desired appearance or durability of the structure. No such tie rods shall be used in any liquid retaining or basement structure.
- 20.2.3 Tie wires shall be permitted only upon approval of the Engineer-in-Charge and shall be cut off flush with the face of the concrete or counter sunk, filled and finished in the manner specified in clause 18.
- 20.2.4 Form joints shall not permit any leakage. The formwork shall be strong enough to withstand the effect of vibrations practically without any deflection, bulging, distortion or loosening of its components.
- 20.2.5 Forms for beams and slabs (span more than 6.0m) shall have camber of 1 in 500 so as to offset the deflection and assume correct shape and line after deposition of concrete. For cantilevers, the camber at free end shall be 1/100th of the projected length. Where architectural considerations and adjunctive work are critical, smaller form cambers shall be adopted as decided by the Engineer-in-Charge.
- 20.2.6 All vertical wall forms may be designed and constructed for the following minimum pressure. The pressures listed in Table-5 are intended as guide only and the Contractor shall ensure that the formwork is adequately strong and sturdy.

**TABLE-5
MINIMUM DESIGN PRESSURE FOR WALL FORMWORK**

Rate of pour in meter/hour	Pressure in KN/m ²	
	at 10° (in Celsius)	at 24° (in Celsius)
0.6	36.0	29.0
0.9	40.0	32.0
1.2	44.0	35.0
1.5	46.0	37.0

All horizontal forms shall be designed and constructed to withstand the dead load of the green concrete, reinforcement, equipment, material, embedment and a minimum live load of 2.0 kN/m².

20.3 INSPECTION OF FORMS

Temporary openings shall be provided at the base of column and wall forms and other places necessary to facilitate cleaning and inspection. Before concrete is placed, all forms shall be carefully inspected to ensure that they are properly placed, sufficiently rigid and tight, thoroughly cleaned, properly treated and free from foreign material. The complete



form work shall be inspected and approved by the Engineer-in-Charge before the reinforcement bars are placed in position. When forms appear to be unsatisfactory in any way, either before or during the placing of concrete, the work shall be stopped until the defects have been corrected as per the instructions of the Engineer-in-Charge.

20.4 CLEANING AND TREATMENT OF FORMWORK

The surfaces of forms that would come in contact with concrete shall be well treated with approved non- staining form release agents such as soft soap, oil, emulsions etc. Release agents shall be applied so as to provide a thin uniform coating to the forms without coating the reinforcement.

20.5 CHAMFERS AND FILLETS

All comers and angles shall be formed with 45 degree mouldings to form chamfers or fillets on the finished concrete. The standard dimensions of chamfers and fillets, unless otherwise detailed or specified shall be 25x25mm. For heavier work chamfers or fillets shall be 50x50mm. Care shall be exercised to ensure accurate mouldings. The diagonal face of the moulding shall be planed or surfaced to the same texture as the forms to which it is attached.

20.6 REUSE OF FORMS

Before reuse, all forms shall be thoroughly scrapped, cleaned, examined and when necessary, repaired and retreated, before resetting. Formwork shall not be reused, if declared unfit or un-serviceable by the Engineer-in-Charge.

20.7 REMOVAL OF FORMS/STRIPPING TIME

In the determination of time for removal of forms, consideration shall be given to the location and character of the structures, the weather and other conditions including the setting and curing of the concrete and material used in the mix.

Forms and their supports shall not be removed without the approval of the Engineer-in-Charge. Forms shall not be released until the concrete has achieved strength of at least twice the stress to which the concrete may be subjected at the time of removal. The formwork shall be removed without shock and methods of form removal likely to cause over stressing or damage to the concrete, shall not be adopted. Supports shall be removed in such a manner as to permit the concrete to uniformly and gradually take the stresses due to its own weight.

In normal circumstances when average air temperature exceeds 15 degree Celsius during the period under consideration after pouring of concrete and where ordinary Portland cement is used, forms may generally be removed after expiry of following periods.

- | | | |
|----|---|---|
| a. | Walls, columns and vertical faces of all structural members | 16 to 24 hours as may be decided by the Engineer-in-Charge. |
|----|---|---|



- b. Slabs (props left under) 3 days.
- c. Beam Soffits (props left under) 7 days.
- d. Removal of props under slabs:
 - Spanning up to 4.5m. 7 days.
 - Spanning over 4.5m. 4 days.
- e. Removal of props under beams and arches:
 - Spanning up to 6m 14 days.
 - Spanning over 6m 21 days
- f. Cantilever Construction Formwork shall remain till structures for counter acting or bearing down have been erected and have attained sufficient strength (minimum 14 days).

Notes:

1. For other cements, the stripping time recommended for ordinary Portland cement shall be suitably modified as per the instructions of the Engineer- in-Charge.
2. The number of props left under, their sizes, supporting arrangement, and disposition shall be such as to be able to safely carry the full dead load of the slab, beam or arch as the case may be together with any live load likely to occur during curing or further construction.
3. Where the shape of the element is such that the formwork has re-entrant angles, the form work shall be removed as soon as possible after the concrete has set, to avoid shrinkage cracking occurring due to the restraint imposed.
4. For rapid hardening cement, 3/7 of the above mentioned periods shall be considered subject to a minimum of 16 hours.

20.8 STAGING/SCAFFOLDING

20.8.1 Staging/Scaffolding shall be properly planned and designed by the Contractor. Use of only steel tubes is permitted for staging/scaffolding. The Contractor shall get it reviewed by Engineer-in-Charge before commencement of work. While designing and during erection of scaffolding/staging, the following measures shall be considered:

- a. Sufficient sills or under pinning's in addition to base plates shall be provided particularly where scaffolding are erected on soft grounds.
- b. Adjustable bases to compensate for uneven ground shall be used.
- c. Proper anchoring of the scaffolding/staging at reasonable intervals shall be provided in each direction with the main structure wherever available.



- d. Horizontal braces shall be provided to prevent the scaffolding/staging from rocking.
- e. Diagonal braces shall be provided continuously from bottom to top between two adjacent rows of uprights.
- f. The scaffolding/staging shall be checked at every stage for plumb line.
- g. Wherever the scaffolding/staging is found to be out of plumb line it shall be dismantled and re-erected afresh and effort shall not be made to bring it in line with a physical force.
- h. All nuts and bolts shall be properly tightened and care shall be taken that all clamps/couplings are firmly tightened to avoid slippage.
- i. Erection work of a scaffolding/staging under no circumstances shall be left totally to semi-skilled or skilled workmen and shall be carried out under the supervision of a technically qualified civil engineer of the Contractor.

20.8.2 For smaller works or works in remote areas, wooden ballies may be permitted for scaffolding/staging by the Engineer-in-Charge at his sole discretion. The contractor must ensure the safety and suitability of such works as described under clause 20.8.1 above

21.0 EXPOSED/ARCHITECTURAL CONCRETE WORK

21.1 FORM WORK

Other things remaining same as per clause no. 20.0, formwork shall be of high quality. Care shall be taken to arrange the forms so that the joints between forms correspond with the pattern indicated in the drawings. The forms shall be butting with each other in straight lines, the corners of the boards being truly at right angles. The joints between the forms shall cross in the two directions at right angles. The size of forms shall be so selected as to exactly match with the pattern of forms impression on the concrete face indicated in the drawings. Maximum care shall be taken to make the form work watertight. Burnt oil shall not be used for treatment of forms. The Contractor shall be permitted reuse of forms brought new on the work for exposed concrete work as specified below.

Such reuses shall be permitted only if forms are properly cared for, stored, repaired and treated after each use.

- a. Plywood Forms 6 Reuses (max.)
- b. Steel Forms 10 Reuses (max.)

The Engineer-in-Charge may, at his absolute discretion, order removal of any forms considered unfit for use in the work irrespective of the number of uses specified above.



21.2 FINISHING

Repairing to exposed concrete work shall be avoided. Rendering and plastering shall not be done. Minor repairing, if unavoidable shall be done as specified in clause 18.0 with the written permission of the Engineer-in-Charge.

22.0 REINFORCEMENT

22.1 The Contractor shall develop the bar bending schedule for all RCC structures/ structural parts at no extra cost to the Owner and shall get it reviewed by the Engineer-in-charge. Reinforcement shall be cut and bent to shape as per dimensions shown in the bar bending schedule/drawings.

If protective fusion bonded epoxy coating is required to be applied on reinforcement bars, the same shall be done as per IS: 13620. All repairs to applied protective coating required due to mishandling and/ or bending of reinforcement bars shall also be done as per relevant clauses of IS: 13620.

22.2 STRAIGHTENING, CUTTING AND BENDING

Procedure for cutting and bending shall be as given in IS: 2502. In case bars are supplied in coils, they shall be smoothly straightened without any kinks.

Cold twisted deformed bars shall be bent cold. Bars larger than 25mm in size (except cold twisted deformed bars) may be bent hot at cherry red heat to a temperature not exceeding 850° Celsius as per the instructions of the Engineer-in-Charge. The bars shall be allowed to cool gradually without quenching.

Bars shall be bent in a slow and regular movement to avoid fractures. Bars which develops cracks or splits after bending shall be rejected. A second bending of reinforcement bars shall be avoided but when reinforcement bars are bent aside at construction joints and afterwards bent back into their original position, care should be taken to ensure that at no time is radius of the bend less than 4 times bar diameter for plain mild steel or 6 times bar diameter for high strength deformed bars. Care shall also be taken when bending back bars to ensure that concrete around the bars is not damaged. All bars shall be properly tagged for easy identification.

22.3 PLACING AND FIXING

All reinforcement shall be cleaned to ensure freedom from loose mill scale, loose rust, oil, form releasing agents, grease or any other harmful material before placing them in position. Reinforcement shall not be surrounded by concrete unless it is free from all such materials. Rough handling and dropping of reinforcement from a height shall be avoided.

All reinforcement shall be fixed in the correct position and shall be properly supported to ensure that displacement will not occur when the concrete is placed and compacted.

The uncoated reinforcement bars shall be tied at every intersection by two strands of 16 SWG black soft annealed binding wire. The Epoxy coated reinforcement bars shall be



tied with 2 strands of PVC coated GI 18 SWG wire at every intersection. Crossing bars shall not be tack welded for assembly of reinforcement. The reinforcement bars shall be kept in position by using the following methods:

- a. In case of beam and slab construction, precast cover blocks (having the same sand contents as the concrete which shall be placed) of size 40 x 40 mm and thickness equal to the specified covers shall be placed firmly in between the bars and forms so as to secure and maintain the specified covers over the reinforcement.

When reinforcement bars are placed in two or more layers in beams, the vertical distance between the horizontal bars shall be maintained by introducing spacer bars at 1 to 1.2m centre to centre.

- b. In case of thick rafts & pile caps having two or multilayer's of reinforcement, the vertical distance between the horizontal bars shall be maintained by introducing suitable chairs, spacers, etc.
- c. In case of columns and walls, the vertical bars shall be kept in position by means of timber templates with slots accurately cut in them. The templates shall be removed after the concreting has been done below it.
- d. Exposed portions of reinforcement bars shall not be subjected to impact or rough handling and workmen will not be permitted to climb on extending bars until the concrete has attained sufficient strength so that no movement of the bars in the concrete is possible.

22.4 SPECIAL REQUIREMENTS FOR HANDLING, STACKING, PLACING OF EPOXY COATED REINFORCING BARS.

Epoxy coated reinforcing bars shall be carefully handled and it shall be ensured that these do not rub on any hard surface or against another epoxy coated/uncoated reinforcing bar whether during conveying/transportation, stacking or placing.

During transportation and while stacking the epoxy coated reinforcing bars shall be placed on wooden planks not spaced farther than 600mm. When placed in stacks the epoxy coated reinforcing bars shall be neatly tied in bundles using PVC binding material.

The cut ends of bars shall be touched up with special touch up material of specifications as provided by the coating agency. After cutting of the bar the application of touch up material shall be completed within four hours.

While bending the bars the pins of work bench(s) shall be provided with a PVC or plastic sleeve. Each bending operation on epoxy coated reinforcing bar shall be completed in time not less than 90 seconds.

Epoxy coated reinforcing steel bar shall not be directly exposed to sun rays or rain, and shall be protected with opaque polyethylene sheets or similar means as approved by the Engineer in Charge.



While doing concreting the workmen or machinery shall not rest or move on the epoxy coated reinforcing bars. Wooden planks shall suitably be placed to create proper gang-way.

22.5 SPLICING/OVERLAPPING

Only bars of full length shall be used as shown in the drawings. But where this cannot be done, overlapping of bars shall be done as directed by the Engineer-in-Charge. Where practicable, the overlapping bars shall not touch each other, but these shall be kept apart by 25mm or 1.25 times the maximum size of the coarse aggregate whichever is greater. But where this is not possible, the overlapping bars shall be tied with two strands of 16 SWG black soft annealed binding wire for uncoated bars and with PVC coated GI 18 SWG wire for Epoxy coated bars. The overlaps shall be staggered for different bars and located at points along the span where neither shear nor bending moment is maximum.

22.6 WELDED JOINTS

Welding of reinforcing bars shall not be permitted without the written permission of the Engineer-in-Charge. If Fusion Bonded Epoxy coated bars are used, welding of reinforcing bars shall generally not be permitted. However, if permitted, the joint shall be coated with epoxy as per BS: 7295. Where welding of uncoated reinforcing bars is permitted, it shall be in accordance with the recommendations of IS: 2751 and IS: 9417. Welded joints shall be located at suitable staggered positions. Tests shall be made as directed by the Engineer-in-Charge to prove that the joints are of the full strength of the bars. Maximum one welded joint shall be allowed per bar.

22.7 MECHANICAL CONNECTIONS

The mechanical splices in reinforcement by means of couplers, clamps etc. shall be used (as per manufacturer's specifications) with the written approval of the Engineer-in-Charge. However, tests shall be made as directed by Engineer-in-Charge to prove that such connections are of the full strength of the bars on trial joints. Mechanical connections for Fusion Bonded Epoxy coated bars shall not be used.

22.8 TOLERANCES ON PLACING OF REINFORCEMENT

Unless otherwise directed by the Engineer-in-Charge, reinforcement shall be placed within the following tolerances:

- | | | |
|----|-------------------------------------|--------|
| a. | For effective depth 200mm or less | ± 10mm |
| b. | For effective depth more than 200mm | ± 15mm |

22.9 SUBSTITUTION



When indicated diameter of reinforcement bar is not available, the Contractor shall use other diameter of reinforcement bars on written approval of the Engineer-in-Charge.

22.10 TOLERANCE TO COVER

The actual concrete cover shall not deviate from the required nominal cover by - 0 mm to +10 mm measured over the steel reinforcement including links.

23.0 PRECAST CONCRETE

- 23.1 Specifications contained in clauses above regarding concrete, formwork and reinforcement shall apply in addition to the clauses given as under. The Contractor shall get the precasting bed approved by the Engineer-in-Charge.
- 23.2 Necessary lifting hooks of suitable (but not less than 12mm dia) diameter M.S. rounds shall be provided for handling, as indicated in drawings or as directed by the Engineer-in-Charge.
- 23.3 Unless otherwise specified, the exposed surfaces of precast members shall be integrally finished smooth. For precast slabs or planks, the top surface shall be finished with 1:3 (1 cement: 3 sand) cement mortar. Surface used as walkways shall be given a non-skid finish.
- 23.4 The precast concrete units shall be marked clearly on top surface with the letter "T" for identification of surfaces at the time of erection and shall be stored properly until required for erection. The precast units shall be handled and erected by methods approved by the Engineer-in-Charge to protect them from damage.
- 23.5 Precast concrete elements shall not be removed from the casting bed until the concrete has developed its characteristic compressive strength based on cube test results.
- 23.6 The units shall be suitably handled, transported, stored and placed taking all necessary safety precautions to avoid development of undue stresses caused by vibrations, impact or lateral forces. During shipment and while in storage, the units shall be placed on suitable blocks to provide clearance from bed/ground.
- 23.7 The Contractor shall take all necessary precautions for safe handling during the course of erection. The Contractor shall replace at his own expense all such units which are damaged during the course of erection. Cement used for a damaged/rejected precast elements shall not be taken into account for material reconciliation.
- 23.8 The inspection for precast concrete units during casting shall be same as applicable to normal concrete works. However, additional inspection checks shall be made during and after erection of units to ensure its suitability for the required service as a structural member. These checks shall include inspection to detect chipping, cracks, warpages in the precast units etc due to improper handling and storage, improper jointing (if required) of the precast unit with the structure and improper finishing.



- 23.9 Fabricated precast concrete units containing defects originating due to use of improper materials or workmanship, excessive repair and not conforming to design drawings shall be rejected. Such rejected units shall not be taken into account for material reconciliation or payment.

24.0 CONTINUOUS CONCRETING

- 24.1 Where called out on the drawings, continuous concreting shall be done in a single operation as per the requirements of IS: 456 and IS: 2974. It shall be ensured that clause 8.3 of these specifications is not violated in case of continuous concreting. Sufficient "Windows" shall be left in the formwork for pouring & compaction of concrete and inspection. These windows shall be fixed tight once the level of concrete reaches their levels.

25.0 CONCRETING UNDER SPECIAL CONDITIONS

- 25.1 Work in extreme weather conditions during hot or cold weather, the concreting shall be done as per procedure set out in IS: 7861(Part 1) or IS: 7861 (Part2).

25.2 UNDER WATER CONCRETING.

Concreting shall be as per clause no. 14.2 of IS: 456.

26.0 PAYMENT

This clause shall apply to item rate tenders only.

26.1 PLAIN AND REINFORCED CONCRETE

- 26.1.1 Payment for plain and reinforced cement concrete (cast- in-situ) shall be made on cubic metre basis of the volume of the actual finished work done or as per approved construction drawings, whichever is less and shall be inclusive of providing pockets, openings, recesses of all sizes, chamfers, fillets, grooves, separation/ expansion/ isolation/ construction/ movement joints, cement wash, curing by normal moist curing or using curing compound etc. as directed by Engineer-in-Charge etc. The rates shall be deemed to include complete cost of getting the respective mix designs approved, making and testing concrete cubes and carrying out other tests including tests of various ingredients, as per specifications and as directed by Engineer-in-Charge. Payment shall, however, be separately made for tests on concrete cubes done by accelerated methods of curing as defined in IS: 9013.
- 26.1.2 No separate payment shall be made for any additive/ admixture used by the contractor for accelerating or retarding the strength of concrete or for achieving specified workability/water tightness. The rate quoted shall be deemed to be inclusive of all costs related to any such additive/ admixture.
- 26.1.3 The rate shall however be exclusive of reinforcement, metal inserts, pipe sleeves, formwork, water stops and any filler material in expansion/isolation joints.



- 26.1.4 Where the strength of concrete mix as indicated by tests, lies in between the strengths of any two grades given in Table-1 and it is accepted by the Owner/Engineer-in-Charge, such concrete shall be classified as a grade belonging to the lower of the two grades between which it lies. In case the cube strength shows higher results than those specified for the particular grade of the concrete, it shall not be placed in the higher grade nor shall the Contractor be entitled for any extra payment on such account. The concrete giving lower strength than specified may be accepted at reduced rates after satisfying the safety of the structure by checking it with tests as specified or rejected entirely at the discretion of the Engineer-in-Charge. The rejected concrete shall be dismantled at no extra cost to the owner and no payment or extension of time shall be granted for the concrete so rejected and the formwork and reinforcement used for the same. Cost of any material supplied by the Owner free of cost shall be recovered from the Contractor at double the prevailing market rate. In case the concrete of lower strength can be improved by carrying out some strengthening measures entirely at the discretion of the Engineer-in-Charge, then the said measures including all related tests shall be carried out by Contractor at his own cost. If the Contractor is able to make up the strength to the required grade by such improvement measures to the entire satisfaction of Engineer-in-Charge, payment shall be made for the grade achieved. However, if the strength of concrete is not made up to the strength of required grade, payment shall be made only for the lower strength if such concrete is accepted by the Engineer-in-Charge.
- 26.1.5 Deductions for openings, pockets etc. shall be as specified in relevant Indian Standard Codes.
- 26.1.6 Payment under continuous concreting item in the schedule of rates shall be made only where the total quantity of concrete between two consecutive construction joints specifically called-out on the drawings exceeds 250 cubic metres. For any foundation/structure involving concrete quantity upto 250 cubic metres between two consecutive construction joints shown on drawings, the concrete shall not be measured or paid for under this category (i.e. continuous concreting), although the same is required to be constructed in single pour. The rate quoted against this item shall be inclusive of all extra costs incurred by the Contractor for arranging continuous pouring of concrete and others as specified complete.

26.2 FORM WORK

Unless otherwise specified, payment for form work shall be on square metre basis of the actual area in contact with the concrete cast. The rates shall be inclusive of keeping the formwork for the full period as specified in the above clauses and removing the same after the period is over. No extra payment shall be made for providing scaffolding/staging/access/stairways/ladders etc.

The rates shall be inclusive of any provision to be made or kept in the formwork for providing dowels, inserts etc.

Superior quality formwork for exposed/architectural concrete work shall be measured and paid separately under the relevant item in the schedule of rates.



26.3 REINFORCEMENT

- 26.3.1 Payment for plain round mild steel reinforcement bars and high strength deformed steel bars shall be on the basis of weight of bare steel irrespective of any coating applied in metric tons. The weight of the bar shall be derived from the sizes and corresponding unit weights given in handbook of Bureau of Indian Standards. Standard hook lengths, chairs, spacer bars and authorized laps only shall be included in the weight calculated. Binding wire shall not be weighed nor otherwise measured. Measurements for weight shall not include cutting allowance etc.
- 26.3.2 Rate quoted for uncoated reinforcement shall include cost of supplying, decoiling, straightening, cleaning, cutting, bending, placing, binding, welding, if required, and providing necessary cover blocks of concrete.
- 26.3.3 Rate quoted for Fusion Bonded Epoxy Coated bars shall also include, apart from those mentioned in clause no. 26.3.2, cost of coating of the bars, all necessary tools and tackles and any repairs required due to damage to coating as per IS: 13620.
- 26.3.4 Payment for mechanical threaded couplers shall be made on number basis (each). The rate shall include supply of complete assembly, fixing, testing etc. all complete.

26.4 WATER STOPS/WATER BARS & EXPANSION/ISOLATION JOINTS

- 26.4.1 Payment for PVC water bars shall be made on running metre (RM) basis of the water stops provided in position. Rate shall include supplying cutting, fixing, jointing by vulcanising or any other approved method, wastage, etc. complete.
- 26.4.2 Payment for filler materials in Expansion/Isolation joints shall be made on running metre basis of the joint provided. For boards provided at expansion/isolation joints, the measurement shall be made on square metre basis. Rate shall be inclusive of supply, cutting, fixing, jointing, wastage etc. complete.

26.5 PRE-CAST CONCRETE

- 26.5.1 Payment for precast concrete members shall be made on cubic metre basis of the volume of the finished member. The rate quoted shall include cost of formwork, preparation of casting yard, finishing as specified, curing, handling, fixing in position, breaking masonry and/or concrete surfaces and making good the same etc. Reinforcement shall be paid separately under relevant items. Lifting hooks shall be paid on the same basis as reinforcement. Metal inserts shall be paid as per relevant clauses of Specification No. VCS-SS-CS-026 (Miscellaneous Steel Works).
- 26.5.2 The quoted rate shall be inclusive of providing pockets, openings, recesses of all sizes, chamfers, fillets grooves, holes, cement wash, curing (hot, cold or by using curing compounds). The rate shall be deemed to include complete cost of taking and testing concrete cubes and carrying out other tests including tests of various ingredients as per specification and as directed by the Engineer-in-Charge.
- 26.5.3 The rate shall however be exclusive of reinforcement, metal inserts, pipe sleeves. Where the strength of concrete mix as indicated by tests, lies in between the strengths



of any two grades given in clause 3.0 and it is accepted by the Owner/Engineer-in-Charge, such concrete shall be classified as a grade belonging to the lower of the two grades between which it lies. In case the cube strength shows higher results than those specified for the particular grade of the concrete, it shall not be placed in the higher grade nor shall the Contractor be entitled for any extra payment on such account. The concrete giving lower strength than specified may be accepted at reduced rates after satisfying the safety of the structure by checking it with tests as specified or rejected entirely at the discretion of the Engineer-in-Charge. The rejected concrete shall be dismantled at no extra cost to the owner and no payment or extension of time shall be granted for the concrete so rejected and the formwork and reinforcement used for the same. In case the concrete of lower strength can be improved by carrying out some strengthening measures entirely at the discretion of the Engineer-in-Charge, then the said measures shall be carried out by Contractor at his own cost. If the Contractor is able to make up the strength to the required grade by such improvement measures to the entire satisfaction of Engineer-in-Charge, payment shall be made for the grade achieved. However, if the strength of concrete is not made up to the strength of required grade, payment shall be made only for the lower strength if accepted by the Engineer-in-Charge.

26.6 CEMENT WASH

- 26.6.1 No payment shall be made for cement wash separately and is deemed to be covered in clause no. 26.1.1 & 26.5.2.

26.7 CONTINUOUS CONCRETING

Payment shall be made as per clause no. 26.1 of this specification. The rate shall be deemed to be inclusive of all extra cost related to labor, shuttering, staging and making all other arrangements for such continuous casting e.g. provisions for adequate movement and storage spaces, special gangways, scaffolding, additional construction equipments, adequate lighting and supervision while the work continues round the clock etc. The rate shall also be inclusive of all costs related to concreting in any thickness, shape and position and at any height or depth so as to avoid any cold joint between specified construction joints.







Energising Quality

VCS Quality Services Pvt Ltd

**STANDARD SPECIFICATION
FOR
STRUCTURAL STEEL WORKS**

VCS-SS-CS-6024

					
03	31.01.2022	NV	GDS	HK	GW
02	25.02.2020	NV	GDS	RKB	SK
01	16.10.2019	MA	MO	AD	SK
00	05.07.2017	MA	MO	AD	SK
Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By

UNCONTROLLED COPY : If printed

CONTROLLED COPY : If in soft and signed



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**STANDARD SPECIFICATION
FOR STRUCTURAL STEEL WORKS**

**DOC NO: VCS-SS-CS-6024
Rev No : 03**

REVISION RECORD						
Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description
00	05.07.2017	MA	MO	RKB	AD	Issued for use as Standard
01	16.10.2019	MA	MO	RKB	SK	
02	25.02.2020	NV	GDS	RKB	SK	New revision system updated
03	31.01.2022	NV	GDS	HK	GW	VCS QMS Integration



ABBREVIATION

m	Metre
mm	Millimetre
IS	Indian Standard
BIS	Bureau of Indian Standards



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1.0 SCOPE

This specification covers the requirements for material, storage, preparation of fabrication drawings, fabrication, assembly, tests/examinations, transportation, erection and painting of all types of bolted and/or welded structural steel works for general construction work. Fabrication of structures shall also include fabricating:

- a. Built up sections/plate girders made out of rolled section and/or plates.
- b. Compound sections made out of rolled sections.

2.0 REFERENCE

2.1 BIS CODES

IS: 800	General Construction in steel-Code of practice
IS: 816	Code of practice for use of Metal Arc welding for General construction in mild steel
IS: 819	Code of practice for Residual spot welding for light assemblies in mild steel
IS: 822	Code of practice for Inspection of welds
IS: 919 (Part-I)	ISO system of limits and fits (Bases of tolerances, deviations and fits)
IS: 919 (Part-II)	ISO system of limits and fits (Tables of tolerances, grades and limit deviation for hole and shafts)
IS: 1024	Use of welding in bridges and structures subject to dynamic loading-Code of practice
IS: 1261	Code of practice for Seam welding in mild steel
IS: 1323	Code of practice for Oxy-Acetylene welding for structural works in mild steel
IS: 1477	Code of practice for painting of ferrous metals in buildings
IS: 1852	Specification for rolling and cutting tolerance for hot rolled steel products
IS: 2074	Ready mix paint, Air draying, Red oxide Zinc Chrome, painting specification
IS: 7205	Safety code for erection of Structural steel works
IS: 7215	Tolerance for fabrication of steel structures
IS: 7307	Approval tests for welding procedures



- IS: 7310 Approval tests for welders working to approved welding procedures
- IS: 7318 Approval tests for welders when welding procedures approval is not required
- IS: 9595 Metal Arc welding of carbon and Carbon manganese steel - Recommendations
- IS: 12843 Tolerance for Erection of Steel structure
and other relevant BIS Codes.

SP: 6(1)

2.2 SPECIFICATIONS

VCS-SS-CS-6021 Materials and Specification for Shop & Field Painting

- 2.3 In case of conflict between the clauses mentioned in this specification and those in the Indian Standards, this specification shall govern. Any special provision as shown or noted on the design drawings shall govern over the provisions of this specification.

3.0 MATERIALS

3.1 GENERAL

All materials shall conform to their respective specifications given in Specification no. VCS-SS-CS-6021. The use of equivalent or alternative materials shall be permitted only in very special cases and for all such cases prior written approval of the Engineer-in-Charge shall be obtained.

3.2 RECEIPT & STORING OF MATERIALS

- 3.2.1 Each section shall be marked for identification and each lot shall be accompanied by manufacturer's quality certificate, chemical analysis and mechanical characteristics.
- 3.2.2 All sections shall be checked, sorted out and arranged by grade and quality in the store. Any instruction given by the Engineer-in-Charge in this respect shall be strictly followed.
- 3.2.3 All material shall be free from surface defects such as pitting, cracks, laminations, twists etc. Defective material shall not be used and all such rejected material shall be immediately removed from the store/site. The decision of the Engineer-in-Charge in this regard shall be final and binding.
- 3.2.4 Welding wires and electrodes (packed in their original cartons) shall be stored separately by quality and lots inside a dry and enclosed room in compliance with IS: 9595 and as per the instructions given by the Engineer-in-Charge. Electrodes shall be kept perfectly dry to ensure satisfactory operation and weld metal soundness.



- 3.2.5 Each lot of electrodes, bolts, nuts etc. shall be accompanied by manufacturer's quality/test certificates.
- 3.2.6 All bolts (including nuts & washers) shall be checked, sorted out and arranged diameter-wise by grade and quality in the store.

3.3 MATERIAL TESTS

- 3.3.1 The Contractor shall submit manufacturers' quality certificates for all the materials supplied by him. In case, quality certificates are not available or are incomplete or when material quality differs from standard specifications, such materials shall not be used in the construction. However, the Contractor shall get all appropriate tests conducted in approved test houses for such materials as directed by the Engineer-in-Charge, at no extra cost, and submit the same to Engineer-in-Charge for his approval. The Engineer-in-Charge may approve the use of such materials entirely at his discretion.
- 3.3.2 The Contractor shall ensure that all materials brought to site are duly approved by the Engineer-in-Charge. Rejected materials shall not be used and shall be removed from site forthwith. Any material of doubtful quality for which specific tests are to be carried out as per the instruction of the Engineer-in-Charge shall be separately stacked and properly identified and shall not be used. These shall be removed from site forthwith.

4.0 FABRICATION DRAWINGS

- 4.1 Fabrication and erection drawings shall be prepared by the Contractor on the basis of "Approved for Construction (AFC)" design drawings, Standards issued to the Contractor. These drawings shall be prepared by the Contractor or by an agency appointed by the Contractor and approved by the Engineer-in-Charge.
- 4.2 Fabrication and erection drawings shall be thoroughly checked, stamped "Approved for Construction" and signed by the Contractor's own responsible Engineer irrespective of the fact that such drawings are prepared by the Contractor or his approved agency, to ensure accuracy and correctness of the drawings. Unchecked and unsigned drawings shall not be used for the purpose of proceeding with the work. The Contractor shall proceed with the fabrication and erection work only after thoroughly satisfying himself in this regard.
- 4.3 All fabrication and erection drawings shall be issued for construction by the Contractor directly to his work- site. Six copies of such drawings shall simultaneously be submitted to the Engineer-in-Charge who may check/ review some or all such drawings at his sole discretion and offer his comments for incorporation in these drawings by the Contractor.

However, the Contractor shall not proceed with the fabrication of such structures whose fabrication drawings are required to be reviewed before taking up the fabrication work as noted on "Approved for Construction (AFC)" design drawings issued to the Contractor or as conveyed by the Engineer-in-Charge. The fabrication of such structures shall be done only as per the reviewed fabrication drawings.



The review of such drawings shall be restricted to the checking of the following only:

- a. Structural layout, orientation and elevation of structures/members.
- b. Sizes of members.
- c. Critical joint details.

4.4 Fabrication drawings shall be drawn to scale and shall convey the information clearly and adequately. Following information shall be furnished on such drawings:

- a. Reference to design drawing number (along with revision number) based on which fabrication drawing has been prepared.
- b. Structural layout, elevations & sections (with distinct erection marking of all members).
- c. Framing plans, member sizes, orientation and elevations.
- d. Layout and detailing of rain water pipes and gutters showing all necessary levels, connections and provisions wherever required.
- e. Detailing of shop/field joints, connections, splices, for required strength and erection.
- f. Location, type, size and dimensions of welds and bolts.
- g. Shapes and sizes of edge preparation for welding.
- h. Details of shop and field joints/welds.
- i. Bill of materials/D.O.D. Lists.
- j. Quality of structural steel, plates etc., welding electrodes, bolts, nuts and washers to be used.
- k. Erection assemblies identifying all transportable parts and sub-assemblies with special erection instructions, if required.
- l. Method of erection and special precautions to be taken during erection as required.

4.5 The Contractor shall additionally ensure accuracy of the following and shall be solely responsible for the same:

- a. Provision for erection and erection clearances.
- b. Marking of members
- c. Cut length of members
- d. Matching of joints and holes.



- e. Provision kept in the members for other interconnected members.
 - f. Bill of materials/D.O.D. Lists.
- 4.6 Connections, splices and other details where not shown on the design drawings shall be suitably designed and shown on the fabrication drawings based on good engineering practice developing full member strength. Design calculations for such connections/splices shall be submitted to the Engineer-in-Charge along with the fabrication drawings.
- 4.7 Any substitution or change in section shall be allowed only when prior written approval of the Engineer-in-Charge has been obtained. Fabrication drawings shall be updated incorporating all such substitutions/changes by the Contractor at no extra cost to the Owner.
- 4.8 In case during execution of the work, the Engineer-in-Charge on review of drawings considers any modifications/substitutions necessary to meet the design parameters/good engineering practice, these shall be brought to the notice of the Contractor who shall incorporate the same in the drawings and works without any extra cost to the owner. The Contractor will be totally responsible for the correctness of the detailed fabrication drawings and execution of the work.
- 4.9 Contractor shall incorporate all the revisions made in the design drawings during the course of execution of work in his fabrication drawings, and resubmit the drawings at no extra cost to the Owner. All fabrication shall be carried out only as per the latest AFC design drawings and corresponding fabrication drawings.
- 4.10 The Contractor shall supply two prints each of the final/as built drawings along with their transparencies to Engineer-in-Charge for reference and record. The rates quoted shall include for the same.

5.0 FABRICATION

5.1 GENERAL

- 5.1.1 Fabrication of structures shall be done strictly as per "Approved for Construction" fabrication drawings (prepared by the Contractor based on the latest design drawings) and in accordance with IS: 800, IS: 9595 & other relevant BIS Codes and BIS Hand Book SP: 6(1).
- 5.1.2 Prior to commencement of structural fabrication, undulations in the fabrication yard, if any, shall be removed and area levelled and paved by the Contractor.
- 5.1.3 Any defective material used in the work shall be replaced by the Contractor at his own expense. Necessary care and precautions shall be taken so as not to cause any damage to the structure during any such removal and replacement.
- 5.1.4 Any faulty fabrication pointed out at any stage of work by the Engineer-in-Charge, shall be made good or replaced by the Contractor at his own cost.



5.1.5 Tolerances for fabrication of steel structures shall be as per IS: 7215.

5.2 FABRICATION PROCEDURE

5.2.1 STRAIGHTENING & BENDING

5.2.1.1 All materials shall be straight and, if necessary, before being worked shall be straightened and/or flattened (unless required to be of curvilinear form) and shall be free from twists.

5.2.1.2 Bending of rolled sections and plates shall be done by cold process to shapes as shown on drawings.

5.2.2 CLEARANCES

The erection clearance for cleated ends of members shall be not greater than 2mm at each end. The erection clearance at ends of beams without web cleats and end plates shall be not more than 3mm at each end but where for practical reasons, greater clearance is necessary, suitably designed seating's approved by the Engineer-in-Charge shall be provided.

5.2.3 CUTTING

5.2.3.1 Prior to cutting, all members shall be properly marked showing the requisite cut length/width, connection provisions e.g. location and dimensions of holes, welds, cleats etc. Marking for cutting shall be done judiciously so as to avoid wastages or unnecessary joints as far as practicable. Marking shall be done by placing the members on horizontal supports/pads in order to ensure accuracy. Marking accuracy shall be limited to + 1 mm.

5.2.3.2 Cutting may be affected by shearing, cropping or sawing. Gas cutting by mechanically controlled torch shall be permitted for mild steel. Hand flame cutting may be permitted subject to the approval of the Engineer-in-Charge.

5.2.3.3 Except where the material is subsequently joined by welding, no loads shall be transmitted into metal through a gas cut surface.

5.2.3.4 Shearing, cropping and gas cutting shall be clean, square, free from any distortion & burrs, and should the Engineer-in-Charge find it necessary, the edges shall be ground afterwards, to make the same straight and uniform at no extra cost to the Owner.

5.2.4 HOLING

5.2.4.1 Holes for bolts shall not be formed by gas cutting process.

5.2.4.2 Holes through more than one thickness of material of members such as compound stanchions and girder flanges shall, where possible, be drilled after the members are assembled and tightly clamped/bolted together. Punching may be permitted before assembly, provided the thickness of metal is less than 16mm and the holes are punched 3mm less in diameter than the required size and reamed, after assembly, to the full diameter. Punching shall not be adopted for dynamically loaded structures.



- 5.2.4.3 Holes may be drilled in one operation through two or more separable parts and burrs removed from each part after drilling.
- 5.2.4.4 Holes in connecting angles and plates, other than splices, also in roof members and light framing, may be punched full size through material not over 12mm thick, except where required for close tolerance bolts or barrel bolts.
- 5.2.4.5 All matching holes for black bolts shall register with each other so that a gauge of 2mm less in diameter than the diameter of hole shall pass freely through the assembled members in the direction at right angle to such members. Finished holes shall be not more than 2mm in diameter larger than the diameter of the black bolt passing through them, unless otherwise specified by the Engineer-in-Charge.
- 5.2.4.6 Holes for turned and fitted bolts shall be drilled to a diameter equal to the nominal diameter of the shank or barrel subject to H8 tolerance specified in IS: 919. Parts to be connected with close tolerance or barrel bolts shall be firmly held together by tacking bolts or clamps and the holes drilled through all the thicknesses in one operation and subsequently reamed to size. Holes not drilled through all the thicknesses in one operation shall be drilled to a smaller size and reamed out after assembly. Where this is not possible, the parts shall be drilled and reamed separately.
- 5.2.4.7 To facilitate grouting, holes shall be provided in column bases or seating plates exceeding 300mm in width for the escape of air.
- 5.2.4.8 To avoid accumulation of water in gusseted column bases of laced, battened or box type stanchions, suitable reverse U-type holes shall be provided at the junction of base plate and column section in the vertical gussets for draining out of any water.

5.2.5 ASSEMBLY

The component parts shall be assembled and aligned in such a manner that they are neither twisted nor otherwise damaged, and shall be so prepared that the required camber, if any, is provided. Proper clamps, clips, jigs and other fasteners (bolts and welds) shall be placed in a balanced pattern to avoid any distortion in the members and to ensure their correct positioning (i.e. angles, axes, nodes etc.). Any force fitting, pulling/stretching of members to join them shall be avoided. Proper care shall be taken for welding shrinkage & distortion so as to attain the finished dimensions of the structure shown on the drawings.

5.2.6 WELDING

5.2.6.1 GENERAL

- a. All joints shall be welded unless noted otherwise on the design drawings.
- b. Welding shall be in accordance with IS: 816, IS: 819, IS: 1024, IS: 1261, IS: 1323 and IS: 9595 as appropriate.
- c. The Contractor shall make necessary arrangement for providing sufficient number of welding sets of the required capacity, all consumables, cutting and grinding



equipment with requisite accessories/ auxiliaries, equipment & materials required for carrying out various tests such as dye penetration, magnetic particle, ultrasonic etc.

- d. Adequate protection against rain, dust, snow & strong winds shall be provided to the welding personnel and the structural members during welding operation. In the absence of such a protection no welding shall be carried out.
- e. It shall be the responsibility of the Contractor to ensure that all welding is carried out in accordance with the terms of this specification and relevant BIS codes. The Contractor shall provide all the supervision to fulfill this requirement.

5.2.6.2 PREPARATION OF MEMBER FOR WELDING

- a. Edge Preparation

Edge preparation/bevelling of fusion faces for welding shall be done strictly as per the dimensions shown in the drawings. In case, the same are not indicated, edges shall be prepared (depending on the type of weld indicated in the drawing) as per the details given in IS: 9595. Bevelling of fusion faces shall be got checked and approved by the Engineer-in-Charge. The tolerances on limits of gap, root face & included angle shall be as stipulated in IS: 9595.

- b. Cleaning

Welding edges and the adjacent areas of the members (extending up to 20mm) shall be thoroughly cleaned of all oil, grease, scale and rust and made completely dry. Gaps between the members to be welded shall be kept free from all foreign matter.

- c. Preheating

Preheating of members shall be carried out as per IS: 9595 when the base metal temperature is below the requisite temperature for the welding process being used. Preheating shall be done in such a manner that the parts, on which the weld metal is being deposited, are above the specified minimum temperature for a distance of not less than 75mm on each side of the weld line. The temperature shall be measured on the face opposite to that being heated. However, when there is access to only one face, the heat source shall be removed to allow for temperature equalization (1 minute for each 25mm of plate thickness) before measuring the temperature.

- d. Grinding

- i. Column splices & butt joints of struts and compression members (depending on contact for load transmission) shall be accurately ground and close-butt over the whole section with a tolerance not exceeding 0.2mm locally at any place. In column caps & bases, the ends of shafts together with the attached gussets, angles, channels etc., shall be accurately ground so that the parts connected butt over minimum 90%



surface of contact. In case of connecting angles or channels, care shall be taken so that these are fixed with such accuracy that they are not reduced in thickness by grinding by more than 2mm.

- ii. Ends of all bearing stiffeners shall be ground to fit tightly at both top and bottom. Similarly bottom of the knife edge supports along with the top surface of column brackets shall be accurately ground to provide effective bearing with a tolerance not exceeding 0.2mm locally at any place.
- iii. Slab bases and caps shall be accurately ground over the bearing surfaces and shall have effective contact with the ends of stanchions. Bearing faces which are to be grouted direct to foundations need not be ground if such faces are true & parallel to the upper faces.

5.2.6.3 WELDING PROCESSES

Welding of various materials under this specification shall be carried out using one or more of the following processes.

- a. Manual Metal Arc Welding Process (MMAW)
- b. Submerge Arc Welding Process (SAW)
- c. Gas Metal Arc Welding Process (GMAW)
- d. Flux Cored Arc Welding Process (FCAW)

The welding procedure adopted and consumables used shall be specifically approved by the Engineer-in-Charge. A combination of different welding processes or a combination of electrodes of different classes/makes may be employed for a particular joint only after qualifying the welding procedures to be adopted and obtaining the written approval of the Engineer-in-Charge.

5.2.6.4 APPROVAL & TESTING OF WELDERS

The Contractor shall satisfy the Engineer-in-Charge that the welders are suitable for the work upon which they will be employed. For this purpose the welders shall have satisfied the relevant requirements of IS: 7318. If the welders will be working to approved welding procedures, they shall have satisfied the relevant requirements of IS: 7310.

Adequate means of identification shall be provided to enable each weld to be traced to the welder by whom it was made. The Contractor shall intimate the Engineer-in-Charge sufficiently in advance, the commencement of tests, to enable him to be present to witness the same.

5.2.6.5 APPROVAL & TESTING OF WELDING PROCEDURES

The Contractor shall carry out procedure tests in accordance with IS:7307 to demonstrate by means of a specimen weld of adequate length on steel representative of that to be used, that he can make welds with the welding procedure to be used for



the work to the complete satisfaction of the Engineer-in-Charge. The test weld shall include weld details from the actual construction and it shall be welded in a manner simulating the most unfavorable instances of fit-up, electrode condition etc., which are anticipated to occur on the particular fabrication. Where material analyses are available, the welding procedure shall be carried out on material with the highest carbon equivalent value.

After welding, but before the relevant tests given in IS: 7307 are carried out, the test weld shall be held as long as possible at room temperature, but in any case not less than 72 hours, and shall then be examined for cracking. The examination procedure shall be sufficiently rigorous to be capable of revealing significant defects in both parent metal and weld metal.

After establishing the welding method, the Contractor shall finally submit to the Engineer-in-Charge for his approval the welding procedure specification in standard format given in IS: 9595 before starting the fabrication.

5.2.6.6 SEQUENCE OF WELDING

- a. As far as practicable, all welds shall be made in a sequence that will balance the applied heat of welding while the welding progresses.
- b. The direction of the general progression in welding on a member shall be from points where the parts are relatively fixed in position with respect to each other towards points where they have a greater relative freedom of movement.
- c. All splices in each component part of a cover-plated beam or built up member shall be made before the component part is welded to other component parts of the member.
- d. Joints expected to have significant shrinkage shall be welded before joints expected to have lesser shrinkage.
- e. Welding shall be carried continuously to completion with correct number of runs.
- f. The Contractor shall choose the welding sequence after carefully studying each case such as to minimize distortion and shrinkage & submit the same to the Engineer-in-Charge for comments and approval.

5.2.6.7 WELDING TECHNIQUE

- a. After the fusion faces are carefully aligned and set with proper gaps, the root pass of butt joints shall be executed properly so as to achieve full penetration with complete fusion of the root edges.
- b. On completion of each run, all slag and spatters shall be removed and the weld and the adjacent base metal shall be cleaned by wire brushing and light chipping. Visible defects such as cracks, cavities and other deposition faults, if any, shall be removed to sound metal before depositing subsequent run of weld.



- c. All full penetration butt welds shall be completed by chipping/gouging to sound metal and then depositing a sealing run of weld metal on the back of the joints. Where butt welding is practicable from one side only, suitable backing steel strip shall be used and joint shall be arranged in such a way as to ensure that complete fusion of all the parts is readily obtained.
- d. While welding is in progress care shall be taken to avoid any kind of movement of the components, shocks, vibrations to prevent occurrence of weld cracks.
- e. Any deviation desired from the recommended welding technique and electrodes shall be adopted only after obtaining written approval of the Engineer-in-Charge.

5.2.6.8 INSPECTION & TESTING OF WELDS

The method of inspection shall be according to IS: 822 and extent of inspection and testing shall be in accordance with the relevant applicable standard or, in the absence of such a standard, as specified by the Engineer-in-Charge. Welds shall not be painted or otherwise obscured until they have been inspected, approved and accepted.

The Engineer-in-Charge or his representative shall have access to the Contractor's work at all reasonable times and the Contractor shall provide him with all facilities necessary for inspection during all stages of fabrication and erection without not limited to the following objectives.

- a. To check the conformity with the relevant standards and suitability of various welding equipments and their performance.
- b. To witness/approve the welding procedure qualification.
- c. To witness/approve the welders performance qualification.
- d. To check whether shop/field welding being executed is in conformity with the relevant specifications and codes of practice.

Inspection and testing of all fabricated structures shall be carried out by the Contractor by any, or, a combination of all the following methods as directed by the Engineer-in-Charge and no separate payment shall be made, unless otherwise mentioned, for inspection and testing of welds/fabricated structures:

A. Visual Inspection

All finished welds (i.e. 100 percent) shall be visually inspected for identification of the following types of weld defects & faults.

- a. Weld defects occurring at the surface such as blow holes, exposed porosity, unfused welds etc.
- b. Surface cracks in the weld metal or in the parent metal adjacent to it.
- c. Damages to the parent metal such as undercuts, burning, overheating etc.



- d. Profile defects such as excessive convexity or concavity, overlapping, unequal leg lengths, excessive reinforcement, incompletely filled grooves, excessive penetration beads, root grooves etc.
- e. Distortion due to welding i.e., local shrinkage, camber, bowing, twisting, rotation, wariness etc.
- f. Linear eccentric, angular and rotational misalignment of parts.
- g. Dimensional errors.

B. Mechanical Tests

The mechanical testing (such as tensile load tests, bend tests, impact tests etc.) shall be done in accordance with the relevant standards and as per the instructions of the Engineer-in-Charge.

C. Magnetic Particle/Dye Penetration/Ultrasonic Examination:

The examination shall be done at random as directed by the Engineer-in-Charge. Whenever such tests are directed, the tests shall be carried out on joints chosen by him. The tests shall be carried out by employing approved testing procedure in accordance with IS: 822.

D. Radiographic Examination

Radiographic examination shall be carried out only in special cases for random joints as directed by the Engineer-in-Charge. The Contractor shall be paid extra for such examination except for penalty radiographic tests for which the cost shall be borne by him. The Contractor shall make necessary arrangement at his own expense for providing the radiographic equipment, films and all other necessary materials required for carrying out the examination. The tests shall be carried in the presence of the Engineer-in-Charge by employing approved testing procedure in accordance with IS: 822. The Contractor shall fulfill all the statutory safety requirements while handling X-ray and Gamma-ray equipment and provide the Engineer-in-Charge all the necessary facilities at site such as dark room, film viewer etc., to enable him to examine the radiographs.

5.2.6.9 Repair of Faculty Welds

No repair of defective welds shall be carried out without proper permission of the Engineer-in-Charge and his approval for the corrective procedure.

Welds not complying with the acceptance requirements (as specified by BIS Codes & the Engineer-in-Charge), as revealed during inspection & testing of welds or erection or in-situ condition shall be corrected either by removing & replacing or as follows:

- a. Excessive convexity - Reduced to size by removal of excess weld metal.
- b. Shrinkage cracks, - Defective portions removed down to sound



- cracks in parent plates metal and re-welded.
- and craters
- c. Under cutting. - Additional weld metal deposited.
- d. Improperly fitted/ - Welding cut & edges suitably prepared and
misaligned parts. parts.
- e. Members distorted - Member straightened by mechanical means or
the by heat of careful application of limited amount of heat,
welding temperature of such area not to exceed 650
degree Centigrade dull red heat).

In removing defective parts of a weld, gouging, chipping, oxygen cutting or grinding shall not extend into the parent metal to any substantial amount beyond the depth of weld penetration, unless cracks or other defects exist in the parent metal. The weld or parent metal shall not be undercut in chipping, grinding, gouging or oxygen cutting.

Any fabricated structure or its component which, in the opinion of Engineer-in-Charge, is defective and/or beyond any corrective action shall be removed forthwith from the site as instructed by the Engineer-in-Charge without any extra claim. The owner reserves the right to recover any compensation due to any loss arising out of such rejections.

5.2.7 BOLTING

5.2.7.1 All bolts shall be provided such that no part of the threaded portion of the bolts is within the thickness of the parts bolted together. Washers of suitable thickness shall be used under the nuts to avoid any threaded portion of the bolt being within the thickness of parts bolted together.

5.2.7.2 The threaded portion of each bolt shall project through the nut at least one thread.

5.2.7.3 Flat washers shall be circular and of suitable thickness. However, where bolt heads/nuts bear upon the bevelled surfaces, they shall be provided with square tapered washers of suitable thickness to afford a seating square with the axis of the bolt.

5.2.8 SPLICING

5.2.8.1 Splicing of built up/compound/latticed sections shall be done in such a fashion that each component of the section is joined in a staggered manner.

5.2.8.2 Where no butt weld is used for splicing, the meeting ends of two pieces of joist/channel/built up section shall be ground flush for bearing on each other and suitable flange and web splice plates shall be designed and provided for the full strength of the flange/ web of the section and welds designed accordingly.



- 5.2.8.3 Where full strength butt weld is used for splicing (after proper edge preparation of the web and flange plates) of members fabricated out of joist/ channel/ angles/ built up section, additional flange and web plates shall be provided, over and above the full strength butt welds, to have 40% strength of the flange and web.
- 5.2.8.4 Where a cover plate is used over a joist/channel section the splicing of the cover plate and channel/joist sections shall be staggered by minimum 500mm. Extra splice plate shall be used for the cover plate and joist/channel section as per clause 5.2.8.2 or 5.2.8.3.
- 5.2.8.5 Prior approval shall be obtained by the Contractor for locations of splices where not shown on design drawings. Only a single splice at approved location shall be allowed for member's up to a length of 6 to 7m. Maximum two numbers of splices shall be allowed for members exceeding this length.
- 5.2.9 MACHINING & GRINDING**
- 5.2.9.1 All slab bases and slab caps shall be accurately machined over the bearing surfaces and shall be in effective contact with the ends of column sections (shafts).
- 5.2.9.2 For slab bases and slab caps, ends of column shafts shall be accurately machined. However, for gusseted bases and caps, the column shafts shall be ground flush for effective contact with parts connected together.
- 5.2.9.3 Gusseted bases and caps shall be ground flush for effective contact with ends of column sections.
- 5.2.9.4 End of all bearing stiffeners shall be machined or ground to fit tightly at top and bottom without any air gap.
- 5.2.9.5 While machining or grinding care shall be taken so that the length or thickness of any part does not get reduced by more than 2.0mm.
- 5.2.9.6 For all machining or grinding works for gusseted base and cap plates, the clearance between the parts joined shall not exceed 0.2mm at any location.

6.0 MARKING FOR IDENTIFICATION

- 6.1 Each component shall be distinctly marked (with paint) before delivery in accordance with the marking diagrams and shall bear such other marks as will facilitate erection.
- 6.2 For small members which are delivered in bundles or crates, the required marking shall be done on small metal tags securely tied to the bundle.

7.0 SHOP ERECTION

The steel work shall be temporarily shop erected complete or as directed by the Engineer-in-Charge, so that the accuracy of fit may be checked before dispatch.



8.0 INSPECTION & TESTING OF STRUCTURES

- 8.1 The Engineer-in-Charge (or his authorized representative) shall have free access at all times to those parts of the Contractor's works which are concerned with the fabrication of the steel work and shall be provided with all reasonable facilities for satisfying himself that the fabrication is being undertaken in accordance with the provisions of these specifications & other relevant BIS Codes.
- 8.2 Should any structure or part of a structure be found not to comply with any of the provisions of this specification (or relevant BIS Codes as referred to), it shall be liable to rejection. No structure or part of the structure, once rejected shall be resubmitted for inspection, exception cases where the Engineer-in-Charge or his authorized representative considers the defect as rectifiable.
- 8.3 Defects which may appear during/after fabrication/ erection shall be made good only with the consent of the Engineer-in-Charge and procedure laid down by him.
- 8.4 All necessary gauges and templates shall be supplied free to the Engineer-in-Charge by the Contractor whenever asked for during inspection. The Engineer-in-Charge, may at his discretion, check the test results obtained at the Contractor's works by independent tests at a test house, and the cost of such tests shall be borne by the Contractor.

9.0 SHOP PAINTING

- 9.1 All components and members of steel work shall be given one shop coat of primer (conforming to relevant BIS codes) or any other primer as specified, in the tender, immediately after the surfaces have been properly prepared (i.e. degreased, de-rusted, descaled & cleaned) in accordance with IS: 1477 or IS: 800, as applicable. The primer coat shall be applied over completely dry surfaces (using brushes of good quality) in a manner so as to ensure a continuous and uniform film without "holidaying". Special care shall be taken to cover all the crevices, corners, edges etc. However, in areas which are difficult to reach by brushing, daubers/mops shall be used by dipping the same in paint and then pulling/ pushing them through the narrow spaces. The primer coat shall be air dried and shall have a minimum film thickness as per table 29 of IS: 800 after drying, as applicable.
- 9.2 Surfaces which are inaccessible after shop assembly, shall receive the full specified protective treatment before assembly (this shall not apply to the interior of sealed hollow sections).
- 9.3 Steel surfaces shall not be painted within a suitable distance of any edges to be welded if the paint specified would be harmful to welders or impair the quality of the welds.
- 9.4 Welds and adjacent parent metal shall not be painted prior to de-slagging, inspection and approval by the Engineer-in-Charge.
- 9.5 Parts to be encased in concrete shall have only coat of primer and shall not be painted after erection.



10.0 PACKING

- 10.1 All items shall be suitably packed in case these are to be dispatched from the fabrication shop to the actual site of erection so as to protect them from any damage/distortion or falling during transit. Where necessary, slender projecting parts shall be temporarily braced to avoid warping during transportation.
- 10.2 Small parts such as gussets, cleats etc., shall be securely wired on to their respective main members.
- 10.3 Bolts, nuts washers etc. shall be packed in crates.

11.0 TRANSPORTATION

Loading and transportation shall be done in compliance with transportation rules. In case, certain parts cannot be transported in the lengths stipulated on the drawings, the position details of such additional splice joints shall be got approved by the Engineer-in-Charge.

12.0 SITE (FIELD) ERECTION

12.1 PLANT & EQUIPMENT

The suitability and capacity of all plant and equipment used shall be to the complete satisfaction of the Engineer-in-Charge.

12.2 STORING & HANDLING

All steel work shall be so stored and handled at site so that the members are not subjected to excessive stresses and any damage.

12.3 SETTING OUT

Prior to setting out of the steel work, the Contractor shall get himself satisfied about the correctness of levels, alignment, location of existing concrete pedestals/columns/brackets and holding down bolts/pockets provided therein. Any minor modification in the same including chipping, cutting and making good, adjusting the anchor bolts etc., if necessary, shall be carried out by the Contractor at his own expense. The positioning and levelling of all steel work including plumbing of columns and placing of every part of the structure with accuracy shall be in accordance with the drawings and to the complete satisfaction of the Engineer-in-Charge.

12.4 TOLERANCES

Tolerances for erection of steel structures shall be as per Annexure 'A'

13.0 SAFETY & SECURITY DURING ERECTION

- 13.1 The contractor shall comply with IS: 7205 for necessary safety and adhere to safe erection practices and guard against hazardous as well as unsafe working conditions during all stages of erection.



- 13.2 During erection, the steel work shall be securely bolted or otherwise fastened and when necessary, temporarily braced/guyed to provide for all loads to be carried by the structure during erection till the completion, including those due to the wind, erection equipment & its operation etc. at no extra cost to the owner. For the purpose of guying, the Contractor shall not use other structure in the vicinity without prior written permission of the Engineer-in-Charge.
- 13.3 No permanent bolting or welding shall be done until proper alignment has been achieved.
- 13.4 Proper access, platform and safety arrangement shall be provided for working and inspection, (at no extra cost to the owner) whenever required.

14.0 FIELD CONNECTIONS

14.1 FIELD BOLTING

Field bolting shall be carried out with the same care as required for shop bolting.

14.2 FIELD WELDING

All field assembly and welding shall be executed in accordance with the requirements for shop assembly and welding. Holes for all erection bolt – where removed after final erection shall be plugged by welding. Alternatively erection bolts may be left and secured.

15.0 GROUTING

- 15.1 Prior to positioning of structural columns/girders/trusses over the concrete pedestals/columns/brackets, all laitance & loose material shall be removed by wire brushing & chipping. The bearing concrete surfaces shall be sufficiently levelled, hacked with flat chisels to make them rough, cleaned (using compressed air) and made thoroughly wet. All pockets for anchor bolts shall also be similarly cleaned and any excess water removed. Thereafter, the structural member shall be erected, aligned & plumbed maintaining the base plates/shoe plates at the levels shown in the drawings, with necessary shims/pack plates/wedges.
- 15.2 After final alignment and plumbing of the structure, the forms shall be constructed around and joints made tight to prevent leakage. Grouting (under the base plates/shoe plates including grouting of sleeves & pockets) shall be done with non-shrink grout having compressive strength (28 days) not less than 40N/sq.mm Non shrink grout shall be of free flow premix type and of approved quality and make. It shall be mixed with water in proportion as specified by the manufacturer. Ordinary 1:2 cement/sand mortar grout shall be used only for small, isolated structures e.g. operating platforms not supporting any equipment, pipe supports, cross-over's, stairs & ladders. The thickness of grout shall be as shown on the drawings but not less than 25 mm nor more than 40mm in any case.
- 15.3 The grout mixture shall be poured continuously (without any interruption till completion) by grouting pumps from one side of the base plate and spread uniformly



with flexible steel strips and rammed with rods, till the space is filled solidly and the grout mixture carried to the other side of the base plate.

- 15.4 The grout mixture shall be allowed to harden for a period as decided by the Engineer-in-Charge. At the end of this period, the shims/wedges/pack plates may be removed and anchor bolts tightened uniformly. The alignment of the structure shall now be rechecked and if found correct, the voids left by the removal of shims/wedges/pack plates (if removed) must be filled up with a similar mixture of grout. In case after checking, serious misalignment is indicated, the grout shall be removed completely and fresh grouting done after making appropriate correction of alignment.

16.0 SCHEME AND SEQUENCE OF ERECTION

The Contractor shall furnish the detailed scheme and sequence of erection to match with the project schedule and get the same approved by the Engineer-in-Charge. All necessary co-ordination and synchronization shall be done with the Civil contractor where Civil works are not included in the scope of structural contractor at no extra cost so as to match with the project schedule.

17.0 PAYMENT

This clause shall apply to Item Rate tender only.

- 17.1 Payment for structural steel works shall be made on the basis of admissible weight in metric tons (determined as described in clause 17.2 and 17.3) of the structure accepted by the Engineer-in-Charge. The rate shall include supplying (as per supply conditions given in the Tender) fabricating, erecting in position (at all levels & locations), testing/examining (excluding radiography only) of bolted and/or welded structural steel works of all types (including all built up/compound sections made out of rolled sections and/or plates) including all handling, transporting, storing, straightening if required, cutting, edge preparation, preheating, bolting and welding of joints (including sealing the joints of box sections with continuous welding), finishing edges by grinding/machining as shown, fixing in line & level with temporary staging & bracing and removal of the same after erection, grouting with no shrink/ordinary grout as specified, preparation of fabrication & erection drawings, & erection schedule and getting them reviewed, preparation and submission of as built drawings, as built drawings, preparing the surfaces for painting, surface cleaning, wire brushing, removal of mill scale, dust, rust, oil or grease and applying coat of primer or any other primer as specified after fabrication, return of surplus materials to owner's stores and material reconciliation in the case of materials supplied by the owner as per relevant contract conditions etc. all complete for all the operations mentioned in the foregoing clauses.
- 17.2 The weight for payment shall be determined from the fabrication drawings and respective bill of materials prepared by the Contractor. The bill of materials shall be checked and approved by the Engineer-in-Charge before making the payment. The Contractor shall prepare full scale template in order to supplement/verify the actual cutting dimensions where so directed by the Engineer-in-Charge. The weight shall be calculated on the basis of BIS Hand Book wherever applicable. In case sections used



are different from BIS sections, then Manufacturers' Hand Book shall be adopted. No allowance in weight shall be made for rolling tolerances.

- 17.3 Welds, bolts, nuts, washers, shims, pack plates, wedges, grout and shop painting shall not be separately measured. The quoted rate shall be deemed to include the same.
- 17.4 The rate shall include all expenses related to safety & security arrangements during erection and all plants & tools required for fabrication, transportation & erection.

18.0 PAINTING AFTER ERECTION

18.1 GENERAL

- 18.1.1 The scope of painting after erection shall be at the sole discretion of the Engineer-in-Charge and the Contractor shall obtain written instruction in this regard sufficiently prior to taking up any procurement of paint and execution of painting work after erection of steel structures.
- 18.1.2 The Contractor shall carry out the painting work in all respects with the best quality of approved materials (conforming to relevant BIS Codes or IS: 800, as applicable) and workmanship in accordance with the best engineering practice. The Contractor shall furnish characteristics of paints (to be used) indicating the suitability for the required service conditions. The paint manufacturer's instructions supplemented by Engineer-in-Charge's direction, if any, shall be followed at all times. Particular attention shall be paid to the following:
- a. Proper storage to avoid exposure & extremes of temperature.
 - b. Surface preparation prior to painting.
 - c. Mixing & thinning.
 - d. Application of paint and the recommended limit on time intervals between consecutive coats.
- 18.1.3 Painting shall not be done in frost or foggy weather, or when humidity is such as to cause condensation on the surfaces to be painted.
- 18.1.4 Surface which shall be inaccessible after site assembly shall receive the full specified protective treatment before assembly.
- 18.1.5 Primers & finish coat paints shall be from the same manufacturer in order to ensure compatibility. Painting colour code shall be as per Annexure-'B'.

18.2 RUB DOWN & PRIMER APPLICATION

The shop coated surfaces shall be rubbed down thoroughly with emery/abrasive paper to remove dust, rust, other foreign matters and degreased, if required, in accordance with IS: 1477 or IS: 800, as applicable, cleaned with warm fresh water and air dried. The portions, from where the shop coat has peeled off, shall be touched up and allowed to dry.



Primer coat as per table 29 of IS: 800 shall be applied by brushing/ spraying over the shop coat in a manner so as to ensure a continuous and uniform film throughout. Special care shall be taken to cover all the crevices, corners, edges etc. The final primer coat shall be air dried and shall have a minimum film thickness as per IS: 800 after drying, as applicable.

In case a different cleaning procedure & primer specifications are specified in the drawing/Tender, the same shall be adopted.

18.3 FINAL PAINT APPLICATION

After the primer is hard dry, the surfaces shall be dusted off and one coat of synthetic enamel paint of approved colour & shade (conforming to IS: 2932) or any other paint as per IS: 800, shall be applied by brushing/spraying so that a film free from "holidaying" is obtained. The colour & shade of first coat of paint shall be slightly lighter than the second coat in order to identify the application of each coat. The second coat of paint shall be applied after the first coat is hard dry. The minimum thickness of each film shall be as per IS: 800 after drying.

In case a different type of paint & painting procedure are specified in the drawing/tender, the same shall be adopted.

Color coding for structural steel shall be as per ANNEXURE "B".

18.4 INSPECTION & TESTING OF PAINTING WORKS

18.4.1 All painting materials including primers & thinners brought to site by the Contractor for application shall be procured directly from reputed and approved manufacturers and shall be accompanied by manufacturer's test certificates. Paint formulations without certificates shall not be accepted.

18.4.2 The Engineer-in-Charge at his discretion may call for additional tests for paint formulations. The Contractor shall arrange to have such tests performance including batch wise test of wet paints for physical & chemical analysis. All costs shall be borne by the Contractor.

18.4.3 The painting work shall be subject to inspection by the Engineer-in-Charge at all times. In particular, the stage inspection will be performed and Contractor shall offer the work for inspection and approval at every stage before proceeding with the next stage. The record of inspection shall be maintained. Stages of inspection are as follows:

- a. Surface preparation
- b. Primer application
- c. Each coat of paint

18.4.4 Any defect noticed during the various stages of inspection shall be rectified by the Contractor to the entire satisfaction of the Engineer-in-Charge before proceeding further. Irrespective of the inspection, repair and approval at intermediate stages of



work the Contractor shall be responsible for making good any defects found during final inspection/guarantee period/defect liability period, as defined in General Conditions of Contract. Dry film thickness (DFT) shall be checked and recorded after application of each coat. The thickness shall be measured at as many locations as decided by the Engineer-in-Charge. The Contractor shall provide standard thickness measuring instrument such as elcometer (with appropriate range for measuring dry film thickness of each coat) free of cost to the Engineer-in-Charge whenever asked for.

18.5 PAYMENT

This clause shall apply to Item Rate tender only.

Payment for painting of structural steel works shall be made on the basis of admissible weight in metric tons of the painted structures accepted by the Engineer-in-Charge.

The rate shall include supplying & applying two coats of synthetic enamel paint or any other paint specified in the tender of approved quality and shade over a coat of red oxide zinc chromate primer or any other primer specified in the tender over one coat of shop primer already applied to structural steel works of all types/shapes at all levels, locations & positions including storage, surface preparation, degreasing, cleaning, drying, touching up of shop primer coat, providing temporary staging, testing etc. all complete to the entire satisfaction of the Engineer-in-Charge.

**ANNEXURE-'A'****(Clause 12.4)**

Maximum Permissible Erection Tolerances

A. Columns

1. Deviation of column axes at foundation top level with respect to true axes.
 - i) In longitudinal direction $\pm 5\text{mm}$
 - ii) In lateral direction $\pm 5\text{mm}$
2. Deviation in the level of bearing surface of columns at foundation top with respect to true level $\pm 5\text{mm}$
3. Out of plumb (Verticality) of column axis from true vertical axis, as measured at top:
 - i) Up to and including 30m height $\pm H/1000$ or $\pm 25\text{mm}$
Whichever is less.
 - ii) Over 30m height $\pm H/1200$ or $\pm 35\text{mm}$
Whichever is less.
4. Deviation in straightness in longitudinal & transverse planes of column at any point along the height. $\pm H/1000$ or $\pm 10\text{mm}$
Whichever is less.
5. Difference in the erected positions of adjacent pairs of columns along length or across width of building prior to connecting trusses/beams with respect to true distance. $\pm 5\text{mm}$
6. Deviation in any bearing or seating level with respect to true level. $\pm 5\text{mm}$
7. Deviation in difference in bearing levels of a member on adjacent pair of columns both across & along the building. $\pm 5\text{mm}$

Note: 1. Tolerance specified under 3 should be read in conjunction with 4 & 5.

Note: 2. 'H' is the column height in mm.

**B. Trusses**

- | | | |
|----|--|---|
| 1. | Shift at the centre of span of top chord member with respect to the vertical plane passing through the centre of bottom chord. | ±1/250 of height of truss in mm at centre of span or ±15mm whichever is less. |
| 2. | Lateral shift of top chord of truss at the centre of span from the vertical plane passing through the centre of supports of the truss. | ±1/1500 of height of truss in mm or ±10mm whichever is less. |
| 3. | Lateral shift in location of truss from its true position. | ±10mm |
| 4. | Lateral shift in location of purlin from true position. | ±5mm |
| 5. | Deviation in difference of bearing levels of truss from the true level. | ±1/1200 of span of truss in mm or ±20mm whichever is less. |

C. Gantry Girders & Rails

- | | | |
|-----|--|---|
| 1. | Shift in the centre line of crane rail with respect to centre line of web of gantry girder. | $\pm \left[\frac{\{\text{web thickness (mm)}\} + 2\text{mm}}{2} \right]$ |
| 2. | Shift of alignment of crane rail (in plan) with respect to true axis of crane rail at any point. | ±5mm |
| 3. | Deviation in crane track gauge with respect to true gauge. | |
| i) | For track gauge up to and including 15m. | ±5mm |
| ii) | For track gauge more than 15m. | ±[5+0.25 (S-15)]
Subjected to maximum ±100mm, where S in Metres is true gauge. |
| 4. | Deviation in the crane rail level at any point from true level. | ±10mm |
| 5. | Difference in level between crane track rails (across the bay) at | |
| i) | Supports of gantry girders | 15mm |
| ii) | Mid span of gantry girders | 20mm |
| 6. | Relative shift of crane rail surfaces (at a joining) in plan and elevation. | 2mm |

**ANNEXURE-'B'****(Clause 18.3)****PAINTING COLOUR CODE FOR STRUCTURAL STEEL**

1.	GANTRY GIRDER & MONORAIL	DARK GREEN
2.	GANTRY GIRDER & MONORAIL STOPPER	SIGNAL RED
3.	BUILDING STRUCTURAL STEEL COLUMNS, BRACKETS, BEAMS, BRACINGS, ROOF TRUSS, PURLINS, SIDEGIRTS, LOUVERS, STRINGERS,	DARK ADMIRALITY GREY
4.	PIPE RACK STRUCTURE & TRESTLE	DARK ADMIRALITY GREY
5.	CHEQUERED PLATE (BOTH FACES)	BLACK
6.	GRATING	BLACK
7.	LADDER	RUNGS-BLACK VERTICALS & CAGE RED
8.	HAND RAILING	
	- HANDRAIL, MIDDLE RAIL, TOE PLATE	SIGNAL RED
	- VERTICAL POST	BLACK







Energising Quality

VCS Quality Services Pvt Ltd

**STANDARD SPECIFICATION
FOR
MISCELLANEOUS STEEL WORKS**

VCS-SS-CS-6026

					
03	31.01.2022	NV	GDS	HK	GW
02	25.02.2020	NV	GDS	RKB	SK
01	16.10.2019	MA	MO	AD	SK
00	05.07.2017	MA	MO	AD	SK
Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By

UNCONTROLLED COPY : If printed

CONTROLLED COPY : If in soft and signed



Energising Quality

**STANDARD SPECIFICATION
FOR MISCELLANEOUS STEEL WORKS**

**DOC NO: VCS-SS-CS-6026
Rev No : 03**

REVISION RECORD						
Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description
00	05.07.2017	MA	MO	RKB	AD	Issued for use as Standard
01	16.10.2019	MA	MO	RKB	SK	
02	25.02.2020	NV	GDS	RKB	SK	New revision system updated.
03	31.01.2022	NV	GDS	HK	GW	VCS QMS Integration



ABBREVIATION

m	Metre
mm	Millimetre
g/m ²	Gram Per Square Metre
MS	Mild Steel
BIS	Bureau of Indian Standards
Kg	Kilogram
RCC	Reinforced Cement Concrete
PCC	Plain Cement Concrete



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1.0 SCOPE

- 1.1 All materials supplied by the Contractor shall conform to their respective specifications given in Specification No. VCS-SS-CS-6021.
- 1.2 The Contractor shall furnish test certificates for all materials prior to their use in the works.
- 1.3 Other requirements not covered under this specification shall be in accordance with specification no. VCS-SS-CS-6024 Structural Steel Works.

2.0 REFERENCES

As mentioned in the respective clauses

3.0 MATERIAL

As mentioned in the respective clauses.

4.0 ANCHOR BOLTS

4.1 MATERIAL

Materials for anchor bolts, nuts, locknuts, washers, pipe sleeves and anchor plates shall conform to their respective specification given in Specification No. VCS-SS-CS-021.

4.2 FABRICATION

Fabrication of anchor bolts and their complete assemblies shall be strictly in compliance with the specifications and drawings/standards. Anchor bolts shall have coarse type threads conforming to IS: 4218.

4.3 PLACEMENT

Anchor bolt assemblies shall be placed in position strictly as per drawings and securely held during pouring and vibrating of concrete with necessary templates and other dummy structures to prevent their dislocation.

4.4 TOLERANCES

Tolerances allowed for anchor bolts positioning shall be:

- a. For sleeved bolts, one tenth of the bolt nominal diameter.
- b. For bolts without sleeves, one twentieth of the bolt nominal diameter.

4.5 PROTECTION

The exposed surfaces of bolts shall be properly covered (after greasing of bolts and packing of sleeves) with jute cloth so as to protect them from damage till final erection of structure/equipment is over.



4.6 PAYMENT

This clause shall apply to item rate tenders only.

- 4.6.1 Payment shall be made on the basis of actual weight in metric tons of the anchor bolt/anchor bolt assembly. The rate shall include supply (as per scope of supply conditions given in the tender) of all materials, handling, transporting, fabrication, turning from available size MS round to required diameter, threading, welding, fixing in position, at all levels and locations, providing necessary templates, greasing, packing of sleeves, covering with jute cloth and other protective measures etc. all complete.
- 4.6.2 The rate shall cover bolt of any diameter and nomenclature.
- 4.6.3 Payment for fixing in position anchor bolt assembly (already fabricated and supplied by the Owner as free issue) shall be made on the basis of actual weight of anchor bolts/bolt assemblies in metric tons. The rate shall include handling, transporting, fixing in position, welding if required, providing necessary templates, greasing, packing of sleeves, covering with jute cloth and other protective measures etc. all complete.
- 4.6.4 No separate payment shall be made for templates, dummy structures; supports etc. and the rate quoted shall be inclusive of all cost related to such provision required for correct and accurate installation of anchor bolts/assembly.

5.0 METAL INSERTS

5.1 MATERIAL

Materials required for fabricating metal inserts shall conform to their respective specification given in Specification No. VCS-SS-CS-6021.

5.2 FABRICATION

Fabrication of inserts shall be done strictly as per drawings/standards and in compliance with the requirements given in Specification No. VCS-SS-CS-6024 Structural Steel Works.

5.3 PLACEMENT

Metal inserts shall be correctly embedded (in plain concrete/reinforced concrete) as per their location shown on the drawings. Care shall be taken that these are securely held in position and do not get disturbed during concreting. Where necessary, these may be welded to the reinforcement bars. Suitable templates, spacers, dummy structures and temporary staging shall be provided. Necessary cutting in the formwork and adjustment of reinforcement bars shall be done for the placement of metal inserts where required.

5.4 PAINTING

The exposed surfaces of metal inserts shall be cleaned with wire brush and given coat of primer as per table 29 of IS: 800 as specified, after fabrication.

5.5 PAYMENT



This clause shall apply to item rate tenders only.

- 5.5.1 Payment shall be made on the basis of actual weight in metric tons of the metal inserts. The rate shall include supply (as per supply conditions given in the tender) of all materials, handling, transporting, fabrication, welding, fixing in position, at all levels and locations, providing necessary templates, spacers, dummy structures, adjusting the formwork and reinforcement, staging, preparation of surface for painting, applying coat of primer as specified, etc. all complete.

6.0 CHEQUERED PLATES

6.1 MATERIAL

Chequered plates shall be of mild steel and conforming to IS: 3502. Chequering shall be closed or open-ended or of any other pattern as shown on drawings.

6.2 FABRICATION DRAWINGS

Refer clause 4.0 of Specification No. VCS-SS-CS-6024- Structural Steel Works.

6.3 FABRICATION

Chequered plates shall be fabricated as per the "Approved for Construction" fabrication drawings (prepared by the Contractor based on design drawings). These shall be perfectly flat and without any dents/deformations and shall be cut to the required size and shape. Holes/notches/openings of the required size, if any, shown on drawings shall be made. Nosing for staircase treads shall be made by cold bending of chequered plates. All edges shall be made smooth and even. All chequered plate units shall be given distinct erection marks in accordance with the marking drawings. Stiffeners of any description shall be welded with the chequered plates where shown on drawings

6.4 ERECTION/FIXING

Chequered plates shall be fixed to the bearing members by welding/ bolting/screwing as shown on drawings. All bolts/screws shall be of counter-sunk type so that the heads remain flush with the top of plate. Where welding is used for fixing, stitch welds of minimum 50mm length with a pitch of 150mm shall be used. Continuous sealing run of weld shall be provided along the junction of two consecutive chequered plates parallel to the span. For removable flooring, details as shown on drawings shall be followed.

6.5 PAINTING

Chequered plates shall be cleaned (both the surfaces) with wire brush and given coat of primer as per table 29 of IS: 800, as specified, on both surfaces.

6.6 PAYMENT

This clause shall apply to item rate tenders only.

- 6.6.1 Payment shall be made on the basis of admissible weight in metric tons (determined as described in clause 6.6.2) of the chequered plates accepted by the Engineer-in-Charge.



Where stiffeners are used, weight of the same shall be included in arriving at admissible weight.

The rate shall include supplying (as per supply conditions given in the tender), fabricating, erecting M.S. chequered plates including transporting, handling, straightening if required, cutting to required size and shape, making holes/notches/opening of required size and nosing, smoothening the edges, fixing by welding/bolting/screwing, at all levels and locations, preparing detailed fabrication drawings, surface cleaning, removal of rust, scale, grease and applying coat of primer as per table 29 of IS: 800, as specified, etc. all complete.

In any stiffening sections are provided below the chequered plates for strengthening, the same shall be separately measured & paid under Structural Steel item (Viz. Specification No. VCS-SS-CS-6024

- 6.6.2 The weight for payment shall be determined from the fabrication drawings and respective bill of materials prepared by the Contractor. The bill of materials shall be checked and approved by the Engineer in Charge before making the payment. The weight shall be calculated on the basis of BIS Handbook. No allowance in weight shall be made for rolling tolerances.
- 6.6.3 Welds, bolts, nuts, screws, washers, and clips shall not be measured. The quoted rate shall be deemed to include the same.

7.0 GRATINGS

7.1 CATEGORIES

The gratings shall be of two categories:

- a. Category 'A' - Fabricated by the Contractor as per design drawings/standards.
- b. Category 'B' - Ready made bought out from an approved manufacturer.

7.2 MATERIAL

Materials for fabrication and fixing of Gratings shall conform to their respective specification given in Specification No. VCS-SS-CS-6021

7.3 FABRICATION DRAWINGS

Refer clause 4.0 of Specification No VCS-SS-CS-6024 - Structural Steel Works.

7.4 FABRICATION

7.4.1 CATEGORY 'A' GRATINGS

These shall be fabricated strictly as per the "Approved for Construction" fabrication drawings prepared by the Contractor based on design drawings and standards. All units shall be given distinct erection marks in accordance with the marking drawing. All notching in the flats shall be punched and not flame-cut. Continuous around welding



shall be done along the contact-lines between two flats on both the surfaces. All fabrication shall be done in a shop under strict supervision. Clamps shall be fabricated as shown on drawing/standard.

7.4.2 CATEGORY 'B' GRATINGS

These shall be as per manufacturer's details designed to carry loads as specified on the design drawing supplied to the contractor. The deflection shall not exceed span/200 or 6mm whichever is minimum. The maximum clear size of voids in the grating shall be limited to 30mm x 55mm. Thickness of grating shall be 25mm. The Contractor shall make necessary notches/ opening in the gratings as shown in the drawings. All edges affected by such notches/openings shall be suitably stiffened by welding additional flats of the requisite size. All units shall be given distinct erection marks in accordance with the marking drawings. Before procurement the Contractor shall submit the design calculations, drawings and manufacturer's literature/catalogues and get the same reviewed by the Engineer-in- Charge. The Contractor shall submit sample gratings for inspection and approval by the Engineer-in-Charge whenever asked for.

7.5 ERECTION / FIXING

Gratings shall be fixed to the bearing members by welding/clamping and bolting as indicated in the drawings. Minimum length and maximum pitch of welds shall be 50mm and 150mm respectively where stitch welding is used for fixing along the lines of supports. The edges of two consecutive gratings shall be bolted with minimum two bolts on each side of the grating panel.

7.6 GALVANIZING

Gratings and the fixing clamps, bolts, nuts shall be cleaned with wire brush and galvanization shall be done in accordance with IS: 2629 and tested as per IS: 2633 & 6745. Quantity of zinc coating shall be minimum 900 gm/sq.m. of surface area (0.12mm uniform thickness).

7.7 PAYMENT

This clause shall apply to item rate tenders only.

7.7.1 Payment shall be made on the basis of admissible weight in metric tons (determined as described in clause 7.7.2) of the gratings accepted by the Engineer- in Charge.

The rate shall include supplying, fabricating, erecting MS gratings (of the specified category) including transporting, handling, cutting to required size and shape, making holes/notches/openings, smoothening the edges, fabricating clamps, fixing by welding/clamping/ bolting, at all levels and locations, preparing detailed fabrication drawings, surface cleaning, removal of rust, scale, grease and applying coat of primer as per table 29 of IS: 800, as specified, or galvanizing as required, all complete.

7.7.2 The weight for payment shall be determined from the fabrication drawings and respective bill of materials prepared by the Contractor. The bill of materials shall be checked and approved by the Engineer-in- Charge before making the payment. The



weight shall be calculated on the basis of BIS Handbook as mentioned above. No allowance in weight shall be made for rolling tolerances.

- 7.7.3 Welds, bolts, clamps, nuts and washers shall not be measured. The quoted rate shall be deemed to include the same.

8.0 TUBULAR HAND RAILING

8.1 MATERIAL

Materials for fabrication and fixing of Tubular Hand Railing shall confirm to their respective specification given in Specification No. VCS-SS-CS-6021

8.2 FABRICATION DRAWINGS

Refer clause 4.0 of Specification No. VCS-SS-CS-6024 - Structural Steel Works.

8.3 FABRICATION

Hand railing shall be fabricated strictly as per the "Approved for Construction" fabrication drawings prepared by the Contractor based on design drawings and standards. All tubes shall be straight and without any dents/deformations. Tubes shall be cut and ends shall be prepared to a neat and workman-like finish. All elements shall be directly welded. All welded joints shall be cleaned and filed or ground smooth, if required, to have a smooth surface and aesthetically pleasant appearance. Splicing of top rail shall not be allowed. Tubes shall be cold bent to shape and curvature in case of discontinuous ends of handrails. Ripples, kinks and/or dents at bends shall not be accepted.

Lower ends of vertical posts shall be cut and splayed (for grouting in pockets in the concrete members). For removable type of hand railing, suitable base plates (with provision for bolting) shall be welded to the lower end of vertical posts. All units shall be given distinct erection marks in accordance with the marking drawing.

8.4 ERECTION/FIXING

Hand railing, shall be fixed to the bearing members by welding/ bolting/ grouting as indicated on the drawings. Local notching shall be made in the floor plate/grating to accommodate vertical posts/their base plates which shall always be welded to the main supporting member. When the posts are to be fixed in concrete members, suitable pockets shall be made in concrete for grouting as shown on drawings/standards.

8.5 PAINTING

Tubes shall be cleaned with wire brush and given coat of primer as per table 29 of IS: 800, as specified, after fabrication.

8.6 PAYMENT

This clause shall apply to item rate tenders only.



- 8.6.1 Payment shall be made on the basis of measured length in meters (m) of top rail only (Horizontal and/or inclined lengths). The rate shall include preparation of fabrication drawings, supply of all materials, handling, transporting, straightening if required, cutting to required size, bending, welding, bolting, fixing in position at all levels and locations, grouting with 1:2 (cement: sand) mortar, surface cleaning, removal of rust, scale, grease and applying coat of primer as per table 29 of IS: 800, as specified, after fabrication etc. all complete.
- 8.6.2 The rate shall include making suitable notches in floor plates/gratings and pockets in concrete structures for fixing the vertical posts.

9.0 MILD STEEL RUNGS

MATERIAL

All materials shall conform to their respective specifications given in Specification No. VCS-SS-CS-6021

9.2 FABRICATION

Rungs shall be fabricated as per standards/drawings. Mild steel bars shall be straightened if required, cut, bent to shape and given coat of primer on exposed portions.

9.3 FIXING

Rungs shall be fixed in position as per detailed drawing and firmly tied/welded with reinforcement to prevent their displacement during vibrating of concrete.

9.4 PAYMENT

This clause shall apply to item rate tenders only.

- 9.4.1 Payment shall be made on the basis of actual weight in kilograms (Kgs.) of the M.S. rungs. The rate shall include supply of all materials handling, transporting, straightening if required, cutting to required size, bending to shape, tying/welding with reinforcement bars, fixing at all levels and locations, adjustment of formwork, applying coat of primer as per table 29 of IS: 800, as specified, and two coats of anti-corrosive paint or any other paint, as specified, on the exposed portion of rungs etc. all complete.

10.0 LIGHT GAUGE STEEL STRUCTURAL SECTIONS

10.1 MATERIAL

All materials required for fabrication and fixing in position of Light Gauge Steel Structural Sections shall conform to their respective specification given in Specification No. VCS-SS-CS-6024

10.2 FABRICATION DRAWINGS

Refer clause 4.0 of Specification No. VCS-SS-CS-6024 Structural Steel Works.



10.3 FABRICATION

Fabrication of members shall be done strictly as per the "Approved for Construction" fabrication drawings prepared by the Contractor based on the latest design drawings and in accordance with IS:800, IS:801 and other relevant BIS Codes.

All members shall be straight and free from any dents/deformations/ twists. Members shall be cut to the required sizes and ends prepared to a neat and workman like finish. Holes (for sag rods and cleat bolts) of appropriate size shall be drilled and all members/ components shall be given distinct erection marks in accordance with the marking drawings. Holes shall not be formed by gas cutting process.

10.4 ERECTION

Structural members shall be erected in proper sequence and aligned properly without causing any twist. Permanent bolting/welding shall be done only after proper alignment has been achieved. Proper access, working platforms and safety arrangements shall be provided by the Contractor for working and inspection.

10.5 PAINTING

All structural components shall be cleaned thoroughly and given coat of primer as per table 29 of IS: 800, as specified, after fabrication.

10.6 PAYMENT

This clause shall apply to item rate tenders only.

10.6.1 Payment shall be made on the basis of admissible weight in metric tons (determined as described in clause 10.6.2) of the structure accepted by the Engineer-in-Charge. The rate shall include supplying, fabricating, erecting, at all levels and locations, testing of bolted and/or welded Light Gauge structural steel works including cleats, crook bolts, splices/sleeves, all other fixtures and accessories, straightening if required, cutting, edge preparation, welding and bolting of joints , fixing in line and level with temporary staging and removal of the same after final alignment, handling, transporting, storage, preparation of detailed fabrication drawings and getting them reviewed by the Engineer-in-Charge, surface cleaning, wire brushing, removal of scale, rust, oil or grease and painting as per clause no. 8.5 above etc., all complete.

10.6.2 The weight for payment shall include all structural members, cleats, splices, gussets and sag rods and shall be determined from the fabrication drawings along with respective bill of materials prepared by the Contractor. The bill of materials shall be checked and approved by the Engineer-in-Charge before making the payment. The weight shall be calculated on the basis of BIS Handbook. Manufacturer's catalogues/ charts shall be adopted in case relevant weights of sections used are not covered in BIS Handbook. No allowance in weight shall be made for rolling tolerances.

10.6.3 All welds, bolts, nuts washers, fixtures and accessories shall not be measured. The quoted rate shall be deemed to include the same.



- 10.6.4 The rate shall be applicable to all cleats, splices, sleeves and gussets. Sag rods, however, shall be separately measured and paid under structural steel item (viz. Specification No. VCS-SS-CS-6024)

11.0 EXPANSION FASTENERS

11.1 MATERIAL

Expansion fasteners (medium and heavy duty) shall be of mild steel/high tensile steel with rust proof coating including both mechanical & chemical fasteners.

11.2 CLASSIFICATION

The expansion fasteners shall be designated as medium and heavy duty depending on their usage. The broad classification is given below for general guidance.

11.2.1 MEDIUM DUTY (MILD STEEL/HIGH TENSILE STEEL)

- a. Ladders and stairs supports.
- b. Cables and cable trays supports.
- c. Electrical panels and fixtures.
- d. Hangers for pipes and cable trays.
- e. Pipe supports.

11.2.2 HEAVY DUTY (MILD STEEL/HIGH TENSILE STEEL)

- a. Platform supports (beam and columns)
- b. Knee brackets for pipes/multi tiers cable trays/walkways etc.

Note: - Expansion fasteners shall not be used for

- i. Members supporting equipment and pipes subjected to vibrations.
- ii. Cantilever connections designed to cater for effective cantilever spans greater than 1000mm and 1000Kgs. of concentrated load at the free end.

11.3 SELECTION

The Contractor shall submit to the Engineer-in-Charge manufacturer's catalogues along with the specimens of expansion fasteners (proposed to be used for the job) for his selection and approval. Selected fasteners shall be capable to carry the specified loads.

11.4 TESTING

If so desired by the Engineer-in-Charge, the Contractor shall carry out all the requisite tests (pullout test, torque test etc.) of specimen expansion fasteners (representative of those to be used) from approved laboratory/ test house and submit the report to him for approval. The decision of the Engineer-in-Charge regarding the adequacy of



strength and load carrying capacity of the expansion fastener shall be final and binding to all. The cost of all such tests shall be borne by the Contractor.

11.5 INSTALLATION

The Contractor shall install the expansion fasteners at their correct location (to suit the requirement of fixtures as shown in drawings) as per the procedure laid down by the manufacturer. Location of all holes shall be pre-marked on the concrete surfaces and then holes drilled carefully with an electric drill to the correct recommended size and depth. Holes shall be exactly round and true perpendicular to the concrete surface. Edge distance and pitch of fasteners shall be as recommended by the manufacturer. The contractor shall suitably shift the hole with the approval of the Engineer-in-Charge in case any reinforcement bar is met with while drilling the hole in RCC structure. Necessary staging shall be provided for working and the Contractor shall take requisite safety precautions so as not to cause any damage to the existing structure/ equipment. Any damage done while executing the job shall be made good by the Contractor at his cost

11.6 PROTECTION

The exposed surfaces of expansion fasteners shall be properly greased & covered with jute cloth so as to protect them from damage.

11.7 PAYMENT

This clause shall apply to item rate tenders only.

- 11.7.1** Payment for installing rust proof expansion fasteners shall be made on number basis (each). The rate shall include supply of complete assembly, handling, transporting, providing necessary temporary staging, installing (as per manufacturer's specifications) in PCC/RCC structures, at all levels and locations, testing, drilling, cleaning, covering with jute cloth, relocating and re-drilling in case of any obstruction, making good any damage done to the structure, grouting the abandoned holes and any gap left between the contact surfaces of PCC/RCC and fixtures to be added, etc. all complete.







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VCS Quality Services Pvt Ltd

**STANDARD SPECIFICATION
FOR
BRICK MASONRY**

VCS-SS-CS-6027

					
03	31.01.2022	NV	GDS	HK	GW
02	25.02.2002	NV	GDS	RKB	SK
01	16.10.2019	MA	MO	AD	SK
00	05.07.2017	MA	MO	AD	SK
Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By

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Energising Quality

**STANDARD SPECIFICATION
FOR BRICK MASONRY**

**DOC NO: VCS-SS-CS-6027
Rev No : 03**

REVISION RECORD						
Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description
00	05.07.2017	MA	MO	RKB	AD	Issued for use as Standard
01	16.10.2019	MA	MO	RKB	SK	
02	25.02.2020	NV	GDS	RKB	SK	New revision system updated
03	31.01.2022	NV	GDS	HK	GW	VCS QMS Integration



ABBREVIATION

m	Metre
mm	Millimetre
Cm	Centimetre
m ²	Square metre
m ³	Cubic Metre
Kg	Kilogram
IS	Indian Standard
MS	Mild Steel
C/C	Center to Center
RCC	Reinforced Cement Concrete
PCC	Plain Cement Concrete



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1.0 SCOPE

THIS SPECIFICATION ESTABLISHES THE MATERIALS, DRESSING, LAYING, JOINING, CURING, WORKMANSHIP ETC. FOR BRICK MASONRY WORKS. BRICK MASONRY SHALL ALSO COMPLY WITH ALL THE REQUIREMENTS OF IS: 2212.

2.0 REFERENCES

2.1 BIS CODES

IS: 2212 Brick works-code of practice

IS: 2250 Code of practice for preparation and use of masonry works

2.2 SPECIFICATIONS

VCS-SS-CS-6021 Materials

3.0 MATERIALS

Refer specification no. VCS-SS-CS-6021: Materials

4.0 GENERAL REQUIREMENTS

4.1 CEMENT MORTAR

Cement mortar shall meet the requirements of IS: 2250 and shall be prepared by mixing cement and sand by volume. Proportion of cement and sand shall be 1:6 (1 part of cement and 6 parts of sand), or as directed by the Engineer-in-Charge/shown on the drawing, for brick masonry of one brick thickness or more, while 1:4 cement mortar (1 part of cement and 4 parts of sand) shall be used for brick masonry of half brick thickness. The sand being used for mortar shall be sieved. The mortar shall be used as soon as possible after mixing and before it has begun to set and in any case within initial setting time of cement after water is added to the dry mixture. Mortar unused for more than initial setting time of cement, shall be rejected and removed from the site of work.

4.1.1 PROPORTIONING

The unit of measurement for cement shall be a bag of cement weighing 50 kgs and this shall be taken as 0.035 cubic metre. Sand shall be measured in boxes of suitable size on the basis of its dry volume. In case of damp sand, its quantity shall be increased suitably to allow for bulkage.

4.1.2 MIXING

The mixing of mortar shall be done in a mechanical mixer operated manually or by power. The Engineer-in-Charge may, however, permit hand-mixing as a special case, taking into account the magnitude, nature and location of work. The Contractor shall take the prior permission of Engineer-in-Charge, in writing, for using hand-mixing before the commencement of work.



a. Mixing in Mechanical Mixer

Cement and sand in specified proportions, by volume, shall be thoroughly mixed dry in a mixer. Water shall then be added gradually and wet mixing continued for at-least one minute. Care shall be taken not to add more water than that which shall bring the mortar to the consistency of stiff paste. Wet mix from the mixer shall be unloaded on water-tight masonry platform, made adjacent to the mixer. Platform shall be at-least 150 mm above the levelled ground to avoid contact of surrounding earth with the mix. Size of the platform shall be such that it shall extend at-least 300mm all-round the loaded wet mix area. Wet mix, so prepared, shall be utilized within initial setting time [thirty (30) minutes either for ordinary Portland cements conforming to IS: 269 or for Portland slag cement conforming to IS: 455] after addition of water. Mixer shall be cleaned with water each time before suspending the work.

b. Hand Mixing

The measured quantity of sand shall be levelled on a clean water-tight masonry platform and cement bags emptied on top. The cement and sand shall be thoroughly mixed dry by being turned over and over, backward and forward, several times till the mixture is of uniform colour. The quantity of dry mix which can be consumed within initial setting time of cement shall then be mixed with just sufficient quantity of water to bring the mortar to the consistency of stiff paste.

5.0 CONSTRUCTION PROCEDURE

5.1 SOAKING OF BRICKS

Bricks shall be soaked in water before use for a period that is sufficient for the water to just penetrate the whole depth of bricks as well as to remove dirt, dust and sand. Proper soaking of bricks shall prevent the suction of water from the wet mortar as otherwise mortar will dry out soon and crumble before attaining any strength. The bricks shall not be too wet at the time of use as they are likely to slip on mortar bed and there will be difficulty in achieving the plumb-ness of wall as well as proper adhesion of bricks to mortar. The period of soaking shall be determined at site by a field test by immersing the bricks in water for different periods and then breaking the bricks to find the extent of water penetration. The least period that corresponds to complete soaking, will be the one, to be allowed for in the construction work.

The soaked bricks shall be removed from the tank, sufficient early, so that at the time of laying, they are skin dry. The soaked bricks shall be stacked over a clean place, wooden planks or masonry platforms to avoid earth, dirt being smeared on them.

5.2 LAYING

5.2.1 BRICK WORK (ONE OR MORE BRICK THICKNESS)



Brick work (one or more brick thickness) shall be laid in English Bond unless otherwise specified. Half or cut bricks shall not be used except when needed to complete the bond. In no case the defective bricks shall be used.

A layer of average thickness of 10mm of cement mortar shall be spread on full width over a suitable length of lower course or the concrete surface. In order to check and achieve uniformity in masonry, the thickness of bed joints shall be such that four courses and three joints taken consecutively shall measure equal to four times the actual thickness of the brick plus 30mm. Each brick with frog upward shall be properly bedded and set in position by gently tapping with handle of trowel or wooden mallet. Its inside faces shall be buttered with mortar before the next brick is laid and pressed against it. After completion of the course, all vertical joints shall be filled from top with mortar.

All brick courses shall be taken up truly plumb; if battered, the batter is to be truly maintained. All courses shall be laid truly horizontal and vertical joints shall be truly vertical. The level and verticality of work in walls shall be checked up at every one metre interval.

The masonry walls of structures shall be carried up progressively, leaving no part one metre lower than the other. If this cannot be adhered to, the brick work shall be raked back according to bond (and not left toothed) at an angle not more than 45 degrees but raking back shall not start within 60 cm of a corner. In all cases returns, buttresses, counter forts, pillars etc. shall be built up carefully course by course, and properly bonded with the main walls. The brick work shall not be raised more than fourteen (14) courses per day.

At the junction of any two walls, the bricks shall at each alternate course, be carried into each of the respective walls so as to thoroughly unite the work.

The courses at the top of plinth and sills, at the top of the wall just below the soffit of the roof slab or roof beam and at the top of the parapet, shall be laid with bricks on edge. Brick on edge course shall be so arranged as to tightly fit under the soffit of the roof beam or roof slab, restricting the mortar layer thickness up to 12mm, however, any gap between the finished brick work and soffit of roof slab/beam shall be suitably sealed with the mortar.

5.2.2 BRICK WORK (HALF BRICK THICKNESS)

For brick walls of half brick thickness, all courses shall be laid with stretchers. Wall shall be reinforced with 2 nos. - 6mm diameter mild steel reinforcement bars, placed at every fourth course. The reinforcement bars, shall be straightened and thoroughly cleaned. Half the mortar thickness for the bedding joint shall be laid first and mild steel reinforcement, one on each face of the wall, shall be embedded, keeping a side cover of 12mm mortar. Subsequently, the other half of the mortar thickness shall be laid over the reinforcement covering it fully.

The reinforcement bars shall be carried at least 150mm into the adjoining walls or RCC columns. In case the adjoining wall being of half brick thickness, the length of bars



shall be achieved by bending the bars in plan. During casting of reinforced concrete columns, 6mm dia. M.S. reinforcing bar shall be placed at every fourth course of brick masonry. At the junction of two walls, the brick shall, at each alternate course, be carried into each of the respective walls so as to thoroughly unite the work. The brick masonry work shall not be raised more than 14 courses per day.

Brick course under the soffit of beam or slab, shall be laid by restricting the mortar thickness to 12mm. However, any gap between the finished brickwork and soffit of slab/beam shall be suitably sealed with the mortar.

5.2.3 CAVITY WALLS

Brick work in cavity walls shall be included with general brickwork. It shall consist of one wall of one or more brick thickness while the other wall shall be of half brick thickness at a clear gap of 50mm. The brick work on either side of cavity shall conform to the specifications already stated under clause no. 5.2.1 and 5.2.2. At the base of the cavity wall, the walls shall be solidly constructed up to 300mm above the ground level. The cavity wall shall be terminated 300mm below the soffit of roof slab/beam and the courses over this shall be continued in solid brickwork.

Cavity should be continuous and free from obstructions. Mortar droppings shall be prevented from falling down the cavity by the use of laths or by hay hands which shall be drawn up the cavity as the work proceeds. Any mortar which may unavoidably fall on the wall-ties, shall be removed daily and temporary openings shall be provided to permit the daily removal of mortar droppings from the bottom of the cavity.

The outer and inner leaves shall be tied by means of wall ties. Ties shall be of mild steel round bars of 8mm dia. 200 mm long with hooks at both the ends. These shall be placed not more than 750mm c/c horizontally and not more than 300mm vertically, and staggered. Additional ties shall be provided near the openings. There shall at least, be 5 ties per square metre of surface area of the wall. Ties shall be given a bituminous coat before placement, to protect them from corrosion.

In order to keep the cavity dry, air slots shall be provided in the cavity walls at bottom as well as top to the extent of 50 sq.cm areas of vents to every 2.0 sq.metre area of the wall.

5.2.4 CIRCULAR BRICK WORK

The detailed specification for brick work covered under clause no. 5.2.1 & 5.2.2 shall apply, in so far as these are applicable. Bricks forming skew backs shall be dressed or cut so as to give proper radial bearing. Defects in dressing of bricks shall not be covered up by extravagant use of mortar, nor shall the use of chips etc., be permitted.

The circular brick work shall be carried up from both ends simultaneously and keyed in the centre. The bricks shall be flushed with mortar and well pressed into their positions so as to squeeze out a part of their mortar and leave the joints thin and compact. All joints shall be full of mortar and thickness of joints shall be between 5mm and 15mm.

5.3 JOINTING



Joints shall be restricted to a width of 10mm with brickwork of any classification. All bed joints shall be normal to the pressure upon them i.e. horizontal in vertical walls, radial in circular brick masonry and at right angles to the face in the battered retaining walls. The vertical joints in alternate courses shall come directly one over the other and shall be truly vertical. Care shall be taken that all the joints are full of mortar, well flushed up. In case no pointing is to be done, cement mortar shall be neatly struck as the work proceeds. The joints in faces which are to be plastered or pointed shall be squarely raked out to a depth of 12mm while the mortar is still green. The rake joints shall be brushed to remove loose particles. After the day's work, the faces of the brick work shall be cleaned on the same day with wire brush and all mortar droppings removed.

5.4 CURING

Green work shall be protected from rain or any other running water or accumulated water from any source, by suitable means. Masonry work as it progresses shall be, kept thoroughly wet by sprinkling water at regular intervals, on all faces. Curing shall be done after 24 hours of completion of day's work and shall be done for at-least 10 days after completion. Proper watering cans with spray nozzles, rubber or PVC pipes shall be used for this purpose.

5.5 STAGING / SCAFFOLDING

5.5.1 Staging/scaffolding shall be properly planned and designed by the Contractor. Use of only steel tubes is permitted for staging/scaffolding. Design of staging/scaffolding shall be submitted for approval of the Engineer-in-Charge, before commencement of work.

Single scaffolding having one set of vertical support, shall be used and other end of the horizontal scaffolding member shall rest in a hole provided in the header course. The support shall be sound and strongly clamped with the horizontal pieces over which the scaffolding planks shall be fixed. The holes left in the masonry work for supporting the scaffolding shall be filled and made good with plain cement concrete of grade 1:3:6 during plastering. Suitable access shall be provided to the working platform area. The scaffolding shall be strong enough to withstand all loads likely to come upon it and shall also meet the requirements specified in IS: 2750.

Double scaffolding shall be provided for pillars less than one metre in width or for the first class masonry or for a building having more than two storey.

The following measures shall also be considered during erection of the scaffolding/staging.

- a. Sufficient sills or underpinnings, in addition to base plates, shall be provided particularly, where scaffoldings are erected on soft grounds.
- b. Adjustable bases to compensate for uneven ground shall be used.
- c. Proper anchoring of the scaffolding/staging at reasonable intervals shall be provided in each direction with the main structure wherever available.



- d. Horizontal braces shall be provided to prevent the scaffolding from rocking.
- e. Diagonal braces shall be provided continuously from bottom to top between two adjacent rows of uprights.
- f. The scaffolding/staging shall be checked at every stage for plumb line.
- g. Wherever the scaffolding/staging is found to be out of plumb line, it shall be dismantled and re-erected afresh. Efforts shall not be made to bring it in line with a physical force.
- h. All nuts and bolts shall be properly tightened and care shall be taken that all the clamps/couplings are firmly tightened to avoid slippage.
- i. Erection work of a scaffolding/staging, under no circumstance shall be left totally to semiskilled or skilled workmen and shall be carried out under the supervision of Contractor's technically qualified civil engineer.

5.5.2 For smaller works or works in remote areas wooden ballies may be permitted for scaffolding/staging by the Engineer-in-Charge at his sole discretion. The contractor must ensure the safety and suitability of such works as described under clause 5.5.1 above.

5.6 EMBEDMENT OF FIXTURES

All fixtures, pipes, conduits, holdfasts of doors and windows etc. required to be built in walls, shall be embedded in plain cement concrete block of grade 1:3:6, at the required positions, as the work proceeds.

6.0 PAYMENT

This clause shall apply to Item Rate tender only.

6.1 GENERAL

The payment of brick masonry shall be inclusive of all labour, material, scaffolding/staging sampling and testing, soaking of bricks, laying of bricks, raking of joints, cutting of bricks, providing recesses and making rectangular or round openings, sealing the gap between brick masonry and soffit of beam/slab with and including cement mortar, curing, making of masonry platform for unloading the wet mix, embedding the fittings/fixtures including providing PCC(1:3:6) etc, all as specified for all heights and depths. Deduction for rectangular or circular openings shall be done as per relevant BIS Codes

- 6.1.1 Payment for brick masonry works of one or more brick thickness, including circular brickwork, shall be made on cubic metre basis of the work done
- 6.1.2 Payment for half brick masonry work shall be made on square metre basis on the area of works done and shall also include the cost of supplying and fixing of reinforcement bars in position



- 6.1.3 Payment for forming the cavity shall be in square metres and shall include the cost of laying of bitumen coated MS ties in position, labour required for keeping the cavity clear, providing air slots etc







Energising Quality

VCS Quality Services Pvt Ltd

**STANDARD SPECIFICATION
FOR
STONE MASONRY**

VCS-SS-CS-6028

					
03	31.01.2022	NV	GDS	HK	GW
02	28.02.2020	NV	GDS	RKB	SK
01	16.10.2019	MA	MO	AD	SK
00	05.07.2017	MA	MO	AD	SK
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**STANDARD SPECIFICATION
FOR STONE MASONRY**

DOC NO: VCS-SS-CS-6028
Rev No : 03

REVISION RECORD						
Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description
00	05.07.2017	MA	MO	RKB	AD	Issued for use as Standard
01	16.10.2019	MA	MO	RKB	SK	
02	28.02.2020	NV	GDS	RKB	SK	New revision system updated
03	31.01.2022	NV	GDS	HK	GW	VCS QMS Integration



ABBREVIATION

m	Metre
mm	Millimetre
m ²	Square metre
m ³	Cubic Metre
Kg	Kilogram
IS	Indian Standard
BIS	Bureau of Indian Standards
PVC	Poly Vinyl Chloride
PCC	Plain Cement Concrete



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1.0 SCOPE

This specification establishes the materials, dressing, laying, jointing, workmanship curing etc for stone masonry works and shall comply, with all the requirements of IS: 1597.

2.0 REFERENCES

2.1 BIS CODES

IS: 269	Ordinary Portland cement 33 grade-specification
IS: 455	Portland slag cement-specification
IS: 1129	Recommendation of dressing of Natural building stones
IS: 1597	Construction of stone masonry-code of practice
IS: 2250	Code of practice for preparation and use of masonry mortars
IS: 2750	Specification for scaffoldings

2.2 SPECIFICATIONS

VCS-SS-CS-6021: Materials

3.0 MATERIALS

Refer specification VCS-SS-CS-6021: Materials

4.0 GENERAL REQUIREMENTS

4.1 CEMENT MORTAR

Cement mortar shall meet the requirements of IS: 2250 and shall be prepared by mixing cement and sand by volume. Proportion of cement and sand shall be 1:6 (one part of cement and six parts of sand) or as specified. The sand being used, shall be sieved before use. The mortar shall be used as soon as possible after mixing and before it has begun to set and in any case within initial setting time of cement, after the water is added to the dry mixture. Mortar unused for more than initial setting time of cement shall be rejected and removed from the site of work.

4.1.1 PROPORTIONING

The unit of measurement for cement shall be a bag of cement weighing 50 kgs and this shall be taken as 0.035 cubic metres. Sand shall be measured in boxes of suitable size on the basis of its dry volume. In case of damp sand, its quantity shall be increased suitably to allow for bulkage.

4.1.2

The mixing of mortar shall be done in a mechanical mixer operated manually or by power. The Engineer-in-Charge may however, permit hand mixing, as a special case, taking into account the magnitude, nature and location of work. The Contractor shall take the prior permission of the Engineer-in-Charge in writing, for using hand-mix, before the commencement of work.

**a. Mixing in Mechanical Mixer**

Cement and sand in specified proportions, by volume, shall be thoroughly mixed dry in a mixer. Water shall then be added gradually and wet mixing continued for at-least one minute. Care shall be taken not to add more water than that which shall bring the mortar to the consistency of a stiff paste. Wet mix from the mixer shall be unloaded on water-tight masonry platform, made adjacent to the mixer. Platform shall be at least 150mm above the levelled ground, to avoid contact of surrounding earth with the mix. Size of the platform shall be such that it shall extend at-least 300mm around the loaded wet mix area. Wet mix, so, prepared shall be utilised within initial setting time of cement [thirty (30) minutes either for ordinary portland cement conforming to IS: 269 or for portland slag cement conforming to IS: 455] after addition of water. Mixer shall be cleaned with water each time before suspending the work.

b. Hand Mixing

The measured quantity of sand shall be levelled on a clean masonry platform and cement bags emptied on top. The cement and sand shall be thoroughly mixed dry by being turned over and over, backward and forward, several times till the mixture is of uniform colour. The quantity of dry mix which can be consumed within initial setting time of cement shall then be mixed with just sufficient quantity of water to bring the mortar to the consistency of stiff paste.

4.2 CURING

Green work shall be protected from rain, running water or accumulated water from any source, by suitable means. Masonry work, as it progresses shall be kept thoroughly wet by sprinkling water at regular intervals, on all faces. Curing shall be done after 24 hours of completion of day's work and shall be done for at least 10 days after completion. Proper watering cans with spray nozzles, rubber or PVC pipes shall be used for this purpose.

4.3 STAGING / SCAFFOLDING**4.3.1 Staging/scaffolding shall be properly planned and designed by the Contractor. Use of only steel tubes is permitted for staging/scaffolding. Design of staging/scaffolding shall be submitted for approval of the Engineer-in-Charge, before commencement of work.**

Single scaffolding having one set of vertical support, shall be used and other end of the horizontal scaffolding member shall rest in a hole provided in the header course. The supports shall be sound and strongly clamped with the horizontal pieces over which the scaffolding planks shall be fixed. The holes left in the masonry works for supporting the scaffolding shall be filled and made good with plain cement concrete of grade 1:3:6 during plastering. Suitable access shall be provided to the working platform area. The scaffolding shall be strong enough to withstand all loads likely to come upon it and shall also meet all the requirements specified in IS: 2750.

Double scaffolding shall be provided for pillars less than one metre in width or for the first class masonry or for a building having more than two stories.



The following measures shall also be considered during erection of the scaffolding/staging.

- a. Sufficient sills or underpinnings, in addition to base plates, shall be provided, particularly, where scaffoldings are erected on soft grounds.
- b. Adjustable bases to compensate for uneven ground shall be used.
- c. Proper anchoring of the scaffolding/staging at reasonable intervals shall be provided in each direction with the main structure wherever available.
- d. Horizontal braces shall be provided to prevent the scaffolding from rocking.
- e. Diagonal braces shall be provided continuously from bottom to top between two adjacent rows of vertical supports.
- f. The scaffolding/staging shall be checked at every stage for plumb line.
- g. Wherever the scaffolding/staging is found to be out of plumb, it shall be dismantled and re-erected afresh. Effort shall not be made to bring it in line with a physical force.
- h. All clamps and couplings shall be properly tightened with nuts and bolts to avoid slippage.
- i. Erection work of a scaffolding/staging under no circumstances shall be left totally to semiskilled or skilled workmen and shall be carried out under the supervision of contractor's technically qualified civil engineer.

- 4.3.2 For smaller works or works in remote areas, wooden ballies may be permitted for scaffolding/staging by the Engineer-in-Charge at his sole discretion. The contractor must ensure the safety and suitability of such works as described under clause 4.3.1 above.

4.4 Embedment of Fixtures

All fixtures, pipes, conduits, holdfasts of doors and windows etc. required to be built in walls, shall be embedded in plain cement concrete of grade 1:3:6 at the required position as the work proceeds.

5.0 SPECIFIC REQUIREMENTS

5.1 RANDOM RUBBLE MASONRY

5.1.1 DRESSING

Stone shall be hammer dressed on the face, the sides and the beds to enable it to come in proximity with the neighboring stone. The "bushing" (projection) on the face shall not be more than 40mm on an exposed face and 19mm on the face to be plastered. It shall not have depression more than 10mm from the average wall surface. It shall also conform to the general requirements for dressing of stones covered in IS: 1129.



5.1.2 LAYING

All stones shall be wetted before laying to prevent absorption of water from mortar. The stones shall be laid so that the pressure is always perpendicular to the natural bed. The courses (if any) shall be built perpendicular to the pressure which the masonry will bear. In case of battered walls, the base of stone and plane of courses (if any) shall be at right angles to the batter.

The walls shall be carried up truly plumb or to the specified batter. Every stone shall be carefully fitted to the adjacent stones, so as to form neat and close joints. Vertical joints shall be staggered as far as possible.

Stones may be brought to level course at plinth, window sills and roof level. Levelling up at plinth level, window sills and roof level shall be done with concrete comprising of one part of the mortar as used for the masonry and two parts of graded stone aggregate of 20mm nominal size.

The bond shall be obtained by fitting in closely the adjacent stones. Transverse bonds shall be provided by the use of bond stones extended from the front to the back of the wall. At angular junctions the stones at each alternate course shall be well bonded into the respective courses of the adjacent wall.

Face stones shall extend and bond well in the back. These shall be arranged to break joints as much as possible, and to avoid long vertical lines of joints. The depth of stone from the face of the wall, inwards, shall not be less than the height or breadth at the face.

Where there is break in masonry work, the masonry shall be raked in sufficiently long steps for facilitating joining of old and new work. The stepping of the raking shall not be more than 45 degrees with the horizontal. The masonry work shall not be raised more than 1.2 metre per day. Toothed joints in masonry shall not be permitted.

5.1.3 HEARTING STONES

The hearting or interior filling of the wall shall consist of rubble stones which may be of any shape but shall not be less than 150mm on any face. These shall be carefully laid, hammered down with a wooden mallet into position and solidly bedded in mortar. The hearting should be laid nearly level with facing and backing, except that at about one metre intervals, vertical bond stones shall be firmly embedded to form a bond between successive courses.

5.1.4 INSERTION OF CHIPS

The chips and spalls of stones shall be used wherever necessary to avoid thick mortar beds or joints and it shall also be ensured that no hollow spaces are left anywhere in the masonry. The chips shall not be used below the hearting stone to bring these upto the level of face stones. The use of chips shall be restricted to the filling of interstices between the adjacent stones in hearting and this shall in no case exceed 20% of the quantity of stone masonry.



5.1.5 BOND STONE

Bond or through stone running across the thickness of wall shall be provided in the walls having thickness upto 600mm. If the walls are thicker than 600 mm, two or more bond stones overlapping each other by at least 150mm shall be provided in a line from face to back. Atleast one bond stone or a set of bond stones shall be provided for every 0.5 sq.m of wall surface. These shall be provided at 1.5m to 1.8m apart clear in every course and shall be staggered in subsequent course. An identification mark for the bond stones shall be given on both faces.

5.1.6 QUOINS

The quoins shall be of selected stones neatly dressed to the required angle and shall be of the same height as the course in which they occur and laid header and stretcher alternately. The quoin stone shall not be less than 0.03 cubic metres in volume.

5.1.7 JOINTING

Stones shall be so laid that all joints are fully packed with mortar. Face joints shall be minimum 20mm thick. The joints shall be struck flush and finished at the time of laying; when plastering and pointing is not required. If walls are to be plastered or pointed, joints shall be raked to a minimum depth of 20mm during the progress of work when the mortar is still green. For the faces of the wall which are not to be plastered, stone surfaces shall be cleared of mortar splashing to give uniform stone appearance.

5.2 COURSED RUBBLE MASONRY

5.2.1 DRESSING

Face stones shall be hammer dressed on all beds and joints so as to give them approximately rectangular shape. These shall be square on all joints and beds. The bed joints shall be chisel drafted for atleast 80mm back from the face and for the side joints atleast 40mm. No portion of the dressed surface shall show a depth of gap more than 6mm from a straight edge placed on it. The remaining unexposed portion of the stone shall not project beyond the surface of the bed and side joints. The bushing on the face shall not be more than 40mm on an exposed face and 10mm on the face to be plastered.

The hammer dressed stone shall also have a rough tooling for a minimum width of 25mm along the four edges of the face of the stone for the exposed stone masonry work.

5.2.2 LAYING

All stones shall be wetted before laying to prevent absorption of water from mortar. The stones shall be laid so that the pressure is always perpendicular to the natural bed. The courses shall be built perpendicular to the pressure which the masonry will bear. In case of battered walls, the base of stone and plane of courses shall be at right angles to the batter.



The walls shall be carried up truly plumb or to the specified batter. Every stone shall be carefully fitted to the adjacent stones, so as to form neat and close joints. All courses shall be laid truly horizontal and all vertical joints shall be truly vertical. The quoin stones shall be laid stretchers and headers alternately and shall be laid square on their beds, which shall be rough chisel dressed to a depth of atleast 100mm.

All courses shall be laid truly horizontal and all vertical joints shall be truly vertical. The stones shall be laid in horizontal courses and each course shall be of equal height of not less than 150mm and more than 300mm.

Levelling at plinth level, window sills and roof level shall be done with concrete comprising of one part of the mortar as used for the masonry and two parts of graded stone aggregate of 20 mm nominal size.

The bond shall be obtained by fitting in closely the adjacent stones. Transverse bonds shall be provided by the use of bond stones extended from the front to the back of the wall. At angular junctions the stones at each alternate course shall be well bonded into the respective courses of the adjacent wall.

Face stones shall extend and bond well in the back. These shall be arranged to break joints as much as possible, and to avoid long vertical lines of joints. The depth of stone from face of the wall, inwards, shall not be less than the height or breadth at the face.

Where there is a break in masonry work, the masonry shall be raked in sufficiently long steps for facilitating joining of old and new work. The stepping of the raking shall not be more than 45 degrees with the horizontal. The toothed joints shall not be permitted. The masonry work shall not be raised more than 1.2 metres per day.

5.2.3 HEARTING STONES

The hearting or the interior filling of the wall shall consist of flat bedded stone carefully laid on their proper beds in mortar. The use of chips shall be restricted to the filling of interstices between the adjacent stones in hearting and these shall not exceed 10% of the quantity of masonry. While using chips it shall be ensured that no hollow spaces are left anywhere in the masonry.

5.2.4 FACE STONES

Face stones shall tail into the work for not less than their heights and atleast one thirds of the stones shall tail into the work for a length not less than twice their height. These should be laid headers and stretchers.

5.2.5 BOND STONE

Same as for random rubble masonry given under clause no. 5.1.5 except that a bond stone or a set of bond stones shall be inserted 1.5 to 1.8 meter apart, in every course and shall be staggered in subsequent layers.

5.2.6 QUOINS



The quoins shall be of the same height as the course in which these occur and shall not be less than 450mm in any direction.

5.2.7 JOINTS

All bed joints shall be horizontal and all side joints vertical. All joints shall be full of mortar. Face joints shall not be more than 10mm thick. When plastering and pointing is not required to be done, the joints shall be struck flush and finished at the time of laying, otherwise the joints shall be raked to a minimum depth of 20mm during the progress of work when the mortar is still green. The joint shall be either flush or struck. Raised or cut pointing, shall be done with cement mortar 1:3 using wooden mould/template of minimum 12mm depth for uniformity.

6.0 PAYMENT

This clause shall apply to item rate tender only.

The payment for stone masonry works shall be inclusive of all labour, material, sampling and testing, scaffolding/staging, dressing, wetting out of stones, laying etc., raking of joints, curing, pointing, providing recesses and making circular or rectangular openings, sealing the gap between the masonry and soffit or beam/slab with and including cement mortar, making of masonry platform for unloading the wet mix, embedding fixtures/fittings including providing PCC(1:3:6) etc., for all heights and depths Deductions for circular or rectangular openings or for making pockets shall be as per relevant BIS Codes.

- 6.1.1 Payment for random rubble stone/course rubble masonry works shall be made on cubic metre basis on the volume of work done, to be measured as per relevant BIS Codes.







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**STANDARD SPECIFICATION
FOR
DEMOLITION AND DISMANTLING**

VCS-SS-CS-6029

					
03	31.01.2022	NV	GDS	HK	GW
02	28.02.2020	NV	GDS	RKB	SK
01	16.10.2019	MA	MO	AD	SK
00	05.07.2017	MA	MO	AD	SK
Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By

UNCONTROLLED COPY : If printed

CONTROLLED COPY : If in soft and signed



Energising Quality

**STANDARD SPECIFICATION
FOR DEMOLITION AND DISMANTLING**

DOC NO: VCS-SS-CS-6029
Rev No : 03

REVISION RECORD						
Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description
00	05.07.2017	MA	MO	RKB	AD	Issued for use as Standard
01	16.10.2019	MA	MO	RKB	SK	
02	28.02.2020	NV	GDS	RKB	SK	New revision system updated
03	31.01.2022	NV	GDS	HK	GW	VCS QMS Integration



ABBREVIATION

m	Metre
mm	Millimetre
Sqm	Square Metre
Cum	Cubic Metre



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1.0 SCOPE

This specification covers the procedure and safety requirements for demolition and dismantling of masonry (Brick & Stone), concrete (Plain /Reinforced), structural steel (sheeted / un sheeted) works.

2.0 REFERENCES

- 2.1 Specification No. VCS-SS-CS-6002, Earth work in site grading
- 2.2 VCS-SS-CS-6003, Earth work for Underground piping
- 2.3 VCS-SS-CS-6022, Earth work in foundations

for Earth work.

3.0 GENERAL

- 3.1 Apart from this specification, the demolition and dismantling of structures (part or whole) shall be in compliance with all statutory safety regulations and any other special requirement as shown/noted on the drawings and General Conditions of Contract. Prior consent and approval of the Engineer-in-charge shall be obtained in writing before starting any dismantling works. Any restrictions imposed regarding working hours shall also be strictly followed by the Contractor.
- 3.2 All materials obtained from dismantling/demolition operations shall be the property of the Owner unless otherwise specified and shall be kept in safe custody until handed over to the Engineer-in-charge.
- 3.3 Where it becomes necessary to disconnect any existing service line(s) (such as electrical, piping etc.) during dismantling/demolishing operation and where so required by the Engineer-charge, suitable alternate arrangement shall be made by the Contractor to maintain the continuity and proper functioning of the affected service line(s) with the approval of the Engineer-in-charge at no extra cost to the Owner.

4.0 SAFETY PRECAUTIONS

- 4.1 The Contractor shall adhere to safe demolishing/dismantling practices at all stages of work to guard against accidents, hazardous and unsafe working procedures.
- 4.2 Necessary propping, shoring strutting and/or underpinning shall be done for the safety of all surrounding structures (whose safety is likely to be endangered) before taking up, the demolishing and dismantling work.
- 4.3 Temporary enclosures made out of GI sheets, fencings, danger lights etc. shall be provided by the Contractor and got approved by the Engineer-in-charge before start of work to prevent accidents.
- 4.4 Contractor must ensure the availability of adequate firefighting equipment / arrangements before starting actual demolishing/dismantling works. These facilities



shall be made available throughout the entire operation of demolition and dismantling of structures.

- 4.5 All equipment's, pipes, fittings and instruments, underground utilities etc. located in the vicinity shall be protected by suitable means, as decided by the Engineer-in-charge, during demolishing, dismantling operations.
- 4.6 Roads and working spaces shall be kept free of any debris/dismantled materials at the end of day's work.
- 4.7 Necessary measures shall be taken to keep the dust and noise nuisance to minimum levels.
- 4.8 Dismantled elements/components shall not be dropped from a height or thrown from a distance. Dismantling of elements fixed by screws/bolts/hooks etc. shall be done by taking out the fixtures with proper tools only. Such fixtures may be allowed to be cut by sawing or flame cutting, in the event of their being stuck-up due to corrosion etc. however the decision of Engineer-in-charge in this regard shall be final and binding, Welds shall be removed by flame cutting. Tearing or ripping of elements shall not be resorted to under any condition.

5.0 PROCEDURE

- 5.1 Entire work of demolishing & dismantling shall be meticulously planned. Prior to start of work, the Contractor shall thoroughly understand the scope and nature of the work, and then prepare and submit the proposed work execution plan of demolishing & dismantling to the Engineer-in-charge for his review. Comments if any, shall be taken care by the contractor and execution of the work shall be done based on the revised execution plan.
- 5.2 Demolition and dismantling shall be restricted to the extent shown on drawings or as directed by the Engineer-in-charge.
- 5.3 Demolition of any structure shall be carried out in the sequence reverse to that followed at the time of its construction.
- 5.4 Dismantling shall be done in a systematic manner. All elements shall be carefully removed without causing any damage.
- 5.5 Blasting in any form shall not be permitted.
- 5.6 Chipping of concrete/grout shall be done with precision by chiseling. The finished surfaces shall be made true to the requisite size and shape.
- 5.7 Pockets/holes of specified size shall be made/cut by drilling/chiseling.



6.0 CLEANING & STACKING

- 6.1 All demolished/dismantled serviceable materials such as bricks, stones, reinforcement bars, structural steel, sheeting etc. shall be separated out, cleaned and stacked in separate lots within the plant boundary as directed by the Engineer-in-charge.

7.0 DISPOSAL

All unserviceable materials shall be disposed off in spoil heaps within or outside the plant boundary as per the directions of the Engineer-in-charge. Areas required outside the plant boundary for dumping of disposed material shall be arranged by the contractor and got approved by the Engineer-in-charge.

8.0 PAYMENT

This clause shall be applicable for item tender rate only.

8.1 GENERAL

Measurement of all works shall be taken prior to start of demolishing / chipping / dismantling works.

8.2 MASONRY/CONCRETE WORKS (DEMOLITION)

- 8.2.1 Payment shall be made on the basis of actual volume in cubic meters (cu.m.) of masonry/concrete works demolished. The thickness of plaster/bitumen felt shall be included in measurements. The rate for demolishing shall include supply of labour, tools & tackles, necessary safety measures, propping, underpinning, scaffolding, handling, cutting, straightening, scraping & cleaning of reinforcement bars and other embedment's (in case of reinforced concrete works), sorting out and stacking of all serviceable materials, disposal of all unserviceable material, clearing the site, etc. all complete as specified and directed by the Engineer-in-charge.

8.3 EXCAVATION & BACKFILLING

- 8.3.1 Excavation and backfilling shall be paid separately as per relevant clauses of specification No. VCS-SS-CS-6002, VCS-SS-CS-6003, VCS-SS-CS-6022 for Earth Work.

8.4 CHIPPING OF CONCRETE WORKS

Payment shall be made on the basis of admissible area in square meters (sq.m.) of concrete surfaces chipped, pertaining to the different categories of thicknesses specified in the schedule of items.

The rate for chipping shall include supply of labour, tools and tackles, necessary safety measures, scaffolding, chiseling, handling exposing, cutting, straightening, scraping, clearing the reinforcement bars (in case of reinforced concrete works), wire brushing and washing the exposed surfaces, disposal of all unserviceable material etc. all complete as directed.

8.5 MAKING POCKETS/HOLES IN CONCRETE WORKS



Payment shall be made on the basis of number (Each) of pockets/holes of sizes up to & inclusive of 200x200x500 mm, made or cut in the concrete works.

The rate for making pockets/holes shall include supply of labour, tools & tackles, necessary safety measures, scaffolding, chiseling, drilling, handling, cutting or relocating reinforcement bars, cleaning, disposal of all unserviceable material etc. all complete as directed.

8.6 DISMANTLING OF STRUCTURAL STEEL WORKS

Payment shall be made on the basis of weight (MT) of the structure/components being dismantled. Assessment of weight shall be done as per the specifications or as per the direction of Engineer-in-charge.

The rate for dismantling shall include supply of labour, tools and tackles, equipment, consumables, necessary safety measures, scaffolding, propping, handling, unbolting, cutting (by sawing or flame cutting) of gussets/plates/bolts/hooks/welds, cleaning, sorting out and stacking of all serviceable materials, disposal of all unserviceable material, etc. all complete as specified and directed.

8.7 DISMANTLING OF ROOF & WALL SHEETING

Payment shall be made on the basis of dismantled sheeted area in square meters (sq.m.) of plan area in case of roof sheeting and area in elevation in case of side and louver sheeting.

The rate for dismantling shall include supply of labour, tools and tackles, equipments, consumables, necessary safety measures, handling, scaffolding, unbolting, cutting (by saw or flame cutting) of hook bolts, removal of ridges, gutters, flashings, transporting, stacking of all serviceable materials, disposal of all unserviceable material etc. all complete as directed.







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**STANDARD SPECIFICATION
FOR
MISCELLANEOUS ITEMS**

VCS-SS-CS-6030

					
03	31.01.2022	NV	GDS	HK	GW
02	28.02.2020	NV	GDS	RKB	SK
01	16.10.2019	MA	MO	AD	SK
00	05.07.2017	MA	MO	AD	SK
Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By

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REVISION RECORD						
Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description
00	05.07.2017	MA	MO	RKB	AD	Issued for use as Standard
01	16.10.2019	MA	MO	RKB	SK	
02	28.02.2020	NV	GDS	RKB	SK	New revision system updated
03	31.01.2022	NV	GDS	HK	GW	VCS QMS Integration



ABBREVIATION

m	Metre
mm	Millimetre
m ²	Square Metre
Kg/m ²	Kilogram Per Square Metre
IS	Indian Standard
BIS	Bureau of Indian Standards
RCC	Reinforced Cement Concrete



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1.0 SCOPE

The scope shall be as specified separately for different items below.

2.0 REFERENCES

2.1 BIS CODES

IS:73 Paving bitumen-specification

IS:383 Coarse and fine aggregates for concrete Specification

IS:6313 Code of practice Ant termite measuring in building

2.2 SPECIFICATIONS

VCS-SS-CS-6021, Materials

VCS-SS-CS-6023, Plain and Reinforced Cement Concrete

3.0 MATERIALS

The materials shall be as specified separately for different items below.

4.0 GENERAL REQUIREMENTS

4.1 The Contractor shall test the materials, where applicable, in approved laboratory as required by the Engineer-in-Charge and furnish test certificates for materials and obtain the approval of the Engineer-in- Charge prior to the use of such materials in the works. All tests shall be in accordance with relevant Indian Standards.

5.0 PRE-CONSTRUCTIONAL ANTI-TERMITE TREATMENT

5.1 SCOPE

This specification establishes the materials and method of accomplishing pre-constructional anti-termite treatment of soil for protection of buildings against attack by subterranean termites with the usage of chemical emulsions in accordance with the procedure laid down.

5.2 MATERIALS

Refer specification no. VCS-SS-CS-6021.

5.3 PROCEDURE FOR TREATMENT

5.3.1 The treatment shall be carried out by an approved agency specialized in the field. Apart from this t his specification, the work shall be carried out in compliance with IS: 6313. In case of any contradiction, this specification shall govern.

5.3.2 SITE PREPARATION



Prior to start of chemical treatment, area(s) shall be made free from logs, stumps timber, off cuts, leveling pegs, roots of plants/trees etc. Soil treatment shall start when foundation trenches/pits are ready to take concrete/masonry in foundations and plinth area ready for laying the subgrade. Treatment shall not be carried out when it is raining or the subsoil water level is at the same or higher than the level of treatment. In the event of water-logging of foundations, the water shall be pumped out and the chemical emulsion applied when the soil is absorbent.

5.3.3 TREATMENT OF THE EXCAVATED PITS/TRENCHES AND BACKFILL FOR FOUNDATIONS

- a. The bottom surface and the lower 300 mm side surfaces of the excavated pits/trenches for foundations of masonry works and RCC plinth beams supporting such masonry works, shall be treated with specified chemical emulsion @ 5 litres/m² of the surface area. However, no such treatment shall be required in case of pits/trenches made for RCC foundations supporting RCC walls and/or columns.
- b. On completion of construction of masonry foundations, the backfill in immediate contact with the substructure shall be treated in layers, of 300mm, with emulsion @7.5 litres/m² of the vertical surface of the substructure (i.e. $7.5 \times 0.300 = 2.25$ litres/meter of perimeter) for each side. The treatment shall be given after ramming of each layer of soil, by rodding the earth at 150mm centres close to the wall surface and working the rod backward and forward (parallel to the wall surface) and then spraying the specified dosage of emulsion. The emulsion shall be directed towards the masonry surfaces so that the soil in contact with these surfaces is well treated with the chemical. After the treatment, the soil shall be tamped back into place. This shall be done for full depth of the fill.
- c. For RCC walls and columns, the treatment as specified in (b) shall start from a depth 500 mm below the finished ground level, and shall be done upto the FGL.

5.3.4 TREATMENT OF PLINTH/BASEMENT AND APRON

- a. The top surface of the consolidated earth below the non-suspended floor slabs and the peripheral aprons of widths upto 750mm, the bottom surface and side surfaces of the excavated pits for the basements shall be treated with chemical emulsion @5 litres/m² of the surface area. Holes 50 to 75mm deep at 150mm centres, both ways, shall be made on the surface with 12mm diameter mild steel rod and then emulsion shall be sprayed uniformly over the area. At expansion joint locations, anti-termite treatment shall be supplemented by treating through the expansion joint @ 2.0 litres per linear metre of joint after the subgrade has been laid.
- b. Treatment of Junctions of plinth filling and wall/column faces shall be done after making a small channel 30mmx30mm, by making rod holes 150mm apart (upto the ground level) in the channel and then by moving the rod backward and forward to break up the earth. The chemical emulsion shall be poured along the channel @7.5 litres/m² of the vertical wall/column surface so as to soak the soil right to the bottom. The soil shall be tamped back into place after the treatment.



5.3.5 TREATMENT OF SOIL ALONG EXTERNAL PERIMETER OF BUILDING

After the building is complete, the earth along the external perimeter shall be rodded at intervals of 150mm and to depth of 300mm. The rod shall be moved backward and forward parallel to the wall to break up the earth and chemical emulsion poured along the wall @ 7.5 litres/m² of vertical surface (i.e. $7.5 \times 0.300 = 2.25$ litres/metre of perimeter). After the treatment, the earth shall be tamped back into place.

5.4 PAYMENT

This clause shall apply to item rate tenders only.

Payment for pre-constructional anti-termite treatment shall be made on square metre (sq.m.) basis of plinth area of the building at ground floor only.

The rate shall include supplying all materials, spray pumps, tools, tackles & other accessories, labour, site preparation, rodding, tamping, mixing, spraying the specified chemical emulsion at prescribed dosage, storage facilities, handling, transporting etc. all complete as directed & specified.

6.0 DRESSING & TRIMMING

6.1 SCOPE

This specification covers the procedure for dressing, trimming and paving with earth the peripheral area around the completed building/structure.

6.2 PROCEDURE

The ground all around the completed building/structure for 3 metres width or as specified by the Engineer-in-Charge, shall be cleaned and dressed to suitable slope. Over the prepared ground a layer of approved earth shall be spread, watered and well consolidated so as to achieve an average thickness of 75mm.

6.3 PAYMENT

This clause shall apply to item rate tenders only.

Payment shall be made on square metre (sq.m.) basis of the actual area dressed and paved with earth.

The rate shall include supplying all materials, labour including cleaning, dressing the ground to required slope, spreading of earth, watering, ramming, consolidating etc. all complete as directed.

7.0 CUTTING PILE HEADS

7.1 SCOPE

This specification covers procedure for cutting pile heads of cast-in-situ RCC piles.

7.2 PROCEDURE



Head of already cast RCC piles shall be cut after 28 days of casting up to a length and elevation as shown on the drawing by chiseling taking all necessary safety precautions. Care shall be taken that pile reinforcement is not cut or damaged during chiseling operation. All debris and loose or cracked concrete in the pile shall be removed and disposed off within the plant boundary as per the directions of the Engineer-in-Charge and site shall be left clean for casting of pile caps. The surface of reinforcement bars shall be cleaned, if required by wire brushing, so that no old concrete sticks to them.

7.3 PAYMENT

This clause shall apply to item rate tenders only.

Payment shall be made per pile basis for the actual number of pile heads cut.

The rate shall include supplying all tools and tackles, labour including disposal of debris, bending the pile reinforcements for proper anchorage within the pile cap etc. all complete as directed.

8.0 BUILDING-UP PILE HEADS

8.1 SCOPE

This specification covers requirements of materials and procedure for building-up of RCC Pile Heads.

8.2 MATERIALS

8.2.1 Concrete shall be of the same grade & specification as that for the pile.

8.2.2 Reinforcement shall be of the same grade and specification as that for the pile.

8.2.3 Type of cement shall be same as that used for the pile.

8.3 PROCEDURE

Concrete in existing piles shall be chiseled off minimum upto the lap-length of the reinforcements in the pile. In cases where reinforcements are longer than the concreted piles, the top concrete of the existing piles shall be chiseled off upto a length of 800mm.

Concrete surface and reinforcement of pile shall be cleaned of any dirt grease, debris etc and concrete surface shall be made rough by hacking. Reinforcement shall be lapped/welded as per the direction of the Engineer-in-Charge. Neat cement slurry shall be applied on top surface of concrete and using approved formwork concreting shall be done upto the level shown on the drawing or as directed by the Engineer-in-Charge.

8.4 PAYMENT

This clause shall apply to item rate tenders only.



Payment shall be made on cubic metre basis for the total quantity of concrete actually poured for achieving the level as shown on drawings.

The rate shall include supply of all materials (except reinforcement which shall be paid separately as per respective item) labour, cleaning, welding, shuttering, vibrating, finishing, curing etc. all complete. Cutting of pile heads and excavation including backfilling shall be paid separately as per respective item.

9.0 HARD CORE

9.1 SCOPE

This specification covers the requirements of materials and procedure for laying of hard core.

9.2 MATERIALS

Hard core shall consist of broken/crushed stones of 150mm and down size. Stones shall be sound, angular, hard and free from flakes, dust and other impurities.

9.3 PROCEDURE

Hard core shall be laid to the grade, level and thickness as shown on the drawing. Broken stones of required height shall be vertically placed and blinded with approved murrum/sand and consolidated with roller including watering, dressing etc. However, areas inaccessible by roller may be compacted by hand rammer.

9.4 PAYMENT

This clause shall apply to item rate tenders only.

The hard core shall be measured on the basis of volume in cubic metres (cu.m.) of the compacted hard core laid. The rate shall include all labour, materials, consolidation by rammer/roller, watering, dressing etc. all complete.

10.0 SAND FILLING IN PLINTH/FOUNDATIONS

10.1 For specification of sand to be used for filling, reference shall be made to specification No. VCS-SS-CS-6002,

10.2 Filling shall be carried out in layers not exceeding 15cms and shall be compacted mechanically or by saturation to specified grade and level and to obtain 90% laboratory maximum dry density or as specified in schedule of rates.

10.3 Compaction by flooding may be accepted at the discretion of the Engineer-in-Charge, provided the required compaction is achieved.

10.4 The Contractor shall not commence filling in and around any work until it has been permitted by the Engineer-in-Charge.

10.5 PAYMENT



This clause shall apply to item rate tenders only.

Payment shall be made on cubic metre (cu.m.) basis of the finished compact volume. The rate shall include cost of sand for any compacted thickness, wastage if any, all handling, transport for all leads, tamping, watering, flooding, dressing etc. Any brick work required for ponding shall be paid separately under relevant item.

11.0 DAMP PROOF COURSE - (DPC)

- 11.1 All materials used for Damp Proof Course shall comply with specification No. VCS-SS-CS-6021.
- 11.2 The 40mm thick Damp Proof Course shall consist of plain cement concrete of grade M-20, unless otherwise specified.
- 11.3 The Damp Proof Course shall be laid at plinth level of masonry walls, flush with the floor surface and shall not be carried across doorways.
- 11.4 Before laying, the top surface of wall shall be thoroughly cleaned and watered. The D.P.C. shall be laid in layers of 20mm thickness retaining the edges by necessary formwork and shall be well tamped and trowelled to smooth finish. The layer shall be cured by keeping the surface wet for 40 hours and after it has dried, two coats of hot bitumen of grade A120/S120 conforming to IS: 73 shall be applied over it at the rate of 1.7 Kg/m². Over this, the second layer of 20mm thick concrete shall be laid and cured as described in case of the first layer and two coats of hot bitumen at the rate of 1.7 Kg/m² shall be applied again in a similar manner. Over this, dry sharp sand shall be sprinkled evenly before hardening of second coat of bitumen paint.
- 11.5 **PAYMENT**

This clause shall apply to item rate tenders only.

Payment shall be made on square metre (sq.m.) basis of the area laid. The rate shall be inclusive of formwork, curing, providing and laying bitumen, supplying and spreading sand over bitumen etc. complete.







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**STANDARD SPECIFICATION
FOR
FLOOR FINISHING**

VCS-SS-CS-6040

					
03	31.01.2022	NV	GDS	HK	GW
02	28.02.2020	NV	GDS	RKB	SK
01	16.10.2019	MA	MO	AD	SK
00	05.07.2017	MA	MO	AD	SK
Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By

UNCONTROLLED COPY	:	If printed
CONTROLLED COPY	:	If in soft and signed



Energising Quality

**STANDARD SPECIFICATION
FOR FLOOR FINISHING**

DOC NO: VCS-SS-CS-6040
Rev No : 03

REVISION RECORD						
Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description
00	05.07.2017	MA	MO	RKB	AD	Issued for use as Standard
01	16.10.2019	MA	MO	RKB	SK	
02	28.02.2020	NV	GDS	RKB	SK	New revision system updated
03	31.01.2022	NV	GDS	HK	GW	VCS QMS Integration



ABBREVIATION

m	Metre
mm	Millimetre
m ²	Square Metre
m ³	Cubic Metre
Kg	Kilogram
IS	Indian Standard
BIS	Bureau of Indian Standards
PVC	Poly Venile Chloride
RCC	Reinforcement Cement Concrete
PCC	Plain Cement Concrete



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1.0 SCOPE

This specification covers the general requirements for all types of floor finishing in all type of building.

2.0 REFERENCES

Reference shall be made to the following Indian Standards for any further information etc. not covered in the specification. In case of any conflict/contradiction, provision of specification shall override.

IS: 4971	:	Recommendations for selection of Industrial floor finishes
IS: 2114	:	Code of practice for laying in situ terrazzo floor finish.
IS: 1237	:	Specification for Cement concrete flooring tiles.
IS: 777	:	Specification for glazed earthenware wall tiles.
IS: 2571	:	Code of practice for laying in situ cement concrete flooring.
IS: 4631	:	Code of practice for laying of epoxy resin floor toppings.
IS: 3462	:	Code of practice for unbacked flexible PVC flooring.
IS: 5318	:	Code of practice for laying of flexible PVC sheet and tile flooring.
IS: 3461	:	Specification for PVC asbestos floor tiles.
IS: 1443	:	Code of practice for laying and finishing of concrete flooring tiles.
IS: 5491	:	Code of practice for laying in situ granolithic concrete floor topping.
IS: 4441	:	Code of practice for use of silicate type Chemical resistant mortars.
IS: 4443	:	Code of practice for use of resin type chemical resistant mortar.
IS: 1196	:	Code of practice for laying Bitumen Mastic flooring.

3.0 CEMENT CONCRETE FLOORING

3.1 GENERAL

Cement concrete flooring shall in general conform to IS: 2571. Cement concrete flooring shall consist of a sub base (laid on the compacted earth or sand fill in case of ground floor only) a base course laid on the sub-base and then finishing layer of floor finishing. In case of ground floor, the filled and compacted bed on which the sub-base is to be laid, shall be as per structural drawings and specifications.

The bed for flooring shall be prepared either level or sloped as per drawings and as instructed by Engineer-in-charge.

3.2 WORKMANSHIP



3.2.1 SUB-BASE

The sub-base which shall be laid on the prepared bed shall be of specified thickness and as per structural drawings and specifications.

The sub-base shall be of boulders/gravel/broken bricks/sand/cement concrete as per drawings. In case of upper floors, the structural RCC slab shall be treated as sub-base.

3.2.2 BASE COURSE

Base course shall be 25mm thick M-15 grade Concrete and shall generally conform to Civil structural specification.

The floor space on which base course is to be laid shall be divided into square/rectangular or as per designed panels to prevent cracks in the floor finish. No dimension of the panels shall exceed 2m and length of the panel shall not exceed 1.5 times its breadth. Base course shall be laid on alternate panels. The borders of the panels shall have mitred joints at the corners of the room and intermediate joints shall be in straight line with panel joints.

The panels shall be bound by glass/PVC/stainless steel strips etc. as specified. These shall be fixed in position with their top at proper level, giving slope wherever required.

The flooring shall butt against masonry of wall which shall not be plastered. When the base course is to be laid on hardened base, the sub-base shall be roughened by steel wire brushing and cleaned. Before laying the base course, neat cement slurry @ 2.75 kg of cement per Sqm. of area shall be brushed into the prepared sub base surface.

Cement concrete shall be placed in position and beaten with trowel and finished smooth. Beating shall cease as soon as surface is found covered with cream of mortar. Necessary slope shall be provided.

3.2.3 FLOOR FINISHING

Finishing of the surface shall follow immediately after the completion of base course. The base course shall be free of excessive moisture before starting the floor finishing. Use of dry cement, cement sand mixture sprinkled on the surface to stiffen the concrete or absorb excessive moisture shall not be permitted.

While the concrete is still green, cement @ 2.75 kg per Sqm. of floor area shall be mixed with water to form a thick slurry and spread over the surface. It shall be pressed twice by

Means of iron floats, once when the slurry is applied and second time when the cement starts setting.

The junction of floor with wall plaster, cladding, skirting shall be rounded off uniformly upto a radius of 25mm unless otherwise mentioned.

3.2.4 CURING



Each finished portion of floor, on completion shall be kept wet with ponding for a minimum period of 7 days.

4.0 CEMENT CONCRETE GRANOLITHIC FLOORING

Workmanship shall in general conform to IS: 5491.

4.2.1 SUB-BASE

The sub-base which shall be laid on the prepared bed shall be of specified thickness and as per structural drawings and specifications.

The sub-base shall be of boulders/gravel/broken bricks/sand/cement concrete as per drawings. In case of upper floors, the structural RCC slab shall be treated as sub-base.

4.2.2 BASE COURSE (UNDER LAYER)

Base course shall be M-15 grade Concrete and shall generally conform to Civil structural specification.

The floor space on which base course is to be laid shall be divided into square/rectangular or as per designed panels to prevent cracks in the floor finish. No dimension of the panels shall exceed 2m and length of the panel shall not exceed 1.5 times its breadth. Base course shall be laid on alternate panels. The borders of the panels shall have mitred joints at the corners of the room and intermediate joints shall be in straight line with panel joints.

The panels shall be bound by glass/PVC/stainless steel strips etc. as specified. These shall be fixed in position with their top at proper level, giving slope wherever required.

The flooring shall butt against masonry of wall which shall not be plastered.

When the base course is to be laid on hardened base, the sub-base shall be roughened by steel wire brushing and cleaned. Before laying the base course, neat cement slurry @ 2.75 kg of cement per Sqm. of area shall be brushed into the prepared sub base surface.

Cement concrete shall be placed in position and beaten with trowel and finished smooth. Beating shall cease as soon as surface is found covered with cream of mortar. Necessary slope shall be provided.

Thickness of base course shall be as follows for different thickness of floorings:

- a. 40mm thick flooring = 25mm thick
- b. 50mm thick flooring = 35mm thick

4.2.3 WEARING TOP LAYER

The top layer shall be laid over first layer within 15 minutes of laying the first layer. The cement and aggregates for the top layer shall be mixed dry. After mixing, sufficient



quantity of washed sand and water shall be added to make the mix plastic but not flowing. The top and bottom layer shall firmly grip together.

4.2.4 FLOOR FINISHING

Finishing of the surface shall follow immediately after the completion of base course. The base course shall be free of excessive moisture before starting the floor finishing. Use of dry cement, cement sand mixture sprinkled on the surface to stiffen the concrete or absorb excessive moisture shall not be permitted.

While the concrete is still green, cement @ 2.75 kg per Sqm. of floor area shall be mixed with water to form a thick slurry and spread over the surface. It shall be pressed twice by means of iron floats, once when the slurry is applied and second time when the cement starts setting.

The junction of floor with wall plaster, cladding, skirting shall be rounded off uniformly up to a radius of 25mm unless otherwise mentioned.

4.2.5 CURING

Each finished portion of floor, on completion shall be kept wet with ponding for a minimum period of 7 days.

5.0 HEAVY DUTY FLOORING

5.1 GENERAL

Heavy duty Flooring shall consist of a sub-base, a base course and a finishing layer of floor finish.

5.2 WORKMANSHIP

5.2.1 SUB-BASE

The sub-base which shall be laid on the prepared bed shall be of specified thickness and as per structural drawings and specifications.

The sub-base shall be of boulders/gravel/broken bricks/sand/cement concrete as per drawings. In case of upper floors, the structural RCC slab shall be treated as sub-base.

5.2.2 BASE COURSE

Base course shall consist of one layer of 35mm thick cement concrete (1 cement: 1.5 Coarse sand : 3.5 stone aggregates of 10mm to 6mm size by volume) laid on sub-base in panels in accordance with, clause no. 3.2.2.

5.2.3 FLOOR FINISH

Finishing layer shall be of cement, hardener and stone aggregate mix of 15mm thickness laid over the base course. Unless otherwise mentioned, one part of approved quality hardener and four parts of cement by weight shall be mixed dry. This dry



mixture shall be mixed with stone grit of 6mm and down size in the ratio of 1 hardener and cement mixture: 2 stone grit by volume. Just enough water shall then be added to the mix.

The mixture so obtained shall then be laid on the base course within 2 to 4 hours of latter's laying. It shall be firmly pressed into bottom concrete so as to have a good bond with it. After the starting of initial setting, the surface shall be finished smooth and true with steel floats.

6.0 PRECAST HYDRAULICALLY PRESSED CEMENT TILES

6.1 MATERIALS

6.1.1 CEMENT CONCRETE TILES

Cement concrete tiles shall conform to IS: 1237 and shall be of approved shade, with 10 mm down size stone aggregates and using a 1:6 or as directed mixture of white and ordinary cement and shall be of 20mm thickness and approved shade.

6.1.2 PIGMENTS

Pigments to be admixed with mortar or for grouting the joints shall conform to Table -1 of IS: 2114.

6.1.3 CEMENT MORTAR

Cement mortar shall be in accordance with civil structural specification and following schedule

- | | |
|----------------------------|--|
| a. For flooring | : 20mm thick, cement mortar (1 cement : 6 coarse sand by volume) |
| b. For skirting/dado/riser | : 12mm thick, cement mortar (1 cement:3 coarse sand by volume) |

6.2 WORKMANSHIP

Workmanship shall in general conform to IS: 1443. The base on which tiles are to be laid shall be cleaned of all dust, dirt and properly wetted by applying neat cement slurry @ 2.75 kg. of cement per Sqm. of area without allowing water pools. Cement mortar of specified thickness shall then be spread over the base for two rows of tiles and 3-5 metres in length. The mortar shall be laid in slope as per requirements and thickness of mortar shall not be less than 10mm at any place. The top of the mortar shall be kept rough so that cement slurry can be absorbed. Laying shall be from centre & proceed outwards in two directions at 90°. Cut tiles of uniform sizes shall be laid along periphery, if necessary. Neat cement slurry @ 4.4 kg. of cement per Sqm. shall be spread over the mortar bed for laying 20 tiles at a time. The tiles shall then be fixed in this grout one after the other, each tile being gently tapped and properly bedded in line and level. The Joints shall not exceed 1.5mm in width. After the day's work, the excess



cement slurry on top and the joints shall be cleaned with broom stick and washed before the slurry sets hard. Next day, the joints shall be filled with the cement grout to match the shade of the tile.

Tiles along the periphery shall be continued by average 12 mm under the wall plaster, skirting or dado.

For skirting/dado/risers on the brick masonry wall, the joints shall be raked out to a depth of at least 15mm while the masonry is being laid. In case of concrete work, the surface shall be hauled and roughened with wire brushes. The wall surface shall be uniformly and evenly covered with backing of cement mortar 1:3 (1 cement : 3 coarse sand by volume) of specified thickness. Before hardening of the cushioning mortar, back of each tile shall be covered with a neat layer of cement slurry @ 4.4 kg of cement per Sqm. and edges with white cement with or without pigment to match the shade of tiles and the tiles then shall be pressed on the backing and tapped.

The tiles shall be corrected to proper planes with joints truly vertical in required pattern and butt jointed. The fixing shall be done from bottom upward. The top of skirting and dado shall be truly horizontal.

6.3 CURING

The flooring shall be cured for 7 days by keeping it wet with ponding. Heavy traffic on the flooring shall be permitted only after 14 days.

6.4 GRINDING AND POLISHING

Grinding shall be commenced after 14 days when the tiles and the joints are properly set. Grinding shall be done by machines except for skirting and small areas. First grinding shall be done with carborundum stones of 48 to 60 grade grit fitted in the machine. Water shall be properly used during grinding. When the chips show up and the floor has been uniformly rubbed, it shall be cleaned with water baring all pin holes. It shall then be covered with a thin coat of grey/white cement mixed with pigments to match with colour of the flooring. This grout shall be kept moist for a week. Thereafter the second grinding shall be started with carborundum stone of 120 grit. Grinding and curing shall follow again. Final grinding shall be with carborundum of grade 220 to 350 grit using water in abundance. The floor shall be washed clean with water, oxalic acid powder shall then be dusted at 35 gm/sq. m. on the surface rubbed with machine fitted hessian bobs or rubbed hard with woollen rags. The floor shall then be washed clean and dried with a soft cloth or linen. If any tile is disturbed or damaged, it shall be refitted or replaced and properly jointed and polished.

7.0 CEMENT PLASTER SKIRTING

7.1 MATERIAL

Cement plaster skirting shall be laid with cement mortar (1 cement: 3 coarse sand by volume) as per clause no. 6.1.3 and shall be of specified thickness (6mm/12mm/18mm) as per item description.



7.2 WORKMANSHIP

The surface on which the skirting is to be applied shall be prepared and skirting of specified thickness shall be laid. The junction between flooring and wall shall be rounded off to a radius of 25mm if not otherwise mentioned.

While the mortar is still green, cement @ 2.75kg per square metre shall be mixed with water to form thick slurry and applied over the mortar. It shall be pressed twice by means of iron floats, once when the slurry is applied and second time when the cement starts setting.

8.0 CAST-IN-SITU TERRAZZO FINISH

8.1 MATERIALS

8.1.1 BASE COURSE (UNDERLAYER)

Base Course for Cast-in-situ terrazzo flooring shall be 25mm thick cement concrete (1 cement: 2 coarse sand: 4 stone aggregate, 10mm nominal size by volume).

In case of vertical surfaces, the base course shall be 13mm thick cement mortar (1 cement: 3 coarse sand by volume)

8.1.2 AGGREGATES FOR TERRAZZO TOPPING

The aggregate to be used in topping shall be marble chips of plain White/Pink Makrana /Baroda green etc. all grade -1 as specified which shall be of 10mm nominal size. Marble powder to be used in terrazzo topping shall pass through IS Sieve Terrazzo. Marble chips shall be hard, sound, dense and homogenous in texture with crystalline and coarse grains. It shall be uniform in colour and free from stains, cracks, decay and weathering. All proportions of materials used should be as directed by the Engg. - in - charge/ as specified.

8.1.3 PIGMENTS

Pigments to be used in terrazzo shall be of permanent colour and shall conform to IS: 2114, table-1.

8.2 WORKMANSHIP

Workmanship shall in general conform to IS: 2114. Terrazzo flooring shall be of specified thickness and shall be laid in two layers and in panels. Under layer or base course shall be of cement concrete laid over sub base and top layer shall be of terrazzo floor finish. Details of panels shall as per drawing. The thickness of Terrazzo finish shall be 15mm.

Top layer shall consist of mix of white cement, marble powder, marble chips, water and pigments. Cement and marble powder mix proportion shall be 3: 1 by weight. Cement, marble powder mix shall be mixed with marble chips in the proportion of 4:7 by volume. Quality and shade of chips and powder shall be as specified with a view to avoid variation in colour. Sufficient quantity of white cement shall be added in the



cement mix to obtain the desired shade. Mixing shall be done in a trough or tub and complete quantities of white cement and pigment for a particular unit of job shall be dry mixed with aggregates. Water shall be added in small quantities to this dry mix to get a proper consistency. The mix shall be plastic but not so wet as to flow. The mix shall be used within 30 minutes of its preparation.

The base course/under layer shall be divided in panels with dividing strips (glass/PVC/stainless steel strips) upto the finished surface levels in accordance with clause no. 3.2.2. The sub-base shall be cleaned of all dust, dirt or any loose material. It shall then be wetted with water, mopped and smeared with neat cement slurry.

Terrazzo topping shall be laid while the under layer is still plastic but has hardened enough which is normally achieved between 18-24 hours after laying the under layer. A cement slurry @ 2.75Kg of cement per Sqm. of area pigmented with the same colour as the topping be brushed on the surface immediately before laying the topping. The terrazzo mix shall be laid to a uniform thickness and be compacted thoroughly by tamping or rolling and trowelled and brought true to required level by a straight edge and steel floats so that the maximum amount of marble chips come up and spreaded uniformly over the surface and no part of the surface is left without the chips.

8.3 CURING

The surface shall be left dry for air curing for a period of 12-18 hours. Thereafter water shall be allowed to stand overnight in pools for a period of minimum four days.

8.4 GRINDING AND FINISHING

Grinding and polishing shall be done with machines and shall start after 7 days of laying. First grinding shall be done with carborundum stone of 60 grit size. The surface shall then be washed clean and grouted with a grout of cement and/or colouring matter in same mix and proportion as the topping in order to fill any pin holes that appear. It shall then be allowed to dry for 24 hours and wet cured in the same manner as in clause no. 6.3. The second grinding shall be done with carborundum stone of 80 grit size. The surface shall then be prepared as after first grinding.

The third grinding shall be done with carborundum stone of 120 to 150 grit size. The surface shall then be prepared again as after first grinding.

The fourth grinding shall be done with carborundum stone of 320 to 400 grit size. The surface shall then be washed clean and rubbed hard with felt and slightly moistened oxalic acid powder @ 35 gms per square metre of floor surface. After the finishing works are over, the surface shall be washed with dilute oxalic acid solution and dried. Floor polishing machine fitted with felt on hessian bobs shall then be run over it until the floor shines.

In case of polishing, wax polish shall be applied on the surface with the help of soft linen over a clean and dry surface. Then the polishing machine fitted with bobs shall be run over it. Clean saw dust shall be spread over the floor surface and polishing machine again operated to remove excess wax.



Cast-in-situ Terrazzo in skirting, dado and risers shall be of specified thickness and of same shade as that of the flooring.

Underlayer for terrazzo on vertical surfaces shall be of stiff cement mortar 1:3 (1 cement: 3 coarse sand by volume) finished rough so as to give a good bond to the topping. Terrazzo topping shall be average 12mm thick and underlayer shall be 13 mm thick. Terrazzo topping shall be laid on the under layer in accordance with clause no. 8.2. Other details shall be same as for flooring excepting grinding which shall be manual and panels dividers are required

9.0 PRECAST HYDRAULICALLY PRESSED TERRAZZO TILES

9.1 MATERIALS

9.1.1 TERRAZZO TILES

Terrazzo tiles shall be of specified thickness and shade and shall generally conform in all respects to IS-1237. The tiles shall be made with 10mm down size stone aggregates, white & ordinary cement mix (1 white cement: 6 ordinary cement by volume) and pigments conforming to IS: 2114, Table -I.

9.1.2 PIGMENTS

Pigments to be admixed with mortar or for grouting the joints shall conform to Table -1 of IS: 2114.

9.1.3 CEMENT MORTAR

Cement mortar shall be in accordance with civil structural specification and following schedule

- | | | | |
|----|-------------------------|---|---|
| a. | For flooring | - | 20mm thick cement mortar (1 cement: 4 coarse sand by volume). |
| b. | For skirting/dado/riser | - | 12mm thick cement mortar (1 cement: 3 coarse sand by volume). |

9.2 WORKMANSHIP

Workmanship shall in general conform to IS: 1443. The base on which tiles are to be laid shall be cleaned of all dust, dirt and properly wetted by applying neat cement slurry @ 2.75 kg. of cement per Sqm. of area without allowing water pools. Cement mortar of specified thickness shall then be spread over the base for two rows of tiles and 3-5 metres in length. The mortar shall be laid in slope as per requirements and thickness of mortar shall not be less than 10mm at any place. The top of the mortar shall be kept rough so that cement slurry can be absorbed. Laying shall be from centre & proceed outwards in two directions at 90°. Cut tiles of uniform sizes shall be laid along periphery, if necessary. Neat cement slurry @ 4.4 kg. of cement per Sqm. shall be spread over the mortar bed for laying 20 tiles at a time. The tiles shall then be fixed in this grout one after the other, each tile being gently tapped and properly bedded in line



and level. The Joints shall not exceed 1.5mm in width. After the day's work, the excess cement slurry on top and the joints shall be cleaned with broom stick and washed before the slurry sets hard. Next day, the joints shall be filled with the cement grout to match the shade of the tile.

Tiles along the periphery shall be continued by average 12 mm under the wall plaster, skirting or dado.

For skirting/dado/risers on the brick masonry wall, the joints shall be raked out to a depth of at least 15mm while the masonry is being laid. In case of concrete work, the surface shall be hauled and roughened with wire brushes. The wall surface shall be uniformly and evenly covered with backing of cement mortar 1:3 (1 cement : 3 coarse sand by volume) of specified thickness. Before hardening of the cushioning mortar, back of each tile shall be covered with a neat layer of cement slurry @ 4.4 kg of cement per Sq.M. and edges with white cement with or without pigment to match the shade of tiles and the tiles then shall be pressed on the backing and tapped.

The tiles shall be corrected to proper planes with joints truly vertical in required pattern and butt jointed. The fixing shall be done from bottom upward. The top of skirting and dado shall be truly horizontal.

9.3 CURING

The flooring shall be cured for 7 days by keeping it wet with ponding. Heavy traffic on the flooring shall be permitted only after 14 days.

9.4 GRINDING AND POLISHING

Grinding shall be commenced after 14 days when the tiles and the joints are properly set. Grinding shall be done by machines except for skirting and small areas. First grinding shall be done with carborundum stones of 48 to 60 grade grit fitted in the machine. Water shall be properly used during grinding. When the chips show up and the floor has been uniformly rubbed, it shall be cleaned with water baring all pin holes. It shall then be covered with a thin coat of grey/white cement mixed with pigments to match with colour of the flooring. This grout shall be kept moist for a week. Thereafter the second grinding shall be started with carborundum stone of 120 grit. Grinding and curing shall follow again. Final grinding shall be with carborundum of grade 220 to 350 grit using water in abundance. The floor shall be washed clean with water, oxalic acid powder shall then be dusted at 35 gms/sq. m. on the surface rubbed with machine fitted hessian bobs or rubbed hard with woollen rags. The floor shall then be washed clean and dried with a soft cloth or linen. If any tile is disturbed or damaged, it shall be refitted or replaced and properly jointed and polished.

10.0 TILE WORK

10.1 MATERIALS

10.1.1 TILES



Glazed (vitreous and ceramic tiles shall conform to IS: 777 and shall be of specified shade, size and of approved manufacturer. Ceramic tiles shall be matt finished and non slip type.

The size shall be as per following:

a. White/ coloured glazed vitreous tiles

200mm x 100mm x 6mm

200mm x 150mm x 6mm

200mm x 300mm x 6mm

300mm x 300mm x 8mm ($\pm 5\%$)

b. Ceramic Tiles

300mm x 300mm x 8mm ($\pm 5\%$)

200mm x 100mm x 6mm

10.1.2 PIGMENTS

Pigments to be admixed with mortar or for grouting the joints shall conform to Table -1 of IS: 2114.

10.1.3 CEMENT MORTAR

Cement mortar shall be in accordance with civil structural specification and following schedule

- | | | |
|----|-------------------------|---|
| a. | For flooring | : 20mm thick, cement mortar(1 cement : 6 coarse sand by volume) |
| b. | For skirting/dado/riser | : 12mm thick, cement mortar (1 cement:3 coarse sand by volume) |

10.2 WORKMANSHIP

The tiles shall be laid over a coating of specified adhesive (as per approved manufacturer's specification) laid on base floor/wall plaster. The Joints of the tiles shall be flush pointed with cement paste (white cement and pigment conforming to IS:2114, Table-1) matching the shade of colours.

10.3 CURING

The flooring shall be cured for 7 days by keeping it wet with ponding. Heavy traffic on the flooring shall be permitted only after 14 days.

11.0 KOTA STONE FINISH

11.1 MATERIALS



The Kota Stone slabs shall be of selected quality and shade, hard, sound, dense, homogenous in texture, free from cracks, decay, weathering and flakes. These shall be machine cut to the requisite size and thickness and chisel dressed. For flooring and skirting/dado/riser the thickness of the stone slabs shall be 25mm and 18mm respectively.

The slabs shall have the top (exposed) face polished before being brought to site. Before starting the work, the contractor shall get the samples of slabs approved by Engineer-in-charge.

11.2 WORKMANSHIP

11.2.1 DRESSING OF SLABS

Each slab shall be machine cut to the required size and shape and fine chisel dressed at all edges to full depth and machine rubbed to a smooth surface finish. All angles and edges of the slabs shall be true Square and free from chippings giving a plane and smooth surface.

11.2.2 PREPARATION OF SURFACE

Cement mortar in accordance with clause no. 6.1.3 of specified thickness and mix and shall be laid over the base after making it rough, cleaning thoroughly and applying neat cement slurry @ 2.75 kg of cement per Sqm. of area to receive the mortar.

The mortar shall be laid for fixing one slab at a time. Cement mortar shall be 15mm thick (1 cement: 4 coarse sand by volume) for flooring and 12mm thick (1 cement: 3 coarse sand by volume) for skirting/dado/riser.

11.2.3 LAYING

The slab shall be washed clean before laying. It shall be laid over cement mortar bedding on top, pressed, and tapped gently to bring it in level. It shall be then lifted and laid aside. Top surface of the mortar then shall be corrected by adding fresh mortar at hollows and depressions. The mortar then shall be allowed to harden and cement slurry of honey like consistency @ 4.4.kg of cement per Sq. M shall be spread over the mortar. The edges of the slabs shall be buttered with white cement with or without pigment grout to match the shade of the slabs. The slabs shall then be gently placed in position and tapped with wooden mallets till it is properly bedded in level. The joints shall be as fine as possible. Surplus cement on the surface of the slab shall be removed. The slabs in flooring shall continue for not less than 10 mm under the plaster/skirting. The finished surface shall be true to levels and slopes as instructed by the Engineer-in-Charge.

The slabs shall be laid in patterns as per drawings and size shall not be less than 310mm X 310mm which shall be uniform. Cut size may be used along periphery as required.

11.3 CURING



The floor shall be cured for a minimum period of 7 days by wetting.

11.4 POLISHING AND FINISHING

Unevenness at the meeting edges of slabs shall be removed by fine chiselling. Polishing etc. shall be done in accordance with clause no. 6.4, except that cement slurry shall not be applied on the surface before each polishing.

12.0 MARBLE STONE FLOORING

12.1 MATERIALS

12.1.1 MARBLE SLABS

The Marble slabs shall be 20mm thick and grade -I Makrana White or Makrana plain Pink or Abu Green or Baroda Green as specified. The marble from which the slabs are made shall be of selected quality, hard, sound, dense, homogenous in texture, free from cracks, decay, weathering and flakes. The sample of Marble stone slabs shall be got approved from the Engineer-in-Charge.

The slabs shall be machine cut to the requisite dimensions.

12.1.2 PIGMENTS

Pigments to be admixed with mortar or for grouting the joints shall conform to Table -1 of IS: 2114.

12.1.3 CEMENT MORTAR

Cement mortar shall be in accordance with civil structural specification and following schedule

- | | | | |
|----|-------------------------|---|---|
| a. | For flooring | : | 20mm thick, cement mortar(1 cement : 6 coarse sand by volume) |
| b. | For skirting/dado/riser | : | 12mm thick, cement mortar (1 cement:3 coarse sand by volume. |

12.2 WORKMANSHIP

Same as clause no. 11.2 except that cement mortar shall be 20mm thick (1 cement: 6 coarse sand by volume) for flooring.

12.3 CURING

The floor shall be cured for a minimum period of 7 days by wetting.

12.4 POLISHING AND FINISHING



Unevenness at the meeting edges of slabs shall be removed by fine chiselling. Polishing etc. shall be done in accordance with clause no. 6.4, except that cement slurry shall not be applied on the surface before each polishing.

13.0 P.V.C. FINISH

13.1 MATERIALS

13.1.1 P.V.C. ROLL/TILES

P.V.C. Roll/tile shall be 2mm thick homogenous, unbacked, flexible type of approved texture, colour and pattern, conforming to IS: 3462/3461.

13.1.2 ANTISTATIC PVC ROLL/TILE

Antistatic P.V.C, roll/tile shall conform to B.S.2050, Table-2 in addition to IS: 3462,

13.1.3 ADHESIVE

Adhesive shall be neoprene based rubber adhesive of approved make.

13.2 WORKMANSHIP

The base course shall be Cement Concrete flooring/Cement Concrete granolithic flooring for flooring and Cement plaster for skirting thoroughly dried and cleaned well before the laying of P.V.C. rolls/tiles.

P.V.C. rolls/tiles shall be brought to the temperature of the area in which it is to be laid and stacked suitably near the site for a period of about 24 hours.

The layout of P.V.C. flooring shall first be marked with guidelines on the base course to required pattern without adhesive. The adhesive then shall be applied by spatula to the base floor and back of the PVC roll/tile. PVC rolls shall be placed in position from one end onwards slowly without creation on any air pockets between roll and the base course. PVC rolls/tiles shall be placed only when the adhesive is set sufficiently for laying. When set sufficiently for laying, the adhesive will be sticky to the touch but shall not mark the fingers. After placing, the roll shall be pressed suitably with a wooden roller weighing about 5 kg. The joint between adjacent rolls shall be thin hairline type. For PVC tiles laying shall start from centre and proceed outwards in two right angle direction till the periphery of the room/area is reached. Fractional tiles of uniform cut sizes may be laid only along the peripheral border if so required owing to size of the room area.

PVC rolls in flooring shall be continued for 100mm high skirting without any joints and with 50mm radius rounded corner at the junction of skirting and flooring. Any excess adhesive squeezing out of the surface shall be wiped off immediately with a wet cloth. In case of such excess adhesive becoming hard, it shall be removed with a solution of one part of commercial Butyle Acetate and three parts of turpentine oil or any other solution as advised by the manufacturer of the roll.



After a minimum period of 24 hours after laying the rolls/tiles, the finished floor shall be cleaned with a wet cloth soaked in warm soap solution of 2 spoons of soft soap powder in 5 litres of warm water or detergent as per approved manufacturers specifications

14.0 ACID RESISTANT TILES

14.1 MATERIAL

The tiles shall be vitrified ceramic tiles of approved size as per approved manufacturer's specification and shall be homogeneous. They shall have the following properties :-

S.No.	Property	Values	Norms
1	Water Absorptions	±0.5%	ASTM C 373
2	Scratch Resistance	≥ 6	ASTM C 373
3	Chemical Resistance	Unaffected	ASTM C 650
4	Abrasion Resistance	≥ 100	ASTM C 501
5	Breaking strength	1400 kg/sq.cm	ASTM C 648
6	Density	≥ 2.0 Gm/CC	

14.2 WORKMANSHIP

The base course shall be Cement Concrete flooring/Cement Concrete granolithic flooring for flooring and Cement plaster for skirting/dado and background surface shall be prepared as per clause no. 6.2 and IS:4443.

Tiles shall be fixed on the prepared surface over a bitumen priming layer, bitumen mastic layer and resin type chemical resistant mortar. The bitumen shall conform to IS:702 and laying of bitumen mastic shall conform to IS: 1196.

Joints shall be allowed to set for 24 hours. The floor shall then be washed as per manufacturer's specifications to totally remove all marks from tile surface.

15.0 EPOXY COATING

15.1 GENERAL

Epoxy floor coating shall be pigmented (approved shade) and consist of a solvent based, two pack system with epoxy resins and amine curing agents, chosen to withstand high degrees of chemical and abrasive action as per approved manufacturer's specification.

15.2 MATERIALS



15.2.1 SCREED

The screed shall be provided in flooring and shall consist of a solvent free combination of epoxy resin, modified amine hardeners filled with specially graded and selected chemically inert aggregates of high strength. The system shall include an epoxy resin primer and screed which are both supplied in pre-weighed units ready for on-site mixing and application. The thickness of screed shall be minimum 3mm thick.

15.2.2 FINISHING COAT

An epoxy resin sealing coat in two coats @ 125 gms./sq.m. (minimum) per coat shall form the topping coat over the screed in case of flooring and over plastering in case of vertical surfaces.

15.3 WORKMANSHIP

15.3.1 PREPARATION OF SURFACE

The surface shall be sound, clean and dry in order to achieve maximum adhesion with the primer coating of epoxy resin as per approved manufacturer's specification.

15.3.2 LAYING

The primer shall be applied by brush and shall be allowed to become tacky. The screed shall be prepared as per manufacturers specification and laid in specified thickness evenly over the base floor by trowel. In case of flooring, the finished, cured screed shall have a slightly granular texture.

The epoxy resin topping shall be applied at least 24 hours after the laying of the screed. This topping shall be applied by brush or sprayed to a specified thickness in two coats with 3-5 hours interval between them. Care shall be taken to finish the topping perfectly smooth and devoid of any bubbles and unevenness. The newly laid floor shall be protected from dust or moisture and allowed to be used only after a minimum lapse of 48 hours.

16.0 MEASUREMENT AND RATE (THIS CLAUSE SHALL BE APPLICABLE FOR ITEM RATE TENDERS ONLY)

Measurement and rate for flooring for item rate tenders shall be in Sqm. in general unless otherwise mentioned.







Energising Quality

VCS Quality Services Pvt Ltd

**STANDARD SPECIFICATION
FOR
WOOD WORK**

VCS-SS-CS-6041

					
03	31.01.2022	NV	GDS	HK	GW
02	28.02.2020	NV	GDS	RKB	SK
01	16.10.2019	MA	MO	AD	SK
00	05.07.2017	MA	MO	AD	SK
Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By

UNCONTROLLED COPY : If printed

CONTROLLED COPY : If in soft and signed



Energising Quality

**STANDARD SPECIFICATION
FOR WOOD WORK**

DOC NO: VCS-SS-CS-6041
Rev No : 03

REVISION RECORD						
Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description
00	05.07.2017	MA	MO	RKB	AD	Issued for use as Standard
01	16.10.2019	MA	MO	RKB	SK	
02	28.02.2020	NV	GDS	RKB	SK	New revision system updated
03	31.01.2022	NV	GDS	HK	GW	VCS QMS Integration



ABBREVIATION

m	Metre
mm	Millimetre
Cm	Centimetre
Sqm	Square Metre
Cum	Cubic Metre
Cm ²	Square Centimetre
Kg/m ²	Kilogram Per Square Metre
C/C	Center to Center
IS	Indian Standard



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1.0 SCOPE

This specification covers the general requirements for all types of wood work in doors, windows, ventilators, partitions, etc.

2.0 REFERENCES

Reference shall be made to the following Indian Standards for any further information etc. not covered in the specification. In case of any conflict/contradiction, provisions of specification shall override.

IS: 2202 Part-I	:	Specifications for wooden flush door shutters (solid core type) particle board and hard board face panels.
IS: 2202 Part-II	:	Specification for wooden flush door shutters (solid Core type) plywood face panels.
IS: 1003 Part-I	:	Specification for Timber paneled and glazed shutters –Door shutters.
IS: 3087	:	Specification for Wooden particle boards (Medium Density) for general purposes.
IS: 309	:	Specification for veneered particle boards.
IS: 848	:	Specification for synthetic resin adhesives for Plywood (phenolic and amino plastic)
IS: 205	:	Specification for nonferrous metal butt hinges.
IS: 2338	:	Code of practice for finishing of wood and wood Based materials. (Part I & II)
IS: 1341	:	Specification for steel butt hinges.
IS: 4021	:	Specification for timber door, window and ventilator frames.
IS: 303	:	Specification for plywood for general purposes.

3.0 MATERIAL

3.1 TIMBER

3.1.1 TEAKWOOD



Teakwood shall be second class Indian Teakwood conforming to IS 4021 of good quality, well seasoned and free from defects such as cracks, dead knots, sapwood etc. No individual hard and sound knot shall be more than 15 sqcm. in size and the aggregate area of such knots shall not exceed 2% of the area of the piece. The timber shall be fairly close grained having not less than 2 growth rings per cm. width in cross section.

3.1.2 HARD WOOD

Hard wood shall be first class wood conforming to IS: 4021 of good quality, well seasoned and free from defects such as dead knots, cracks, sapwood etc. No individual hard and sound knot shall exceed 6 sq. Cm. in size with no dimension more than 50 mm and the aggregate area of such knots shall not be more than 1% of the area of the piece. There shall not be less than 5 growth rings per cm. Width in cross-sections.

3.1.3 MOISTURE CONTENT IN TIMBER

The maximum permissible percentage of moisture content for well seasoned timber shall be as per IS: 287.

3.1.4 WORKMANSHIP OF WOOD WORK

Workmanship for wood and joinery shall be as per IS: 1200 and IS: 4021.

3.1.5 PAINTING/POLISHING OF WOOD WORK

Painting/polishing of wood work shall be in accordance with specification No. VCS-SS-CS-6045

PARTICLE BOARD

Particle board shall conform to IS: 3097 and shall be three layer flat pressed teakwood based and of exterior grade (Grade-I), type-1, BWP type, bonded with phenol Formaldehyde Synthetic resin conforming to IS: 848.

3.2 MDF (MEDIUM DENSITY FIBRE) BOARD

Medium density fibre board shall conform to IS: 12406 Exterior grade (EGSB). It shall be dense, homogenous and manufactured from agro based lignocellulose fibres bonded with BWP type phenol formaldehyde synthetic resin conforming to IS: 848. It shall be categorized as class 1 for 'Surfaces of very low flame spread' as per IS: 1642.

3.3 BLOCK BOARD

Block board shall conform to IS: 2202 and shall be made of solid Core block board. 'T' type Teak wood beading of minimum 12mm thickness shall be fixed to the exposed edges of the boards.

3.4 VENEERS

Veneers shall conform to class-1 of IS: 303 and BS: 476 Part-7.



3.5 FITTINGS & FIXTURES

3.5.1 HINGES

Hinges shall be of Extruded Aluminium Alloy and butt type conforming to IS: 205. Size of hinges shall be minimum 125mm long. Maximum spacing of hinges shall not exceed 600mm c/c

3.5.2 OVERHEAD HYDRAULIC DOOR CLOSER

Overhead hydraulic door closers shall be of heavy duty type and shall conform to IS: 3564.

3.5.3 FLOOR MOUNTED DOOR CLOSER

Floor mounted door closers shall be of heavy duty type and hydraulically operated and shall conform to IS: 6315.

3.5.4 MORTICE LOCK

Mortice locks shall be of chromium plated brass body and shall have 6 levers and pair of handles of pressure die cast zinc alloy (satin finished). Mortice locks shall conform to IS: 2209.

3.5.5 DOOR HANDLES

Door handles shall be of pressure die cast zinc alloy and shall be chromium plated.

3.5.6 ALDROP

Aldrop shall be of anodized Aluminium in bronze colour and shall be 300 mm long and 19.05mm dia.

3.5.7 TOWER BOLTS

Tower bolts shall conform to IS: 204 and shall be of anodized Aluminium in Bronze colour.

3.5.8 DOOR STOPPER

Door stoppers shall consist of heavy duty rubber shoes spring loaded type with zinc alloy pressure die cast chromium plated holders.

3.5.9 TOILET DOOR LATCH

Toilet Door latch shall be of Anodized Aluminium and shall be 75mm long with Vacant/occupied indicator.

3.5.10 COAT & HAT HOOK



Coat & Hat hooks for Toilet doors shall be of chromium plated brass body.

3.6 GLAZING

Glass sheets for glazing shall be i) 4 mm thick plain glass (wt. 7.2 kg/m²) conforming IS: 2835, or ii) 5.5 mm thick toughened glass conforming to IS: 5437 as specified.

Glass sheets shall be free from flaws, scratches, cracks, bubbles etc.

4.0 WOODEN DOOR/WINDOW FRAME

Wooden Door/Window frame shall be made of specified wood and shall be in accordance with detailed drawings.

The wooden members of the frame shall be planed smooth and accurate to the full dimensions. Rebates, rounding, moulding etc. shall be done before the members are join into frames.

Joints in the frame work shall be perfect with square edges and shall be pinned with hard wood/bamboo pins of 10 to 15 mm dia.

Wood work shall be painted/polished or otherwise treated as specified. All exposed portions shall be coated with wood primer and concealed surface by bituminous paints as per specification No VCS-SS-CS-6045.

Before any surface treatment is applied, the wood work shall be got approved by the Engineer-in-charge. The frames shall be fixed to the masonry by 300mm x 25mm x 6mm MS hold fasts embedded in M-15 grade concrete block of 350mm x 100mm x 100mm in the hole of masonry. In case of concrete, frames shall be fixed by 96mm long, 12mm dia metallic dash fasteners.

5.0 DOOR SHUTTERS

Door shutters shall be complete with all operational fittings & fixtures like hinges, overhead hydraulic door closers, Tower bolts, Locking device, handles, door stopper etc.

5.1 BLOCK BOARD FLUSH SHUTTER

Block board flush shutter shall conform to IS: 2202. The shutter shall be 35mm thick and shall be made of solid core block board. *T* type Teak wood beading of minimum 12mm thickness fixed to the perimeter of the shutter. The shutter shall be faced on both sides with following finishes as specified and shall be factory made.

- a. 3mm thick commercial type plywood conforming to IS:303, BS:476 part-7 finished with 2 coats of approved quality synthetic enamel paint over primer coat or
- b. Approved quality 1mm thick teakwood veneering conforming to IS:303, BS:476, part 7 or



- c. 1mm thick approved quality lamination of approved shade.

The edges of the shutters shall either be painted with synthetic enamel paint or French polished.

5.2 PANEL DOOR SHUTTER

Panel door shutter shall be 35mm thick and shall consist of 100mm x 35mm teakwood stiles & top rail, 200mm x 35mm bottom rail and 150mm x 35mm lock rail and 12mm thick particle board infill panels. The infill panels shall be fixed with adhesive and moulded Teakwood headings (minimum 12.5mm x 12.5mm size).

The shutter shall be painted with 2 coats of approved shade synthetic enamel paint or polyurethane paint as specified over approved coat of primer.

5.3 GLAZED WOODEN DOOR SHUTTER

Glazed wooden door shutter shall be 38mm thick and shall consist of 100mm x 38mm Teakwood stiles and top rail, 200mm x 38mm bottom rail and 150mm x 38mm thick lock rail. 4mm thick plain glass or 5.5mm thick toughened glass panels shall be fixed in the stiles & rails with neoperene adhesive and 12.5mm x 12.5mm moulded Teakwood beading. All the wood work shall be painted with 2 coats of approved shade synthetic enamel paint or polyurethane paint as specified over a coat of primer.

5.4 FLYMESH DOOR SHUTTER

Fly mesh door shutter shall be 38mm thick and shall consist of 100mm x 38mm Teakwood stiles and top rail, 200mm x 38mm bottom rail and 150mm x 38mm thick lock rail and net of galvanised MS wire gauge of IS gauge designation 856 & dia 0.56mm fixed with 12.5mm x 12.5mm moulded Teakwood beading. The shutter including wire mesh shall be painted with 2 coats of approved shade synthetic enamel paint or polyurethane paint as specified over a coat of primer.

6.0 MEASUREMENT & RATE

This clause shall be applicable for item rate tenders only.

For item rate tenders wood work in door/window frames shall be measured in Cum. Door/window shutters shall be measured in Sqm. Hardwires and fittings like locks, tower bolts, door closer etc. shall be counted in numbers provided. Length and width shall be measured to the nearest 0.01 M. Area and volume shall be worked out to the nearest 0.01 Sqm. and 0.001 Cum.

Rate for item rate tenders shall include all materials, labour, erection, protective measures, transport, conveyance, storage and other incidental expenditures as required for completion of the items.







Energising Quality

VCS Quality Services Pvt Ltd

**STANDARD SPECIFICATION
FOR
STEEL/ALUMINIUM DOORS, WINDOWS AND VENTILATORS**

VCS-SS-CS-6042

					
03	31.01.2022	NV	GDS	HK	GW
02	28.02.2020	NV	GDS	RKB	SK
01	16.10.2019	MA	MO	AD	SK
00	05.07.2017	MA	MO	AD	SK
Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By

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**STANDARD SPECIFICATION
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VENTILATORS**

**DOC NO: VCS-SS-CS-6042
Rev No : 03**

REVISION RECORD						
Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description
00	05.07.2017	MA	MO	RKB	AD	Issued for use as Standard
01	16.10.2019	MA	MO	RKB	SK	
02	28.02.2020	NV	GDS	RKB	SK	New revision system updated
03	31.01.2022	NV	GDS	HK	GW	VCS QMS Integration



Energising Quality

**STANDARD SPECIFICATION
FOR STEEL/ALUMINIUM DOORS, WINDOWS AND
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**DOC NO: VCS-SS-CS-6042
Rev No : 03**

ABBREVIATION

m	Metre
mm	Millimetre
Cm	Centimetre
IS	Indian Standard
Kg/m ²	Kilogram Per Square Metre
MS	Mild Steel



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1.0 SCOPE

This specification covers the general requirements for aluminium glazed doors, windows and ventilators. The work shall be in accordance with the latest IS codes and to the satisfaction of the Engineer-in-Charge. The Contractor shall be responsible for the proper arrangement of material, labour, tools, etc., as may be required for the completion of the works, though not specifically mentioned in the specification.

2.0 REFERENCES

Reference shall be made to the following Indian Standards for further information etc. not covered in the specification. In case of any conflict/contradiction the provisions of the specification shall override.

IS: 6248	:	Specifications for metal rolling shutters and rolling grill.
IS: 1081	:	Code of practice for fixing and glazing of metal (steel and aluminium) doors, windows and ventilators.
IS: 4351	:	Specifications for steel door frames.
IS: 1948	:	Specifications for Aluminium doors, windows and ventilators.
IS: 1361	:	Specifications for steel windows for Industrial buildings.
IS: 1038	:	Specifications for steel doors, windows and ventilators.
IS: 1200	:	Method of measurement of glazing.
IS: 3614	:	Specification for fire check doors.
IS: 7452	:	Specification for hot rolled steel sections for doors, windows and ventilators.
IS: 2835	:	Flat transparent sheet glass.
IS: 5437	:	Wired and Figured glass.
IS: 2553	:	Safety glass.

3.0 PRESSED STEEL DOOR/WINDOW/VENTILATOR FRAME

The frames shall be of specified sectional size, dimension and profile.

The frames shall be made of 16 gauge pressed steel bent to shape using bending machine, and mitred with square edges. The frames shall be provided with spacers by welding 50 mm x 5 mm flats to the portion of the frame in contact with the wall jambs @ 600 mm vertical spacing.



The frame shall be fixed to the masonry by means of 300 mm x 25mm x 6mm hold fast welded to the spacers and grouted with M-15 grade concrete in minimum 350 mm x 100 mm x 100 mm sized hole in the masonry.

In case of concrete, the frames shall be fixed by 96 mm long, 12 mm dia metallic counter sunk type dash fasteners through the frame and spacers.

Provisions for hinges, locking arrangement and other hardware's shall be provided in the frames by machine cutting required size cutout on the frame body and welding/screwing to 3 mm thick MS pad plates already welded over the cut out from behind.

The frame surface shall be thoroughly cleaned of rust, mill scale, dirt, oil etc. and then finished with painting (by priming with red oxide zinc chromate primer conforming to IS: 2074 and painting conforming to IS: 1477 Part (II) or by approved shade electrostatic powder coating (25 micron).

4.0 PRESSED STEEL DOOR SHUTTER

Pressed steel shutters shall be hollow type with 18 gauge pressed steel sheet welded at meeting of the sheets with pad plate of MS flat 3 mm thick all along perimeter. The cavity shall be packed with rigid phenolic foam board adequately cut into shape to fully fit into the box cavity without gaps.

The shutter shall be formed by machine bending of 18 gauge pressed steel sheet in form of hollow box making an overall thickness of 40mm forming truly square edge in accordance with the shutter profile. It shall further be braced with channel shaped horizontal stiffeners formed by folding 16 gauge MS sheets (35mm wide) @ 500 mm max. and fixed by flush riveting. 3mm thick MS pad plates shall be welded inside at required locations for fixing of hardwires such as tower bolt, aldrop etc.

For double shutter doors, an MS angle 25mm x 45mm x 3 mm thick shall be welded to one of the shutters providing a minimum 25mm wide rebate for the other shutter at the meeting point during closed condition.

The shutter surfaces shall be painted with electrostatic ally powder coating/two coats of synthetic enamel paint over a priming coat of red oxide zinc chromate conforming to IS:2074/IS:1477 (Part-II) as specified.

The shutters shall be fixed to the door frame by means of heavy duty MS butt hinges of 150mm size conforming to table 6 of IS 1341 @ 600mm.

In case of air tight door shutters, approved quality continuous neoprene rubber beading shall be provided continuously along the door frame rebate fixed with neoprene rubber adhesive of approved make.

In case of partly glazed door shutter, Glass as specified shall be fixed with glazing clips and solid drawn 10 mm x 10 mm, MS beading backed with putty and fixed by countersunk screws. Necessary rebate for fixing the glass shall be provided by arranging the shutter bracing accordingly.



The overall shutter shall ensure smooth operation, proper sizing and shaping as per drgs.

The shutters shall be provided with locking device, handle and other hardware's as specified.

5.0 STEEL WINDOWS & VENTILATORS

Steel windows, ventilators shall in general conform to IS: 1081, IS: 1038 and IS: 7452.

5.1 MATERIALS

5.1.1 ROLLED STEEL SECTION

Rolled steel sections for the fabrication of steel windows, ventilators shall conform to IS: 7452.

5.1.2 GLASS PANELS

Glass panels for glazing purpose shall be as specified. All glass panes shall have properly squared corners and straight edges. Glass panes shall be of following types as specified.

- a. 4mm thick transparent sheet glass conforming to IS: 2835 (wt. 7.2 kg/Sqm)
- b. 5.5 mm thick wired glass conforming to IS: 5437.
- c. 6.3 mm thick laminated safety glass conforming to IS:2553.

5.2 WORKMANSHIP

The profile and type of windows, ventilators (glazed, partly glazed/louvered, side hung/top hung/fixed shutter, composite) shall be as per drawings.

The frames shall be constructed of sections cut to size and mitred. Corners shall be welded to form a fused welded joint. Process of welding shall be flash butt welding. The welded joints shall be grinded to square and flat edges.

Where larger units are to be formed by coupling individual units, the mullions, transoms shall be bedded in mastic to ensure weather tightness. Mastic shall be applied liberally to the channels of the outside frame sections before assembly, and the two units being coupled shall be drawn together tight with clamps, the mastic being squeezed out and cut off neatly when the units shall be screwed together tight.

Where fixed glazing units are placed over open able units a push fit weather bar shall be provided.

Before glazing, all opening parts shall be checked for their operational smoothness. The frame shall be completely cleaned and bedding putty shall be placed in the rebate before glazing. Glass then shall be cushioned into the bedding and shall be fronted with front putty in a manner so as to enable the painting to be done upto the sight line. The



back putty oozing out over the glazing rebate shall be cut off square and smoothed down.

For panels exceeding 600 x 300 mm in size, glass shall be secured by special glazing clips inserted in holes already provided in the steel sections, before applying the front putty.

For glazing of very large areas, rust proof steel beading with mitred corners shall be provided with screws @ 10 cm. from each corner and @ 20 cm. apart from each other. Putty shall be provided to the face of the bead in contact with glass, in addition to back putty.

Side hung shutters shall be connected to the frame by means of friction hinges. The handle for side hung shutters shall be of pressed brass mounted on a steel handle plate welded to the opening shutter frame and shall not be removable easily after glazing. The handle shall have a two point nose which shall engage with a brass striking plate on the fixed frame in a slightly open as well as in a fixed position.

Top hung shutters shall be provided with steel butt hinges welded to the fixed frame after cutting a slot in it. Top hung casements shall be provided with peg stay of 3 holes of pressed brass, 300 mm long which when closed shall be held tightly by the locking bracket fitted to the fixed frame or to the window.

Before fixing the frames, the size of the opening shall first be checked and cleaned of all obstructions. The positions of the unit in the reveal shall be taken off the drawings and shall be marked on the reveal at the jambs using a plumb line.

In case of fixing with masonry, holes for fixing the lugs/hold fasts shall be cut at required locations.

In case of concrete or stone, the frames shall be fixed by means of dash fasteners.

In case of masonry, the lugs shall be grouted in the holes with cement concrete, M-15 Grade when fixing to steel work, mastic shall be applied to the sill of the opening and the unit shall be placed on it with the jambs and head buttered with mastic and the unit shall be fixed with special fixing dips or with nuts and bolts.

The windows/ventilators shall be checked to ensure smooth operation, perfect level and plumb.

All the steel surfaces shall be thoroughly cleaned free of rust, mill scale, dirt, oil etc. by sand and shot blasting and then finished with painting by priming with red oxide zinc chromate primer conforming to IS:2074 and painting conforming to IS: 1477 (Part II) or by hot dipped galvanizing conforming to IS: 1477 Part (I). Putty shall also be provided with painting in a manner so as to seal the putty glass junction. Surfaces not meant for painting shall be cleaned of any strains of paint.

6.0 ALUMINIUM GLAZED DOORS/WINDOW/VENTILATORS

6.1 GENERAL



Aluminium glazed doors/window/ventilators shall be of specified sectional size, dimension and profile as per drawing.

6.2 MATERIALS

All Aluminium sections shall be extruded sections of "INDAL" aluminium alloy as per IS: 733 and IS: 1285. Aluminium sections shall be anodised as per IS: 7088 or electro statically powder coated to min. 25 microns as specified.

Glass used for glazing shall be of following types as specified.

- a. 5.5 mm thick wired glass conforming to IS:5437.
- b. 6.3 mm thick laminated safety glass conforming to IS:2553.
- c. 5.5 mm thick transparent sheet glass conforming to IS:2835 (wt.7.2 kg/Sqm.)

6.3 WORKMANSHIP

Frames shall be square and flat, the corner of the frame being fabricated to true right angles. Details of construction of frames, shutters etc. shall be as per drawings.

Side hung window shutters shall be fixed to the frame with pivots, or aluminium alloy friction hinges. For fixing the hinges, slots shall be cut in the fixed frames and the hinges inserted inside may be riveted to the frame. The handles for side hung shutters shall be of cast aluminium conforming to IS designation A-5-M of IS:617 and shall be mounted on a handle plate rivetted to the opening frames. The handles shall have same finish as that of the window sections. The handles shall have a two point nose which shall engage with an aluminium striking plate on the fixed frame. The striking plate shall be finished in the same manner as for the handle.

In case of top hung shutters, aluminium alloy cast hinges and peg stays shall be provided.

Centre hung shutters shall be hung on the two pairs of cup pivots of aluminium alloy of IS designation NS-4 of IS 737 and IS designation A-5-M of IS:617 or chromium/cadmium plated brass/bronze cup pivots riveted to the outer and inner frames to permit to swing through an angle of 85°. Cast aluminium (conforming to IS designation A-5-M of IS:617) or chromium/cadmium plated bronze spring catches shall be fixed in the centre of the top bar of the shutter. The spring catch shall be secured to the frame by screwing/riveting to the frame and shall close into an aluminium catch plate riveted/welded to the outside of the outer shutter frame bar. Aluminium or cadmium plated brass chord pulley wheel in an aluminium bracket shall be fitted at the sill of the shutter with Aluminium or galvanized/cadmium plated steel screws.

The door shutters shall be fitted with pivots as specified.

The handles for doors shall be of Aluminium and as per design. The door shutters shall be provided with locking device, floor spring, door closer and any other hardware's as specified



In case of composite Door/window/ventilator units, the units shall be coupled as per drawing. Weather bar shall be provided whenever a coupling member is fitted over an external opening shutter.

Glazing shall be fixed to the extruded sections by means of extruded aluminium beading. Glass panes shall be provided with EPDM gasket/rubber lining before fixing.

The aluminium frames shall be fixed to the masonry by means of aluminium lugs fixed to the frame (by counter sunk brass machine screws) and grouted with M-15 grade concrete in the hole in the masonry as per drawing,

In case of concrete wall, the frames shall be fixed by 96 mm long, 12 mm dia metallic dash fasteners. Any steel material coming in contact with aluminium shall be galvanized.

The windows/ventilators/doors shall be checked to ensure smooth operation, perfect level and plumb.

7.0 MEASUREMENT & RATE

This clause shall be applicable for item rate tenders only.

Measurement & rates for item rate tender shall be on Sqm. basis as per item description.

Area shall be measured correct upto two places of decimal. Dimensions shall be measured correct upto 0.5 cm.

A composite unit of various designations shall be first measured over all as a unit of predominant designations and measurement for remaining designations shall be deducted from the overall measurement of the composite unit in order to arrive at the quantities for various designations. Mullions/Transoms/Coupling bars etc. at the meeting points of various designations shall be equally distributed to all such designations for measurement and rates.

Rate shall include cost of all materials, specified hardware's, labour, erection, hoisting, scaffolding, removal of scaffolding, protective measures, conveyance, handling, loading/unloading, storing etc. required for proper completion of the item of work in accordance with the specification.







Energising Quality

VCS Quality Services Pvt Ltd

**STANDARD SPECIFICATION
FOR
PLASTERING AND POINTING**

VCS-SS-CS-6043

					
03	31.01.2022	NV	GDS	HK	GW
02	28.02.2020	NV	GDS	RKB	SK
01	16.10.2019	MA	MO	AD	SK
00	05.07.2017	MA	MO	AD	SK
Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By

UNCONTROLLED COPY : If printed

CONTROLLED COPY : If in soft and signed



Energising Quality

**STANDARD SPECIFICATION
FOR PLASTERING AND POINTING**

**DOC NO: VCS-SS-CS-6043
Rev No : 03**

REVISION RECORD						
Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description
00	05.07.2017	MA	MO	RKB	AD	Issued for use as Standard
01	16.10.2019	MA	MO	RKB	SK	
02	28.02.2020	NV	GDS	RKB	SK	New revision system updated
03	31.01.2022	NV	GDS	HK	GW	VCS QMS Integration



ABBREVIATION

m	Metre
mm	Millimetre
Cm	Centimetre
Kg	Kilogram
Sqm	Square Metre
RCC	Reinforced Cement Concrete
IS	Indian Standard



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1.0 SCOPE

This specification covers the general requirements for all types of plastering & pointing in all type of building.

2.0 REFERENCES

IS: 1542	Sand for plaster -Specification
IS: 460	Specification for test sieves
IS: 2645	Integral water proofing compounds for cement mortar and concrete –Specification
IS: 2386	Method of test for aggregates for concrete

3.0 MATERIALS

3.1 CEMENT

Cement shall conform to Specification No. VCS-SS-CS-6023.

3.2 SAND

Sand for plaster and pointing shall consist of natural sand, crushed stone sand or crushed gravel sand or a combination of any of these and shall conform to IS: 1542. Sand shall be hard, durable, clean and free from adherent coatings and organic matter and shall not contain any appreciable amount of silt, day bails or pellets. Sand shall not contain harmful impurities such as iron pyrites, coal particles, lignite, mica shale etc in such form or in quantities as to affect adversely the hardening, strength or durability of the mortar.

The maximum quantities of clay, fine silt, fine dust and organic impurities in the sand shall not exceed the following limits:

- a. Clay, fine silt and fine dust when determined in accordance with IS 2386 (Part 2).
In natural sand or crushed gravel sand & crushed stone sand
: Not more than 5% by mass
- b. Organic impurities when determined in accordance with IS 2386 (Part 2):
: Colour of the liquid shall be lighter than that indicated by standard specified in IS 2386 (Part-2)

Grading of sand for use in Plaster shall conform to IS 1542 (as below)

IS sieve designation	Percentage passing
10mm	100



4.75mm	95 to 100
2.36mm	95 to 100
1.18mm	90 to 100
600 micron	80 to 100
300 micron	20 to 65
150 micron	0 to 15

3.3 WATER

Water for plastering and pointing shall conform to VCS-SS-CS-6021

3.4 CEMENT MORTAR

Preparation of cement mortar shall conform to Specification No VCS-SS-CS-6021 and unless otherwise mentioned.

3.5 CEMENT MORTAR WITH WATERPROOFING COMPOUND

Waterproof compound shall conform to IS: 2645 of approved make. The compound shall be well mixed with dry cement in the proportion of 3% by weight or as recommended by manufacturer. Further procedures for preparation of cement mortar shall be as per clause No. 3.4

4.0 WORKMANSHIP

4.1 PREPARATION OF BACKGROUND SURFACE

The surface shall be cleaned of all dust, loose mortar droppings, traces of algae, efflorescence and other foreign matter by water or by brushing. Smooth surfaces shall be roughened by wire brushing or hacking for non-hard and hard surfaces respectively. Projections on surfaces shall be trimmed wherever necessary to get even surfaces. In case of brick/stone masonry, raking of joints shall be carried out wherever necessary. The masonry shall be allowed to dry out for sufficient period before carrying out the plaster work. The masonry shall not be soaked but only damped evenly thereafter before applying the plaster.

In case of concrete work, projecting blurs of mortar formed due to the gaps of joints in shuttering shall be removed. Such surface shall be scrubbed clean with wire brushes. The surface shall be pock marked with a pointed tool at spacing of not more than 50 mm centers, the pocks being made not less than 3 mm deep to ensure a proper key for the plaster. The surface shall be washed off and cleaned of all oil, grease etc. and well wetted before the plaster is applied.

4.2 SEQUENCE OF OPERATIONS



For external plaster, the plastering operations shall be started from the top floor and carried downwards. For internal plaster, the plastering may be started wherever the building frame, roofing, and brick work are ready.

The surfaces to be plastered, shall first be prepared as described in 'Preparation of background surface' in clause no 4.1

The first under layer shall then be applied to ceilings. After the ceiling plaster is complete and scaffolding for the same removed, plastering on wall shall be started.

After a suitable time interval as detailed under various types of plaster in subsequent para's, depending upon the type of mortar, the secondary layers if required shall be applied. After a further suitable time interval as detailed under various type of plaster in subsequent paras, the finishing coat shall be applied first to the ceiling and then to the walls.

Plastering of cornices, decorative features, etc. shall be completed before the finishing coat is applied. Unless otherwise specified corners and edges shall be rounded off to a radius of 25mm, such rounding off shall be complete along with the finishing coat to prevent any joint marks showing out later.

4.3 SCAFFOLDING/STAGING

Scaffolding/staging for plastering/pointing shall be as per 'Technical Specification for Civil and Structural Work'.

4.4 DAMAGE RECTIFICATION

Any cracks, damages, any part of work which sound hollow when tapped or found damaged or defective otherwise shall be cut out in rectangular shape and redone as directed by Engineer-in-charge.

4.5 CHICKEN WIRE MESH

150mm wide, closely knit , 20 gauge chicken wire mesh stretched tight and fixed with G.I. "U" type nails shall be provided at all the brick/stone masonry and RCC joints.

5.0 PLAIN CEMENT PLASTER

5.1 PREPARATION OF MORTARS

The mortars of specified mix. shall be used as per the specifications of 'Cement Mortar' described in clause no. 3.4

5.2 APPLICATION OF PLASTER

5.2.1 ONE LAYER PLASTER WORK

To ensure even, specified thickness, plaster of 150 mm x 150 mm shall be first applied horizontally and vertically at not more than 2 meter interval over the entire surface to serve as gauges. The surface of these gauged areas shall be truly in the plane of the



finished plaster surface. The mortar shall be brought to true surface by working with a wooden straight edge reaching across the gauges with small upward and sideways movements at a time. Finally the surface shall be finished off true with a trowel or wooden float to obtain a smooth texture. Excessive troweling or overworking the float shall be avoided. All corners, arises, angles and junctions shall be truly vertical/horizontal and shall be carefully finished. Rounding or chamfering of corners, arises, junctions etc. shall be carried out with proper templates to the size required.

In suspending the work, the plaster shall be left, cut clean to line, both horizontally and vertically. When recommencing the plastering, the edge of the old work shall be scrapped clean and wetted before plastering the adjoining area. Plastering work shall be closed on the border of the wall and nearer than 150 mm to any corners or arises and shall not be closed on the body of the features such as plaster bands, cornices nor at the corners or arises.

5.2.2 TWO LAYER PLASTER WORK

a. First or Under Layer

The first or under layer of the specified thickness shall be applied as described in clause no. 5.2.1. Before the first coat hardens, surface of it shall be beaten up by edges of wooden tapers and close dents shall be made on the surface. The subsequent coat shall be applied after this coat has been allowed to set for 3 to 5 days depending upon weather conditions. The surface shall not be allowed to dry during this period.

b. Second or Finishing Layer

The second layer shall be complete to the specified thickness in the same manner as for first layer.

5.3 CURING

Curing shall be started 24 hours after finishing the plaster. The plaster shall be kept wet for a period of 7 days. During this period the plaster shall be suitably protected from all damages at the contractor's expense by such means as approved by the Engineer-in-charge. The date of execution of plastering shall be marked on the plastering to ensure the proper duration of curing.

6.0 SAND FACE PLASTER

6.1 PREPARATION OF MORTAR

The mortar of specified mix shall be used as per the specifications of cement mortar described in clause no. 3.4.

6.1.1 APPLICATION OF PLASTER

Sand face plaster shall consist of 13 mm thick (1 cement: 4 coarse sand by volume) under layer and 7 mm thick (1 cement: 2 coarse sand, granule size 2 to 2.5mm by



volume) top layer. Application of plaster shall be as described in "two coat plaster work" in clause no. 5.2.2.

The surface of the sand face plaster shall be finished rough with sponge or as directed by the Engineer-in-charge.

6.1.2 CURING

Curing shall be described in clause 5.3

7.0 EXPOSED AGGREGATE FINISH

7.1 PREPARATION OF MORTAR

The mortar of specified mix shall be used as per the specifications of cement mortar described in clause no. 3.4. White and coloured marble chips shall be of 6 mm to 12mm size out of Makrana/Ambaji, grade I or Dongri Chittor Brown/Rajnagar/Abu green grade-1 quality as specified. Marble dust shall be obtained from crushing hard marble stone.

7.1.1 APPLICATION OF PLASTER

Exposed aggregate finish plaster shall consist of 12mm thick plain cement plaster under layer (1 cement: 4 coarse sand by volume) finished rough and 20 mm thick top layer. Under layer shall be applied in accordance with "One layer plaster work" described in clause no. 5.2.1.

Top layer shall be 20 mm thick admixture of white cement and grey cement (mix. ratio 1:1 by volume) mixed with white/coloured marble chips/pebbles of 6mm to 9mm nominal size as per item description. Mix ratio shall be 1 cement: 1 marble chips/pebbles by volume. Marble dust @ 15% by volume shall be added to the admixture. The pebbles to be used shall be well washed and drained. The admixture shall be thrown wet on to the underlayer while it is still plastic using strong whipping motion at right angles to the face of the wall. One coat of neat cement slurry @ 2.75 kg cement per square metre of area shall be applied on to the underlayer to receive the top layer. The whole plastering shall be laid in panels of maximum 1.2 M x 1.2M or as per drawing with 12mm x 20mm grooves in between formed by holding removable wooden battens of 12mm x 25mm size over the under layer.

Loose mortar etc. on the top surface shall be cleaned/removed by brushing/washing/spraying with water jet after initial setting of mortar.

7.1.2 CURING

Curing shall be as described in Clause no. 5.3

8.0 POINTING

Pointing shall be of the type specified such as flush, cut or weather struck, raised and cut etc.



8.1 PREPARATION OF BASE SURFACE

The joints shall be raked to such a depth that the minimum depth of the new mortar measured from either the sunk surface of the finished pointing or from the edge of the brick shall be less than 20 mm.

8.1.1 MORTAR

Mortar shall be in accordance with the specifications of cement mortar described in clause no. 3.4

8.1.2 APPLICATION OF MORTAR AND FINISHING

The mortar shall be pressed into the raked out joints with a pointing trowel according to the type of pointing specified. The mortar shall be spread over the corner edges or surfaces of the masonry. The pointing shall then be finished with the pointed tool. The superfluous mortar shall be cut off from the edges.

8.1.3 FLUSH POINTING

The mortar shall be pressed into joints and shall be finished off flush and levelled. The edges shall be neatly trimmed with trowel and straight edges.

8.1.4 CUT OR WEATHER STRUCK POINTING

The mortar shall first be pressed into joints. The top of the horizontal joints shall then be neatly pressed back by about 15 mm with the pointing tool so that the joint is sloping from top to bottom. The vertical joint shall also be similarly pointed. The junctions of vertical joints with the horizontal joints shall be at true right angles in case of brick & coursed rubble masonry.

8.1.5 RAISED AND CUT POINTING

This type of pointing shall project from the wall facing with its edges cut parallel so as to have a uniformly raised band about 6 mm and width 10 mm more as directed. The pointing shall be finished to a smooth but hard surface.

8.1.6 CURING

Curing shall be as described in clause no. 5.3

9.0 MEASUREMENT & RATE

The description of each item, unless otherwise mentioned includes wherever necessary all material, conveyance and delivery, handling, loading/unloading, storing, fabrication, hoisting, all labour for finishing the work, preparation of background surface, staging/scaffolding, application, finishing, removal of staging/scaffolding, curing and other incidental charges. The rate for item rate tenders shall be for all heights and at all heights of work.

9.1 PLASTERING & POINTING



Thickness of the plaster shall be the minimum thickness at any point on a surface and shall be exclusive of the key i.e. grooves or open joints in masonry. No extra payment shall be allowed for extra thickness of plaster done by contractor, drip moulds, rounding of edges etc.

For item rate tenders, all plastering/pointing shall be measured in square meters unless otherwise specified. Length, breadth and height shall be measured correct to 0.1 meters. Soffits of stairs shall be measured as plastering on ceiling. Ceiling with projected beams shall be measured over beams and plastered side of beam shall be measured and added on ceiling.

Deductions and additions shall be made in the following manner.

- a. No deductions shall be made for ends of joists, beams, posts, openings not exceeding 0.5 Sq.m. area and no addition shall be made for reveals, jambs, soffits etc. of these openings mortar finish to plaster around ends of joists, beams, posts etc.
- b. Deductions for openings exceeding 0.5 Sq.m but not exceeding 3 Sq.m each shall be made as follows and no addition shall be made for reveals, jambs, soffits etc. of these openings.
 - i. When both faces of wall are plastered with same type of plaster, deduction shall be made for one face only.
 - ii. When two faces of wall are plastered with different types of plasters or if one face is plastered and the other pointed, deduction shall be made from the plaster or pointing on the side of frame for door, window etc. on which width of reveals is lesser, but no deduction shall be made on the other side. Where widths of reveals on both faces of wall are equal, deduction of 50% of area of opening on each face shall be made.
 - iii. When only one face is plastered, full deduction shall be made from plaster if width of reveal on plastered side is lesser. But if widths of reveal on both sides are equal or more on unplastered side, no deduction shall be made.
- c. In case of openings of area above 3 Sq.m each, deduction shall be made for openings but jambs, soffits, and sills shall be measured.







Energising Quality

VCS Quality Services Pvt Ltd

**STANDARD SPECIFICATION
FOR
ROOF TREATMENT**

VCS-SS-CS-6044

					
03	31.01.2022	NV	GDS	HK	GW
02	28.02.2020	NV	GDS	RKB	SK
01	16.10.2019	MA	MO	AD	SK
00	05.07.2017	MA	MO	AD	SK
Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By

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**STANDARD SPECIFICATION
FOR ROOF TREATMENT**

DOC NO: VCS-SS-CS-6044
Rev No : 03

REVISION RECORD						
Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description
00	05.07.2017	MA	MO	RKB	AD	Issued for use as Standard
01	16.10.2019	MA	MO	RKB	SK	
02	28.02.2020	NV	GDS	RKB	SK	New revision system updated
03	31.01.2022	NV	GDS	HK	GW	VCS QMS Integration



ABBREVIATION

m	Metre
mm	Millimetre
Kg/sqm	Kilogram Per Square Metre
gm/Sqm	Gram per Square Metre
Sqm	Square Metre
PCC	Plain Cement Concrete



Energising Quality

**STANDARD SPECIFICATION
FOR ROOF TREATMENT**

**DOC NO: VCS-SS-CS-6044
Rev No : 03**

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1.0 SCOPE

This specification covers the general requirements for all types of roof treatment in all type of building.

2.0 REFERENCES

As mentioned in the respective clauses.

3.0 POLYURETHANE (PU) WATERPROOF COATING

3.1 MATERIAL

PU waterproof coating shall consist of 2 pack clear/pigmented Aliphatic Polyurethane using Polyether Polyols (Polyester or Castor oil based Polyols are not acceptable) with Iso-cynorate for rendering flame resistant characteristic. The 2 pack system consisting of pigment and the solvent (Xylene/Toulene, no filter) shall be mixed in definite ratio by weight strictly as per approved Manufacturers specification for preparing the coating for application. The coating shall have physical features like high resistance to impact, abrasion and cracking, superior tensile strength (80 Kg/Sq.cm after 4 weeks at ambient temperature) and perfectly smooth, dust free glossy finish retained at least up to 3 years. It should also be resistant to acid, alkalies and have a very low water absorption rate (0.5 % maximum at ambient temperature after 7 days)

The packs shall not be older than 9 months after the date of manufacture and packing.

3.2 WORKMANSHIP

3.2.1 PREPARATION OF SURFACE

The roof surface shall be thoroughly cleaned with a wire brush and all foreign matter etc. shall be removed. Well defined cracks on the surface shall be cut to "V" section, cleaned and filled up with a paste of 2 component Polyurethane based crack filling compound and white cement in a ratio of 1:2.

3.2.2 PRIMER COAT

It shall consist of 2 packs Polyurethane. Primer coat shall be mixed in the ratio as per Manufacturer's specification. A single coat of this primer shall be applied by brush over the prepared bed as an adhesion coat. The primer shall be allowed to dry for a minimum of 8 hours time before the successive finishing coats of PU are applied.

3.2.3 FINISHING COAT

The finishing coats shall consist of three successive pigmented sealing coats each of 2 packs Polyurethane mixed in the ratio as per Manufacturer's specification. Application shall be with brush to a smooth and even finish. The overall dry film thickness shall be 450 microns or minimum covering capacity shall be 160 gm/Sqm per coat. Each coat shall be allowed to dry for minimum 12 hours before applying next coat. Care shall be taken for quick application after mixing the 2 pack primer in view of short pot life of the



mix and shall be fully consumed within the stipulated period as per Manufacturer's specification (maximum 60 minutes at 30 deg. C).

The PU coating shall be continued up the parapets/walls for a minimum of 150mm over the finished roof surface. It shall be continued into rain water pipes by at least 100mm. The final coat of PU when tacky shall be sprinkled with 300 micron layer of clean sand. Plain cement concrete (1:2:4) of 25mm minimum thickness with 24 SWG chicken wire mesh shall be laid to slope in panels of maximum 1.2m x 1.2m size over this. The joints between panels shall be raked out neatly (after stipulated curing period) to a minimum 6mm X 6mm V groove and filled up with an approved quality elastomeric compound sealant. Drain outlet shall be provided for all spouts/rain eater pipes by suitable rounding, filling and sloping of PCC as per drawing. At the junction of the roof and parapet or any other vertical surfaces, a fillet of 75mm radius shall be formed in cement concrete (1:2:4).

4.0 MEASUREMENT & RATE

This clause shall be applicable for item rate tenders only

The finished work shall be measured in Sqm. of area for the purpose of payment in item rate.







Energising Quality

VCS Quality Services Pvt Ltd

**STANDARD SPECIFICATION
FOR
WHITE WASHING, COLOUR WASHING, DISTEMPERING, PAINTING
AND POLISHING**

VCS-SS-CS-6045

					
03	31.01.2022	NV	GDS	HK	GW
02	28.02.2020	NV	GDS	RKB	SK
01	16.10.2019	MA	MO	AD	SK
00	05.07.2017	MA	MO	AD	SK
Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By

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Energising Quality

**STANDARD SPECIFICATION
FOR WHITE WASHING, COLOUR WASHING,
DISTEMPERING, PAINTING AND POLISHING**

**DOC NO: VCS-SS-CS-6045
Rev No : 03**

REVISION RECORD						
Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description
00	05.07.2017	MA	MO	RKB	AD	Issued for use as Standard
01	16.10.2019	MA	MO	RKB	SK	
02	28.02.2020	NV	GDS	RKB	SK	New revision system updated
03	31.01.2022	NV	GDS	HK	GW	VCS QMS Integration



ABBREVIATION

m	Metre
mm	Millimetre
Sqm	Square Metre
Kg	Kilogram
gm	Gram
IS	Indian Standard



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1.0 SCOPE

This specification covers the general requirements for all types of white washing, colour washing, distempering, painting and polishing.

2.0 REFERENCES

Reference shall be made to the following Indian Standards for further information etc. not covered in the specification. In case of conflict/contradictions provisions of the specification shall override.

IS: 6278	:	Code of practice for white washing and Colour washing.
IS: 2395	:	Code of practice for painting concrete, masonry and plaster Surfaces.
IS: 712	:	Specification for building limes.
IS: 55	:	Specification for Ultramarine blue for paints.
IS: 63	:	Specification for whiting for paint and putty.
IS: 427	:	Distemper, dry, Colour as required- Specification
IS: 428	:	Washable Distemper Specification
IS: 5411	:	Specification for plastic Emulsion paint for interior use.
IS: 2338	:	Code of practice for finishing of wood, and wood based Materials.
IS: 5410	:	Cement paint, Colour-Specifications
IS: 2524	:	Code of practice for painting nonferrous metals in buildings.
IS: 384	:	Brushes, paints and varnishes, flat-Specifications
IS: 486	:	Specification for Brushes, sash, tool, for paints and varnishes.
IS: 110	:	Ready mixed paint, brushing, grey filler enamels for use Over primers.
IS: 426	:	Paste filler for colour coats.
IS: 345	:	Wood filler, transparent liquid.
IS: 3585	:	Ready mixed paint, aluminium brushing priming water Resistant for wood work.



- IS: 426 : Paste filler for colour coats.
- IS: 106 : Ready mixed paint, brushing, priming for enamels, for use on metals.

All materials required for the execution of painting work shall be obtained direct from approved manufacturers and shall be brought to the site in makers drums, bags etc. with seals unbroken.

In case of ready mixed paints, thinning if necessary, the brand of thinner shall be as per recommendations of the manufacturer.

Paint shall be applied by brushing or spraying. The brushing operations are to be adjusted to the spreading capacity advised by the manufacturer. During painting, every time after the paint has been worked out of the brush bristles, the bristles shall be opened up by striking the brush suitably.

Spray machine used may be of high pressure type or low pressure depending on the nature and location of work. After work, the brushes shall be completely cleaned of paint and shall be hung in a thinner if intended to be used afterwards. The spray guns shall be cleaned thoroughly after every break in work. The paint containers, when not used shall be kept close and free from air.

After the finishing of work, the adjacent surfaces not intended to be washed/distempered/painted/polished shall be thoroughly cleaned of all paint patches and shall be finished in accordance with surface finishing of such surfaces.

3.0 WHITE WASHING

White washing in general shall conform to IS: 6278.

3.1 WORKMANSHIP

3.1.1 SCAFFOLDING

Wherever scaffolding is necessary, it shall be erected in such a way that as far as possible no part of scaffolding shall rest against the surface to be white/ colour washed. For white washing of ceiling, proper stage scaffolding shall be erected.

3.1.2 PREPARATION OF SURFACES

The surface shall be thoroughly cleaned of all dirt, dust, mortar dropping and other foreign matter before white wash is to be applied. Surfaces already white/colour washed shall be broomed down to remove all dust, dirt, loose scales of lime wash or other foreign matters.

All damaged portions of the surface plaster shall be removed to full depth of plaster in rectangular patches and plastered again after raking the joints in masonry properly. Such portions shall be wetted and allowed to dry before any operation.



All holes, cracks, patches etc. not exceeding 0.1 sq. m. in area shall be made good with material similar to that of the surface. Surfaces affected by efflorescence, moss, fungi, algae, lichen etc. shall be treated in accordance with IS: 2395.

3.1.3 PREPARATION OF WHITE WASH

The fat lime conforming to IS: 712 shall be slaked at site and shall be mixed and stirred with about 5 litres of water for 1 kg. of unslaked lime to make thin cream. This shall be allowed to stand for a period of 24 hours and then shall be screened through a clean coarse cloth. 4 kg of gum dissolved in hot water shall be added to each cubic metre of lime cream. Approved quality ultramarine blue conforming to IS 55 @ 3 gram per kg. of lime shall also be added to the solution. The whole solution shall be stirred thoroughly before use.

3.1.4 APPLICATION

White wash shall be applied with "MOONJ" brush to the specified number of coats .The operation for each coat shall consist of stroke of the brush from the top to down wards, another from the down to upwards over the first stroke, similarly one stroke horizontally from right and another stroke from the left. Each coat shall be allowed to dry before the next coat is applied. The white washing on ceiling should be done prior to that on walls.

3.1.5 PROTECTIVE MEASURES

Surfaces of doors, windows, floors etc. which are not to be white washed shall be protected from being splashed upon. Such surfaces shall be cleaned of white wash splashed if any.

4.0 COLOUR WASHING

4.1 WORKMANSHIP

4.1.1 SCAFFOLDING

Scaffolding is necessary, it shall be erected in such a way that as far as possible no part of scaffolding shall rest against the surface to be white/ colour washed. For white washing of ceiling, proper stage scaffolding shall be erected.

4.1.2 PREPARATION OF SURFACE

Surface shall be thoroughly cleaned of all dirt, dust, mortar dropping and other foreign matter before white wash is to be applied. Surfaces already white/colour washed shall be broomed down to remove all dust, dirt, loose scales of lime wash or other foreign matters.

All damaged portions of the surface plaster shall be removed to full depth of plaster in rectangular patches and plastered again after raking the joints in masonry properly. Such portions shall be wetted and allowed to dry before any operation.



All holes, cracks, patches etc. not exceeding 0.1 Sqm. in area shall be made good with material similar to that of the surface. Surfaces affected by efflorescence, moss, fungi, algae, lichen etc. shall be treated in accordance with IS: 2395.

4.1.3 PREPARATION OF COLOUR WASH

Sufficient quantity of colour wash enough for the complete job shall be prepared in one operation to avoid any difference in colour. The basic white wash solution shall be prepared in accordance with clause 3.1.3. Mineral colours of approved shade and quality not affected by lime shall be added to the white wash solution in proportions as directed by Engg.in-charge. Solid lumps etc. in the colour powder shall be ground to fine powder, sieved and mixed evenly and thoroughly to the white wash solution.

4.1.4 APPLICATION OF COLOUR WASH

Colour wash shall be applied with "MOONJ" brush to the specified number of coats. The operation for each coat shall consist of stroke of the brush from the top to down wards, another from the down to upwards over the first stroke, similarly one stroke horizontally from right and another stroke from the left. Each coat shall be allowed to dry before the next coat is applied. The white washing on ceiling should be done prior to that on walls.

4.1.5 PROTECTIVE MEASURE

Surfaces of doors, windows, floors etc. which are not to be white washed shall be protected from being splashed upon. Such surfaces shall be cleaned of white wash splashed if any.

5.0 DRY DISTEMPERING

5.1 WORKMANSHIP

5.1.1 SCAFFOLDING

Scaffolding is necessary, it shall be erected in such a way that as far as possible no part of scaffolding shall rest against the surface to be white/ colour washed. For white washing of ceiling, proper stage scaffolding shall be erected.

5.1.2 PREPARATION OF SURFACE

The surface shall be thoroughly brushed free from dust, dirt, grease, mortar droppings, other foreign matter and shall be made smooth by sand papering.

In case of distempering over existing distempered surface, the existing distempering shall be scrapped by steel scrappers leaving a clean surface.

All nails shall be removed. Pitting in plaster shall be made good with plaster of paris mixed with dry distemper of colour to be used. The surface then shall be rubbed down again with a fine grade sand paper and made smooth. A coat of distemper shall be applied over the patches. The surface shall be allowed to dry thoroughly before the regular coat of distemper is allowed.



The surface affected by moss, fungus, algae, efflorescence shall be treated in accordance with IS: 2395.

5.1.3 PRIMING COAT

A priming coat of whiting conforming to IS 63 shall be applied over the prepared surface. The priming coat shall be prepared by mixing 2.5 kg. of whiting and one litre of glue solution (prepared by mixing 250 gm. glue conforming to IS: 852 with boiling water) together and placing it in a covered vessel with enough water to cover the mixture which shall be left to cool until it becomes a jelly.

Priming coat shall be applied with "MOONJ" brush to the specified number of coats. The operation for each coat shall consist of stroke of the brush from the top to down wards, another from the down to upwards over the first stroke, similarly one stroke horizontally from right and another stroke from the left. Each coat shall be allowed to dry before the next coat is applied. The white washing on ceiling should be done prior to that on walls.

5.1.4 PREPARATION OF DISTEMPER

The dry distemper of approved shade and quality conforming to IS: 427 shall be stirred slowly in clean warm water using 0.6 liters of water per kg. of distemper. It shall be allowed to settle for at least 30 minutes before applying. The mixture shall be well stirred before and during use to maintain an even consistency.

5.1.5 APPLICATION OF DISTEMPER

After the priming coat has dried for at least 48 hours, the surface shall be lightly sand papered and dusted off avoiding rubbing off of the priming coat. Prepared distemper shall then be applied in minimum two coats with proper distemper brushes in horizontal strokes immediately followed by vertical ones which together shall constitute one coat. The subsequent coats shall be applied only after the previous coat has dried. The finished surface shall be even and uniform without patches, marks, distemper drops etc. The application of a coat in each room shall be finished in one operation. After each day's work, brushes shall be thoroughly washed in hot water and hung down to dry.

5.1.6 PROTECTIVE MEASURE

Surfaces of doors, windows, floors etc. which are not to be white washed shall be protected from being splashed upon. Such surfaces shall be cleaned of white wash splashed if any.

6.0 OIL BOUND DISTEMPERING

6.1 WORKMANSHIP

6.1.1 SCAFFOLDING

Same as in clause no. 5.1.1

6.1.2 PREPARATION OF SURFACE



Preparation of surface shall in general be in accordance with clause no. 5.1.2 except that any unevenness shall be made good by applying putty made of plaster of paris mixed with water including filling up the undulation and then sand papering the same after it is dry.

6.1.3 PRIMER COAT

The primer coat shall be alkali resistant primer or distemper primer and shall be of the same manufacture as oil bound distemper.

If the wall surface plaster has not dried completely, alkali resistant primer otherwise distemper primer shall be applied. The mixture of alkali resistant primer shall be prepared as per approved manufacturer's instructions.

The application of primer coat shall be in accordance with 5.1.3

6.1.4 PREPARATION OF OIL BOUND DISTEMPER

The distemper shall conform to IS: 428 and shall be diluted with water or any other prescribed thinner recommended by the manufacturer.

6.1.5 APPLICATION OF DISTEMPER

After the primer coat has dried for at least 48 hours, the surface shall be lightly sand papered and dusted off avoiding rubbing off of the primer coat. Minimum two coats of distemper shall be applied with brushes in horizontal strokes followed by immediate vertical strokes which together shall constitute one coat. The subsequent coats shall be applied after at least 24 hours between consecutive coats to permit proper drying of the preceding coat. The finished surface shall be even and uniform without patches, brush marks drops etc. Application of a coat in each room shall be finished in one operation. 14 cm double bristled distemper brushes shall be used. After each days work brushes shall be thoroughly wahsed in hot water with soap solution and hung down to dry.

6.1.6 PROTECTIVE MEASURES

Same as in clause no. 5.1.6

7.0 WATERPROOF CEMENT PAINT

7.1 WORKMANSHIP

7.1.1 SCAFFOLDING

Same as in clause 5.1.1

7.1.2 PREPARATION OF SURFACE

Preparation of surface shall be in accordance with clause no. 5.1.2. The surface so prepared shall be thoroughly wetted with clean water before the paint is applied.

7.1.3 PREPARATION OF PAINT



Waterproof cement paint of approved make shall be mixed with water and stirred to obtain a thick paste which shall then be diluted to brushable consistency. The proportion of mixture shall be as per manufacturer's recommendation. The paint shall be mixed in such quantity which can be used up within an hour of mixing to avoid setting and thickening of the paint.

7.1.4 APPLICATION OF PAINT

The surface shall be treated with minimum two coats of waterproof cement paint. No less than 24 hours shall be allowed between two coats and subsequent coats shall be applied only after the preceding coat has become hard to resist marking by subsequent brushing.

The finished surface shall be even and uniform in shade without patches, brush marks, paint drops etc. Cement paints shall be applied with a brush with relatively short stiff hog or fibre bristles.

7.1.5 CURING

Curing shall be started after the paint has hardened. Curing shall be done by sprinkling with water two or three times a day. This shall be done between coats and for at least two days following the final coat.

7.1.6 PROTECTIVE MEASURE

Same as in clause in 5.1.6

8.0 PLASTIC EMULSION PAINTING

8.1 WORKMANSHIP

8.1.1 SCAFFOLDING

Same as in clause 5.1.1

8.1.2 PREPARATION OF SURFACE

Same as in clause 6.1.2 under specification of oil bound distempering.

8.1.3 PREPARATION OF PAINT

Plastic emulsion paint shall conform to IS: 5411 (Part-1) and shall be of approved shade. Preparation of paint shall be as per manufacturer's instructions.

8.1.4 APPLICATION OF PAINT

The paint mix shall be continuously stirred while applying for maintaining uniform consistency. Number of coats shall be as specified. The painting shall be laid evenly and smoothly by means of crossing and laying off. The crossing and laying off consists of covering the area with paint, brushing the surface hard at first, then brushing alternately in opposite direction 2 to 3 times and then finally brushing lightly in a



direction at right angles to the same. In this process, no brush marks, no hair marks no clogging of paint puddles shall be permitted. The full process of crossing and laying off will constitute one coat. The paint shall be applied by means of brush or roller.

Before starting painting with plastic emulsion paint, the prepared surface shall be treated with two coats of primer consisting of cement, primer, whiting and plastic emulsion paint shall start only after the preceding coat has become sufficiently hard to resist brush marking. Subsequent coats of plastic emulsion paint shall also be started after the preceding coat is dried by evaporation of water content.

The surface on finishing shall present a flat, velvety smooth finish, even and uniform shade without patches, marks, paint drops etc.

8.1.5 PRECAUTIONS

- a. Brushes shall be quickly washed in water immediately after use and kept immersed in water during break periods to prevent the paint from hardening on the brush. Old brushes, if used shall be completely dried of turpentine/oil paints by washing in warm soap water.
- b. No oil base putties shall be used in filling cracks/holes.
- c. Washing of painted surface shall not be done within 3-4 weeks of application.

8.1.6 PROTECTIVE MEASURES

Same as in clause 5.1.6

9.0 ACRYLIC COPOLYMER AGGREGATE FINISH

9.1 MATERIAL

It shall be an acrylic based textured wall coating consisting of quartz and silica aggregate, inorganic pigments and other additives to form a crack free, flexible, tough, waterproof coating.

9.2 PREPARATION OF SURFACE

The surface to be coated shall be cleaned and all dirt, dust, grease and loose particles shall be removed. Any old textured surface shall be removed with removing agent as per manufacturer's instructions.

9.3 APPLICATION

Bonding agent and water shall be mixed first. Then the flakes/granules shall be added and mixed thoroughly and kneaded till no lumps are found. The dough shall be left for 20-30 minutes before starting application. The bonding agent, flakes/granules and water shall be mixed in different ratios for different finishes as per manufacturer's specifications.



The first application shall be by steel trowel. It shall be smoothened, if the specified finish requires, by a plastic trowel.

10.0 PAINTING OF WOOD WORK

10.1 PREPARATION OF SURFACE

Preparation of wood surface shall conform to IS: 2338 (Part-1) in general. All woodwork shall be dry and free from any foreign matter. Nails shall be punched well below the surface. The surface shall be smoothened off with abrasive paper used across the grain prior to painting, with the grain prior to the staining. Any knots, resinous or bluish sap wood, cutting out of which is not justified shall be covered with red lead conforming to IS: 103.

Plywood and block board shall be treated in the same manner as for wood work.

Particle boards surface shall be filled with a thin brushable filler and finished as for solid wood.

10.2 PRIMING

Priming shall be in accordance with IS: 2338 (Part I and II). Dirt or any other extraneous material on the surface shall be removed and the priming shall be applied by brushing.

Priming shall be done on all exposed and unexposed surfaces. Unless specified otherwise all joinery work intended to be painted shall receive atleast 2 coats of primer. Type of primer shall be in accordance with Table-1 and Table-2 of IS: 2338 (Part-II).

10.3 STOPPING AND FILLING

Stopping and filling shall be done after priming. Stopping shall be made to the consistency of stiff paste and shall be used to fill holes and cracks. Filler shall be used to level up slight irregularities of the surface. Filler shall be applied with a putty knife and subsequently rubbed down to a level surface with abrasive paper.

The filler coat shall be allowed to fully flatten and harden before subsequent coat is applied.

10.4 APPLICATION OF UNDERCOAT

Under coat shall be applied after the surface has been primed, stopped and filled, and rubbed down to a smooth surface. Under coat may be brushed or sprayed. After drying the coat shall be carefully rubbed down and wiped clean before the next coat is applied.

The type of undercoat shall be depending upon the finishing and in accordance with Table 1 and Table-2 of IS: 2338 (Part II).

10.5 FINISHING



The finishing paint shall be as specified and shall be applied either by the brush or by spraying.

Reference shall be made to the Table-1 and Table-2 of IS: 2338 (Part-II)

10.6 APPLICATION OF CLEAR FINISHES

For the application of clear finishes, the following procedures shall generally be adopted in accordance with IS: 2338 (Part-I).

- a. Filling
- b. Staining
- c. Sealing
- d. Finishing

10.6.1 FILLING

Fillers shall be applied to prevent the excessive penetration of the finish to the surface for obtaining a smooth finish. Fillers shall be conforming to IS: 345.

Fillers shall be heavily applied to the wood surface by hand, using hessian or jute rag across the grain. It shall be rubbed when still wet to get better penetration. After 5-10 minutes it shall be wiped off by hand across the grain followed by a light wipe with the grain. The filled surface shall be dried preferably over night and smoothened with abrasive paper.

10.6.2 STAINING

10.6.2.1 Spirit Stains

Spirit stains are solutions of spirit soluble dyes in Industrial methylated spirit.

10.6.2.2 Oil Stains

Oil stains are solutions of oil soluble dyes in linseed oil, but, usually consist of insoluble, semi-transparent pigments ground in linseed oil and thinned with turpentine or other solvent.

10.6.2.3 Preparation of Wood for Staining

Surface intended for staining shall be kept scrupulously clean and free from greasy finger marks. It shall be prepared by careful smoothing with fine abrasive paper used in the direction of the grain. Small cracks/nail holes shall be stopped with plastic wood/fine plaster of paris. The stopping shall be rubbed down with fine abrasive paper when hard and touched with a thinned knotting before staining. In case of oil staining stopping shall be done after staining using tinted putty or wood filler.

10.6.2.4 Application of Stains



Stains shall be applied by brushing and wiping or by spraying. The stain shall be so thinned that it can be applied fairly, liberally without over staining and over lapping.

10.6.3 SEALING

A suitable sealer shall be applied on the filled and sanded surface to prevent absorption by the wood of the succeeding coats of finish and to seal stain and filler and thus preclude their bleeding into the finish coat.

Sealer may be sprayed on taking care not to flood the surface and it shall be allowed to dry hard. When fully dry the surface shall be sanded taking care not to cut through at corners and edges. Dust shall be blown off and surface wiped with a clean rag.

10.6.4 FINISHING

The stained surface shall be varnished, wax-polished or french polished as required after it is dried.

10.6.4.1. Varnishing

Varnishing of wood and wood based material shall be in accordance with IS: 2338 (Part-I). Surfaces to be Varnished shall be prepared to produce a smooth, dry and matt surface and all dust and dirt shall be removed from the surface.

The Varnish shall be applied liberally with a brush and spread evenly over a portion of the surface with short light strokes to avoid frothing. It shall be allowed to flow out while the next section is being laid in. Excess Varnish shall be scraped out of the brush and then the first section be crossed, re- crossed and laid off lightly. The Varnish, once it has begun to set, shall not be retouched. In case of any mistake, the Varnish shall be removed and the work shall be started afresh.

Where two coats of varnish are applied, the first coat shall be a hard drying under coating or flattening varnish which shall be allowed to dry hard and then be flattened down before applying the finishing coat. Sufficient time shall be allowed in between two coats.

When flat varnishing is used for finishing, a preparatory coat of hard drying undercoating of flattening varnish shall first be applied and shall be allowed to harden thoroughly. It shall then be lightly rubbed down before the flat varnish is applied. On larger areas, the flat varnish shall be applied rapidly, and the edges of each patch applied shall not be allowed to set, but shall be followed up whilst in free working conditions.

10.6.4.2 French Polish

French polish shall conform to IS: 348. Suitable pigments shall be added to get the required colour. The surface to be French polished shall be rubbed down to



smoothness with sand paper and shall be well dusted. Pores in the surface shall be filled up with fillers.

A pad of woollen cloth covered by a fine cloth shall be used to apply the finish. The pad shall be moistened with polish and rubbed hard on the surface in a series of overlapping circles applying the polish sparingly but uniformly over the entire area to give an even surface. A trace of linseed oil may be used on the face of the pad for the purpose. The surface shall be allowed to dry and the remaining coats applied in the same way. To finish off, the pad shall be covered with a fresh piece of clean fine cloth, slightly damped with methylated spirit and rubbed lightly and quickly with circular motions. The finished surface shall have a uniform texture and high gloss.

11.0 PAINTING OF STEEL AND OTHER METAL SURFACE

11.1 GENERAL

Reference shall be made to IS :2524 and IS: 1447.

11.2 PREPARATION OF SURFACE

The surface, before painting, shall be cleaned of all rust, scale, dirt and other foreign matter with wire brushes, steel wool, scrappers, sand paper etc. The surface shall then be wiped finally with mineral turpentine which shall then be removed of grease etc. The surface then shall be allowed to dry.

In case of GI surface, surface so prepared shall be treated with Mordant solution (5 litre for about 100 Sqm.) by rubbing the solution generously with brush. After about half an hour, the surface if required shall be retouched and washed down thoroughly with clean cold water and allowed to dry.

11.3 APPLICATION OF PRIMING AND PAINTS

Approved quality primer and paint in specified numbers of coats shall be applied as per manufacturer's recommendations either by brushing or spraying. Each subsequent coat shall be applied only after the preceding coat has dried.

12.0 MEASUREMENT AND RATE

This clause shall be applicable for item rate tenders only.

For item rate tenders, all work shall be measured in areas. Areas shall be worked out to the nearest 0.01 sq. m and all dimensions to the nearest 0.01 metre.

Deductions shall be made in accordance with Specification no. VCS-SS-CS-6043.

For item rate tenders, rate shall include the cost of all materials, labour, scaffolding, protective measures etc. and all works involved in specification. The rate shall also include, if not mentioned otherwise, conveyance, delivery, handling, unloading, storing etc.



Energising Quality

**STANDARD SPECIFICATION
FOR WHITE WASHING, COLOUR WASHING,
DISTEMPERING, PAINTING AND POLISHING**

**DOC NO: VCS-SS-CS-6045
Rev No : 03**







Energising Quality

VCS Quality Services Pvt Ltd

**STANDARD SPECIFICATION
FOR
ROOFING**

VCS-SS-CS-6046

					
03	31.01.2022	NV	GDS	HK	GW
02	28.02.2020	NV	GDS	RKB	SK
01	16.10.2019	MA	MO	AD	SK
00	05.07.2017	MA	MO	AD	SK
Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By

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**STANDARD SPECIFICATION
FOR ROOFING**

DOC NO: VCS-SS-CS-6046
Rev No : 03

REVISION RECORD						
Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description
00	05.07.2017	MA	MO	RKB	AD	Issued for use as Standard
01	16.10.2019	MA	MO	RKB	SK	
02	28.02.2020	NV	GDS	RKB	SK	New revision system updated
03	31.01.2022	NV	GDS	HK	GW	VCS QMS Integration



ABBREVIATION

m	Metre
mm	Millimetre
Kg/Sqm	Kilogram Per Square Metre
Sqm	Square Metre
IS	Indian Standard
°C	Degree Celsius



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1.0 SCOPE

This specification covers the general requirements for all types of roofing in all type of building.

2.0 REFERENCES

Reference shall be made to the following Indian Standards for information etc. not covered in the specification. In case of any conflict/contradiction, provisions of specification shall override.

IS: 277	:	Galvanized steel sheet (plain & corrugated)
IS: 730	:	Hook bolts for corrugated sheet roofing.
IS: 459	:	Specification for unreinforced corrugated and semi Corrugated asbestos cement sheets.
IS: 3007	:	Code of practice for laying asbestos cement sheets (corrugated sheets.)
IS: 3007	:	Code of practice for laying asbestos cement sheets (semi corrugated sheets.)
IS: 1230	:	Cast iron rainwater pipes & fittings.
IS: 1626	:	Specification for asbestos cement building pipes and pipe fittings, gutter and gutter fittings and roofing fittings.
IS :1728	:	Specification for sheet metal rain water pipes up to 100 mm nom. size gutters, fittings and accessories.

The roof slope shall be as specified and in general not pitched flatter than 1:5 the normal pitch if not specified shall be 1:2. Materials shall be supplied by approved manufacturer. The items supplied shall be free from cracks, chipped edges or corners or other damages. Storage and safety precautions shall be taken to avoid damage to the accessories.

3.0 MATERIALS

3.1 CORRUGATED GI SHEET (CGI) ROOFING/CLADDING

3.1.1 CORRUGATED GI SHEET

GI sheets shall be of specified thickness and of class-3 galvanized as per IS: 277 and shall be of approved brand.

3.1.2 GI RIDGES AND HIPS



These shall be of specified thickness and of class-3 plain galvanized and shall be bent to the required shape and dimensions as per drawings without damaging the sheet in the process of bending.

3.1.3 GI VALLEYS AND FLASHINGS

These shall be of specified thickness and of class-4 plain galvanized and shall be bent to the required shape and size as per drgs, without damaging the sheet in the process of bending.

3.1.4 GI GUTTERS

These shall be of specified thickness and of class-3 plain galvanized and shall be constructed to the required shape and size as per drawings.

3.1.5 WIND TIES

Wind ties of MS flats shall be of specified size, subjected to minimum size of 40mm x 6mm.

3.2 CORRUGATED ASBESTOS CEMENT (AC) SHEET ROOFING/CLADDING

3.2.1 ASBESTOS CEMENT SHEETS

These shall be of specified thickness and as per IS: 459 and shall be of approved brand.

3.2.2 RIDGES AND HIPS

These shall be of the same thickness of CGI sheets, as specified. The type of ridges shall be suitable to the type of sheets used and location.

3.2.3 OTHER ACCESSORIES

Accessories such as flashing pieces, eaves filler pieces, north light and ventilator curves, barge boards etc. shall be of approved brand and shall be suitable to the location of items as specified.

4.0 WORKMANSHIP

4.1 CORRUGATED GI SHEET ROOFING

4.1.1 SPACING OF PURLINS

One purlin each shall be provided at the ridge and the eaves. Spacing of the purlins shall be as specified. Purlin shall coincide with the centre line of the end lap. Ridge purlin shall be placed such that ridges can be placed properly. Portion overhanging the wall support should not be more than one fourth the purlin spacing.

4.1.2 FINISH FOR PURLINS

The top surfaces of the purlins shall be painted before fixing the sheets and the embedded portion shall be finished with two coats of coal tar.



4.1.3 LAYING OF SHEETS

Sheets shall be laid on the purlins to a true plane with the lines of corrugation truly parallel or normal to the sides of area to be covered, unless otherwise specified. They shall be bent up along their side edges close to the wall and the junction shall be protected by flashing on projecting drip course as specified.

4.1.4 LAPS

End laps shall be 150 mm for 1:2 slope and 200 mm for flatter ones. Side lap shall be of two ridges of corrugations on each side.

4.1.5 CUTTING OF SHEET

Sheets shall be cut according to the dimensions and as specified as per drawings. Sheets shall be cut with a straight edge and chisel to give a straight finish.

4.1.6 FIXING OF SHEETS

The sheets shall be fixed to the roof members with J or L polymer coated bolts, polymer cap, seal washer and thrust washer. The bolts shall be long enough to project at least 12 mm above the top of their nuts, The grip of J or L hook bolts on the side of purlins shall not be less than 25 mm. There shall be at least three hook bolts placed at the ridges of corrugations in each sheet in every purlin and their spacing shall not exceed 300 mm. Sheets shall be joined together at side laps by polymer coated bolts and nuts as specified, each bolt shall be with a polymer cap (grease filled) seal washer and polymer coated thrust washer. Bolts shall be placed zig zag on overlapping Corrugations. The spacing of the beam bolts shall not exceed 600 mm in each of the staggered rows.

4.1.7 HOLES

Holes for all bolts shall be drilled in the ridges of the corrugations from the underside before placing in position. The holes in the sheet shall be at least 50 mm from the edge. The holes in the washers shall be of diameter of the hook bolts or the seam bolts. The nuts shall be tightened from above to give a leak proof roof.

4.1.8 RIDGES AND HIPS

The overlap for ridges and hips on either side of CGI sheet and end legs shall be at least 225 mm. Ridges & hips shall be fixed to the purlins with polymer coated hook bolts, thrust washer and polymer cap. At least one of the fixing bolts shall pass through the end laps of ridges and hips on either side, If it is not possible extra hook bolts shall be provided. Each end lap of ridges and hips shall be joined together by at least galvanized iron seam bolts and GI washers.

Ridges and hips shall fit squarely on the sheets.

4.1.9 VALLEYS AND FLASHINGS



The edge, wherever the roof sheeting or valley gutter is turned up against a wall shall be made weather proof with flashing. Flashing shall be bent to shape and fixed as specified. Lap over the sheet shall be minimum 150 mm. End laps between flashing sheets shall not be less than 225 mm.

Flashing shall be inserted into brick work or masonry joints to a depth of 50 mm and shall be filled with cement mortar (1:3). When flashing has to be laid at a slope, it shall be stepped at each course of masonry. The steps shall be cut back at an angle of at least 30°. Valleys shall be bent to shape and shall have at least 225 mm end lap and projection on either side under CGI sheet. Valleys shall be fixed to the roof members below with polymer coated GI bolts, polymer cap, seal washer and polymer coated thrust washer. At least one fixing bolt shall pass through end laps of the valley piece.

4.1.10 GUTTERS

The longitudinal edges shall be turned back by 12 mm and beaten to form a rounded edge. The ends of the sheet at junctions of pieces shall be hooked into each other and beaten flush to avoid leakage.

Gutters shall be laid to minimum 1:120 slope. Gutters shall be true to line and slope and shall be supported by brackets as specified.

4.1.11 WIND TIES

Wind ties shall be of 40 mm x 6 mm flat iron section and other size as specified. These shall be fixed at the two eaves end of the sheet. Fixing shall be done with the same loose bolts which secure sheets to the purlins. Slot holes shall be cut in the wind ties to allow for temperature variations.

4.2 ASBESTOS CEMENT CORRUGATED SHEET ROOFING.

4.2.1 SPACING OF PURLINS

The minimum spacing of purlins shall be 1.6M in case of 7 mm thick AC sheets and 1.4M in case of 6 mm thick AC sheets. Ridges and purlins shall be fixed 75 mm to 115 mm from the apex of the roof.

4.2.2 LAYING AND FIXING OF SHEETS

Sheets shall be laid on the roof members as per the codes. The top bearing surfaces of all roof members shall be in one plane. The finished roof shall have uniform slope and the line of corrugations shall be straight and true. The sheets shall be laid smooth side upwards. Corrugated sheets shall be laid starting at the eaves from one side as directed.

4.2.3 OVERHANG

The free overhang of the sheets at the eaves shall be maximum 300 mm for 6 mm thick sheets and 400 mm for 7 mm thick sheets.

4.2.4 MITRE



The length of the mitre shall be 150 mm. and width shall be equal to the width at the side lap.

4.2.5 LAPS

End laps shall be at least 150 mm, in cases of pitch flatter than 1:2 large & appropriate laps shall be given as directed. Side laps shall be laid with a side lap of half a corrugation. The roof shall be pitched at least at a slope of 18°. Usually it shall be 1:2.

4.2.6 FIXING ACCESSORIES

Sheets shall be secured to the roof members by means of 8 mm dia polymer coated GI bolt. ('J' type hook bolt in case of purlins and 'L' type bolts in case of R.S. joists & precast concrete) and nuts bearing on seal washer and polymer coated thrust washers. The roof hook bolt and nut bearing on the washers shall be used for stitching of sheets, fixtures etc. The grip of the J or L bolt on the side of purlins/joists shall not be less than 25 mm. Both type of washers mentioned above shall be placed over the sheets before the nuts are screwed down. On purlin there shall be one hook bolt on the crown adjacent to the side lap on either side. GI washer shall be of 25 mm dia and 1.60 mm thick while bitumen washer shall be 35 mm dia & 1.5 mm thick.

Nuts shall be screwed lightly first. After laying about a dozen sheets nuts shall be tightened enough. Length of J bolt shall be 75 mm more than the length of purlin for side sheet fixing and 90 mm more where two sheets overlap in ridges or other accessories are to be fixed. Number and length of bolts and number of washers shall be as follows:

- a. At horizontal laps of sheets, at eaves when filler pieces are used, at ridge when sheets and ridge pieces are secured by the same bolt = Thrice the number of sheets in one horizontal course. Length = Depth of purlin plus 90 mm.
- b. At eaves when filler pieces are not used, at ridge when corrugated sheets and ridge pieces are secured by the same bolt Number: Twice the number of sheets in one horizontal course, Length = Depth of purlin plus 75mm.
- c. At intermediate purlins where horizontal laps do not occur Number: Twice the number of sheets in one horizontal course, Length = Depth of purlin plus 75 mm.

4.2.7 HOLES

The holes for fixing shall be drilled in the centre of the end lap of sheets to suit one purlin. Holes for hook bolts etc. shall be drilled. The diameter of the holes shall be 2 mm more than the dia of the fixing bolt. Holes shall be made at least 40 mm away from any edge of sheet or accessory

4.2.8 WIND TIES

It shall be same as in case of CGI sheeting.



5.0 PRECOATED GALVANISED STEEL SHEET ROOFING/CLADDING

5.1 MATERIAL

The base metal of the roofing shall be Cold Reduced Steel Sheet conforming to IS-513. It shall be galvanized by Hot-dip process as per IS-277. The bottom unexposed surface shall then be coated with alkyd backer of minimum 7 microns. Top exposed surface shall have epoxy primer of minimum 5 microns followed by polyester top coat of minimum 20 microns of specified colour.

5.2 PROPERTIES

The precoated galvanized steel sheets shall meet the following performance standards

Pencil Hardness	: H-2H
Formability	: 2-3 t
Impact Resistance	: 40"/lb.
Salt spray test	: 750 hours
QUV-Weatherometer	: 1000 hours
Test Humidity Test	: 1000 hours
Temperature Resistance	: 150°C
Fire performance Profile	: Class I

5.3 PROFILE

The profiles shall have a depth of not less than 30mm and pitch of 198mm. Overall sheet thickness shall be 0.60mm. minimum weight shall be 5.24 kg/Sqm.

5.4 ACCESSORIES

All roofing accessories like ridge, gutters, north light curves etc. shall be fabricated out of the approved precoated sheet as per drawing. Metallic Fasteners and Fixing accessories shall be corrosion proof. Non metallic fasteners shall be of neoprene. Sealants shall be neutral cure type and cold setting variety.

6.0 MEASUREMENTS AND

This clause shall be applicable for item rate tenders only.

6.1 MEASUREMENT

a. Measurements shall be taken in square metres for the finished work in superficial area in the general plane of the roof. Laps along ends and side edges shall not be measured. The overlaps of sheets over valley pieces and under the ridge, hip and flashing piece shall be included in the measurement. Measurement for ridges, hips,



valleys and gutters shall be taken for the finished work in length along their centre line. No laps for these shall be measured. All measurements shall be made correct up to two places of decimal. No deductions shall be made for openings in roof for chimneys, skylights etc. for area upto 0.40 Sqm. No extra shall be allowed for extra labour in cutting or wastage. For openings exceeding 0.40 Sqm. deductions shall be made for full opening. Cuttings across corrugations shall be measured flat.

- b. Roofs with curved sheets shall be measured and paid for separately.
- c. No additions shall be made for laps cut through.
- d. Cutting required to be done in position shall be measured separately.
- e. Openings or recesses involving cutting not exceeding 1M girth shall be classified as hole, notches and shall be enumerated according to the following:
 - i. Those not exceeding 0.01 Sqm.
 - ii. Those exceeding 0.01. Sqm. but not exceeding 0.04 Sqm.
 - iii. Those exceeding 0.04 Sqm.

6.2 RATES

The roofing rate shall include the cost of all labour and materials involved in all the operations. The rate shall also include the cost of provision, erection and removal of scaffolding, benching, ladders, templates and tools required for the proper execution and erection, The cost of fixing purlins shall not be included in the rate. The rate for flashing shall include the cost of mortar for fixing apart from the other labour and material required. The rate for gutters shall include cost of all labour and material, all specials such as angles, junctions, drop ends or funnel shaped connecting pieces, stop ends. etc. flat iron brackets and bolts and nuts required for fixing latter to the roof members.







Energising Quality

VCS Quality Services Pvt Ltd

**STANDARD SPECIFICATION
FOR
FALSE CEILING, FALSE FLOORING, UNDERDECK INSULATION &
PARTITIONING**

VCS-SS-CS-6047

					
03	31.01.2022	NV	GDS	HK	GW
02	28.02.2020	NV	GDS	RKB	SK
01	16.10.2019	MA	MO	AD	SK
00	05.07.2017	MA	MO	AD	SK
Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By

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Energising Quality

**STANDARD SPECIFICATION
FOR FALSE CEILING, FALSE FLOORING,
UNDERDECK INSULATION & PARTITIONING**

**DOC NO: VCS-SS-CS-6047
Rev No : 03**

REVISION RECORD						
Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description
00	05.07.2017	MA	MO	RKB	AD	Issued for use as Standard
01	16.10.2019	MA	MO	RKB	SK	
02	28.02.2020	NV	GDS	RKB	SK	New revision system updated
03	31.01.2022	NV	GDS	HK	GW	VCS QMS Integration



ABBREVIATION

m	Metre
mm	Millimetre
Sqm	Square Metre
IS	Indian Standard
BS	British Standard
C/C	Center to Center
Kg/m ²	Kilogram Per Square Metre
M.S.	Mild Steel
PVC	Poly Vinyl Chloride



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1.0 SCOPE

This specification covers the general requirements for all types of false ceiling, false flooring, underdeck insulation & partitioning in all type of building.

2.0 REFERENCES

IS: 3087	Particle Board of wood and other Lignocellulosic materials medium density for general purpose -Specification
IS: 1642	Code of practice for fire safety of building (General)
IS: 2095	Gypsum plaster Boards - Specifications
IS: 12406	Medium density fibre boards for general purpose
IS: 848	Synthetic Rasin adhesive for plywood
BS: 476	Fire test on Building and structural materials
BS: 4370	Method of test for rigid cellular materials

3.0 FALSE CEILING GRID SYSTEMS

3.1 GALVANISED STEEL GRID SYSTEM

Galvanized Steel grid system shall be erected for the purpose of supporting Mineral fibre false ceiling tiles.

3.1.1 MATERIAL

a. Main Runner

Main runner shall be of hot dipped galvanized steel and 'T' shaped of 24 mm x 38mm size and 0.33mm thickness with double rotary stitching with backed polyester coating (min 25 micron) on the cap of flange.

b. Cross Runner

Cross runner shall be of hot dipped galvanized steel and 'T' shaped of 24 mm x 30mm size, 0.25mm thickness, 1200mm long and 24 mm x 25mm size, 0.25mm thickness, 600mm long with double rotary stitching with backed polyester coating (min 25 micron) on the cap of flange.

c. Perimeter Section

Material shall be same as runners. Sections shall be 22mm x 22mm size of 0.45mm thickness. Exposed areas of all the metallic members shall be powder coated (25micron).

3.1.2 ERECTION



Main Runners shall be placed at the spacing of max. 1200 mm c/c. Cross runners shall be fixed @ max. 600 mm c/c to obtain a grid of 600mm x 600mm.

The grid shall be suspended by means of 4mm dia MS wire, 6mm thick MS cleat of 25mm x 25mm section, dash fasteners and level adjusters.

The overall grid system shall be rigid by self locking joints, in accordance with false ceiling patterns, perfectly levelled and aligned at desirable height as per drawings.

3.2 ALUMINIUM GRID SYSTEM

Aluminum grid system for supporting false ceiling tiles shall be of approved make and shall be perfectly leveled, aligned at desired height and in accordance with the false ceiling pattern as per drawings.

3.2.1 MATERIAL

a. Main Runner

Main Runners shall be of extruded anodized (25 micron) aluminum Tee Sections of 25 mm x 35 mm size (approved make), 2.5mm thick.

b. Cross Runner

Cross Runners shall be of extruded anodized (25 micron) aluminum Tee Sections of 25 mm x 25 mm size (approved make), 2.5mm thick.

c. Perimeter Section

Perimeter sections shall be of extruded anodized (25 micron) aluminum angle Sections of required size.

3.2.2 ERECTION

The grid system shall be assembled by interlocking the main and cross runners @ 600 mm max. both ways by means of Aluminum angle cleats. The main runners shall be suspended from the ceiling by means of 3 mm thick MS flat clamp fixed to main runners @ 1200 mm max. and fixed to 6 mm dia MS hook which again is fixed to the ceiling. 3 mm thick MS flat clamp shall be connected to main runner with 25 mm long MS clamp with leveling nut and @ 1200 mm maximum. The MS hooks shall be suspended from the ceiling by means of slotting in 25 mm x 25mm x 3 thick MS angle, fixed to the slab by 12 mm dia Dash fasteners @ 1200 mm c/c.

The overall grid system shall be rigid, in accordance with false ceiling pattern, perfectly leveled and aligned at desirable height.

3.3 GI GRID SYSTEM

3.3.1 MATERIAL AND WORKMANSHIP



a. Wall Channels

Wall channels shall be made of 0.5 mm thick GI of size 27 mm, one flange 20 mm and the other 30 mm. Wall channels shall be fixed to peripheral walls by rawl plugs/dash fasteners @ 450 mm c/c.

b. Intermediate Channels (main runners)

GI intermediate channels shall be 0.9 mm thick, of size 45 mm and with two flanges of 15 mm each. The intermediate channels shall be suspended from the ceiling @ 1200 mm with 25 mm x 0.5 mm GI hanger bolted to the channel and fixed to the ceiling (by means of bolting to GI cleat fixed to the ceiling with dash fasteners).

c. Ceiling Sections (Cross runners)

GI channel shaped ceiling sections shall be 0.5 mm thick having a knurled Web of 51.1 mm and two flanges of 26 mm each with lips of 10.5 mm. The ceiling sections shall be fixed to the intermediate channels in perpendicular direction at 450 mm C/C with the help of connecting clips.

GI grid system for supporting false ceiling tiles shall be perfectly leveled, aligned at desired height in accordance with false ceiling pattern.

4.0 FALSE CEILING TILES

The tiles shall be placed in position over the supporting grid system by means of hold down clips at four corners of each tiles and one in Centre of each side. The finished false ceiling shall be perfectly leveled and aligned, at desired height as per drawings.

Necessary Electrical & AC and other fixtures shall be provided as per drawing and in coordination with relevant construction activities.

4.1 MINERAL FIBRE TILES

Mineral fibre false ceiling tiles shall be with durable tegular edging having NRC value of min. 0.50, Light reflectance value of min. 80%, K value of 0.052 to 0.057 w/m deg. C and fire performance conforming to class I as per BS : 476. The tiles shall be of 600 mm x 600 mm x 15 mm size. The tiles shall have fissured or granulated texture on the front side as specified. Back side shall be provided with protective coating.

4.2 PARTICLE BOARD TILES

Particle board tiles shall be made of teakwood particle board conforming to IS: 3087 (3 layer flat pressed particle board bonded with BWP type phenol Formaldehyde Synthetic resin and as per IS: 848, categorized as class- I for ' Surface of very low flame spread ' as per IS: 1642, treated with antifungus chemicals)

The tiles shall either be painted or laminated as specified. Lamination shall be 0.5 mm thick and of approved quality, shade and texture fixed by hot press method and shall conform to BS 476, Part -7. The tiles shall be painted at the bottom surface (Facing the floor) with two coats of approved colour acrylic emulsion paint (of approved make)



after sanding off the surface with 120 grit sand paper and applying particle board primer. The other surfaces shall be painted with 2 coats of linseed oil varnish.

Tile sizes shall be 600mm x 600 mm x 12 mm and all four edges of the tiles shall be painted with a coat of approved quality primer.

4.3 GYPSUM BOARD TILES

Gypsum board shall conform to IS: 2095. The Gypsum boards used for false ceiling shall have following properties.

- | | | | |
|------|-------------------------|---|--|
| a. | Thermal Conductivity | - | 0.16W/mk |
| b. | Thermal Resistance. | | |
| i. | For 9.5 mm thick board | - | 0.06Sq.MK/W |
| ii. | For 12.5 mm thick board | - | 0.08Sq.MK/W |
| iii. | For 15 mm thick board | - | 0.09 Sq.MK/W |
| c. | Fire Propagation | | |
| i. | Fire Propagation | | |
| | Index of performance | - | Not exceeding 12 and a sub index not exceeding 6 (when each side is tested separately to BS 476, Part -6) |
| ii. | Surface spread of flame | - | Class 1 (both sides) as per test to BS 476 Part -7). |

Gypsum boards shall be of specified thickness and of specified finish (painted with Plastic Emulsion paint/ Laminated with 0.5mm thick lamination). The Gypsum board shall be screw fixed to the underside of false ceiling grid system with 12.5mm dia dry wall screw @ 230 mm C/C by drilling machine, Joints in the board shall be finished flush with fillers, finisher and primer as per manufacturer's recommendation to give a seamless finish.

5.0 UNDERDECK INSULATION

5.1 MATERIAL

Underdeck insulation shall be of phenolic foam rigid slab of 25mm thickness and approx. 1000mm x 500mm size as specified and shall conform to IS: 13204. It shall have density of 32 kg / M3 and K Value 0.016 KCal/hr M°C as per BS 4370, Part 2. The insulation shall be classified as ' Non Combustible ' as per BS 476, part 5 and ' Class I ' for surface spread of flame as per BS 476, part 7. It shall be prelaminated on both sides with kraft paper.

5.2 WORKMANSHIP



The entire soffit of slab and beams shall be thoroughly cleaned. Bituminous primer or zinc chromate primer shall be applied evenly @ 0.5 kg/m² over the entire surface. Hot bitumen or CPRX adhesive shall then be applied on the insulation panel @ 1.5 kg/m². The panels shall be pressed in position and further secured by dash fasteners.

The underdeck insulation shall be fixed only after all fixtures like hooks, clamps, cleats etc. for light fixtures, ducts etc. have been fixed in the ceiling.

6.0 CAVITY (FALSE) FLOORING (WITH METAL TRAY)

6.1 MATERIAL

a. Pedestal base plate

Pedestal base plate shall be made of galvanized Mild steel and shall be of 100 mm x 100 mm size and 3mm thick. It shall have stiffening folds as per drawing.

b. Pedestal stud

Pedestal stud of 19 mm I.D. and 3 mm thickness shall be made of galvanized mild steel seamless pipe.

c. Top -head attachments

Top head attachments shall be made of pressure die cast aluminum alloy disc of 2.5 mm thickness, having channel shaped projections in all 4 directions and 4 pin heads on top as per drawing to receive panels. A fully threaded bright red of 19 mm I.D. shall be fitted to underside of top head and inserted into base pipe stud.

d. Channel stringers

Channel stringers shall be galvanized, machine cut, cold rolled mild steel channels of size 18.5 mm x 18.5 mm and 2.5 mm thickness.

e. MDF board floor panels

Floor panels shall be of dense, homogeneous, medium density fibre boards manufactured from agrobased lignocellulosic fibres conforming to IS-12406, exterior grade bonded with synthetic resin conforming IS: 848, BWP type and categorized as class-I for 'Surfaces of very low flame spread' as per IS-1642. It shall be of 18 mm thickness and of size 610 mm x 610 mm in general.

The floor panels shall be fixed with screws onto MS bottom tray of 1.2 mm thickness die formed to shape as per drawing.

The floor panels shall be finished on top with antistatic type PVC tiles or laminate as specified and along four sides with hard PVC lipping as per drawing.

6.2 WORKMANSHIP



False flooring pattern shall be as per approved drawing. Pedestal base plates shall be fixed to the base floor by dash fasteners as per the grid.

The pedestal stud locations shall ensure the grid work as per flooring pattern which in general shall be of 610 mm x 610 mm dimension. The length of the pedestal studs shall be such that clear cavity between false flooring and base flooring is of desired depth.

The threaded bright rod with the top head attachments shall be inserted into the studs and shall be adjusted to obtain proper level of the finished floor panels by means of the adjustment nuts.

Stringer channels then shall be fitted onto the top heads in position to form the supporting grid work for the floor panels checking the level once again by adjusting the nut position if necessary. Now the check nut shall be finally tightened to secure the final level. Floor panels as specified shall be placed over the stringer channels and top head disc in such a manner that the holes in MS tray fit into the pin heads on discs.

Each floor panel shall be marked with positional numbering on the underneath. The finished floor panels shall be perfectly leveled, aligned without any gaps in between the panels.

Each individual panel shall be removable for the purpose of maintenance of the cavity.

Necessary cut-outs shall be made in the panels for cable routing, control panel fixation etc. as per dwg.

Necessary ramps, slopes, steps etc. shall be also provided for as per dwg.

Around a control panel/rack, the residual space left out shall be filled up with cut panels of uniform size as required to fully close the gap between the adjacent full panel and the control panel base channel. In this case the part floor panel shall extend up to the full width of the base channel and the cut size shall be determined accordingly. An additional row of jack pedestals shall be provided along the cut out on which the edge of the floor panel shall rest and over which the base channel of control panel shall be placed. It shall not directly rest on the jack head pedestal or grid channels.

The cavity between false flooring and base floor shall be properly cleaned and made dust free. The floor shall be finally coated with polyurethane based coating. The finished false flooring shall be able to serve for a distributed load of 1250 kg/m².

7.0 CAVITY (FALSE) FLOORING (WITH PARTICLE BOARD)

7.1 MATERIAL

- a. Pedestal base plate



Pedestal base plate shall be made of galvanized Mild steel and shall be of 100 mm x 100 mm size and 8mm thick.

b. Pedestal stud

Pedestal stud of 30 mm dia shall be made of galvanized mild steel seamless pipe. The stud shall have threading at top and bottom for attaching the top head attachment and fixing to base plate.

c. Top-head attachments

Top head attachments shall be made of pressure die cast aluminum alloy of shape and thickness as per drawing. The top head attachment shall be provided with check nuts at bottom portion for attaching the top head threading in the stud allowing for adjustment upto 25mm up & down.

d. Channel stringers

Channel stringers shall be galvanized, machine cut, cold rolled mild steel channels of size 40 mm x 40 mm and 3.15 mm thickness.

e. Particle board floor panels

Floor panels shall be of unveneered, 3 layer flat pressed, teakwood particle board conforming to IS: 3087 bonded with BWP type phenol formaldehyde synthetic resin conforming IS: 848 and categorized as class-I for 'Surfaces of very low flame spread' as per IS: 1642. It shall be of 35 mm thickness and of size 610 mm x 610 mm in general.

The floor panels shall be finished on the underneath side with 0.05mm thick Aluminum foil turned up and extended by minimum 12mm along the perimeter.

The floor panels shall be finished on top with antistatic type PVC tiles or high pressure laminate as specified and along four sides with hard PVC lapping as per drawing.

12mm x 12mm x 75mm long, 2mm thick Aluminum channel cleats shall be provided on middle of four sides of the panels for lateral stability.

7.2 WORKMANSHIP

False flooring pattern shall be as per approved drawing. Pedestal base plates shall be fixed to the base floor by 6mm dia, 40mm long dash fasteners as per the grid.

The pedestal stud locations shall ensure the grid work as per flooring pattern which in general shall be of 610 mm x 610 mm dimension. The length of the pedestal studs shall be such that clear cavity between false flooring and base flooring is of desired depth.



The top head attachments shall be inserted into the studs and shall be adjusted to obtain proper level of the finished floor panels by means of the adjustment nuts.

Stringer channels then shall be fitted onto the top heads in position to form the supporting grid work for the floor panels checking the level once again by adjusting the nut position if necessary. Now the check nut shall be finally tightened to secure the final level. Floor panels as specified shall be placed over the stringer channels.

Each floor panel shall be marked with positional numbering on the underneath. The finished floor panels shall be perfectly leveled, aligned without any gaps in between the panels.

Each individual panel shall be removable for the purpose of maintenance of the cavity.

Necessary cut-outs shall be made in the panels for cable routing, control panel fixation etc. as per drawing.

Necessary ramps, slopes, steps etc. shall be also provided for as per drawing. Around a control panel/rack, the residual space left out shall be filled up with cut panels of uniform size as required to fully close the gap between the adjacent full panel and the control panel base channel. In this case the part floor panel shall extend upto the full width of the base channel and the cut size shall be determined accordingly. An additional row of jack pedestals shall be provided along the cut out on which the edge of the floor panel shall rest and over which the base channel of control panel shall be placed. It shall not directly rest on the jack head pedestal or grid channels.

The cavity between false flooring and base floor shall be properly cleaned and made dust free. The floor shall be finally coated with polyurethane based coating. The finished false flooring shall be able to serve for a distributed load of 1250 kg/Sqm.

8.0 PARTITIONING & PANELLING

8.1 MS FRAME

MS frame for Partitioning & Paneling shall consist of horizontal & vertical members of 18SWG 52mm X 38mm MS sections. The members shall be welded to each other at maximum 600mm c/c both ways. The frame shall be fixed to the floor/ceiling/wall with GI roullete plug, screw and washers & 300mm maximum c/c. The members shall be provided with one coat of red oxide zinc chromate primer.

The frame-work arrangement shall be in accordance with the pattern for partition including doors/windows etc.

8.2 GYPSUM BOARD FOR PARTITIONING & PANELLING



Gypsum boards for partitioning & paneling shall be 12.5mm thick and same as specified in clause no. 3.3

Number of Gypsum board layers (single skin or double skin) shall be as specified and with finishing (painting or lamination) as specified.

Frame work along the edges shall be concealed with partition/panel boards. Necessary cutouts for electrical, AC, return air etc. and other fixtures shall be provided in the boards. Glazing if any shall be fixed with putty and wooden headings.

8.3 LAMINATED PARTICLE BOARD FOR PARTITIONING & PANELLING

Particle board for partitioning/paneling shall be 12mm thick and shall be same as in clause no. 3.2.

Number of Particle board layers (single skin or double skin) shall be as specified and with finishing (painting or lamination) as specified.

Frame work along the edges shall be concealed with partition/panel boards. Necessary cutouts for electrical, AC, return air etc. and other fixtures shall be provided in the boards. Glazing if any shall be fixed with putty and wooden beadings.

9.0 MEASUREMENT AND RATES

This clause shall be applicable for item rate tenders only.

For item rate tenders, False ceiling/flooring, Insulation, Partition, Paneling shall be measured in Sqm. correct up to two places of decimal. Dimensions shall be measured correct upto 0.01m.

No deduction shall be done for cut outs for fixtures, cables etc. up to 0.18 Sq.m in area. No extra shall be paid for providing such cutouts.

Rate for item rate tenders shall include all materials, labour, transport, conveyance, erection, storage, other incidental expenditures involved in carrying out the items.







Energising Quality

VCS Quality Services Pvt Ltd

**STANDARD SPECIFICATION
FOR
ACID PROOF TILE LINING**

VCS-SS-CS-6048

					
03	31.01.2022	NV	GDS	HK	GW
02	28.02.2020	NV	GDS	RKB	SK
01	16.10.2019	MA	MO	AD	SK
00	05.07.2017	MA	MO	AD	SK
Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By

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CONTROLLED COPY : If in soft and signed



Energising Quality

**STANDARD SPECIFICATION
FOR ACID PROOF TILE LINING**

**DOC NO: VCS-SS-CS-6048
Rev No : 03**

REVISION RECORD						
Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description
00	05.07.2017	MA	MO	RKB	AD	Issued for use as Standard
01	16.10.2019	MA	MO	RKB	SK	
02	28.02.2020	NV	GDS	RKB	SK	New revision system updated
03	31.01.2022	NV	GDS	HK	GW	VCS QMS Integration



ABBREVIATION

m	Metre
mm	Millimetre
Sqm	Square Metre
IS	Indian Standard
BIS	Bureau of Indian Standards
ASTM	American Society for Testing And Materials



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1.0 SCOPE

This specification covers the requirement of material and laying of Acid Proof tile lining for flooring on acid storage areas.

2.0 REFERENCES

IS: 4832 (Part-I)	:	Specification for Chemical resistant mortar silicate type
IS: 4832 (Part-II)	:	Specification for Chemical resistant mortar Resin type
IS: 4860	:	Specification for Acid resistant bricks
IS:9510	:	Specification for Bitumen, Mastic Acid Resisting Grade
ASTM D41-94	:	Standard Specification for Asphalt Primer Used in Roofing, Damp proofing, and waterproofing

Note: - Latest edition of IS shall be followed.

3.0 MATERIAL

3.1 ACID PROOF TILES

The Tiles shall conform to IS: 4860 - Class I quality. All tiles shall be dense, homogeneous and manufactured out of special raw material which shall have low lime, flint, sand and iron contents. These shall be specially fired and vitrified at high temperature to have qualities of low absorption. The size of the tiles shall normally be 230mm x 115mm or as per IS: 4860. The thickness shall be as specified in the item.

3.2 ACID PROOF MORTAR

3.2.1 SILICATE MORTAR

It shall consist of selected potassium silicate solution and inert filter powder. Both mixed well to enable to set at ambient temperature. The mortar shall conform to IS: 4832 (Part - I). The mixing proportion and other instructions for use shall be as specified standard manufacturers."Cement Proctor S.W.K" manufactured by Corromondal Prodorite or equivalent may be used. This type of Mortar is resistant to most acids except hydro-fluoric acid and concentrated ortho-phosphoric acid; they are not resistant to alkalis of any concentration or to boiling water or stream.

3.2.2 RESIN MORTAR

The furane and phenolic mortar for jointing consist of inert powder synthetic resin syrup. No water shall be used during mixing. This mortar shall conform to IS: 4832 (Part - II). The mixing proportion and other instructions shall be as specified by standard manufacturers. "Furacin" and "Phencil" manufactured by Corromondal Prodorite or equivalent may be used. This type of Mortar has a good resistance to non-oxidizing mineral acids, and poor resistance to oxidizing mineral acids. They are fairly resistant to inorganic alkalis and water.



3.3 BITUMEN PRIMER

A bitumen primer is an asphalt based material thinned with petroleum solvent (conforming to ASTM D-41) should be applied over the surface. Primers from standard manufacturers only shall be used.

3.4 BITUMEN MASTIC

The bitumen mastic shall consist of a mixture of asphalt cement mineral filler, and mineral aggregate, which are acid alkali proof. The composition, preparation and properties of the bitumen mastic shall be as per IS: 9510 for resisting acid. The bitumen mastic shall be insoluble in Benzol and the matter soluble in diluted hydrochloric acid should not be more than five percent. "Prodorpalte" by Coromandal Prodorite or equivalent may be used.

4.0 LAYING

4.1 SURFACE PREPARATION

- a. All damaged or questionable areas should be chipped out and replaced.
- b. Adequate floor slope for good drainage is important.
- c. Low spot should be avoided because finished floor will follow contour or sub floor.
- d. Concrete should be dry, clean and well cured before application of membrane is started.

4.2 PRIMER APPLICATION

A bitumen primer should be applied over the prepared surface. It should be allowed to dry before applying the membrane material.

4.3 MEMBRANE APPLICATION

Bitumen mastic is used to build up the membrane. It is heated to 120-205°C and applied to the primed surfaces. Multiple coat application should be made to thickness requirements. The thickness of the mastic layer shall be to suit the acid concentration and expected load or as specified by the Engineer-in-charge. Each coat should be inspected for blisters and pinholes. If present, they should be broken and before applying subsequent coats. Bitumen mastic should not be used as the membrane material where solvents are involved.

4.4 REINFORCEMENT APPLICATION

Bitumen coated glass cloth can be used for membrane reinforcements at the corners, edges, walls, etc. depending on the requirements.

4.5 APPLICATION OF MORTAR AND BRICKS



There are two ways of lining Acid resisting linings:

4.5.1 WHEN BEDDING AND JOINTING MATERIAL ARE THE SAME.

A thin layer of about 3mm suitable resinous mortar is spread on the back of the acid proof tiles and the tiles are pressed down on the bed. Suitable joint thickness of about 3mm should be maintained. Jointing is done with suitable resin mortar.

4.5.2 WHEN BEDDING AND JOINTING MATERIAL ARE DIFFERENT

A thin layer of about 6mm suitable silicate type mortar is spread on the back of the acid proof tiles and the tiles are pressed down on the bed. Proper joint thickness of about 3mm should be maintained and filled up with suitable resin type mortar. In case of pointing the joint thickness should be 6mm and depth of the pointing should be 19mm.

In this case, joints with silicate mortar should be acid cured with 20 to 25 percent hydrochloric acid or with 30 to 40 percent sulphuric acid before applying the resin type mortar. After acid curing, the free acid in the joints shall be cleaned with water and sufficient time should be allowed for thorough drying. After curing resin mortar is used for filling up the joints.

5.0 GUARANTEE

The Vendor shall give material and performance guarantee for a period of minimum one year from the date of commissioning of the plant.

6.0 PAYMENT

This clause shall apply to item rate tender only.

6.1 Payment shall be on square meter basis of area covered.

6.2 The payment clause(s) as described in the clause no. 6.1 shall not be referred / applicable for LSTK Jobs.







Energising Quality

VCS Quality Services Pvt Ltd

**STANDARD SPECIFICATION
FOR
INSPECTION AND TEST PLAN(ITP)
CIVIL-STRUCTURAL & ARCHITECTURAL WORKS**

VCS-SS-CS-6100

					
03	31.01.2022	NV	GDS	HK	GW
02	28.02.2020	NV	GDS	RKB	SK
01	16.10.2019	MA	MO	AD	SK
00	05.07.2017	MA	MO	AD	SK
Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By

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Energising Quality

**STANDARD SPECIFICATION
FOR INSPECTION AND TEST PLAN (ITP)
CIVIL STRUCTURAL & ARCHITECTURAL WORKS**

**DOC NO: VCS-SS-CS-6100
Rev No : 03**

REVISION RECORD						
Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description
00	05.07.2017	MA	MO	RKB	AD	Issued for use as Standard
01	16.10.2019	MA	MO	RKB	SK	
02	28.02.2020	NV	GDS	RKB	SK	New revision system updated
03	31.01.2022	NV	GDS	HK	GW	VCS QMS Integration



ABBREVIATION

AFC	Approved For Construction
BM	Bench Mark
CI	Cast Iron
CPT	Cone Penetration Test
GI	Galvanized Iron
IRC	Indian Road Congress
JB	Junction Box
MS	Mild Steel
MT	Magnetic Particle Testing
NDT	Non Destructive Testing
PCC	Plain Cement Concrete
PQR	Procedure Qualification Record
PT	Penetration Testing
PVC	Poly Vinyl Chloride
PWHT	Post Weld Heat Treatment
RCC	Reinforced Cement Concrete
RF	Reinforcement
SPT	Standard Penetration Test
U/G	Under Ground
WBM	Water Bound Macadam
WPS	Welding Procedure Specification
ITP	Inspection and Test Plan
VCS	VCS Project Consultants Pvt. Ltd.



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GENERAL NOTE

The enclosed ITPs are indicative and shall be followed for developing the job specific ITP's for the works to be performed by the contractor. The provisions indicated for stage wise inspection by VCS/Owner (For specific activities) are the minimum and the Engineer-In-Charge may decide to increase Hold Points/ Witness Points while approving the job specific ITP's. Activities for which ITP's are not provided in this specification contractor to develop and get the same approved by VCS/Owner before start of the work. In general role of VCS has been specified in the document. The role of owner to be specified during preparation of site specific ITPs

Contractor to submit job specific reporting formats with the aid of enclosed sample reporting formats and job procedures for the jobs for which ITP's are attached and submit to VCS/Owner for approval, before commencement of the activity. If the contractor has to deviate from the given ITP for a valid reason, he shall obtain prior written approval of VCS/Owner. Contractor to carry out 100% examination of all activities.

LEGEND

HP: Hold Point;

A point which requires witnessing/inspection/verification and acceptance by Owner/VCS before any further processing is permitted.

The Contractor shall not process the activity/item beyond a Hold Point without written approval by Owner/VCS except where prior written permission for further processing is available.

W: Witness Point;

An activity which requires witnessing/inspection/verification by Owner/VCS when the activity is performed.

After proper notification has been provided (notification modalities and period shall be finalized before hand), the Contractor is not obliged to hold further processing if Owner/VCS is not available to witness the activity or does not provide comments before the date notified. In such cases, basis of acceptance shall be review of Contractor generated report/document as per relevant technical specification.

Rw: Review of Contractor's documentation.

S: Surveillance Inspection by Owner/ VCS.

Monitoring or making observations to verify whether or not material/items or services conform to specified requirements. Surveillance activities may include audit, inspections, witness of testing, Review of quality documentation & records, personnel qualifications, etc.

WC: 100% Supervision and Examination by Contractor.

Responsibility for execution of the inspection/testing is with the Contractor; Owner/VCS only verifies examination or testing done by the Contractor at important stages

**ITP NO: 101****LAND & TOPOGRAPHICAL SURVEY**

SL. NO.	ACTIVITY	CONTRACTOR	VCS
1.	Boundary markings and submission of drgs./sketches	WC	S
2.	a) Availability of valid calibration certificates of instruments/ testing equipment's	WC	HP
	b) Field calibration, if any	WC	W
3.	Block levels, contour plans, establishing Permanent bench marks with ref. to Survey of India B.Ms. by check levels and submission of relevant drgs. & records	WC	S
4.	Protection of control points, permanent bench marks and regular rechecking	WC	S
5.	Submission of Master plan showing monuments, structures exposed rocks, weirs, water works, ponds, underground services if crossing that area, etc.	WC	S
	INSPECTION & TEST DOCUMENTS		
1.	Review Test and Inspection Documents	WC	Rw

**ITP NO: 102****SOIL INVESTIGATION**

SL. NO.	ACTIVITY	CONTRACTOR	VCS
1.	Positioning of test location	WC	S
2.	a) Availability of valid calibration certificates of instruments/ testing equipment's	WC	HP
	b) Field calibration, if any	WC	W
3.	Boring & sampling	WC	S
4.	In-situ testing (SPT, CPT, Plate load test, Soil Resistivity, Block vibration test, etc.)	WC	S
5.	Lab testing (as applicable)	WC	W/ Rw
6.	Monitoring of water level	WC	S
	INSPECTION & TEST DOCUMENTS		
1.	Review Test and Inspection Documents	WC	Rw



ITP NO: 103

SITE GRADING

SL. NO.	ACTIVITY	CONTRACTOR	VCS	
			CAT A	CAT B
1.	Clearing and stripping of soil including disposal of unsuitable material	WC	S	-
2.	a) Availability of valid calibration certificates of instruments/ testing equipment's	WC	HP	HP
	b) Field calibration, if any	WC	S	-
3.	Taking and plotting of initial levels at specified intervals for cutting as well as filling areas	WC	S*	S*
4.	Classification (Levels of strata) and testing of filling soil for suitability including preparation of Lead Charts to filling/disposal areas.	WC	S	-
5.	Proper warning of explosions, misfires and storage of explosive materials (As applicable).	WC	-	S
6.	Breaking up of clods, lumps, etc. at the time of filling and compaction.	WC	S	-
7.	Identification and suitability of borrow areas for filling soil/murum including verification of payments for royalty, etc.	WC	Rw	-
8.	Compaction test for earth filling in specified layers including finished areas.	WC	Rw	-
9.	Verification of final finished grade levels.	WC	S*	S*
10.	Computation of Earth works.	WC	Rw*	Rw*
11.	Record of tree cuttings, stacking of blasted rocks and other quarry materials including handing over to Owner	WC	S	S
12.	Preparation of "As built drawings	WC	Rw	Rw
13.	Removal of Surplus earth/excavated material and levelling in disposal areas.	WC	S	-
	INSPECTION & TEST DOCUMENTS			
1.	Review Test and Inspection Documents	WC	Rw	Rw



CAT A: All fillings
CAT B: All cuttings.

* In case quantum of earthwork is required to be certified by VCS then HP.

ITP NO: 104

EXCAVATION

SL. NO.	ACTIVITY	CONTRACTOR	VCS		
			CAT A	CAT B	CAT C
1.	a) Availability of valid calibration certificates of instruments/ testing equipment's	WC	HP	HP	RW
	b) Field calibration, if any	WC	W	S	-
2.	Layout checking	WC	S	-	-
3.	Taking initial levels	WC	S	-	-
4.	Slopes of excavation, benching, overburden, shoring & strutting (in case of deep excavation)	WC	S	S	-
5.	Check for sub-soil water, dewatering requirements as per specifications.	WC	S	S	S
6.	Bottom level of excavation and compaction	WC	S	S	S
7.	Stacking of different type of soils separately	WC	S	-	-
8.	List of obstacles encountered (cables, pipes, conduits, etc)	WC	S	S	-
9.	Barricading of excavated pits for safety & protection from rain	WC	S	S	S
	FOR HARD ROCK				
1	Obtaining license from district authorities for undertaking blasting operations	WC	Rw	Rw	Rw
2	Storing of explosive materials as per explosive rules	WC	S	S	S
3	Prominent display of red flags around the area to be blasted	WC	S	S	S
4	Check the dimensions of bore holes	WC	S	S	S
5	Stacking of hard rock for useable/non useable including handing over to owner	WC	S	S	S



	INSPECTION & TEST DOCUMENTS				
1.	Review Test and Inspection Documents	WC	Rw	Rw	Rw

CAT A : Equipment foundations, Plant buildings, etc.

CAT B : Non Plant buildings, pipe culverts, bridges, etc.

CAT C : Boundary walls, wing walls, manholes, drains, etc.

ITP NO: 105

BACK FILLING

SL. NO.	ACTIVITY	CONTRACTOR	VCS		
			CAT A	CAT B	CAT C
1.	Selection of materials/selected earth	WC	W	S	S
2.	Check for treatment of soil, if any	WC	S	S	-
3.	a) Availability of valid calibration certificates of instruments/ testing equipment's	WC	HP	HP	HP
	b) Field calibration, if any	WC	W	S	-
4.	Filling in specified layers, consolidating, watering.	WC	S	-	-
5.	Compaction tests for layers	WC	W	S	Rw
6.	Filling to required levels	WC	S	-	-
	INSPECTION & TEST DOCUMENTS				
1.	Review Test and Inspection Documents	WC	Rw	Rw	Rw

CAT A: Equipment foundations, Plant buildings, etc.

CAT B: Non Plant buildings, pipe racks, pipe culverts, bridges, etc.

CAT C: Boundary walls, wing walls, manholes, drains, etc.

**ITP NO :106****UNDERGROUND PIPING (RCC/ CI)**

SL. NO.	ACTIVITY	CONTRACTOR	VCS	
			CAT A	CAT B
1.	Checking of material	WC	NOTE 1	NOTE 1
2.	Adequate slope, benching in excavation for safety purposes (if required)	WC	S	
3.	Layout, line & level	WC	S	-
4.	Laying & jointing, grouting at manholes/chambers	WC	S	-
5.	Check for supports/ firm bed/ sub soil water level	WC	S	-
6.	Testing for leakages by blocking pipe ends	WC	W	W
7.	Hydro-testing and other tests, Removal of blockages, Cleaning & flushing of system	WC	W	W
8.	Backfilling in layers	WC	Rw	Rw
9.	Check for MS rungs in proper position, inlet/outlet pipe levels in manholes	WC	S	S
10.	Preparation of "As-built drawings"	WC	Rw	Rw
	INSPECTION & TEST DOCUMENTS			
1.	Review Test and Inspection Documents	WC	Rw	Rw

NOTE : 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

CAT A: Plant Buildings, etc.

CAT B: Non Plant Buildings, Admn. Buildings, Gate House, Security/Guard



Rooms etc.

ITP NO:107

WBM ROADS

SL. NO.	ACTIVITY	CONTRACTOR	VCS	
			CAT A	CAT B
1.	a) Availability of valid calibration certificates of instruments/ testing equipment's	WC	HP	RW
	b) Field calibration, if any	WC	S	-
2.	Layout checking including Road crossings and taking initial levels	WC	S	S
3.	Approval of source & checking/testing of materials (wherever required)	WC	NOTE 1	NOTE 1
4.	Filling (if any), compaction, providing cambers in sub-base including levels	WC	S	S
5.	Spreading metal to required thickness, line & levels, dry rolling including spreading of screening material	WC	-	-
6.	Check for camber and levels over metalling	WC	S	S
7.	Spreading murrum/ sand, watering and rolling	WC	S	-
8.	Checking thickness after each layer and rectification thereof (if any)	WC	S	S
9.	Checking quantity of aggregate by excavation of trial pits as per IRC Code	WC	W	S
	INSPECTION & TEST DOCUMENTS			
1.	Review Test and Inspection Documents	WC	Rw	Rw

NOTE : 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

CAT A: Roads subjected to heavy loading, connected to main highway, main plant roads



CAT B: Balance Roads

ITP NO:108

BLACK TOPPING (PREMIX CARPETING) & BITUMINOUS MACADAM (BM)

SL. NO.	ACTIVITY	CONTRACTOR	VCS
1.	Approval of source of materials	WC	Note 1
2.	a) Availability of valid calibration certificates of instruments/ testing equipment's	WC	HP
	b) Field calibration, if any	WC	S
3.	Surface preparation & check for camber/level	WC	S
4.	Checking/ testing of material wherever required	WC	W
5.	Tack coat application	WC	-
6.	Laying of Premix carpeting/ BM including rolling	WC	S
7.	Application of Seal coat	WC	-
8.	Check for camber and levels	WC	S
9.	Check for bitumen temperature and consumption	WC	S
10.	Thickness check of Premix carpet/ BM	WC	S
11.	Removal of surplus earth	WC	-
12.	Berm preparation	WC	-
13.	Final Inspection	WC	W



	INSPECTION & TEST DOCUMENTS		
1.	Review Test and Inspection Documents	WC	Rw

NOTE : 1) For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

ITP NO:109**MICRO GRADING**

SL. NO.	ACTIVITY	CONTRACTOR	VCS
1.	a) Availability of valid calibration certificates of instruments/ testing equipment's	WC	RW
	b) Field calibration, if any	WC	-
2.	Taking initial levels	WC	S
3.	Clearing/ Removal of extra soil, debris, etc. from site by transportation	WC	-
4.	Taking final levels	WC	S
5.	Verification of gradient of ground	WC	-
6.	Finishing of ground surface by hand compactor/ Roller (As applicable)	WC	S
7.	Final inspection	WC	W
	INSPECTION & TEST DOCUMENTS		
1.	Review Test and Inspection Documents	WC	Rw

**ITP NO:110****PLAIN CEMENT CONCRETE**

SL. NO.	ACTIVITY	CONTRACTOR	VCS	
			CAT A	CAT B
1.	a) Availability of valid calibration certificates of instruments/ testing equipment's	WC	RW	RW
	b) Field calibration, if any	WC	S	Rw
2.	Checking of layout and materials, compaction of sub –grade	WC	S	-
3.	Mix proportion	WC	S	-
4.	Check for shuttering, dewatering if any.	WC	-	-
5.	Concreting with proper compaction	WC	-	-
6.	Checking of top level of PCC	WC	Rw	-
7.	Curing	WC	-	-
	INSPECTION & TEST DOCUMENTS			
1.	Review Test and Inspection Documents	WC	Rw	Rw

CAT A : for filled-up area

CAT B : for cutting area

**ITP NO:111****REINFORCED CEMENT CONCRETE (SUBSTRUCTURE)**

SL. NO.	ACTIVITY	CONTRACTOR	VCS	
			CAT A	CAT B
1	Approval of source of materials	WC	HP	Rw
2.	a) Availability of valid calibration certificates of instruments/ testing equipment's	WC	HP	HP
	b) Field calibration, if any	WC	Rw	Rw
3.	Checking of layout & condition of PCC/ levelling course	WC	S	-
4.	Incoming material checking	WC	NOTE 1	NOTE 1
5.	Design of mix & establishment of strength at site by trial mix	WC	HP	HP
6.	Check for line & level of shuttering including its condition, quality and rigidity.	WC	S	-
7.	Check for sub-soil water & dewatering arrangement, if any	WC	S	-
8.	Reinforcement & covers to reinforcement	WC	S	S
9.	Inserts, Anchor bolts and pipe sleeves, pockets, dowels, etc.	WC	S	S
10.	Pour Card	WC	W	Rw
11.	Check for obstacles encountered (Electrical conduits, pipe lines, etc.)	WC	S	-
12.	Concreting, testing, compaction & finishing	WC	S	Rw
13.	Casting of cubes	WC	S	S
14.	Curing	WC	S	-



15.	Testing of cubes	WC	W	W
16.	Removal of shuttering	WC	-	-
17.	Check for water tightness, rendering, if any	WC	S	S
18.	Preparation of As-built drawings	WC	Rw	Rw
	INSPECTION & TEST DOCUMENTS			
1.	Review Test and Inspection Documents	WC	Rw	Rw

NOTE: 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

CAT A: Pipe racks, plant buildings and equipment foundations etc

CAT B: non-plant buildings, pipe sleepers, manhole, catch pit and balance works.

ITP NO:112

REINFORCED CEMENT CONCRETE (SUPER STRUCTURE)

SL. NO.	ACTIVITY	CONTRACTOR	VCS	
			CATB	CAT C
1	Approval of source of materials	WC	HP	Rw
2.	a) Availability of valid calibration certificates of instruments/ testing equipment	WC	HP	HP
	b) Field calibration, if any	WC	Rw	Rw
3.	Checking of layout	WC	S	-
4.	Incoming material inspection	WC	Note 1	Note 1
5.	Design of mix & establishment of strength at site by trial mix	WC	HP	HP
6.	Check for line & level of shuttering and scaffolding/ vertical bracing including hoisting arrangements.	WC	S	-
7.	Reinforcement & covers to reinforcement	WC	S	S
8.	Inserts, bolts, pipe sleeves, MS rungs, concealed electrical conduits, fan hooks, dowels, etc. including welding if any	WC	S	-
9.	Pockets/ openings	WC	S	-
10.	Expansion joints, if any	WC	S	-
11.	Check for water stops, slopes, stoppers, if any	WC	S	-
12.	Pour Card	WC	W	Rw
13.	Concreting, testing, compaction & finishing	WC	S	S
14.	Casting of cubes	WC	S	S
15.	Curing	WC	S	-



16.	Testing of cubes	WC	W	W
17.	Removal of formwork/ staging	WC	-	-
18.	Verification of dimensions viz AFC drawings and tolerances	WC	S	S
19.	Check for water tightness, rendering, if any	WC	S	-
20.	Preparation of As built drawings.	WC	Rw	Rw
	INSPECTION & TEST DOCUMENTS			
1.	Review Test and Inspection Documents	WC	Rw	Rw

NOTE: 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

CAT A: Pipe racks, plant buildings and super structure of equipment Foundations, etc

CAT B: non-plant buildings, pipe sleepers, manhole, catch pit and balance work.

ITP NO:113

RCC PAVEMENT/FLOORING

SL. NO.	ACTIVITY	CONTRACTOR	VCS
1.	Approval of source of materials	WC	Rw
2.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	HP
	b) Field calibration, if any	WC	S
3.	Layout checking/ excavation of all new foundations	WC	-
4.	Incoming material inspection	WC	NOTE 1
5.	Design of mix & establishment of strength at site by trial mix	WC	HP
6.	Check for proper back filling/compaction/ completion of sub - Structure works	WC	S
7.	Check for edges of shuttering, alternate panels	WC	-
8.	Check for slopes, thickness of flooring	WC	S
9.	Shuttering, reinforcement (as applicable)	WC	-
10.	Check for expansion joints/ Construction joints	WC	S
11.	Check for concealed pipe embedment, earthing, if any	WC	-
12.	Check for dividing strips, as applicable	WC	S



13.	Concreting, finishing, etc	WC	S
14.	Checking for line, levels, slopes, joints, thickness of flooring viz. AFC drawings	WC	S
15.	Curing	WC	S
16.	Grinding & polishing, as applicable	WC	S
17.	Testing of concrete cubes (as applicable)	WC	W
18.	Preparation of "As Built Drawings"	WC	Rw
	INSPECTION & TEST DOCUMENTS		
1.	Review Test and Inspection Documents	WC	Rw

NOTE: 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

ITP NO:114

BRICK MASONARY

SL. NO.	ACTIVITY	CONTRACTOR	VCS	
			CAT A	CAT B
1.	a) Availability of valid calibration certificates of instruments/ testing equipment's	WC	RW	RW
	b) Field calibration, if any	WC	Rw	Rw
2.	Incoming material inspection	WC	Note 1	Note 1
3.	Cleaning of surface	WC	-	-
4.	Wetting/soaking of bricks	WC	S	S
5.	Cement mortar proportion	WC	S	S
6.	Staging & scaffolding	WC	-	-
7.	Hacking of adjacent concrete surface	WC	S	S
8.	Check for bond/closers, thickness of joints	WC	S	-
9.	Line, level & plumb	WC	S	S
10.	Raking out joints, keys in brick work, if any	WC	S	S
11.	Check for placement of Reinforcement bars in case of partition brick work	WC	S	S



12.	Embedment of fixtures	WC	S	S
13.	Curing	WC	-	-
14.	Preparation of 'As Built' Drawings	WC	Rw	Rw
	INSPECTION & TEST DOCUMENTS			
1.	Review Test and Inspection Documents	WC	Rw	

NOTE: 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

CAT A : Load bearing walls

CAT B : Balance works

ITP NO:115

STRUCTURAL STEEL WORKS

S. NO	ACTIVITY	CONTRACTOR	VCS	
			CAT B	CAT C
A	PRE – FABRICATION ACTIVITIES			
1.	a) Availability of valid calibration certificates of instruments/ testing equipment's	WC	HP	RW
	b) Field calibration, if any	WC	S	Rw
2.	Incoming material inspection	WC	Note 1	Note 1
3.	Welding Filler material approval/ qualification			
	a) Manufacturing test certificates/ documents	WC	Rw	Rw
	b) Testing, if any	WC	W	W
4.	Approval of WPS/ PQR	WC	HP	HP
5.	Welders performance qualification	WC	W	Rw
6.	Layout checking	WC	-	-
7.	Welding equipment and accessories	WC	-	-
8.	Preparation and approval of Fabrication drawings	WC	Rw	-
B	FABRICATION ACTIVITIES			
1.	Materials as per design drawing	WC	Rw	Rw
2.	Check straightness and non-warping of members	WC	S	-
3.	Dimensional and fit-up checks including provision of slopes for deflection wherever required	WC	S	-



4.	Visual check for welding	WC	S	-
5.	Grinding including surface preparation for painting and application of primer	WC	S	Rw
6.	Checking paint as per specs, shelf-life, etc.	WC	S	-
7.	Application of specified paint, painting thickness, etc.	WC	S	-
C	FIELD ERECTION ACTIVITIES			
1.	Lifting arrangements including test certificates of lifting tackles	WC	S	Rw
2.	Correctness of location	WC	-	-
3.	Orientation of bracing, lugs	WC	-	-
4.	Alignment & levels	WC	-	-
5.	Field welding (if any)	WC	S	-
6.	Grouting	WC	S	-
7.	Finishing coat of paint, thickness of paint etc.	WC	S	S
8.	Preparation of As-built drawings	WC	Rw	Rw
	INSPECTION & TEST DOCUMENTS			
1.	Review Test and Inspection Documents	WC	Rw	Rw

NOTE: 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

CAT A: Steel structures pertaining to Pipe racks, and equipment's, etc.

CAT B: Steel structures of plant buildings and non-plant buildings, pipe sleepers, manhole, catch pit, walkways, platforms at grade levels, etc.

ITP NO: 116

PILING WORKS

SL. NO.	ACTIVITY	CONTRACTOR	VCS	
			CAT A	CAT B
1.	Approval of source of materials	WC	Rw	Rw
2.	Layout and ground level	WC	S	-
3.	Incoming material inspection	WC	Note 1	Note 1
4.	Design of mix & establishment of strength at site by trial mix	WC	HP	HP
5.	Driving of piles & check for set point	WC	S	-
6.	Check for depth of bore and lowering of cage measuring	WC	-	-
7.	Pour Card	WC	HP	Rw
8.	Concreting, testing	WC	S	S
9.	Casting of cubes/Testing	WC	S/W	S



10.	Check for cut off level of concreting & quantity of concrete poured	WC	-	-
11.	Lifting of casing pipe	WC	S	-
12.	Pile load tests (lateral/vertical/cyclic/pull out)	WC	Rw	Rw
13.	Submission of pile load test report	WC	Rw	Rw
	INSPECTION & TEST DOCUMENTS			
1.	Review Test and Inspection Documents	WC	Rw	Rw

NOTE: 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

CAT A: Pipe racks, plant buildings and other equipment foundations etc.

CAT B: Non-plant buildings, Pipe sleepers, Manhole, Catch pit, etc.

ITP NO:117

ANTI-TERMITE TREATMENT

SL. NO.	ACTIVITY	CONTRACTOR	VCS
1.	Incoming material inspection & spraying devices including personal protective equipment's like facemask, gloves, shoes, etc.	WC	HP & Note 1
2.	Preparation of surface for taking dosage of emulsion by ramming of each layer of soil by roding the earth at specified intervals	WC	-
3.	Backfilling and compaction in specified layers along with application of emulsifier along the sides of masonry & RCC structures	WC	S
4.	Compaction of top surface for taking dosage of emulsifier by roding the earth at specified intervals for the entire floor area before concreting	WC	-
5.	Check for consumption of emulsifier utilized	WC	S



	INSPECTION & TEST DOCUMENTS		
1.	Review Test and Inspection Documents	WC	Rw

NOTE: 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

ITP NO:118**PLASTERING**

SL. NO.	ACTIVITY	CONTRACTOR	VCS	
			CAT A	CAT B
1.	Check for completeness of all hidden jobs like piping, conduiting, etc.	WC	-	-
2..	Check for grading of sand, Mix proportion	WC	S	S
3.	Sample preparation for finish and its approval	WC	W	S
4.	Neeru application on plaster (as applicable)	WC	S	-



5.	Hacking and cleaning the surface, removing loose particles, wetting the surface	WC	-	-
6.	Checking of plaster thickness, plumb & even surface	WC	S	-
7.	Check for grooves, openings, rounding off the corners, hollowness in plaster	WC	-	-
8.	Curing	WC	S	-
	INSPECTION & TEST DOCUMENTS			
1.	Review Test and Inspection Documents	WC	Rw	

CAT A: Area requiring special finish (e.g. pebble dash finish etc.)

CAT B: Balance works.

ITP NO:119

DOORS, WINDOWS AND VENTILATORS

SL. NO.	ACTIVITY	CONTRACTOR	VCS	
			CAT A	CAT B
1.	Incoming material inspection	WC	Note 1	Note 1
2.	Check for sections & dimensions	WC	S	-
3.	Line, level & plumb	WC	-	-
4.	Section joinery details	WC	Rw	-



5	Grouting with lugs/ dash fasteners	WC	-	
6	Check for fixtures & fittings	WC	S	S
7	Check for thickness & type of glazing	WC	-	-
8	Check for rubber gasket, anodizing (as applicable)	WC	-	-
9	Brand/ shade of paints, no. of coats including surface preparation	WC	S	Rw
	INSPECTION & TEST DOCUMENTS			
1.	Review Test and Inspection Documents	WC	Rw	Rw

NOTE: 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

CAT A: plant buildings
CAT B: Balance works

ITP NO:120

PAINTING (BUILDING WORKS)

SL. NO.	ACTIVITY	CONTRACTOR	VCS	
			CAT A	CAT B
1.	Completion of surface preparation	WC	-	-
2.	Incoming material inspection	WC	Note 1	Note 1



3.	Confirmation of colour, shade & brand	HP	-	-
4.	Check for number of coats and thickness	WC	S	-
5.	Curing, if any	WC	S	-
INSPECTION & TEST DOCUMENTS				
1.	Review Test and Inspection Documents	WC	Rw	Rw

NOTE: 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

CAT A: plant buildings

CAT B: Balance works

ITP NO:121**SANITARY FITTINGS**

SL. NO.	ACTIVITY	CONTRACTOR	VCS	
			CAT A	CAT B
1.	Incoming material inspection	WC	Note 1	Note 1



2.	Checking of sample (as applicable)	WC	S	-
3.	Check completeness of finishing works w.r.t. line, level & position	WC	S	-
4.	Check proper fixing of the sanitary fittings to give aesthetic appeal	WC	S	-
5.	Check for leakage	WC	S	Rw
	INSPECTION & TEST DOCUMENTS			
1.	Review Test and Inspection Documents	WC	Rw	Rw

NOTE: 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

CAT A: Main plant buildings

CAT B: Balance works

ITP NO:122

WATER PROOFING (ROOF)

SL. NO.	ACTIVITY	CONTRACTOR	VCS



1.	Surface preparation for screeding/ water proof plastering	WC	W
2.	Mix proportion, thickness of screeding/ plastering & slope towards rain water pipes	WC	S
3.	Formation of groove at specified height on parapet wall	WC	-
4.	Incoming material inspection, no. of coats, application procedure and consumption.	WC	S/Note 1
5.	Termination of material in groove on vertical plane	WC	S
6.	Check for hollowness, bubbles in water proofing, if any	WC	S
7.	Conducting a sample of water proofing test by flooding the area for specified interval (as applicable)	WC	S
8.	Cleaning of surface	WC	-
9.	Submission of Guarantee in the requisite Performa	WC	Rw
	INSPECTION & TEST DOCUMENTS		
1.	Review Test and Inspection Documents	WC	Rw

NOTE: 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

ITP NO:123

FALSE FLOORING AND FALSE CEILING

SL. NO.	ACTIVITY	CONTRACTOR	VCS
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	FALSE FLOORING		
1.	Manufacturers Test Certificate	WC	Rw
2.	Incoming material inspection	WC	Note 1
3.	Cleaning base floor	WC	-
4.	Painting base floor with Polyurethane based paint (as specified)	WC	S
5.	Proper line, level & layout	WC	S
	FALSE CVCSING		
1.	Manufacturers Test Certificate	WC	Rw
2.	Incoming material inspection	WC	Note 1
3.	Surface preparation of panel boards	WC	-
4.	Proper line, level & cut-outs	WC	S
5.	Painting of panel boards	WC	S
	INSPECTION & TEST DOCUMENTS		
1.	Review Test and Inspection Documents	WC	Rw

NOTE: 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

ITP NO:124

**UNDER DECK INSULATION**

SL. NO.	ACTIVITY	CONTRACTOR	VCS
1.	Incoming material checking including density	WC	Note 1
2.	Checking of adhesive, fasteners for anchorage	WC	S
3.	Fixing of scaffolding, ladders, platforms	WC	S
4.	Fixing of under-deck insulation with adhesive	WC	-
5.	Fixing of dash fasteners at defined spacing	WC	-
6.	Finishing	WC	S
	INSPECTION & TEST DOCUMENTS		
1.	Review Test and Inspection Documents	WC	Rw

NOTE: 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

ITP NO:125

**ROOFING ACCESSORIES**

SL. NO.	ACTIVITY	CONTRACTOR	VCS	
			CAT A	CAT B
1.	Incoming material inspection	WC	HP/Note 1	HP/Note 1
2.	Check for mitring, overhang, laps, etc.	WC	S	-
3.	Slopes line, level of sheets, barge boards, ridges & gutters, overhang of sheets	WC	S	-
4.	Bolting by drilling only, length of bolts, nos., anodizing and type of washers	WC	S	-
5.	Check for slopes of rain gutters, down take pipes, north lighting curves/ supports for gutters	WC	S	-
6.	Check for leakage/ passing of light	WC	S	-
	INSPECTION & TEST DOCUMENTS			
1.	Review Test and Inspection Documents	WC	Rw	Rw

NOTE: 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001
2) Fixing arrangement need to be reviewed with respect to contract specifications.

CAT A: Important structures (e.g. Compressor House, Warehouse and Pump House etc.)

CAT B: Balance works.

**ITP NO:126****LIGHTING WORKS (NON PLANT BUILDINGS)**

SL. NO.	ACTIVITY	CONTRACTOR	VCS
1.	Prepare detailed conduit layout diagram as per the approved electrical drawing	WC	W
2.	Provide /PVC/GI sleeves in columns/beams at identified locations to facilitate laying of conduit on later date.	WC	S
3.	Ensure conduit & accessories material is inspected at site before using	WC	W
4.	Ensure that the conduit is laid in line with execution drawings & provide pull-wires as per requirement.	WC	S
5.	Check correctness of drop/JB locations	WC	S
6.	Check threaded joints are proper	WC	S
7.	Ensure all JB/Fan box are properly stuffed with jute	WC	S
8.	Ensure conduits are properly tied to reinforcement bars to prevent floating during concrete	WC	S
9.	Ensure proper supporting of conduit lengths wherever required	WC	S
10.	Ensure adequate chasing depth for conduit portion coming inside brick walls	WC	S
11.	Check workmanship towards joints and presence of any foreign material inside the conduits	WC	S
12.	Ensure wiring material is inspected at site before use	WC	W
13.	Ensure correctness of lighting wire size and no. of wires as per the drawing in each conduit portion	WC	S
14.	Preparation of "As Built" drgs.	WC	Rw
	INSPECTION & TEST DOCUMENTS		
1.	Review Test and Inspection Documents	WC	Rw