

	<b>TECHNICAL SPECIFICATION FOR FLOOR FINISHES AND ALLIED WORKS</b>	SPECIFICATION NO. PE-TS-999-600-C010	
		VOLUME - II B	
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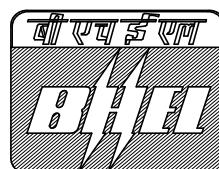
**VOLUME – II B**  
**CIVIL, STRUCTURAL & ARCHITECTURAL WORKS**

**SPECIFICATION NO. PE-TS-999-600-C010**

**SECTION - D**

***GENERAL TECHNICAL SPECIFICATION***

**FLOOR FINISHES AND ALLIED WORKS**



**Bharat Heavy Electricals Limited**  
**Project Engineering Management**  
**PPEI Building, Power Sector,**  
**Plot No. 25, Sector 16A,**  
**Noida (U.P.)-201301**

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**TECHNICAL SPECIFICATION  
FOR  
FLOOR FINISHES AND ALLIED WORKS**

**1.0.0      SCOPE**

This specification covers furnishing, installation, finishing, curing, testing, protection, maintenance till handing over various types of floor finishes and allied items of work as listed below :

**a)      In Situ Finishes**

- i)      Integral finish to concrete base
- ii)     Red Oxide of Iron finish
- iii)    Terrazzo finish
- iv)     Granolithic finish
- v)      Patent Stone
- vi)     Metallic Hardener like "Ironite" finish
- vii)    Mastic Asphalt finish
- viii)   Chemical Resistant finish

**b)      Tiled Finishes**

- i)      Terrazzo tile
- ii)     Chequered tile
- iii)    Glazed tile
- iv)     Tesse rae (Mosaic etc.)
- v)      Chemical Resistant
- vi)     Rubber, Vinyl etc.
- vii)    Stone Slab

**1.0.1      Base**

The base to receive the finish is covered under other relevant specifications.

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#### 1.0.2 **Sequence**

Commencement, scheduling and sequence of the finishing works shall be planned in detail and must be specifically approved by the Engineer in view the activities of other agencies working in that area. However, the Contractor for the finishing items shall remain fully responsible for all normal precautions and vigilance to prevent any damage whatsoever till handing over.

#### 2.0.0 **INSTALLATION**

##### 2.0.1 **Special Materials**

Basic materials are covered under Specification "Properties Storage and Handling of Common Building Materials". Special materials required for individual finishing items are specified under respective items. In general, all such materials shall be as per relevant I.S. Codes where available. In all cases these materials shall be of the best quality available indigenously, unless specified otherwise.

The materials for finishing items must be procured from well-reputed specialised manufacturers and on the basis of approval of samples by the Engineer. The materials shall be ordered, procured and stored well in advance to avoid compulsion to use substandard items to maintain in the construction schedule.

##### 2.0.2 **Workmanship**

Only workers specially experienced in particular items of finishing work shall be engaged, where such workers are not readily available, with the Engineer's permission, experienced supervisors recommended by the manufacturer shall be engaged. In particular cases where the Engineer so desires the Contractor shall get the finishing items installed by the manufacturer.

##### 2.0.3 **Preparation of the Base Surface**

The surface to be treated shall be thoroughly examined by the Contractor. Any rectification necessary shall be brought to the notice of the Engineer and his approval shall be taken regarding method and extent of such rectification work.

For all types of flooring, skirting, dado and similar locations, the base to receive the finish shall be adequately roughened by chipping, raking out joints and cleaning thoroughly all dirts, grease etc. with water and hard brush and detergent if required, unless otherwise directed by the manufacturer of any special finishing materials or specifically indicated in this specification under individual item.

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		To prevent of water from the finishing treatment the base shall be thoroughly soaked with water and all excess water mopped up.	
		The surface shall be done dry where adhesives are used for fixing the finishes.	
		Prior to commencement of actual finishing work the approval of the Engineer shall be taken as per the acceptability of the surface.	
		<p><b>2.1.0      In Situ Finishes</b></p> <p><b>2.1.1      Integral Finish To Concrete Base</b></p> <p>While the surface of the concrete laid as per specification for 'Cement Concrete' has been fully compacted and levelled but the concrete is still 'green' a thick slurry made with neat cement shall be applied evenly and worked in with iron floats. When the slurry starts to set it shall be pressed with iron floats to have a firm compact smooth surface without trowel mark or undulations.</p> <p>This finish shall be as thin as possible by using 2.2 kg. of cement per Sq. M. of area.</p> <p>The surface shall be kept in shade for 24 hours and then cured for at least 7 days continuously by flooding with water. The surface shall not be subjected to any load or abrasion till 21 days after laying.</p> <p>As desired by the Engineer the surface, while still 'green' shall be indented by pressing strings. the marking shall be of even depth, in straight lines and the panels shall be of uniform and symmetrical patterns.</p>	
<p><b>2.1.2      Red Oxide of iron Finish</b></p> <p>It shall consist of an underbed and a topping over already laid and matured concrete base.</p> <p>a)      <b>Thickness</b></p> <p>Unless otherwise specified the total thickness of the finish shall be minimum 40 mm for horizontal and 25 mm for vertical surface of which the topping shall (not less than 10 mm) while the underbed shall be of uniform thickness the underbed may vary in thickness to provide necessary slopes. The vertical surface shall project out 6 mm from the adjacent plaster or other finishes. Necessary cutting into the surface receiving the finish shall be done to accommodate the specified thickness.</p> <p>All junctions of vertical with horizontal shall be rounded neatly to uniform radius of 25 mm.</p>		<p><b>b)      Mix</b></p> <p>i)      <b>Underbed</b></p> <p>The underbed for floors and similar horizontal surfaces shall consist of a mix of 1 part cement, 2 parts coarse sand</p>	

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and 4 parts 10 mm down graded stone chips by volume. For vertical and similar surfaces the mix shall consist of 1 part cement to 3 parts coarse sand by volume.

ii) **Topping**

For the topping cement, screened through a fine mesh and red oxide of iron pigment powder similarly screened shall be dry mixed thoroughly in right proportions to produce the desired colour when laid. The mix shall then be prepared with 1 part cement (mixed with pigment) and 3 parts coarse sand volume. The whole quantity required for each visible area shall be prepared in one batch to ensure uniform colour.

c) **Laying**

The underbed shall be laid in panels of mixing area 5 Sq.M. each and no side shall be more than 2.5 along. For outdoor locations the maximum area shall be 2.0 Sq.M. The forms for the panels shall have perfectly aligned edges to the full depth of the total thickness of finish. If specified aluminium or glass dividing strips shall be used.

The panels shall be laid in alternate bays or in chequered board pattern. No panel shall be cast in contact with another already laid until the contraction of the latter has taken place. The underbed shall be laid, compacted, levelled and brought to proper grade with a screed or float. The topping shall be placed after about 24 hours while the underbed is still somewhat 'green' but firm enough to receive the topping. The surface of the underbed shall be roughened for better bonding. The topping shall be rolled for horizontal areas and thrown and pressed for vertical areas to extract all superfluous cement and water to achieve a compact dense mass fully bonded with the underbed. The topping shall then be levelled up by trowelling and finished smooth with a slurry made with already prepared cement and pigment mixture. About 2.0 Kg. of the mixture shall be consumed/per Sq.M. for horizontal surface, and 1.0 Kg. for vertical surface. The surface shall be cured for seven days by keeping it moist.

d) **Polishing**

About 36 hours after laying when the surface has hardened sufficiently it shall be polished with polishing stone till a smooth shiny surface to the satisfaction of the Engineer, is achieved. The finish shall be washed and cleaned just before handing over.

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### 2.1.3 **Terrazo Finish : In Situ**

It shall consist of an underbed and a topping laid over an already laid and matured concrete base.

#### a) **Thickness**

Unless otherwise specified the total thickness of the finish shall be minimum 40 mm for horizontal and 25 mm for vertical surface of which the topping shall be not less than 10 mm. While the topping shall be of uniform thickness the underbed may vary in thickness to provide necessary slopes. The vertical surface shall project cut 6 mm from the adjacent plaster or other finish. Necessary cutting into the surface receiving the finish shall be done to accommodate the specified thickness.

All junctions of vertical with horizontal shall be rounded neatly to uniform radius of 25 mm.

#### b) **Mix**

##### i) **Underbed**

The underbed for floors and similar horizontal surfaces shall consist of a mix of 1 part cement, 1.1/2 parts sand and 3 parts stone chips by volume. For vertical surfaces the mix shall consist of 1 part cement to 3 parts sand by volume. The sand shall be coarse. The stone chips shall be 10 mm down well graded. Only sufficient water to be added to give a workable consistency.

##### ii) **Topping**

The mix for the topping shall be composed of cement, colour pigment, marble dust and marble chips. Proportions of the ingredients shall be such as to produce the terrazzo of colour texture and pattern approved by the Engineer. The cement shall be white or grey or a mixture of the two to which pigment shall be added to achieve the desired colour. To 3 parts of this mixture 1 part marble powder by volume shall be added and thoroughly mixed dry. To 1 part of this mix 1 to 1.1/2 parts of marble chips by volume shall be added and thoroughly mixed dry again.

The pigment must be stable and nonfading. It must be very finely ground. The marble powder shall be from white marble and shall be finer than IS Sieve No. : 30. The size of marble chips may be between 1 mm to 20 mm.

Sufficient quantity to cover each visible area shall be prepared in one lot to ensure uniform colour. Water to make it

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just workable shall be added to a quantity that can be used up immediately before it starts to set.

**c) Laying**

The underbed shall be laid in panels. The panels shall not be more than 5 sq.m in area of which no side shall be more than 2.5 M long. For exposed locations the maximum area of a panel shall be 2.0 Sq.M. The panel shall be laid in alternate bays or chequered board pattern. No panel shall be cast in contact with another already laid until the latter has contracted to the full extent.

Dividing strips made of aluminium or glass shall be used for forming the panels. The strips shall exactly match the total depth of underbed plus topping.

After laying, the underbed shall be levelled compacted and brought to proper grade with a screed or float. The topping shall be laid after about 24 hours while the underbed is still somewhat "green" but firm enough to receive the topping. A slurry of the mixture of cement and pigment already made shall be spread evenly and brushed in just before laying the topping. The topping shall be rolled for horizontal areas and thrown and pressed for vertical areas to extract all superfluous cement and water and to achieve a compact dense mass fully bonded with the underbed. The surface of the topping shall be trowelled over, pressed and brought to a smooth dense surface showing a minimum 75% area covered by marble chips in a even pattern of distribution.

**d) Curing**

The surface shall be left for curing for about 12 to 18 hours and then cured by allowing water to stand on the surface or by covering with wet sack for four days.

**e) Grinding and Polishing**

When the surface has sufficiently hardened it shall be watered and ground evenly with rapid cutting coarse grade (no.60) grit blocks, till the marble chips are exposed and the surface is smooth. Then the surface shall be thoroughly washed and cleaned. A grout with already prepared mixture of cement and pigment shall be applied to fill up all pinholes. The surface shall be cured for 7 days by keeping it moist and then ground with fine grit blocks (no.: 120). It shall again be cleaned with water, the slurry applied again to fill up any pinholes that might have appeared and allowed to be cured again for 5 days. Finally, the surface is ground a third time with very fine grit blocks (no.: 320) to get smooth surface without any pinhole. The grinding shall be done by a suitable machine. Where grinding machine can not be used hand grinding may be allowed when the first rubbing shall be with carborundum stone of coarse grade (no.60), second rubbing with medium grade (no.: 80) and final rubbing and polishing with fine grade

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(no.: 120). The surface shall be cleaned with water, dried and covered with soil free, clean sawdust if directed by the Engineer. The final polishing shall be positioned till before handing over if desired by the Engineer. Just before handing over the surface shall be dusted with oxalic acid at the rate of 0.33 gm. per. Sq.M, water sprinkled on to it and finished by buffing with felt or hessian bobs. The floor shall be cleaned with soft moist rag and dried. However, all excess wax polish to be wiped off and the surface to be left glossy but not slippery.

#### 2.1.4 **Granolithic Finish**

Granolithic finish shall either be laid monolithically over base concrete or separately over hardened base concrete.

##### a) **Thickness**

The finish shall be average 20 mm and minimum 12 mm thick, unless specified otherwise.

##### b) **Mix**

The mix shall consist of 1 part cement : 1 part coarse sand : 2 parts coarse aggregate by volume. The coarse aggregate shall be very hard like granite and well graded between 6 mm and 12 mm. Minimum quantity of water to get workability shall be added.

##### c) **Laying of Monolithic Topping**

The concrete base shall be laid as per specification "Cement Concrete" and levelled upto the required grade. The form shall remain sufficiently protruding to take the finish.

Within about 3 hours of laying the base while it is still fully "green" the topping shall be laid evenly to proper thickness and grade. If considered necessary the surface of the base shall roughened by wire brushing. Unless manual operation is permitted by the Engineer, mechanical vibrators of suitable design shall be used to press the topping firmly and work vigorously and quickly to secure full bond with concrete base.

The laitance brought to the surface during compression shall be removed carefully without disturbing the stone chips. The surface shall then be lightly trowelled to remove all marks. When sufficiently set, hand trowelling shall be done to secure a smooth surface without disturbing the stonechips.

For large areas the laying shall be in panels of maximum 25 Sq.M area. The panels shall be laid in chequered board pattern.

##### d) **Laying of Topping Separately on Hardened Base**

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The base concrete shall be prepared as stated in clause 2.0.3 and a slurry of neat cement applied just prior to laying the granolithic concrete mix (1:1:2). The method of compaction etc. shall be same as for monolithic topping.

**e) Curing**

Immediately after laying, the finish shall be protected against rapid drying. As soon as the surface had hardened sufficiently, it shall be kept continuously moist for at least 10 days by means of wet gunny bags or pounding of water on the surface. The floor shall not be exposed to heavy traffic during this period.

**f) Grinding**

If grinding is specified, it shall start only after the finish has fully set. Clause 2.1.3 (c) shall be followed. However, the ultimate polish required shall be decided upon by the Engineer.

**g) Finishing**

Where specified, sodium silicate or magnesium or zinc silico fluoride treatment shall be done. The number of coats to be applied shall be as specified. The concentration and method of application of the solutions shall be as specified in IS : 5491.

**2.1.5 Patent Stone**

It shall consist of an underbed and a topping laid on an already laid and matured concrete base.

**a) Thickness**

The patent stone finish shall have thickness as stipulated under clause 2.1.2 (a) except that the topping shall be 6 mm thick.

**b) Mix**

**i) Underbed**

The mix shall be as stipulated under clause 2.1.3(b).

**ii) Topping**

The mix for the topping shall consist of 1 part cement and 1 part fine sand by volume.

**c) Laying**

The Patent Stone finish, including the underbed shall be laid in alternate bays or in chequered board pattern. No panel shall be

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cast in contact with another already laid till the contraction of the latter has already taken place.

The maximum area of each panel shall be 3 Sq.M of which no side shall be more than 2 M long.

A cement grout shall be applied and worked into the surface to receive the finish, the underbed then laid, compacted and levelled to proper grade with a screed or float. The topping shall be applied evenly on the underbed while it is not fully set but firm enough and rolled and pressed to get full bond.

The topping shall trowelled to a dense finish to the satisfaction of the Engineer. All trowel marks shall be mopped out with a soft cloth to give a clean smooth surface.

After the surface is sufficiently set, the finished floor shall be kept moist for 7 days for curing. If desired the finish shall be polished as directed by the Engineer.

#### 2.1.6 Metallic Hardener Like "Ironite" Finish

This will consist of a topping (incorporating iron particles) to bond with concrete base while the latter is "Green".

##### a) Thickness

Unless otherwise specified the metallic hardener finish shall be of 12 mm depth.

##### b) Material

The hardening compound shall be uniformly graded iron particles free from non-ferrous metal impurities, oil, grease, sand soluble alkaline compounds or other injurious materials. When desired by the engineer, actual samples shall be tested.

##### c) Mix

Proportion of the metallic hardener shall be as specified or as indicated by the manufacturer. However, in absence of any such direction 1 part metallic hardener shall be mixed dry with 4 parts cement, by weight. To this mixture 6 mm nominal size stone chips shall be added in proportion of 1 part cement (mixed with hardener) to 2 parts of stone chips by volume and uniformly mixed. Minimum quantity of water shall be added to make it workable.

##### d) Laying

The concrete floor shall be laid as per specification "Cement Concrete" an levelled upto the required grade. The forms, if any shall remain sufficiently projecting to take the finish.

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<p>The surface shall be roughened by wire brush as soon as possible.</p> <p>The finish shall be laid while the concrete underbed is still very "green" within about 3 hours of laying of the latter. The finish shall be of uniform thickness and even dense surface without trowel marks, pin holes etc. This topping layer shall be pressed firmly and worked vigorously and quickly to secure full bond with the concrete base. Just when the initial set starts the surface shall be finished \smoothened with steel trowel.</p> <p>The finished floor shall be cured for 7 days by keeping it wet.</p>			
2.1.7	<b>Mastic Asphalt Finish</b>		
	This is a one layer treatment on concrete or brick base.		
a)	<b>Thickness</b>		
	The thickness shall be as specified in the drawing		
b)	<b>Materials</b>		
	Bitumen shall be industrial bitumen of the grades 90/15 and 75/15 conforming to IS: 702.		
	Mineral filler shall be dry stone dust passing through 75-micron IS Sieve.		
	Fine aggregate shall be crushed and graded natural lime stone or other hard-work.		
	Coarse aggregate shall be crushed siliceous stone or other approved aggregate 6 mm stone chips shall be used for finish upto 20 mm thick & 10 mm chips for thicker finish.		
c)	<b>Composition</b>		
	Bitumen mastic shall conform to IS: 1195 and shall be either brought to site in blocks weighing about 25Kg. or prepared at site. If brought in blocks, these shall be remelted in mechanically agitated mastic cookers and coarse aggregate, preferably preheated fed in successive portions until the complete change is thoroughly incorporated. At no stage during the remelting and mixing process, shall the temperature exceed 205°C.		
d)	<b>Laying</b>		
	The hot mastic shall be laid on dry base surface cleaned thoroughly by wire brushing and sweeping. The mastic shall be levelled and when cooled to some extent shall be finished with a wooden float with addition of small quantity of fine sand if required.		

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No load shall be allowed till the finish has cooled to normal temperature.

The mastic shall be laid in suitable panels of about 15 Sq.M in area each formed by formers. Succeeding panels shall be laid overlapping the finish panel so as to melt its edges and form a continuous finish without joint.

#### 2.1.8 **Chemical Resistant in Situ Finish**

Chemical resistant in situ finish shall be as epoxy resin with suitable filler material over a primer or called for in the Schedule of Items. The minimum thickness shall be 6 mm. About its performance the Engineer shall have to be fully satisfied by test results and examination of similar treatment already in existence.

The Contractor shall get it done by a specialised manufacturer, get guarantee of performance from the organisation and pass it on to the Owner in addition to his own guarantee.

#### 2.2.0 **Tiled Finish**

These shall include finish tiles, stone slabs and similar manufactured or natural items over already laid and matured base of concrete or masonry by means of an underbed or an adhesive layer.

##### 2.2.1 **Terrazzo Tile Finish**

The finish will consist of manufacture terrazo tile and an underbed.

###### a) **Thickness**

The total thickness including the underbed shall be minimum 40 mm for floors 30 mm for walls unless otherwise specified.

The skirting, dado and similar vertical surfaces shall project out 6 mm uniformly from the adjacent plaster or other wall finishes. The necessary cutting into the surface receiving the tiled finish, to accommodate the specified thickness shall be done.

###### b) **Tiles : Terrazzo**

The tiles shall, unless specifically permitted in special cases be machine made under quality control in a shop. The tile shall be pressed hydraulically to a minimum of 140 Kg. per Sq.cm.

Each tile shall bear on its back permanent and legible trade mark of the manufacturer. All angles of the tiles shall be right angles all arises sharp and true, colour and texture of the wearing face uniform throughout. Maximum tolerance allowance length and breadth shall be  $\pm 1$  mm and the thickness + 3 mm. Face of the tile shall be plane, free from pin holes and other blemishes.

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<p>The tiles shall be composed of a backing and topping. The topping shall be of uniform thickness not less than 10 mm. The total thickness including the topping shall be as specified but not less than 20 mm in any case.</p> <p>The backing shall be composed of 1 part ordinary grey cement and 3 parts of stone chips by weight mixed with water.</p> <p>The topping shall be as specified under clause 2.1.3 (b).</p> <p>The tile shall be cured at the shop for at least 14 days before delivery to the site. First grinding shall be given to the tiles at the shop before delivery. Tiles shall be packed properly to prevent damage during transit and storage. The tiles must be carefully stored to prevent staining by damp, rust, oil, and grease or other chemicals.</p> <p>Tiles made in each batch shall be kept and used separately so that colour of each area of the floor may remain uniform.</p> <p>The manufacturer shall supply along with the tiles the grout mix containing cement and pigment in exact proportions as used in topping of the tiles. The containers for the grout mix shall be suitably marked to relate it to the particular type and batch of tiles.</p>				
<p>c) <b>Mix : Underbed</b></p> <p>The underbed for floor and similar horizontal surfaces shall be 1 part lime putty : 1 part surkhi : 2 parts coarse sand by weight mixed with sufficient water to form a stiff workable mass. For skirting and dado and all vertical surfaces it shall be about 12 mm thick and composed of 1 part cement and 3 parts coarse sand by weight.</p>				
<p>d) <b>Laying</b></p> <p>The underbed mortar shall be evenly spread and brought to proper grade and consolidated to a smooth surface. The surface shall be roughened for better bond. Before the underbed had time to set and while it is still fairly moist but firm, cement shall be hand dusted over it or a cement slurry applied and the tiles shall immediately be placed upon and firmly pressed by wooden mallet on to the underbed until it achieves the desired level. The tiles shall be kept soaked for about 10 minutes just before laying. The joints between tiles shall be as close as possible and not more than 1.5 mm wide.</p> <p>Special care shall be taken to check the level of the surface and the lines of the joints frequently so that they are perfect.</p> <p>When tiles are required to be cut to match the dimensions these shall be sawn and edges rubbed smooth. The location of cut tiles shall be planned in advance and approval of the Engineer taken.</p>				

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At the junction of horizontal surface with vertical surface the tiles on the former shall enter at least 12 mm under the latter.

After fixing, the floor shall be kept moist and allowed to mature undisturbed for 7 days. Heavy traffic shall not be allowed.

If desired dividing strips as specified under Clause 2.1.3 (c) may be used for dividing the work into suitable panels.

**e) Grinding and Polishing**

Procedure shall be same as Clause 2.1.3 (c) 2. Grinding shall not commence earlier than 14 days after laying of tiles.

**2.2.2 Chequered Tile Finish**

The finish shall consist of manufactured grey or coloured cement tiles or terrazzo tiles with chequered face and an underbed laid over concrete or brick surface.

**a) Thickness**

Thickness shall be same as in clause 2.2.1 (a).

**b) Tiles : Chequered**

The tiles shall have chequers not less than 2.5 cm. c/c and not more than 5 cm c/c, Depth of grooves shall be not less than 5 mm. The grooves shall be uniform and straight.

The tiles shall conform to clause 2.2.1 (b) except that these may have the topping in terrazzo or plain grey cement or colour pigment added to cement as specified.

**c) Underbed**

As per clause 2.2.1 (c).

**d) Laying**

As per clause 2.2.1 (d).

**e) Grinding and Polishing**

As per clause 2.2.1 (e) except that the tiles shall be ground and polished by hand after laying taking special care in polishing the grooves properly and uniformly.

**2.2.3 Glazed Tiles Finish**

This finish shall be composed of glazed earthenware tiles with an underbed laid over a concrete or masonry base.

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**a) Thickness**

The total thickness shall be between 20 mm and 25 mm including the underbed. The tile finish on vertical surface shall project out 6 mm uniformly from the adjacent plaster or other wall finishes. The necessary cutting into the surface receiving the finish, to accommodate the specified thickness shall be done.

**b) Tiles : Glazed**

The tiles shall be of earthenware, covered with glaze white or coloured, plain or with designs, of 150 mm x 150 mm nominal sizes and 10 mm thick unless otherwise specified. The tolerance shall be  $\pm$  1.5 mm for length and breadth and  $\pm$  0.5 mm for thickness specials like internal and external angles, beads, covers, cornices, corner pieces etc. shall match. The top surface of the tiles shall be glazed with a gloss or matt unfading stable finish as desired by the Engineer. The tiles shall be flat and true to shape. The colour shall be uniform and fractured section shall be fine grained in textures, dense and homogeneous. The tiles shall be strong and free from flaws like cracks, craze, specks, crawlings, etc. and other imperfections. The edge and the underside of the tiles shall be completely free from glaze and the underside shall have ribs or indentations for better anchorage with the fixing mortar.

The coloured tiles, when supplied, shall preferably come from one batch to avoid difference in colour.

**c) Mix : Underbed**

The mix for the underbed shall consist of 1 part cement and 3 parts coarse sand by weight mixed with sufficient water or any other mix if specified.

**d) Laying**

Same as clause 2.2.1 (d).

**e) Finishing**

The joints shall be cleaned and flush pointed with white cement and cured for 7 days by keeping it wet. The surface shall be cleaned with soap or suitable detergent, washed fully and wiped with soft cloth to prevent scratching before handing over.

**2.2.4 Tesserae Finish (Mosaic etc.)**

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This finish consists of manufactured vitreous, glass, ceramic or similar hard small pieces set in an underbed over a concrete or masonry surface, already laid.

**a) Thickness**

The total thickness including the underbed shall be between 16 mm and 25 mm.

**b) Tesserae Finish**

These shall usually be 6 mm thick small piece of ceramic vitreous china, tinted glass or similar hard wearing, strong and durable material in desired shapes and sizes and patterns.

The supply shall come in the desired pattern in full or sections conveniently for handling, stuck to pieces of strong thick paper on the surface to be exposed. The gum used for this purpose must be water soluble and non-staining. The sections shall be properly marked to avoid mistakes and master drawing shall be available at the site for guidance.

**c) Mix : Underbed**

Same as clause 2.2.3 (c)

**d) Laying**

The specification for laying if given by the manufacturer of the item shall be followed provided it is approved by the Engineer. Otherwise clause 2.2.3 (d) shall generally be followed. However, instead of grey cement the slurry shall be made with white cement to fix the panels. The paper mounted patterns in sections shall be carefully placed and pressed in position true to lines and levels. Earliest possible the paper shall be peeled off and surface examined and cleaned, joints flush pointed with white cement and cured for 7 days by keeping it wet.

**2.2.5 Chemical Resistant Tiled Finish**

This shall include all varieties of special tiles used for specific chemical resistance function and an underbed over already laid concrete or masonry.

**a) Tiles**

The chemical resistant tiles as detailed in the Schedule of items shall be of the best indigenous manufacture unless otherwise specified and shall be resistant to the chemical described in the Schedule of

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Items. The tiles shall have straight edges, uniform thickness, plain surface, uniform non-fading colour and textures.

Glazed tiles if permitted to act as chemical resistant finish shall be considered under clause 2.2.3.

Usually the chemical resistant tiles shall not absorb water more than 2% by weight. The tiles shall have at least compression strength of 700 Kg/cm<sup>2</sup>. The surface shall be abrasion resistant and durable.

**b) Laying**

The mortar used for setting or for underbed the tiles shall be durable and strong. The grout which shall be to the full depth of tile shall have equal chemical resistant properties. Joints shall be pointed if so desired. The setting and fixing shall be according to the manufacturer's specification approved by the Engineer.

**2.2.6 Rubber, Vinyl or Vinyl Asbestos Tiles Finish**

This shall include various types of tiles manufactured from rubber, vinyl, etc. set with a adhesive on concrete or masonry base. An underbed may be required to secure desirable surface and grade.

**a) Thickness**

The thickness of the tiles shall be mentioned in the Schedule or in drawing.

**b) Tiles**

Unless otherwise desired the tiles shall be squares of approved dimensions. The tolerance in dimensions shall be  $\pm 1.5\text{mm}$ .

The face of the tiles shall be free from porosity, blisters, cracks, embedded foreign matters or either physical defects which affect appearance or serviceability. All edges shall be cut true and square. The colour shall be nonfading and uniform in appearance, insoluble in water and resistant to alkalies, cleaning agents and usual floor polishes.

Each tile shall be marked on the back legibly and indelibly with manufacturer's trade mark, the thickness, sizes, batch number and date of manufacturer.

Tiles shall be delivered securely packed and stored in clean, dry well ventilated place at a temperature near about to that the tiles shall be called upon to stand ultimately.

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Adhesive to be used for sticking the tiles shall be approved by the tile manufacturer. The adhesive shall have a short drying time and long life in addition to toughness.

**c) Mix : Underbed**

The underbed where required to make up the specified thickness or to give the required grade or to get the right type of surface shall be composed of 1 part like putty : 1 part cement : 4 parts coarse sand mixed with just sufficient water to make it workable.

**d) Laying**

The tiles shall be kept in the room to be tiled for at least 24 hours to bring them to the same temperature as the room. For air conditioned space, the air-conditioning shall be completed before tiling is taken up.

The surface to receive this finish shall be firm even textured but not too smooth, without undulations and other deficiencies. If an underbed is laid the same shall be cured for at least 7 days by keeping it moist and then fully dried.

The surface shall be thoroughly cleaned. All loose dust particles shall be removed. Oil and grease if any shall be completely cleaned by use of detergent.

The adhesive shall be applied to fully dry surface in desired thickness uniformly. The adhesive shall also be applied to the backs and edges of the tiles and allowed to surface dry. The tiles shall be placed neatly on the surface exactly to the approved pattern and set with a suitable tool. If the edges tend to curl, weights are to be used to keep the edges down. Special care shall be taken to avoid formation of air pockets under the tiles. The joints shall be very fine. Any adhesive squeezed out through the joints shall be removed immediately.

**e) Finishing**

If any adhesive mark is there on the surface a soft cloth soaked in solvent shall be used to wipe it off. The surface shall be cleaned with soft soap, dried and polished with an approved type of polish just before handing over.

**2.2.7      Stone Slab Finish : Marble, Stone and Similar Fine Grained Stone**

**a) Thickness**

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The underbed shall be minimum 12 mm and average 20 mm thick. The slabs may be 25 mm, 30 mm or 40 mm thick as specified.

**b) Stone Slab**

The stone slabs shall be made from selected stock which are hard, sound, homogeneous and dense in texture and free from flaws. Angles and edges shall be true, square, free from chipping and surface shall be plane. The slabs shall preferably be machine cut to the required dimensions.

Tolerance of  $\pm 5$  mm in dimensions and  $\pm 2$  mm in thickness will be allowed. Unless specified the slabs shall be minimum 300 mm x 300 mm.

The stone slabs shall come from specific regions and in specified quality with top surface fine chisel dressed. All sides shall also be fine chisel dressed to the full depth to allow finest possible joints.

The slabs shall be delivered to the site well protected against damages and stored in dry place under cover.

**c) Mix : Underbed**

Same as clause 2.2.1 (c).

**d) Laying**

The sides and top surface of the slabs shall be machine rubbed or table rubbed with coarse sand stone and washed clean before laying.

The underbed mortar shall be evenly spread and brought to proper level on the area under each slab. The slab shall be laid over the underbed, pressed and tapped down with wooden mallet to the proper level. The slab shall then be lifted and the underbed corrected as necessary and allowed to stiffen a little. Next, a thick cement slurry shall be spread over the surface. The edges of the slab shall be buttered with slurry of cement, grey/white/mixed with pigment matching the colour of the stone slabs. The slab shall be gently laid and tapped with wooden mallet to bed properly to a very fine joint and to the required level. All surplus cement slurry shall be removed and the surface mopped clean with wet soft cloth. The laid finish shall be cured for 7 days by keeping it wet.

**e) Polishing, Finishing**

Fine chiselling shall be done to remove the slight undulations that usually exist at the joints. The polishing and finishing shall be done as specified under clause 2.2.1 (e). However, the joints shall be so fine in the case of stone slabs that grouting shall not be called for.

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**2.2.8      Stone Slab Finish : Sand Stone and  
Similar Coarse Grained Stone Finish**

Generally clause 2.2.7 shall be followed except that the workmanship and finish shall not be fine as which are explained hereunder.

The slabs shall be rough chiseled or fine chiseled as specified. Tolerance may be allowed upto  $\pm$  6 mm for rough finish, but no sharp unevenness and shall be allowed. For fine chiseling the unevenness shall be limited to  $\pm$  2 mm. The sides shall be chisel dressed at least to half slab depth so that the maximum deviation from straight line shall be within 25 mm. Beyond this depth the edge may be slightly splayed.

The joint thickness shall be kept limited to 5 mm in case of rough finish and 3 mm in case of fine finish unless wider joints are specified. The joints shall be grouted with white or coloured cement.

**3.0.0      ACCEPTANCE CRITERIA**

The finish shall be checked specially for :

- a)      Level, Slope, Plumb as the case may be
- b)      Pattern and Symmetry
- c)      Alignment of joints, dividing strip etc.
- d)      Colour, texture
- e)      Surface finish
- f)      Thickness of joints
- g)      Details at edges, junctions etc.
- h)      Performance
- i)      Precautions specified for durability

**4.0.0      I.S. CODES**

Important relevant codes for this section :

- IS : 777      :      Glazed earthenware tiles
- IS : 1196      :      Code of practice for laying bitumen mastic flooring
- IS : 1197      :      Code of practice for laying of rubber floors
- IS : 1237      :      Cement concrete flooring tiles

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<p>IS : 1443 : Code of practice for laying and finishing of cement concrete flooring tiles</p> <p>IS : 2114 : Code of practice for laying in situ terrazzo floor</p> <p>IS : 3461 : PVC asbestos floor tiles</p> <p>IS : 4860 : Specification for acid resistant bricks</p> <p>IS : 5518 : Code of practice for laying of flexible PVC Sheet and tile flooring.</p> <p>IS : 5491 : Code of practice for laying in situ granolithic floor topping.</p>			