

Tentative Specifications
FOR
OXYCEMENT UNDERLAYMENT
AND
ITS INSTALLATION



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Tentative Specifications for

OXYCEMENT UNDERLAYMENT AND ITS INSTALLATION

OCA-108-50

Revised June 30, 1950

SCOPE

1. These specifications cover the requirements with respect to quality of materials and workmanship, installation, and testing of oxycement underlayment for prefabricated coverings such as asphalt tile, rubber tile, and linoleum.

TYPES

2. Oxycement underlayment shall be furnished in one of the following types, as specified:

Type 1. Oxychloride

Type 2. Oxy sulfate complete mix

MATERIALS

3. Dry Mix. - (a) The oxycement composition shall consist of an intimately machine-mixed compound of dry ingredients, which at the time of installation, will set to a product as herein required, when mixed with the gauging liquid specified.

(b) Type 1. - All ingredients shall be dry, and shall be accurately proportioned and compounded by weight, mechanically mixed, and shall consist of caustic-calcined magnesia conforming to requirements of specification OCA Designation 500-10-50; inert fillers, such as talc, sillex, marble flour; fibrous aggregate such as asbestos, wood flour, sawdust, or other organic fibers; inert fine aggregates such as sand, fine crushed stone, or other fine, low-absorbent, physically strong aggregates. All fillers and aggregates shall be alkali-resistant and free from deleterious materials such as clay and silt. (See Note 1)

(c) Type 2. - In addition to the ingredients specified for Type 1 Section 3 (b) the Type 2 mix shall contain magnesium sulfate conforming to the requirements of Specification OCA Designation 500-12-48 in the amount required to yield a solution having a specific gravity of $26 \pm 0.5^\circ$ Baume when dissolved in the volume of water required to yield a plastic mix of the consistency specified in Section 6 (c). The mix shall also contain an amount of citric acid (U.S.P.) equivalent to one-half (1/2) per cent of the weight of the magnesium sulfate calculated as $MgSO_4 \cdot 7H_2O$.

(d) The dry mix of oxycement underlayment composition which is to be used in contact with aluminum alloys shall contain 1.5 per cent (by weight) of potassium dichromate.

(e) Aggregates and fillers shall be uniformly graded in the size ranges specified as follows:

Sieve U.S. Number*	Per cent Passing		
	Fibrous Aggregate	Filler	Fine Aggregate
8	100		
30			100
50	80 max.		20 max.
100		100	
200		95 max.	

* As designated by A.S.T.M. Standard E 11-39

(f) The use of premixed dry ingredients which have become lumpy shall not be permitted.

(9) *same as 101*
4. Gauging Liquid. - (a) Type 1. - The gauging liquid for Type 1 shall be a water solution of magnesium chloride meeting requirements of OCA Specification Designation 500-11-46. The specific gravity of the gauging liquid shall be $22.0 \pm 0.5^\circ$ Baume when tested in accordance with OCA Specification Designation 350-11-50. Water used shall be clean and free of deleterious amounts of acids, alkalies, salts, or organic materials. (See Note 2)

(b) Alternate Gauging Solution for Type 1. - As an alternate for that in Section 4 (a) a gauging solution containing magnesium sulfate may be used. This shall be a water solution of magnesium chloride and magnesium sulfate complying with the requirements of the Specifications for Magnesium chloride (OCA Designation 500-11-46) and the Specifications for Magnesium Sulfate (OCA Designation 500-12-48), respectively, of the Oxychloride Cement Association. The weight of the magnesium sulfate, calculated as $MgSO_4 \cdot 7H_2O$, shall be ten per cent (10% of the weight of the magnesium chloride calculated as $MgCl_2 \cdot 6H_2O$. The specific gravity of the gauging solution shall be $24 \pm 0.5^\circ$ Baume at 70 F when tested in accordance with OCA Specification, Designation 350-11-50. Water used shall be free of deleterious amounts of acids, alkalies, salts, or organic materials. (See Note 2)

(c) Solutions shall be prepared sufficiently in advance to permit their being cooled to at least room temperature before using. Care shall be exercised to insure complete solution of all crystalline material and to insure thorough mixing.

(d) Type 2. - Water shall be used as the gauging liquid for the Type 2 mix. This water shall be clean and free of deleterious amounts of acids, alkalies, salts, or organic materials.

5. Certification of Raw Materials. - Contractor shall certify to the architect or owner that the magnesium oxide, magnesium chloride, magnesium sulfate, fillers, and aggregates conform to specifications designated in Sections 3 and 4.

PROPORTIONING AND MIXING

6. (a) Composition. - The underlayment shall be compounded strictly according to the formula used in making the sample or samples approved by and on file with the architect or owner. The composition shall be essentially the same as or better in appearance than the approved samples.

(b) Mixing. - The dry ingredients shall be placed in a clean mortar box or mechanical mixer, the required amount of the specified gauging liquid added, and the mass mixed until it is free from lumps. Mixing shall be continued for at least five minutes after the last addition of gauging liquid. In no case shall the material be retempered for use by addition of gauging liquid after it has become too stiff to be applied.

(c) Consistency. - The wet mix, prepared as specified in Section 6 (b), shall slump not more than 7 inches when tested in accordance with Specification OCA Designation 350-12-50.

CONDITIONING OF WORKING AREA

7. In spaces where the underlayment is to be placed the temperature shall not

be less than 50 F and shall not exceed 95 F until final set is attained. The prevailing temperature shall be maintained substantially uniform in a stipulated range, and shall not decrease more than twenty degrees from the temperature at the time of installation for at least twenty-four hours after placing. Heating shall not be accomplished by the use of salamanders. Convection heating may be employed, provided local overheating is avoided, or air not exceeding 70 F may be used in forced circulation providing its velocity at the floor level is not in excess of 500 cu. ft. per min. at any location. Openings shall be kept closed or so arranged as to prevent harmful circulation of air. All water and steam connections from which leaks might affect the underlayment shall be made tight before placing of the underlayment is begun.

Note:-It is recognized that, with the specified temperature range conditions of low relative humidity may be encountered in arid areas which can deleteriously affect linear change characteristics and strength of an installation. Humidification of the atmosphere of the working area is recommended when such conditions are encountered.

PREPARATION OF SUBFLOORS

8. (a) The underlayment shall be laid only on a subfloor which has been prepared in accordance with the Specifications for Preparation of Subfloors to Receive Oxychloride Composition Flooring, OCA Designation 200-50.

(b) Prepared subfloors or basecoats shall be protected from injury and the surface shall be free from any substance deleterious to the formation of a bond, such as water, dust and grease.

METHOD OF APPLICATION

9. (a) When the underlayment is to be laid on an absorptive surface* (such as concrete, stone or ceramic subfloor), this surface shall be thoroughly dampened with gauging solution of full strength, leaving no puddles. The surface shall then be broomed with a thin slurry prepared from gauging solution and either the dry mix or neat caustic-calcined magnesia. Areas prepared in this manner shall be covered with the underlayment composition as specified in Section 9 (c) before they become dry or acquire a glaze.

(b) When the underlayment is laid on a non-absorptive surface where an anchoring medium is employed, a thin layer of the underlayment composition shall be thoroughly worked into and around the anchors. Application of additional composition shall then be made as specified in Section 9 (c).

(c) After preparation of the subfloor surfaces as specified in Section 9 (a) or 9 (b) a thin layer of the underlayment composition shall be thoroughly worked into all recesses and depressions by scraping with a trowel just prior to spreading the underlayment mix. The underlayment composition shall then be spread to the specified thickness and leveled by use of a screed or darby.

THICKNESS

10. (a) The thickness of the underlayment shall be not less than 3/8 in. at any point.

PROTECTION OF FINISHED INSTALLATION

11. The completed underlayment shall be protected from injury and kept clean and dry until it is surfaced.

PHYSICAL REQUIREMENTS

12. The underlayment shall conform to the following physical requirements when tested in accordance with methods listed in Section 17:

Transverse strength, minimum, pounds per sq. in. at 7 days	700
Compressive strength, minimum, pounds per sq. in. at 7 days	1400
Linear change, 1 to 7 days, within limits, per cent	+0.040 to -0.050

WORKMANSHIP

13. The prepared mix shall be laid to the specified thickness and levels in accordance with drawings, by qualified workmen, producing the finished surfaces as specified.

SUPERVISION

14. The contractor shall give his personal supervision to the work or provide a competent foreman or superintendent with authority to act for him who shall be present throughout the entire progress of the installation.

INSPECTION

15. The architect or owner may reserve the right to conduct any inspection or make any test deemed necessary to determine conformance with the requirements of this specification.

SAMPLING

16. (a) The architect or owner may, at the time of or prior to installation, take representative composite samples, for testing, of materials from each lot offered for delivery, in accordance with Specification OCA Designation 350-13-49.

Premixed dry ingredients	40 pounds
Gauging solution	2 gallons
Additives (Notes 1 and 2)	1 pound

(b) Samples thus obtained shall be placed in separate, clean, dry, air tight, waterproof containers, securely closed, distinctly labeled and dated. Any tests performed shall be completed within 30 days from date of mixing.

METHODS OF TEST

17. All methods of test shall conform to those of the American Society for Testing Materials or the Oxychloride Cement Association, Inc., designated as follows:

	<u>A.S.T.M.</u>	<u>OCA</u>
Sieve Analysis of Magnesium Oxychloride Compositions	C 238-49T	300-10-49
Sampling Oxychloride Compositions and Ingredients	C 237-49T	350-13-49
Field Determination of Specific Gravity of Gauging Solution		350-11-50
Slump Test for Consistency of Magnesium Oxychloride Cements		350-12-50
Mixing Oxychloride Cement Compositions with Gauging Solution		300-20-50

	<u>A.S.T.M</u>	<u>OCA</u>
Consistency of Magnesium Oxychloride Cement by Means of a Flow Table		300-12-50
Setting Time of Magnesium Oxychloride Cements		300-15-50
Transverse Strength of Magnesium Oxychloride Cement Compositions		300-13-49
Compressive Strength of Magnesium Oxychloride Cement Compositions		300-14-49
Linear Change of Magnesium Oxychloride Cements		300-16-50
Magnesia for Magnesium Oxychloride Cements:		
Ignition Loss of Magnesia		400-1-50
Active Calcium Oxide in Magnesia		400-2-50
Sieve Analysis of Plastic Calcined Magnesia	C 239-49T	400-3-49
Testing, for Magnesium Oxychloride Cements		400-4-50
Magnesium Chloride, Analysis of		400-12-50
Bulk Density of Oxychloride Compositions		300-19-49
Magnesium Sulfate, Analysis of		400-13-50

PACKAGING, MARKING AND STORAGE

18. (a) The contractor shall take such measures as may be necessary to insure the safe delivery and storage of all materials used on the job, such measures being adequate to avoid damaging moisture pick-up or other contamination from sources existing at the job site.

(b) In addition to other markings, each package shall bear the specific name of the material and, in the case of premixed ingredients, the date of mixing.

(c) All dry premixed compositions shall be packaged in suitable containers and kept under adequate conditions to prevent damaging moisture pick-up. When aged longer than sixty days from date of mixing, the composition shall be tested, not more than ten days before using, and shall at the time of testing meet the requirements specified herein.

(d) If requested or if samples are to be tested the flooring contractor shall supply his recommended ratio of gauging solution to dry mix.

Note 1. - Section 3 (b) - Additives intended to make the composition water-repellant or water-resistant, or to lend valuable properties to the composition, may be added to the dry ingredients provided the finished flooring meets specified requirements.

Note 2. - Section 4 (a) - If any water soluble ingredient is used other than specified, it shall be added to the full strength gauging solution, and such material may be used only if the finished floor meets specified requirements.

Tentative Specifications
FOR
PREPARATION OF SUBFLOORS TO RECEIVE
OXYCHLORIDE COMPOSITION FLOORING



OXYCHLORIDE CEMENT ASSOCIATION, INC.
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WASHINGTON 6, D. C.

Accepted by HAH

Tentative Specifications

For

PREPARATION OF SUBFLOORS TO RECEIVE
OXYCHLORIDE COMPOSITION FLOORING

OCA-200-50

Revised June 30, 1950

SCOPE

1. These specifications cover the preparation of new and old concrete (and other types of monolithic), wood, steel, aluminum, brick, stone and ceramic tile subfloors, with respect to the quality of materials and workmanship and suitability for receiving oxychloride composition flooring.

STRUCTURAL STRENGTH AND RIGIDITY OF SUBFLOOR

2. The subfloor shall be of such design and of sufficient soundness, structural strength and rigidity to withstand, without appreciable deflection or movement, the maximum service conditions to which the finished floor will be subjected.

MISCELLANEOUS REQUIREMENTS

3. (a) No hot water or steam pipes shall be embedded in the subfloor. (See Note 1).

(b) All pipes passing through the floor shall be separated from the flooring composition by a galvanized sleeve, leaving a minimum clearance of 1/4 in. between the pipe and the floor to permit free movement of the pipes under all conditions. Sleeves around pipes which also penetrate subsequent oxychloride surfacings shall be of sufficient length to extend through these surfacings. Where required by fire or other regulations, the space between pipe and sleeve shall be filled with approved fire-resistant thermal insulating material which will retard passage of smoke and fumes.

(c) Unprotected metal surfaces which will be in contact with oxychloride flooring composition shall be protected with a bituminous coating or a coating (including rubber and synthetic resin base compositions) which is known to be suitable for the particular metal and which is known to be highly moisture resistant.

Note:-These precautions are particularly important where dissimilar metals are in contact with the oxychloride composition and where there is likelihood of local moisture conditions occurring (as from condensation, or around drinking fountains and outside doorways).

(d) At points where construction or expansion joints occur in the concrete, stone, or ceramic subfloor, corresponding expansion joints, construction joints or division strips shall be provided in the surface flooring. These shall be so designed and constructed that the oxychloride surface floor will not crack at other points as a result of transmitted stresses.

(e) All bonding mediums having a rubber or synthetic plastic base shall comply with the requirements of Section 4 (b) and shall be applied in accordance with manufacturers' specifications.

(f) Where oxychloride compositions are to be applied directly to subfloors without the use of bonding mediums the surfaces of the subfloors shall be free of foreign materials which might prevent thorough bonding, such as mud, grease, plaster, oils, or loose mill-scale (on steel), and paint or bituminous materials other than those applied for protection of metal surfaces or for damp-proofing.

(g) Porous concrete, cinder concrete, light-weight concrete, grout or other similar highly absorbent surfaces shall be covered over the entire area with a bonding medium such as specified in Section 4 (b).

MATERIALS

4. (a) Anchoring Mediums. - 1. Expanded metal shall be a standard diamond-mesh, galvanized or black-painted after expansion, and shall be not lighter than two and five tenths (2.5) pounds per square yard.

2. Hexagonal mesh metallic fencing, metallic reinforcing mesh, and hardware cloth shall be galvanized after fabricating or welding and shall conform to the following gauge and mesh-size requirements.

<u>Mesh Size</u>	<u>Wire Gauge</u>
1.0 in.	20 minimum
1.5 in.	18 "
2.0 in.	16 "

(b) Bonding Mediums. - Bonding materials having a rubber latex or plastic resin base may be used provided the tensile strength of the bond between oxychloride and subfloor is not less than 150 pounds per square inch, and subsequently does not become less, when tested at age of 7 days in accordance with Method For Determination of Tensile Bond Strength of Bonding Mediums, OCA Designation 300-30-47, of the Oxy-chloride Cement Association.

(c) Miscellaneous Materials. - 1. Nails for securing anchoring medium as specified in Section 9 (e), except on joist lines, shall be standard large-headed galvanized roofing nails or galvanized self-furring nails or galvanized staples, in either case of adequate length and of the type specified or noted on drawings.

2. Nails for securing anchoring medium on joist lines as described in Section 9 (e) shall be standard galvanized eight (8) or ten (10) penny nails, single or double-headed as specified or noted on drawings.

3. Asphalt-saturated felt shall conform to the requirements of Federal Specifications HH-F-191a, Type 1, and shall weigh not less than ~~fifteen (15)~~ *thirteen (13)* pounds per 100 square feet.

4. Waterproofed building paper shall conform to the requirements of Federal Specification UU-F-356, ~~Grade A~~ *UU, 147, Type II, Class A.*

5. Paraffined paper shall conform to the requirements of Joint Army-Navy Specification JAN-P-456, Grade B.

(d) Base screeds and edging strips shall be located as indicated on drawings.

WORKMANSHIP

5. The subfloor shall be prepared in accordance with drawings and specifications and by qualified workmen, in accordance with accepted commercial practice. The condition of the subfloor shall be such that it will not impair the serviceability or appearance of the finished oxychloride floor.

NEW CONCRETE SUBFLOORS

6. (a) The term new concrete, for the purpose of this specification, shall be construed to include regular new concrete, new cinder concrete, light-weight concrete, and concrete fill or grout.

(b) All new concrete shall conform to all pertinent A.S.T.M. specifications for portland cement concrete.

(c) A new concrete subfloor shall be finished to a reasonably true plane surface not less than the specified thickness below the desired grade for the finished floor, with full clearances provided at all openings, in corners, behind pipes, and for other projections above the level of the floor.

(d) The surface shall not be troweled, but shall be worked to a uniform plane surface by screeding and floating. At an appropriate time prior to final set, the surface shall be broomed in one direction to produce a finish approximating that of tapestry brick and to remove all laitance. The markings left by brooming the surface shall have a minimum depth of $1/32$ in. and a minimum width of $1/32$ in. and shall be spaced not over $1/4$ in. apart.

(e) New concrete to which oxychloride compositions are to be applied directly shall be allowed to age for at least thirty (30) days before the oxychloride composition is applied. When oxychloride compositions are applied over bonding mediums such as specified in Sections 3 (e) and 4 (b) the concrete shall be allowed to age not less than seven (7) days before application of the bonding medium.

(f) Where necessary, as for example, when the concrete is to be placed directly over the ground, or on a crushed stone, gravel or earth fill, or in any place where it might be exposed to moisture from below, suitable damp-proofing means (such as recommended by the National Bureau of Standards in Letter Circular LC 813, January 25, 1946) to provide against capillary moisture shall be installed under it. Sidewalls contacting the floor slab shall be protected in the same manner.

(g) Surface curing agents or hardening agents other than water shall not be used on the concrete.

(h) No lime admixture shall be used in the concrete where oxychloride is to be applied directly to the concrete.

OLD CONCRETE SUBFLOORS

7. (a) The term old concrete, for purposes of this specification, shall be construed to include light-weight concrete, cinder concrete, and concrete fill or grout.

(b) The subfloor shall be dry and remain dry.

(c) If oxychloride compositions are applied over a bonding medium having a rubber latex or plastic resin base the bonding medium shall conform to the requirements specified in Sections 3 (e) and 4 (b).

(d) 1. If oxychloride compositions are to be applied directly to the concrete or other old monolithic subfloors the entire surface of the subfloor shall be roughened to a sufficient degree by suitable means as, for example, by sand-blasting, tooth-chiseling or picking, to provide adequate mechanical and chemical bond between the subfloor and the subsequent oxychloride coating.

Note:-Since some old concrete floors may have been waterproofed, care should be exercised to assure adequate chemical bond which depends on wetting and penetration. In such instances, a bonding medium shall be employed, as specified in Section 7 (c).

2. If the surface is prepared by tooth-chiseling or by picking, the chisel or pick marks shall be not less than one-eighth ($1/8"$) deep and shall be evenly spaced at intervals not greater than six inches ($6"$) in all directions.

3. If a channel router is employed the channels shall be not less than one-quarter inch ($1/4"$) wide, not less than one-eighth ($1/8"$) deep, and shall be spaced on centers not greater than two inches ($2"$). For industrial types of oxychloride floors or for any types which are to be subjected to severe service and/or shock, channeling in checkered pattern is to be preferred to parallel channeling in only one direction.

(e) If "Steelcrete" nails are used for anchoring they shall be not less than three-quarters ($3/4"$) long, and shall be spaced at intervals not greater than four inches ($4"$) in all directions and allowed to protrude not more than one-quarter inch ($1/4"$) above the surface of the subfloor.

(f) Cracks in old concrete subfloors shall be thoroughly routed. Loose chips and dust, including any particles which have been cracked but not loosened sufficiently to be swept away with a broom, shall be completely removed.

STONE OR CERAMIC SUBFLOORS

8. (a) A stone, marble or ceramic-tile subfloor shall be in approved condition with respect to strength of the bond between the stone or ceramic units and the subfloor. Any sections of the stone, marble or ceramic subfloors which are loose shall be removed.

(b) The surface of a stone, marble or ceramic subfloor shall be prepared in any approved manner which does not fracture the stone or ceramic units or their bond to the bed and which produces a surface so roughened that satisfactory mechanical and chemical bond is provided. Sand-blasting may be employed for roughening those surfaces where the resulting siliceous dust and/or moisture are not objectionable.

(c) If oxychloride compositions are applied over a bonding medium having a rubber latex or plastic resin base the bonding medium shall conform to the requirements specified in Sections 3 (e) and 4 (b).

WOOD SUBFLOORS

9. (a) The wood subfloor shall be sound and free from irregularities such as protruding or loose knots, and shall be securely nailed to the supporting structure. The floor shall be adequately ventilated on the under side to prevent rotting, and shall be termite proof if in areas where these pests are prevalent.

(b) New wood subfloors shall be of lumber having a moisture content of not over nineteen per cent (19%).

(c) Anchoring mediums such as specified in Sections 4 (a) 1 and 4 (a) 2, shall be installed over all wood subfloors which are to be surfaced with oxychloride compositions.

(d) Where anchoring mediums such as described in Sections 4 (a) 1 and 4 (a) 2 are employed, the wood subfloor, before the anchoring medium is placed, shall be covered with a layer of asphalt-saturated felt or waterproofed building paper of the grades specified in Section 4 (c) 3, 4 (c) 4, or 4 (c) 5, or with a coating of emulsified asphalt of such consistency that it will not pass through cracks or holes in the subfloor. The felt shall be laid tight against the subfloor at all points and shall be free of wrinkles and bulges. (See Note 2.)

(e) Metallic anchoring mediums such as specified in Sections 4 (a) 1 and 4 (a) 2 shall be flattened and laid over the felt or paper covering or the bituminous coating in such a manner that the surface which is to receive the flooring mix is completely covered and shall be secured by means of nails such as are specified in Section 4 (c), with the nails placed not more than six inches (6") apart in both directions. The nails shall be driven in such a manner that the anchoring medium is nowhere embedded in the asphalt-saturated felt or asphalt coating and so that the anchoring medium shall at no point be less than 1/16 in. or more than 1/4 in. above the surface of the subfloor. The nails not on joist lines shall extend not less than seven-eighths in. (7/8") into the wood subfloor, and in the case of a double subfloor the nails shall extend into the lower layer of the subfloor. Nails on joist lines shall extend not less than one in. (1") into joists. All nails into wood-block subfloors shall be driven at an angle to insure permanent bond.

STEEL SUBFLOORS

10. The steel subfloor shall be prepared either in accordance with United States Maritime Commission Specification for Preparation of Steel Plating in Way of Magnesite Deck Covering, No. 59-MC-1, May 19, 1944, or by coating with bonding material as specified in Section 3 (e) or 4 (b) and such as approved by the United States Coast Guard, or equivalent materials.

ALUMINUM SUBFLOORS

11. Aluminum subfloors shall be fabricated from corrosion resistant aluminum alloys (Note (a)). If plain surfaced the subfloor shall be coated with a bonding material suitable for aluminum and as specified in Sections 3 (e) and 4 (b). If constructed with a mechanical key (such as chanarch) the aluminum subfloor shall be coated as specified in Section 3 (c). (See Note (b)).

Note (a).--These include aluminum alloys using additions of silicon, magnesium, chromium with a copper content not exceeding 0.4 percent; and clad products such as Alclad 3S, Alclad 4S, Alclad 24S, or others of equal resistance to corrosion.

Note (b).--The dry mix of oxychloride composition which is to be applied over aluminum shall contain 1.5 percent (by weight) of potassium dichromate. If a two-coat application is used the incorporation of dichromate may be restricted to the base coat only.

SUBFLOORS FOR NON-SPARK STATIC DISCHARGING OXYCHLORIDE FLOORS

12. Subfloors for receiving Non-Spark Static Discharging Oxychloride Flooring shall comply with the requirements of the specification for this type of flooring, Designation OCA 103-50, of the Oxychloride Cement Association.