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COATING COMPOSITION AND METHOD

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ABSTRACT OF THE DISCLOSURE

Protection of structures having steel structural elements by spraying directly onto the steel a cementitious composition containing at least 30%, by weight of dry ingredients, of magnesium chloride; magnesium oxide and filler, and water.

BACKGROUND OF THE INVENTION

This invention relates to the protection of structural materials. More particularly the invention relates to the spraying of an improved coating composition onto columns, beams, tower-skirts, LP gas tanks and other structural elements to form a protective sheath for fire protection, corrosion protection and insulation. The composition of this invention has particular application to protecting structural steel, but other materials may also be protected.

Various cementitious fireproofing and insulating materials have been used to protect structural elements, but all have suffered from one or more of the disadvantages of excessive weight, difficulty in application, difficulty in finishing, and sensitvity to weathering.

One of the objects of this invention is to provide a method of protecting steel structural elements with a composition which is both highly protective and relatively light in weight.

Another object is to provide such a composition which requires no special finish coat.

Another object is to provide such a composition which does not require the use of expansion joints when applied to structural steel.

Other objects will become apparent to those skilled in the art in the light of the following disclosure.

In accordance with this invention, generally stated, a lightweight, efficient, easily applied, and highly durable coating is provided, comprising a cementitious composition containing a closely controlled mixture of magnesium oxide, talc and at least 30% by weight of magnesium chloride.

The composition of this invention is a mixture of dry materials which are mixed with water to form a plastic mass which can be applied in the standard ways by troweling, spraying or casting, at the convenience of the user. It is hydraulic setting and requires no separate finish coat. In some of its embodiments, it is highly waterproof and will continue to protect structural elements even after extended exposure to both the high temperature and the high pressure water streams which characterize some industrial fires.

The method of use of the composition of this invention is quite simple. To determine the thickness of the coating to be applied, the user must first determine the maximum fire temperature which might be encountered, and the length of time the structure might have to withstand this fire temperature. He must then determine the feasible level of damage. It is then a relatively simple matter to compute the thickness of the coating required from the critical constants of the structural material and the thermal conductivity of the protecting composition (see table).

The dry mixture of the present invention is mixed with water to a homogeneous plastic mass just before application. For heavy trowel applications lath is used to box in the structural element. For lighter spray application the composition may be sprayed directly onto the structural element. With either form of application, the first coat applied is a tack coat which should dry for four hours before the remaining coats are added. The setting time for each coat is three to four hours for the initial set and three to four weeks for complete drying.

The composition of the dry mixture of this invention must be controlled carefully. The weight of the $MgCl_2$ should be between 35% and 45% of the total weight of the dry mixture. The remaining weight of the dry mixture should be divided as follows:

	Percent
MgO	36–38
Asbestos shorts	21–24
Vermiculite (No. 2, 3 or 4 grade, at 5 to 50 lbs./cubic ft.)	32–34
$NaNO_2$	0.2–0.3
Talc	6–7
Additive	1–3

The following examples have been found to form particularly useful coatings.

EXAMPLE 1

$MgCl_2$ is 40.2% by weight of total dry mixture. The rest is divided as follows:

	Percent
MgO	36.6
Asbestos shorts	21.7
Vermiculite	32.6
$NaNO_2$	.27
Talc	6.11
Calcium stearate	2.72

This composition is a good "all purpose" protective coating. It will withstand considerable weathering.

EXAMPLE 2

$MgCl_2$ is 38.7% by weight of total dry mixture. The rest is divided as follows:

	Percent
MgO	36.1
Asbestos shorts	22.7
Vermiculite	32.2
$NaNO_2$	.27
Talc	6.0
Calcium stearate	2.73

This composition is extremely resistant to weathering.

EXAMPLE 3

$MgCl_2$ is 38.7% by weight of total dry mixture. The rest is divided as follows:

	Percent
MgO	36.1
Asbestos shorts	22.7
Vermiculite	32.2
$NaNO_2$	.27
Talc	6.0
Silicone oil (Dow Corning 772)	2.73

EXAMPLE 4

$MgCl_2$ is 40.2% by weight of the total dry mixture. The rest is divided as follows:

	Percent
MgO	37.1
Asbestos shorts	23.3
Vermiculite	33.1
$NaNO_2$	.3
Talc	6.2

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This composition is not as weatherproof as those in the foregoing examples, but is well suited to interior applications.

The pertinent characteristics of the composition of Example 1 are characteristic of the composition of this invention and are listed in the table:

Summary of physical properties

Thermal conductivity: (K) at 70° F. mean temp.=.28 B.t.u.
Density: 36 pounds per cu. ft. at 220°; 55 pounds per cu. ft. at 70°.
Water permeability: 10×10^{-4} cm./sec.
Moisture absorption: 100° humidity=.19.
Coefficient of expans. 0° to 100° centigrade 10.5×10^{-6} (11.0×10^{-6} C. is the expans. of structural steel).
Compressive strength: 550 lbs. per sq. in. (2" x 2" cube)
Lineal shrinkage: <1%
Setting time: 3 to 4 hours for initial set; 21–28 days for complete drying.
Oxidation potential: Magnesium=2.37; zinc=.763.
Bonding ability (lbs./sq. in.):
- Steel (−2.0)
- Primed steel (−2.0)
- Galv. steel (−1.0)
- Concrete (−4.0)
- Concrete block (−9.3)
- Brick (−4.7)
- Sheet rock (−2.5)

Indentation strength: 1000 p.s.i. (⅛" penetration on 1/20 sq. in. pin)

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:

1. A cementitious composition for the protection of structural steel comprising about 35% to 45% by weight of dry ingredients of magnesium chloride and, of the dry ingredients other than magnesium chloride, magnesium oxide, 36 to 38 parts, asbestos (shorts) 21 to 24 parts, vermiculite, 32 to 34 parts, sodium nitrite, 0.2 to 0.3 part, talc, 6 to 7 parts, and calcium stearate, 1 to 3 parts, and sufficient water to make a sprayable composition.

2. A method of protecting a structure having steel structural elements comprising spraying directly onto said steel structural elements a cementitious composition containing at least 30%, by weight of dry ingredients, of magnesium chloride; magnesium oxide, vermiculite, asbestos, a corrosion inhibitor, talc and water.

3. The method of claim **2** wherein the cementitious composition contains about 35% to 45% by weight of dry ingredients of magnesium chloride and the remaining constituents of the composition include a waterproofing agent, said corrosion inhibitor being sodium nitrite.

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