

TESTS ON X Y P E X WATERPROOFING COATING

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TESTS ON X Y P E X WATERPROOFING COATING

OBJECT OF TEST: General

A., To devise test methods and to observe the performance of XYPEX in the following situations:

i.) Preventing seepage of water through porous concrete or leakage zones.

ii.) Encapsulation of asbestos fibre on corrugated asbestos roofing material.

B., To examine Microscopically the change in the concrete matrix due to the application of XYPEX.

BACKGROUND: General

Uses:

Water proofing of concrete structures (mainly tunnels at the S.R.A.) is a most difficult goal. Though a very high degree of impermeability can be achieved by sound construction methods at the time of construction (backfill grouting, pressure grouting, weep holes,) these methods are very costly as remedial works. Water ingress, which in most cases causes mainly cosmetic damage, (unsightly and nuisance,) however structural integrity as a whole is not being affected. In the light of this, the S.R.A. could be interested in a product which can deliver a cost effective way of controlling water seepages (flows). The XYPEX COMPOUND is claimed to do just that.

Claimed action:

The product is claimed to work by the infusion of crystalline growth into the matrix of the concrete body, filling in the minute voids and capillary channels, thus water molecules cannot penetrate.

The process:

The crystalline growth needs the presence of CEMENT and water. It is claimed that the growth stops if water is not present but will be re-activated again when water is re-introduced. The essential requirement of the PRESENCE of CEMENT to successful crystal growth does limit the application mainly to concrete or to some extent to cement rendered structures, however it is privately being suggested that ordinary house-bricks or even asbestos sheetings could be treated with benefit.

Discussion:

According to independent laboratory tests, the mix does contain 35.7% of cement, enough to generate some excess crystals for migrating into non cement containing materials, following the moisture.

APPENDIX A

A.i)a POROSITY OF CONCRETE BLOCKWORK.

Object:

It was planned to use cavity Concrete Blocks to test for effects on porosity.

1., Procedure:

4 cavity Concrete Blocks (2 pairs), were used. At the early stages one pair was used as untreated control, however later they also were coated with the XYPEX CONCENTRATE. Before the application of the XYPEX compound the blocks were tested for water retention by temporarily sealing one open end and filling the cavity with water just to have an idea how the blocks leaked. No measurements were taken at this time, however it was observed that the blocks were leaking at a widely differing rate from one another suggesting a rather poor quality control at the manufacturing site. This differing leakage rate has remained throughout the test.

Two sides of the blocks normal to each other were coated 1-2mm thick with the XYPEX CONCENTRATE, mixed by hand as per instructions, then cured for 3 days with regular sprays of water and there after the cavities were filled with water (during working hours) as they drained out. One of the open ends was plugged with a sand-cement mix of 3:1, creating a container which would hold water. Originally only two bricks were treated but later on another was added. To measure the effect of XYPEX on the blocks, they were filled with water and 24 hours later the volume of water remaining inside the blocks was measured and the blocks again re-filled. This 24hrs. cycle was repeated (as closely as possible) during the duration of the test.

2., Results:

Some selected measurements are tabulated here in Table 1.

Volume of water measured after 24 hours

TABLE 1.

Date:	19/3	26/3	5/4	12/4	19/4	3/5	10/5	17/5	24/5
1., Vol. (ml.)	1040	1040	1120	1300	1310	1370	1370	1370	1370
2., "	670	760	765	790	890	1170	1170	1230	1230
3., "	-	580	595	620	620	620	910	1010	1020
Date:	7/6	14/6	25/6	2/8	9/8	14/8			
1., Vol. (ml.)	1430	1440	1410	1410	1400	1410			
2., "	1230	1230	1250	1290	1260	1340			
3., "	1060	1060	1080	1180	1330	1380			

3., Observations:

These figures show the clear trend for all three bricks treated, of more water being retained as time passes, (not a very straight line but the trend is there). The first slow down of water seepage was noticed 14 days after the application of the XYPEX Compound.

Also, after 6 weeks of the application, the treated sides have become dry to the touch, while the untreated feels moist, suggesting that the water loss is through the untreated sides only. Conclusions:

The tabulated data in Table 1 shows the tests have been in progress over 5 month now. The slowness of the results could be attributed to the porosity and lower cement content of the specimen.

Our tests does show that the treated surfaces DO BECOME WATERTIGHT after a period, but we did not achieve full water tightness during our test run.

A.i)b THE CONCRETE CYLINDER BLOCKS:

Object:

To test for effects of XYPEX on absorption

1., Background:

If the claim of crystalline infusion is correct the concrete blocks should gradually weigh less and less with time as the growing crystals force out the water from a submerged treated concrete block's voids, conversly water should not be able to penetrate in measurable quantities after a time.

2., Procedures:

Two cylindrical concrete blocks, (100mm dia. 200mm long) were coated (bar one end) with the XYPEX CONCENTRATE, mixed as per instructions. Two similar blocks, uncoated, were used as control. After the prescribed curing the 4 blocks were submerged in water and were weighed periodically in a saturated surface dry condition (Photographs of specimens are shown on plate 1.)

3., Results:

Selected results of a 2 month period are tabulated below in Table 2:

TABLE 2.
(Wet weights)

13/3/91	26/4/91	15/5/91	
4033.7g	4037.6g	4040.0g	Coated with XYPEX
4231.4g	4237.4g	4238.0g	"
3895.9g	3901.1g	3902.0g	Uncoated (control)
3691.5g	3694.1g	3695.0g	"

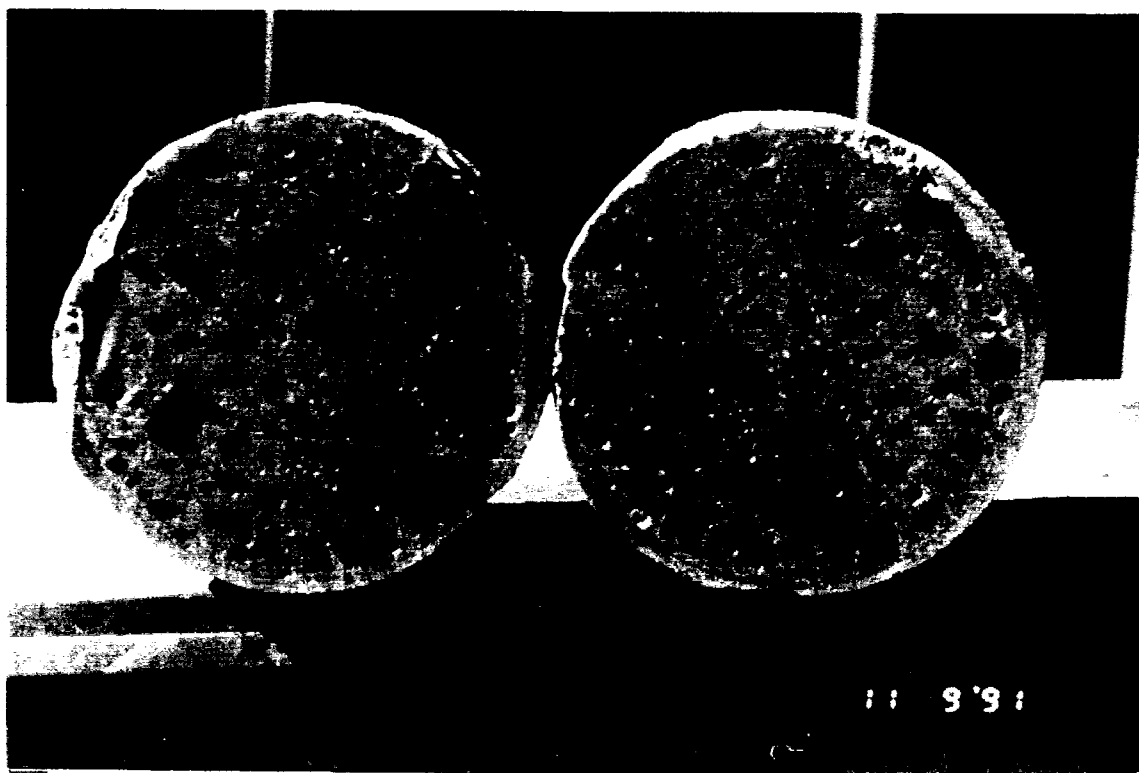
4., Observations:

The above results were not expected and it was decided to change the testing procedures. A wet and dry cycle was established where the blocks were submerged for 4-5 days, surface dried then weighed than put in a low temperature oven for 4-5 days to dry out then weighed, put back in water for 4-5 days and so on.....The intention was to drive out all the free moisture by evaporation - thereby proving incidentally the claim that the coating allows "breathing" - and the next WET CYCLE weighing should weigh less (by some margin) than the previous one etc....

Continuing from the last wet weighings of the 15/5/91 here are some selected tabulated weighings in Table 3:



SAMPLES: 1 & 2 XYPEX TREATED
3 & 4 UNTREATED



SAMPLE No. 2 : XYPEX TREATED.
CUT FOR ELECTRON MICROSCOPE AND
PETROGRAPHIC INSPECTION



TABLE 3
(wet weights)

15/5/91	24/5/91	31/5/91	7/06/91	17/6/91	
4040.0g	4035.0g	4030.0g	4028.0g	4028.0g	Coated
4238.0"	4233.0"	4228.0"	4228.0"	4228.0"	"
3902.0"	3897.0"	3895.0"	3892.0"	3892.0"	Uncoated
3695.0"	3688.0"	3684.0"	3682.0"	3682.0"	"

The above tabulated figures show the coated blocks to gain and loose weight quite the same way as the uncoated control blocks.

From the first set of figures (Table 2), the coated blocks GAINED (over time,) an aver.of 6.45g the uncoated ones 4.8g; from the second set, (Table 3), the figures indicate a LOSS of 11.0g and 11.5g respectively. These results show the same degree of weight gain and loss (over time) in the treated and untreated samples. It was expected that an appriciable less weight gain would be measured in the treated than the untreated samples, due to the supposed blocking action of the crystalline growth against water penetration.

A.ii) ASBESTOS FIBRE:

Object:

The encapsulation and water proofing of Asbestos Fibre.

1., Background:

The issue of treating old corrugated asbestos sheeting to improve water proofing and to encapsulate asbestos fibres was introduced as a use of XYPEX.

2., Procedures:

Pieces of asbestos sheeting were treated with XYPEX as per instructions and subjected to wetting and drying cycles, similarly to the concrete blocks

3., Results:

Table 3 shows two sets of readings to indicate the progress to date:

TABLE 3
(Wet weights)

	13/05/91	17/06/91
CONCENTR.	1568g	1561g
MODIFIED	1513"	1506"

4., Observations:

The results show only minor loss in mass.

B. Examination of crystalline growth & Mineralogy

Samples of concrete and asbestos cement treated by Xypex were examined by electron Microscope and petrographic analysis in attempt to observe the mechanism by which waterproofing of the concrete was achieved.

The reports of these analyses are contained in separate reports which as follow:

A. Examination of Xypex treated concrete by Scanning electron Microscope by State Rail Scientific Services.

B. Examination by Petrographic Microscope.

R.Nagy
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