

Surface Treatment Strategies For Exposed Concrete

A case study of Secretariat building, Chandigarh, India.

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ABSTRACT

This research is focused on three pressing issues for the preservation of exposed concrete in the tropics.

It begins with a comprehensive review of the literature on the behavior of concrete especially when exposed to high levels of humidity and temperature and ends by looking at the application of the surface treatments as remedial and preventive methods for the preservation of exposed concrete as used by Le Corbusier for the governmental complex at Chandigarh, India.

This research is divided into 3 parts:

- (i) Understanding the behavior of concrete in the tropics
- (ii) Surface treatments- classification, types and efficacy
- (iii) Case Study: The Secretariat building, Chandigarh, India

Major observations from the literature suggest that polymer coatings reduce water permeability through the surface and provide chloride resistance, both of which prove to be a major source of corrosion of the embedded steel and reducing the life expectancy of reinforced concrete buildings.

Chandigarh, being the first planned city of India, was designed by Le Corbusier in 1950 and hence is subjected to climatic deterioration. Recent studies have shown that there is no major structural damage to the buildings but there is evidence for the appearance of superficial cracks in the concrete/ spalling of concrete, rusting/ and carbonation of steel reinforcement. Although more than 60 years old; the exterior concrete surface is chemically stable, and its surface porosity is also fully developed. The external concrete surface of the Secretariat Building is soiled, carbonated, and disfigured by bio deterioration

Field tests were performed on the exposed exterior surface of the Secretariat Building. An area at the ground level which remained moist for a long period of time was selected for the field trial. After surface preparation, the selected concrete coatings were applied on a surface area of 300 X 300 mm². A control area was also maintained with the same dimensions for comparison. The coated surface was compared for any deterioration of the treated surface due to temperature, relative humidity, air, wind, rain, and UV radiation up to 38 weeks. Of all the products tested, silicates showed higher water absorption than any other products, whereas silanes and siloxanes were found more suitable for application on the exterior concrete surface.. The results provide a convenient method to enhance the durability of exterior surface of the Secretariat Building from further environmental deterioration.

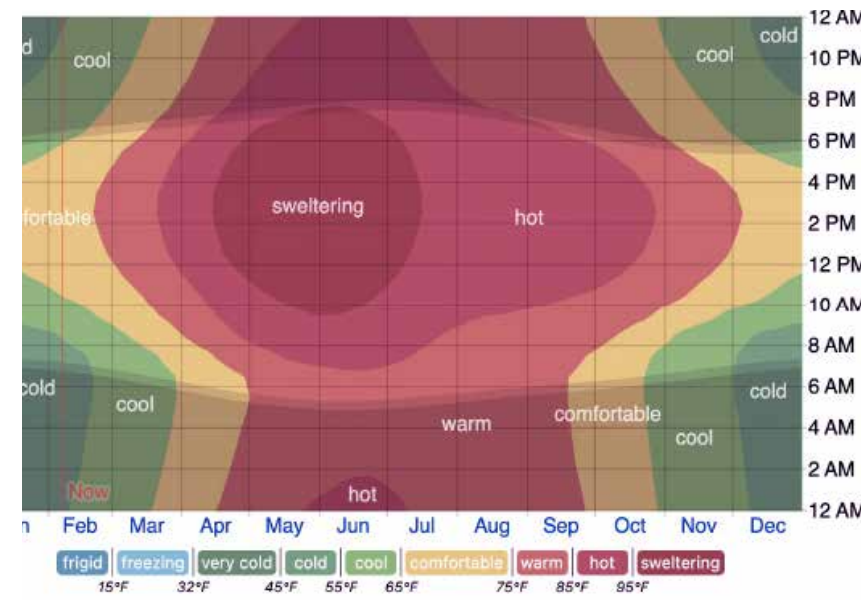


Figure 1. Climate weather chart for Chandigarh, a typical sub-tropical climate. (Source: waterspark).

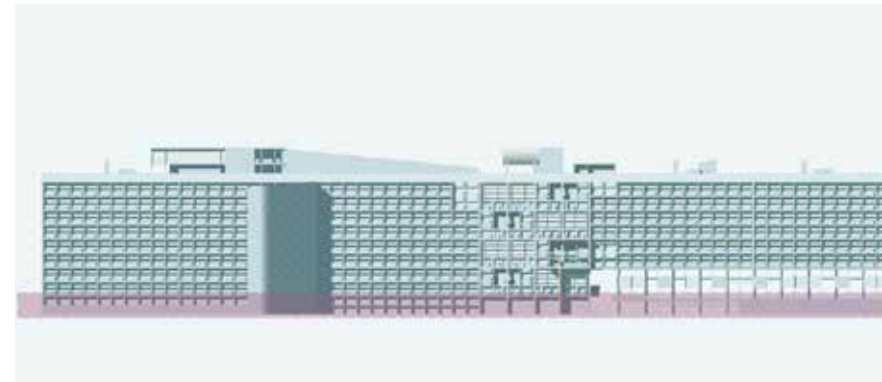


Figure 2. Diagram depicting the area for the implementation of strategies. (Source: drawing by Archdaily, red-lining by the author).

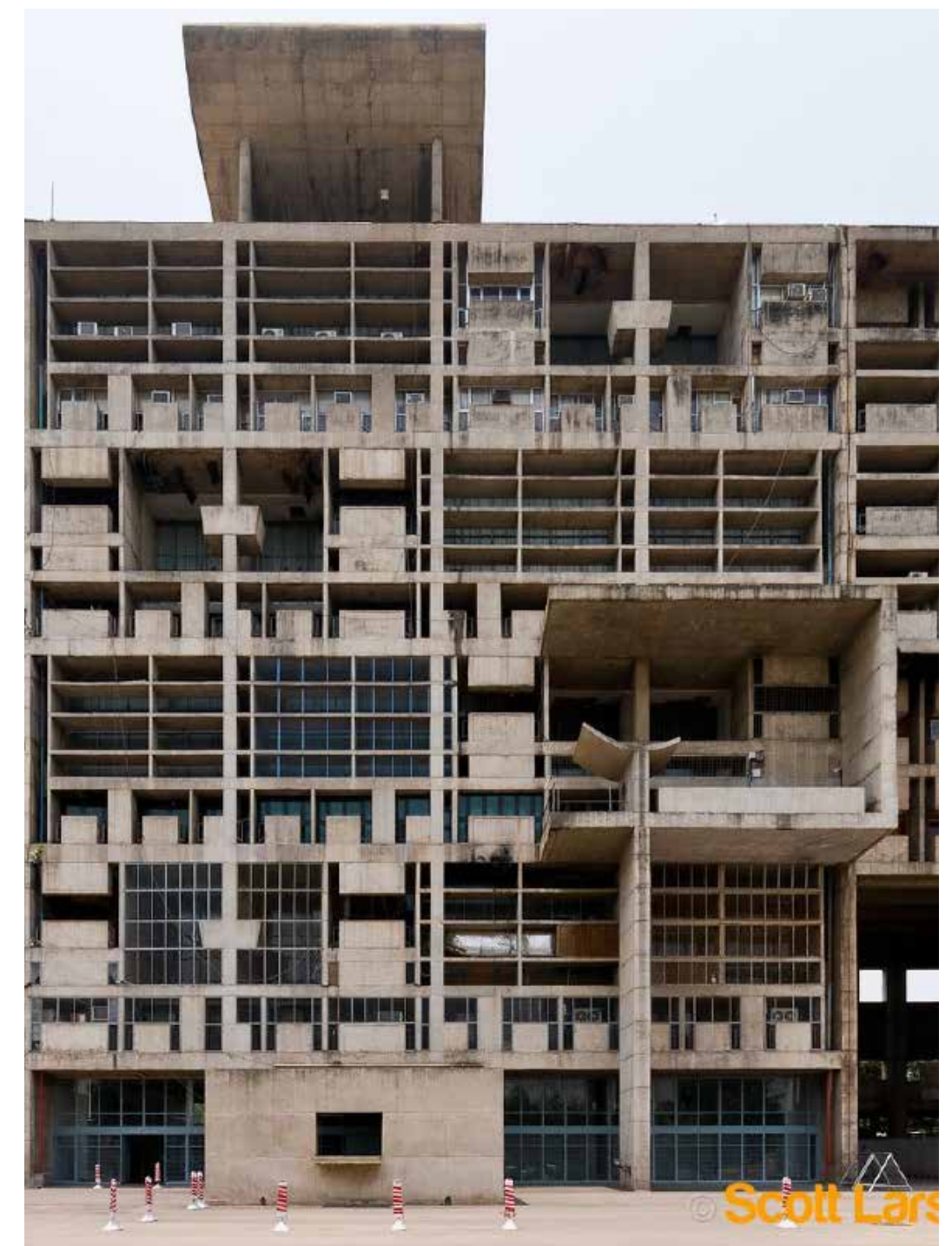


Figure 3. Elevation photograph for the Secretariat building (Source: ArchDaily).

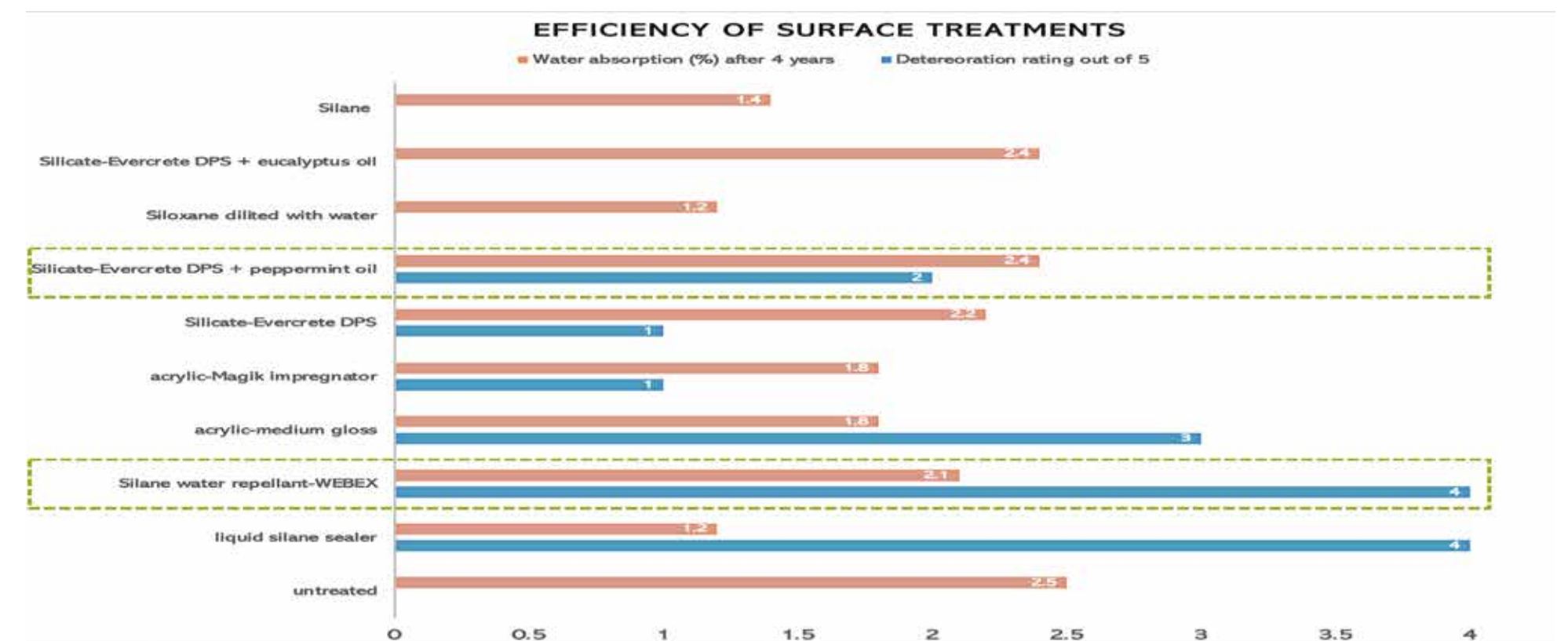


Figure 4. Graph on the effectiveness of the strategies according to the research in Surface treatment of the Secretariat Building, Chandigarh, India using selected concrete sealers for protection from environmental deterioration (Source: author).