



**SURTREAT®**

**FLUOR DANIEL  
ENVIRONMENTAL**

# CASE STUDY

## PROBLEM

Application of Surtreat proprietary concrete protection system to hazardous materials warehouse floors

## STRUCTURE

Building #80, Flour Daniel  
Fernald INC  
Fernald, OH

## PROBLEM

Building 80 is located on site of environmental remediation project in Fernald, OH, operated by Fluor Daniel Fernald, Inc. The building has been used for storage of contaminated materials, liquids and solid waste. It was estimated that the total warehouse floor area is 10,600 sf. A curing compound was applied to the floor upon installation several years ago. The floor appeared to be in good condition with some cracking and one section undergoing moderate spalling.

Surtreat Corp. was invited to install a chemical concrete protection system on the total area of the floor to reduce chemical reactivity of the floor surface, inhibit penetration of radioactive and other hazardous chemicals into the concrete, improve physical properties of the concrete (hardness, etc.) and seal cracks and spalled areas.

## THE SURTREAT DIFFERENCE

Surtreat Corp. has developed a proprietary system that involves a continuous application of a combination of chemical formulations designed to penetrate porous zones of concrete structures and solidity inside by chemically reacting with cement components.

Installed SURTREAT system does not allow hazardous chemicals to penetrate into the slab, which makes the clean up effort significantly less expensive. SURTREAT is not a coating or a sealer in the conventional sense of the word, it can not crack or peel off, it does not deteriorate due to weather or chemical attack. SURTREAT is a permanent solution to the problem of concrete deterioration. The effectiveness of the SURTREAT treatment is quantified by performing a series of tests to verify the benefits of the SURTREAT technology. Tests commonly used are: CAPO (Pull Out), Carbonation (pH, Chloride, Water Permeation, Acid Resistance, and Half-Cell Potential).

Performed on numerous projects, the tests show that properly applied SURTREAT system delivers:

- Improved compression strength
- Decreased permeability
- Increased resistance to chemical attack
- Inhibition of rebar corrosion \* Decreased carbonation, elevation of pH
- Purging of the contaminants from the concrete microstructure.

SURTREAT is a unique system superior to the majority of concrete protection products both in its ability to deliver the desired degree of protection and cost efficiency.

## OUR PROCESS

The floor surface was prepared by shot blasting A Blastrac machine equipped with a HEPA filtering system was used. Shot blasting is the best method of surface preparation as it removes the residual sealant, accumulated grime, etc. from the concrete surface opening the porosity and allowing SURTREAT formulations to penetrate easily. Surface cracks were sealed immediately following surface abrasion. One part moisture cured urethane was used.

Surtreat GP-HP is a high penetrating formulation designed to permeate to the depth of 1-3 inches depending on the porosity of the substrate. Two spray on applications of SURTREAT GP-HP were made. Surtreat GP is a formulation designed to furnish additional degree of top surface protection. One saturation level application of Surtreat GP was made by spraying. Combined application rate of SURTREAT materials was 65 sf/gal.

Residual SURTREAT solids unable to penetrate saturated concrete surface had to be dissolved and removed by water washing, brooming and squeegeeing. Surtreat Corp. technical representative also performed tests to confirm the anticipated results of the treatment.

## TESTING RESULTS

### WATER PERMEATION


Permeability of concrete by water or any other solutions is of utmost importance to the customer in the warehouse floor installation. The ability of concrete to resist permeation will allow a response team to easily cleanup any spill without allowing contamination of the concrete micro structure and decreasing risks associated with possible site demolition at a later date.

Water permeability was measured using a Germann Instruments pressure cell, which measures the amount of water adsorbed by the surface at a certain pressure in a certain period of time (see Appendix for detailed description)




**UNTREATED SURFACE**

(At 3 atmospheres of pressure)




10-cc volume  
of water




Adsorbed in  
7.5 minutes.

**TREATED SURFACE**

(At 3 atmospheres of pressure)



2-cc volume  
of water



Adsorbed in  
10 minutes.

The tests show that the rate of adsorption was **decreased by 85%**. It should also be noted that 2 cc of water on the treated surface was adsorbed during first 1-3 minutes of the experiment which normally accounts for the process of surface wetting, not penetration.

## PULL OUT STRENGTH (CAPO TEST)

The test was performed using Germann Instruments pull machine, and procedures. The test measures the force (in KiloNewtons) that is required to extract a concrete cone from the surface of the structure (see Appendix for detailed description). KiloNewtons of force are translated in the psi of compression strength (see Appendix for conversion table).

<b>BEFORE</b>	<b>AFTER</b>	<b>CHANGE</b>
Pull force 42 kN or 6,843 psi of compression strength	Pull force 44 kN or 7,130 psi of compression strength	287 psi of compression strength 4.2% increase

It should be noted that the lower the original compression strength of the substrate the greater the change that could be expected after the SURTREAT treatment was administered, Important: test areas for "before" and "after" pullouts are located on the same slab within 34 inches of each other. Testing "after" in the immediate proximity of "before" is the only way to assure objectivity.

It should also be mentioned that the concrete cone pulled out of the surface before treatment broke in two upon extraction. The concrete cone pulled out after the treatment did not break suggesting that the tensile strength of the concrete has also been improved.

## ACID REACTIVITY

Acid reactivity test measures the ability of concrete to resist attack and penetration by strong acids and other aggressive solutions. It is performed by applying a drop of concentrated hydrochloric acid to the concrete surface and observing the reaction.

### BEFORE TREATMENT

Violent reaction is observed with a lot of foaming and acid etching the surface.

### AFTER TREATMENT

Very mild reaction with acid laying on the surface, not penetrating.

The test shows that chemical spills could be contained without jeopardizing integrity of the concrete surface.

## PH

After being shot blasted, the floor showed no signs of carbonation. No change has occurred after the treatment. pH of the slab was measured at 12.

## CONCLUSION

All combined, the results of the tests show that the objectives of the treatment have been achieved. We extend our thanks to the personnel of Fluor Daniel Fernald, Inc. and to the workers of Wise Construction Co., Inc. for the assistance in performing the project.

We invite your comments, questions, and inquiries.  
Reach us at one of the below.