
Orlando Utilities Commission **Remediation of Sick Building Syndrome**

Orlando Utilities Commission, a quasi-public agency located in Orlando Florida, has provided the following attached information to Aquron Corporation for publication. Aquron Corporation, with manufacturing facilities located in Rowlett, TX, provided material and an initial demonstration during testing at OUC to determine the suitability of its product to solve a problem which had occurred at an OUC building. Other companies products were evaluated as well during this test period. The data that appears here is not linked to any specific product names with the exception of Aquron, although OUC does have that information in its entirety. As a matter of policy and fair ethics, Aquron does not present data naming competitive products. Aquron's only purpose here is to show the performance of its own products in these tests, and to demonstrate how Aquron achieved final resolution of the problem. The OUC data included here is part of one of the most in depth testing programs ever undertaken to resolve a sick building syndrome problem. At stake was the *entire OUC building*, which is explained in more detail below.

Background:

In 1993, OUC had their new 65,000 sq. ft. multi-story engineering office building at 6003 Pershing Ave. completed, and had Collins & Aikman carpet squares installed in it. The flexible vinyl backing was formulated using an unstable plasticizer that broke down upon exposure to moisture and released C-9 and C-10 alcohols, which traveled upwards into the air and also permeated downward into the concrete. After the subject carpeting was removed, unhealthy levels of a range of pollutants persisted within the structure. Blame was first placed on the air conditioning system by the carpet installer, claiming that insufficient air exchange was causing the high levels of contaminants. At the time, levels of pollutants ranged between 3000 and 4000 microns per cubic meter. The concrete was measured as emitting 6,000 to 7,000 microns per cubic meter. As levels of above 500 microns were unacceptable for habitation, and the target levels for remediation were 75 microns per cubic meter, the building had to remain evacuated until the situation could be corrected. OUC was now in a position whereas they had to make a solid case for what had happened, to determine true cause and effect, and to implement a solution. An expert was brought in from Harvard University to test the air conditioning, which was found to be functioning normally. It was determined that the pollutants were being fed into the environment faster than the air conditioning system could exchange the air to remove them. It was now apparent that all remaining sources, one of which was determined to be the concrete, had to be dealt with.

Implementation of a solution was to evaluate different courses of action to remove or control the sources of the contaminants. Furniture, wall and ceiling tiles were removed and discarded due to absorption of the chemicals. The first floor concrete was jack hammered out, removed, and re-poured. For the second floor, removal was not an option, since the second floor was structurally tied to the building as a hurricane diaphragm, and its removal in this manner would compromise the overall structure. Therefore, OUC was faced with either solving the emissions problem from the concrete, or to *demolish the entire building*.

OUC had contacted every known source for the very best available products making claims that they could remediate this problem. As OUC had set up trials for a number of candidate products on 4 x 4' sections of the 2nd floor, Aquron Corporation was invited in for evaluation of their product. The most sophisticated testing equipment available was used to gather the data. Over twenty different

products were applied to the concrete on their respective test areas, and results measured. Epoxies, sealers (see attached table), and concrete treatments of various types were tested.

The chief environmental consultant contacted for this project was GZA GeoEnvironmental of Grand Rapids, MI, who used Air Quality Sciences Laboratory of Atlanta, GA to run the chamber tests. In addition, another lab noted for being one of the top labs in the country, Berkeley Analytical Associates of Richmond CA, were also retained to test the chamber samples and other building areas where outgassing of materials affecting adjacent parts of the structure were a concern.

For the tests, the laboratory would prepare a set of absorbent tubes of various charcoal medium through which air was drawn from an aluminum tent over the test areas. The exposed tubes would then be hooked up to a gas chromatograph mass spectrometer at the lab for analysis. Levels of all the pollutants posing a serious health risk such as nonanol, heptonol, pentanol, and hexanol were measured, along with many other chemicals.

During the Aquron trial, the Aquron 2000 was applied with two OUC officials present: Artie Spitzer of OUC and the building manager. Later, Artie would relate the experience by describing his first impression that "the Aquron looked like water", and that he thought it was "snake oil". His initial impression was that this material could not possibly be effective judging by its appearance, physical composition, and method of application. The building manager basically agreed with this initial evaluation. However, the lab results on the test area showed a different story. Initial tests with the Aquron 2000 showed that treated areas displayed reduced emissions to levels of *between 50 and 100 microns per cubic meter*. Aquron 2000, among over twenty other products, was the *only product* that passed the tests.

During actual remediation treatment of the second floor, shallow grooves were cut in rows to help ensure the deepest possible absorption rates of the Aquron 2000 into the concrete. Initial tests had shown penetration depths of 3" into the concrete. An option would have been controlled multiple coats of product to achieve greater penetration depth, coupled with light surface scarification to allow greater penetration rates.

Results of tests, OUC data attachments:

The below section will reference specific attached data. Table rows of GZA GeoEnvironmental summary table have been noted to what is referenced.

Original test (6/95) shows condition of floor prior to any remediation attempts.

SOM 1st floor shows Aquron remediation levels.

EDIS, PRS, Loss Prev. and Training Room, all first floor, shows measured levels of re-poured new concrete.

EE Drafting, EDIS (Huggins) EE West, and EE East, all second floor, shows results achieved using Aquron CPT 2000.

As shown in the accompanying tables and data, the Aquron produced numbers *well below the target levels of 75 micrograms per cubic meter*.

Comments regarding the OUC experience, from the Aquaron point of view:

After the first floor had been re-poured, OUC was advised by the carpet company that no warranty would be given on the carpet if the moisture vapor pressure was determined to be higher than a desired target of 3 PSI. OUC ran the air conditioning system at least three months during the winter period to try to reduce moisture levels in the new concrete. Even doing this, they were unable to reduce the moisture vapor pressure below the desired threshold. (See accompanying table "Diagnosing & Confirming the Source"). OUC was not aware at the time that had they simply used the Aquaron 2000 product as a curative for the new concrete, flooring installation could have taken place just 72 hours after the concrete was poured. In addition, had the original concrete been treated with Aquaron 2000 prior to the carpet failure, the failure in all probability would not have occurred. Even if it had, through contact of the carpet with other sources of moisture, the alcohols and other chemicals which out-gassed would not have had access to the concrete due to the presence of the Aquaron 2000 in the matrix. At that point, simple removal and replacement of the defective carpeting and other affected building materials would have been sufficient to solve the problem.

Therefore our recommendation to any design engineers or architects would be simply to specify Aquaron 2000 as the concrete curative agent during new construction as the ultimate preventative for such a scenario, in addition to controlling moisture vapor pressure and allowing faster project completion.

Information compiled from OUC data and letters of 3/25/96 and 9/3/97.

Attachments: GZA GeoEnvironmental, Inc. Summary Charts,
Narrative report from Berkeley Analytical Associates.

R. Bruce Bowers, 12/16/01
