

# CertainTeed

## Fraunhofer Case Study



# Case Study

## Fraunhofer – The Building Technology Showcase



Architect:	DiMella Shaffer
Location:	Boston, MA
Construction Manager:	Gilbane Building Company <a href="http://www.gilbaneco.com/">http://www.gilbaneco.com/</a>
Gypsum Products:	AirRenew® IAQ Gypsum Board

## Who is Fraunhofer?

Fraunhofer is Europe's largest application-oriented research organization. Operations include 67 institute and research facilities. The efforts of Fraunhofer are geared towards everyday needs which include: health, security, communications, energy and the environment. In addition to the institutions in Germany, there are seven US-based centers through Fraunhofer USA.

One of Fraunhofer's notable research units is Fraunhofer's Center for Sustainable Energy Systems (CSE). Fraunhofer CSE is an applied research and development laboratory dedicated to the commercialization of clean energy technologies. Its headquarters was originally located in Cambridge, near Boston, Massachusetts, but the headquarters was relocated to south Boston's Innovation District.

Fraunhofer CSE headquarters underwent a deep energy retrofit of a 100-year-old building. The inside of the new headquarters was completely renovated, but due to its architectural significance, the exterior of the building was preserved. The interior renovation incorporated today's most advanced sustainable building products. Each building material was carefully chosen for its sustainable and unique contributions. The selected products were integrated into the building and were evaluated by Fraunhofer CSE researchers for their reliability and effectiveness in real-life applications. Completed in 2013, the facility is now a unique combination of cutting-edge design concepts and historic architecture.

### **Fraunhofer CSE's Headquarters Notable Achievements:**

- The Building Technology Showcase now serves as a "living laboratory" for R&D of advanced sustainable energy technologies
- Products are displayed in a public exhibition and educational space within the facility to call attention to their sustainable attributes
- Fraunhofer CSE's headquarters is one of the Top Five Green Buildings in Boston.



### **Fraunhofer CSE commissioned CertainTeed's® AirRenew® Indoor Air Quality (IAQ) Gypsum Board for the building**

Today, it's more important than ever to improve the quality of air inside our buildings. Research indicates that people spend approximately 90% of their time indoors, and indoor air is often more polluted than outdoor air. Volatile organic compounds (VOCs) are some of the primary pollutants found in indoor air, and formaldehyde is the most prominent VOC. Formaldehyde and other aldehydes, which contribute to poor IAQ, pose a potential health threat of respiratory illnesses per the U.S. Centers for Disease Control and Prevention (CDC). Formaldehyde is found in some building products and furnishings such as unsealed plywood or particle board, carpets, furniture, cabinets, shelving, and insulation, as well as every day use items such as cleaning materials, paints, solvents, adhesives, glues, perfumes, hairspray, anti-wrinkle treated fabrics, computers, copiers and printers.

Using proprietary industry-first technology, AirRenew IAQ Gypsum Board captures and converts formaldehyde into inert compounds, so that it cannot be re-emitted into the air. The effectiveness of the AirRenew process has been tested in accordance with ISO 16000-23 and validated by UL Environment through their Environmental Claims Validation (ECV) program. AirRenew continues to effectively clean the air even when used with multiple coats of water-based acrylic or epoxy paints and breathable wallpaper per tests conducted by Cornerstone laboratories, LLC. AirRenew works continuously for years and is moisture and mold resistant. AirRenew gypsum board products can be installed and finished like regular gypsum board and is recyclable.

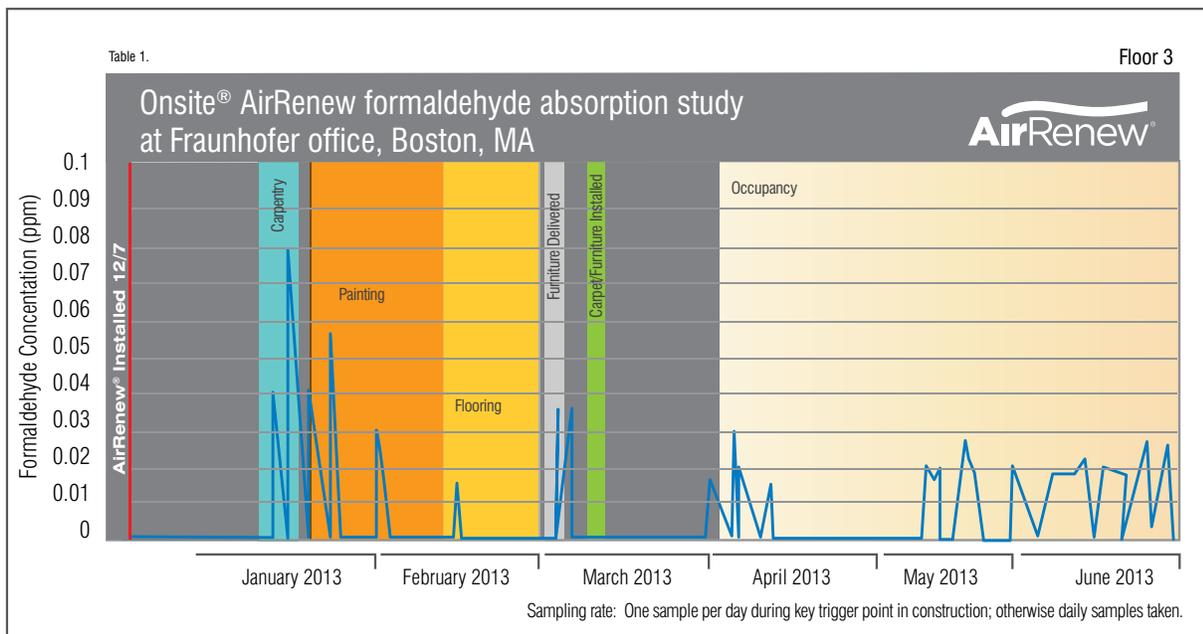
AirRenew's ability to improve indoor air quality, as well as other sustainable attributes, made it an integral component of architect DiMella Shaffer's LEED® Gold design strategy for the building. AirRenew products have achieved GREENGUARD® Gold Certification and have undergone UL Environment's Environmental Claims Validation (ECV) program. On green building projects, AirRenew gypsum board products can potentially contribute credits for indoor environmental quality and recycled materials. AirRenew contains up to 99 percent total recycled content and may provide a regional materials credit, depending on project location.

### **The Study**

The scope of the Fraunhofer case study was to evaluate the effectiveness of AirRenew in permanently reducing indoor formaldehyde concentrations over time. AirRenew was installed on multiple floors, each floor with a different layout and design.

Fraunhofer CSE researchers took measurements of formaldehyde concentration levels over time. Starting from prebuild up until occupancy, daily measurements were taken during the course of the renovation. Measurements were taken from December 2012 until June 2013. This seven month period included three months of occupancy. In addition, Fraunhofer captured four measurements daily for three days after completion of each of the "trigger point" events. The events during construction in which formaldehyde levels were expected to significantly increase were drywall finishing, painting, carpet installation, furniture delivery, and occupancy. After completion of the building renovation, over 800 measurements were conducted during and post-construction.

Measurements were taken using RKI Instruments® FP-30 formaldehyde gas detectors and measurement tabs, both provided by CertainTeed. The gas detector uses a photoelectric photometry method to measure formaldehyde levels. The minimum detection rate is 0.01 ppm. Measurements are accurate +/- 10% of readings or 5% of full scale, and with air temperature between 14 °F – 104 °F (-10 °C – 40 °C) and with a relative humidity (RH) below 90%.



### Results and Findings

Floor three had the highest level of formaldehyde activity during construction. Fraunhofer researchers found that some of the measurements were even greater than 0.027 ppm, which is the maximum allowable concentration as specified by LEED® (Leadership in Energy and Environmental Design).

Table 1 shows the daily formaldehyde measurements in parts per million (ppm) on floor three, along with a timeline of the construction and renovation process and various triggers impacting the indoor environmental quality. The vertical axis reflects the formaldehyde levels and the horizontal axis shows the day the measurement was captured.

### Conclusions

CertainTeed Gypsum believes the data shows CertainTeed Gypsum's AirRenew® IAQ Gypsum Board was able to absorb the excess formaldehyde on floor three. This allows for a further decrease in indoor formaldehyde concentrations and higher indoor air quality. The installation of AirRenew on this project along with good indoor air quality design and good building operation practices provided an effective strategy to reduce the exposure to formaldehyde.

The final report of this study: "Formaldehyde concentration measurements at 5 Channel center, July 2013, by Kurt Roth, Peng Cao, and Alliston Watts" can be obtained from Fraunhofer CSE or CertainTeed Gypsum.



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