

April 22, 2013

Dr. Norman & Roxanne Schulman  
6580 Martinique Way  
Vero Beach, FL 32967

RE: Chinese Drywall Post Remediation Verification; Report No. FL05-0394B  
Property address: 6580 Martinique Way, Vero Beach, FL 32967

Dr. & Mrs. Schulman,

At your request, assessment, consulting and remediation verification services at the subject property were performed at the various stages of the process starting on February 6, 2013 and completing on April 14, 2013. Chinese Drywall Screening, LLC (CDS) is providing the enclosed report for your reference and use.

#### **Project Description**

3,879 sf single family home located at 6580 Martinique Way in the Antilles Community in Vero Beach, Florida.

#### **Overview**

The above referenced property contained corrosive drywall in several areas. CDS was hired for independent, 3<sup>rd</sup> party consultation, inspections, testing and documentation of the remediation in order to certify that the property was remediated properly and provide a detailed report that the property is free and clear of corrosive drywall and the associated affects. CDS was also hired to preserve evidence for the pending lawsuit. Refer to the separate property preservation report for further information.

#### **Scope and Methodology**

CDS's scope and methodology was a phased approach to remediation that included a detailed assessment, a remediation action plan and post remediation verification. The ultimate goal was to verify that the corrosive gypsum (including dust and particulate) and any related residual sulfide gases were properly abated.

#### **Assessment**

The detailed assessment included a thorough review for the effects of corrosive drywall along with a detailed mapping of the drywall for elevated levels of strontium which are characteristic of corrosive and Chinese drywall. The mapping utilized x-ray fluorescence (XRF) testing of the drywall to classify the drywall as Chinese or domestic/non-problematic. There was a direct correlation to drywall with high strontium and areas of corrosion. (High strontium is characteristic of Chinese drywall). Some removal of finishes was necessary to properly test the drywall. Refer to attached Exhibits for details of the assessment techniques and summary of findings.

The assessment revealed corrosive Chinese drywall produced by International Materials Trading (IMT) in limited areas of the property. The corrosive drywall was limited to portions of the

Master Suite on the first floor, Guest Bed 2 on the second floor and a small section in the bath of Guest Bed 4. Except for the small section in Guest Bath 4, the results of the detailed assessment were consistent with the original inspection report dated June 1, 2010.

### **Demolition and Preservation**

On January 29, 2013, the demolition was completed and observed. Unaffected and non-work areas were sealed and the property was properly prepared prior to demolition activities. The drywall types and areas of corrosive drywall were as anticipated during the assessment with the exception of the small section in the bathroom of Bedroom 4. The drywall types were documented per the Courts Order. Refer to a separate report for preservation of evidence.

### **Post Remediation Verification (PRV)**

A customized remediation action plan was scripted specifically for the subject property to address the proper abatement for the corrosive drywall, particulate and residual gases. It was understood that source removal and micro-cleaning are the most important aspects of corrosive drywall remediation. The contractor utilized various techniques for micro-cleaning such as HEPA vacuuming, air scrubbing and hard surface wipe down with a sanitizing cleaning solution. This type of cleaning is also referred to as hygienic cleaning due to the level of cleaning along with the sanitization of the cleaned surfaces. The wet method wipe down of the remaining surfaces provides for the cleaning and sanitization but also aids in the oxidation and/or removal of the absorbed residual gases.

The action plan was monitored for proper execution. Thorough inspections were performed to verify the remediation was completed properly. The inspections involved up-close review of the components remaining within the property. Each component in each room was methodically inspected to ensure no items were missed. A meticulous review was performed and if any dust and/or particulate were observed, it was properly abated by a member of the cleaning crew. Components were photographed in each room illustrating the clean conditions. Close attention was paid to various nooks and crevices where gypsum dust and particulate tend to gather and elude cleaning techniques. Forced air was utilized to verify the lack of presence. Hard surfaces were wiped and inspected for any remaining residue.

Components inspected and analyzed included, but were not limited to:

- Top and bottom tracks of wall framing
- Perimeter walls and block penetrations
- Horizontal framing and blocking
- Trusses and attic space bottom chords
- Electrical boxes
- Plumbing
- HVAC rough-in
- Floors
- Tub, tile, shower and fixtures
- Windows
- Doors and jambs
- Stair stringers
- Drywall tracks and furring strips
- Miscellaneous items

It was observed that the property was treated by spraying the neighboring porous materials in the remediated areas with NanoScale's OdorKlenz which is a structural surface treatment for residual sulfide gases that may not have fully de-absorbed. Refer to attached Exhibits for photographic documentation and product submittal data.

The property was also aired out to allow for the escape of any residual gases lingering in absorbable materials. For more than two weeks, various high volume air scrubbers with HEPA filtration and fans ducted to exterior windows were situated throughout the property during the air out period. This allowed for rapid, clean air exchanges with the outside air.

### **Environmental Corrosion Testing**

Initial environmental corrosion testing of the work areas prior to air out was concluded on March 1, 2013 after 5 days of accelerated exposure. The levels of sulfur deposition on the interior test coupons were low but a little higher than the levels on the outside coupons. The levels were also a little higher than you would typically see in a home without corrosive drywall.

Subsequently, the areas of concern were assessed in a more aggressive manor. Destructive testing and invasive investigation was performed. The investigation revealed a minor amount of trapped debris and a small section of corrosive drywall of approximately 6" by 6 feet. This was proportionate to what would be expected based on the results of the previous test and further validated the effectiveness of the test which served its intended purpose to comprehensively test all areas of the property. A post-remediation action plan was provided to address the additional work. After inspection and verification of the action plan to verify that it was properly competed, a second environmental corrosion test was concluded on April 12, 2013. Upon XRF analysis, the levels of sulfur deposition on the interior copper test coupons were non-detectable or negligible similar to a home built without corrosive drywall.

### **Conclusion Summary**

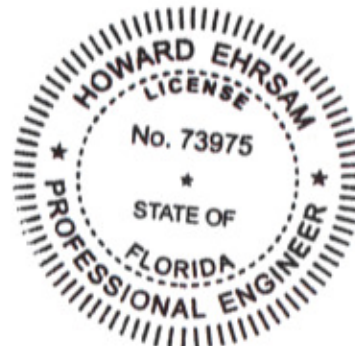
Based our best ability, belief and knowledge along with our thorough assessments, visual observations, XRF testing and environmental corrosion testing, we are of the professional opinion that all corrosive drywall has been removed and properly abated and the atmosphere in the property is representative of the atmosphere in houses built without "problem" drywall.

We appreciate the opportunity to work with you on this matter. Please feel free to contact us for any clarifications or further assistance.

Sincerely,



Howard Ehrsam, P.E., LEED AP  
CGC 1509717  
on behalf of Chinese Drywall Screening, LLC



### **Attachments:**

- |   |                                     |
|---|-------------------------------------|
| Exhibit A – Certification of the Inspector        | Exhibit F – Scope Descriptions      |
| Exhibit B – Assessment Summary                    | Exhibit G – Nano Scale Product Data |
| Exhibit C – PRV Cleaning Photographs              | Exhibit H – Application Photos      |
| Exhibit D – Environmental Corrosion Testing (ECT) | Exhibit I – Microban Product Data   |
| Exhibit E – Environmental Certificate             |                                     |

## Certification of the Inspector

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The undersigned do hereby certify that, to the best of our knowledge and belief:

- The statements of fact contained within this report are true and correct.
- The statements of opinions have certain limitations. It is not feasible and is impossible to confirm 100% of corrosive drywall was either removed or is not present. There are several conditions that we have seen that could prevent discovery without a more exhaustive investigation. They include, but are not limited to:
  - Low strontium, corrosive drywall that is domestic and non-homogeneous.
  - Limited amounts of corrosive drywall in inaccessible areas or installed in a way that would seclude it from available receptacles and switches.
  - Limited amounts of high strontium drywall covered with joint compound or heavy textures hindering detection by x-ray fluorescence.
  - Variable amounts of low off-gassing drywall or drywall with corrosive recycled gypsum.
- We have no present or prospective interest in the property that is the subject of this report and we have no personal interest with respect to the parties involved. We have no bias with respect to the property that is the subject of this report or to the parties involved with this assignment.
- The information in this report is based on the existing conditions of the structure's materials, documents, and information (written or verbal) supplied by contractor, the owner or their representatives, and our observations during the inspection.
- Our compensation or engagement in this assignment is not contingent upon the development or reporting of a predetermined conclusion that favors the cause of the client, the remediator, the attainment of a stipulated result, or the occurrence of a subsequent event directly related to the intended use of this report.
- Any use of this report by any other parties without our expressed or written consent is prohibited. Should another individual or entity rely on this analysis or its conclusions without our consent, they shall indemnify Chinese Drywall Screening, LLC, its employees, and service providers from all damages, losses or expenses that may occur as a result of its use.
- Our report is based on information made available to us at this time. Should additional information become available, we reserve the right to determine the impact, if any, of the new information on our opinions and conclusions and to revise our opinions and conclusions if necessary and warranted by the discovery of additional information.
- The provided services and documentation been completed to the best of our knowledge and based on current known facts regarding reactive drywall.



Howard Ehsam, P.E., LEED AP  
CGC 1509717

on behalf of Chinese Drywall Screening, LLC

# Exhibit B Assessment Summary Floorplan

Remove drywall from floor to ceiling in areas marked in RED. Includes door and window wraps.

Work Area

Exhaust scrubber location.

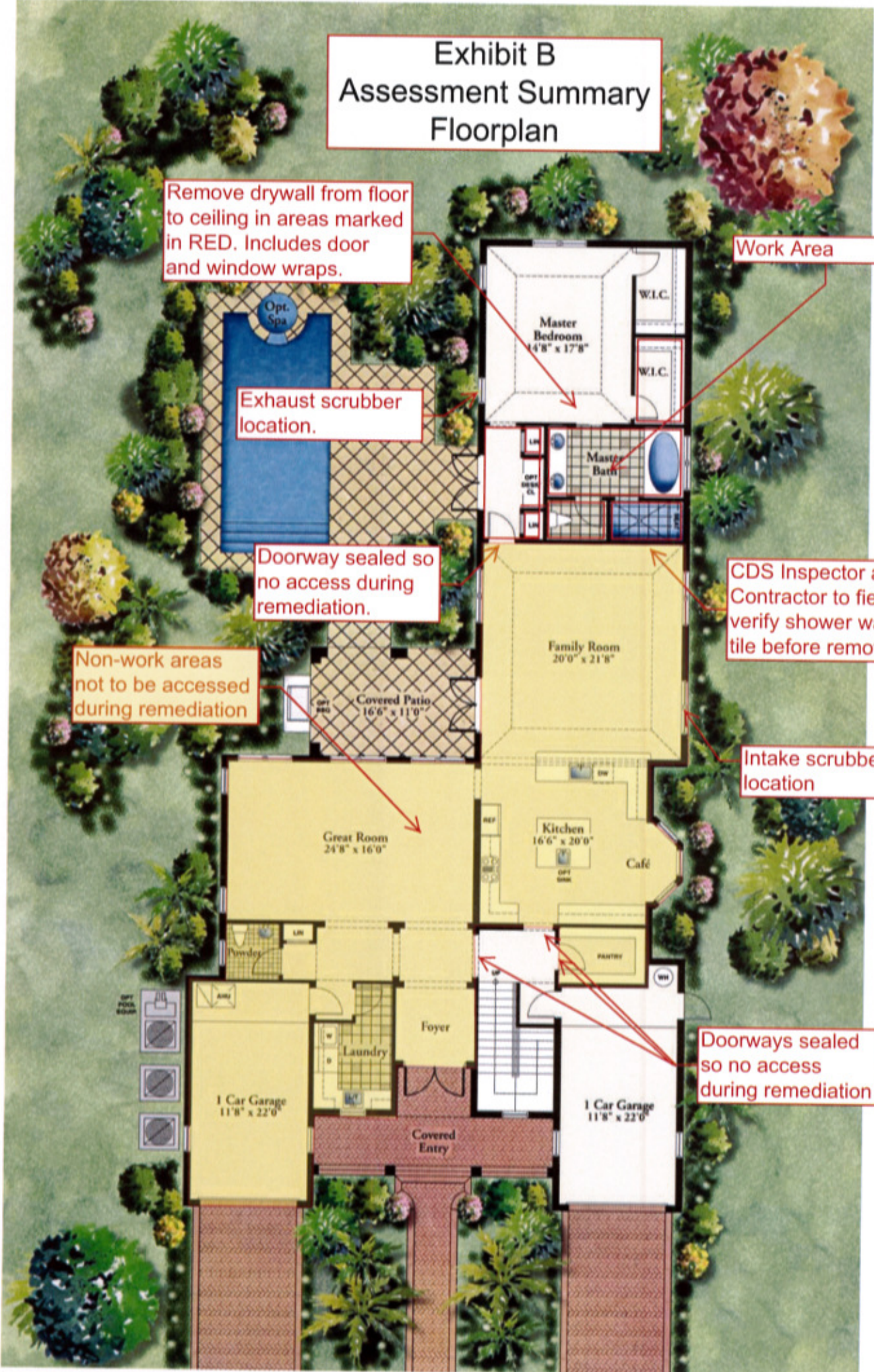
Doorway sealed so no access during remediation.

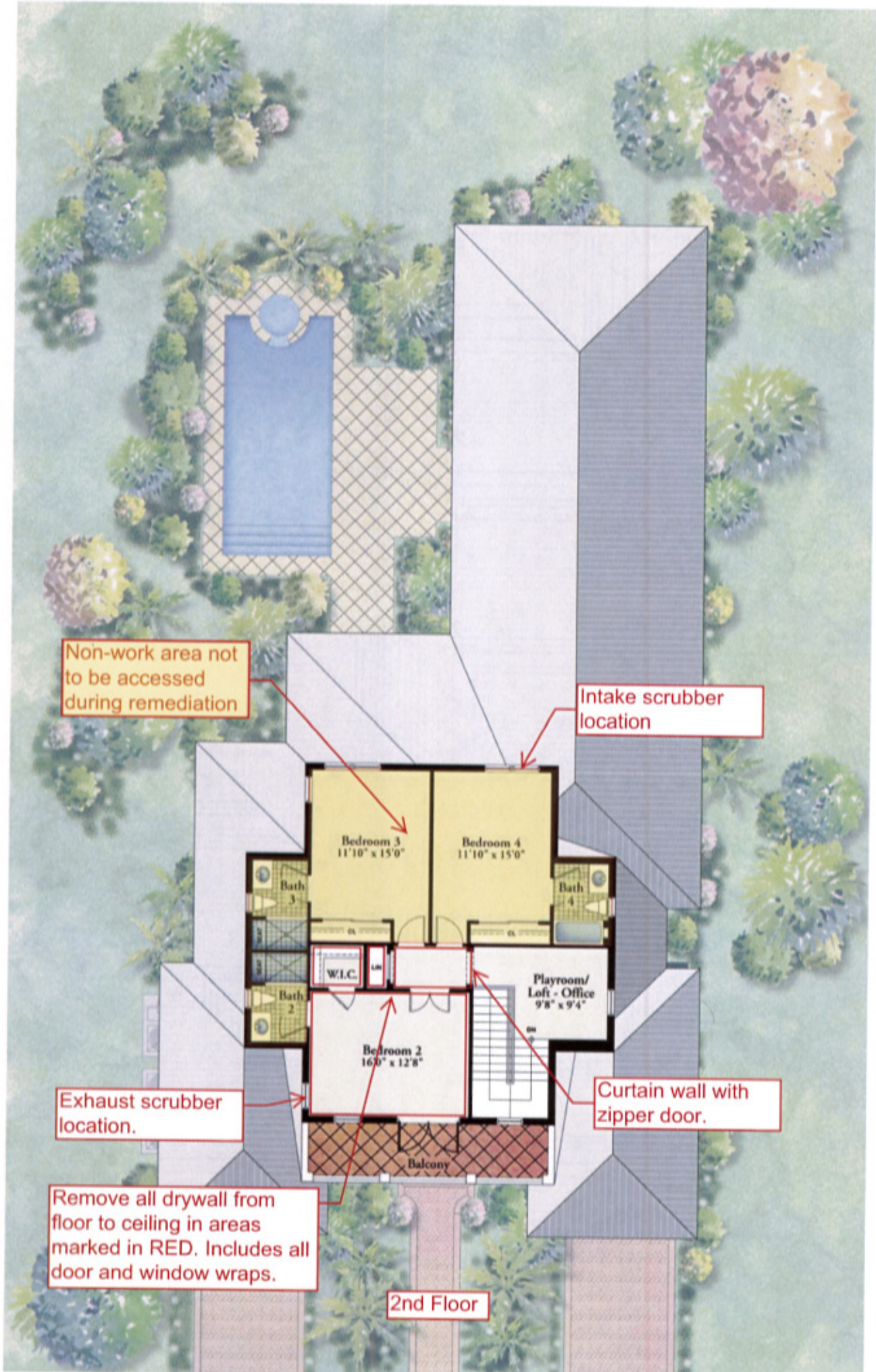
CDS Inspector and Contractor to field verify shower wall tile before removal.

Non-work areas not to be accessed during remediation

Intake scrubber location

Doorways sealed so no access during remediation





Non-work area not to be accessed during remediation

Intake scrubber location

Bedroom 3  
11'10" x 15'0"

Bedroom 4  
11'10" x 15'0"

Bath 3

Bath 4

Bath 2

W.I.C.

Playroom/  
Loft - Office  
9'8" x 9'4"

Bedroom 2  
16'0" x 12'8"

Balcony

Exhaust scrubber location.

Curtain wall with zipper door.

Remove all drywall from floor to ceiling in areas marked in RED. Includes all door and window wraps.

2nd Floor

Exhibit C - PRV Micro Clean  
6580 Martinique Way  
Vero Beach, FL 32967



Schulman Micro Clean 01



Schulman Micro Clean 02



Schulman Micro Clean 03



Schulman Micro Clean 04



Schulman Micro Clean 05



Schulman Micro Clean 06



Schulman Micro Clean 07



Schulman Micro Clean 08



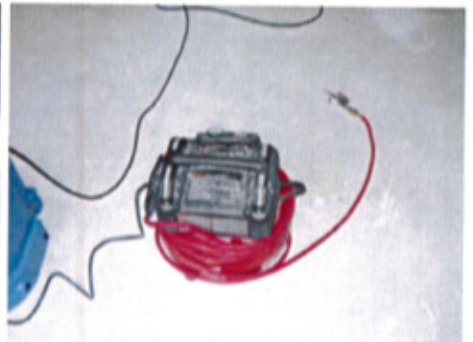
Schulman Micro Clean 09



Schulman Micro Clean 10



Schulman Micro Clean 11



Schulman Micro Clean 12

Exhibit C - PRV Micro Clean  
6580 Martinique Way  
Vero Beach, FL 32967



Schulman Micro Clean 13



Schulman Micro Clean 14



Schulman Micro Clean 15



Schulman Micro Clean 16



Schulman Micro Clean 17



Schulman Micro Clean 18



Schulman Micro Clean 19



Schulman Micro Clean 20



Schulman Micro Clean 21



Schulman Micro Clean 22



Schulman Micro Clean 23



Schulman Micro Clean 24



**Exhibit C - PRV Micro Clean**  
6580 Martinique Way  
Vero Beach, FL 32967



Schulman Micro Clean 25



Schulman Micro Clean 26



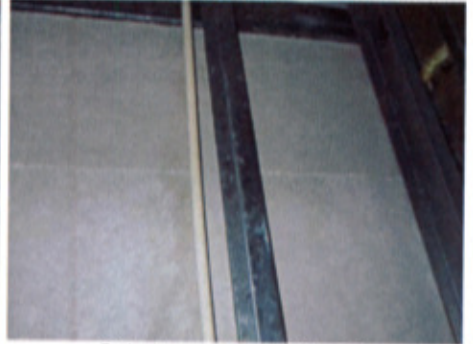
Schulman Micro Clean 27



Schulman Micro Clean 28



Schulman Micro Clean 29



Schulman Micro Clean 30



Schulman Micro Clean 31



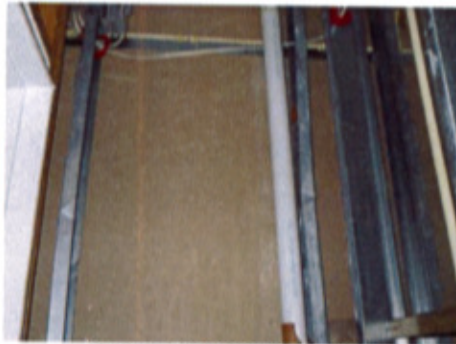
Schulman Micro Clean 32



Schulman Micro Clean 33



Schulman Micro Clean 34



Schulman Micro Clean 35



Schulman Micro Clean 36

**Exhibit C - PRV Micro Clean**  
6580 Martinique Way  
Vero Beach, FL 32967



Schulman Micro Clean 37



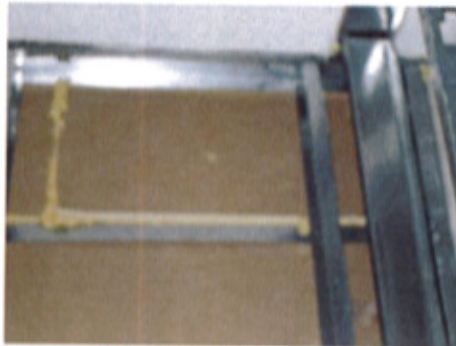
Schulman Micro Clean 38



Schulman Micro Clean 39



Schulman Micro Clean 40



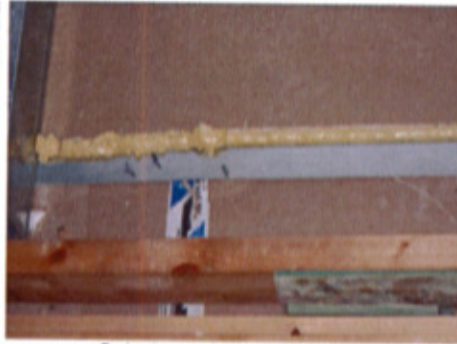
Schulman Micro Clean 41



Schulman Micro Clean 42



Schulman Micro Clean 43



Schulman Micro Clean 44



Schulman Micro Clean 45



Schulman Micro Clean 46



Schulman Micro Clean 47

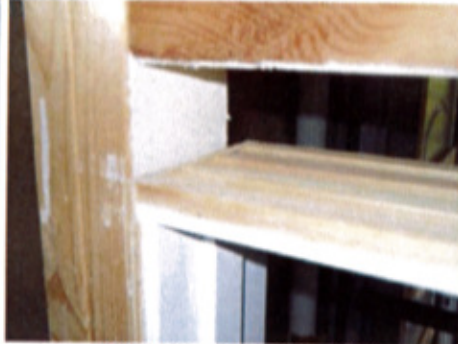


Schulman Micro Clean 48

Exhibit C - PRV Micro Clean  
6580 Martinique Way  
Vero Beach, FL 32967



Schulman Micro Clean 49



Schulman Micro Clean 50



Schulman Micro Clean 51



Schulman Micro Clean 52

Exhibit D - ECT  
6580 Martinique Way  
Vero Beach, FL 32967



Schulman ECT 01



Schulman ECT 02



Schulman ECT 03



Schulman ECT 04



Schulman ECT 05



Schulman ECT 06



Schulman ECT 07



Schulman ECT 08



Schulman ECT 09



Schulman ECT 10



Schulman ECT 11



Schulman ECT 12

Exhibit D - ECT  
6580 Martinique Way  
Vero Beach, FL 32967



Schulman ECT 13



Schulman ECT 14



Schulman ECT 15



Schulman ECT 16



Schulman ECT 17



Schulman ECT 18



Schulman ECT 19



Schulman ECT 20



Schulman ECT 21



Schulman ECT 22



Schulman ECT 23

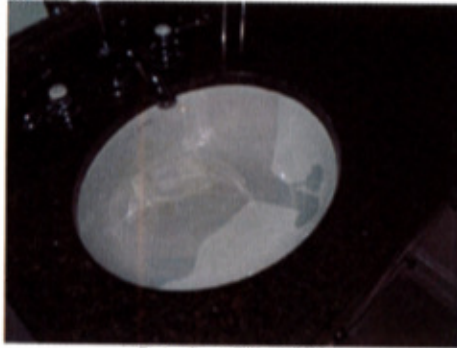


Schulman ECT 24

Exhibit D - ECT  
6580 Martinique Way  
Vero Beach, FL 32967



Schulman ECT 25



Schulman ECT 26



Schulman ECT 27



Schulman ECT 28



Schulman ECT 29



Schulman ECT 30



Schulman ECT 31



Schulman ECT 32



Schulman ECT 33



Schulman ECT 34



Schulman ECT 35



Schulman ECT 36

Exhibit D - ECT  
6580 Martinique Way  
Vero Beach, FL 32967



Schulman ECT 37



Schulman ECT 38



Schulman ECT 39



Schulman ECT 40



Schulman ECT 41



Schulman ECT 42

# Environmental Certificate

*Subject Property:* 6580 Martinique Way  
Vero Beach, FL 32967

I certify that the above referenced property has been thoroughly inspected and tested and no corrosive drywall is present. This certification is based upon a detailed visual assessment, x-ray fluorescence testing of the drywall throughout the property, observation of corrosive drywall removal, and a visual inspection of all surfaces in the work areas that found no dust, debris or residue. Also, there was no detectable odor of Chinese drywall at the completion of the remediation. In addition, the atmosphere in the house was tested utilizing accelerated sulfur deposition testing. All observations and testing confirmed that no corrosive drywall and related particulate is present and the atmosphere was found to be representative of the atmosphere in houses built without "problem" drywall.

*Presented on April 12, 2012*



Howard Ehrsam, P.E., LEED AP  
CGC 1509717

On behalf of Chinese Drywall Screening, LLC





### Scope of Services

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#### Phase I and Phase II – Visual and Product ID

Chinese Drywall Screening, LLC (CDS) conducted a visual investigation of the various elements within the property for the presence of reactive drywall.

Investigative services typically include, but are not limited to:

- Verification of a sulfur attack on various components of the property
- Visual inspection of the drywall markings in respective areas of the sulfur attack
- Documentation of findings
- Samples of reactive drywall prepared for future laboratory analysis

CDS provided the above investigation in multiple areas throughout the home. However, we cannot guarantee all types of reactive drywall within the subject property were identified.

The inspection required removal of various sections of drywall to be utilized as visual access points. These access points were sealed upon completion. For each unique variety of drywall discovered, at least one sample piece of drywall was preserved for future lab testing to be held by the homeowner.

The corroded elements along with any discovered drywall markings were documented during the inspection. Observations were recorded and photographed. Refer to the report and photograph exhibit(s) for details.

The following engineering report is utilized as a reference in regards to the sulfur attack on copper: Unified Engineering Report File 4050 dated March 17, 2009. Unified Engineering, Inc; 3056 Weber Drive, Aurora, IL 60502

## Scope of Services (continued)

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### **X-ray Florescence (XRF) for Strontium**

XRF analyzers are handheld instruments used predominantly to evaluate the presence of metal constituents in building materials or other products. XRF works by exposing a material to high energy x-rays and measuring those x-rays and comparing them to the known and unique pattern of x-rays produced by each element. For help in identifying corrosive drywall, XRF is used to determine levels of strontium (Sr) present within the gypsum of the drywall throughout the property.

Strontium is a light metal that is a common, naturally occurring element found within the earth. Certain geographical regions have higher concentrations than others that can translate to the origin of the raw materials. Strontium levels above 1850 ppm have been associated with drywall of Chinese origin. However, high levels of strontium do exist in drywall from other origins and testing must be used in conjunction with other means to produce proper conclusions.

The attenuating effects of joint compound and textures could inhibit the detection of small amounts of corrosive drywall. Furthermore, corrosive drywall could also be present in inaccessible areas that include, but are not limited to, walls above drop ceilings, fire stopping, behind tile, behind cabinets, under raised floor systems, etc. However, the potential for these conditions can be reduced or eliminated with proper property evaluation and corrosion evaluation.

### **Sulfur Corrosion Testing - Environmental**

Our patent pending method for environmental corrosion testing is the analyzing of deposited sulfur on copper and/or silver coupons utilizing x-ray florescence. The sulfur is a byproduct of the corrosion of the metals from sulfide gases. Problematic or corrosive drywall emits sulfide gases that react with copper and silver to form copper sulfide and silver sulfide respectively on the surface of the test coupons. This process is accelerated utilizing forced air over a set period of time.

## Scope of Services (continued)

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X-ray fluorescence (XRF) is utilized to quantify the sulfur deposits on the coupons in  $\text{ug}/\text{cm}^2$  (micrograms per square centimeter). Readings can then be interpreted to determine the presence of sulfide gases that may be present within the subject property. A non-detect (ND) reading upon analyzing the test coupons indicates there are no detectable sulfur deposits on the surface of the coupons. This in turn leads to the conclusion that there are no sulfide gases present at any significant or detectable levels during the course of the exposure period. Positive readings for sulfur are compared against various controls and environmental conditions to make determinations as to the source for cause.

### **Sulfur Corrosion Testing – Drywall**

Our internally developed method of sulfur corrosion testing specific samples of drywall is to analyze copper and/or silver coupons for deposited sulfur utilizing x-ray fluorescence. The sulfur is a byproduct of the corrosion of the metals from emitted sulfide gases. Problematic or corrosive drywall emits sulfide gases that react with copper and silver to form copper sulfide and silver sulfide respectively on the surface of test coupons. This process can be accelerated by elevating the temperature.

X-ray fluorescence (XRF) is utilized to quantify the sulfur deposits on the coupons in  $\text{ug}/\text{cm}^2$  (micrograms per square centimeter). Readings can then be interpreted to determine to whether the drywall tested is corrosive and at what proportionate levels. A non-detect (ND) reading upon analyzing the test coupons indicates there are no detectable sulfur deposits on the surface of the coupons. This in turn leads to the conclusion that the drywall is non-corrosive at any significant or detectable levels during the course of the testing period. Positive readings for sulfur are compared against various controls and known samples in order to make proper determinations as to the conditions of the samples being tested. Samples with low levels of off gassing may need multiple rounds of testing to verify that the gypsum is the root source of the corrosive gases and the sulfur deposition is not a result from de-absorbed environmental sources.

# OdorKlenz®



## Optimize the Outcome of CDW Home Remediation

### Remediation | Structural Surface Treatment | Optimum Outcomes

Corrosive drywall off-gasses a variety of chemical pollutants into indoor air. Simply removing the known or suspect corrosive drywall is not sufficient to ensure an optimal outcome during remediation. Unless the CDW chemical contaminants are addressed at the source, corrosive gasses and unpleasant and noxious odor may reoccur.

OdorKlenz® Structural Surface Treatment is applied during remediation to surfaces within the home that were in direct contact with, or in close proximity to, corrosive drywall. The product is designed for convenient spray-application by the remediation contractor on and behind exposed surfaces prior to installation of new drywall. The product provides a long lasting, active barrier to surfaces such as wood, CMU block, and concrete that may harbor residual hazardous chemicals. OdorKlenz Structural Surface Treatment adsorbs and neutralizes residual CDW chemical contaminants, preventing re-emission of corrosive gasses and recurrence of unpleasant and noxious odor.

- Optimizes the outcome of remediation by establishing an active, protective, breathable, and long-lasting barrier on contaminated structural building materials.
- Provides immediate surface decontamination by irreversibly capturing and destroying residual CDW-associated chemical pollutants.
- Prevents corrosion of metals and recurrence of CDW-associated unpleasant and noxious odors.
- Safe and green – natural earth minerals, non-toxic, non-corrosive, benign byproducts. No extraordinary handling or disposal precautions.
- Aids in protecting workers from hazardous chemical exposure during remediation.
- Visual affirmation of application to exposed surfaces.
- Proven effective in CDW homes.

*“Spray NanoScale’s OdorKlenz Structural Surface Treatment on and odors are gone. Period. It even keeps working on residual off-gas. Unlike other products that you can’t see, it’s light residual proves where it has been applied... gives me and my clients the confidence and peace of mind to know the job has been done right.”*

Julie Miller  
President

Kogen Construction  
Boca Raton, Florida

 NanoScale.

1310 Research Park Drive  
Manhattan, KS, 66502 USA  
888.537.0179 Phone  
785.537.0226 Fax  
CustServ@NanoScaleCorp.com  
www.NanoScaleCorp.com  
www.OdorKlenz.com

## ABOUT ODORKLENZ STRUCTURAL SURFACE TREATMENT APPLICATION

- Used after corrosive drywall removal and tear-out is complete
- 1 gallon covers approximately 500 square feet of treated surface area
- Typical home uses 15 gallons (available in 1 gallon and 5 gallon containers)
- Safe and green materials
- Simple application process that does not have special handling procedures
- Applied via an airless paint sprayer to surfaces that were in close proximity to the corrosive drywall
- Process does not yield down-time

## CREATING A SAFER WORLD

OdorKlenz is synthesized from natural earth minerals that are inherently safe and often utilized as food additives, in medicinal and baby products, and in popular cosmetics.

OdorKlenz's chemistry has been tested against U.S EPA protocols and demonstrated to be non-toxic, non-corrosive, non-flammable, and environmentally safe.

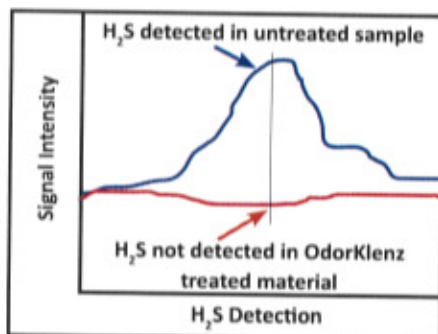
## TREATMENT OF HYDROGEN SULFIDE OFF-GASSING SURFACES

Naturally occurring earth minerals are engineered/synthesized by NanoScale to enhance their unique chemical properties for the destruction of toxic materials. OdorKlenz works by "destructive adsorption." As pollutants in circulating air or on surfaces come in contact with OdorKlenz, the product's chemistry 1) irreversibly attaches to and reacts with the pollutants followed by 2) destruction/neutralization of the pollutants. The result is a benign, environmentally safe byproduct. OdorKlenz has been tested and proven effective against a broad spectrum of hazardous chemicals and VOC's.

The active component of OdorKlenz is extremely effective against hydrogen sulfide that is encountered in CDW impacted homes. OdorKlenz Structural Surface Treatment forms an active, protective barrier that irreversibly captures and neutralizes the residual gasses and sulfur compounds preventing them from being released overtime.

OdorKlenz is the result of the Company's 15 plus years of research and development focused on chemical decontamination. Today, NanoScale's advanced NanoActive chemistry is employed to protect our military troops from chemical warfare agents, assist HazMat and other first responders to neutralize hazardous chemical releases and by disaster restoration teams for odor elimination following fire or flood damage.

## SCIENTIFICALLY PROVEN EFFECTIVENESS



Samples of corrosive drywall were analyzed for the detection of hydrogen sulfide. One sample had a coating of the OdorKlenz Structural Surface Treatment applied, another sample was left untreated. The samples were sealed in separate containers to capture the off-gassing chemicals for comparison analysis.

In the graph (left), the blue line represents detection and confirmation of hydrogen sulfide (H<sub>2</sub>S) coming from the untreated sample of corrosive drywall. The height of the peak is in relation to the amount of H<sub>2</sub>S detected. The red line represents the corrosive drywall sample treated with OdorKlenz. In the OdorKlenz treated sample, H<sub>2</sub>S was not detected as evident by the absence of a peak ... H<sub>2</sub>S was irreversibly captured and neutralized. The broad chemical neutralization capabilities of OdorKlenz allows the product to be effective against CDW chemical pollutants and byproducts.

CALL 888.537.0179 TO ORDER TODAY.  
CONTRACTOR AND QUANTITY PRICING  
AVAILABLE.

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**OdorKlenz-Air™ Cartridge**

MSDS-0323.2

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**1. PRODUCT AND MANUFACTURER IDENTIFICATION**

Product names:

**OdorKlenz-Air™ Cartridge**

Manufacturer:

**NanoScale Corporation**  
**1310 Research Park Drive**  
**Manhattan, KS 66502**  
**(785) 537-0179**

Product Information:

**(785) 537-0179**  
 24-Hour Chemtrec Emergency Number:  
**U.S. (800) 424-9300**  
**International (703) 527-3887**

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**2. CHEMICAL COMPOSITION AND EXPOSURE LIMITS**

<u>Component</u>	<u>CAS Number</u>	<u>OSHA PEL</u>	<u>ACGIH TLV</u>
Magnesium Oxide	1309-48-4	15 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>
Titanium (IV) Dioxide	13463-67-7	15 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>
Zinc Oxide	1314-13-2	15 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>

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**3. HAZARD IDENTIFICATION AND EMERGENCY OVERVIEW**

**Appearance and Odor:** White odorless granules or powder.

**Routes of Exposure:** Eye and skin contact, inhalation, ingestion. When used as directed, exposure to cartridge contents is minimal.

**Eye Contact:** Slight to moderate eye irritation

**Skin Contact:** May cause irritation

**Inhalation:** May cause respiratory tract irritation

**Ingestion:** May cause gastrointestinal irritation with nausea, vomiting and diarrhea

**Acute Health Effects:** May cause irritation of the skin and eyes. Inhalation of dust may cause irritation of mucus membranes and the upper respiratory tract causing coughing and sneezing.

**Chronic Health Effects:** Prolonged and repeated exposure to skin may cause irritation or dermatitis.

**OdorKlenz-Air™ Cartridge**MSDS-0323.2

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**4. FIRST AID MEASURES**

**Skin:** In case of skin contact flush with copious amounts of water for at least 15 minutes, remove contaminated clothing and shoes. If irritation continues after flushing, seek medical attention.

**Inhalation:** If inhaled, remove to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. DO NOT use mouth-to-mouth respiration.

**Eyes:** In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating eyelids with fingers. Seek medical attention.

**Ingestion:** If conscious and alert, rinse mouth and drink 2-4 cupfuls of water or milk. Seek medical attention. Do NOT induce vomiting.

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**5. FIRE-FIGHTING MEASURES**

This product is not flammable, combustible, or explosive. May emit toxic fumes at temperatures greater than 2800°C. The formulation may be exposed to water, carbon dioxide, dry chemical and foam-extinguishing agents as necessary during fire-fighting operations. Full protective gear and a NIOSH approved self-contained breathing apparatus (SCBA) should be used to protect eyes, skin, and lungs from exposure during firefighting operations around zinc oxide. During a fire, irritating and highly toxic gases, such as zinc oxide fume, may be generated by thermal decomposition or combustion.

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**6. ACCIDENTAL RELEASE MEASURES**

Vacuum or sweep up material and place into a suitable disposal container. Clean up spills immediately, using the appropriate protective equipment. Avoid generating dusty conditions and provide adequate ventilation.

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**7. HANDLING AND STORAGE**

Store in a closed container in a cool, dry location to avoid slow reactions with carbon dioxide and moisture in air. Use dust control and protection in handling and storage. Avoid storage near magnesium, rubber, and strong oxidizers.

## OdorKlenz-Air™ Cartridge

MSDS-0323.2

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## 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

**Respiratory Protection:** Use NIOSH approved respirator when use is necessary.

**Skin Protection:** Wear appropriate protective gloves to minimize skin exposure.

**Eye Protection:** Wear appropriate protective glasses or chemical safety goggles.

Titanium dioxide can adsorb moisture and natural oils from the surface of the skin during prolonged exposure. Prolonged exposure should be avoided by wearing suitable protective gloves and clothing.

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## 9. PHYSICAL AND CHEMICAL PROPERTIES

**Appearance:** White Granule or powder

**Odor:** Odorless

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## 10. STABILITY AND REACTIVITY

**Stability:** Stable under normal temperatures and pressures.

**Hazardous Polymerization:** None reported.

**Incompatibility:** Lithium at 200° C, chlorinated rubber, linseed oil, magnesium, aluminum + hexachloroethane, zinc chloride or strong oxidizing agents; reacts violently with phosphorus pentachloride, chlorine trichloride, or bromine pentafluoride.

**Decomposition Products:** Toxic gases such as metal fumes may be released in a fire.

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## 11. TOXICOLOGICAL INFORMATION

### TiO<sub>2</sub>

**Acute Oral Toxicity:** LD<sub>50</sub> > 2 g/kg

**Acute Dermal Toxicity:** LD<sub>50</sub> > 5 g/kg

**Acute Dermal Irritation:** PII = 0, non-irritating

**Skin Sensitization:** Non-sensitizer

**Acute Eye Irritation:** Practically non-irritating

**Acute Inhalation:** EPA Toxicity Category IV, non-toxic.

Chronic *dust* inhalation exposure (250 mg/m<sup>3</sup> for 6hrs/day, 5day/week for 2 years) can be a potential carcinogen to rats. The authors of this study concluded that based on the excessive dust loading and overwhelmed clearance mechanism in the lungs of rats exposed chronically at 250 mg/m<sup>3</sup>, the biological relevance of lung tumors to man appears to be negligible.



**OdorKlenz-Air™ Cartridge**

MSDS-0323.2

A number of epidemiology studies evaluating > 20,000 TiO<sub>2</sub> industry workers in Europe and the United States have been reported. Workers employed for at least six months in TiO<sub>2</sub> production were assessed using company records and quality controls, taking into account the different manufacturing procedures used at the sites as well as the actual relative levels of exposure to respirable TiO<sub>2</sub>. Exposure categories such as job site, title, and calendar years on the job were examined. Findings from each of the studies were similar, in that the authors concluded that the results did not suggest a carcinogenic effect of TiO<sub>2</sub> dust on the human lung, and mortality from other chronic diseases, including other respiratory diseases, was not associated with exposure to TiO<sub>2</sub> dust. Based upon the results of these studies, NanoScale Corporation concludes that titanium dioxide will not cause lung cancer or chronic respiratory disease in humans at concentrations experienced in the workplace.

**ZnO****Acute Oral Toxicity:** LD<sub>50</sub> > 2 g/kg**Acute Dermal Toxicity:** LD<sub>50</sub> > 5 g/kg**Acute Dermal Irritation:** PII = 0, non-irritating**Skin Sensitization:** Non-sensitizer**Acute Eye Irritation:** Moderately irritating**MgO****Acute Oral Toxicity:** LD<sub>50</sub> > 5 g/kg**Acute Dermal Irritation:** EPA Category IV, non-irritating**Skin Sensitization:** Non-sensitizer**Acute Eye Irritation:** EPA Category III, slightly irritating.**Acute Inhalation:** EPA Toxicity Category IV, non-toxic.

**Carcinogen status:** OSHA – No, NTP – No, ACGIH (TiO<sub>2</sub>) – Group 3; Not classifiable as a human carcinogen. IARC (TiO<sub>2</sub>) – 2B; possibly carcinogenic to humans

Although the three animal studies reviewed by IARC showed evidence of tumors it is important to note that these studies tested pigmentary and ultrafine titanium dioxide. As stated in the IARC *draft* monograph, volume 93, primary particle sizes for pigmentary titanium dioxide are typically between 0.2 and 0.3 μm. Ultrafine grades range from 10-50 nm. NanoScale's NanoActive® Titanium Dioxide particles are larger and do not fall into the pigmentary or ultrafine classifications. Also, as realized in studies reviewed by NIOSH, the toxicity seems to be more related to the particle size rather than the chemical itself.

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**12. ECOLOGICAL INFORMATION**

None available.

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### **13. DISPOSAL CONSIDERATIONS**

Disposal should be in accordance with applicable local, state and federal regulations.

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### **14. TRANSPORT INFORMATION**

(49 CFR 172.101-2): Not listed.

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### **15. REGULATORY INFORMATION**

**TSCA:** All components are listed in the TSCA inventory.

**SARA (Title 313):** Components are not subject reporting requirements.

**CERCLA RQ:** None

This MSDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

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### **16. OTHER INFORMATION**

The above information is believed to be correct but does not purport to be all-inclusive and shall be used only as a guide. NanoScale Corporation makes no warranty with respect hereto and disclaims all liability from reliance thereon. The information is intended for use by persons with professional knowledge of the subject matter or with access to such persons. Persons receiving this information are urged to conduct their own assessment of the suitability and completeness of the information for their particular application.

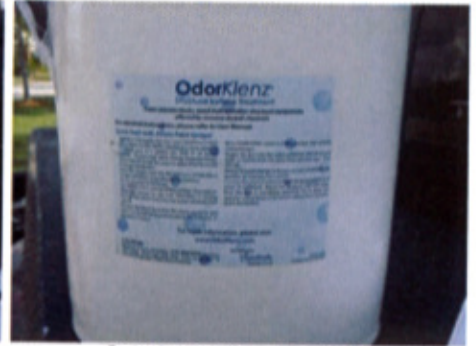
**Exhibit H - Nano Scale Application**  
6580 Martinique Way  
Vero Beach, FL 32967



Schulman Nano Scale 01



Schulman Nano Scale 02



Schulman Nano Scale 03



Schulman Nano Scale 04



Schulman Nano Scale 05



Schulman Nano Scale 06



Schulman Nano Scale 07



Schulman Nano Scale 08



Schulman Nano Scale 09



Schulman Nano Scale 10



Schulman Nano Scale 11



Schulman Nano Scale 12

**Exhibit H - Nano Scale Application**  
6580 Martinique Way  
Vero Beach, FL 32967



Schulman Nano Scale 13



Schulman Nano Scale 14



Schulman Nano Scale 15



Schulman Nano Scale 16



Schulman Nano Scale 17



Schulman Nano Scale 18



Schulman Nano Scale 19



Schulman Nano Scale 20



Schulman Nano Scale 21



Schulman Nano Scale 22



Schulman Nano Scale 23



Schulman Nano Scale 24

**Exhibit H - Nano Scale Application**  
**6580 Martinique Way**  
**Vero Beach, FL 32967**



Schulman Nano Scale 25



Schulman Nano Scale 26

## Exhibit I - Microban Product Data



### Material Safety Data Sheet

#### 1. Chemical Product & Company Data

Product Name: <b>Microban Germicidal Cleaner Concentrate (Formerly known as Microban QGC)</b>	
Manufacturer:	Supplier:
ProRestore Products 4660 Elizabeth Street Coraopolis, PA 15108 Telephone: 1-412-264-8340	

#### 2. Ingredients

Name	CAS #	UN #	% by volume
N, N-Dialkyl (C <sub>8-10</sub> ) -N,N-dimethylammonium chloride	68424-95-3		3.3
N-Alkyl (C <sub>12-18</sub> ) dimethylbenzylammonium chloride	68424-85-1		2.2
Secondary Alcohol Ethoxylates	84133-50-6		2.5
Tetrasodium ethylenediamine tetraacetate	64-02-8		1.9
Sodium metasilicate	6834-92-0		0.3
Ethanol	64-17-5		1.0
Water	7732-18-5		

#### 3. Hazards Identification

Emergency Overview
Alkaline Liquid Mixture.

NOTE: Hazard information is based on the characteristics of the components of this mixture.

**Ingestion** - May cause abdominal discomfort, nausea, vomiting and diarrhea. Drowsiness or unconsciousness may occur.

**Inhalation** - Low concentration of the vapor may cause irritation of the respiratory tract with possible chest pain and coughing. High concentrations may cause headache and drowsiness.

**Eye Contact** - Causes eye irritation and possible permanent eye injury.

**Skin Contact** - Prolonged contact may cause discomfort, redness, drying and defatting of the skin.

#### 4. First Aid

**Ingestion** - If swallowed, immediately give 3-4 glasses of milk (if unavailable, give water). **Do not** induce vomiting. If vomiting occurs, give fluids again. Get immediate medical attention. Have physician determine if patient's condition allows for induction of vomiting or evacuation of the stomach. Do not give anything by mouth to a convulsing or unconscious person.

**Inhalation** - Remove from area to fresh air. If not breathing, clear airway and start artificial respiration. If victim is having trouble breathing, give supplemental oxygen.

**Eye Contact** - Flush eyes with water for 15 minutes. Seek immediate medical attention.

**Skin Contact** - Wash with large amounts of running water, and soap if available, for 15 minutes. Remove contaminated clothing and shoes.

**Note to physician** - Probable mucosal damage may contraindicate the use of gastric lavage. Supplemental oxygen and or other measures to support breathing may be needed to combat circulatory shock. Persistent convulsions may be controlled by the cautious intravenous injection of a short acting barbiturate drug.

## Microban Germicidal Cleaner Concentrate

### 5. Fire Fighting Measures

Flammability Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	If yes, under which conditions?	
Flashpoint: >200 °F (93.3 °C)	Upper flammable limit % by volume n. av.	Lower flammable limit % by volume n. av.
Autoignition temperature n. av.	Hazardous combustion products Products of combustion are toxic	Explosion data n. ap.
Means of extinction: Apply alcohol type or all purpose foam for large fires. Use dry chemical media or carbon dioxide extinguishers for small fires. SCBA and bunker gear for fire department personnel.		

### 6. Accidental Release Measures

<p>Warning: May be corrosive.</p> <p>Wear personal protective equipment.</p> <p>Do not allow spill to reach watercourse or sewers.</p> <p>Contain spill with absorbent mats or booms or inert materials such as sand. Material should be readily available in the workplace.</p> <p>Collect and store waste materials in suitable containers for disposal i.e. metal drums. Floors may become slippery.</p>
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### 7. Handling & Storage

<p><b>PRECAUTIONS FOR STORAGE AND HANDLING:</b></p> <p>Store at temperatures below 140°F. Keep containers closed until used. Do not contaminate drinking water, food or feed by storage or disposal.</p>
--

### 8. Exposure Controls & Personal Protection

Personal Protective Equipment		
Gloves Rubber or neoprene, to prevent skin contact.	Respirator In processes where mists or vapors may be generated, a NIOSH/MSHA jointly approved respirator is advised in the absence of proper environmental controls.	Eye Wear chemical splash goggles where there is a potential for eye contact. Use safety glasses with side shields under normal use conditions.
Footwear n. ap.	Clothing Coveralls or equivalent	Other Eye wash; safety shower; protective clothing (long sleeves, coveralls or other, as appropriate), when needed, to prevent skin contact.
Exposure Guidelines		
<p><b>EFFECTS OF OVEREXPOSURE</b></p> <p>No information found for human exposure. Based on the available animal toxicity information for this and similar products, it is anticipated that direct contact with this material will produce severe skin or eye irritation. Upon prolonged contact, burns and possible irreversible damage may occur. Solvent vapors or mists of products can cause irritation of mucous membranes. Exposure to Ethanol concentrations of over 1,000 ppm may cause headache, irritation of the eyes, nose and throat, and, if long continued, drowsiness and loss of appetite and inability to concentrate.</p>		

## Microban Germicidal Cleaner Concentrate

### 9. Physical and Chemical Properties

Physical state Liquid	Odor and appearance Clear liquid, odor varies with fragrance	
Odor threshold (ppm) n. av.	Vapor pressure (mm Hg) n. av.	Vapor density (Air=1) n. av.
Evaporation (butyl acetate = 1) n.av.	Boiling point 215.6 °F (102 °C)	Freezing point n. av.
pH 12.4	Specific gravity 1.01 @ 77 °F (25 °C)	Coefficient water/oil distribution n. av.
Solubility in water 100%	Viscosity <100 cps @ 77 °F (25 °C)	% Volatiles (by weight) 90%

### 10. Stability and Reactivity

Chemical Stability Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	If no, under which conditions?	
Incompatibility with other substances Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	If yes, under which conditions? Avoid strong oxidizing agents.	
Reactivity, and under what conditions?	Stable under normal conditions.	
Hazardous decomposition products?	Thermal decomposition may produce toxic vapors/fumes of hydrogen chloride, amines, and other organic materials and oxides of carbon and nitrogen.	

### 11. Toxicological Information

Route of Entry Skin Contact <input checked="" type="checkbox"/> Skin Absorption <input checked="" type="checkbox"/> Eye Contact <input checked="" type="checkbox"/> Inhalation <input checked="" type="checkbox"/> Ingestion <input type="checkbox"/>			
oral LD <sub>50</sub> (rat): 2800 mg/kg dermal LD <sub>50</sub> (rabbit): 2850 mg/kg eye irritation (rabbit): extreme irritant (primary irritation = 97.5 without washing, and 93.3 with washing) skin irritation (rabbit): severe irritant (primary irritation index 8.0) DOT skin corrosivity (rabbit): non-corrosive skin irritation at 1:64 use dilution: non-irritant (primary irritation index = 0.0)			
Carcinogenicity No	Mutagenicity No	Teratogenicity No	Reproductive toxicity No
Synergistic products No	Sensitization No	Neurotoxicity No	Target organs Eyes and Skin

### 12. Ecological Information

None known.
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## Microban Germicidal Cleaner Concentrate

### 13. Disposal Considerations

Dispose of in compliance with all Federal, state, and local laws and regulations.

### 14. Transport Information

Shipping Name: NOT REGULATED

Hazard Class:

UN Identification #:

### 15. Regulatory Information

This material safety data sheet has been prepared in accordance with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200) and the Hazardous Products Act (Can.) and the Controlled Products Regulations (Can.) This product has been classified in accordance with the hazard criteria of the CPR (Can.) and the MSDS contains all the information required by the CPR (Can.).

**SARA Title III Sections 311/312** - This act requires reporting under the Community Right-to-Know provisions due to the inclusion of the following components of this material in one or more of the five hazard categories listed in 40 CFR 370:

Chemical Name	CAS Number	Hazard *) Categories
N, N-Dialkyl (C <sub>8-13</sub> )-N,N-dimethylammonium chloride	68424-95-3	A
N-Alkyl (C <sub>12-18</sub> )dimethylbenzylammonium chloride	68424-85-1	A
Ethanol	64-17-5	F
Secondary alcohol ethoxylates	84133-50-6	A

\*) The five hazard categories are as follows: F=FIRE HAZARD; S=SUDDEN RELEASE OF PRESSURE; R=REACTIVE; A=IMMEDIATE (ACUTE) HEALTH HAZARD; C=DELAYED (CHRONIC) HEALTH HAZARD.

**FEDERAL LEVEL REGULATIONS:** This is an EPA FIFRA registered pesticide (EPA Registration No. 70385-6). This material can only be used commercially in the EPA registered application(s) noted on the product label.

**TOXIC SUBSTANCES CONTROL ACT (TSCA INVENTORY) STATUS:** Found on U.S. EPA TSCA inventory.

**Canadian Workplace Hazardous Material Information System (WHMIS) Classification**  
Not Regulated

**Domestic Substance List (DSL) Status**  
All the components of this material are currently listed on the Canadian DSL.

**Transport of Dangerous Goods (TDG)**  
Not Regulated

### 16. Other Information

HMIS (U.S.A.)

Health Hazard	3
Fire Hazard	1
Reactivity	0
Personal Protection	c

National Fire Protection  
Association (U.S.A.)



This product is a disinfectant and cleaner.

For chemical emergency during transportation call INFOTRAC (US) **1-800-535-5053** (INT'L) **1-352-323-3500**

Prepared by: ProRestore Products, Coraopolis, PA / Cliff Zlotnik

Phone No: 1-412-264-8340

Date: August 20, 2009

Abbreviations:

n. av. = not available

mm Hg = millimeters of Mercury

COC = Cleveland Open Cup

LD = Lethal Dose

n. ap. = not applicable

PMCC = Pensky Martens Closed Cup

TWA = Time Weighted Average

LC = Lethal Concentration

ppm = parts per million

TCC = Tagliabue Closed Cup

STEL = Short Term Exposure Limit

CS = centistokes

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