



The Pros and Cons of Chinese Drywall

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There are many methods or approaches to remediation practices in the construction industry. The current crisis with defective Chinese drywall that is diffusing low levels of sulfur compounds like hydrogen sulfide, carbonyl sulfide, carbon disulfide and others creates a serious concern as to the method of remediation. There are four main methods or approaches to remediation currently being used or considered:

- 1). **Leave all drywall in the home** and diffuse chemical treatments into the drywall by painting it, coating it, encapsulating it, spraying it, or sealing it, or add filters to stop it, capture it, clean it, and diffuse it through mechanical means. No drywall, electrical, or other materials that show signs of corrosion are removed.
- 2). **Remove only the drywall that is considered foreign (Chinese)**, assuming that it is defective or causing the diffusion of sulfur compounds, while leaving domestic drywall and all other building materials in the home.
- 3). **Remove all the drywall as well as corroded or contaminated materials**, which includes cross-contaminated drywall in a home and all materials and metals showing signs of corrosion. This method is also known as "gut out," which means removal of all the electrical wiring, copper plumbing, inside HVAC units, duct work, all fire and security equipment (life safety elements), and any other item that shows signs of damage.
- 4). **Tear down the structure**. Remove any evidence of the structure's existence. This is full demolition of the home which only leaves the original foundation.

To help everyone understand the four different methodologies that are currently being considered in the marketplace, we must first understand the pros and cons of each method or system.

Pros and cons of the four methods of remediation.

#1. **Leave all drywall in the home**. Leaving ALL the drywall in the home through cleaning, painting, or diffusing chemicals into the defective drywall.

Pros: Cost-effectiveness (\$12.00 –\$20.00 P/SF); quick mobilization and demobilization for contractors; limited mess and clean up; short turnaround time for reoccupation of the residence;

good analytical processes with control mechanisms; proven process to remove toxic gases and bacteria.

Cons : All liability for low and high voltage wire corrosion assumed by the client or homeowner; cross-contamination of personal belongings; limited liability exclusions on many items outside the actual areas of remediation; future diffusion of gases; as-yet unknown physical or chemical processes, which increase risk; insurance coverage may go up or be cancelled; electrical problems may continue or lead to life safety issues; partial remediation does not allow for a national warranty standards; stigma and disclosure issues may cause property values to plummet; future governmental standards or court rulings that require source removal of affected materials.

#2. Remove only the drywall that is considered foreign (Chinese). Remove drywall that is marked Chinese and leave all other drywall and items in place.

Pros: Cost-effectiveness (\$10.00 –\$30.00 P/SF, depending on amount of drywall); quick mobilization and demobilization for contractors; limited mess and clean up; short turnaround time for reoccupation of the residence; good analytical processes with control mechanisms; proven process to remove toxic gases and bacteria.

Cons : All liability for low and high voltage wire corrosion in the home assumed by client or homeowner cross-contamination of personal belongings; limited liability exclusions on many items outside the actual areas of remediation; future diffusion of gases from cross-contaminated drywall; some drywall boards may be missed and continue to diffuse sulfur compounds, jeopardizing the overall success (**Fact:** one 2ft. by 2ft piece of defective Chinese drywall can turn an A/C coil black and cause corrosion problems in a 3,500 SF home); gypsum drywall will cross-contaminate by diffusion into the non-contaminated drywall, which increases risk; insurance coverage may go up or be cancelled; home or building will not comply with national warranty standards, electrical problems may lead to life safety issues; stigma and disclosure issues may cause property values to plummet; future damages in home value and resale if the industry as a whole accepts complete source removal; lack of a way to validate and confirm partial remediation success and removal of all defective drywall. Partial remediation will most likely affect the home's value and possible long-term performance through this type of band-aid or patch-type repair process.

#3. Remove all the drywall as well as the corroded or contaminated materials (removing all drywall within the home or building regardless of the contamination source.

Pros: The source of the problem is removed and cannot continue under any circumstances; preferred remediation methodology and long-term success; perception of the remediation processes by removal has a much greater positive impact for resale versus non-source removal; home can receive National Construction Warranty status; stigma under a certified process is

dramatically removed for property value protection; energy savings, green standards, and upgrades can be instituted during remediation with financial reimbursements to owner from both governmental agencies and local energy companies, which can offset some of the extra costs; homeowner does not assume responsibilities for future failures such as electrical wiring; personal belongings are addressed through decontamination methods in source removal and help protect against cross-contamination. Much better chances of success by removal of the source contamination and prevention of associated damages to copper and other metal materials.

Cons: Longer reconstruction time; increased cost (\$35.00–\$86.00 P/SF); owners will have to be out of the home for a longer period of time (2–4 months); finding a qualified remediation contractor can be difficult; quality control during the process will be critical and require third-party oversight, incurring some additional cost; complexities of remediation from start to finish require more qualified individuals and subcontractors.

#4). Tear down the structure.

Pros: The home has been completely torn down, removing all perceived stigmas, and rebuilding can incorporate all the new energy upgrades, code upgrades, improved design, and other modifications.

Cons: The majority of good materials (roofing, wall claddings, windows, doors, plumbing, structural and interior components) that are salvageable items will not be paid for by any settlement, governmental agency or legal proceedings since the actual cost of tearing the home down goes above and beyond the physical evidence of damage or defect from the defective drywall. The tearing down of good building materials would not be a recoverable cost benefit and financially impact the home or building owner. This method would be considered overkill in standard remediation practices.

The risk of doing it wrong

When designing remediation efforts, it should be understood that a systems approach needs to be validated by either past case histories or previous successes. Since there are no statistical data or proven scientific methods at this time, careful consideration must be used in properly evaluating and testing a remediation process. The only way to do this is to first seek to understand the science, and then develop processes to fit that science. In a time of crisis, remediation systems do not have enough field testing or controls prior to moving forward, requiring BETA home testing and analysis. Future monitoring of homes for corrosion should be one of the key considerations when implementing a remediation standard. The systems introduced for remediation should always be based on good science, field inspection and analysis, and laboratory results. All possible options that would best benefit those caught up in such a crisis should be explored. Currently, individuals or companies are coming up with methods or products that are not based on a full understanding of the science or the impacts of their systems on the value of the property

and the safety of the occupants. Attorneys, chemists, environmental consultants, general contractors, home inspectors, government agencies and a host of others are attempting to design and implement protocols for remediation of Chinese drywall, but they have no clue as to the overall complexities and dynamics at work. Most individuals trying to write the protocols have little or no experience in the methods of application or full understanding of the science behind remediation measures. Why would you want someone writing your remediation protocol if he or she has never been involved with remediation of buildings and is not versed in the industry standards? Individuals or groups who have come out with protocols or standards have not had extensive field experience in remediation practices for mold, water intrusion, indoor air quality contamination, water extractions, or partial demolitions and rebuilds. Almost all protocols being suggested today have no scientific backup or a group of remediation specialists onboard to enlighten the uneducated. If you want to know about remediation, don't consult a salesman at Sears and Roebuck who sells ten-speed bikes. If you have a brain tumor, don't ask the pizza boy to perform surgery on your head. If you are going to attempt to remediate a Chinese drywall problem, contact a remediation company with specialists onboard who can help develop a solution. Most people are doing remediation wrong not because they want to, but because they are playing a guessing game. The key to the unknown is to systematically test, re-test, and test some more. If you still don't know the answer, build in the proper redundancies and aim high. The consumer who is already in a very difficult situation should not have to endure incompetence through short sighted remediation techniques.

“Lipstick on the pig” mentality of remediation.

The weakest link is often insufficient redundancies in your remediation system. It is critical that allowances be calculated in the approach to understanding all the dynamics and insuring your protocols address each issue. Corrosion of key components such as smoke alarms, carbon monoxide alarms, and low voltage wiring leading to these components is an important home safety issue. All life safety issues in a home or building should always be a number-one priority in a remediation system and should not take a back seat to project profits, value engineering cost, or system redundancies. This was one concern that the Building Envelope Science Institute recognized early in 2009 and addressed in its certified protocols. The Consumer Product Safety Commission (CPSC) and U.S. District Court Judge Eldon Fallon so noted almost ten months later in their guidelines that came out in 2010.

Is a secondary crisis brewing behind the scene?

Many people will misinterpret the intent of both the CPSC's and Judge Fallon's guidelines, since they were somewhat vague. This approach was expected since the CPSC and the Judge Fallon lacked the full understanding of remediation processes and had very limited testing or case history data to support their guidelines. The issues of remediation are not straightforward and

redundancies have to be considered. Some of the key issues that were left out of the CPSC guidelines that would normally be considered critical are:

1. Cross-contamination of personal belongings
2. Removal of all drywall to insure all corrosion of metal is addressed
3. Chemical application for redundancies
4. Filtering and removal of residual sulfur gases along with new VOCs that will be released into homes and buildings
5. Third-party evaluation and certification of the process
6. Warranty for homeowners and building owners

The proper remediation is absolutely essential if the damages sustained by homeowners and building owners are to be addressed. I am afraid that the half-baked ideas, the short-sighted approaches, and the scam artists who are not looking at the processes but only the profits will ultimately create a secondary crisis on top of the current one. Partial remediation practices that are being used improperly will show very different results and may ultimately require additional remediation practices. One home owner who performed a \$300,000 partial remediation (removal of only the bad drywall) on his \$4 million dollar home ultimately had to remove all the drywall because of the perception from buyers and the stigma on the home. The homeowner found out that only removing some drywall created a \$3 million loss in value. Everyone considering remediation on a home or building should understand it's not so much the facts as it is the perception of the process and overall understanding of the crisis in the public's mind. Everything should be factored in or you may ultimately find yourself in a secondary crisis that in my opinion is a lose-lose situation for the industry.

What is the Building Envelope Science Institute?

A group of companies and scientist got together in early 2009 in an attempt to spearhead inspection and remediation standards to combat the crisis with Chinese drywall. This task group, Defective Drywall in America (DDIA), has spent over a million dollars in time, money, laboratory analysis, field testing, and BETA home research to come up with the most cost-effective protocol in the industry, which can help prevent fraud and scams. The work they have done can be seen on the institute's web site at www.BESInstitute.org

Today, DDIA and BESI have found 1,000 ways how not to remediate Chinese drywall. How?

Get 25 of the top experts in the fields of forensic analysis, building science, chemistry and metallurgy and network them together. Spend 50,000 hours with a million dollar budget and spend 90% of your time on the solutions and 10% of your time on the problem and you just may find a viable solution to Chinese drywall remediation.... if you're lucky....

The institute felt it was extremely important to find a way to both properly and effectively deal with the problems since we noticed state and governmental agencies were getting bogged down

in the process. We noticed they were spending most of their time, money and efforts on the problem and not the actual solution. Normally, the industry private sector can move much more quickly and has a history of policing itself. The two working together can actually complement each other, as in the recent state of Florida mold certification where the government requires a license but uses the private sector to train and certify individuals. This particular effort on a mold standard for the state of Florida took the government almost ten years to activate in a state that is plagued with microbial problems due to the heat and high humidity. This is why it is extremely important that both government and the private sector work together in a unified front to help those caught up in this crisis. Together, they can make an impact and help many individuals that have found themselves unsuspecting victims.

Why the complexities?

Some of the science related to defective drywall is not understood, and this has led to confusion in dealing with the multiple dynamics at work including corrosion, clearance testing, trigger mechanisms creating the diffusion of sulfur compounds (anaerobic bacteria, elemental sulfur, S8), cross-contamination of other materials, etc. However, one approach that I have found useful in sorting out remediation protocols is as follows:

Focus on all the issues from a broad perspective, taking into account everyone and everything affected by the materials; test and re-test your findings and then share your findings with a large group of experts who can play the devil's advocate and pick your methodology and designs apart. This approach is not based on anecdotal and casual observations but rather rigorous and scientific analysis from multiple third-party sources: controls, controls, and more controls. The people in the group will contribute to the success of the protocols or system. Your ultimate goal should be to develop a solution that not only works but goes beyond the lowest minimum standard with cost-effective redundancies that guarantee your success. The redundancy or "belt and suspenders" approach is typically used when there are:

1. Scientific anomalies, unknown or elusive patterns from field studies;
2. Inconsistent patterns based on a wide range of changing factors, no matter how insignificant;
3. Uncharted scientific waters, or lack of good statistical data;
4. A new crisis where the technological advances have not caught up with the science and forensic equipment is inadequate to properly diagnose all the dynamics both in the field or lab; and
5. No case precedence or history of claims or studies.

Because of these factors, the restoration protocol or multiple systems approach needs to be held to a standard of continuous improvement in quality, technology, processes, cost analysis,

monitoring and testing, safety and clearance testing and random follow-up analysis. Furthermore, long-term life cycling studies should be studied via BETA testing in the field and laboratory experiments to gain statistical data that can be applied to future crises that have similar circumstances or product identifiers. Everything and everyone works to engineer and perfect the system, which should not be affected by unsubstantiated opinions, politics, hidden agendas, kickbacks, prejudices by association, or other means that could taint the system or science behind the protocol.

The scope must factor in every known failure that could jeopardize the overall mission. Engineering controls cannot be sacrificed at the cost of the mission critical process, and if a process can be factored out, it should be immediately removed to achieve the cost effectiveness of the systems. Cost reductions + simplicity of process + redundancies + continual monitoring and adjusting = performance-driven solutions.

The question may arise, what is the main mission of remediation of Chinese drywall in homes and buildings? In my opinion, its “making people whole” and only having to implement the remediation phase once. The tragedy is that quick-fix schemes, improper evaluation of remediation methods, and other non-viable solutions will be sold to the public and could create billions in lost property values and equity, leaving the American dream at risk for tens of thousands of Americans in 38 states.

The overall process of remediation must have more than adequate controls or mechanisms in place with enough cost-effective redundancies that protect against failures. If you have corrosion of the new copper wiring or it still smells like Chinese drywall months later after your remediation, you have to ask yourself, what is the ultimate impact of this failure on the building? This is quickly becoming an issue as some have chosen to launch out prior to fully understanding all the dynamics that are at work. Others who are working for defense attorneys are purposely downplaying the facts on remediation and promote quick fix repairs that will prove to be short sighted. Another big issue that we are seeing is stigma. If your home cannot regain a majority of its value back through a certifiable process, that process should not be considered a viable solution. This was one of the main reasons the Building Envelope Science Institute pulled together the parties back in 2009 to pursue the first national warranty on Chinese drywall that was just recently released to the public. A warranty in my opinion and others on the task group would serve as a critical element in fighting the stigma issue associated with owning, selling and remediating a Chinese drywalled home or building.

Do your homework.

There are a lot of individuals and companies trying to take advantage of the current crisis. With little or no work going on in the construction industry, it has created a tremendous opportunity for those who can perform such remediation work. Good and bad, educated and non-educated,

experienced and non-experienced contractors will jump into the Chinese drywall crisis. Do your homework and be selective with the type of contractor you choose.

Using your nose for clearance testing?

Some individuals are hanging their hats on smell testing, including previous home owners. While it is true that approximately 70% to 80% of the time you can smell the gases diffusing out of the drywall and personal belongings, caution should be used when putting validity in this process. There are more VOCs in furniture than in Chinese drywall. Many VOCs are in a home and personal belongings. Also, H₂S or other identifiable gases may not be the predominant gas and give false indications. New construction products will have many VOCs that will be released and individuals who have lived in a Chinese drywalled home may have their receptors damaged or not be able to smell low levels of sulfur compounds from over-exposure. The nose can only smell the gases for about 15 minutes before your receptors can no longer smell the low concentrations of sulfur compounds. This gives a very limited approach to using the “scratch and sniff” technique for clearance testing. Some individuals may not have a good sense of smell, further complicating the technique. Confusion and misdiagnosing by smell only should be well understood by everyone in the industry. The Building Science Institute is working with several other companies who are about to release clearance testing measures based on copper corrosion techniques and the use of X-ray fluorescence guns in the field.

Clearance testing - is it smoke and mirrors?

Yes, most people doing clearance testing after the drywall is removed report excellent analytical back-up that the gases are gone. The facts are if they conducted the same test prior to removing the drywall, they would most likely get the same results—non-detect or ND. When questioning several well-known laboratories who are conducting such clearance testing, they reported that over 90% of the sampling comes back as ND prior to remediation. There are no good standards for clearance testing of Chinese drywall, although some methods are being developed using copper corrosion coupons with outside controls and inside analysis using X-ray fluorescence guns in the field. I currently know of two clearance testing protocols that are very close to final testing which will assist in proper evaluation of the remediation process.

The key to successful remediation actually may not be in the clearance testing itself but the remediation process. The two keys are source removal and decontamination of construction materials left in the home (i.e., concrete masonry units, wood flooring), and all materials going back into the home (i.e., kitchen counters, appliances, cabinets, furniture and all personal belongings).

There is a right way and a wrong way to remediate Chinese drywall. Just don't sell yourself short in resale value, either perceived or actual, and be forced to do it again down the road. I learned that most people cannot afford to do this once, let alone twice. This is one of the main reasons

the Building Envelope Science Institute trains and certifies only state-certified contractors in good standing who can satisfactorily complete the course and final written exams. The training covers all current protocols, technologies, and methods of remediation. Currently, only the BESI System protocol requires certification and has been accepted by the National Construction Warranty program. Regardless of what protocol you choose, proper training, third-party evaluation and reporting is going to be a key item along with securing some kind of warranty to protect against the stigma and uncertainty of remediating Chinese drywall from homes and buildings. These are complex issues, and everyone should take careful consideration when selecting the systems of remediation and contractor who will be responsible for the repairs and performance of the work.

Scott “Spiderman” Mulholland has twenty-five years’ experience in the construction industry, specializing in forensic investigations and remediation of residential, commercial and high-rise buildings. Mulholland is the principal and owner of U S Building Consultants, U S Building Laboratories, and is on the board of directors for the Building Envelope Science Institute which promotes training and certification for the construction industry. For more information, go to www.usbcinc.com or call the main office in Gainesville, Florida at (352)505-6771.