Overcoming the Challenges of Asbestos Containing Materials in Remodels
A Case Study

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This is a study of one project's experience with delays caused by the need for asbestos abatement. It will also cover the best approaches for limiting both safety and financial risks to the contractor, subcontractors and owner. I wanted to gather information on this type of issue within our industry because there will be an increased need for large scale remodeling within major cities to keep them up to the level of standard people expect. This includes the more modern infrastructure of a building to accommodate for the technological improvements made in recent years and to provide a more comfortable space for the tenants of the building. This renovation includes old buildings made prior to the halt of asbestos use in our industry. I was an intern on a project that experienced many difficulties along the duration of the project because of the challenges with occupants, owner, and other governing authorities. The project was delayed four months to clean the tenant spaces which did not appear as a problem to the parties involved. As this new spectrum of project type is needed in major cities it creates a new niche for contractors to diversify and expand. Many companies have not performed this type of project and should know what to expect to limit the risk involved. The new knowledge would be to compile a detailed and accurate list of project difficulties and conflict resolution for future reference. Though asbestos abatement has been a problem for over 30 years, this is a new beast for most commercial contractors to take on. A detailed list from a specific case study and the best ways to improve project quality and time would be highly valued by a contractor.

Key Words: ACM, Asbestos, Remodel, APCD, TEM, PCM

Introduction

A contractor who finds an opportunity to work on a project containing present Asbestos Containing Materials (ACM) should not be too fearful of the legal risks and hazards involved. This project type is recently becoming more popular as buildings constructed during the timeframe of asbestos use are reaching their designed lifespan. Getting your foot in the door with a new spectrum of project types for the contractor is beneficial for diversity and longevity. The benefits can still outweigh the risks involved but there is some information the contractor should know before jumping right into a project. Legal challenges can shoot up prices and abatement work is much more expensive than a typical demolition activity. Therefore, it is valuable to learn from first experiences with this building type to avoid the mistakes involved when entering this line of work. Asbestos was deemed to be hazardous many years ago but the rules and regulations haven't been fully established. The process of dealing with asbestos in large amounts on a construction project has not been developed in the same way that other construction projects have seen a typical cycle. Asbestos authorities are run by separate self-governing organizations depending on location. These regulators actually have a very difficult time establishing the safe legal limits because no one wants take responsibility for future incidents. The general lack of precedent creates difficulties that need to be understood before a contractor enters the market. Therefore ,it is important to analyze past occurrences to receive a better understanding of concerns involved with managing asbestos in a building remodel as risks can be very impactful to the contractor.

Literature Review

Asbestos material was determined to be harmful by the U.S. Government beginning in 1918 but did not provide any numerical data or report a full set of risks until much later. Evidence of related diseases did not surface until decades

later and was not regulated until 1972. Regulations were quickly brought into legislation accompanied with the scare of exposure to the county's citizens and was not fully developed until 1974 by the Occupational Health and Safety Act (OSHA) and the Environmental Protection Agency (EPA). These new statutes did not ban the use of asbestos material within the US but instead regulated its exposure to the general population for safety of its people (Lahav, 2018). This material is continually manufactured under safe working limits and used in special circumstances.

The legislative acts developed over the years mentioned are as follows. The clean air act of 1970 resulted in EPA regulations on the use and disposal of asbestos. The Toxic Substance Control Act allowed the EPA to regulate new commercial chemicals. It also granted power to regulate existing materials that pose unreasonable health or environmental risks. Changes in this act did eventually ban the use of asbestos in specific settings but the list is very thin and is primarily limited to use in paper materials. Thus, the material was never truly banned but the use of it in a dozen products was limited. Attempts were later made to ban the use of asbestos but each of these stopped at Congress and never received their final approval. Although asbestos is still used in various products, its identification as a pollutant has helped reduce use through the overall understanding of its harm as a carcinogen. It became bad press for companies to utilize asbestos which heavily withdrew its use among the United States.

These acts express the danger of the material and jointly determine asbestos to be a harmful substance that needs proper government guidelines in place. But the most notable change for the construction industry was the Significant New Use Rule in 2018 by the EPA. Any work done with the use of asbestos containing material (ACM) must provide prior notice to the EPA of the activities details and procedures. This notice is primarily used so the EPA is aware of the work and date of material disturbance on a project site to monitor the progress and document any exposure. The EPA has jurisdiction over ACM and has the power to provide fines if work is not being done in a safe working manner.

The definition of ACM is any material where a point count analysis confirms the sample contains equal to or greater than 1% asbestos. On site, material sampling is generally done by a third party that surveys the site of any hazardous materials or very specific areas when need be. This material testing must be done over an appropriate amount of samples to establish a base of continuity among the material. For example, testing one area of a fireproofed gridline is usually not enough backup to provide a sense of security that the entire area contains asbestos. In many cases this third party will want to test multiple surfaces of a beam such as the web and the underside of the flange over multiple beams in the area before giving direction that the area is free of asbestos concerns. Anything that is found to be less than this legal limit (1%) but still shows some detection is now under the authority of OSHA (Byers, 2017). This material detection range is characterized as Asbestos-Containing Construction Material (ACCM).

Proper abatement or encapsulation procedures must be followed when handling ACM but material containing a lower point count is not as clearly regulated. This ACCM is much more difficult to establish proper procedures (Miles, 1998). This material tends to have some sort of grey area depending on authority having jurisdiction for proper handling. OSHA interprets the requirements for ACCM disturbance to be accompanied with wet methods, to the extent feasible, and to promptly clean up and dispose in closed containers. The waste and debris contaminated with asbestos must be handled as asbestos but may be thrown out as regular construction waste. However, OSHA identifies HEPA vacuuming procedures do not apply with material that contains less than 1% asbestos. Even though this material has such a small trace amount of asbestos, any work that will or has the potential to disturb this substance must be done by an abatement contractor. This is necessary to maintain proper education of material disposal and handling by receiving the proper certification. Work on ACCM requires a dust barrier, wet methods, proper breathing apparatus and bagged for construction disposal. Therefore, this work requires additional costs associated with added labor and materials. The abatement contractor charges higher labor costs because of the specialized work and activities such as drilling into an asbestos containing concrete deck require much more than a standard drilling procedure.

ACCM can be thrown out as common construction waste after being double bagged while ACM must be thrown out as hazardous material waste. The procedures revolving around ACM are much more strenuous with full containment setup and negative air pressure being obtained within the working barrier (EPA, 2016). Below are basic O&M procedures to minimize or contain asbestos fiber release when there is a potential to disturb ACM.

1. Wet methods (such as applying water to ACM with a low pressure sprayer).
2. Use of mini-enclosures.

3. Use of portable power tools equipped with special local ventilation attachments.
4. Area isolation.
5. Avoidance of certain activities, such as sawing, sanding, and drilling ACM.

Work within a confined space such as a containment and the challenges of exiting and re-entering the work area creates added costs and time to each activity. Abatement or encapsulation procedures typically take much longer than a typical demolition procedure. For instance, the work area must be put under full containment typically by the nature of a plastic barrier. This established work area must be provided with use of negative air machines in case of openings or punctures in the barrier during the work activity. The activity must be done in proper suits and respirators work by the workers which adds additional time to setup the work area and begin the working procedure. All material must be sprayed down to mitigate any material from being released into the air while collected into disposal bags to be trashed out after leaving containment. Additionally, the entire containment must be sprayed and wiped down after the work is completed. After the work is finished and the interior of the containment is cleaned, air clearances must then be made by a certified specialist; this testing takes about a day to finalize results. After receiving the results showing safe limits, the containment can be torn down and the process is complete. This is a much slower process than normal demolition work because of the regulations behind the handling of ACM and the additional work area setup needed. Also, working with a respirator and full PPE does not make things any easier when working in a confined space. Each containment is usually accompanied by a full time laborer who stays outside the containment and retrieves anything needed by the crew inside.

Proper understanding of the added labor costs associated with material containing any level of asbestos is mandatory for a contractor looking to bid a job. Identifying the activities and which ones are disturbing asbestos containing materials is necessary for proper costs and schedule estimating. If you underestimate the work associated with abatement or special treatment, the numbers will be undervalued and the contractor will lose money and time. It is important to work off of a detailed survey of the current materials to adjust prices for the subcontractor handling the abatement work.

Methods of Testing Air Quality

There are multiple methods to test air quality and ACM fibers in the air. The two most popular methods of are Transmission Electron Microscopy (TEM) and Phase Contrast Microscopy (PCM). The difference of these methods have to do with size of fibers, what is considered to be a contaminant and ratios involved in the calculation process. PCM only visualizes fibers greater than 5.0 microns in length or 0.25 microns in width. This is considered to make up the majority of asbestos released during abatement activities. This test does not distinguish between asbestos and non-asbestos fibers and counts them all. OSHA considers the PCM test as the leading test and uses this under their regulations. The desired limit by the EPA is a clearance level of 0.01 fibers per cubic centimeter or air.

TEM can visualize fibers less than 0.5 microns in length and 0.01 microns in width. TEM can differentiate asbestos from non-asbestos fibers using morphology, selected area electron diffraction (SAED), and energy dispersive x-ray analysis (EDXA). TEM filters contain a grid system that is used during the testing method by randomly selecting a couple grids. TEM testing is technically superior and more defensible in a court of law because of the definite results of knowing the material is asbestos related (Thomas, 2018).

Methodology

The majority of the research I planned to conduct did not fit the form of quantitative data. The results observed would be of cause and effect of the varied processes and outcomes that would carry along this project.

My objective for this case study is to…

- extend the overall knowledge of ACM material
- analyze the processes behind managing this material during demolition of other possible disturbances
- shed light onto the difficulties of remodeling a high rise that contains asbestos
- provide valuable insight into the best means and methods in construction.

Case Study

Sundt Construction was one of two general contractors to bid on the Tower 180 re-model project in San Diego, California which consisted of multiple trades of work but a very limited amount of scope. Most of the work was very small in comparison to construction of a brand new high rise building. The renovation included replacement of the current glazing system which would be the majority of the scope along with other improvements such as replacement of defective back-up generators. Additional work included renovating the old lobby and full retrofit of three floors as a sample in leasing opportunities. Hammer Ventures purchased The Executive Complex for $54.4 million in 2016 in attempts to renovate the building, change the entrance location to the more popular Broadway Avenue and increase lease prices for payback (Mirsh, 2016). This building turnover would take this 324,000 square feet purchase and create the city's first Class A office space.

This 25-story building was originally completed in 1963 with its 8-story brother built ten years later. During the construction of each of these buildings asbestos was used in the fireproofing in addition to other popular uses of this material during its time. These included pipe sleeves, waterproofing, carpet mastic, caulking and other small uses throughout the buildings. The beginning of the project lacked understanding of the extent of hazardous material and was among one of the first of its kind for the general contractor. Large scale remodels were not a typical project type and the association of asbestos created an underestimated burden for the contractor. Time and money along with special procedures were not fully understood by the contractor which created quite the learning experience for this $45 million GMP contract.

Results and Discussion

The project began in June 2017 with the hands of Rob Foster who started on the preconstruction team for this project. Once the contract was awarded, he was moved into the on-site duties of a project manager. Very little was understood about the work that was required in order to restrict the exposure of ACM to the public. They were aware the building was originally constructed in the 70s which fit the time frame of asbestos utilization. From what was discussed in the preconstruction stage of the project, the owner representatives gave the impression that most of the asbestos would be called out by old surveys made during TI work within the building. It was explained to the contractor that all but three of the twenty-five floors had been abated during previous TI work and would not create added costs in fulfillment of the contract. The general contractor (GC) for this project did not receive a full survey in the bidding process but had a good idea of hazardous materials that would be encountered based on the popular uses of this material in its time. The contractor awaited a final survey of the building but did not receive the completed 800-page report until days before signing the GMP. This did not give them enough time to explore the information contained which created an exclusion for additional work associated with the hazardous materials survey.

They expected abatement work but thought most floors had been fully abated as described by the owner. The original fireproofing containing asbestos was present on the skeleton of the building. This was understood by the contractor before they were awarded the contract and a plan was constructed by asbestos contractors who were knowledgeable of the means and methods. The general ownership direction was to encapsulate all ACM material unless abatement was required due to special circumstances. Sundt Construction, the general contractor, asked many abatement subcontractors and specialists about the means and methods involved in the work within the contract. As they were developing an understanding of proper work procedures based on the known asbestos presence, they were able to create a work plan for replacing the glazing system which was seen as the most critical process for the contract. This searching process and discussion provided them with a work plan to remove the exterior glazing system without containment followed by immediately encapsulate coverage applied to the fireproofing. This process was simple and would limit the exposure time of the hazardous fireproofing on the perimeter beams to the outside air. Sundt Construction requested a full-time asbestos specialist to accompany the project to help minimize unseen hazards in the work activities but ownership did not agree to this idea, mostly for costs reasons.

During the construction process there was a lot of concern for the safety of the present tenants in the building. Sundt was under the impression that work would take place after they were moved out. The building already had signs located at its entrances that provided warnings of asbestos presence within the building. But the added dusts and disturbance when construction began created an added fear for asbestos hazards for the tenants. Most of the floors were still occupied when the project site broke ground and workers began showing up at a regular basis. The project began with demolition of the first five feet in from the exterior windows around the exterior of the building. This demolition included ceiling tiles, walls, the exterior heating and air systems and anything else found within this

boundary of the interior. Before this activity would begin, the demo contractor had to set up a plastic barrier separating this 5' perimeter from the rest of the tenant space to prevent dust and debris exposure. This obstruction into the exterior office spaces replaced their ocean view with a poly barrier blurring the work activities behind. The work could only take place at night for noise purposes which created a bid surprise for tenants who's spaces changed overnight. The occupants became frustrated with the work taking place over night and the constrained work environment they would receive after losing five feet around their space. Putting a poly barrier five feet into their ten by twelve foot office with asbestos warning signs did not provide a sense of comfort.

Precedent of Air Sampling Methods

PCM air testing was being done in the working areas of the activities on site. This was conducted by an asbestos specialist that was assisting the project as recruited by ownership for material testing when a new material was subject to questioning. Each of the air quality tests resulted in safe limits under government guided limits. In September of 2017, both the owner and GC were notified with an air quality sample from a third party that was hired by the city tenants who occupied the first 13 floors of the building. Using the TEM method, two results showed poor air quality past the exposure limits described in the testing procedure. Although this specific test deemed as the OSHA regulated air measurement, the concern was still present. The tenants working for the city gave the results to APCD which caused a shutdown of the building project. Ownership was notified that work must be put on hold and the building must be cleaned. They released the abatement order causing a halt to further work and demanded cleaning the entire building. This event goes to show that even working within the required legal limits, there is still a concern for human health that takes precedent over government regulations.

Asbestos Authority Direction

The language for the order was very important for both the all entities involved. It would describe the standards of the building project as eyes were now covering this project. The order of "cleaning the entire building" did not provide detail as to how much cleaning was required and if the entire building must be cleared or just the two areas that showed exposure. Also there wasn't any details of at what point a space was safe to work/occupy again. For example, would the carpet just have to be vacuumed or ripped out? Did they have to clean the floors and spaces that did not come up as positive from all these tests or just the two individual spaces that showed exposure? Was ductwork included in the cleaning process because that is difficult to get inside and would require a lot more work? Was there some sort of test that needed to happen before occupants could re-enter the building? These were all very important questions that could not be answered by the APCD order. Sundt and ownership requested further guidelines to understand that standards at which the project would operate but APCD would be very vague in their demands. Most of this was due to the risk involved in setting the standards at which exposure might result from.

Violations

There have been many violations along the span of the project but none of the fine amounts will be presented until the end of the project. The list of fines are built up over the length of the schedule and once the project is completed APCD will present all the parties with the total violation amount. There aren't any set numbers established within their laws for the different types of violations. So everyone is still awaiting the final fine amount, but it is expected to be upward of a million dollars on top of the four million it took to clean the building for several months. APCD is given authority by Government Health and Safety to create their own standard of rules and regulations for their limits of assigned territory. Each authoritative body for hazardous material is not provided with governmental funding which forces their costs of operation to be funded through fines. Government Health and Safety gives APCD full jurisdiction of how they should run their organization but the method of how they operate to sustain their line of work. This creates a parasitic relationship for the authoritative entity to receive funding by the projects and activities that take place within their area of jurisdiction.

Conclusions

Asbestos governing authorities have a very difficult time giving full detail into what is considered safe exposure limits or the activities needed before re-entering a hazardous area. In this case study it was strenuous to receive direction of what exactly should be done before occupancy after the area was considered unsafe for the general

public. The general contract and ownership was not provided with a procedure of how to clean the building and what tests needed to take place prior to re-opening the building. Government authority does not want to be the party who stamps their name on a sheet describing safe limits and when those are met. This would increase the level of risk they are subject to in the event of misdirection. They did not want to be the judge on what was considered clean and safe for re-occupancy. Therefore, they provide orders such as make sure the building is clean without the details of what is involved in their direction. This puts the risk on the contractor to make sure the environment is safe and they aren't exposing people to any harmful air conditions. But a contractor is unfit to describe safe working limits and wants to receive the direction for what they can do to get the project running again. This cycle of contractor wanting direction on how to satisfy safe working limits while the authoritative figure wants things safe but doesn't want to be the one responsible for defining what is safe is created by the lack of precedent for the subject matter. The asbestos managing systems are built on regulation rather than partnership. The authority runs off of money received from fines they give to different contractors within their area of jurisdiction. This business model creates a harmful network where people are working against each other rather than providing assistance. The contractor wants to do everything they can to hide the problem which can lead to hiding unsafe conditions while these governing authorities are pushed to find anything they can to support themselves through fines. This creates a bad relationship between the two parties. The system is not setup to help the parties work together to safely and effectively navigate a hazardous material.

One of the problems when working with such an old building is if APCD wanted to find a violation they could walk around the building and find something. Over time the building materials have settled and broken lose or exposed unsafe materials. In the same way that an old building is not up to current building codes, the conditions are under violation without the being grandfathered in. Any exposure or unsafe conditions are creating hazards to the public and must be fixed immediately to limit exposure. For example, APCD could go into the elevator shafts and most likely find a pile of asbestos debris that has accumulated over the years that has fallen off the original fireproofing of the building. The contractor was not responsible for the years of buildup as fireproofing dries and pieces can break off from over the years. Although the contractor was not working in the elevator shaft or causing a disturbance of the material there is a possibility of being fined because the violation is found within the working limits of the project. This forces the contractor to focus on much more that the scope of the project because anything unsafe on the current building is now a threat to the health and safety of its workers.

There are two major take-aways from this early advance into remodeling a building containing ACM. Firstly, tenant presence should have been more heavily emphasized and specified before starting the project. The risk in working with ACM in the presence of occupants is magnified heavily. Work should not have begun until the building was completely clear of these individuals. It would have been in everyone's best interest if the building was clear of people. Ownership was trying to accommodate the tenants to continue charging rent but in reality they are not receiving anything from the additional cash because of the additional costs involved to keep them there. Lawsuits and health risks attached to maintaining the current tenants depleted this income over the duration of the project. In addition, costs of special requests by several tenants such as additional air testing in their spaces for peace of mind and cleaning up dust created by the vibration caused in demolition of each desk in the building added to the cost of construction activities. Also, additional dust barriers and containment needed to create a boundary for the people working in the building increased each activity cost because of loss of production, higher labor rates, and added material costs. The accommodations involved to keep the building accessible to the public and added construction related costs make it difficult to advocate for keeping tenants within the building during construction. In reality, costs associated with maintaining tenants have increased with the lawsuits and activity markup costs required to suit the special needs of tenants.

Additional Costs:

1. More Risk
    a. Special requests for maintaining public safety.
    b. Lawsuits involved.
2. Added Construction Costs
    a. Loss of production when working in a confined space.
    b. Higher labor rates for abatement contractors.
    c. Added material and labor costs for setup of dust barrier and containment

Secondly, the approach to abatement should have been more carefully established. Each party worked on trying to limit the risk involved with asbestos through the use of contract language. But the realization needs to be that neither party can hold all the risk. It would eventually hurt you even if all the risk was placed on ownership. Neither party in reality can bear the costs associated with asbestos exposure. If contractually the owner decided to take all the risks associated to asbestos and lawsuits, the owner is not financially capable of paying for the results of a lawsuits. For example, early on in the project there was concern of the windows breaking during the removal of the old glazing system. Sundt believed it was necessary to put a film over the glass to prevent glass raining down in the case of an incident. The owner representatives did not like this idea because of the added costs associated so they declared they would take on the risk and to continue working. But in reality if the glass were to break during a construction activity and rain down on the public below the risk is not only directed to the owner. If the glass injures someone below, the costs of the resulting lawsuit would create a large monetary burden for the owner. Therefore, the owner is going to come after the general contractor to seek compensation from the lawsuit. On the other hand if the general contractor decided to take the risk and responsibility for anything resulting from the windows breaking during construction activities, the GC would do just the same. In the case of an incident they couldn't eat the costs associated with a lawsuit and would go after the owner for not providing the necessary costs to maintain a safe working environment. No matter the language, either party would go after the other for compensation for very large costs due to liability. Therefore, it is very important to understand that neither party can really bear the burden of a violation or incident. This must be understood prior to creating the contract agreement and maintaining risk along with the construction activities.

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