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MAJOR RENOVATION OF PUBLIC SCHOOLS THAT INCLUDES RADON PREVENTION: A Case Study of Approach, System Design and Installation; and, Problems Encountered

By: Thomas Meehan

An increasing number of schools had been identified by 1989 with radon concentrations in excess of U.S. EPA guidelines. As some data suggests that children may be more susceptible to radiation induced cancer than adults. The State of Connecticut Department of Health Services recommended in April 1989 that all local education agencies and districts test their schools for radon. One school district that followed these recommendations identified high levels in an elementary school that was scheduled for major renovations. The local education agency agreed to mitigate existing building and utilize radon-resistant new construction techniques for the additional buildings planned. Many problems were encountered while attempting to install these systems, and utilize techniques recommended by the EPA for installation of radon reduction systems. An outline of this experience with recommendations for avoiding similar problems is presented.

After initial testing identified high radon levels in the school, maintenance workers attempted to lower the levels by sealing openings and cracks in the slab and foundation, isolating an open dirt tunnel, yet not allowing for release of any trapped gases, and putting a fan in the boiler room window to bring outside air in. More testing was performed and the levels were still high.

Since major renovations were slated, the school district asked architects to design systems to address the existing building and utilize radon resistant techniques for new buildings planned.

We were invited to submit a bid to install systems to the architects specifications and secured the job.

In reviewing the prints and specifications of the mitigation systems, it was evident that, although the systems were superbly designed, knowledge of EPA protocols were lacking.

The most prevalent was the fan location. The architect chose to mount in-line duct fans horizontally above the ceiling within the building.

We discussed this matter with the general contractor and the architect, pointing out the potential problems of condensation build-up in a horizontally mounted fan. Also discussed, were EPA protocols suggesting the mounting of fans outside the occupied envelope to avoid potential release of radon gas inside the building on the positive pressure end of the exhaust.

After the general contractor and architect discussed the matter among themselves, the decision to mount the fans vertically was agreed upon, but that the fans were to remain inside, stating the change would cost too much.

As a sub-contractor, we could not push the subject without alienating ourselves.

Another aspect of the job discussed was the decision to use Schedule 80 for all above ground pipe on a system that would have relatively low pressure. They decided to stay with the larger and more costly pipe for reasons not explained.

152

Although work on the existing building has not begun, another potential problem we feel that might arise is in reference to the lack of diagnostics.

When we are invited to bid to do work on existing schools and large buildings, mitigation systems are designed in conjunction with thorough diagnostics of the building consisting of:

1. Communication testing with micromometer
2. Sniffing with Pylon AB-5 to identify hot spots
3. Use of blower door to identify air balancing affects.

A follow-up paper we will be writing will cover these areas in more detail.

What we have learned to date, in reference to doing work on State funded School Radon Mitigation, might assist you on your next project.

In the decision to engage your company in large scale radon mitigations, there are many things that must be taken into consideration. These can be broken down into three categories.

1. Bid process
2. Job Orientation and Familiarization
3. Actual Work

There are many things to consider in each of these areas. The following are what we feel are important factors that must be addressed.

1. Bid Process - Pre bid on site inspection is strongly advised. There are always characteristics unique to each construction site that are not explained on the blueprint or in the specifications.

When putting a bid together, always verify any State or Federal wage rate requirements. If there are, obtain the classification of your workers in writing from the State Labor Department.

Another important aspect is the insurance and bonding requirements. These can vary depending upon the project. Generally, a $1,000,000 liability and workman's compensation coverage is required.

One of the most important factors to consider, are the payment schedules. Most government and State jobs give no

money up front and will make payments on a scheduled basis, a minimum of 30 days from the date of requisition. This also involves elaborate paperwork that is required for each payment. It is very important to have the proper funding in place prior to acceptance of large scale jobs. Be sure to check on performance penalties.

2. Job Orientation & Familiarization - Once a job has been secured and contracts signed, it is key to the sucess of the job that you spend time with the following:

Materials - Obtain a locked in price, purchase materials and get them stored on site. This will allow you to submit bills for materials purchased, and avoid any future price increases. Also, request specification sheets on all materials purchased and retain for job file. When possible, locate supply houses near the job site and obtain an account to avoid costly delays.

The most important person related to your work, other than employees, is the job superintendent. It is important to establish a working relationship with him. Be sure to let him know your capabilties and possible short comings related to the job. Review the entire job with him, if possible. Going over potential problems you might see that he does not realize (EPA Protocols).

It is very important to go through this entire process with another key employee in case you are unavailable.

3. Actual work - It is important to have two people very familiar with blueprint reading. The need will also arise to coordinate your work along with other contractors on the job.

Some potential problems that can occur are: pouring foundation prior to placement of piping. Be sure to coordinate with concrete workers so the appropriate steps can be taken to insure access through foundation in the appropriate place. (Core bore drilling is expensive).

Check all foundation prints on the interior of the building for footings. The prints might not show this, but a dip in the piping may be required where footings are present.

Exact measurements are a necessity. Do not rely on one measurement. Measure pipe placement from two locations. Where piping comes through a slab, measure from four points. (Concrete cutters are expensive).

In reviewing the prints throughout the course of the job, if you see anything that might create future problems, discuss this with the superintendent or architect.