Practical Considerations for Minimizing the Asbestos Hazard

Moderators: Andy Oberta and Dave Hodgkin

In his capacity as an Environmental Housing and Emergency Shelter Consultant, Dave Hodgkin was ideally placed to address the subject of ***Post-disaster Recovery and the Problem of Asbestos***. Unfortunately, the global impact of infrastructural damage from disasters was increasing, especially in Asia which was experiencing a dramatic rise in emergency-caused homelessness and environmental asbestos contamination. The main asbestos challenges during emergency situations such as those caused by the Indian Ocean tsunami (2004) or the Yogyakarta (Indonesia) earthquake (2006) were dealing with asbestos-contaminated rubble and preventing the use of new asbestos during reconstruction efforts [43]. Responding to the high levels of basic human need created by the extensive destruction of domestic and national infrastructures was done in conditions which were far from ideal; previous attempts at asbestos education – such as posters recommending prevention methods had little impact [44].

On the ground, local asbestos industrialists viewed an emergency as "a big sales opportunity" to market their products which, they claimed, were cheaper, stronger, lighter, more waterproof and easier to install than the alternatives. In Yogyakarta, some programs chose "community procurement-based models" which included rules against the purchase of asbestos-containing materials. In some cases these rules were overlooked, whilst in others although the agency specified and purchased asbestos-free roofing when the material was tested they discovered it had been falsely marketed and contained asbestos. This was because it was cheaper for companies to keep using old technology rather than upgrade to the different machines required to produce cellulose-fiber reinforced sheets, and there was little or no control over the use of asbestos in countries like Indonesia.

"Current guidelines," the speaker said "are complex and ineffective." What was needed was more broadly agreed and much simpler messaging like "keep it wet," on posters, leaflets etc. that could be pre-prepared in local lan-

In the aftermath of natural disasters, clean-up operations usually require the removal of large amounts of contaminated debris, as evidenced by this mound of building rubble at Aceh.

Easily identified asbestos debris at Aceh.

guages for the top 20 disaster-prone countries. Such messages needed to be made available in conjunction with simple tools and procedures to minimize hazardous exposures; unless these resources were available immediately, affected communities (who were the primary actors in post-disaster clean-ups) would continue to respond as previously – asbestos-contaminated rubble would be swept up by hand or machine and then dumped haphazardly and broken asbestos products would be used for temporary housing.

Ideally, an international agency with a ring-fenced budget and a mandate to advise on asbestos issues during emergency situations should be enfranchised to develop practical guidelines (and translate them into various languages), send personnel to disaster zones, help coordinate asbestos policy amongst local governments and aid providers, and progress the debate on phasing out the future use of asbestos in the affected country. Having seen the highly graphic photographs which illustrated Hodgkin's talk, there is little doubt that these recommendations should be considered a priority.

The majority of asbestos used globally has been in the production of asbestos-cement building materials. Even when countries ban the new use of asbestos, the presence of these products constitutes a threat to public and occupational health. In the presentation ***A Holistic Approach to Managing Asbestos Hazards***, Environmental Consultant Andy Oberta discounted myths propagated by industry about asbestos cement, stating categorically that:

> *It is a myth that asbestos fibers are locked firmly in a cement matrix; in fact fibers are readily released from asbestos-cement surfaces.*

- asbestos-cement roofing and siding could release fibers inside and outside buildings;
- asbestos fibers were readily released from asbestos-cement surfaces;
- asbestos cement could be crumbled to powder by hand pressure;
- paint and encapsulants did not offer permanent protection against asbestos fiber release.

Standards had been developed for the management of asbestos materials, including asbestos-cement building products, by the ASTM, the world's largest producer of voluntary consensus standards [45]:

- ASTM E2356 Standard Practice for Comprehensive Building Asbestos Surveys, which dealt with baseline surveys, sampling, exposure assessments and project design surveys;
- ASTM E1368 Standard Practice for Visual Inspection of Asbestos Abatement Projects, which focused on removal project management;
- ASTM E2394 Asbestos Cement; about work practices for installed materials;
- ASTM Manual on Asbestos Control: Surveys, Removal and Management – Second Edition, which explained the use of the ASTM standards [46].

With the use of a flow chart, the speaker explained how, taken together, these standards provided a scientifically validated framework for managing asbestos materials. Compliance with the ASTM asbestos-cement standards involved the prohibition of cutting with high-speed power saws, burnishing with high-speed wire brushes, cleaning with compressed air, high-pressure water blasting and the re-use and re-cycling of asbestos products. Concluding his presentation, the speaker said that "to use this holistic approach an infrastructure involving the public and private sectors is needed."

Some of the lessons learned by the Irish Electricity Supply Board (ESB) [47] in dealing with asbestos installed in its 30 power stations from 1927 to 1968 were the subject of the presentation ***ESB Experience of Remediating Asbestos Contaminated Land***, by Patrick Colman. After the ESB banned the new use of asbestos in its facilities (1968), codes of practice for managing asbestos, which exceeded requirements laid down in national legislation, were put into place.

After a review of the ESB's asbestos policy (1990), a 6-year plan was drawn up to remove all accessible asbestos from power stations; a budget of 13 million Irish pounds was allocated. While the removal of asbestos insulation was straightforward, the remediation of some former dump sites was problematic. In the 1960s, asbestos waste was disposed of with ordinary power station waste on sites within the grounds. After safety legislation was adopted in Ireland to protect workers (1972), all removed asbestos was bagged and disposed of in separate sites on station grounds [48].

As a result of the pre-1972 regime, locating areas where contaminated debris had been dumped could necessitate a fair amount of detective work: station records were consulted, former staff were interviewed and samples were taken at suspected sites – such as ash ponds. An incident in October 1998 illustrated the costly consequences of exporting soil from an industrial site. A contractor, who had sought in-fill from ESB for a housing development, inadvertently removed soil from the site of a local power station which had been used as an asbestos disposal site. When ESB staff became aware of this they immediately contacted people living in the development and started the process of recovering the contaminated soil. The area in the housing development was cordoned off and over a period of two months the ESB removed a considerable amount of asbestos-contaminated waste [49]. To carry out the decontamination, the company developed a management structure to oversee the work and a detailed methodology which specified techniques for surveying, sampling, risk assessment, remediation, inspection and air monitoring [50]. “The ESB has,” concluded the speaker “built up unique experience in managing the remediation and development of asbestos contaminated sites.”

The division in the United States between federal and state powers to regulate occupational health and safety issues creates gaps through which workers can be exploited, Vincent Brennan told delegates during his presentation: ***The Art of Applying Science to Asbestos Abatement: A Moral Obligation to Minimize Exposure While Maintaining Costs*** [51].

In 1995, as a result of a sting set by the University of Vermont, the use of unskilled and untrained illegal workers to remove asbestos was discovered. Twelve years later, a firm in Massachusetts was convicted on 28 felony counts of conspiracy, false payroll tax returns, counterfeit training records, non-payment of taxes and the use of illegal aliens to carry out asbestos work. Even where states, such as Vermont, had developed criteria to implement a federal accreditation plan, confusion persisted because of a lack of coordination amongst the different state departments tasked with enforcing the regulations.

The University of Vermont had developed a flexible protocol for asbestos removal and management projects which had achieved multiple benefits for business by focusing on performance-based activities, streamlining the procurement process, maintaining competition and contracting job ordering. Web based documentation increased financial transparency and ensured that the abatement process was properly managed; everything was documented consistently and efficiently so that more time and resources could be used to monitor work daily. The responsibilities of the various parties – owners, contractors, supervisors, workers – were clearly stipulated.

This new regime increased the ownership of all the actors, helped foster long-term relationships and increased safety not only relating to asbestos exposures but also for occupational risks such as electrical hazards, slips, falls and heat and cold exposures. Larger institutions had a moral obligation to hold contractors accountable, stipulate their expectations, ensure consistent working practices and train workers and supervisors. There were better workers and supervisors in Vermont and a higher level of protection for asbestos abatement workers as a result of the approach designed by the University of Vermont.

Throughout the world, sprayed-asbestos insulation was used on a massive scale during the twentieth century; even when new this material was highly friable and therefore capable of liberating asbestos fibers when handled. When it was decades old, such as was the case in the situation described by the next speaker, it was even more likely to cause hazardous airborne concentrations. A project recently completed in Vienna, Austria illustrates how the use of up-to-date technology and management systems can accomplish the safe removal of sprayed-asbestos fireproofing even under difficult circumstances. In the presentation ***Asbestos Removal in a Subway Station During Operation***, Engineer Heinz Kropiunik [52] outlined the requirements of this project:

- removal of 2,500 m² of sprayed asbestos from the ceiling of the subway station by 40 workers over a period of eight months; decontamination of all cables;
- workers, positioned on scaffolding [53] above the platform on which the passengers were waiting, had to work in a confined space (less than a meter high);
- 30,000 passengers used the station every day.

Throughout the asbestos removal, air monitoring was carried out on the passenger platforms of the subway station as well as in the working zone above. The use of scores of photographs by the speaker illustrated the difficulties posed by this project and the technical solutions which were found so that the removal work could continue while the station was open to normal traffic.

Cramped working conditions

Asbestos cement is big business in China, the world’s largest user of asbestos. There are more than 400 factories with 600 production lines annually outputting 300 million m² of asbestos-cement corrugated sheeting, said the next speaker, Lin Zhen [54] in his presentation: ***Development of Non-asbestos Fiber Cement Products in China.*** Even though the continuing use of asbestos was supported by stakeholders from the mining and construction industries, in light of the asbestos health hazard [55] research had been carried out in the last 20 years into the production of asbestos-free cement:

- autoclaved cellulose-fiber reinforced cement (CCA); CCA flat boards were used for sidings, partitions and ceilings. More than 200,000 m² of CCA boards were used in the Grand Stadium and other constructions for the Beijing 2008 Olympic Games (the use of asbestos was not permitted in the Olympic buildings); other key construction projects which used CCA boards were the South Station of Shanghai Subway line No. 1 and the Sino-French Centre in Tongji University, Shanghai.

- vinylon-fiber reinforced cement (VRC) corrugated sheets, flat boards and cable protection pipes were mainly being sold to the domestic market with some overseas sales; as the costs of VRC corrugated sheets were relatively high, demand was low.

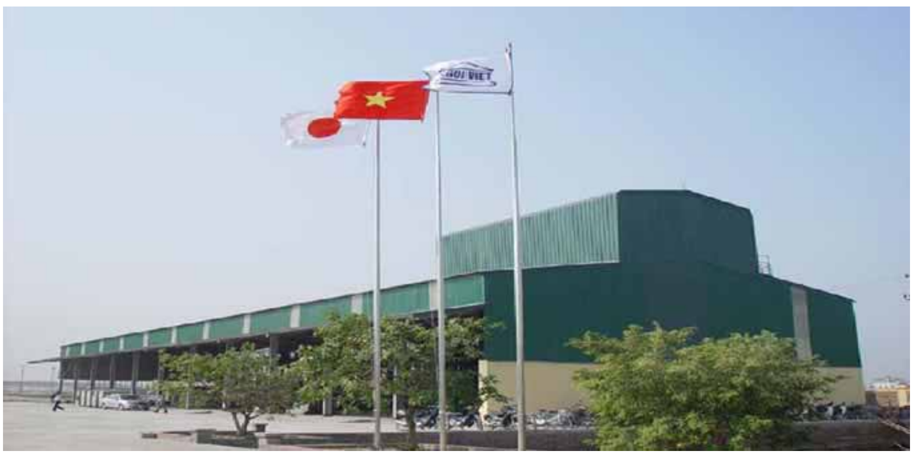
- glass-fiber reinforced cement (GRC) products were especially suitable for architectural decorative components and landscape decorative art works. Other applications were: lightweight partition panels, roof slabs with pre-stressed concrete ribs for grid structure, exterior wall panels, ventilation ducts and tube-shaped form works.

Despite these innovations, in 2005 asbestos-cement corrugated sheets and flat sheets accounted for 92% of all sales of fiber-cement roof and wall materials. Even so, the total dominance of asbestos cement was over and a transitional period had begun, during which asbestos cement and non-asbestos fiber cement would co-exist. The market for autoclaved calcium silicate board had been increasing quickly in recent years. The speaker believed that “non-asbestos fiber cement products represented the future development of the fiber-cement industry in China.”

As in China, asbestos-cement products continued to be popular in Vietnam and 50 factories produced nearly 100 million square meters of asbestos roofing sheets every year. In the presentation given by Nguyen Dinh Kien on the ***Technology and Equipment for the Production of Non-asbestos Corrugated Cement Sheets in Vietnam***, the speaker detailed major problems experienced in Vietnam in the industrial conversion of the Hatschek cement production process from asbestos to non-asbestos technology, such as fiber balling, delaminating, low cement yield and cracking [56]. In 1988, personnel at the Research Institute of Technology for Machinery (RMIT) started development work on the Hatschek process and machinery design for the asbestos-cement industry; twelve years later, they extended their research to the investigation of a production methodology and equipment for non-asbestos technology. In 2007, as a result of collaboration with Kuraray and Dipro International of Japan, RMIT succeeded in developing a highly efficient, low energy consuming, highly automated PVA-cement production line.

Pictures were shown of TTC, Vietnam’s first PVA-cement sheet factory; TTC asbestos-free corrugated cement sheets satisfied stringent tests for mechanical and physical behavior. As these products complied with Korean standards, exports were now being sent to that country. Although non-asbestos technology was, said the speaker: “very different in the equipment and production methods used and requires experienced engineers to solve the many technical changes, the achievement of non-asbestos technology in Vietnam opens the way for the replacement of asbestos in the fiber-cement industry in Vietnam and other countries which continue to use asbestos-cement products.”

During the discussion which followed the presentations, delegates expressed particular interest in the development of asbestos-free technology in China and Vietnam. In China, the availability of local raw materials meant that costly imports could be avoided. If you had needed to import raw materials said Mr. Lin Zhen, production costs would have been up to 30% higher. Even though production costs of asbestos-free materials in Vietnam were about 20% higher, some countries (Indonesia) had expressed interest in the new technology. With regard to mechanical properties, PVA cement was of a better standard than asbestos cement. PVA cement had also proved popular in Brazil which had now developed the ability to produce PVA locally in order to avoid the high costs of imports. The same equipment used for asbestos manufacturing had been adopted for the production of PVA cement. Although energy costs were 10-15% higher, output and new investment in the Brazilian PVA-cement industry were increasing.



TTC, Vietnam’s first PVA-cement sheet factory