PROTECTION AGAINST ASBESTOS DEBRIS IN POST- EARTHQUAKE CONDITIONS

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Abstract: *Many construction products contain asbestos. These are incorporated in the buildings that surround us. The term "asbestos" refers to six fibrous silicate materials that are naturally found in the Earth's crust. It consists of many tiny fibers that can be seen only by a microscope. When products containing asbestos are disturbed, the asbestos fibers are broken into smaller pieces and these pieces float into the air even under the smallest air currents. Friable materials are therefore to be removed from buildings before demolition since they are considered hazardous waste, whereas non-friable materials may be normally treated as construction debris.*
Key words: *asbestos, lead, paint, regulatory levels, effects upon health.*

1.INTRODUCTION

Earthquakes belong to the category of natural phenomena that are most commonly associated with catastrophes. These are the consequence of the huge amount of energy of the seismic impacts, the unpredictability of the time of their occurrence and the wide space in which they occur.

Since one has to deal with such an abrupt and unusual natural phenomenon that has multiple effects, it is clear that the study of earthquakes equally interests the geologists, the geophysicists, the physicists and the civil engineers and even the economists, planners, sociologists and philosophers. This is a complex and multidisciplinary work that requires collective labour and frequently, an international cooperation with the only goal of preservation of the most precious – the human lives. The central issue in this matter is the adaptation of the Man to the effects of earthquakes, i.e., undertaking of technical measures for protection against earthquakes.

All this means that earthquakes as natural phenomena are inevitable and people should consider these phenomena and adapt their activities, i.e., they should find an interrelationship.

2. SEISMICITY OF R. MACEDONIA

From the epicentral map of the Republic of Macedonia [7], it can be concluded that its territory is considerably seismically active. It shows the occurred earthquakes with M > 3.0 < M≥7.0. From the analysis of the epicentral map, it is concluded that individual areas in the Republic of Macedonia, including the bordering areas, are different in respect to their seismic activity.

There are three seismogene zones: Drim, Vardar and Struma zones stretching along the rivers bearing the same names. Individual parts of these zones represent epicentral areas, in which, in the considered period from 1900-2009, there have occurred the strongest earthquakes in our country. These epicentral zones of strong earthquakes (Fig. 1) are the following:

- Drim zone: Debar and Ohrid – Podgradec
- Vardar zone: Skopje, Valandovo – Gevgelija, Tikves
- Struma zone: Pehcevo – Kresna.

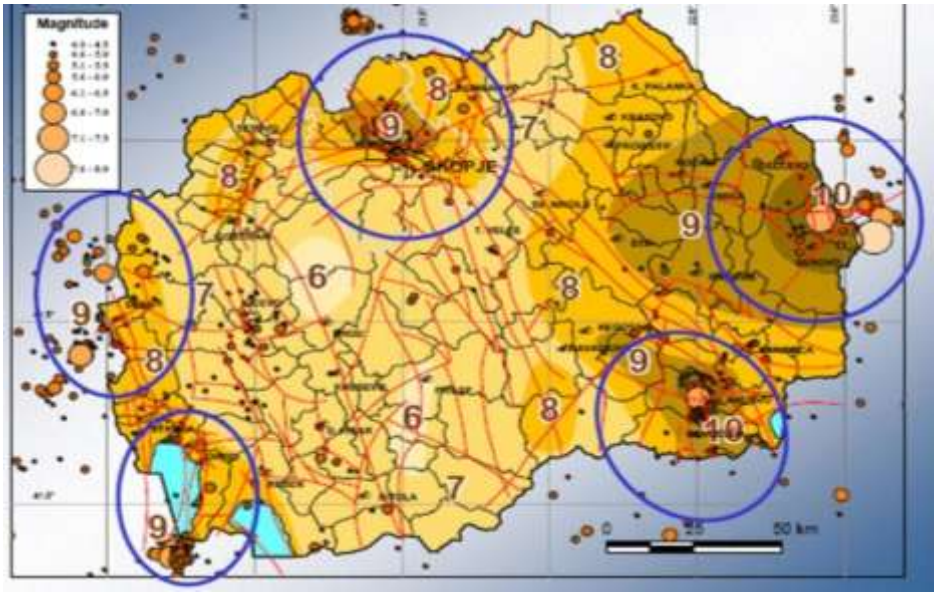

Fig. 1. Seismotectonic map of Macedonia

In addition to these main longitudinal seismogene zones, there are also secondary (transverse) seismogene zones as follows: Kustendil – Skopje – Debar; Pehcevo – Veles – Ohrid and Sandanski – Valandovo – Korca. The places where these zones intersect are places of the most

intensive seismic activity, i.e., these are the places of occurrence of the strongest earthquakes that have been recorded in Macedonia. From the investigations that have so far been performed, it has been defined that a larger part of the R. Macedonia is susceptible to strong earthquakes. These earthquakes are with an intensity of VII and VIII degrees according to the MCS scale.

The Skopje earthquake of 26th July, 1963 was a 6.1 magnitude earthquake according to Richter. It occurred in Skopje and also affected part of SFR Yugoslavia. 1,000 people were killed, 3,000 were injured and 120,000 to 200,000 people were left homeless. 75 to 80 percent of the city was destroyed Fig. 2.

Fig. 2. Ruins due to the earthquake of 1963

After each natural catastrophe, particularly a catastrophic earthquake, there comes an ecological catastrophe as well. The air and the water are polluted as is the entire environment. It is therefore necessary that the population be evacuated in tents in safe areas. To continue with life, water from cisterns as well as conserved food are

provided. The water is polluted [3] very fast, the water supply and the sewerage system don't function and the food is contaminated. Controlled motion of people is introduced as is also sanitary discipline and fast medical aid.

The ruins are composed of different construction materials that are ecologically unhealthy for the people and the environment and they indirectly affect the health of the people. The lethality rate is increased.

Asbestos is one of the constituent elements of construction materials. It was frequently used in construction in the past. Asbestos pipelines and sewerage systems as well as asbestos plates for the ceilings, etc. used to be made. There was a percentage of lead in the paints used in construction which also poses a danger for the human life (occurrence of cancer) [8].

These materials will be discussed in this paper. Reference will also be given to protection against them and establishment of regulations for their further use in the environment.

3. WHAT IS "ASBESTOS"

The exact definition of asbestos [1] varies depending upon whom you ask. For example, an OSHA regulator may give a different definition than one given by a geologist. In general, "asbestos" is the name given to six fibrous silicate minerals that occur naturally in the earth's crust.

3.1. WHERE DOES ASBESTOS COME FROM

Asbestos can be found in almost every section of the earth's crust. Only in a few countries, however, is there enough of it in the ground to make mining worthwhile.

3.2. FOR WHAT IS ASBESTOS USED

Asbestos fibers were used in two to three thousand different types of products or applications. The most common uses of asbestos [4] were:

- Thermal and acoustic insulation
- Fireproofing
- Textiles
- Asbestos concrete and cement
- Flooring
- Gaskets, packaging
- Roofing felts, papers, shingles
- Electrical insulation

3.3. ASBESTOS CONTAINING MATERIALS (ACM)

This is the broadest category of materials that might contain asbestos. Besides the commonly discussed construction products, this category includes many products used in industry either currently or in the past.

3.4. ASBESTOS CONTAINING BUILDING MATERIALS (ACBM)

The Asbestos Hazard Emergency Response Act of 1986 (AHERA) required trained inspectors to look for friable and nonfriable asbestos in schools.

The EPA created the term "Asbestos Containing Building Materials" (ACBM) to limit and focus the attention of inspectors. In brief, ACBM was limited to friable and nonfriable construction materials found inside buildings.

4. MISCELLANEOUS PRODUCTS

Miscellaneous materials include asbestos-containing construction materials that are not surfacing or thermal system insulation (TSI). The list of miscellaneous products and materials is extensive [9]. The list below summarizes only the most common materials and categories of materials.

4.1. ASBESTOS MATERIALS ON ROOFS

Asbestos was used extensively in roofing products. Asbestos containing roofing products include asphalt asbestos shingles, asbestos cement shingles, roofing felt, roofing paint and roof patching compound. These products are considered non-friable when they are new. Heat, water, the effects of weathering and time can cause these products to become friable.

4.2. CELING TILES

A small percentage of acoustic ceiling tiles contain asbestos. Usually these tiles contain pressed cellulose, woodpulp, fiberglass, or other mineral wools. Asbestos was sometimes added in concentrations of 5-20 percent. Most ceiling tiles are considered somewhat friable. The mastic or adhesive that holds the tiles to the wall or ceiling is actually more likely to contain asbestos than the tile itself. Suspended ceiling tiles rarely, but occasionally contain asbestos.

4.3. ASBESTOS MATERIALS ON FLOORS

Asbestos was often used to reinforce vinyl or asphalt floor tiles. Vinyl asbestos floor tiles are generally considered non-friable unless severely disturbed or subjected to abrasion. However, the mastic compound used to attach these tiles to the sub-floor often also contains asbestos.

Leveling compounds and mastics used on floors may contain asbestos. They are nonfriable during their application but can become friable over time.

4.4. ASBESTOS MATERIALS ON WALLS

Walls were constructed with many products that might contain asbestos. Some of these materials might be considered "surfacing materials" since they are sprayed or troweled on the surface of the wall. Many caulking, patching, mastic and leveling compounds contain asbestos. Most of the time they are considered a miscellaneous material even though, like taping compound, they are troweled on the wall surface. They are considered miscellaneous because they are more similar to the nonfriable miscellaneous materials than they are similar to the always friable surfacing materials.

Gypsum board Wallboard (also called sheetrock, wallboard, or drywall) rarely contains asbestos. Yet manufactures sometimes made it for special purposes included asbestos [6].

5. HEALTH EFFECTS ASSOCIATED WITH ASBESTOS EXPOSURE

Doctors and medical researchers have studied the illnesses associated with asbestos exposure for many years. These studies demonstrated that breathing asbestos fibers may lead to increased risk of developing one or more diseases.

Asbestos workers (in mining, manufacturing, and insulation installation) make up the majority of people who developed a disease as a result of asbestos exposure. These workers were frequently exposed to high concentrations of asbestos fibers and usually did not wear respirators. The asbestos abatement worker of today follows specific work practices and wears appropriate protection, including respirators, to minimize the risk of exposure [2].

Asbestos has negative effect upon the respiratory system It can cause asbestosis, which represents a restrictive lung disease reducing the capacity of the lung. Asbestosis is prevalent among workers, who have

been exposed to large doses of asbestos fibers over a long period of time [5]. There is a clear dose-response relationship between asbestos exposure and development of this disease. This means that the greater the asbestos exposure, the more likely asbestosis will develop. Asbestos is one known cause of lung cancer. OSHA estimates (based on research with heavily exposed workers) that employees exposed to industrial concentrations of asbestos have five times greater risk of getting lung cancer than those employees not exposed to asbestos.

Mesothelioma is probably the asbestos-related disease of the greatest concern since only a very small exposure to asbestos may cause it. Fortunately, it is also the rarest asbestos-related disease. Mesothelioma is a cancer of the chest lining (pleura). Pleural plaques indicate past exposure to asbestos (or some other dust particles) but they are not cancerous and do not necessarily indicate that asbestos disease will develop. Several other diseases are found more often among persons exposed to asbestos than in the normal population. These include cancer of the esophagus, stomach, colon, and pancreas, pleural plaques, pleural thickening, and pleural effusion.

In general, asbestos fibers can only cause disease when we breathe them. The more asbestos we breathe, the more likely we will get one of the fatal diseases. Those diseases are lung cancer, asbestosis and mesothelioma. All three have long latency periods before the symptoms of the disease are apparent. It normally takes between 10-40 years for asbestos diseases to become apparent.

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5.1. ASSESSING INDIVIDUAL RISK

We can define three kinds of exposure to airborne asbestos:

• Occupational exposure occurs on the job as a result of job-related activities;

• Incidental exposure may occur in buildings where asbestos-containing materials are present (and may have been disturbed);

• Environmental exposure occurs when the ambient air outside contains asbestos fibers.

• The risk of developing disease will vary according to the amount of exposure.

5.2. ASBESTOS REGULATIONS

Asbestos regulations are complicated and confusing, yet, it is very important to determine which regulations will apply before starting any asbestos inspection or work.

5.3. OSHA REGULATIONS

The Federal Occupational Safety and Health Administration (OSHA) is an agency for developing and implementing asbestos regulations. OSHA develops regulations, called standards, aimed at protecting the health and safety of workers. Employers must follow those regulations or be subject to financial (and sometimes criminal) penalties. OSHA inspectors may visit a job site to review work practices and determine if the employer is complying with the standards. Workers may call OSHA and complain about unsafe conditions. OSHA staff then visits the worksite and issue citations if their standards (regulations) have not been followed.

OSHA is concerned with worker health and safety. OSHA has asbestos standards for construction, general industry, and shipyards. Most asbestos removal and maintenance activity is covered by the construction standard 29 CFR 1926.1101.

The standard divides asbestos work into four work classes. The work class determines the amount of training required, the personal protection required, and the work practices required. The standard is very specific about exactly how asbestos can be disturbed in order to reduce airborne asbestos fibers.

6. CONCLUSION

Based on the above stated where it is clearly said what asbestos is and where it can be found in households, within the buildings and in nature and the extent it can harm people's health, it is necessary to observe the regulations for its use. This means that we need to know what the responsible agencies have prescribed regarding the use of the asbestos in everyday life, i.e., in the human environment. Two major agencies developing and enforcing asbestos regulations are the EPA and OSHA. The EPA enforces the AHERA Rule and the NESHAP. AHERA

requires public and non-profit private schools K-12 to inspect for asbestos and develop management plans to manage any ACM left in their buildings. The training standards and programs developed under this regulation now apply to all school, public and commercial buildings. That means that any asbestos inspection, project design, project supervision or work done in regulated buildings must be done by AHERA-accredited individuals. Knowing all this, it is concluded that we should be cautious and rigorous in making decisions about application of all construction materials and particularly asbestos in construction of structures.

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