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TECHNICAL REPORT

Review of Literature Related to Exposures and Health Effects at Structural Collapse Events

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Prepared for the National Institute for Occupational Safety and Health

INFRASTRUCTURE, SAFETY, AND ENVIRONMENT

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Summary

As part of the development of guidelines for personal protective equipment (PPE) for emergency responders, the RAND Corporation assembled information on acute and chronic health effects that might result from working in a structural collapse environment. The rationale for describing the human health risks associated with the post-collapse environment is to better understand the possible consequences of inadequate PPE at the site of a structural collapse.

In the months following the collapse of the World Trade Center (WTC) on September 11, 2001, several federal agencies monitored the air, dust, and water at the collapse site and in the surrounding areas. The air and dust sampled by these agencies were tested for hundreds of substances. Analyses of the dust and smoke aerosol that settled in the areas adjacent to the WTC after its collapse indicated that it was composed of a complicated mixture of pulverized building material and combustion by-products. The topics for the health effect summaries included in this report were selected by focusing on these two components of the mixture. Individual substances were selected that (1) had well-documented adverse health effects, (2) were likely to be present in other structural collapse environments, and (3) represented the full range of hazardous exposures in the structural collapse environment.

The report summarizes data on injuries among emergency responders available from incidents of structural collapse. It also reviews the possible health effects of substances likely to be found in the pulverized building materials, including asbestos, particulate matter, silica, synthetic vitreous fibers, and metals (arsenic, cadmium, chromium, lead, and mercury). Finally, the report describes the possible health effects of several combustion by-products, including benzene, dioxins, polychlorinated biphenyls, and polycyclic aromatic hydrocarbons. For each substance, information is summarized related to the following topics:

- identity, properties, and uses
- possible routes of exposure
- evidence for health effects from human studies
- occupational exposure limits
- carcinogenicity status.

Information about human health effects in these summaries is based primarily on published reviews.