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Project Summary

Characteristics of School Buildings in the U.S.

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A subsample of 100 schools from the Environmental Protection Agency's (EPA's) National School Radon Survey were visited to obtain information on building structure, location of utility lines, and the type of heating, ventilating, and air-conditioning (HVAC) system. Information from each school was entered into a database to determine the relative proportions of physical characteristics of the U.S. school building population. Results indicate that most school structures are of slab-on-grade construction, gravel was used as subslab fill material in approximately 50% of the structures, approximately 80% of the schools have either central HVAC or unit ventilators capable of delivering conditioned outdoor air to the classrooms, and almost 25% of the schools have subslab footings extending both beneath the classroom walls and along the corridors, thus complicating the installation of effective subslab depressurization systems. The results obtained in this study will be used by the EPA to guide future mitigation research in schools.

This Project Summary was developed by EPA's Air and Energy Engineering Research Laboratory, Research Triangle Park, NC, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Introduction

To help guide future radon research in schools and to better focus technical guidance documents, the Air and Energy Engineering Research Laboratory (AEERL) of EPA's Office of Research and Development conducted a literature search to find information that quantifies the physical characteristics of U.S. school buildings. Information specific to radon mitigation research in schools was not found in any existing reports or databases. As a result, AEERL's Radon Mitigation Branch (RMB) chose to characterize the U.S. school building population using a sample of 100 schools from the National School Radon Survey (NSRS). The schools are a nationally representative random sample selected by EPA's Office of Radiation and Indoor Air.

The 100 schools were visited to obtain information on building structure, location of utility lines, and the type of heating, ventilating, and air-conditioning (HVAC) system. Information for each school was entered into a database to determine the relative proportions of physical characteristics of the U.S. school building population. To record the necessary information, a building characteristic profile sheet was completed for each school by RMB staff engineers and selected contractors during 1991 and 1992.

The three-page profile sheet was developed for this project for on-site characterization of the structure, utility penetrations, types of HVAC equipment, and other building features pertinent to radon diagnostics and mitigation. Because many schools have several contiguous structures often constructed at different times and each with its own unique characteristics, the profile sheet was completed separately for each structure. In a few cases, where the structures are not contiguous but are

campus-style complexes, profile sheets were completed for each distinct structure in the school, unless all were of the same vintage and construction type.

Where available, building plans were examined to determine structure and HVAC system information that is not always available through on-site observation. Following inspection of the building plans, the school was visited to verify information on the plans and to collect any additional profile sheet information that was not on the plans. Complete sets of construction plans were available for only 40% of the structures. When plans were not available, the profile sheet was completed based on discussions with school personnel and the judgement of the researchers.

The results of the survey provide many significant findings concerning the distribution of school building characteristics. The profile sheets provide evidence of the variety of building structures and HVAC equipment found in typical schools. The age of a school, number and size of different structures, type of substructure, location of utility lines, and types of HVAC equipment vary widely in the sample schools.

Major Findings

Major findings of this study relative to radon diagnostics and mitigation are:

- Over 70% of school structures have slab-on-grade construction;
- Gravel was used as subslab fill material in approximately 45% of the structures with information available;
- Approximately 40% of schools have a single type of HVAC system in all classrooms;
- Approximately 80% of the schools have either central HVAC or unit ventilators capable of delivering conditioned outdoor air to the classroom; and
- While over 50% of the structures have no internal subslab footings (thus facilitating mitigation with subslab depressurization systems), almost 25% of the structures have footings both along corridor walls and between classrooms (thus complicating the installation of subslab depressurization systems).

The distribution of the profile sheet responses into the categories used for data analysis required reducing detailed responses to shorter, categorical responses for many of the profile sheet questions. The original responses for each school were entered into a dBase IV file, and a separate file was created containing the shorter categorical responses used for the statistical analyses.

The full report discusses the random sample selection procedures, describes the information collected on the building characteristic profile sheets, summarizes some of the results recorded on the school profile sheets, compares the results with those observed in RMB's research schools, describes the accompanying dBase IV data files, and presents the statistical limitations of this study. The information collected during this study may be useful to EPA and others to guide future radon mitigation research in schools.

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The complete report, entitled "Characteristics of School Buildings in the U.S.," (Order No. PB94-121704; Cost: $19.50; subject to change) will be available only from:
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5285 Port Royal Road
Springfield, VA 22161
Telephone: 703-487-4650
The EPA Project Officer can be contacted at:
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