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Project Summary

Case Studies Of Radon Reduction Research In Maryland, New Jersey, and Virginia Schools

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This report details the radon mitigation research in school buildings in Maryland, New Jersey, and Virginia that was conducted during 1991 and 1992. One school in each state was selected for the research. In two schools, the objective was to evaluate the potential for modifying the school ventilation system to control radon concentrations. The other school was newly constructed with radon resistant features, and the objective was to evaluate the effectiveness of those features.

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).

Paramount Elementary School

School mitigation research to date has emphasized reduction of radon levels using active subslab depressurization (ASD). Although ASD has proven successful in a number of schools, alternative techniques may be required in some schools: one promising alternative is modifying the heating, ventilating, and air-conditioning (HVAC) system in the school to provide radon mitigation. The Paramount Elementary School in Hagerstown, MD, was selected because it was a typical older school with a unit ventilator HVAC system, and it had an ASD radon control system.

The unit ventilator HVAC system in one wing was modified, and its radon mitigation potential was tested under a number of conditions. Several problems in providing radon mitigation with unit ventilators were encountered at Paramount: unit ventilators do not generally provide a constant ventilation rate, their ventilation capability may be reduced to achieve increased energy conservation, or they may be poorly maintained. However, when these problems were corrected at Paramount, the radon mitigation performance was comparable to that of the previously installed ASD system. Unfortunately, the radon mitigation performance observed at Paramount was probably enhanced by the passive stack action from the two ASD stacks that were unsealed, although their fans were turned off.

Desmares Elementary School

The Francis A. Desmares Elementary school near Flemington, NJ, completed in September 1991, was selected because the 1989 building design included a rough-in of an ASD system with 10 stacks and a network of perforated pipes in the subslab aggregate. Subslab pressure field measurements after construction indicate that one or two stacks equipped with exhaust fans would probably provide adequate radon mitigation performance, and that one active stack can depressurize at least 50,000 ft^2 (4645 m^2) if subslab barriers are absent. The Desmares subslab depressurization was achieved without significant additional slab sealing. The $25,000 cost of this system could probably be reduced to about $5,000 by reducing the number of stacks and using less expensive subslab perforated piping.

The report also describes a simple method of characterizing pressure field extension (PFE) data, a method that was

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used to analyze PFE data from the Desmares school and compare it with another building. Test equipment to simplify PFE measurements is described.

Dranesville Elementary School

The Dranesville Elementary school in Herndon, VA, was selected because it had a modern variable air volume (VAV) HVAC system that could be compared with the standard ASD radon mitigation technique. The school also has an ASD radon control system. The school was built in 1987 near houses with elevated radon levels, and the school design incorporated features for easy radon mitigation with ASD. When 1991 radon tests showed elevated concentrations in one wing, a single-stack ASD system was installed by school personnel.

During the summer of 1991 when the school was generally unoccupied, the ASD system was shut down and the HVAC system operation was changed in a controlled manner over several weeks. The data collection included continuous measurements of radon, pressures, and temperatures. The results show that the indoor radon concentrations were very low during the weekdays under all VAV operation modes, while higher radon levels were measured on the weekends. Two factors are suspected to have caused the low radon levels:

1) unanticipated increased ventilation because school personnel corrected an error in their HVAC control strategy just before the experiment started, and
2) reverse stack pressures in the building because the summer outdoor temperatures were generally higher than the inside temperatures.

Unfortunately, the radon levels in this school were too low during the summer to be useful in evaluating VAV HVAC modification as a radon mitigation tool. The reverse stack effect in this building suggests that summer indoor radon concentrations may be quite different from winter radon concentrations. The subslab radon concentration measurements suggest that large variations in these levels make it difficult to interpret spot measurements.

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The complete report, entitled "Case Studies of Radon Reduction Research In Maryland, New Jersey, and Virginia Schools," (Order No. PB94-117363; Cost: $27.00; subject to change) will be available only from:
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