



21CR Project 612-40041

Investigation of Building Exhaust Air Re-Entrainment into Outdoor Air Intakes of Packaged Outdoor HVAC Equipment — Phase II

Updated 9 March 2006

Objective:

The objectives of the project are to determine the extent of building exhaust re-entrainment under a variety of wind, temperature, unit designs, and structural conditions. Also intend to verify the applicability of existing equations contained in Chapter 44 Of the 2003 ASHRAE HVAC Applications Handbook (also Chapter 15 of the 1997 ASHRAE Fundamentals Handbook and Chapter 43 of the 1999 ASHRAE HVAC Applications Handbook), to suggest refinements as needed, and to demonstrate the use of commercial CFD models to more accurately characterize re-entrainment through correlation with measured results.

Information/items expected to result from this project:

The output of this research will allow ARTI to determine if packaged products being manufactured by its member companies are designed to deliver an acceptable quality of fresh air into the occupied space. The expected results of this project are as follows:

- 1 Guidelines for the spacing of multiple units to minimize re-entrainment.
- 2 Guidelines for the separation distances between ground units and buildings, or roof-top units next to walls or parapets, to minimize re-entrainment.
- 3 Data will be generated to support the ASHRAE Handbook prediction methodology and CFD prediction capability, by comparing the predictions with the data collected on this project.
- 4 Verification of a CFD model will provide a cost-effective tool for analyzing plume flow fields, and a means to generate new/or modified design guidelines.

How are the results likely to be applied:

Manufacturers of packaged equipment and building design engineers will be provided with an understanding of the magnitude of problem of exhaust air re-entrainment and recommendations for possible solutions. ASHRAE Handbooks will be provided technical data upon which to develop standards or guidelines concerning installation of packaged equipment with respect to re-entrainment of exhaust air. Building owners and occupants will be provided better IAQ.

Research subcontractor:

Battelle Memorial Institute, Columbus, OH (Principal Investigator: Rodney Osborne)

Status:

Project has been concluded and a final report approved for release. The final report is available for free by downloading from it from the ARTI website.

Responsible 21CR Subcommittee: System Integration and Indoor Environmental Quality