Indoor Air Quality Design and Performance of Modern Office Building Designed for both Energy Efficiency and Superior Indoor Air Quality and Comfort

W.A. Turner, P.E. **F.W. McKnight** **S.M. Martel, P.E.**
Lorin Belinda, AIA

ABSTRACT

In late 1991, a U.S. company embarked on the design of its new 280-m² (3,000-ft²) branch office. The facility is located in a rural area and is surrounded by a wooded area with no local sources of man-made air pollution emissions. However, as with most of the Northeast, the area routinely exceeds the U.S. Environmental Protection Agency ozone guidelines during hot summer periods and is exposed to wood smoke emissions during the winter period. Given the firm's recognized expertise in the field of air quality engineering, it was determined early on that the design features for this office building would incorporate items of both traditional and recent concern.

Design goals included reasonable costs (less than US $500 per m² ($50 per ft²), suitability of the facility for use as an office/research building and indoor air quality/HVAC diagnostics training facility, resaleability as a residential structure, superior indoor air quality and comfort (European category "A" plus), and maximum energy efficiency (less than $2,000 annual total energy cost).

These goals were accomplished through the use of modern cost-effective concepts. Features that have been incorporated into the design include a) source control of construction materials and building furnishings; b) local exhaust; c) radon soil gas venting; d) transfer air utilized for exhaust makeup; e) high ventilation efficiency (a goal of 150% by ASHRAE definition) and a variable-air-volume system; f) high-efficiency air filter and gaseous absorption media; g) an extremely tight building shell, facilitating positive building pressurization; h) a nonglare, high-efficiency lighting design; i) an energy management and control system; j) double-wall, high R-value construction; k) air-to-air heat recovery at "minimum" outdoor air; l) a full air economizer; m) high-COP airconditioning; and n) a condensing gas boiler. This presentation will focus on the indoor air quality, health, comfort, and energy-efficient aspects of the design approach and results of air quality gaseous and particulate testing that has been conducted to date in this building and another built in 1989.

W.A. Turner, F. W. McKnight, S.M. Martel, and Lorin Belinda are with the H.L. Hunter Group Inc. Concord, NH, USA.