UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

Kevin
Steve

A 12(A)

June 3, 1987

MEMORANDUM

SUBJECT: Use of ISC to Predict Building Cavity Concentrations

FROM: Dean A. Wilson, Meteorologist
Source Receptor Analysis Branch (MD-14)

TO: Mike Koerber, Regional Meteorologist
Air Programs Branch, Region V

This response to your request has primarily been developed by J. Dicke who is more familiar with answering building downwash/cavity modeling questions. Although, R. Lee has recently responded to similar questions from J. Lax, State of Michigan DNR (with copy to you), we have now considered these questions in more detail.

A review of the literature and conversations with others have not identified any method superior to that in Appendix C of the Regional Workshop Report you cite unless considerably more sophisticated input data than building dimensions are available. A few additional ideas are presented in Chapter 7-8.2 of Atmospheric Science and Power Production but they are couched with caveats and pleas for experimental data to confirm the estimates so obtained. Since the basic time average of one hour is assumed for the Appendix C screening procedure, the corollary assumption of uniform mixing within the cavity over this interval is reasonable and is not disputed in the above reference, from which the Appendix C method has its roots.

The second suggestion, to modify the ISC code to allow calculations of toxic/carcinogenic chemical concentrations within 3L of the source, is questionable as you note. First we have no experience to judge the validity of the model estimates even if the numbers turn out to be higher than from the Appendix C approach. A second difficulty then arises if the recommended screening technique does not yield more conservative estimates than the refined model (ISC), even though ISC would be used outside of its stated limitation of 3L. This is because screening techniques, by design, are expected to yield conservative estimates

compared to estimates from a refined model. Moreover, the version of ISC modified to allow estimates within 3L becomes a nonguideline technique. In our opinion, modifying a guideline model without adequate technical justification is not acceptable. Thus, for consistency, we recommend against accepting any cavity estimates from the ISC model as modified by the State of Michigan unless supported by a performance evaluation which utilizes ambient monitoring data from with the building cavity.

If the interest is to ensure a conservative estimate, one suggestion might be to vary the coefficient of 1.5 in the cavity equation. That number is not necessarily the most conservative value cited in the literature; others mentioned in the above reference might be justified in this situation. Another suggestion might be to perform a hand-calculated estimate using a standard Gausssian modeling technique, such as described in the Workbook of Atmospheric Dispersion Estimates, for plume centerline (or off-centerline, as appropriate) concentration at the distance of the intake vent. Reasonable assumptions on initial sigmas or use of a virtual point source approximation to account for the building dispersion might be appropriate in this case.

If you require further assistance, please call Jim at FTS 629-5682.

cc: J. Dicke
R. Lee
J. Tikvart