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

cc Roy/Henry Annamaria/ Bill B. recv. 2/22

FEB 0 2 1994

MEMORANDUM

SUBJECT: Wind Tunnel Report for Determining Equivalent Building Height Determinations for the Cape Industries Facility of Wilmington, North Carolina

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

TO: Brenda Johnson, Regional Modeling Contact
Region IV

In response to your request, the Model Clearinghouse has completed its review of your position that equivalent building heights, as determined from a wind tunnel study, may be used in Industrial Source Complex (ISC2) modeling of the subject source. In principle, we agree with your position that such a wind tunnel study can be accomplished. However, we are not convinced that the Company's consultant, CPP, has demonstrated and documented, within an acceptable level of uncertainty, that their wind tunnel derived building dimensions are appropriate.

As you are aware, we asked Dr. William Snyder, Chief of the Environmental Protection Agency's (EPA's) Fluid Modeling Facility, to review the technical details of the wind tunnel study performed by CPP. Dr. Snyder's comments, as well as our request memorandum to him, are attached. It is clear from his comments that he had a very hard time forming a conclusive opinion on the study. Furthermore, Dr. Snyder does not believe that the wind tunnel study should be designed around the requirements of Good Engineering Practice (GEP).

We had a followup discussion with Dr. Snyder in order to better understand some of his comments. In that conversation, we mutually agreed that in principle it is possible to design a wind tunnel study to derive a set of pseudo building parameters for input to the ISC2 model. However, given the results presented, and setting aside the many problems with errors and inconsistencies, we are not convinced that the CPP study has enough data points in every case (five points along each downwind direction) to derive the appropriate pseudo parameters with an acceptable degree of uncertainty.

A more complete analysis and write-up might be convincing that the wind tunnel study that CPP conducted is acceptable and that the building dimensions so derived can be used in ISC2. If the Company chooses to do this, they should insure that their write-up is "educational" enough that people such as ourselves who are not intimately familiar with fluid modeling, as Dr Snyder is, can understand what was done and be convinced that it is accurate and appropriate. Information should be provided that clearly define the criteria employed to insure that the wind tunnel simulations are appropriate and meaningful. Are five locations sufficient to define the variation of concentration values as a function of downwind distance, including the magnitude and location of the maximum concentration value? As an illustration of this point, note that for one set of data, Dr. Snyder was able to fit several possible curves to the five data points, showing a possible significant uncertainty in the location and magnitude of the maximum concentration. The uncertainties resulting from the inherent limitations of such simulations should be explained, so that one can understand the basis for the criteria employed on defining "acceptance." For instance, if repeatability in wind tunnel simulations is typically within plus and minus 10% (they should provide a basis appropriate to their experience), this should be reflected in the definition of the criteria used to determine when the equivalent building dimensions have been determined. Having defined the "acceptance criteria," the statistical results should be clearly available showing that such criteria were met. For instance, where is the assessment exploring whether bias and scatter between the pseudo building results and the actual simulation results vary as a function of distance downwind?

Insuring not only that the various technical aspects are adequately addressed, but that the summary of the results is clear and complete, is important not only so that we can be convinced that what was done is technically supportable but so that we can further communicate the information to managers and to the general public in such a way that they can also make an informed judgment on the worth of the proposal. This means that the report will need to contain not only the scientific details but also considerable explanatory material such that these scientific details can be translated into more commonly understood language.

In summary, we agree with your position that in principle the fluid modeling can be used to derive ISC2 input parameters. However, we are not confident that the study for Cape Industries has derived parameters that can be confidently used.

If you have any questions, please contact me.

Attachments

cc: J. Irwin
D. Neeley
F. Schiermeier
W. Snyder