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

8 DEC 1993

MEMORANDUM

SUBJECT: Equivalent Building Height Determinations for Cape Industries

FROM: John S. Irwin, Chief
Techniques Evaluation Section, OAQPS (MD-14)

TO: William H. Snyder, Chief
Fluid Modeling Branch, AREAL (MD-81)

Pursuant to our discussions of December 1, attached is a copy of the fluid modeling report and video for the subject facility. As we discussed, the report purports to having determined, through fluid modeling, building heights for solid buildings that would be "equivalent," from a wake effects standpoint, to the heights of several lattice structures at the facility. By "equivalent," they apparently mean "produce similar concentrations" to the lattice structure (see page 6). These equivalent building heights are then to be input to the Industrial Source Complex Short Term Model (ISCST2) to determine concentrations in the vicinity of the plant for comparison to the National Ambient Air Quality Standards.

Per our agreement, please review this report and provide us with written technical comments by January 10, 1994. We will then evaluate your comments together with other regulatory considerations and recommend to Region IV whether or not the ISCST2 model with equivalent building heights, may be applied to the facility. Region IV indicated that they will send us a short request memorandum on this issue. It is my understanding that the memorandum will indicate that they believe, subject to your evaluation of the technical supportability of the fluid modeling study, that the equivalent building heights are appropriate for the regulatory modeling.

We have scanned through the report ourselves and have made several observations on their procedures and results. These comments are attached. We would appreciate your thoughts on these comments, i.e., are they true concerns and are they relevant to the bottom line question which is, will the equivalent building heights determined in the wind tunnel result in realistic concentration estimates with ISCST2?

We appreciate the time of you and your staff on this review. Please send the report and video back with your comments for our reference and files. If you have any questions, please contact Dean Wilson at 1-5683 or me at 1-5682.

cc: B. Johnson

Observations/Preliminary Comments on "Equivalent Building Height Determinations for Cape Industries Facility of Wilmington, North Carolina"

D. Wilson, J. Irwin
12/2/93

1. The title of the report and the designation of "equivalent building height" is a bit misleading since what is derived from the fluid modeling is really all three dimensions of the equivalent building as well as that building's simulated location.

2. The fluid modeling appears to be conducted for neutral to slightly unstable conditions. The modeling with ISCST2 for the equivalent building would cover all stabilities. Is there any concern that the equivalent building (for purposes of ISCST2 input) might be different for unstable or stable conditions?

3. This facility is extremely complicated with a large number of buildings of all different shapes, sizes and locations with respect to the 10 stacks. Are the conclusions that one can draw from fluid modeling greatly compromised because of the complexity of the facility? Or, maybe the better question is whether they are compromised to any greater degree than the uncertainties associated with straightforward ISCST2 modeling of such a complicated facility?

4. We realize that it just follows GEP procedural logic, but we are bothered by the scheme on page 6 where the equivalent building height for ISCST2 input is assumed to be zero if the excess concentration for buildings in vs. buildings out is less than 40%. It seems that they have been able to completely discount the wake effects of some lattice structures purely because of the definition of GEP stack height. A related question is does the fluid modeling checklist (Appendix C) only apply to GEP determinations and not to the somewhat different purposes of this study?

5. The "90% criteria" described on page 16 for determining the equivalent building height seems arbitrary and really not all that conservative. Does that say that the concentration could be underpredicted by as much as 10%, using the equivalent building height? Because of inexperience with this procedure, would it not be wise to ensure that concentration estimates are biased high by inputting the most conservative building dimensions?

6. There appears to be a typographical error in the table on page iii. In that table there is a Source B-3, whereas in the material that follows, including the appendices, Sources B-1, B-4, and B-5 are listed. Based on information in Tables 6a, 6b, and 6c, we believe that on page iii Source B-3 is really B-4 and Source B-4 should relabeled as B-5.

7. It is really difficult to determine what buildings are being replaced by equivalent buildings from the material presented. They provide tables of the "equivalent" dimensions for the relevant buildings in Table 1. But, we cannot find a graphic that shows us these 12 buildings individually from several viewpoints, including their locations, nor can we find the actual (real) dimensions of the building(s) they replace. Given that this is a discussion of the difference between what is actually present in the building construction versus a solid building, where is this information for comparison?

8. Related to Comment 7, it appears from the photographs that for each stack, several buildings, including solid structures, are being replaced by a single solid structure (location unknown). This is a little different from the original impetus of the study, which was to determine appropriate building dimensions for lattice types of structures. Perhaps the replacement of all the significant buildings influencing each stack was a necessary component to a useful wind tunnel modeling analysis, but the implications are somewhat uncertain. Should not the ISCST2 runs using the original building dimensions be compared to the estimates with the new building dimensions?