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

February 23, 1987

MEMORANDUM

SUBJECT: University of Iowa, Iowa City, Iowa
Selection of Structure Diversions for Input to ISCST Model

FROM: Joseph A. Tikvart, Chief
Source Receptor Analysis Branch (MD-14)

TO: Richard L. Daye
Regional Meteorologist, Region VII

Russ Lee and Jim Dicke have reviewed your technique for selecting building dimensions for use in the ISC model. As you know from your telephone conversation of February 6 with J. Dicke and Russ Lee, we differ in some details with your approach, but these differences probably do not affect the modeling results.

We concur that the boiler house must be considered as well as the silos. The Regional Workshops on Air Quality Modeling: A Summary Report Appendix C, states on page C-4 that the first step is to "determine the 'worst case' building dimensions for input into the model. To model 'worst case' conditions, care should be taken to use the same critical building dimensions (maximum projected width and/or height) that give the greatest stack height in the GEP analysis." Note that the choice of receptor is not a factor in this determination.

The combination of the silos and the boiler #11 enclosure may be treated as a single structure based on the Guideline for Determination of Good Engineering Practice Stack Height, Section 3.3.2. The greatest projected width for all wind directions is the distance from the east corner of the proposed silos to the west corner of the boiler #11 enclosure, approximately 47m. The projected profile along this direction shows the boiler #11 enclosure to have a height of 30.48m and a projected width of about 13m. The silos have a height of 42.06m and a projected width of about 19m. The gap between the two structures is about 15m. Since the lesser of the height and projected width of the silos (19m) is greater than the gap, the gap may be treated as though it were filled by a structure of a height equal to the height of the lower structure (30.48m). This is the greatest width, and therefore produces the greatest justifiable GEP stack height (76.2m) considering these two buildings and considering all wind directions.

The GEP Guidelines Section 3.2, states that "the GEP stack height [and therefore the modeling of that source] should be based on the plane projection lying upwind from the source (stack) which results in the greatest justifiable height." The projected width on which the modeling is based is thus independent of both the hourly wind and the receptor direction. For this reason, we differ with your proposal to use a different projected width for different receptors around the same source. Referring to the plan of the plant, the wind direction that is associated with the maximum width of 47m derived above does place some part of the building upwind of each of the stacks. Thus, 47m is the appropriate projected width for each of the stacks. Note that considering the proposed silos alone results in a GEP stack height of only about 71m, which is not the greatest justifiable height.

So far, this analysis has ignored the silo southwest of the boiler #11 enclosure. Including that silo increases the projected width to about 66m. Since the ISC model, for stacks above 1.2 buiding heights, uses only the lesser of the building height and the projected width, any building widths greater than 30.48m will have no additional effect.

Our recommendation is to evaluate building wake effects for each of the stacks based on a building height of 30.48 meters and a projected width of 47m (or 66m - the predicted concentrations will be the same).

As you are aware, for the ISCST to use a projected width of 47m, one must input building length and width of 47 x$\sqrt{\pi}/2$ = 41.7m each. For a 66m projected width, the corresponding input length and width are each 74.5m.

SHOULD BE 58.5m

cc: D. Wilson
bcc: Regional Modeling Contact, Regions I-VI, VIII-X