



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII
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SUBJECT: Stack-Structure Relationships

FROM: Richard L. Daye, Regional Meteorologist

TO: Joseph A. Tikvart, Chief
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This is a follow-up to the telephone conversation of February 29, 1988, that I had with your staff in which we discussed the policy for selecting building/structure parameters for emission points that are not directly downwind or upwind of a dominating structure. Page 2-35 of the December 1987 version of the Industrial Source Complex (ISC) Dispersion Model User's Guide - Second Edition (Revised), Volume I, contains the statement ". . . For regulatory application, a building is considered sufficiently close to a stack to cause wake effects when the distance between the stack and the nearest part of the building is less than or equal to five times the lesser of the height or the projected width of the building. . . ." I asked whether the intent of the change in the user's guide is to apply this criterion to all directions from the dominating structure. In Region VII, we have been using this criterion when the stack is downwind or upwind from the structure. This distance is used for upwind sources as the fluid modeling studies done for sources in Region VII have shown dynamic wake effects as the plume from an upwind source passes over a dominating structure or terrain feature. We have not used this great a distance when the stack is adjacent to or beside the structure. I also asked whether the modeling clearing house knew what critical distance other regions are using and what the EPA policy is on selecting the distance.

The criteria for determining when a plume is no longer affected by a building/structure when the stack is "close to" the building/structure but not directly downwind or upwind of the building/structure are of great concern to us as we have several evaluations where this decision must be made. Unfortunately, there is little information in the literature that address how plumes from sources located adjacent to a structure are affected by the structure.

The Empire District Electric Company's Riverton Power Station evaluation is an example of a situation where the emissions points may be adjacent to the dominating structure. The evaluation is for a PSD permit application (NO₂) and a potential SIP revision (SO₂). The section of the power station's plot plan that contains the identified emission points, two cross sections indicating the structures that the wind flow encounters as it approaches and passes the main stack to the critical receptors, one cross section with flow from the proposed turbine units and parallel to the tallest structures, the company's/consultant's plot-plan sketch, and the portion of the USGS chart showing the location of the facility are enclosed. The plot plan and the cross sections contain the structures that may effect the plumes from the various stacks. The critical receptors are about 200 meters north-northwest of the main stack.

The parameters that I believe should be used as input to the Industrial Source Complex Short-Term (ISCST) model for these wind flows are enclosed. In this particular evaluation I am confident that the structure dimensions are appropriate. The stacks are within one structure height or width of the selected structure. I believe that sources located adjacent to a structure and within two building/structure heights or widths of a structure are significantly influenced by the structure. Stack parameters must be considered as well as the structures so the decision as to what structures to use is a case-by-case evaluation. However, I believe that maximum distances should be established in terms of the dominating building/structure height or width.

We keep receiving different information from the company or consultant so that these data may change again. However, the information that I have included is sufficient to serve as an example of the problem. The need to consistently determine the building/structure data exists.

I have also included a more generic example, CASE 4. It shows a stack at various distances from a group of influencing structures. Again, the question is at what distance does these structures quit influencing the plume from the stack located adjacent to the structure.

I recommend that we adopt a policy of considering building/structures whenever a source adjacent to a building or structure is located within two or three building/structure heights or widths of the building/structure. The characteristics of the source will determine whether the building/structure should be included. The building/structure data must be included in the model whenever the source is within one building/structure height or width. Your comments are welcome.

Enclosure: a/s