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Modification to ISC

Michael Koerber
Regional Meteorologist

Dean Wilson
Source Receptor Analysis Branch

The purposes of this memo are (1) to discuss a proposed modification to the calculation of building downwash in ISC, (2) to present Region V's position on the modification, and (3) to request the Model Clearinghouse's comments.

Proposed Modification

Dames & Moore has developed a two-step process that allows ISC to incorporate wind direction-dependent building dimensions in the calculation of building downwash. In Step 1, the PREWAK program selects the constraining dimensions for each 10-degree wind direction sector for each stack. In Step 2, ISC uses the appropriate dimensions in calculating the one-hour average concentration due to each stack.

In Step 1, the user inputs:

(1) the downwind "region of influence" parameter (assumed to be 5L)
(2) the "region of influence" parameter for all other directions (assumed to be 0.25L)
(3) for each building block, the center coordinate, length, width, and height,
(4) for each emission point, the stack coordinates and stack height.

The PREWAK program loops through each of the 36 wind directions and first determines which sources fall within the "region of influence" of each structure. In the case of building tiers, not only are the individual tiers examined, but also one "structure" represented by the maximum width (of any tier) and the average height (of all tiers) and the group of "structures" represented by the maximum width and average height of all the upper tiers. If a source falls within more than one structures' "region of influence", then the structure whose dimensions yield the greatest GEP formula height (i.e., H + 1.5L) is selected. The PREWAK program output consists of a table of constraining building dimensions for each source for each of the 36 wind directions.

In Step 2, the ISC program calls upon the PREWAK output tables in selecting the appropriate building dimensions to use in calculating the one-hour average concentration due to a given source. Consequently, the building dimensions are allowed to vary hourly for each souce according to the acutal hourly wind direction.

(For additional information, please consult the attached "User's Guide to PREWAK").

Region V's Position

In general, we believe that the use of the actual building dimensions is preferable to ISC's assumption of a constant set of dimensions. Furthermore, the ISC User's Manual supports the use of "receptor-specific" dimensions. Thus, Dames & Moore's routine is acceptable to us, provided two changes are made:

(1) An upwind "region of influence" parameter of 2L should be specified, based on "Incorporating Building/Terrain Wake Effects on Stack Effluents", A. Huber, 1977, Preprint Volume for the Joint Conference on Applications of Air Pollution Meteorology

(2) For tiered structures, only the individual tiers should be examined, consistent with the "Guideline for Determination of Good Engineering Practice Stack Height", DRAFT November 1984.

EPA acceptance/rejection of Dames & Moore's approach at this time is necessary since Dames & Moore is under contract to many sources in Wisconsin who are developing SO_2 emission limits in response to Region V's April 26, 1984 SIP deficiency notice (copy also attached). I look forward to your comments.

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