Building Downwash Analysis

Note: **In most cases, the structure which will need to be input into the computer model (i.e. has the highest GEP stack height and is "nearby") will be the tallest structure nearest the stack of concern. For some (most likely large) facilities there may be more than one structure which creates building downwash. For each stack evaluated, there will only be one structure with the highest GEP stack height, however it may be a different structure for each stack evaluated. For most cases though, the structure which is determined to have the highest GEP stack height and is "nearby" will be the same structure for all stacks at the facility.**

1. Each stack must be evaluated separately. Different structures may affect building downwash for different stacks. The stack height should be determined for each stack. The stack height is the distance from the ground to the top of the stack (in some cases this will be the building height plus the stack height above the building).

2. For each structure being evaluated, determine the height, length (maximum horizontal dimension), width (minimum horizontal dimension), and the projected width (if needed) - all dimensions are in feet. The projected width is needed if the building height is greater than the building width.

   The "projected width" is calculated as follows:

   Projected Width = $[(\text{length})^2 + (\text{width})^2]^{0.5}$

3. Determine the distance from the given stack to the structure being evaluated.

4. Determine the stack influence area (i.e. **"nearby building"**) for each structure being evaluated. The stack influence area is defined by a circular area with a radius of five (5) times the lesser of the 'building height' or 'building projected width' from the stack. Compare this stack influence area with actual distance between the structure and the stack. Do not consider buildings or structures more than 2625 feet or 800 meters from the stack. If the structure is not within the stack influence area ,or is more than 2625 feet away, then the structure does not need to be considered for building downwash purposes.

   Stack Influence Area ("nearby building") = 5 X (Lesser of Building's Height or Projected Width)

5. For all "nearby" buildings or structures for the stack of concern, calculate the GEP stack height for each building or structure.

   GEP stack height for structure = Building Height + 1.5 (lesser of Building Height <u>or</u> Projected Width)

   Note: (Usually GEP stack height = 2.5 X Building Height)

6. Choose the building or structure with the highest GEP stack height and is within the stack's influence area, i.e. it is a "nearby" building. In general, this will be the tallest building or structure. The chosen building or structure must have a GEP stack height which exceeds the modeled stack height - if it is less than or equal to, then it will not inhibit dispersion (i.e. not cause building downwash).

7. Enter the following data into STARSHIP Point Information Tab (page 185-6 of users manual) for the chosen building (in #6 above) for the stack being modeled: GEP Building Height, GEP Building Length, and GEP Building Width.

Ref: (a) Engineering Guide #69
        (B) EPA - 454/R92-019

Building Downwash Analysis Worksheet

EMISSIONS UNIT: _____   **STACK NAME:** _____

STACK HEIGHT: _____   **Unit housed in:** _____

Structure name: _____

Height (ft): _____

Length max. (ft): _____

Width min. (ft): _____

Projected Width - only needed if height is greater than width (ft): _____

Distance from stack to structure (ft): _____

Stack Influence Area ("nearby structure") (ft): _____

Is structure within the stack influence area (if no, then structure does not need to be evaluated)? _____

GEP stack height for structure (ft): _____

Is GEP stack height for structure greater than the emissions unit stack height? _____
(if no, then the structure will not affect building downwash)

Structure name: _____

Height (ft): _____

Length max. (ft): _____

Width min. (ft): _____

Projected Width - only needed if height is greater than width (ft): _____

Distance from stack to structure (ft): _____

Stack Influence Area ("nearby building") (ft): _____

Is structure within the stack influence area (if no, then structure does not need to be evaluated)? _____

GEP stack height for structure (ft): _____

Is GEP stack height for structure greater than the emissions unit stack height? _____
 (if no, then the structure will not affect building downwash)

Make multiple copies of this page as needed.

For the computer modeling program, choose the structure which has the highest GEP stack height and is within the stack influence area (i.e. it is considered to be a "nearby building").