AERMOD

Input

CO CONTROL
SO SOURCE
RE RECEPTORS
ME METEOROLOGY
OU OUTPUT

```
** To run the example, copy the AERTEST.INP file to AERMOD.INP and type:
**
**    AERMOD
**
** The results for this example problem are provided in file AERMOD.OUT.

CO STARTING
   TITLEONE A Simple Example Problem for the AERMOD Model with PRIME
   MODELOPT  CONC   FLAT
   AVERTIME  1  3  8  24  PERIOD
   POLLUTID  SO2
   RUNORNOT  RUN
   EVENTFIL  aertest_evt.inp
   ERRORFIL  ERRORS.OUT
CO FINISHED

SO STARTING
   ELEVUNIT  METERS
   LOCATION  STACK1  POINT  0.0   0.0   0.0

** Point Source      QS     HS     TS    VS    DS
** Parameters:      ----   ----   ----  ----  ---
   SRCPARAM  STACK1  500.0   65.00  425.  15.0   5.

SO BUILDHGT  STACK1    36*50.
SO BUILDWID  STACK1    62.26  72.64  80.80  86.51  89.59  89.95
SO BUILDWID  STACK1    87.58  82.54  75.00  82.54  87.58  89.95
SO BUILDWID  STACK1    89.59  86.51  80.80  72.64  62.26  50.00
SO BUILDWID  STACK1    62.26  72.64  80.80  86.51  89.59  89.95
SO BUILDWID  STACK1    87.58  82.54  75.00  82.54  87.58  89.95
SO BUILDWID  STACK1    89.59  86.51  80.80  72.64  62.26  50.00
SO BUILDLEN  STACK1    82.54  87.58  89.95  89.59  86.51  80.80
SO BUILDLEN  STACK1    72.64  62.26  50.00  62.26  72.64  80.80
SO BUILDLEN  STACK1    86.51  89.59  89.95  87.58  82.54  75.00
SO BUILDLEN  STACK1    82.54  87.58  89.95  89.59  86.51  80.80
SO BUILDLEN  STACK1    72.64  62.26  50.00  62.26  72.64  80.80
SO BUILDLEN  STACK1    86.51  89.59  89.95  87.58  82.54  75.00
SO XBADJ     STACK1   -47.35 -55.76 -62.48 -67.29 -70.07 -70.71
SO XBADJ     STACK1   -69.21 -65.60 -60.00 -65.60 -69.21 -70.71
SO XBADJ     STACK1   -70.07 -67.29 -62.48 -55.76 -47.35 -37.50
SO XBADJ     STACK1   -35.19 -31.82 -27.48 -22.30 -16.44 -10.09
SO XBADJ     STACK1    -3.43   3.34  10.00   3.34  -3.43 -10.09
SO XBADJ     STACK1   -16.44 -22.30 -27.48 -31.82 -35.19 -37.50
SO YBADJ     STACK1    34.47  32.89  30.31  26.81  22.50  17.50
SO YBADJ     STACK1    11.97   6.08   0.00  -6.08 -11.97 -17.50
SO YBADJ     STACK1   -22.50 -26.81 -30.31 -32.89 -34.47 -35.00
SO YBADJ     STACK1   -34.47 -32.89 -30.31 -26.81 -22.50 -17.50
SO YBADJ     STACK1   -11.97  -6.08   0.00   6.08  11.97  17.50
SO YBADJ     STACK1    22.50  26.81  30.31  32.89  34.47  35.00

   SRCGROUP  ALL
SO FINISHED

RE STARTING
RE GRIDPOLR POL1 STA
            ORIG STACK1
            DIST 175. 350. 500. 1000.
            GDIR 36 10 10
RE GRIDPOLR POL1 END
RE FINISHED

ME STARTING
   SURFFILE  AERMET2.SFC
   PROFFILE  AERMET2.PFL
   SURFDATA  14735  1988  ALBANY,NY
   UAIRDATA  14735  1988  ALBANY,NY
   SITEDATA  99999  1988  HUDSON
   PROFBASE  0.0  METERS
ME FINISHED

OU STARTING
   RECTABLE  ALLAVE  FIRST-THIRD
   MAXTABLE  ALLAVE  50
   SUMMFILE  AERTEST.SUM
OU FINISHED
```

Input

- What do the following mean:
  - CONC , FLAT
  - AVERTIME 1 3 8 24 PERIOD
- What output files will be produced?

```
** To run the example, copy the AERTEST.INP file to AERMOD.INP and type:
**
**    AERMOD
**
** The results for this example problem are provided in file AERMOD.OUT.

CO STARTING
   TITLEONE A Simple Example Problem for the AERMOD Model with PRIME
   MODELOPT  CONC   FLAT
   AVERTIME  1  3  8  24  PERIOD
   POLLUTID  SO2
   RUNORNOT  RUN
   EVENTFIL  aertest_evt.inp
   ERRORFIL  ERRORS.OUT
CO FINISHED
```

Input

- What do the following mean:
  - ELEVUNIT METERS
  - LOCATION STACK1 POINT 0.0 0.0 0.0
  - QS, HS, TS, VS, DS (and their units)
  - SRCGROUP ALL
- Next, info about building downwash.

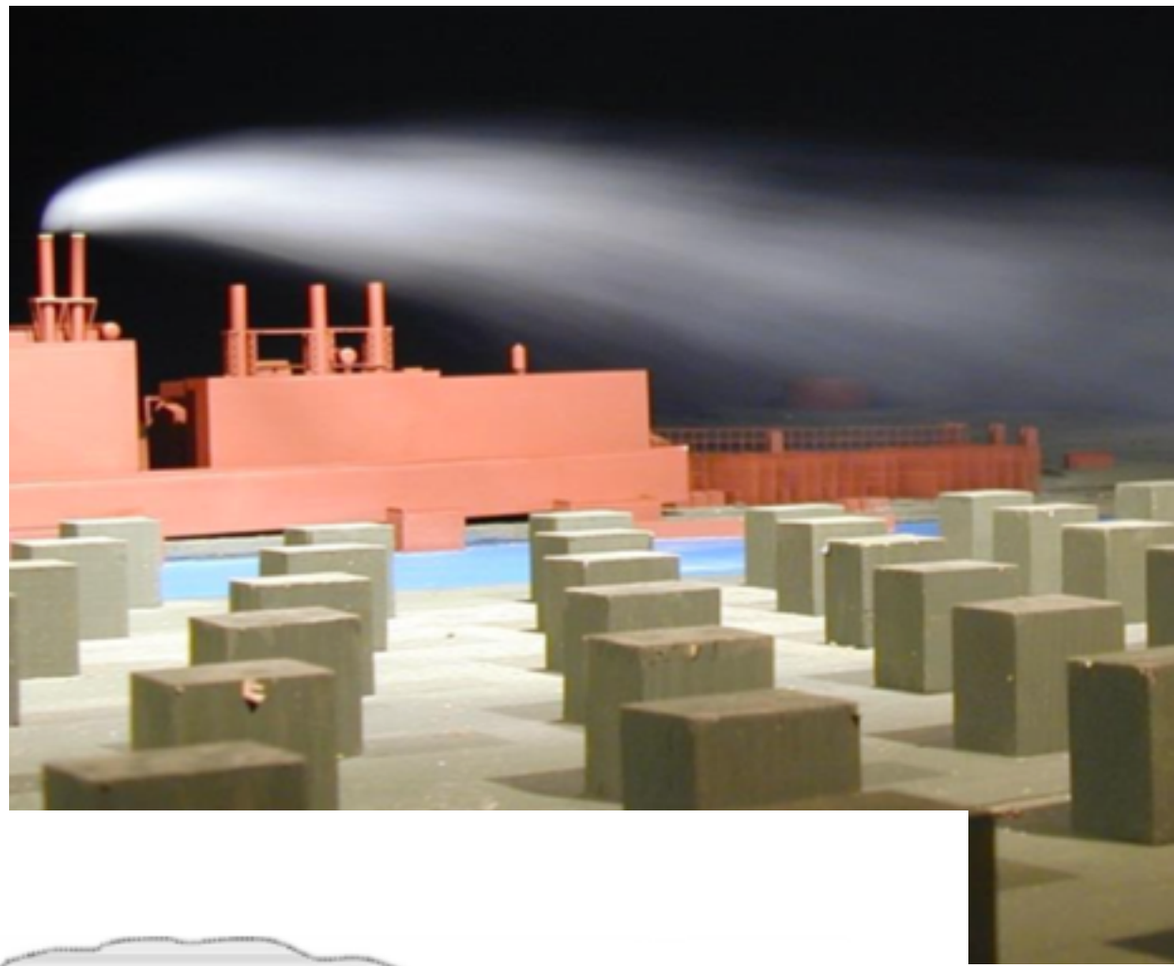
```
SO STARTING
  ELEVUNIT  METERS
  LOCATION  STACK1  POINT  0.0   0.0   0.0

** Point Source      QS     HS     TS    VS    DS
** Parameters:       ----   ----   ----  ----  ---
  SRCPARAM  STACK1  500.0   65.00  425.  15.0   5.

SO BUILDHGT  STACK1   36*50.
SO BUILDWID  STACK1   62.26  72.64  80.80  86.51  89.59  89.95
SO BUILDWID  STACK1   87.58  82.54  75.00  82.54  87.58  89.95
SO BUILDWID  STACK1   89.59  86.51  80.80  72.64  62.26  50.00
SO BUILDWID  STACK1   62.26  72.64  80.80  86.51  89.59  89.95
SO BUILDWID  STACK1   87.58  82.54  75.00  82.54  87.58  89.95
SO BUILDWID  STACK1   89.59  86.51  80.80  72.64  62.26  50.00
SO BUILDLEN  STACK1   82.54  87.58  89.95  89.59  86.51  80.80
SO BUILDLEN  STACK1   72.64  62.26  50.00  62.26  72.64  80.80
SO BUILDLEN  STACK1   86.51  89.59  89.95  87.58  82.54  75.00
SO BUILDLEN  STACK1   82.54  87.58  89.95  89.59  86.51  80.80
SO BUILDLEN  STACK1   72.64  62.26  50.00  62.26  72.64  80.80
SO BUILDLEN  STACK1   86.51  89.59  89.95  87.58  82.54  75.00
SO XBADJ     STACK1  -47.35 -55.76 -62.48 -67.29 -70.07 -70.71
SO XBADJ     STACK1  -69.21 -65.60 -60.00 -65.60 -69.21 -70.71
SO XBADJ     STACK1  -70.07 -67.29 -62.48 -55.76 -47.35 -37.50
SO XBADJ     STACK1  -35.19 -31.82 -27.48 -22.30 -16.44 -10.09
SO XBADJ     STACK1   -3.43   3.34  10.00   3.34  -3.43 -10.09
SO XBADJ     STACK1  -16.44 -22.30 -27.48 -31.82 -35.19 -37.50
SO YBADJ     STACK1   34.47  32.89  30.31  26.81  22.50  17.50
SO YBADJ     STACK1   11.97   6.08   0.00  -6.08 -11.97 -17.50
SO YBADJ     STACK1  -22.50 -26.81 -30.31 -32.89 -34.47 -35.00
SO YBADJ     STACK1  -34.47 -32.89 -30.31 -26.81 -22.50 -17.50
SO YBADJ     STACK1  -11.97  -6.08   0.00   6.08  11.97  17.50
SO YBADJ     STACK1   22.50  26.81  30.31  32.89  34.47  35.00

  SRCGROUP  ALL
SO FINISHED
```

Building Downwash



Saathoff et al.

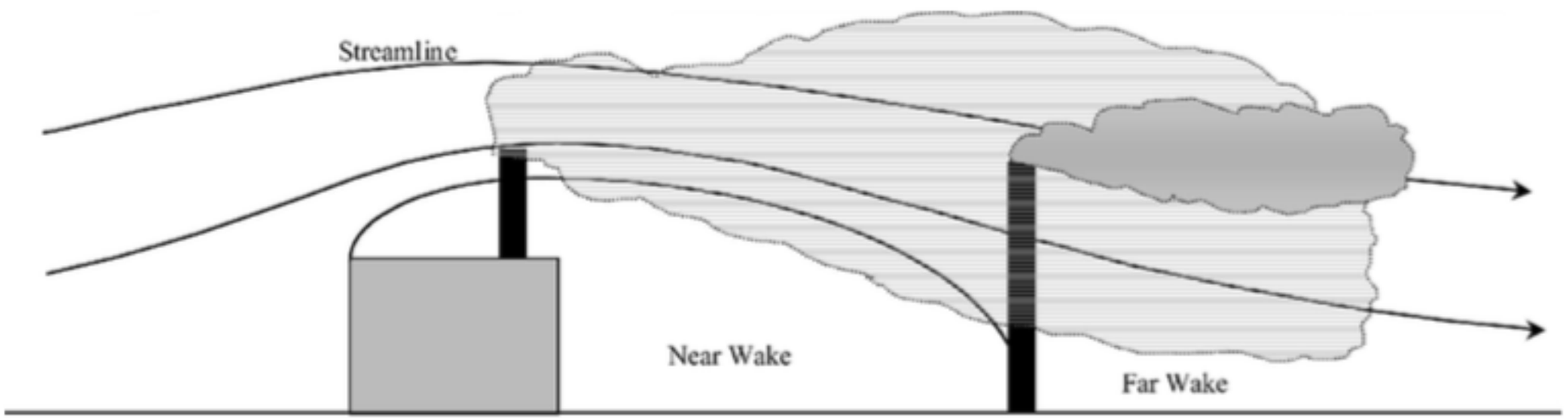


Figure 1. Schematic representation of two identical emission sources showing the dependence of plume dispersion on stack proximity to a structure. Reproduced with permission from Schulman et al.[8] Copyright 2000 A&WMA, *Journal of Air & Waste Management Association*.

Building Downwash

Figure 1. From Schulman[3] showing a comparison of streamlines predicted by the PRIME model with thorse observd in wind tunnel simulation of a cubic building.

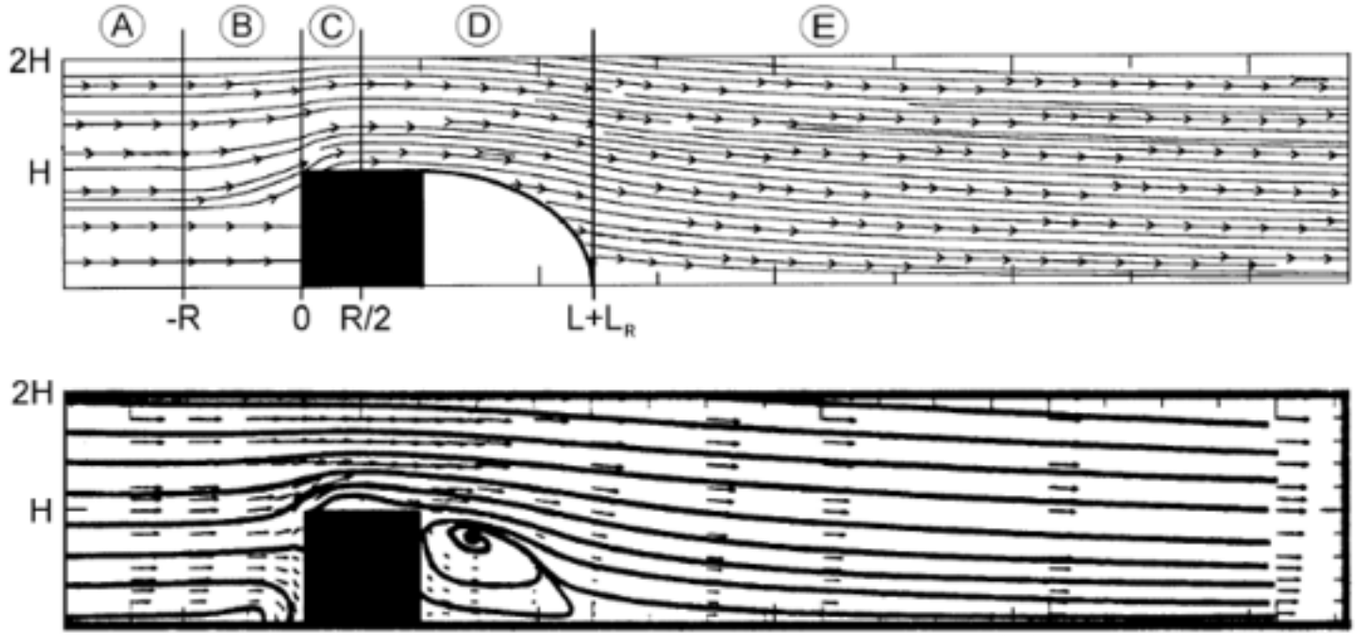
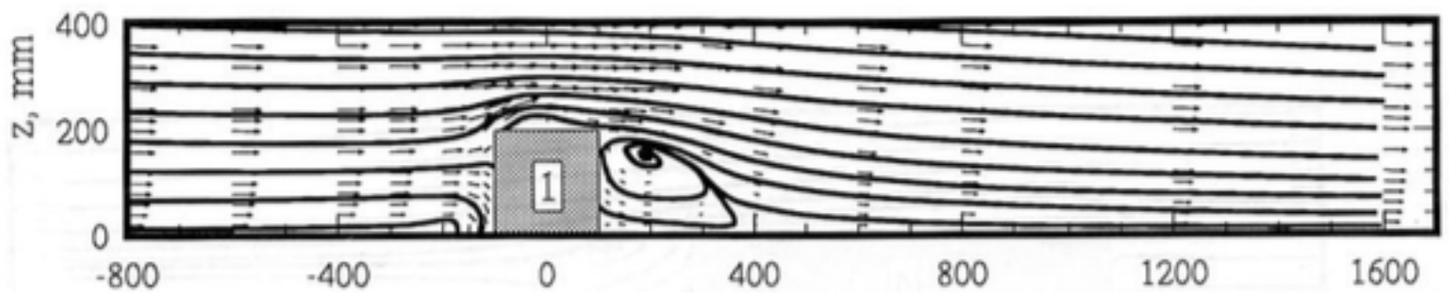
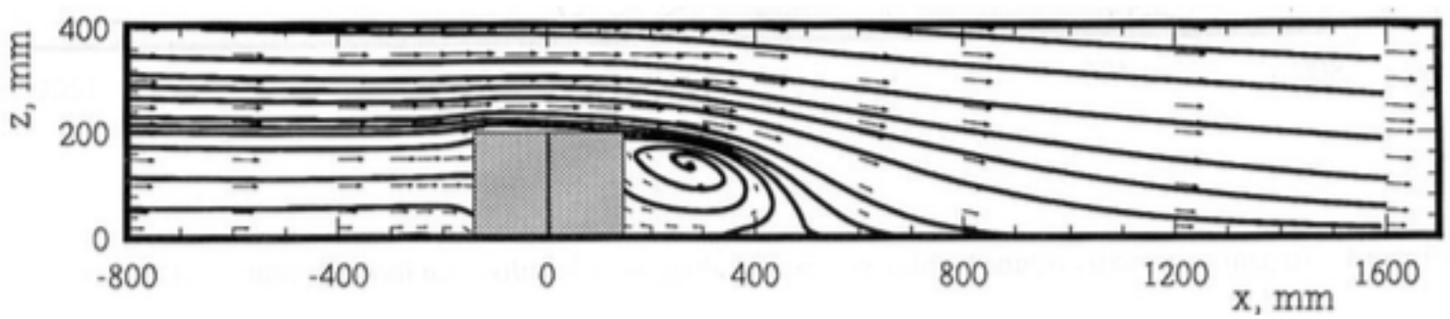


Figure 7: Streamline patterns around cubical buildings; a) wind perpendicular to leading wall; b) cube rotated 45 degrees, so the wind approaches the leading corner. (Snyder and Lawson, 1994)

a)

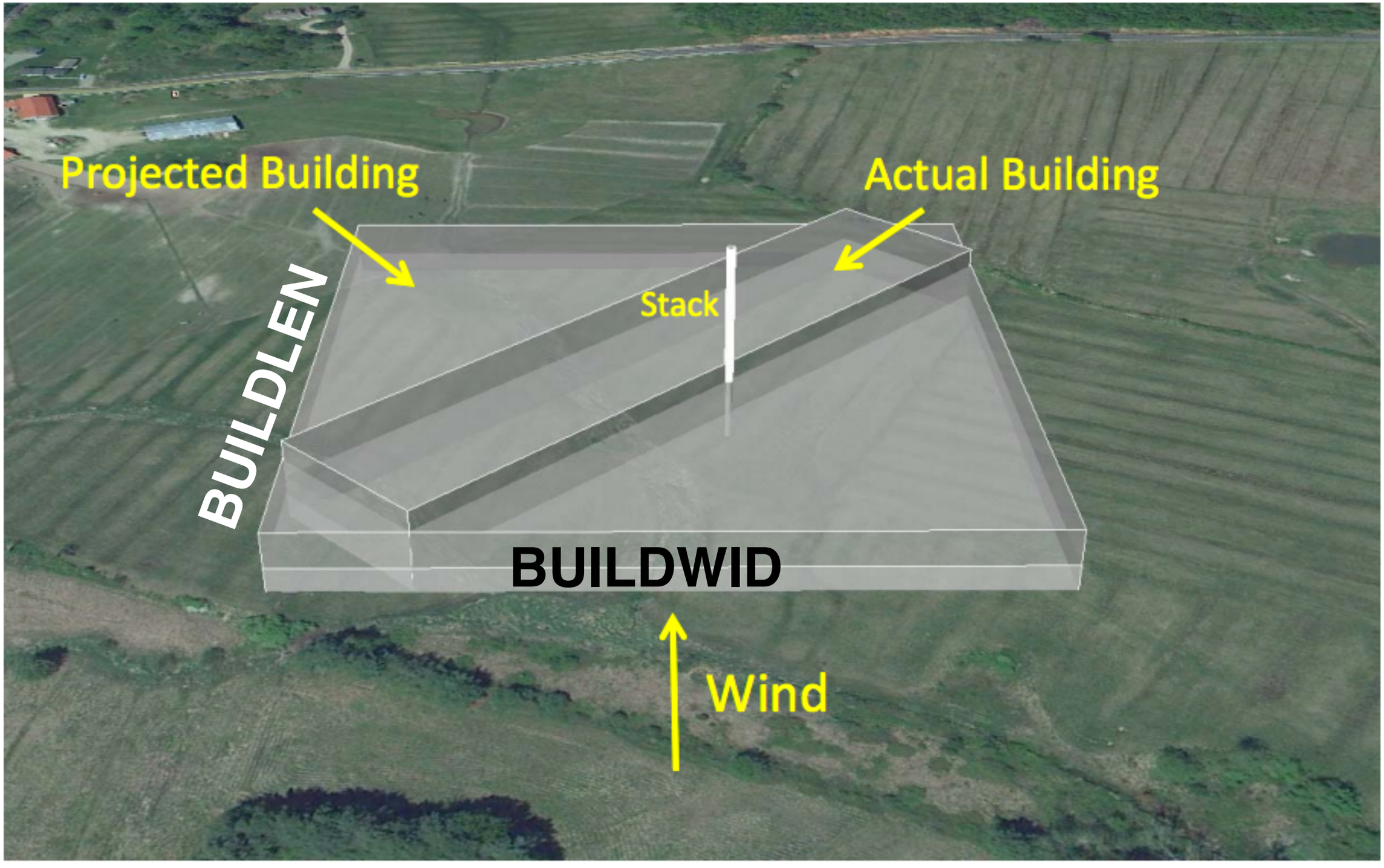


b)



http://www.cppwind.com/wp-content/uploads/2014/01/AWMA2012-Petersen-Paper-387-Downwash-Problems.pdf

“PROJECTED” BUILDING, USED IN AERMOD



http://www3.epa.gov/scram001/10thmodconf/presentations/3-3-EPA10thConferenceAQModeling-BuildingDownwash_SchulmanScire.pdf

Input

- Definitions:
  - BUILDHGT = building height [36 heights, one for each 10° flow vector starting with wind blowing **toward** 10° (with respect to true north), and going clockwise every 10°. E.g., 10, 20, 30, … 350, 360]
  - BUIILDWID = width of the "projected" bldg, every 10°, starting with the 10° vector.
  - BUIILDLEN = length of the "projected" bldg, every 10°

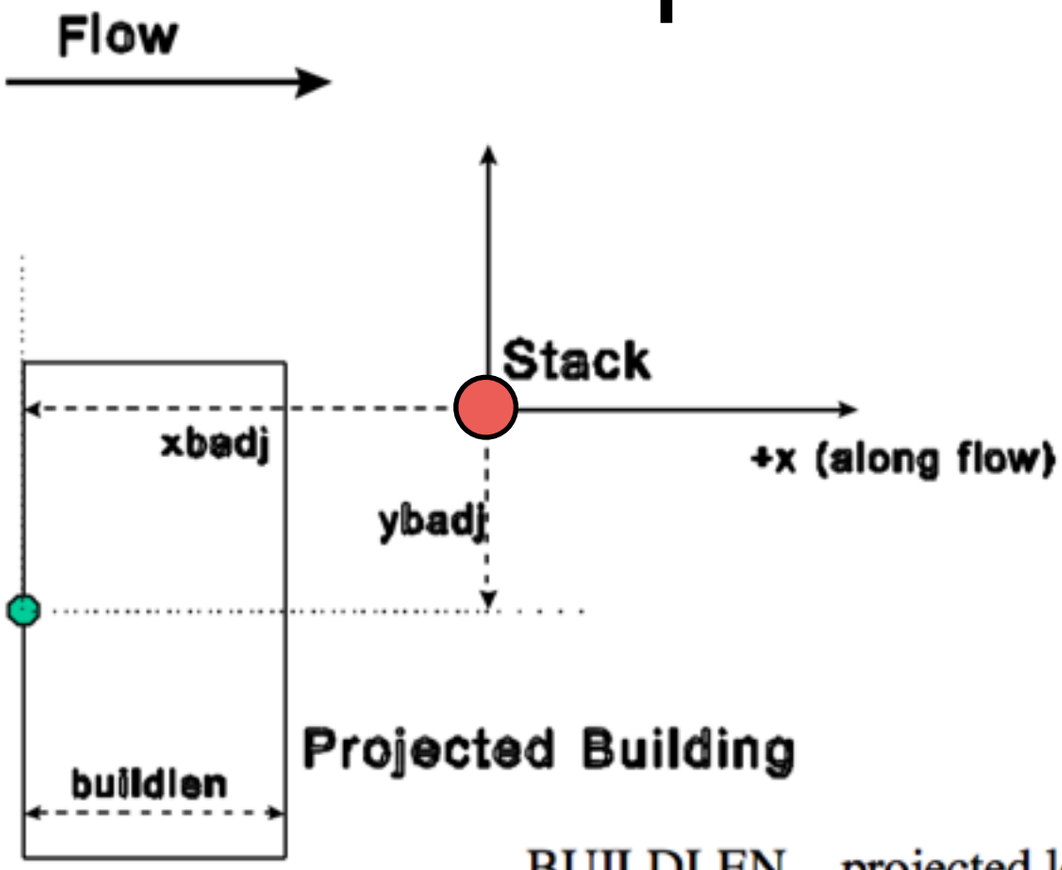
```
SO STARTING
  ELEVUNIT  METERS
  LOCATION  STACK1  POINT  0.0   0.0   0.0

** Point Source      QS     HS     TS    VS    DS
** Parameters:      ----   ----   ----  ----  ---
  SRCPARAM  STACK1  500.0   65.00  425.  15.0   5.

SO BUILDHGT  STACK1   36*50.
SO BUILDWID  STACK1   62.26  72.64  80.80  86.51  89.59  89.95
SO BUILDWID  STACK1   87.58  82.54  75.00  82.54  87.58  89.95
SO BUILDWID  STACK1   89.59  86.51  80.80  72.64  62.26  50.00
SO BUILDWID  STACK1   62.26  72.64  80.80  86.51  89.59  89.95
SO BUILDWID  STACK1   87.58  82.54  75.00  82.54  87.58  89.95
SO BUILDWID  STACK1   89.59  86.51  80.80  72.64  62.26  50.00
SO BUILDLEN  STACK1   82.54  87.58  89.95  89.59  86.51  80.80
SO BUILDLEN  STACK1   72.64  62.26  50.00  62.26  72.64  80.80
SO BUILDLEN  STACK1   86.51  89.59  89.95  87.58  82.54  75.00
SO BUILDLEN  STACK1   82.54  87.58  89.95  89.59  86.51  80.80
SO BUILDLEN  STACK1   72.64  62.26  50.00  62.26  72.64  80.80
SO BUILDLEN  STACK1   86.51  89.59  89.95  87.58  82.54  75.00
SO XBADJ     STACK1  -47.35 -55.76 -62.48 -67.29 -70.07 -70.71
SO XBADJ     STACK1  -69.21 -65.60 -60.00 -65.60 -69.21 -70.71
SO XBADJ     STACK1  -70.07 -67.29 -62.48 -55.76 -47.35 -37.50
SO XBADJ     STACK1  -35.19 -31.82 -27.48 -22.30 -16.44 -10.09
SO XBADJ     STACK1   -3.43   3.34  10.00   3.34  -3.43 -10.09
SO XBADJ     STACK1  -16.44 -22.30 -27.48 -31.82 -35.19 -37.50
SO YBADJ     STACK1   34.47  32.89  30.31  26.81  22.50  17.50
SO YBADJ     STACK1   11.97   6.08   0.00  -6.08 -11.97 -17.50
SO YBADJ     STACK1  -22.50 -26.81 -30.31 -32.89 -34.47 -35.00
SO YBADJ     STACK1  -34.47 -32.89 -30.31 -26.81 -22.50 -17.50
SO YBADJ     STACK1  -11.97  -6.08   0.00   6.08  11.97  17.50
SO YBADJ     STACK1   22.50  26.81  30.31  32.89  34.47  35.00

  SRCGROUP  ALL
SO FINISHED
```

Input




```
SO BUILDLEN  STACK1    86.51   89.59   89.95   87.58   82.54   75.00
SO XBADJ     STACK1   -47.35  -55.76  -62.48  -67.29  -70.07  -70.71
SO XBADJ     STACK1   -69.21  -65.60  -60.00  -65.60  -69.21  -70.71
SO XBADJ     STACK1   -70.07  -67.29  -62.48  -55.76  -47.35  -37.50
SO XBADJ     STACK1   -35.19  -31.82  -27.48  -22.30  -16.44  -10.09
SO XBADJ     STACK1    -3.43    3.34   10.00    3.34   -3.43  -10.09
SO XBADJ     STACK1   -16.44  -22.30  -27.48  -31.82  -35.19  -37.50
SO YBADJ     STACK1    34.47   32.89   30.31   26.81   22.50   17.50
SO YBADJ     STACK1    11.97    6.08    0.00   -6.08  -11.97  -17.50
SO YBADJ     STACK1   -22.50  -26.81  -30.31  -32.89  -34.47  -35.00
SO YBADJ     STACK1   -34.47  -32.89  -30.31  -26.81  -22.50  -17.50
SO YBADJ     STACK1   -11.97   -6.08    0.00    6.08   11.97   17.50
SO YBADJ     STACK1    22.50   26.81   30.31   32.89   34.47   35.00

  SRCGROUP  ALL
SO FINISHED
```

BUILDLEN	projected length of the building along the flow
XBADJ	along-flow distance from the stack to the center of the upwind face of the projected building
YBADJ	across-flow distance from the stack to the center of the upwind face of the projected building

BPIP is a pre-processor that takes actual building dimensions and figures out projected bldg length, width, xbadj, and ybadj.
Get BPIP-PRIME from EPA web page:
http://www3.epa.gov/ttn/scram/dispersion_related.htm

BPIP Input

The test case addresses the following configuration (see Figure 3):

Building Dimensions (L,W,H)	75, 50, 50 (m)
Building Orientation	Long side aligns N-S
Stack Height	65 (m)
Stack Location1	10 m East of Center of East Wall

The input file for BPIP contains the following information:

```
'PRIME test case'
'ST'
'METERS'  1.0
'UTMN'  0.0
   1
'unit1 '          1   0.0
        4    50.00
   0.0     0.0
   0.0    75.0
  50.0    75.0
  50.0     0.0
   1
'unit1'         .00     65.00       60.     37.5
```

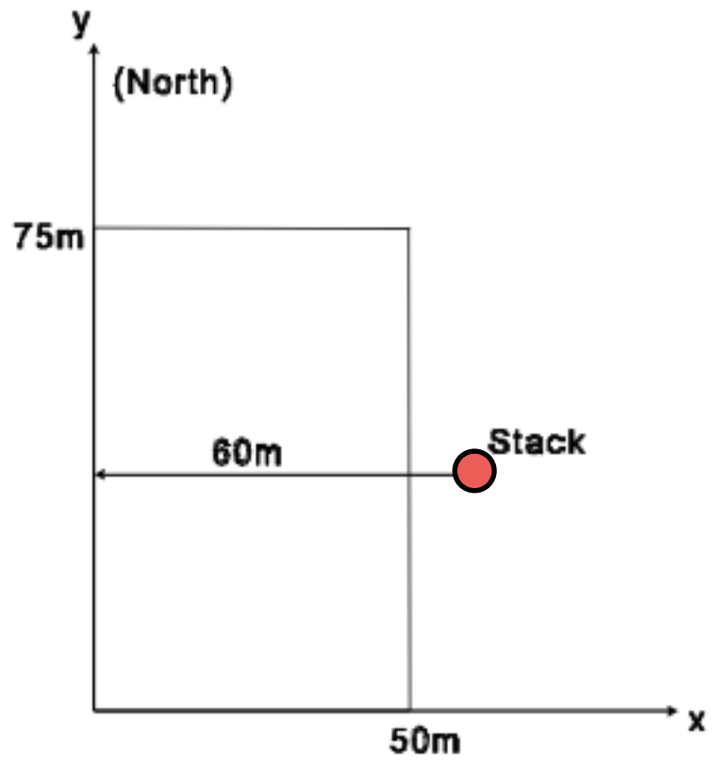


Figure 3. Building/stack configuration for test case.

BPIP output

The test case addresses the following configuration (see Figure

Building Dimensions (L,W,H)	75, 50, 50 (m)
Building Orientation	Long side aligns N-S
Stack Height	65 (m)
Stack Location1	10 m East of Center of East Wall

```
PRIME test case

BPIP output is in meters

SO BUILDHGT Unit 1   50.00   50.00   50.00   50.00   50.00   50.00
SO BUILDHGT Unit 1   50.00   50.00   50.00   50.00   50.00   50.00
SO BUILDHGT Unit 1   50.00   50.00   50.00   50.00   50.00   50.00
SO BUILDHGT Unit 1   50.00   50.00   50.00   50.00   50.00   50.00
SO BUILDHGT Unit 1   50.00   50.00   50.00   50.00   50.00   50.00
SO BUILDHGT Unit 1   50.00   50.00   50.00   50.00   50.00   50.00
SO BUILDWID Unit 1   62.26   72.64   80.80   86.51   89.59   89.95
SO BUILDWID Unit 1   87.58   82.54   75.00   82.54   87.58   89.95
SO BUILDWID Unit 1   89.59   86.51   80.80   72.64   62.26   50.00
SO BUILDWID Unit 1   62.26   72.64   80.80   86.51   89.59   89.95
SO BUILDWID Unit 1   87.58   82.54   75.00   82.54   87.58   89.95
SO BUILDWID Unit 1   89.59   86.51   80.80   72.64   62.26   50.00
SO BUILDLEN Unit 1   82.54   87.58   89.95   89.59   86.51   80.80
SO BUILDLEN Unit 1   72.64   62.26   50.00   62.26   72.64   80.80
SO BUILDLEN Unit 1   86.51   89.59   89.95   87.58   82.54   75.00
SO BUILDLEN Unit 1   82.54   87.58   89.95   89.59   86.51   80.80
SO BUILDLEN Unit 1   72.64   62.26   50.00   62.26   72.64   80.80
SO BUILDLEN Unit 1   86.51   89.59   89.95   87.58   82.54   75.00
SO XBADJ    Unit 1  -47.35  -55.76  -62.48  -67.29  -70.07  -70.71
SO XBADJ    Unit 1  -69.21  -65.60  -60.00  -65.60  -69.21  -70.71
SO XBADJ    Unit 1  -70.07  -67.29  -62.48  -55.76  -47.35  -37.50
SO XBADJ    Unit 1  -35.19  -31.82  -27.48  -22.30  -16.44  -10.09
SO XBADJ    Unit 1   -3.43    3.34   10.00    3.34   -3.43  -10.09
SO XBADJ    Unit 1  -16.44  -22.30  -27.48  -31.82  -35.19  -37.50
SO YBADJ    Unit 1   34.47   32.89   30.31   26.81   22.50   17.50
SO YBADJ    Unit 1   11.97    6.08    0.00   -6.08  -11.97  -17.50
SO YBADJ    Unit 1  -22.50  -26.81  -30.31  -32.89  -34.47  -35.00
SO YBADJ    Unit 1  -34.47  -32.89  -30.31  -26.81  -22.50  -17.50
SO YBADJ    Unit 1  -11.97   -6.08    0.00    6.08   11.97   17.50
SO YBADJ    Unit 1   22.50   26.81   30.31   32.89   34.47   35.00
```

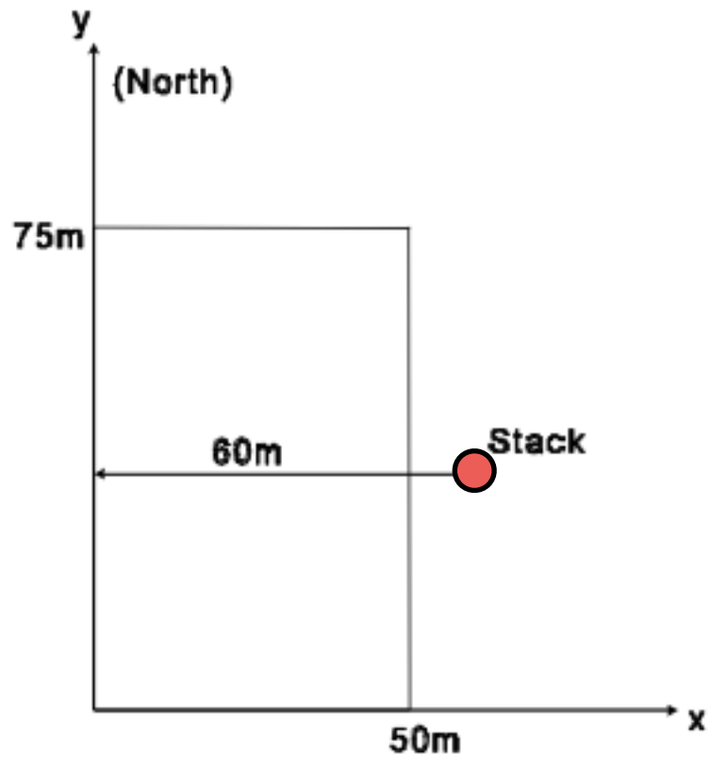


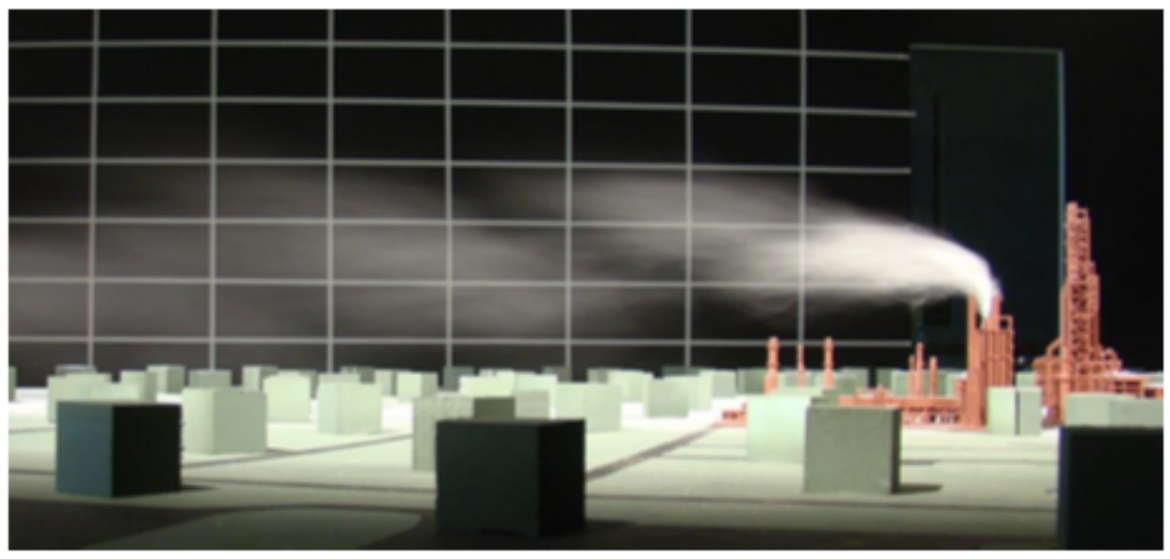
Figure 3. Building/stack configuration for test case.

Other Downwash Issues

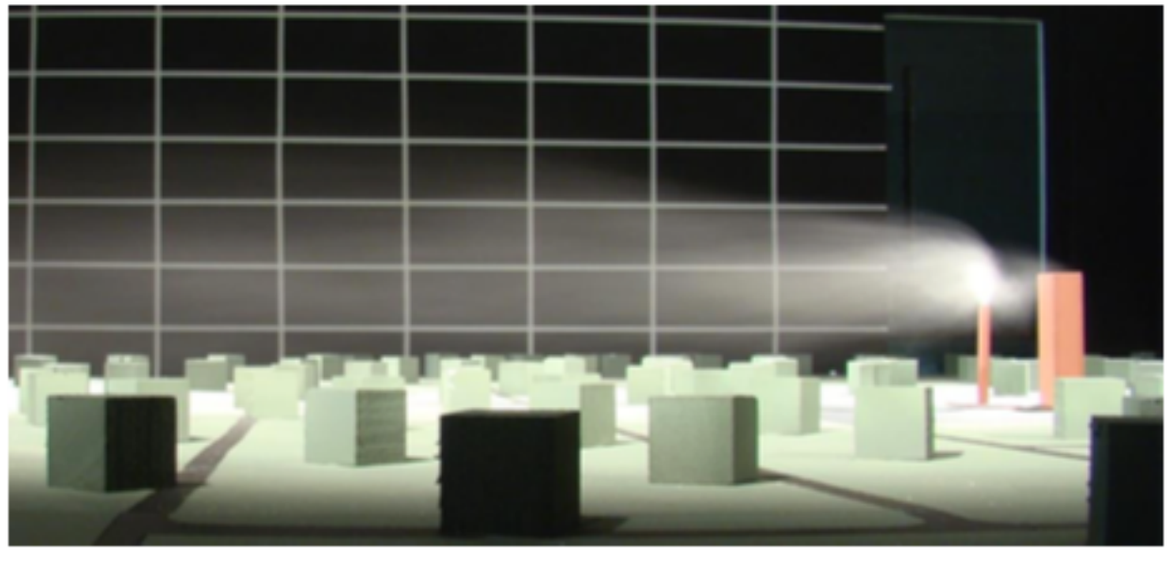
Terrain Downwash

wind tunnel model of downwash behind a ridge.

Downwash behind open structures vs. solid buildings



b)



c)

Observed v. Predicted Q-Q Plots – 1977 (1-hr Average SO_2 Concentrations)

from R. Peterson, CPP