

Grain Dryers

NOTE: Grain dryers, as described here, generally refers to those at grain *storage* facilities. Other types of grain dryers, such as those at ethanol plants, are generally modeled as point sources.

Grain storage dryers are very open structures. Air, usually heated, is blown through the dryer and typically exits the porous sides.

The emissions from grain dryers should be modeled using volume sources. The parameters are:¹

Release height = height above ground of middle of opening

Initial lateral dimension = σ_{y0} = width of opening / 4.3

Initial vertical dimension = σ_{z0} = height of opening / 2.15

Note that this is a (horizontal) discharge at elevated temperature. Since it is modeled as a volume source, rather than a point source, neither buoyant plume rise or building downwash effects will be computed by the model. These effects may roughly counter-balance each other, so the results may be considered acceptable.

In the case of column-style dryers the emissions are distributed across a rather large vertical distance. Column dryers also generally have an air intake in the lower third of the column, restricting emissions to the upper two thirds of the column. These effects can be accounted for by stacking several volume sources on top of each other, making sure that the release height of each is adjusted to evenly space them in the upper two thirds of the column. The number of volumes to use is determined by dividing the height of the upper two thirds of the dryer column by the dryer's width. The vertical distribution and dimensions of the volumes are determined in the same way that the horizontal distribution of volumes would be when representing internal emissions inside a building. The upper two-thirds of the column should be divided into sections based on the number of volumes determined above. The release height of the volume representing each section should be the center of that section. The initial lateral and vertical dimensions should be based on the width of a cube with a volume equal to the volume of each section divided by 2.15.

The emissions profile may vary across the height of the dryer. This is caused by the differences in moisture content of the grain as well as the amount of particulate still entrained in the grain column as it travels through the various sections of the dryer. If the emissions profile is known this can be accounted for by assigning different percentages of the total emission rate to the different volume sources that represent the dryer.

¹This assumes there are defined areas of emissions from the dryer. If not, DNR recommends using the dryer housing dimensions in the equations to determine release height and initial plume dimensions.