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How safe is safe location?



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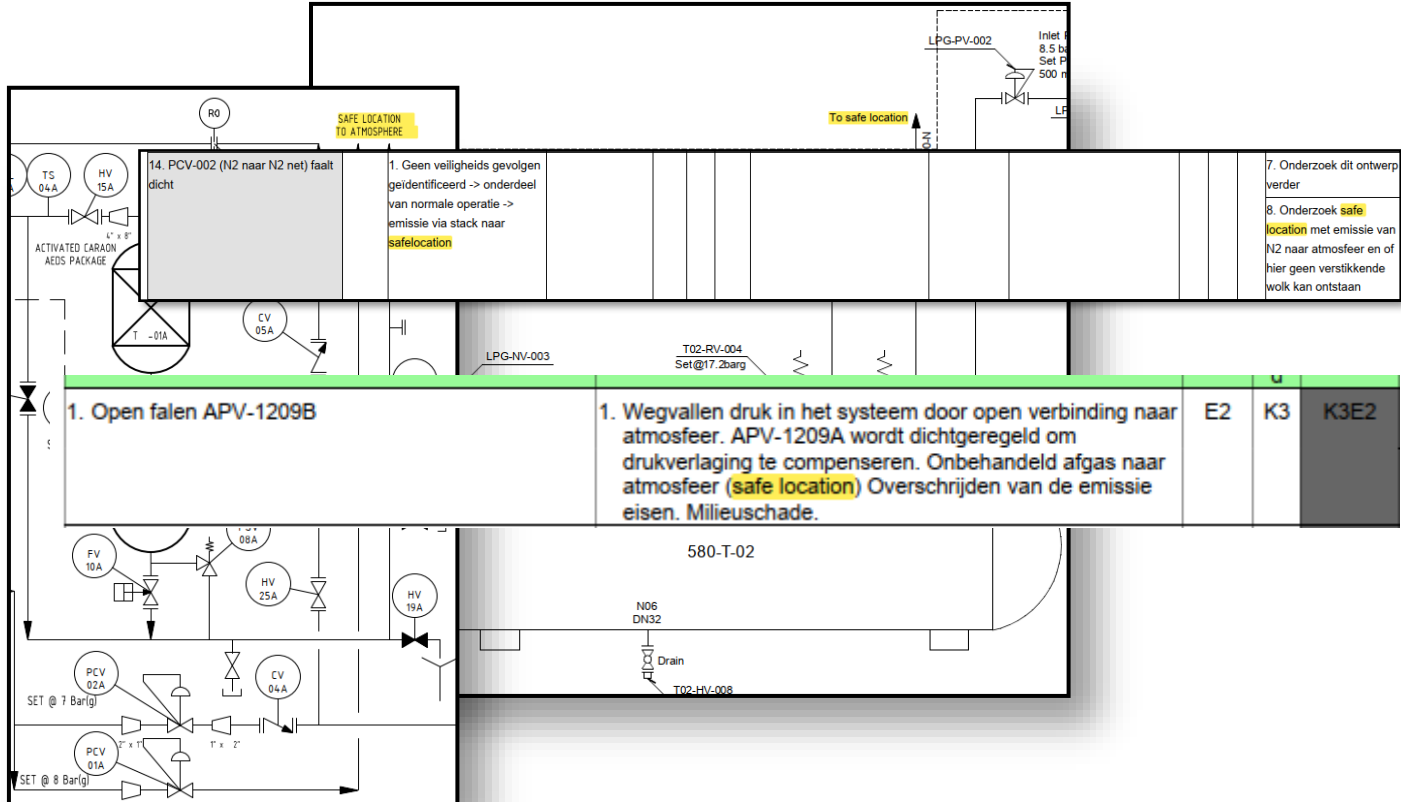
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Safe locations



Content



Safe location
definitions



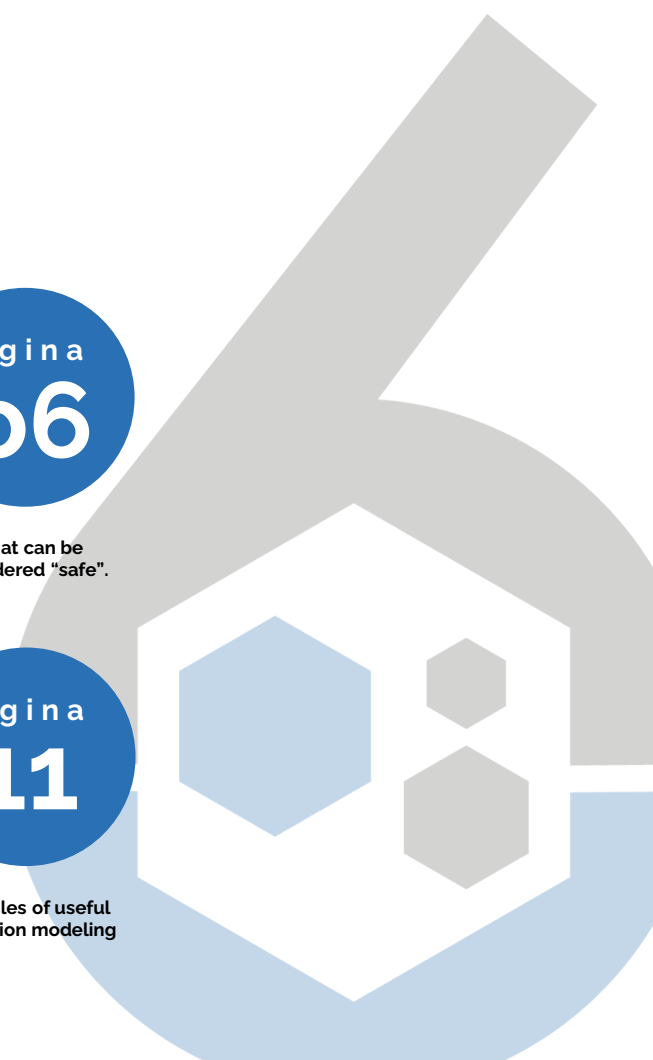
How to determine
safe location



What can be
considered "safe".



Examples of useful
dispersion modeling



Safe location definitions

Safe location could be defined as:

“an area where the release of hazardous material or energy does not pose a threat to personnel, the environment, or the integrity of the plant”

What can be considered in a release source:

- Flammability
- Toxicity
- Thermal radiation
- Temperature
- Asphyxiation



Different outlets to “safe location”

Venting equipment:

- Vent
- Relief valve outlet
- Stack
- Flare



What can be considered “safe”?

Flammability

- Continuous
 - <10% LEL
- Incidental
 - <25% or 50% LEL



What can be considered “safe”?

Toxicity

- Continuous
 - TWA 8 hours (Time weight average)
 - STEL 15 minutes (Short term exposure limit)
- Incidental
 - ERPG 2 values
 - AGW (Alarmeringsgrenswaarde) 30 min
 - Other known values:
 - VRW (Voorlichtingsrichtwaarde)
 - LBW (Levensbedreigende waarde)



What can be considered “safe”?

Thermal radiation

- 1 or 1,5 kW/m² considered safe for personnel without protective clothing
- 3 kW/m² for personnel with protective clothing
- 10 kW/m² is the “Brandaandachtsgebied” or Fire safety zone



What can be considered “safe”?

Temperature

- Humans
 - Maximum 60 °C
- Assets
 - Where it is designed for
 - Eurocode III maximum 50 °C



Asphyxiation

- Continuous
 - 19-19,5% oxygen (considered safe limit)
 - 18% according arbeidsomstandigheden besluit



How to determine safe location

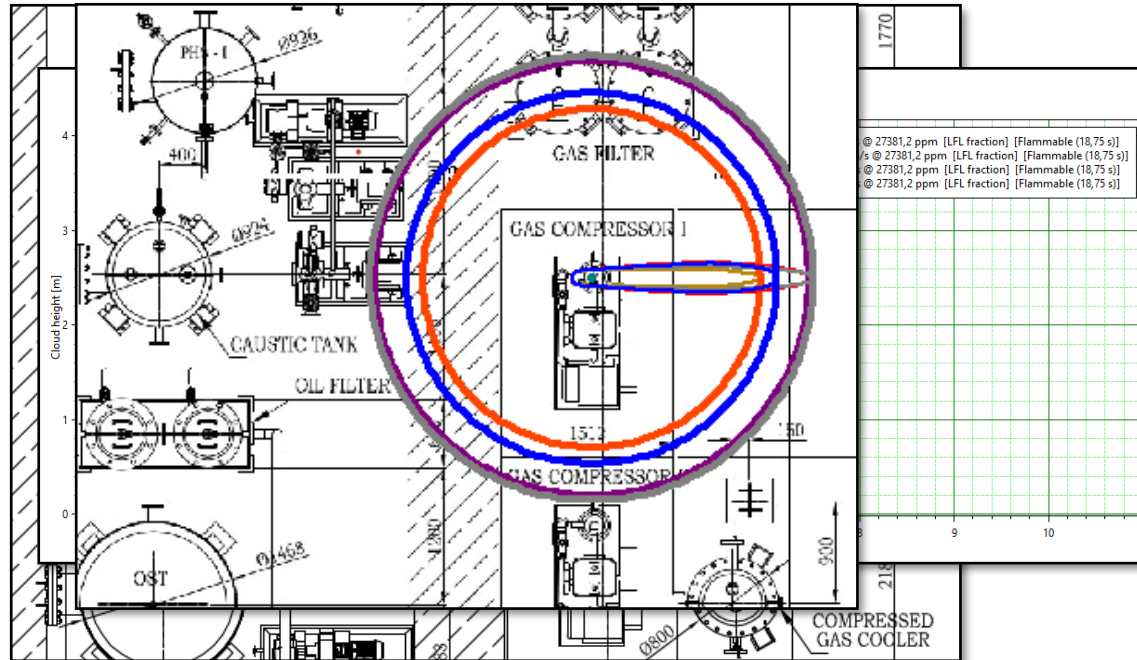
Using software like

- Dispersion modeling software:
 - Phast/Safeti-NL
 - FRED (old Shell)
 - EFFECTS (Gexcon)
 - And many others
- CFD
 - ANSYS Fluid
 - FLACS (Gexcon)
 - Autodesk CFD
 - And many others



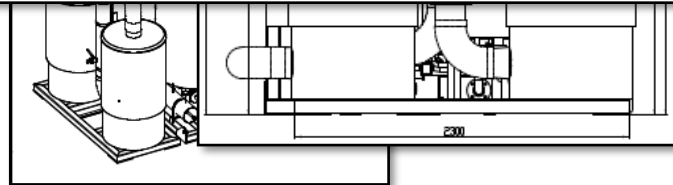
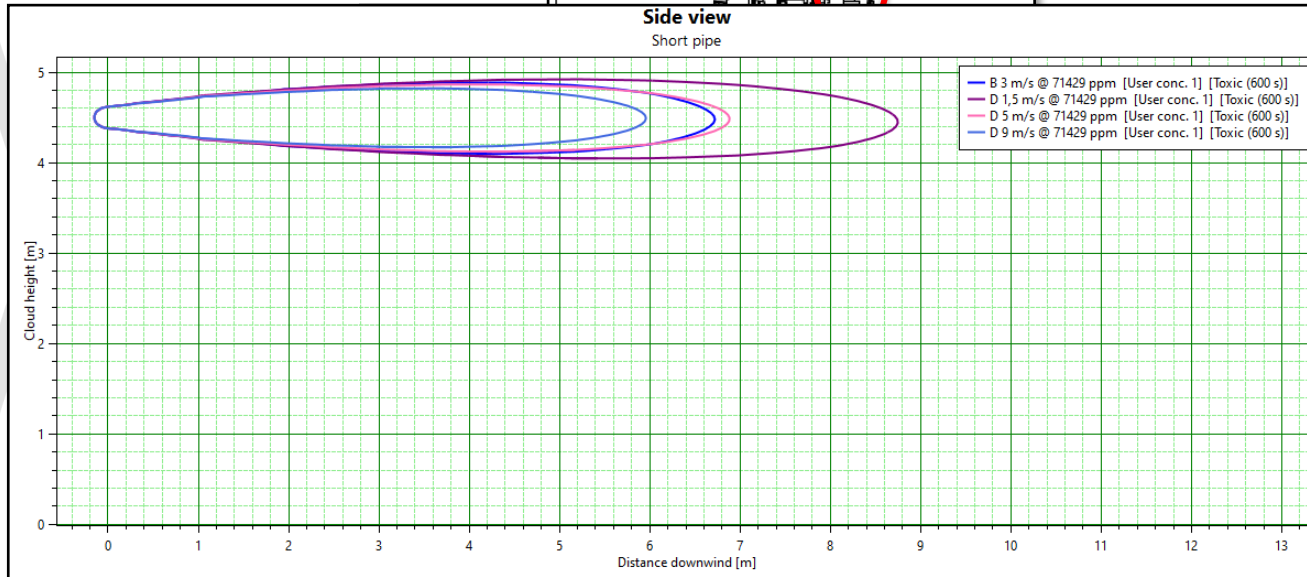
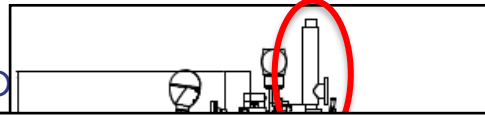
Examples of useful dispersion modeling

Flammability contour



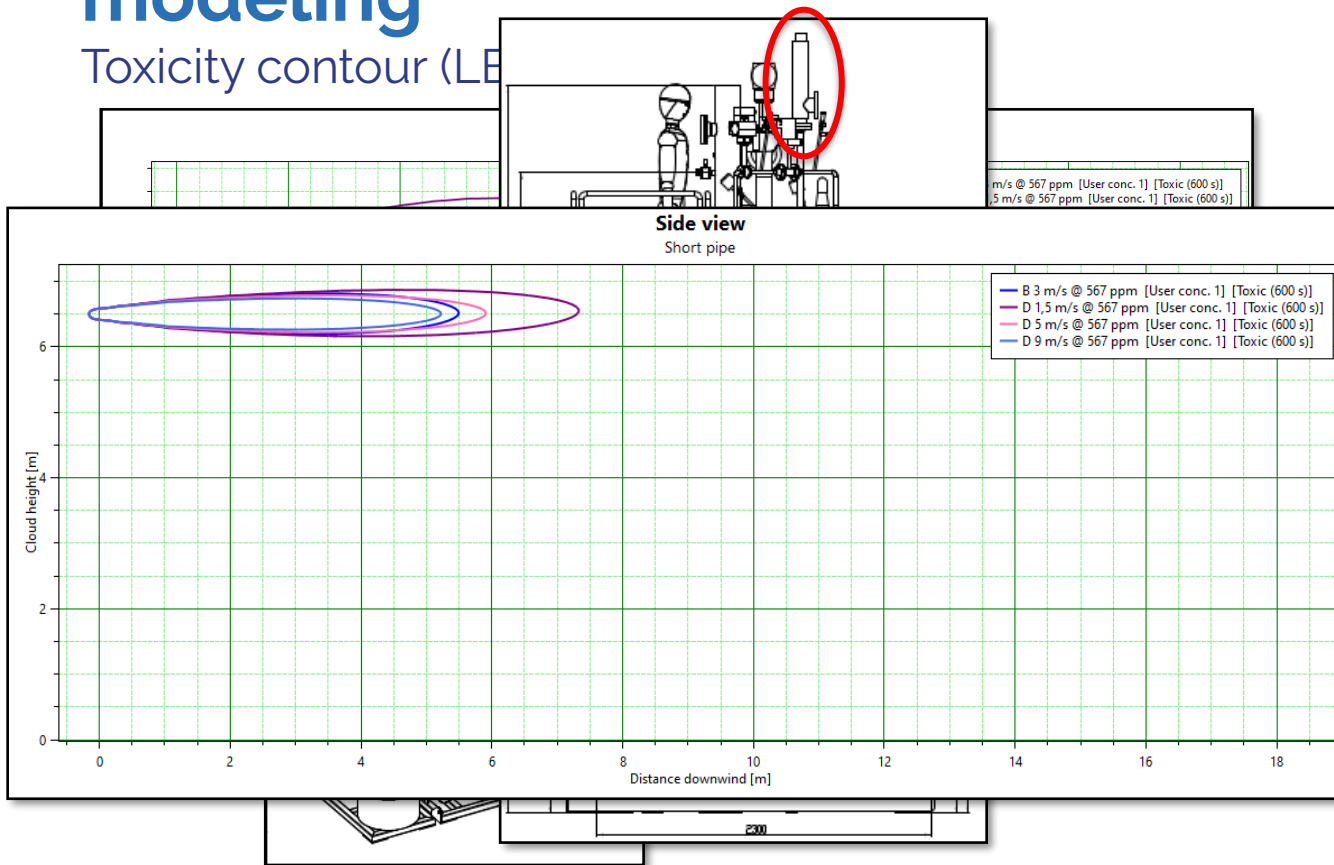
Examples of useful dispersion modeling

Asphyxiation contd



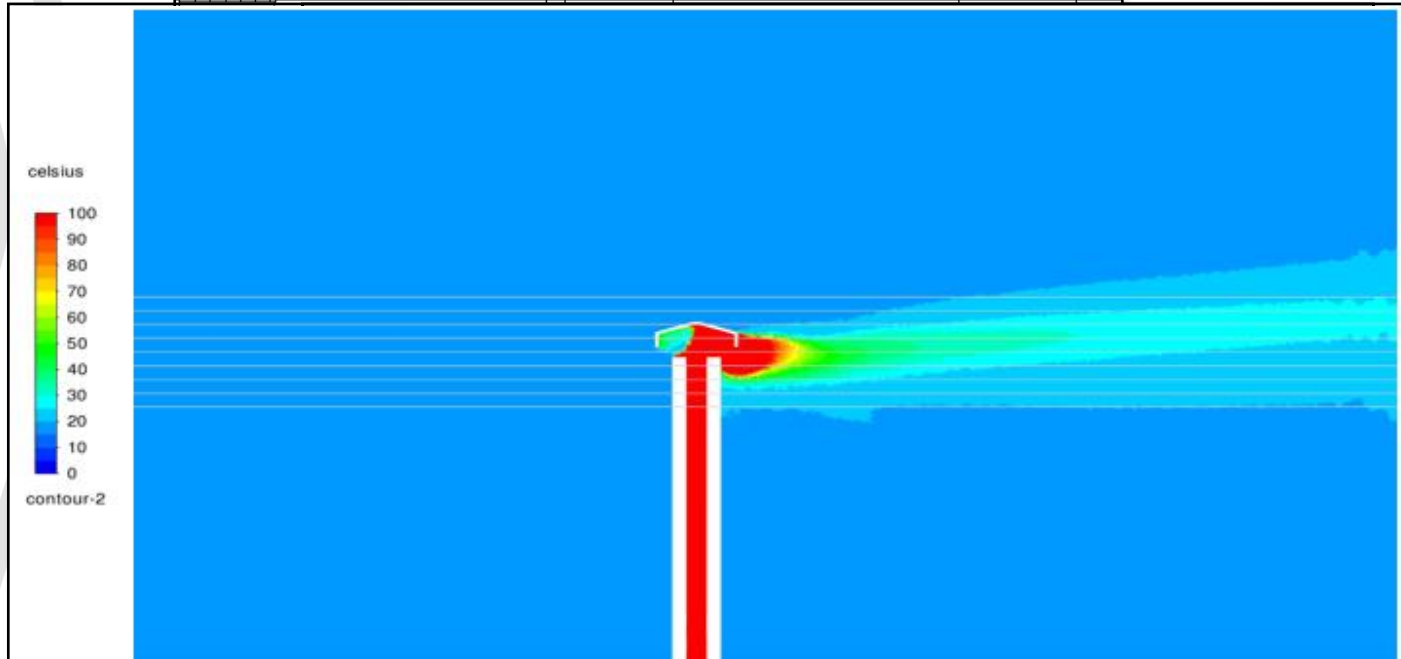
Examples of useful dispersion modeling

Toxicity contour (LEL)



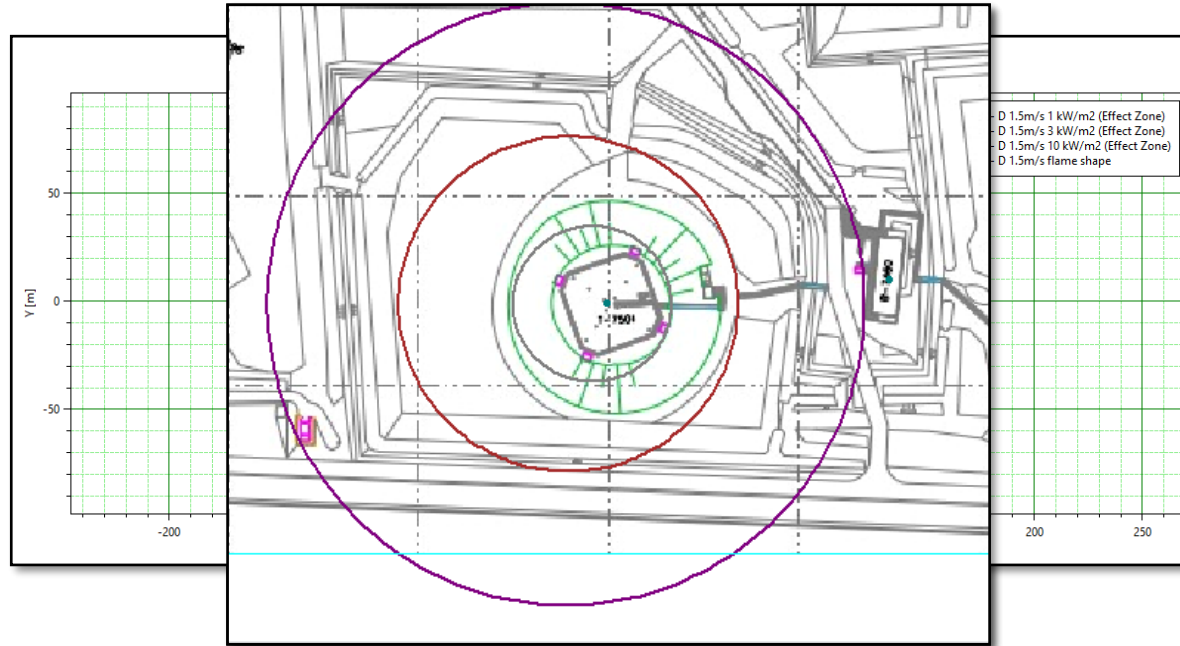
Examples of useful dispersion modeling

Temperature contour (OVC stack)



Examples of useful dispersion modeling

Heat radiation contour 1, 3 and 10 kW/m²



How safe is safe location?

Flammability:

- No ignition sources within the effect zone
- Used to verify effect zone in radiation with ATEX zone



Toxicity:

- Effect zone for safe levels where people can be present



Temperature:

- Verify safe temperature limits on assets and people



Radiation contour

- Verify for 1 kW/m² contour

Asphyxiation

- Effect zone for safe levels where people can be present





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