

SeReMo, decision-support for self-rescue during accidents with hazardous substances



TNO innovation
for life

Self Rescue Model (SeReMo) is a software package developed by TNO to identify the best protective actions for individuals affected by accidents involving hazardous substances. People can use SeReMo to compare various possible protective actions and to combine the most effective self-rescue strategies with additional protective actions or measures. SeReMo is based on scientific knowledge about the release, spread and behaviour of hazardous substances, and the way these affect people. The model was created in cooperation with experts from everyday practice.

WHY WAS SEREMO DEVELOPED?

During incidents involving combustible or toxic substances, self-rescue behaviour can save lives and limit injury. The initial phase of an incident largely determines the number of casualties and the severity of the injuries sustained. Usually, at this stage, the emergency responders will not yet have arrived, so it is important that responders and the authorities help those affected to make the right choices. Should they stay indoors? How long should they stay there? Should they turn the ventilation system on or off? Or would it actually be better to leave the building and go outside? If so, what is the safest escape route?

HOW DOES SEREMO WORK?

SeReMo uses models from TNO's EFFECTS software package. EFFECTS is an international standard for calculating the effects of accidents involving hazardous substances. These effects include incidents such as a

flash fire, a vapour cloud explosion, a Boiling Liquid Expanding Vapour Explosion (BLEVE), a pool fire, a jet fire and a toxic cloud.

The best protective action depends on the individual (healthy, physically limited, bed-bound) and the location (inside or outside). A number of accident scenarios have already been analysed, with surprising results. For instance, covering windows with a wet cloth to prevent toxic substances entering through gaps and cracks often has little effect. Research from TNO also shows that, in some cases, the usual advice of 'close windows and doors, turn the ventilation system off' actually may cause more casualties. This is because, once substances are inside, you can't get them out again. The period of time during which you are safer indoors than outdoors depends on the time it takes to reduce the level of ventilation and on how well the building is sealed.

SELF-RESCUE STRATEGIES

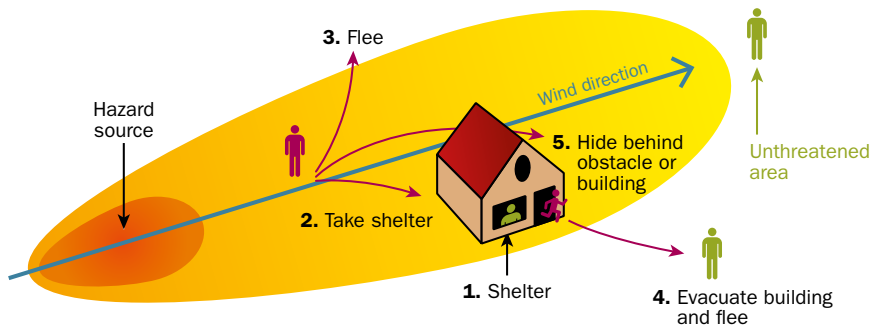


Figure 1: self-rescue strategies for accidents involving hazardous substances

SeReMo can be used to calculate the number of casualties (both lethal and injured) in accidents involving hazardous substances. SeReMo uses a range of self-rescue strategies (see Figure 1).

Individuals who are indoors at the time of the incident can either stay where they are (1) or evacuate the building and flee (4).

Individuals who are outdoors at the time of the incident can either take shelter (2), flee (3), or take cover behind an obstacle or building (5).

- The reduction of the number of casualties and the reduction in severity of the injuries that can be achieved by taking measures.
- A summary of possible protective actions for individuals for each type of incident.
- The severity of injury in relation to casualties' self-rescue capabilities.
- The severity of injury expressed in terms of the triage categories used by the emergency response organisations. This gives an impression of the scale of the incident, which can then be used to set priorities for effective intervention.
- Understanding the effect of self-rescue capabilities and construction measures for indoor-protection.

Emergency response organisations can use SeReMo to better prepare for specific incidents, enabling them to respond quickly and adequately. Together with local government, they can inform citizens more effectively about what to do or what not to do, via sirens and cell broadcast, for example.

Government bodies can use SeReMo to develop safety policies.

Consultancies can use SeReMo to assess the effect of specific measures, such as protective construction measures in relation to protective actions for self-rescue.

SeReMo yields the following results:

- the number of potential casualties for each type of incident and the severity of the injury involved.

WHO IS SEREMO FOR?

SeReMo is, first and foremost, aimed at emergency response organisations, as a tool for determining the most appropriate strategy.

SeReMo can evaluate the effect of the following protective actions and measures:

- close windows & doors, turn off ventilation system;
- evacuate vertically to another floor;
- flee: downwind, crosswind, with a wet cloth over the mouth;
- wall or embankment between the source of the risk and affected buildings that acts as a heat shield or dilutes the concentration of the hazardous substance;
- heat-resistant glass, double glazing, single glazing;
- blind façade (no windows);
- draught proofing: reduce leakage of air through gaps and cracks

- alarm: including sirens, cell-broadcast or preventive risk communication;
- supervised evacuation, role of personnel trained for emergency intervention;
- (re)location of people within buildings (vulnerable groups should be located as far from risk sources as possible);
- multiple evacuation routes;
- altering the layout of a building;
- when planning building functions, take account of individuals with mobility issues.

TNO offers the option of developing additional models for measures, not yet included.

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