

Recommended Operating Procedure (ROP)

Aim of ROP (tick box)

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| <input checked="" type="checkbox"/> Munition detection or identification | <input type="checkbox"/> Toxicity |
| <input type="checkbox"/> Sampling | <input type="checkbox"/> In situ exposure studies |
| <input type="checkbox"/> Chemical analysis | <input type="checkbox"/> Bioassays |
| <input type="checkbox"/> Bioindicators/biomarkers | |

5. People safety procedures

version 1.0

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Scope

The procedure is applied in case of equipment contamination, that may appear during conduct of **Sampling safety procedure**, or accidental people contamination occurred, e.g. during sampling or decontamination of research equipment.

The procedure presents the necessary actions that should be carried out aboard the vessel in relation to persons who may have been contaminated with toxic agents: Sulphur Mustard, Lewisite, Tabun or Adamsite. The purpose of this procedure is to protect the research team and vessel crew from contamination by chemical warfare agents. The procedure is based on mobile/portable equipment for contamination recognition and means for decontaminating people.

Summary of the method/ROP

Properly conducted procedure secures the research team and the vessel crew from contamination. Although the primary purpose of the procedure is to prevent contamination, the procedure also includes the scheme of conduct (workflow) in case of such an event occurrence, even though safety rules were applied.

Procedure can provide the following information to the user:

- Type of protective clothing required for operating the research equipment,
- Type of measuring equipment for the contamination recognition,
- Types of disinfectants,
- Decontamination equipment,
- Algorithm to be conducted upon detection of people contamination,
- Handling/disposal of contaminated clothing.

Safety aspects

All agents discussed in this ROP are harmful to humans and to many other organisms. During operation on the vessel deck, crew should be dressed and equipped as if they have contact with samples containing high amounts of CWA:

- Chemical overall protective clothing Type 2, in accordance with EN 943-1 standard

(military type isolation or filtration chemical clothing is recommended)

- Gas filter mask for protection against CWA (military gas mask is recommended),
- Portable/Mobile chemical contamination indicator - detection method: photometric flame spectroscopy (e.g. AP4C, AP2C), Ion Mobility Spectrometry (LCD 3.3)
- Portable/Mobile chemical contamination indicator - detection method: ion-mobility spectroscopy- IMS (e.g. CAM - Chemical Agent Monitor)
- IPLS - Individual Decontamination Pack (organic decontaminant ORO, prophylactic decontaminant ointment, decontaminant powder, glove, alcowipes), (Fig.1)
- 5-10% aqueous sodium bicarbonate solution,
- 5% aqueous sodium bicarbonate solution,
- 2% aqueous sodium bicarbonate solution (NaHCO_3),
- aqueous chlorinated lime solution - paste (1 part of lime + 3 parts of water),
- powder chlorinated lime with talc (1: 1)
- 3-5% aqueous monochloramine B solution,
- 0,5% aqueous solution of monochloramine B or dichloroamine T,
- 0,2% aqueous chloroamine B,
- 2,3-dimercaptopropanol ointment,
- 10% aqueous or alcoholic solution of potassium (potash lye) or sodium hydroxide (soda lye),
- 4% aqueous ammonia solution,
- hydrogen peroxide,
- 1-2% potassium permanganate solution,
- Activated carbon tablets,
- Atropine injections set (Fig. 2).

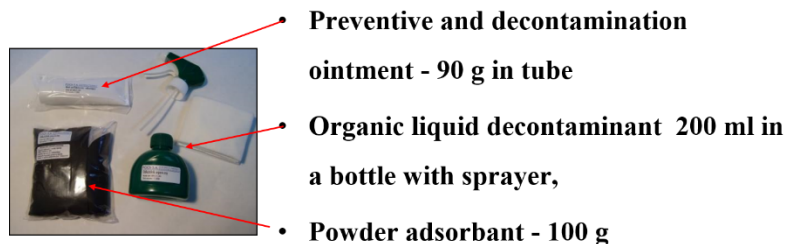


Fig. 1 IPLS - Individual Decontamination Pack



Fig. 2 Atropine injections set

Documentation

Position of sampling, date, time, name, surname and institution of contaminated person, type of detected chemical warfare agents (CWA) and type of chemical detector must be recorded. Additionally, the person(s) who carried out the detection, and the institute responsible for the detection should be recorded. All the mentioned information must be recorded also electronically

(e.g. Excel table).

Information how the decontamination was provided must be given (type of decontamination mixture).

In case of body contamination personal data of person who was contaminated must be recorded as a remarks (name, surname, institution, phone number, type of medical help that was applied)

Methods

- Whenever contamination of research equipment is found (ROP Safety sampling procedures), immediately after the equipment and deck decontamination, the decontamination of protective clothing used by the research team and vessel crew involved in the extraction of equipment on board and sampling should be carried out
- Protective clothing should be removed after decontamination and placed in a sealed container with decontaminant, to pass it to the services involved in the disposal of hazardous materials after returning to the harbour.
- After removing protective clothing, take a shower by thoroughly washing the body with warm, soapy water.
- In case of the body, eyes contamination, or swallowing contaminated material, decontamination of contaminated sites must be carried out,
- A decontamination method and type of decontaminant used depends on the location and type of CWA involved,
- After the body decontamination, heavy shower must be taken, washing the body with warm water and soap,
- In the absence of decontaminants, immediately after contamination detection, rinse protective clothing with water, and wash the body with warm, soapy water.

Providing decontamination:

Sulphur mustard or Lewisite contamination

- Wipe the place of protective clothing contact with contaminated material with an organic reagent IPLS.
- In case of the absence of IPLS, wipe contaminated areas with a solution of ORO, C9 or 2% aqueous or water-alcohol solution with a solution of dichloroamine in dichloroethane (Warning: skin irritants).
- After 5 minutes, rinse clothing with water.
- Check the decontamination efficiency using one of the portable measuring instruments in accordance with the device's user manual.
- In case of the positive test result (contamination), repeat decontamination process as above and carry it out until the result is negative (no contamination).
- Remove protective clothing and secure it in a sealed container with sanitizer (clothing cannot be re-used. Upon arrival at the harbour, clothing should be handed over for destruction at the hazardous materials disposal plant).
- Perform bath with soap and warm water.

First aid in case of skin, eyes or gastrointestinal tract/digestive track contamination with sulphur mustard or lewisite:

- Apply decontaminating/preventive ointment/cream from IPLS to contaminated areas and apply a dressing.

- In case of the absence of IPLS, immediately after the detection of contamination, remove the sulphur mustard or lewisite from the surface of the body or digestive tract with cotton wool (gauze) moistened with 5-10% aqueous sodium bicarbonate or 3-5% aqueous monochloramine B, hydrogen peroxide or 1-2% aqueous solution of potassium permanganate, wiping place for about 5 minutes., You can also apply to the contaminated areas an aqueous chlorinated lime solution - paste (3:1), or powder chlorinated lime with talc (1: 1)
- In case of skin contamination with lewisite, it is expedient to cover the contaminated areas with ointment containing 2,3-dimercaptopropanol (BAL).
- Wash mucous surfaces and wounds with 5% aqueous sodium bicarbonate solution or 0,5% aqueous monochloramine B solution.
- Wash eyes with 0.2% aqueous chloramine B solution or 2% aqueous sodium bicarbonate solution.
- To remove sulphur mustard from the gastrointestinal tract induce vomiting or apply gastrolavage with activated carbon solutions.
- After decontamination, shower should be taken washing the body thoroughly with warm soapy water.
- Apply sterile dressing to contaminated areas. / Cover contaminated areas with sterile dressing.
- In the absence of decontaminants, rinse affected areas intensively with water.
- Do not use petrol, oil or other organic solvents to remove contaminants, as they dissolve sulphur mustard but do not degrade it. It may spread contamination.

Tabun contamination

- Wipe the place of protective clothing contact with contaminated material with an organic reagent IPLS.
- In case of the absence of IPLS, wipe contaminated areas with a solution of ORO, C9 or 2% aqueous or water-alcohol solution with a solution of dichloroamine in dichloroethane (Warning: skin irritants).
- After 5 minutes, rinse clothing with water.
- Check the decontamination efficiency using one of the portable measuring instruments in accordance with the device's user manual.
- In case of positive result (contamination), repeat the decontamination process as above and carry it out until the result is negative (no contamination).
- Remove protective clothing and secure it in a sealed container with sanitizer (clothing cannot be re-used. Upon arrival at the harbour, clothing should be handed over for destruction at the hazardous materials disposal plant).
- Perform bath with soap and warm water.

First aid in case of skin, eyes and gastrointestinal tract/digestive track contamination with tabun:

- Apply decontaminating/preventive ointment/cream from IPLS to contaminated areas and apply a dressing.
- In the absence of IPLS, immediately after detecting contamination, remove tabun from the body surface by rinsing the affected areas with running soap water.
- Eyes should be rinsed with running water, then with 2% aqueous sodium bicarbonate solution.
- In case of internal contamination, drink an aqueous suspension of activated carbon and induce vomiting. Repeat several times.
- In case of severe intoxications, give an intramuscular atropine injection.
- In weaker breathing, artificial respiration may be used.
- After decontamination, take a shower thoroughly washing the body with warm, soapy water.

Clark I, II, Adamsite contamination

- Wipe the place of protective clothing contact with contaminated material with an organic reagent IPLS.
- After 5 minutes, rinse clothing with water.
- Remove protective clothing and leave it for ventilating and drying at the leeward side - the clothing is re-usable.
- Perform bath with soap and warm water.

First aid in case of skin, eyes and gastrointestinal tract/digestive track contamination with Clark I, II, Adamsite:

- Immediately after symptoms of contamination occur, wash the eyes and nasopharynx with a 2% aqueous solution of sodium bicarbonate or a large amount of water.
- If necessary, give sedatives, painkillers and cough suppressants.
- In the absence of decontaminants, rinse contaminated areas intensively with water.

Additional information about decontamination are available in „Chemical munitions dumped in the Baltic sea - a guidebook for fishing boat crews” Michalak (2014)

Conclusions (if applicable)

References

Use this format in all references:

- ¹ Michalak, J., Chemical munitions dumped in the Baltic sea a guidebook for fishing boat crews, **2014**
- ² Ceremuga M., Pirszel J., Stela M., Czerwiński P., Decontamination of chemical agents, in: CBRN. Security Manager Handbook, M. Bijak (ed.), WUŁ, Łódź, **2018**, DOI: 10.18778/8142-184-3.18,
- ³ Popiel S., Witkiewicz Z., Nalepa T., The reactions of sulfur mustard with the active components of organic decontaminants, *Journal of Hazardous Materials*, 123 (1-3), **2005**, 269-80, <https://doi.org/10.1016/j.jhazmat.2005.04.006>
- ⁴ Equipment and software manuals

Change history

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| 1.0 | 30.06.2020 | First edition. |
| 1.1 | 20.05.2021 | Definition of the document was changed from SOP to ROP. |

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