Recommended Operating Procedure (ROP)

Aim of ROP (tick box)

☐ Munition detection or identification	☐ Toxicity
☒ Sampling	☐ In situ exposure studies
☐ Chemical analysis	☐ Bioassays
☐ Bioindicators/biomarkers	

4. Sampling safety procedures

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Scope

The procedure presents the indispensable actions that should be carried out aboard the vessel upon the underwater research works completion, using the equipment which has been in contact with the seabed and there is a risk of contamination of equipment (ROV, bottom sediment sampling devices) with chemical warfare agents. The aim of the procedure is to protect the research team and the vessel crew against contamination by toxic warfare agents after underwater work in the areas where chemical munitions occurrence is probable. The procedure uses portable chemical contamination recognition equipment/devices and decontamination agents.

Summary of the method/ROP

The procedure applies to the crew operating (or having contact with) the measurement and research equipment that may have experienced direct contact with bottom sediments.
Properly performed procedure will allow the early detection of contamination of the research equipment or sediment samples by sulphur mustard (HD), a mixture of sulphur mustard and Lewisite (HL), Lewisite (L), Tabun (GA) and Adamsite (DM) and will prevent contamination of the crew and the vessel deck.
Procedure can provide the following information to the user:

- Type of protective clothing for team operating research equipment,
- Type of measurement equipment for contamination recognition,
- Types of decontaminants,
- Decontamination equipment,
- The algorithm of conduct after contamination detection of research equipment or vessel deck.

Safety aspects

All agents discussed in this ROP are harmful to humans and also 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:

- Overall chemical protective clothing Type 2, in accordance with EN 943-1 standard (military

type, isolation or filtration chemical clothing is recommended) (Fig. 1),
- Gas filter mask for protection against CWA (military gas mask is recommended), (Fig. 2)
- Portable/Mobile chemical contamination indicator - detection method: photometric flame spectroscopy (e.g. AP4C, AP2C),
- Portable/Mobile chemical contamination indicator - detection method: ion-mobility spectroscopy- IMS (e.g. CAM - Chemical Agent Monitor),
- Hand-operated, pressurised decontamination device (acid-proof and alkaline-proof sprayer).

Contaminated equipment should be decontaminated using one of the given decontaminating mixture (Tab. 1).

Tab. 1. Decontaminating mixture for general-purpose.

	ORO	C9	DS – 2
Sodium (Na)	2	4	2
Ethanol	28	—	—
2-methoxyethanol	—	—	28
2-ethoxyethanol	—	66	—
2-aminoethanol	25	30	—
Diethylenetriamine (DETA)	45	—	70

Fig. 1. Overall chemical protective clothing Type 2, in accordance with EN 943-1 standard.

Fig. 2. Gas filter mask for protection against CWA.

Documentation

Position of sampling, date, time, type of research equipment (ROV, bottom sediment sampling devices), type of detected chemical warfare agents (CWA) or lack of CWA, and type of chemical detector and the name of person responsible for identifying contamination must be recorded. Additionally, the person(s) who carried out the detection and decontamination, and the institute responsible for the detection should be recorded. Each detection record must be coherent with the sample code. All the mentioned information and sample codes must be recorded also electronically (e.g. Excel table). The electronic detection list containing all the information mentioned previously, should be sent to analyzing laboratory.
Additionally in case of equipment contamination detection, must be given information how the decontamination was provided (type of decontamination mixture).
In case of contamination personal data of person who has contact with contaminated equipment and samples must be recorded as a remarks (name, surname, institution)

Methods

- At the time of the decision to extract/recover research equipment, samplers, grab samplers, the core probes, etc. from water to vessel deck, supporting crew/recovering equipment crew and the person responsible for the samples collection are required to put on overall chemical protective clothing Type 2 and gas filter mask.
- It is recommended to place a tray/cuvette under the recovered equipment or lining the deck with foil in order to reduce possible vessel deck contamination.
- Before collecting the samples, person responsible for identifying contamination using portable devices, identifies and assess the contamination, in accordance with the devices' manuals. The measurements must be performed using two devices using different analytical methods, for the factual CWA detection confirmation (the presence of hydrogen sulphide may distort the results, by indicating the presence of sulphur mustard using only the photometric flame spectroscopy).
- Decontamination of equipment and vessel deck must be carried out using the universal, organic, highly alkaline decontaminants, with the recommended spraying density for decontaminant applied.
- People decontamination was included in the ROP **People safety procedures**

Providing decontamination

<u>Negative result of contamination recognition</u>

- In case of a negative equipment contamination diagnosis (CWA absence) research material can be collected in accordance with the sampling procedures, keeping safety

conditions/procedures. Warning: the sample may contain CWA. The sample must be properly secured. It is recommended to place the container with the sampling material in an airtight polyethylene foil bag.

- Research equipment after the sampling operation should be thoroughly rinsed with water.

Positive result of contamination recognition (CWA presence)

- Collect the research sample in accordance with the sampling methodology. Place the container with the material in a sealed polyethylene bag with the participation of a second person (also in protective clothing and a gas mask) staying in the so-called clean (not endangered) zone. After the transfer of the research material, the person which was taking the sample supervises and, if necessary, supports the decontamination of equipment and vessel deck, after decontamination person supervising this action is also subjected to the decontamination in accordance with the decontamination procedure ROP **People safety procedures**
- Spray thoroughly the research equipment and part of the vessel deck under the device using an organic disinfectant with a spraying density of $0.1dm^3 * m^{-2}$.
- After 5 minutes, rinse the devices and the vessel deck with water.
- Repeat the CWA detection analysis.
- In case of CWA redetection, repeat decontamination process increasing by half the organic decontaminant spraying density.
- Continue operations until you receive a negative result.
- Decontaminate people according to procedure ROP **People safety procedures**

Additional information may be found in: „Chemical munitions dumped in the Baltic Sea - a guidebook for fishing boat crews" Michalak J. (2014)

Conclusions (if applicable)

References

[1] Michalak, J., Chemical munitions dumped in the Baltic sea a guidebook for fishing boat crews, **2014**

[2] Equipment manuals

Change history

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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