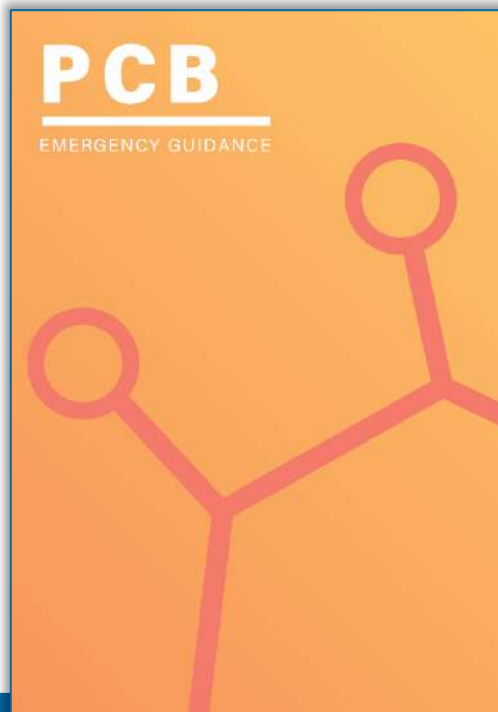


PCB e-Learning Platform

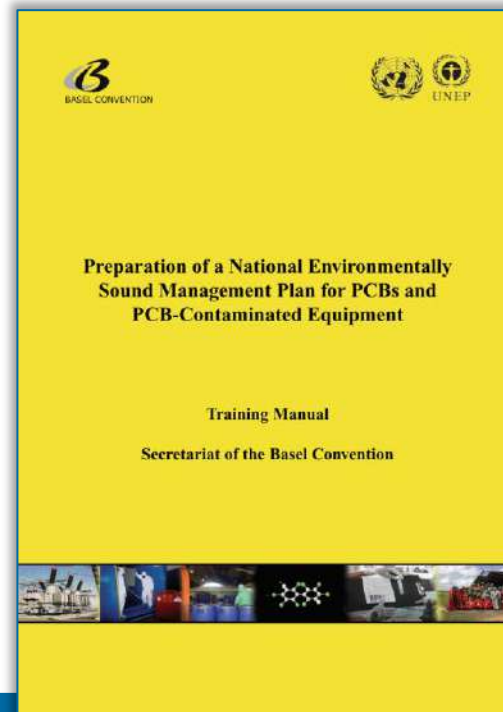
**RESPONSE MECHANISMS
FOR PCB RELATED ACCIDENTS**

PCB EMERGENCY KEY GUIDANCE DOCUMENTS



**CLICK TO READ THE PCB
EMERGENCY GUIDANCE DOCUMENT**

Source: https://pcb.unitar.org/wp-content/uploads/2023/06/29f572_7a0fd11b4a1545dca52a529641327c57_compressed.pdf



**CLICK TO READ THE BASEL
CONVENTION'S TRAINING MANUAL**

Source:
<https://www.basel.int/Portals/4/Basel%20Convention/docs/pub/pcbManualE.pdf>



CLICK TO CONSULT THE GUIDANCE DOCUMENTS

DEFINING ACCIDENT AND INCIDENT

ACCIDENT



Accidents are defined as an unexpected event that may result in property damage(s) and **does** result in an injury or illness.

INCIDENT

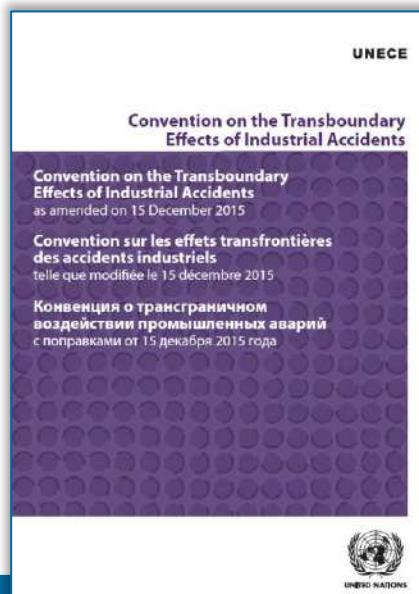


Incidents are defined as an unexpected event that may result in property damage(s) and **does not** result in any injury or illness. Incidents are also called, “near misses” or “near hits”.



CLICK TO CONSULT THE GUIDANCE DOCUMENTS

DEFINING INDUSTRIAL ACCIDENTS



CLICK TO READ THE UNECE
INDUSTRIAL ACCIDENTS CONVENTION

Source: <https://unece.org/environment-policy/publications/convention-transboundary-effects-industrial-accidents>

INDUSTRIAL ACCIDENT



Industrial accidents are defined as an event resulting from uncontrolled development during an activity involving hazardous substances, either:

- In an installation. For example, during manufacturing, use, storage or disposal.
- During transportation, in so far as it is covered by paragraph 2 (d) of article 2 of the [UNECE Industrial Accidents Convention](#).



EXAMPLES OF PCB ACCIDENTS

CLICK TO CONSULT THE GUIDANCE DOCUMENTS

“OIL SYMPTOMS” (Yushō disease)

Mass poisoning by PCB Northern Kyūshū, Japan, in 1968

- PCB contaminated rice bran oil.
- PCB concentrations reached about 2000-3000 ppm
- 1800 people affected; more than 500 people died.
- Poultry farms: loss of 400,000 birds.
- **Major diseases:** chloracne, dark brown pigmentation, ocular swelling, discolored skin/nails.
- High rates of stillbirth.
- Newborns with decreased birth weight and smaller neonatal size.
- Long-term negative effects for children.

Image source: <https://www.okinawatimes.co.jp/articles/-/578283>





CLICK TO CONSULT THE GUIDANCE DOCUMENTS

EXAMPLES OF PCB ACCIDENTS

2015 LAURELTY ELECTRICAL COMPANY FIRE (PARAGUAY)

In October 2015, a fire started at a storage site of the national electrical company in the city of Laurelty.

Burned equipment:

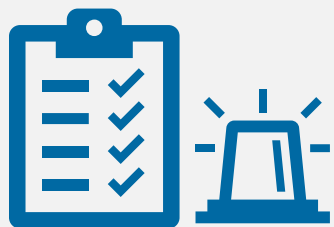
- 10 tons of metal
- 2 tons dielectric oil
- Transformers
- Capacitors
- Other materials

Image source: <https://www.abc.com.py/edicion-impresa/suplementos/judicial/incendio-en-la-subestatica-de-la-ande-en-san-lorenzo-1640965.html>



PCB EMERGENCY PLAN AND ITS OBJECTIVE

EMERGENCY PLAN



An emergency plan includes necessary procedures before, during and after the crisis. It provides a clear set of roles and responsibilities and established instructions for preventions and response to any emergency.

OBJECTIVE



The main objectives of emergency plan are to protect, prevent and to reduce adverse effects on workers, the facility and environment in any case of an incident or accident.



PCB EMERGENCY PLAN INCLUDES

SAFETY

Refers to the condition of being protected from aspects that are likely to cause harm.

In terms of PCB safety, it means being protected during regular operation at, for example:

The electrical facility is equipped against leaking equipment or fire.

SECURITY

Refers to the protection of individuals, organizations or facilities and the environment against external threats and criminal activities.

1. SAFETY AND SECURITY PLAN

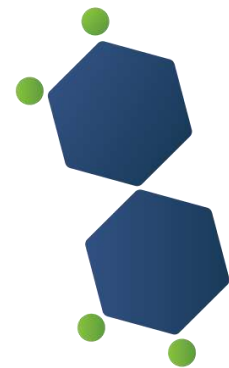
CONTINGENCY



An event such as an emergency that may occur but is not certain to happen (e.g. natural disasters).

2. CONTINGENCY PLAN





PCB e-Learning Platform

1. SAFETY AND SECURITY PLAN

SAFETY AND SECURITY PLAN

Incidents involving PCBs can occur during their whole life-cycle:

- Equipment in service
- During maintenance
- In storage
- During transport
- At a disposal facility.



Incidents can be for example:

- A leak or spill of PCB liquid
- Failure of a piece of in-service equipment
- Explosions due to failures

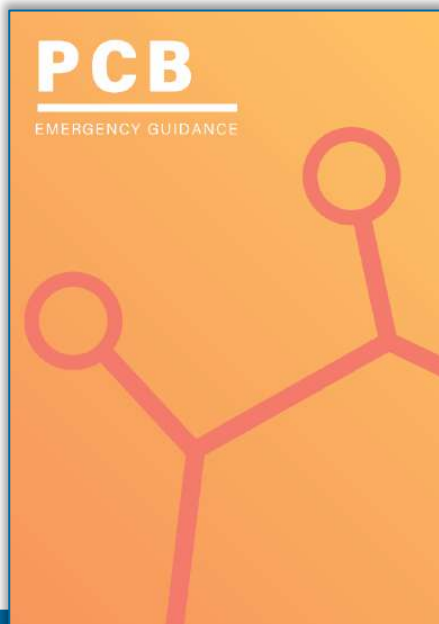


PREVENTIVE MEASURES

- Safety procedures to avoid both cold and hot incidents; following the life-cycle of the PCB
- Personal Protective Equipment (PPE)
- Measures to avoid possible event from external sources (robbery, attacks, etc.)
- Training



INCIDENT MECHANISM



REFER TO CHAPTER 2 IN THE
PCB EMERGENCY GUIDANCE
BOOKLET

When incidents happen that involve hazardous chemicals, such as PCBs, three major mechanisms are usually involved:

RAPID RESPONSE



EVALUATION



MITIGATION



PCB RELATED INCIDENTS

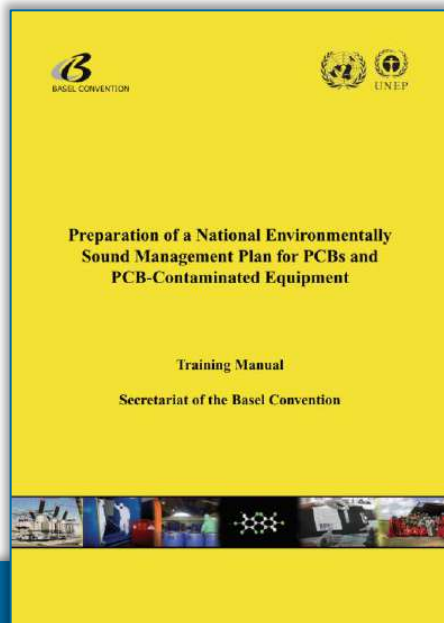
Capacitors and transformers could cause what we call **COLD** and **HOT INCIDENTS**.

If they contain PCB liquids, the incident can have serious consequences to the environment or turn into a serious accident if humans get injured or exposed to PCB.



CLICK TO CONSULT THE GUIDANCE DOCUMENTS

COLD INCIDENTS



**CLICK TO READ THE
BASEL CONVENTION'S
TRAINING MANUAL**

Cold incidents happen due to infiltration of PCB from a device into the environment from, for example:

- Unintended mechanical damage to the transformer's cooling fans
- Corroded transformer walls
- Capacitor draining activities
- Handling of stored oil

Source:
<https://www.basel.int/Portals/4/Basel%20Convention/docs/pub/pcbManualE.pdf>



CLICK TO CONSULT THE GUIDANCE DOCUMENTS

COLD INCIDENTS RESPONSE MECHANISM

1. ALERT RELEVANT AUTHORITIES

2. ALERT ON-DUTY DOCTOR

3. MAKE SURE STAFF ARE EQUIPPED WITH PPE

4. MARK OUT SAFETY PERIMETER AND VENTILATE THE PREMISES

5. LIMIT PCB SPILLS BY SEALING BREACHES AND USING ABSORBENTS

COLD INCIDENTS RESPONSE MECHANISM

6. CLEAN-UP OFF THE FLOOR

If it is watertight:

- Scrape thoroughly and use steam to soften the PCBs.
- Keep flames away from the area.
- Use only mild detergents (e.g. dishwashing liquids)

If it is not watertight:

- Heavily contaminated underfloor supports must be removed.

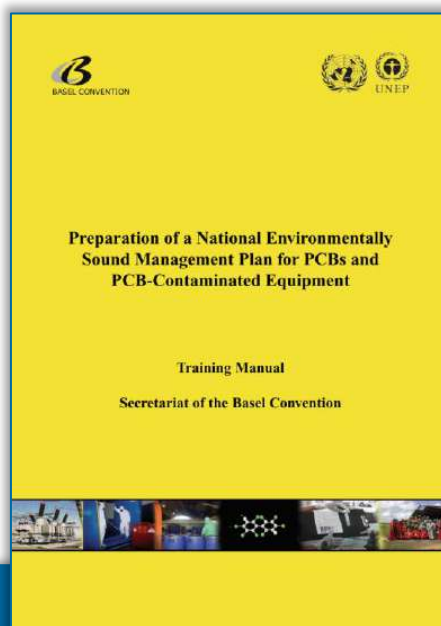
If there is any risk of ground water contamination:

- Take appropriate measures immediately to limit, settle and ultimately eliminate the ground pollution.

7. CLEAN-UP AND DISPOSAL OF CONTAMINATED MATERIALS AS HAZARDOUS WASTE



COLD INCIDENTS RESPONSE MECHANISM



**CLICK TO READ THE
BASEL CONVENTION'S
TRAINING MANUAL**

7. CLEAN-UP AND DISPOSAL OF CONTAMINATED MATERIALS AS HAZARDOUS WASTE

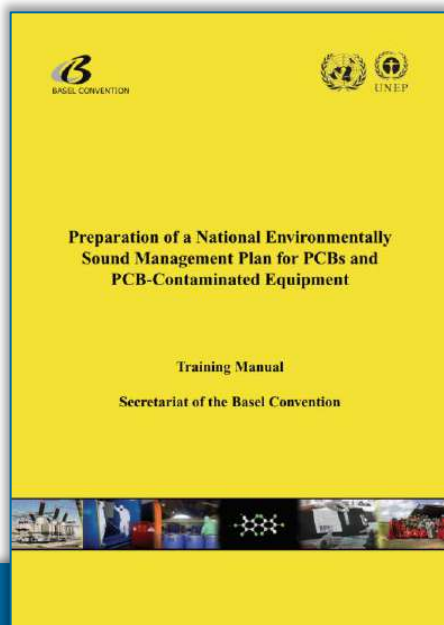
EVALUATION AFTER A COLD INCIDENT

Soils with a PCB concentration level:

- Higher than **100 ppm** must be treated.
- Between **10 ppm and 100 ppm** should be disposed of in an approved landfill or kept on site.
- Under **10 ppm** are considered non-contaminated.

Water cannot be thrown out unless its PCB content is less than 0.5 µg/L

HOT INCIDENTS



**CLICK TO READ THE
BASEL CONVENTION'S
TRAINING MANUAL**

Source:
<https://www.basel.int/Portals/4/Basel%20Convention/docs/pub/pcbManualE.pdf>

Hot incidents are usually short circuits or a fire in the vicinity of the equipment.

- Equipment exceed boiling point of PCB ($\pm 300^{\circ}\text{C}$).
- In fires also toxic furans (PCDFs) and dioxins (PCDDs) can be formed.
- PCB vapors can be released
- Released vapors deposit viscous oil films on fittings, floors and walls.

GUIDANCE IN THE TRAINING MANUAL OF THE BASEL CONVENTION

- The authorities may order the evacuation of the polluted area.
- Inspection of the contamination might be ordered; which is an extremely complex and delicate exercise and must be carried out under the strictest conditions.

Depending to the results of these inspections, the inspectorate might ask the owner to take certain essential steps for the decontamination of the area



CLICK TO CONSULT THE GUIDANCE DOCUMENTS

HOT INCIDENTS RESPONSE MECHANISM – NO FIRE

Scenario: An electrical short circuit may generate heat causing excess pressure in the equipment to build up, without bursting it.

To avoid the possibility of dielectrical decomposition (300°), the following steps must be taken:

1. BAN ACCUMULATION OF FLAMMABLE MATTER AND BLOCK OFF THE AREA (E.G., FIRE-WALLS)

2. INFORM LOCAL FIRE DEPARTMENT AND EMERGENCY SERVICES OF THE PRESENCE OF PCBs

3. CHECK THAT THE PCB-CONTAINING APPLIANCES ARE NOT OPERATING ON ELECTRICAL OVERLOAD

HOT INCIDENTS RESPONSE MECHANISM – NO FIRE

4. CHECK THAT ALL ELECTRICAL EQUIPMENT HAS PROTECTION MEASURES

5. ENSURE THAT ALL GAS CONTAINERS ARE PROPERLY SEALED

6. ISOLATE ALL SITES WHERE PCBs ARE HANDLED AND STORED



7. SMOKE AND VAPOUR RESULTING FROM AN ACCIDENT SHOULD BE PREVENTED FROM REACHING NEIGHBOURING SITES AND OFFICES.

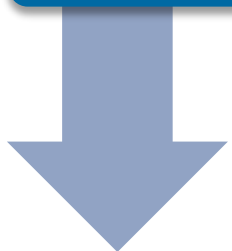


CLICK TO CONSULT THE GUIDANCE DOCUMENTS

HOT INCIDENTS RESPONSE MECHANISM – FIRE

Scenario: The transformer is intact, there may have been some internal priming, and melting of the fuses:

1. DO NOT REPLACE THEM WITHOUT TESTING THEM FIRST AND DO NOT OPEN THE TRANSFORMER WITHOUT TAKING PRECAUTIONS



2. USE AN OXYGEN MASK WITH A GAS FILTER AS THE INTERNAL PRESSURE MAY HAVE RISEN ADDING TO THE RISK OF AN ESCAPE OF HYDROCHLORIC GAS.



HOT INCIDENTS RESPONSE MECHANISM – FIRE

Scenario: Fire or re-priming of an open, run-down appliance. Risk for PCB decomposition and formation of furans and dioxins exists. There is consequently a risk of “hot pollution”

1. DISCONNECT THE UNIT

2. CALL THE LOCAL FIRE DEPARTMENT AND GIVE THEM PRECISE DETAILS ABOUT THE ACCIDENT*

*Use CO2 or dry ice instead of water, lessening the risk of creating polluted water

3. INFORM THE RELEVANT AUTHORITIES WITHOUT DELAY

HOT INCIDENTS RESPONSE MECHANISM – FIRE

4. CONFINE POLLUTED AREA AND ENSURE AREA IS STRICTLY CONTROLLED



5. CONFINE POLLUTION BY SEALING OFF ALL CHANNELS BETWEEN (NON-)POLLUTED AREAS



INCIDENTS RESPONSE MECHANISM – PARTICULAR CASE

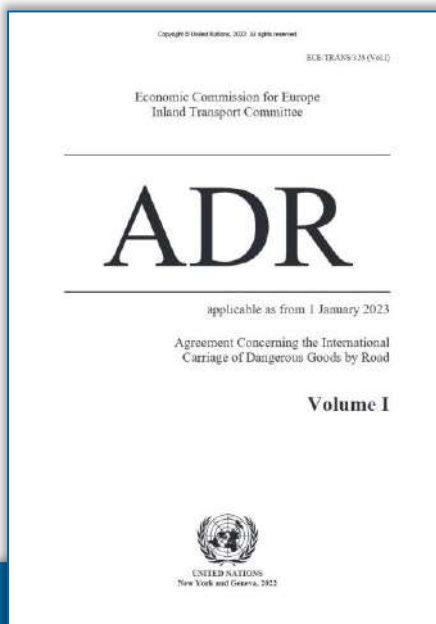
Scenario: Arcing has occurred, leading to a crack in the tank of the appliance. There is no fire. Spread of PCBs in a liquid state with hydrochloric acid vapors.

THIS IS A COLD INCIDENT SITUATION; MEASURES APPLY FOR **COLD** INCIDENTS.



WASTE AFTER THE ACCIDENT

Wastes from PCB incidents are hazardous wastes and should therefore be packed and managed according to the international guidelines, such as the ADR and Basel Convention.



[CLICK TO READ THE ADR](#)

Source: https://www.safetyadr.com/?page_id=18



CLICK TO CONSULT THE GUIDANCE DOCUMENTS

INSTRUCTIONS FOR THE FIRE BRIGADE

- Only use CO₂ to extinguish the fires.
- Avoid using water, it will become contaminated!
 - If water is used, use it only to cool down the environment.
- Use protective overalls that cover all exposed skin.
- Clothes and any protective clothing that has come into contact with PCB is toxic waste.
- All firefighters should shower thoroughly to remove any soot.
- If a firefighter develops a skin rash after a fire, they need an immediate medical check-up.



CLICK TO CONSULT THE GUIDANCE DOCUMENTS

PERSONAL PROTECTIVE EQUIPMENT (PPE)

While working with PCB equipment, workers get in direct contact with oils, parts of a transformer, or with contaminated material.



Image source: brcr-argentina.net.ar



USING PERSONAL PROTECTION EQUIPMENT (PPE) IS CONSIDERED AS A BASIC ACTION FOR ANY ACTIVITY INVOLVING HANDLING PCBs!

Image source: equiposproteccion.com/proteccion-productos-quimicos/

DIFFERENT TASKS REQUIRE DIFFERENT PPE

TASK	PPE
Liquid or Soil Sampling	- Gloves (Vinyl or nitrile) - Light respiratory mask (A2P2 Filter; for organic vapors and particles)
Sampling a Capacitor	- Gloves (Vinyl or nitrile, not latex) - Safety gloves, only while opening or drilling the capacitor - Light respiratory mask (A2P2 Filter)
Concrete Sampling or Brick Wall	- Gloves (Leather) - Safety gloves, during perforation activity - Light respiratory mask (A2P2 Filter)
Capacitor Dismantling (No Filtration)	- Gloves (Leather) - Light respiratory mask (A2P2 Filter) - Work overalls - Head protection (According to safety regulations) - Steel-tipped boots (Rubber)



DIFFERENT TASKS REQUIRE DIFFERENT PPE

TASK	PPE
Capacitor dismantling (With filtration)	• Gloves (Neoprene) • Light respiratory mask (A2P2 Filter) • Protective suit (Tyvek) • Steel-tipped boots (Rubber)
Cleaning activities	• Safety gloves, for heavy work • Light respiratory mask (A2P2 Filter) • Protective suit (Tyvek) • Steel-tipped boots (Rubber)



CLICK TO CONSULT THE GUIDANCE DOCUMENTS

MEASURES TO AVOID EVENTS FROM EXTERNAL SOURCES

Protect the facility and its equipment, control all the visitors and employees accessing the perimeter:

1. Install permanent or temporal fences around the facility equipment or working place.
2. Review all incoming the equipment and materials entering to the facility perimeter.
3. Be sure that all people entering the facility perimeter to have the security instructions and clearance.
4. Prepare emergency procedures for when an alarm goes off.
5. Devise an emergency plan for personnel and visitors in case of any occurring event.
6. Provide first aid equipment.



Image source: dreamstime.com ;globalshieldsecurityservices.com

TRAINING OF PERSONNEL

The company should provide training sessions to all personnel that handle PCB related equipment and/or wastes.

Training is especially important for the following subjects:

1. Electrical risks
2. Security and hygiene risks
3. Handling PCB
4. Emergency and contingencies response
5. Personal Protective Equipment
6. First aid



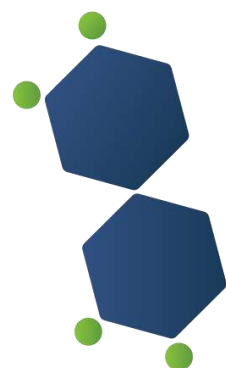
Image source: Pictures from the mining PCB project, Peru (2008). Inspection and training sessions. Mario Mendoza



CLICK TO CONSULT THE GUIDANCE DOCUMENTS

FIRST AID

CASE	PROCEDURE	NOTES
Skin contact with PCB oil	Wash and rinse thoroughly with soap	If rash develops, see a doctor
Eye contact with PCB oil	Rinse eyes thoroughly with lukewarm jets of water for 15 minutes (with both eyes kept wide open)	See a doctor
Ingestion of PCB oil	Rinse mouth thoroughly with water Do not drink anything else	See a doctor immediately or go to the hospital's emergency room (ER)
Breathing in highly concentrated PCB vapors	Take affected people outside in the open air	If discomfort does not go away, see a doctor



PCB e-Learning Platform

2. CONTINGENCY PLAN

CONTINGENCY PLAN

Incidents involving PCBs can occur during natural disasters affecting:

- Equipment in service
- In storage
- A disposal facility



Image source: depositphotos.com



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CONTINGENCY PLAN

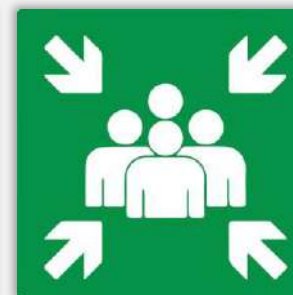
Preventing or minimizing the impact of unforeseen PCB incidents can be done via:

1. Identifying all potential risks and determine prevention measures.
2. Devising a plan for emergency situations.
3. Providing training sessions for personnel (with simulated emergencies and applications of first aid).
4. Maintaining capacities for mobile response .
5. Notifying fire brigade, police, and government agencies.
6. Adopting mitigation measures, such as:
 - Fire extinguishing systems
 - Spill containment equipment
 - Water deposits for extinguishing fires
 - Fire and spill alarms
 - Firewalls

FIRST AID



ASSEMBLY
POINT



FIRE
EXTINGUISHER



Image source: shutterstock.com

CONTINGENCY PLAN

7. Installing clear communication systems, such as installing:

- Exit signs
- Emergency telephone numbers
- Alarm locations
- Emergency instructions



Image source: shutterstock.com

8. Carrying out periodic maintenance of equipment and tools for emergency situations.
9. Carrying out periodic verification and revision of the Contingency Plan.
10. Integrating facility plans with regional, national and international planning instruments for emergency response.
11. Making sure the surface of the containment area is coated with:
- Paint, urethane or epoxy
 - Plastic coating or absorbent mats

CONTINGENCY PLAN

 **Emergency contact numbers for
PCB related accidents**

	 Person in charge for accidents
	 Person in charge of facility
	 Fire department
	 Police
	 Local doctor
	 Hospital
	 Authority
	 Authority

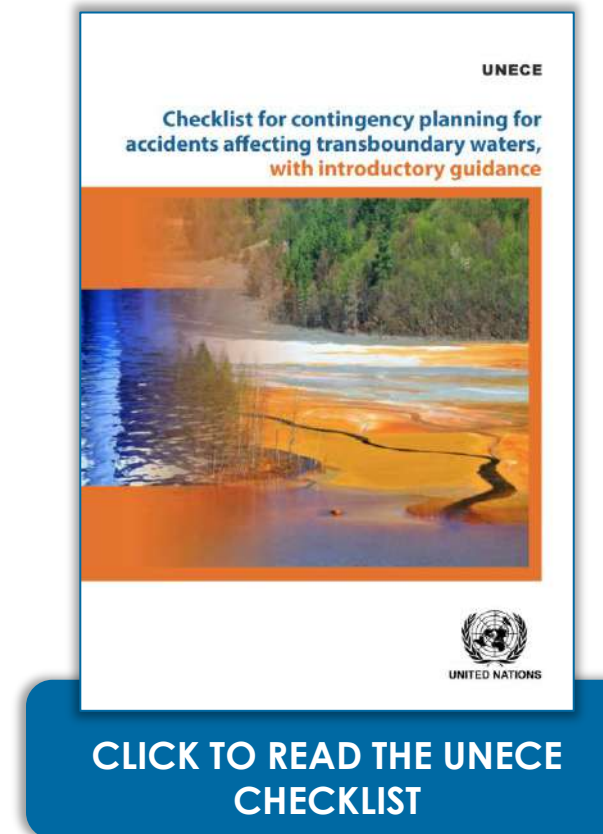


CLICK TO CONSULT THE GUIDANCE DOCUMENTS

CONTINGENCY PLAN

UNECE CHECKLIST FOR CONTINGENCY PLANNING

- Aims to limit the number of accidents causing water pollution and the severity of their consequences:
 - Mitigate consequences of industrial accidents affecting transboundary water courses for human health and the environment.
- Is a tool for harmonized contingency planning between neighboring or riparian countries (applied in the Danube Delta and Armenia)
- Includes recommendations on legislation, early warning/alarm/notification systems, joint bodies and financial mechanisms in place; exchange of information and consultations between countries

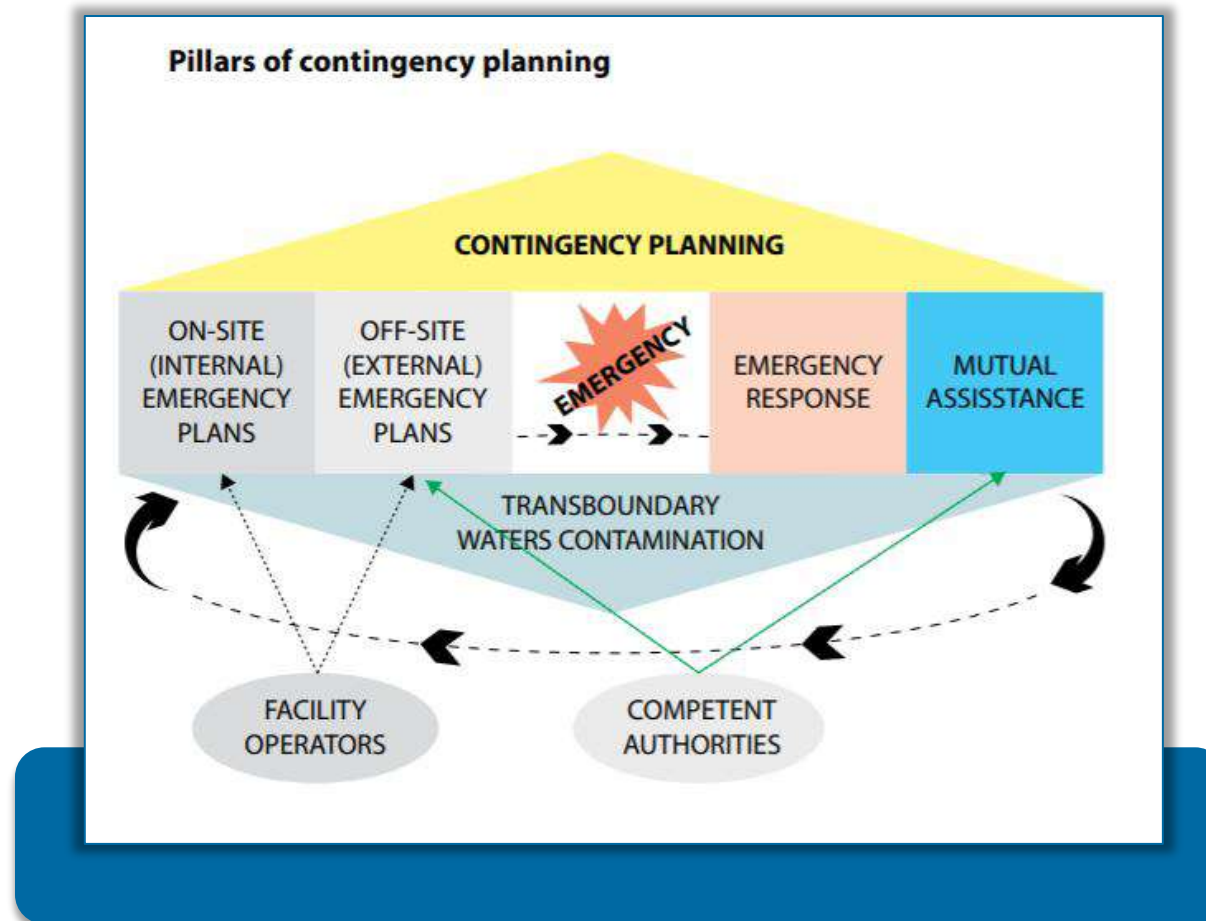


Source:
https://unece.org/fileadmin/DAM/env/documents/2016/TEI/A/ece.cp.teia.34.e_Checklist_for_contingency.pdf



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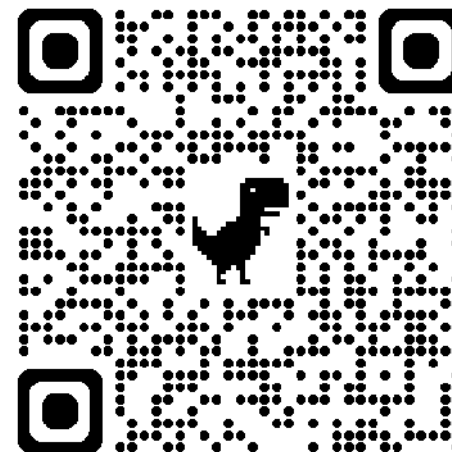
CONTINGENCY PLAN



EXPLOSION IN BÜRRIG, GERMANY (ARTICLE)



Image source: Currenta-Info-Bürrig Das Ereignis, Currenta



Source: <https://www.currenta-info-buerrig.de/das-ereignis/>

SCAN ME!



CLICK TO CONSULT THE GUIDANCE DOCUMENTS

CONCLUSION

PCBs ARE TOXIC CHEMICALS THAT
CAUSE ADVERSE EFFECTS TO
HUMANS AND THE ENVIRONMENT.

THE BEST MEASURE TO AVOID
INCIDENTS IS **PREVENTION!**

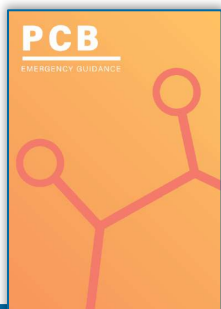


**PLANNING AND PREVENTION MEASURES → PCB MANAGEMENT PLAN
PROTOCOL OF RESPONSE TO PCB EMERGENCIES (FACILITY LEVEL)**



CLICK TO CONSULT THE GUIDANCE DOCUMENTS

MENTIONED DOCUMENTS



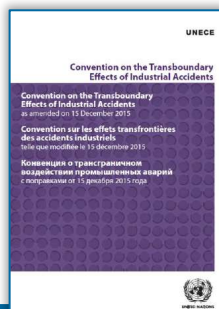
**THE PCB EMERGENCY
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Source: https://pcb.unitar.org/wp-content/uploads/2023/06/29f572_7a0fd11b4a1545dca52a529641327c57_compressed.pdf



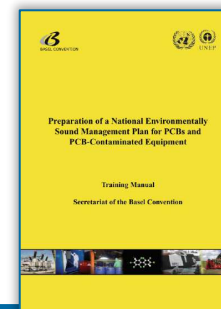
**THE STOCKHOLM
CONVENTION'S UNINTENTIONAL
POPs GUIDANCE DOCUMENT**

Source: <https://chm.pops.int/Implementation/BATandBEP/ReleasesfromunintentionalPOPs/BATandBEPGuidance/tabid/9647/Default.aspx>



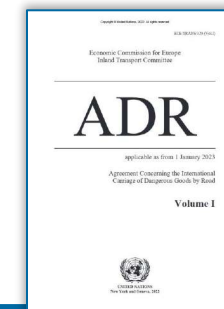
**THE UNECE INDUSTRIAL
ACCIDENTS CONVENTION**

Source: https://unece.org/DAM/env/documents/2017/TEIA/Publication/ECE_CP_TEIA_33_final_Convention_publication_March_2017.pdf



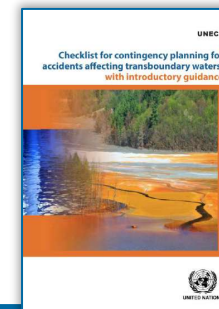
**THE BASEL CONVENTION'S
TRAINING MANUAL**

Source: <https://www.basel.int/Portals/4/Basel%20Convention/docs/pub/pcbManualE.pdf>



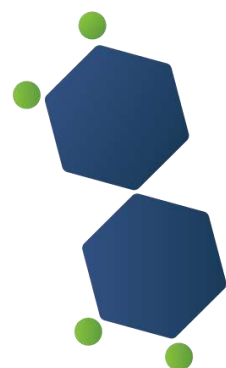
THE SAFETY ADR

Source: https://www.safetyadr.com/?page_id=18



THE UNECE CHECKLIST

Source: https://unece.org/fileadmin/DAM/env/documents/2016/TEIA/ece.cp.teia.34.e_Checklist_for_contingency.pdf



PCB e-Learning Platform

END OF EMERGENCY RESPONSE MECHANISMS

<https://pcb.unitar.org/>