

DOKUMENTATIONEN

12/2015

Checklists for surveying and assessing industrial plant handling materials and substances, which are hazardous to water

Nº 4

Joint storage

DOKUMENTATIONEN 12/2015

Advisory Assistance Programme (AAP) of the
Federal Ministry for the
Environment, Nature Conservation,
Building and Nuclear Safety

Checklists for surveying and assessing industrial plant handling materials and substances, which are hazardous to water

Nº 4

Joint storage

by

Gerhard Winkelmann-Oei (idea and conception)
Federal Environment Agency, Dessau (Germany)

Jörg Platkowski
R+D Industrie Consult, Adelebsen (Germany)


International Commission for the Protection of the Danube River (ICPDR),
Vienna (Austria)

On behalf of the Federal Environment Agency (Germany)

Imprint

Publisher:

Umweltbundesamt
Wörlitzer Platz 1
06844 Dessau-Roßlau
Tel: +49 340-2103-0
Fax: +49 340-2103-2285
info@umweltbundesamt.de
Internet: www.umweltbundesamt.de

 /umweltbundesamt.de

 /umweltbundesamt

Updated:

09/2014

Edited by:

III 2.3 Plant Safety
Gerhard Winkelmann-Oei

Publication as pdf:

<http://www.umweltbundesamt.de/publikationen/checklists-for-surveying-assessing-industrial-plant-3>

ISSN 2199-6571

Dessau-Roßlau, June 2015

This publication is financed by the German Federal Environment Ministry's Advisory Assistance Programme (AAP) for environmental protection in the countries of Central and Eastern Europe, the Caucasus and Central Asia and other countries neighbouring the European Union.

The responsibility for the content of this publication lies with the authors.

Explanation

Substances are considered to be in a joint storage if they are stored:

- together in the same room or
- in the open air, and are without a stable and fireproof wall or without an adequate safety gap (in the magnitude of 8 to 10 m), or
- in a joint containment or in a partitioned tank.

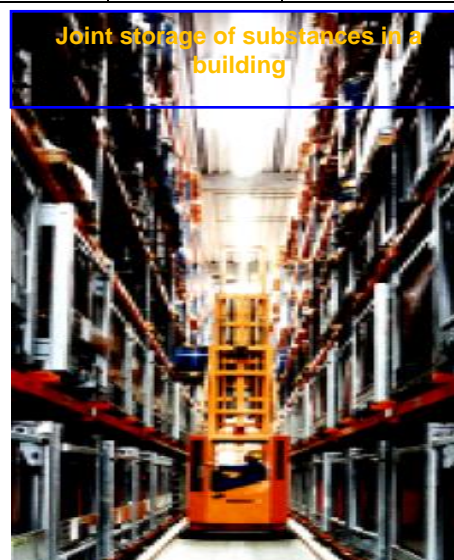
Recommendations of the International River Basin commission for Joint Storage

- Dangerous substances and preparations must be orderly stored in storage (according to EC-guidelines 67/548/EWG) in accordance to their properties.
- Dangerous substances and preparations should not be stored together if this may give rise to hazardous situations (release of toxic substance, explosions, fires or highly exothermic reactions).
- The following table shows categories of substances that should never be stored together:

	E	F/F⁺	O	T/T⁺	Xn/Xi	C
E	+	-	-	-	-	-
F/F⁺	-	+	-	-	-	-
O	-	-	+	-	-	-
T/T⁺	-	-	-	+	+	-
Xi/Xn	-	-	-	+	+	-
C	-	-	-	-	-	+

Explanation:

E	explosive
F/F ⁺	low flammability/high flammability
O	fire promoter
T/T ⁺	toxic/very toxic
Xn/Xi	harmful to health/irritant
C	corrosive
+	Substances can normally be stored together
-	Substances must not be stored together without taking special safety precautions



- When substances are stored together the safety measures must be geared to the most dangerous substance.
- Large quantities of combustible material (pallets, packaging material etc.) which are by their nature conducive to the rapid development and spread of fires should be stored separately unless special safety measures have been taken.
- Normally, auto igniting substances and substances that form toxic, flammable or combustible gases with water should not be stored with other dangerous substances.
- Pressurised gases, cryogenically liquefied gases, and fertilisers containing ammonium nitrate should not be stored with toxic substances.
- Corrosive substances in fragile containers, polychlorinated biphenyls and organic peroxides are only allowed to be stored together with other combustible substances in tanks with joint secondary containment unless this is done in such a way that they can not influence each other in the event of an accident.

Checklists for monitoring the implementation of the recommendations

General details on the examined storage

Operational name:

Drum storage
 tanks
 outdoor
 in the room

Total Volume: m³

Name of substance:

(further details in Checklist No. 1 „Substances“)

WRI:

Remarks:

1. Concept for joint storing dangerous substances and preparations

Name of substance See Checklist 1	E	F/F+	O	T/T+	Xn/Xi	C

1.1 Are dangerous substances and preparations stored together?

- Yes → 1.2 No → Checklist is processed
 Action No action

1.2 Is there a concept for the joint storage of dangerous substances and preparations?

- Yes No → 2 Not applicable
 Action No action

1.3 Were the dangerous properties of the substances and preparations taken into consideration?

- Yes No Not applicable
 Action No action

Remarks:

Examples of actions:

Short-term measures:

- The following separate measures should be carried out in order to assess the joint storage of substance:
 - Collect information on dangerous substances and preparations in each storage sections.

- Identify the relevant characteristics which are required to assess the joint storage of substances (see table of Recommendation No. 3).
- Put up a concept for storing dangerous substances and preparations.

Determination of the real risk

Is the sub-point of the recommendation implemented?

Yes	Partially	No
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RC=1	RC=5	RC=10

2 Hazard risks in joint storage

2.1 Have there been taken technical and organisational measures to exclude joint storage of dangerous substances and preparations, which can lead to a hazardous situation (release of toxic substances, explosions, fire or highly exothermic reactions)?

Note: Such substances must not be stored together.

- | | | |
|---------------------------------|------------------------------------|---|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Not applicable |
| <input type="checkbox"/> Action | <input type="checkbox"/> No action | |

Remarks:

Examples of actions:

Short-term measures:

- Provide temporary measures like:
 - Acquisition of mobile extinguishing devices,
 - Construct earth walls,
 - Construct simple partitioning walls made of bricks,
 - If possible, change the criteria for storing the substances in the each storage sections.

Medium-term measures:

- Install fire-proof partitioning walls,
- Store the substances outdoors with sufficient safety gap between the substances or separate the storage sections using fire-proof walls.
- Change the criteria for storing the substances in the each storage sections.
- Subdivide joint secondary containments using additional fire-proof separating walls (ensure that sufficient retention volume is still available).

Long-term measures:

- If the substances are stored separately but the available separating walls are not fire-proof or it is **not** possible to provide sufficient safety gap:
 - Install fire alarms and install automatic alarm transmission to the fire brigade.
 - Install automatic fire extinguishing equipment.
- Install the tanks in separate secondary containment or use double walled vessels.
- Provide stationary extinguishing equipment for the tank farm.
- Provide sprinkling devices for the exterior surfaces of the tanks.

Determination of the real risk

Is the sub-point of the recommendation implemented?

Yes	Partially	No
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RC=1	RC=40	RC=80

3 Consider the categories of the substances when storing in a joint storage

3.1 Is the information on how to categorise the substance described in Table 3 recommendations considered for the joint storage?

- Yes No Not applicable
 Action No action

3.2 Has additional safety measures for joint storage been taken in case the conditions specified in the table could not meet?

- Yes No Not applicable
 Action No action

Remarks:

Examples of actions:

Like the measures described in Point 2.

Determination of the real risk

Is the sub-point of the recommendation implemented?

- | | | |
|--------------------------|--------------------------|--------------------------|
| Yes | Partially | No |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| RC=1 | RC=40 | RC=80 |

4 Safety measures

4.1 Are the safety measures geared toward the most dangerous substance in the joint storage?

- Yes No Not applicable
 Action No action

Remarks:

Examples of actions:

Short-term measures:

- Ascertain the dangerous substances and identify their hazardous properties which are relevant for specifying the safety measures.
- Carry out measures like those described in Point 2.

Medium-term measures: Carry out the measures described in Point 2.

Long-term measures: Carry out the measures described in Point 2.

Determination of the real risk

Is the sub-point of the recommendation implemented?

- | | |
|--------------------------|--------------------------|
| Yes | No |
| <input type="checkbox"/> | <input type="checkbox"/> |
| RC=1 | RC=10 |

5 Combustible materials

relevant not relevant → 6.

5.1 Are large quantities of combustible materials handled, e.g. pallets or packing materials?

- Yes → 5.2 No → 6 Not applicable
 Action No action

5.2 Are they stored together with dangerous substances or preparations?

- Yes No Not applicable
 Action No action

5.3 Is additional and sufficient safety measures provided for storing large quantities of combustible materials?

- Yes No Not applicable
 Action No action

Remarks:

Examples of actions:

Short-term measures:

- Provide temporary measures, e.g.:
 - Determine the special factors to be considered in joint storage in co-ordination with the local fire brigade.
 - Provide mobile fire extinguishing equipment.
 - Construct earth walls.
 - Construct simple partition walls made of brick.
 - If possible, store combustible materials at another location.

Medium-term measures:

- Store combustible materials at another storage location.
- Install stationary fire extinguishing devices.
- Install fire-proof separating walls.
- Ensure sufficient safety gaps.

Long-term measures:

- Install automatic fire alarm devices.
- Install automatic fire extinguishing equipment.

Determination of the real risk

Is the sub-point of the recommendation implemented?

Yes

RC=1

Partially

RC=5

No

RC=10

6 Special requirements for joint storage

6.1 In general, it is important to ensure that self-igniting substances and substances which can form toxic, ignitable or flammable gases when they come in contact with water should **not** be stored with other dangerous substances. Have these requirements been considered?

- Yes No Not applicable
 Action No action

Remarks:

Examples of actions:

Short and medium-term measures:

- Carry out measures recommended in the Paragraph 2.

Long-term measures:

- Don't store this category of substances together.

Determination of the real risk

Is the sub-point of the recommendation implemented?

Yes

RC=1

Partially

RC=5

No

RC=10

7 Special requirements for toxic substances

relevant

not relevant

7.1 Has it been ensured that compressed gases, liquefied gases at very low temperatures and fertilisers containing ammonium nitrate are not stored together with toxic substances?

- Yes No Not applicable
 Action No action

Remarks:

Examples of actions:

Short and medium-term measures:

- Carry out measures recommended in the Paragraph 2.

Long-term measures:

- Do not store these groups of substances together.

Determination of the real risk

Is the sub-point of the recommendation implemented?

Yes

RC=1

Partially

RC=5

No

RC=10

8 Corrosive substances, polychlorinated biphenyl's, organic peroxides

relevant

not relevant → 9

8.1 Has it been ensured that corrosive substances stored in fragile vessels and polychlorinated biphenyl's and organic peroxides stored in tanks having a joint secondary containment with other combustible substances are stored in such a way that they do not influence each other in case of an incident?

- Yes

 No

 Not applicable
 Action

 No action

Remarks:

Examples of actions:

Short and medium-term:

- Carry out measures recommended in the Paragraph 2.

Long-term measures:

- Do not store these groups of substances together if interaction can not be avoided in case of an incident.

Determination of the real risk

Is the sub-point of the recommendation implemented?

Yes

RC=1

Partially

RC=5

No

RC=10

Summary of the Checklist

Sub-point of the Recommendation	Possible Risk category	Risk categories
1	1 / 5 / 10	
2	1 / 40 / 80	
3	1 / 40 / 80	
4	1 / 10	
5	1 / 5 / 10	
6	1 / 5 / 10	
7	1 / 5 / 10	
8	1 / 5 / 10	

Average Risk of the Checklist (ARC)