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Guideline for identification of hazardous substances during PDA

Purpose of the guide: Pre-demolition audits are a prerequisite for high quality CDW management and increased preparing for re-use and recycling of CDW materials. An important part of the pre-demolition audit is the identification of materials containing hazardous substances or mixtures and those that might hinder re-use or recycling.

The identification of hazardous substances is the basis for planning, cooperation and dialogue between the client, consultants, demolition contractor and authorities throughout the demolition project. On the basis of an accurate pre-demolition audit, problematic environmental situations can be identified, described, and managed early on in the process.

This guideline is intended as a practical guidance and supplement to on-the job-training for practitioners carrying out the identification of hazardous substances in buildings prior to demolition. This is referred to as the *audit* in this guide. Practitioners carrying out this type of work are referred to as *auditor* in this guide.

Target group: The guide is intended for those practitioners who are new to this field of expertise and would like to get a practical overview of how to accurately plan and carry out the identification of hazardous substances in buildings as part of a pre-demolition audit.

This guide is not intended as an exhaustive, stand-alone resource for the identification of hazardous substances in buildings. Rather, readers should be aware that this document only provides a basic orientation and a high-level overview of the necessary knowledge, methods, and key steps involved. Comprehensive expertise and practical competence should be developed through additional training, hands-on experience, and consultation of specialised literature, national guidelines, and expert resources.

Content: This guide will take you through the relevant steps of an audit and explain your responsibilities at each step when it comes to identification of hazardous substances in buildings:

1. Planning and scoping the audit
2. Desk study
3. Preparation of the field survey
4. Field survey
5. Sample handling
6. Reporting

Limitations: Pre-demolition audits cover the following important aspects:

- Collecting and assessing information about the qualities and quantities of construction products for re-use, CDW materials with the potential for preparing for re-use, recycling and other material recovery as well as other types of CDW materials that will be generated during the demolition works.
- Giving general and site-specific recommendations regarding the demolition process.
- Identification of materials containing hazardous substances or mixtures and those that might hinder re-use or recycling.

This guide focusses on the third aspect only.

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1. Planning and scoping the audit

1.1 Purpose and scope definition

Identify any specific legal requirements that apply to the audit process. These may vary by building type and/or size, intended demolition or renovation approach, local/national regulation. If needed, discuss with relevant authorities. Also identify any specific legal requirements that apply to the audit's results, e.g. waste classification legislation and limit values for the pollutants of interest.

Before beginning any work, clarify the purpose and scope of the audit with the building owner. Establish whether the audit covers the entire building or specific sections, estimate the expected number of samples to be collected and analysed, the pollutants requiring investigation, and define the exact deliverables expected.

1.2 Building access and post-audit arrangements

Assess building occupancy status (residential, industrial, vacant) and identify any specific concerns related to its occupancy. Determine whether destructive testing is acceptable for the building owner and users and establish "repair protocols" if sampling will leave visible damage.

When entering into an agreement with the client/building owner, make sure that responsibility for repairs have been agreed on. E.g. ensure that there is an agreement with a contractor who will handle necessary repairs after sampling, especially where substantial destructive sampling is expected.

1.3 Laboratory Coordination

Start coordination with the laboratory as soon as possible, as this with help you in your dialogue with the building owner and in planning your work. Select as far as possible an accredited laboratory with capabilities matching your project requirements.

The following questions and considerations may help you, e.g.:

- *What are the detection limits for the relevant chemical analyses?* You need this information to verify that detection limits for chemical analysis align with any regulatory thresholds.
- *Can you specify the analytical methods to be used?* Make sure to confirm appropriate analytical methods when specific regulatory requirements exist.
- *How to get the samples to the laboratory?* Do you have to drop of the samples or can pick up by the laboratory be arranged?
- *What sample amount is needed and what packaging should be used?*
- *What is the price for the chemical analysis (per sample and considering the expected number of samples in the batch)?*
- *What is the expected turnaround time from sample arrival at the laboratory to final delivery of the analytical results?*
- *What format will the final report be?* You should inquire whether it is possible to obtain different formats, e.g. a signed paper or PDF-copy supplemented with a spreadsheet containing the results.

This information helps you to align timeline and budget expectations with both the building owner and the laboratory.

1.4 Budget Planning

Make sure to make an agreement with the building owner on how to manage extra samples. Plan for contingencies by allocating budget for additional samples if unexpected materials are discovered and for

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supplementary analyses if initial results indicate further investigation is needed. Make sure to include expenses for e.g. specialised equipment such as lifting equipment.

2. Desk study

Gather all available building documentation from multiple sources, such as owner/client records, online resources (Google Maps), building registers, public archives. You can research building drawings, layouts and historical information through web archives and municipal or national building records. Detail drawings of specific construction details could contain useful information on structures, hidden layers, joints, etc.

Collect comprehensive information about:

- Construction year and original building materials used;
- Maintenance and renovation history;
- Modifications over time;
- Previous uses of the building (including spills/accidents, fires, polluting processes).

This information is necessary in planning the field survey, as it provides relevant background on materials, construction products, and hazardous substances that are likely to be found.

3. Preparation of the field survey

3.1 Initial assessment

Determine necessary safety equipment based on building age and likely hazards. Conduct a thorough visual inspection of the building before the actual field survey. This will help you in determining the sampling method and locations.

For small to medium-sized projects, the visual inspection can typically be combined with the actual field survey.

3.2 Sampling Methods

The final choice of sampling method and equipment depends on the substances to be tested for and the underlying building materials. Sampling methods include both on-site measurement (non-destructive testing) and destructive testing. On-site measurements can be used for the identification of hazardous substances in the field.

Identify appropriate sampling methods and sampling tools based on materials and hazardous substances of concern and the scope of the audit:

- Non-destructive testing, such as:
  - XRF, Raman and other field screening technologies for preliminary assessment
- Destructive testing, such as:
  - Scraping/cutting for surface materials, e.g. using a paint scraper;
  - Chipping/breaking for solid materials, e.g. using a chisel;
  - Core drilling for layered materials;
  - Dust sampling for residues.

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3.3 Sampling locations and number of samples

Choose sampling locations strategically based on the scope of the project and minimise visible damage when sampling in occupied buildings. Focus on joints, hidden areas, and locations likely to contain hazardous materials.

Determine the number of samples needed for a comprehensive and accurate audit. The number and type of samples vary depending on the type, size and complexity of the buildings, type and complexity of the demolition or renovation project, previous use and materials used. Therefore, it is a case-by-case assessment.

3.4 Laboratory coordination

Make sure to coordinate the final details with the laboratory. This may include contacting the laboratory regarding requirements for sample packaging and labelling/documentation and sample requisition if you have not done this yet. Set aside time to order sample containers from the laboratory and prepare sample packaging and containers according to laboratory specifications.

Clarify with the laboratory how much sampling material is needed for the chemical analysis.

For medium-sized and large projects where many samples are expected, it is beneficial to notify the laboratory of the expected delivery of the samples to ensure timely expedition and delivery of results.

Make sure to have additional sample packaging and containers in case of unforeseen samples.

3.5 Site access

Confirm site access arrangements including potential requirements for roof access or lifting equipment. This may include short confirmation of contact information or obtaining keys but may also imply obtaining security clearance or hiring relevant equipment well in advance of the field survey.

4. Field work

Confirm access arrangements before arriving at the site. Ensure that you have prepared necessary documents/templates and building drawings that you will need to document sampling in the field. Make sure that you have tools and equipment (including spare tools) ready to perform the sampling and to document the building through photographs or even 3D scanning during inspection. Unless there is an agreement with a contractor who will handle necessary repairs after sampling, make sure to bring necessary equipment and materials for repairs if sampling will leave damage requiring restoration that you need to take care of.

4.1 Safety and personal protective equipment

Whenever possible, work in pairs for safety and efficiency. Consider safety precautions for unexpected conditions like unstable structures.

Use appropriate personal protective equipment, e.g.:

- Nitrile gloves for all sampling
- P3 masks for asbestos sampling, appropriate coverall suit
- A2P3 filters when cutting PCB-containing materials
- P2 filters when cutting lead-containing materials

Minimise dust spreading during sampling activities. Ensure to follow any specific local or national safety regulations or instructions.

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4.2 Documentation

Document all field work with photographs, take notes and collect information in relevant templates. Mark sample locations on the floor plan and relevant detail drawings. Photograph each sampling location. Consider using digital tools to register information (specialised apps, 3D scanning hardware and software, etc.) as this may help you during reporting.

4.3 Sampling equipment

Clean all equipment between samples using alcohol or acetone to prevent cross-contamination. Replace cutting blades after each sample to prevent contamination of subsequent samples.

4.4 Sample Management

Package samples properly and as prescribed by the laboratory. Label each sample with a unique identification number and maintain a detailed log of all samples collected. Create a clear connection between physical samples and documentation.

5. Post field work/Sample handling

Identify any areas that could not be investigated but remain relevant. These could be areas that are inaccessible for various reasons, they may be hidden, located high up, or otherwise difficult to reach. The building might also be in operation, making it impossible to take destructive samples in some areas.

Document reasons for any missed samples and determine if additional site visits are necessary.

5.1 Internal Registration

If relevant, register all samples in your organisation's system and maintain clear traceability between field documentation and laboratory submissions. Create backup documentation of all field notes and sample information.

5.2 Laboratory Submission

Prepare and send samples to the laboratory according to their requirements and verify that sample documentation and requisition forms are complete and accurate. Make sure that any requirements from the laboratory for sample storage and labelling are followed. Ask for confirmation from the laboratory that the samples have been received.

6. Reporting

The analytical results and observations from the desk study and field survey are the basis for the reporting. The audit report will typically contain information on the scope of the report, summary of the audit, inventory of CDW fractions, and resource management recommendations.

6.1 Analysis Interpretation

The first step is to process analytical results thoroughly to ensure completeness. Consult with laboratory specialists for any unclear results.

Interpret laboratory reports correctly and apply appropriate generalisation from individual samples to building areas. Be aware of what results are based on (for example, a surface sample or an average sample) and what this means for the assessment and the subsequent recommendations for decontamination and classification of CDW.

Classify samples according to relevant standards and regulations and determine CDW classification for different materials (e.g. hazardous waste, non-hazardous waste). Identify hazardous substances requiring

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removal prior to demolition or renovation and identify hazardous materials requiring special handling during demolition.

6.2 Report Preparation

Present the findings in a clear and comprehensive report that includes visual documentation of hazardous materials and provides recommendations for safe handling and disposal. Create maps or drawings showing locations of hazardous materials and include laboratory reports as appendices.

When integrating the analytical results in buildings layouts, colour codes or other type of simple markup can ease results communication, e.g. red for samples classified as hazardous waste.

6.3 Client Communication

Summarise the findings in a format accessible to non-specialists and present the results to the client in a clear, understandable manner. Explain implications for the demolition or renovation process and discuss potential cost implications of hazardous material management. Provide guidance on the next steps and regulatory compliance.

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Checklist for decontamination of buildings

- *Before Work Starts*
  - Audit report reviewed: All precise risks known before work commences
  - Work area defined: Area with hazardous substances identified and marked
- *Containment and Barriers*
  - Effective containment established: Area enclosed with plastic sheeting and tape
  - Negative pressure established in the area with outlet to the outside through a suitable filter
  - Spread of dust prevented: Filters ensure that hazardous dust does not spread to other areas
- *Personal Protective Equipment (PPE)*
  - Respiratory protection (preferably full-face): supplied air, motorised or filtering respirators
  - Correct filters fitted: P3 filter (for asbestos), A2P3 filter (for PCB and heavy metals)
  - Disposable suits and gloves: Suitable material and sufficient quantity
  - Appropriate eye, ear and face protection ensured, properly worn and fitted
- *Work Equipment and Methods*
  - Tools checked before work commences, regular checks during work
  - On-tool point extraction set up
  - H-class vacuum cleaners with HEPA filters, filters checked and functional
  - If large water amounts are used (e.g. high pressure washing), ensure collection of wastewaters
- *During Work*
  - Workspace kept tidy: Ongoing clean-up
  - Tools and surfaces cleaned regularly: Prevents spread of dust/hazardous substances
  - Plastic enclosures checked: Repair or replace in case of damage or contamination
- *Waste Management (During and After)*
  - Hazardous and non-hazardous waste kept separate, mixing forbidden
  - Appropriate containers used (examples):
    - Asbestos: double-bagged plastic bags, double foil-wrapping, large closed containers for larger items.
    - PCB: sealed containers, clamping drum, large closed containers for larger items.
    - Heavy metals: big bags, containers
  - All waste labelled: Indicating content and contaminants
  - All waste sealed and registered: Enables tracking at the recipient
  - All waste bags/containers wiped before being removed from decontaminated area
- *Final Cleaning and Clearance*
  - All hazardous material fully removed: All areas inspected
  - Thorough final cleaning carried out: All surfaces
    - HEPA-vacuuming + wet wiping
    - Cleaning documented: Results properly archived for record keeping
  - Area checked:
    - Air samples taken (if required)

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  - Gel tape test (if required)
  - Material samples/core samples collected (if required)
- When cleaning is documented and approved: Area can be cleared

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