



timbre

Tailored Improvement of
Brownfield Regeneration
in Europe

Occupational Health and Safety During the Deconstruction of Buildings and Structures – Technical Guideline –

Lead author	Andreas Hesse	Report short name	WP5 status – D5.4
Deliverable number	D5.4	Due date for deliverable	31/03/2014
Version	3	Actual date for delivery	22/04/2014

Document information

Title	Occupational Health and Safety During the Deconstruction of Buildings and Structures – Technical Guideline –
Short name	WP5 status – D5.4
Deliverable title	Technical guideline on the working safety during the deconstruction of buildings / structures, evaluation of the best-of-practice on working safety in the EU countries and elaboration of a technical guideline on the working safety during deconstruction of buildings / structures
Deliverable number	D5.4
Due date for deliverable	31/03/2014
Version	3
Actual date of delivery	22/04/2014
Lead Author	A. Hesse (GE)
Contributors	M. Kühne, P. Hagemann (GE), S. Bartke (UFZ)
Distribution	X PU Public PP Restricted to other programme participants (including the Commission Services) RE Restricted to a group specified by the consortium (including the Commission Services) CO Confidential, only for members of the consortium (including the Commission Services)
Reference	D5.4 – Version 3

Document history

Date	Revision	Prepared by	Organisation	Approved by	Notes
20/01/2014	Version 1	P. Hagemann A. Hesse M. Kühne	GE GE GE		Discussed internally; sent to WP5 partner for revision and comments
20/03/2014	Version 2	As Version 1 and S. Bartke	UFZ	Feedback by coordinator requested and included	Updates included.
22/04/2014	Version 3	A. Hesse	GE	Approved by coordinator	Final edited version.

Acknowledgement

timbre acknowledges the received funding from the European Community's Seventh Framework Programme FP7 under Grant Agreement no 265364 (2011-2014)



Occupational Health and Safety During the Deconstruction of Buildings and Structures

– Technical Guideline –

Content

1. Introduction	5
2. Approach.....	6
3. Legal requirements	7
4. Safety and Health Management System for Deconstruction Work (SHMSDW). 10	
4.1 General requirements	10
4.1.1 Scope	10
4.1.2 Safety and health policy.....	10
4.2 Planning.....	11
4.2.1 Hazard identification, risk assessment and control.....	11
4.2.2 Legal and other requirements	12
4.2.3 Objectives, targets and programmes	12
4.2.4 Implementation and operation	13
4.2.5 Competence, training and awareness.....	13
4.2.6 Communication.....	14
4.2.7 Participation and consultation	14
4.2.8 Documentation	15
4.3 Operational control.....	16
4.3.1 Requirements	16
4.3.2 Contractor management	16
4.3.3 Safety and health supervision	17
4.4 Prevention of and response to emergencies	17
5 Preparation of a deconstruction measure	18
5.1 Pre-demolition investigations	18
5.2 Choice of deconstruction methods	18
5.3 Deconstruction plan	19
5.4 Typical hazards during deconstruction works	20
5.5 Health and Safety Plan	22

6	Implementation and Operation of the SHMSDW	24
6.1	Aim and Scope	24
6.2	Abbreviations and Definitions	25
6.3	Reference Documentation	25
6.4	Responsibilities	26
6.5	Deconstruction Work Requirements	29
A	DECONSTRUCTION SITE FACILITIE LOCATION	30
B	DECONSTRUCTION SITE ACCESS	31
C	CONSTRUCTION SITE ORGANIZATION	33
D	SOCIAL FACILITIES / OFFICES AREAS	34
E	HOUSEKEEPING PLAN	37
F	EQUIPMENT, MACHINERY AND AUXILIARY MEANS	38
G	HEIGHT FALL PROTECTION	43
H	EXCAVATIONS WORKS / PITS	45
I	HAZARDOUS MATERIALS	47
J	NOISE AND VIBRATIONS CONTROL	48
K	MANUAL HANDLING OF LOADS	49
L	PERSONAL PROTECTIVE EQUIPMENTS	50
M	ALCOHOL AND DRUGS	54
N	EMERGENCY PREVENTION AND RESPONSE	55
O	COMPETENCE, TRAINING AND AWARENESS	58
P	RISK ASSESSMENT	59
Q	COMMUNICATION, PARTICIPATION AND CONSULTATION	60
R	HEALTH AND SAFETY FILE	62
S	SANCTIONS	63
T	WORKING HOURS	64
7	Summary and Conclusions	65
8	References	66
	Annex: Contributors to the report and Disclaimer	73

1. Introduction

The TIMBRE project aims to overcome existing barriers to brownfield regeneration by developing and providing customised problem- and target-oriented packages of approaches, technologies and tools. As a unique asset, these packages shall deliberately include cultural and administrative characteristics and their regionally distinctive features. By providing a customisable toolbox specifically addressing the diverse processes that have to be dealt with during the course of a regeneration project, end-users shall be enabled to find best practice based solutions. Improvement of existing means to support brownfield regeneration shall be further accomplished by filling methodological core topics such as intelligent remediation in terms of technological advancements with regard to phytoremediation and partial source removal technologies. TIMBRE shall deliver a tailored training and dissemination programme as part of an information centre that will transfer existing and emerging knowledge to the scientific community and end-users. The project started on 1st January 2011 and information is available on <http://www.timbre-project.eu>.

One important issue for the revitalisation of a brownfield is to answer the question how to deal with **the remains of buildings and infrastructures** in a sustainable way. In order to provide the basis for adequate decision making by site owners, investors and developers concerning the deconstruction and re-use of existing buildings and structures on brownfields, Work Package (WP) 5 is to develop strategies, tools and instruments supporting decision makers in deriving efficient in as much as environmentally friendly strategies.

In the **Deliverable 5.1 report**, the legal frame and common practice in different European countries is described and discussed (Hagemann et al. 2012). In the **Deliverable D5.2 report** (Hagemann et al. 2013a), environmental friendly and economical methods of re-use of buildings and use of building rubble have been introduced. The report can be downloaded from the TIMBRE website.

All deconstruction or refurbishment measures cause emissions influencing workers, neighbourhood and the environment. In the last **Deliverable D5.3** (Hagemann et al. 2013b) a technical guideline for prediction and minimization of emissions during deconstruction measures has been presented.

Deconstruction is one of the most dangerous activities within the construction business. The risk of a lethal occupational accident is about 15 times higher than in other construction branches (cf. BAuA 2010). The risks resulting from deconstruction activities affect employees at the deconstruction site as well as people in the neighbourhood. Experience shows that a high security level for employees and non-involved third parties can be only attained by comprehensive consideration of occupational health and safety aspects during planning, preparation and performance of deconstruction works.

This Deliverable 5.4 report as a Technical Guideline deals with the question how to manage the existing risks and how to create a legally compliant organisation that takes the complexity of deconstruction measures of buildings and structures into account.

2. Approach

To approach the above initial question, the intention is to elaborate on how a legally compliant organization is designed that transfers the full responsibility of the client into a management system to ensure safety and health control and improvement processes according to the organizational hierarchy from the top management down to the site workers.

It should base on the legal frame within the EU and as well taking the European best-of-practice into account. The task now is to centralize and transfer these complex requirements on the organizational level of a company or deconstruction project. Based on the author's experience – involved in the improvement of safety & health organisations for construction projects for the last decade – this can be done by applying an occupational health and safety system which is adaptable to the specific needs of a deconstruction project.

The approved and worldwide spread occupational health and safety system OHSAS 18001 is a proper system regarding the formulated tasks, which is very close to the ISO 9001 and ISO 14001 standards and means an easy integration of these three standards as needed.

The following report describes the development of a **Safety and Health Management System for Deconstruction Work (SHMSDW)** based on the European legislation and OHSAS 18001 for a fictitious deconstruction project. The recommendations are based on experience of the authors from GeoExperts that have been developed since the introduction of the Safety and Health Management Systems with regard to building projects of international investors. The systematics of the SHMSDW is based on OHSAS 18001 as well as related management systems. The exemplary system has to be adapted to the specific conditions of each real-world project and its foreseen works.

This system for deconstruction activities as described in the following chapters is based on the OHSAS 18001 standards under consideration of the European legal requirements that are briefly introduced in the following **chapter 3 "Legal requirements"**.

Chapter 4 "Safety and Health Management System for Deconstruction Works (SHMSDW)" names and describes the actual safety and health management system with its general and strategic requirements in the first instance. It outlines a pre-defined general system, which needs to be adapted to the special conditions of each construction site and the foreseen works.

The initial needs of a deconstruction site are specified in **chapter 5 "Preparation of a Deconstruction"** in order to support the adaption of the general system to a specific case. This chapter includes the "first step requirements" as a kind of pre-implementation. Typical dangers related to deconstruction activities, their prediction, prevention and measures to ensure health and safety of involved persons are described. Required pre-demolition investigations to detect risks resulting from the building or contaminants are pointed out.

Chapter 6 "Implementation and Operation of the SHMSDW" duly appropriates the specific needs based on the Safety and Health Management System for Deconstruction standards. It is presented as a recipe that is applicable for a wide range of possible construction and deconstruction works.

Chapter 7 will conclude and summaries the main findings.

3. Legal requirements

The whole legislation on occupational health and safety in the member countries of the European Union and Switzerland is based on the Council Directive 89/391/EEC of June 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work. As the improvement of workers' safety, hygiene and health at work is an objective, which should not be subordinated to purely economic considerations, based on article 16(1) of this Council Directive several individual Directives have been worked out, concerning special issues of occupational health and safety. The most important Directives regarding deconstruction business are the following:

- Council directive 80/1107/EEC and Council directive 88/642/EC,
- Council Directive 1998/24/EC,
- Directive 2002/44/EC,
- Directive 2003/10/EC and
- Directive 2009/104/EC.

In those European Directives, the mandatory minimum requirements on occupational health and safety for all EU members are set. No country within the European Union is allowed to erode those standards. Additionally, higher standards may be set in national laws in several countries.

Regarding the countries of the test sites on which TIMBRE WP5 investigations have been performed, i.e. Romania, Poland and Germany, the European legislation is fully transferred into national law. In Poland basic regulations according to European legislation are fixed in the Construction Law and in the Regulation of the Ministry of Infrastructure of 06.02.2003 on Safety and Hygiene during Construction Activities (see references below). In Romania the European Directives listed above are adopted in Government decisions with similar wording. The Swiss regulations concerning occupational health and safety are similar to the legislation within the EU and on the same standard.

Also the German regulations fully adopted the related European directives. The overall German law is the Work Protection Act, which implements the requirements of the EU legislation into national law. This is specified by several ordinances regarding special aspects of occupational health and safety: The Construction Site Ordinance (Baustellenverordnung BaustellV), the Ordinance on Industrial Safety and Health (Betriebssicherheitsverordnung BetrSichV), the Working Place Ordinance (Arbeitsstättenverordnung ArbStättV), the Ordinance on Hazardous Agents (Gefahrstoffverordnung GefStoffV) with associated technical rules for the handling of specific dangerous materials (TRGS – Technische Regeln für Gefahrstoffe), Ordinance on work protection regarding noise and vibration, Ordinance on use of personal protection equipment. Ordinance on occupational health supervision, rules for occupational safety and health on construction sites (RAB) (when applicable see references below).

The handling of hazardous materials is guided by technical rules for hazardous materials (TRGS – **T**echnische **R**egeln für **G**efahr**s**toffe). In detail, the following rules are crucial for the assessment and minimization of emissions:

- TRGS 517
- TRGS 519
- TRGS 521
- TRGS 524
- TRGS 559
- TRGS 900

The safety of work places is guided by the Technical rules for safety at work (Technische Regeln für Betriebssicherheit TRBS). These rules represent the state of art regarding technique, occupational medicine and further knowledge of occupational science for

- Allocation of work equipment
- Use of work equipment
- Operation of facilities requiring supervision

for example:

- TRBS 1111
- TRBS 1201
- TRBS 1203
- TRBS 2111
- TRBS 2121

Not mandatory, but common practice in a lot of countries is the OHSAS 18001 (Occupational Health and Safety Assessment Series) (Poland + UK). It is based on the British standard BS 8800:1996 and orientates on the structures of the ISO 9001 and 14001. OHSAS is the basis for certification of occupational health and safety management systems in a lot of other countries and it is discussed whether it should become an international valid norm.

The OHSAS certification is often required though not yet standard (social responsibility of company) often together with ISO 14001 (environmental management) and 5001 (energy management).

In general the occupational health and safety legislation defines the following obligations and steps:

- preannouncement of the deconstruction project,
 - investigation on potential hazards (physical, chemical, organisational),
 - assessment of risks related to the estimated work places and activities,
 - deconstruction plan,
-

- appointment of a Coordinator (on deconstruction sites with several contractors or subcontractors),
- Health and Safety Plan (including emergency and rescue plan),
- detailed working instructions related to defined risks,
- training of employees,
- supervision and documentation

that are taken into account while generating the Safety and Health Management System in the subsequent chapters.

4. Safety and Health Management System for Deconstruction Work (SHMSDW)

The recommendations of this chapter are based on experience developed in GeoExperts since the introduction of the Health & Safety (H&S) management systems with regard to building projects of international investors. The systematics of the management systems are based on the approaches which can also be found in the OHSAS 18001 as well as in OHSAS related H&S management systems. These systems are certified similar to the ISO 9001, ISO 14001 and are working effectively on an international level relating to the establishment of H&S organization.

4.1 General requirements

The improvement of workers' safety, hygiene and health at work is an objective, which should not be subordinated to purely economic considerations.

The organisation should establish, document, put into practice, maintain and continuously improve a Safety and Health Management System in accordance with the requirements of OHSAS 18001 and declare, how it will comply with those requirements.

4.1.1 Scope

The organisation should define and document the scope of the Safety and Health Management System.

4.1.2 Safety and health policy

The management should define the safety and health policy of the organisation and guarantee that the policy is within the scope defined for the safety and health management system.

The Safety and Health Management System should:

- be appropriate to the scale of the organisation's safety and health risks
 - include a commitment for prevention of injury and damage to health and continuous improvement of the performance of the management system
 - include a commitment to comply with the legal requirements regarding specific safety and health hazards
 - set a framework for establishing and monitoring the safety and health objectives and targets
 - be documented, implemented and maintained
 - be communicated to everyone working for the organisation or in its name
 - be available to interested third parties including the public
 - be reviewed periodically
 - be in compliance with the safety and health policy requirements
-

4.2 Planning

4.2.1 Hazard identification, risk assessment and control

The organisation shall establish, implement and maintain procedures for the ongoing identification of hazards, risk assessment and determination of necessary controls, taking into account:

- routine and non-routine activities
- activities of all persons with access to the workplace (including contractors)
- human behaviour, capabilities and other human factors
- identified external hazards but capable of adversely affecting people within the workplace
- hazards created in the neighbourhood of the workplace by work-related activities of the organisation
- infrastructure, equipment and materials at the workplace (provided by the organisation or third parties)
- changes or proposed changes in the organisation, activities or materials
- modification to the health and safety management system, including temporary ones, and their impacts on the operations, processes and activities
- legal requirements related to risk assessment and implementation of necessary controls
- design of work areas, processes, installations, equipment, operating procedures and work organisation, including their adaptation to human capabilities

The methodology for hazard identification and risk assessment shall:

- be defined respecting its scope, nature and timing, ensuring its proactive rather than reactive character
- provide the identification, prioritization and documentation of risks and the application of controls as appropriate
- ensure consideration of the result of these assessments when determining control measures

The determination of control measures, changes to existing controls and reduction of risks follows the hierarchy:

- elimination
- substitution
- engineering controls
- signals, warnings or administrative controls
- personal protective equipment

The results of hazard identification, risk assessments and determined control measures have to be documented contemporary.

The organisation has to ensure, that risks and determined controls are taken into account by establishing, implementing and maintaining the health and safety management system.

4.2.2 Legal and other requirements

The organisation should establish, implement and maintain one or more procedures to identify and access the applicable legal requirements and other requirements which the organisation considers to be relevant.

The organisation should ensure that these applicable legal and other requirements that the organisation adheres to are taken into consideration in the implementation and maintenance of its safety and health management system. Furthermore, the information needs to be updated regularly.

Relevant information on legal and other requirements has to be communicated to people working under control of the organisation and to interested third parties.

4.2.3 Objectives, targets and programmes

Documented safety and health objectives should be established, implemented and maintained at all relevant functions, levels and operations within the organisation.

Objectives and targets should be measurable if possible.

The objective and targets should be consistent with the:

- safety and health policy
- commitment to the prevention of injury and damage of health
- fulfilment of the applicable safety and health requirements and other requirements which the organisation adheres
- continuous improvement

When establishing and reviewing its objective, the legal requirements and other requirements to which the organisation subscribes, its safety and health risks and significant aspects have to be taken into account.

Other aspects that need to be taken into account are:

- technological options
- financial requirements
- operational requirements and
- business requirements

from the point of view of the interested parties.

One or more programmes should be implemented to reach the objectives and targets of the organisation. These should included as minimum requirements:

- the designation of responsibilities to reach the objectives and targets, the relevant levels and operations of the organisation and
- the means and timing to carry them out

The programme should be reviewed regularly and adjusted if necessary to ensure the achievement of the objectives.

4.2.4 Implementation and operation

The management shall take ultimate responsibility for safety and health as well as for the safety and health management system demonstrating its commitment by

- a) ensuring the availability of resources to establish, implement, maintain and improve the safety and health management system. These include:
 - human resources
 - specific skills
 - interior infrastructure
 - technical resources
 - financial resources
- b) defining roles, allocating responsibilities and accountabilities and delegating authorities which should be defined, documented and communicated.

The management of the organisation should nominate one or more specific representatives who should hold defined attributions, responsibilities and authority independently from other responsibilities for:

- a) assuring that the safety and health management is established, implemented and maintained in accordance with the requirements of the OHSAS 18001 and
- b) reporting the development of the safety and health management to the management of the organisation for the purpose of revision including recommendations for improvement.

The identity of this representative shall be available to all persons working for the organisation including contractors. All responsible persons have to demonstrate their commitment to the continuous improvement of the safety and health performance.

The organisation has to ensure that persons in the workplace take responsibility for the aspects of safety and health over which they have control, including adherence to the organisation's applicable safety and health requirements.

4.2.5 Competence, training and awareness

Everyone who takes out tasks for the organisation or in its name has to be competent regarding potentially related safety and health aspects. This has to be ensured and proven by adequate education, training or experience.

This should be documented. The organisation has to maintain the associated records.

Training needs should be identified in relation to:

- specific safety and health risks
- requirements of the safety and health management system

The organisation has to provide necessary training and information. The effectiveness of the training measures has to be evaluated and documented.

Procedures should be installed and maintained, which allow all involved parties to be aware of the following objectives:

- importance of conformity with the safety and health policy and the procedures and requirements of the safety and health management system
- significant environmental aspects and related impacts, real or potential, associated with the work and for the environmental benefits resulting from the improvement of individual performance
- security and health consequences, actual or potential, of their activities and behaviour as well as safety and health benefits of improved personal performance
- attributions and responsibilities for reaching the conformity with the requirements of the safety and health management system
- their roles and responsibilities in achieving conformity to the requirements and procedures of the safety and health management system and policy, including emergency preparedness and response requirements
- potential consequences of digression from the specified procedures

The conception of training procedures should take into account differing levels of risk, responsibility, ability, language skills and literacy.

4.2.6 Communication

Suitable communication structures regarding terms of specific safety and health hazards, environmental aspects and the safety and health management system should be established, implemented and maintained for:

- internal communication between various levels and roles within the organisation
- communication with contractors and other visitors of the workplace
- receive, documentation and response to relevant communications from external parties

The organisation should decide about the extent of external communication and document the decision. If the organisation decides to communicate, methods and extent should be established and implemented.

4.2.7 Participation and consultation

Procedures have to be established for the participation and involvement of workers in:

- hazard identification, risk assessment and determination of controls
- incident investigation
- development and review of safety and health policies and objectives
- consultations regarding changes affecting their security and health
- representation on safety and health matters

Workers have to be informed about the participation arrangements and their representatives for safety and health issues.

Also the consultation with contractors and relevant third parties has to be ensured.

4.2.8 Documentation

The safety and health management system documentation should include:

- safety and health policy and objectives
- description of the scope of the safety and health management system
- description of the main elements, their interaction and reference to related documents
- documents including records required by the OHSAS 18001 standard
- documents and records required for ensuring effective planning, operation and control of processes relating to the management of safety and health risks and significant environmental aspects

The documents required by the safety and health management system and European Standards have to be controlled. The records are a specific type of document and should be controlled in accordance with the requirements set out in chapter 4.3.5 Control of records.

Procedures should be established for:

- approval of documents as far as their adequacy is concerned
 - approval prior to respective publication of documents
 - review, update and re-approval if necessary
 - ensuring of identification of changes and present revision numbers of all documents
 - ensure that the relevant versions of documents are available at the related places
 - ensuring that documents remain legible and easily identifiable
 - ensure that external necessary documents are identified and their distribution is controlled
 - preventing involuntary use of obsolete documents and identify them accordingly when they are kept for any reason
-

4.3 Operational control

4.3.1 Requirements

The organisation determines those operations and activities that are associated with the identified hazards and environmental aspects as well as where the implementation of controls is necessary to manage the safety and health risks and significant environmental impacts.

The following processes should be implemented and maintained:

- operational controls as applicable to the organisation and its activities integrated in the safety and health management system
- controls related to purchased goods, equipment and services
- controls related to contractors and visitors of the workplace
- documented procedures if their absence in specific situations could lead to deviations from the safety and health policy objectives
- stipulated operating criteria where their absence could lead to deviations from the safety and health policy objectives.

4.3.2 Contractor management

The practical implementation of the safety and health management system, the legal requirements and required protection measures according to the hazard assessment has to be ensured as follows:

- information of all participants (staff, contractors) regarding the safety and health management system and protection measures
- request of safety and health organisation and related persons e.g. specialist for work safety and safety advisor

The relevant documents for the deconstruction activities have to be requested and recorded:

- identification of related staff
 - proof of qualification for specific works
 - hazard assessment
 - hazardous substances register
 - safety data S&H
 - operating instructions
 - proof of instructions
 - proof of schooling on Safety and health management system
 - proof of occupational health examination
 - emergency plans
 - proof of first aiders
 - proof of regular security checks of foreseen equipment and machine
-

4.3.3 Safety and health supervision

The safety and health supervision includes the following aspects:

- legal conformity
- implementation of Safety and health Management
- implementation of safety and health practice within the deconstruction processes
- hazards and controls

4.4 Prevention of and response to emergencies

The organisation shall establish, implement and maintain procedures to identify:

- potential emergency situations
- potential accidents that could have an impact on safety or health
- potential for emergency situations

The organisation shall respond to actual emergency situations and prevent or mitigate associated adverse safety and health consequences.

The needs of relevant interested parties, e.g. emergency services and neighbours should be taken into account for the planning of the emergency response.

Procedures for emergency response should be tested periodically if practicable. Relevant interested parties should be involved in those tests if appropriate.

The organisation shall periodically review and, if necessary, revise its emergency preparedness and response procedure, in particular, after periodical testing or occurrence of emergency situations.

5 Preparation of a deconstruction measure

Aside the determined needs of a specific project implementation based on the SHMSDW – as introduced in chapter 6 – the consecutively labelled fundamental steps and documents are mandatory to ensure a legal-conform project preparation.

5.1 Pre-demolition investigations

The basis for the choice of deconstruction methods, the assessment of potential hazards and the preparation of a Health and Safety Plan is a detailed investigation on the building and its surroundings with the following aims:

- Preparation of a catalogue of building materials and contaminants regarding the separation of materials according to the European directive 2008/98/EC of the European Parliament and of the Council of 19th November 2008 on waste and repealing certain directives, to increase the percentage of recyclable materials and minimize disposal of demolition waste and building rubble. These detailed investigations also allow the prediction of the exposition of workers to dangerous contaminants or building materials during a deconstruction measure.
- Investigation on the construction, statics and state of conservation of the building (historic investigations, construction plans, on-site investigations), loading capacity of ceilings and building parts. This information is the basis for the choice of deconstruction procedures and detection of hazards due to collapse of ceilings or building parts.
- Inventory of supply lines regarding their purpose, position and condition on the base of plans and on-site investigations.
- Estimation of the possible influence of the deconstruction activities on neighbouring buildings or traffic areas.

5.2 Choice of deconstruction methods

The choice of the deconstruction method is influenced by four main objectives:

- maximum of safety for involved staff and neighbourhood
- minimization of emissions
- economy (Qualified contractors, use of equipment, separation and recycling of materials)
- Best-Of-Practice

The most sustainable way of deconstruction is a selective dismantling. The aim of this approach is the separation of recyclable materials from unsuitable materials and the removal of contaminated building materials and hazardous substances (Hagemann et al. 2013a).

Commonly, the deconstruction of a building or a structure includes the following parts with its typical choice of performances.

Gutting, decontamination: Commonly with small equipment, high percentage of handwork or work with hand-operated tools. Abrasive cutting, cutting by blowpipe, sawing, grinding and milling

Demolition: with heavy equipment (excavator, long range excavator, demolition ball) or by blasting

Along with other requirements the selected deconstruction methods are to be found in an comprehensive document. This document is the bases for an official deconstruction permission as well as the bases for deconstruction performance.

5.3 Deconstruction plan

Based on the results of the pre-demolition investigations the permission of deconstruction has to be requested at the related institution. If this permission is granted, a detailed demolition instruction has to be developed before the deconstruction measure begins. This deconstruction plan has to contain the following issues:

- construction and condition of the building
- statics
- extent, spatial and chronological order of the deconstruction works
- deconstruction methods
- application of tools and machines
- auxiliary constructions, scaffolds, stairways, ladders, etc.
- loading capacity of ceilings
- safety of public traffic
- traffic lines on the site
- protection of attached or neighbouring buildings
- access to working areas
- fall protection
- personal protective equipment
- barrier of dangerous areas
- protection against hazardous substances or dust
- handling, recycling/disposal of rubble and other materials

Before the beginning of any work, this demolition instruction has to be available on the deconstruction site. Each contractor and sub-contractor has to acknowledge the contents of the deconstruction plan.

5.4 Typical hazards during deconstruction works

Workers on a deconstruction site are exposed to a lot of different hazards, risks of accidents, health, physical and psychical risks.

Accidents

Falling

- from roofs e.g. during separation of roofing
- from exposed edges
- through unsecured apertures e.g. elevator shafts, staircases and wall openings
- loss of balance near unsecured edges
- through brittle ceilings
- through collapse of ceilings due to overload
- collapse of building parts

Being hit or struck

- by falling building parts
- during collapse of building sections

Falling on the plane

- stumbling over rubble, edges, damaged traffic lines
- slipping e.g. on wet building parts or mud resulting from moistening for dust prevention
- twisting the ankle on edges or rubble

Cutting or stitch damage

- on sharp edges
- on free metal parts, e.g. reinforcement steel

Overrun, bruise

- stay within the danger area of machines or vehicles
-

Health hazards

Dangerous substances

- dust (mineral dust, wood)
- fibrous dust (Asbestos, SMF)
- heavy metals (lead, chrome, zinc, mercury, ...)
- PCB
- PAH
- CHC
- biologic (mould, dove droppings, bacteria)

Electrical risks

- e.g. non-disconnected wiring and defective equipment

Vibration

- system hand – arm
- whole body

Noise

- e.g. from demolition machines

Dust

- e.g. from quartz containing stones or concrete (danger of silicosis)

Physical risks

- lifting / carrying of heavy loads
- constrained postures
- working time exceedance

Psychical risks (Factors which may lead to fatigue and less concentration)

- hurry due to pressure of time
 - lack of knowledge or experience
 - monotony
-

5.5 Health and Safety Plan

Another mandatory document is the Health and Safety Plan. This document, based on the known hazards, is commonly required by the authorities and belongs to the most important preparatory documents alongside the deconstruction plan.

Usually the basic elements of a safety and health plan are:

- working sequences
- risks
- spatial and chronological allocation of the working sequences
- measures to avoid or minimise the risks (see chapter 6 "Implementation and Operation **SHMSDW** ")
- occupational safety and health provisions

Additional elements, which should be incorporated in a Safety and Health Plan, are usually recommended. In this current technical guideline the requirement is covered by the existing Safety and Health Management System (SHMSDW).

Working sequences

Determination and specification of the working sequences are broken down according to trades, (in Germany with reference to VOB PART C ATV DIN 18300 ff. taking account of DIN 18299).

Risks

From the relevant trade-related risks, the cross-trade risks must be determined and documented.

Trade-related risks

These are risks arising with the performance of a trade, e.g. risk of falling from elevated workplaces during roofing and roof sealing work; risk of engulfment during earthworks in building excavations and ditches.

Cross-trade risks

These are:

- reciprocal hazards arising from when a number of trades are exercised together in terms of location and time, e.g. risk of a worker whose gutting workplace is close to a welding workplace; impact of noise at the workplace due to machines used in demolition trades.
- reciprocal risks emanating from or initiated by a trade and which affect employees in other trades who work successively on the construction project, e.g. missing covers for demolition or missing anti-fall safeguards for wall openings.
- risks arising from the local circumstances on the construction site, e.g. risks due to emissions of all kinds, risk from buried cables or exposed cables crossing the deconstruction area.
- risks caused by third parties, e.g. due to the continued operational use of parts of the deconstruction area by the client; risk due to public transport; risks arising from neighbouring construction sites

Spatial and chronological allocation of the working sequences

Presentation of possible interactions between the working sequences broken down according to trades, e.g. in the form of construction schedules.

Measures to avoid or minimise the risks

Stipulation and documentation of the measures is needed to avoid or reduce the cross-trade risks determined beforehand, such as jointly used equipment and mutually adjusted measures to ensure the safety and health of employees. When the measures are being selected, the applicable occupational safety and health provisions and the knowledge regarding safety and health protection according to the state of the art, regarding occupational medicine and hygiene and sound knowledge according to the relevant Codes of Practice must be taken into account.

Occupational safety and health provisions

In the safety and health plan there should be hints to the occupational safety and health provisions required allocated to the selected measures (see above).

6 Implementation and Operation of the SHMSDW

The recommendations of this chapter are based on experience of the authors from GeoExperts that have been developed since the introduction of the Safety and Health Management Systems with regard to building projects of international investors. The systematics of the Safety and Health Management System for Deconstruction Work are based on the approaches, which can also be found in the OHSAS 18001 as well as in OHSAS related S&H management systems. These systems are certified similar to the ISO 9001, ISO 14001 and are working effectively on an international level relating to the establishment of SHMS organization.

These procedures define the safety and health requirements to be assured at deconstruction works within the scope of its corporate safety and health management system. These requirements shall be included, as a minimum; in the site's Safety and health plans for all projects. More stringent requirements might be applicable per se. This procedure in no case consist ad waiver to more stringent requirements.

The procedure applies to the activities performed by contractors and their subcontractors at the site and gives an overview to the roles and responsibilities of the project participants.

6.1 Aim and Scope

The following procedure defines the safety and health requirements to be assured at construction works and within the scope of its corporate Safety and Health Management system. These requirements shall be included, as minimum, in the sites' Safety and Health Plans for all projects. More stringent requirements might be applicable per se. This procedure in no case consist and waiver to more stringent requirements.

This procedure applies to the construction activities performed by contractors and their sub-contractors at construction sites.

The compliance with these requirements does NOT imply compliance with all of the legal requirements of each country. Whenever legal, by law, or other requirements or measures to adopt resulting from risk assessments are more stringent, these must be enforced. In particular the local site specifications reference documentations, must be taken into account.

6.2 Abbreviations and Definitions

DM	Development Manager (head of the project)
EPM	External Project Manager
SHC	Safety and Health Coordinator
SHSM	Safety, Health System Manager
CON	Contractor
SH	Safety and Health
HSP	Health and Safety Plan
HSF	Health and Safety File
SHMSDW	Deconstruction Works Safety and Health Management System

6.3 Reference Documentation

Occupational Health and Safety Management System (OHSAS 18001)
Safety and Health European directives
Pre-Demolition Investigation documents
Deconstruction Methods (incl. Best-of-Practice)
Deconstruction Plan
Typical Hazards during Construction Works
Health and Safety Plan (HSP)
Health and Safety File (HSF)

6.4 Responsibilities

<p>DM: Development Manager (head of the project)</p>	<ul style="list-style-type: none"> • ensure the compliance with the minimum requirements established in the present operational procedure at the construction site; • ensure that a HSP and a HSF are developed at the design phase and included in the contractual documentation; • ensure that monthly S&H meetings are held at project management level and join them; • ensure that S&H audits are conducted at regular intervals by a competent person/organisation; • provide the SHC and SHSM with the authority to force out from the site, any person, equipment or material not meeting the legal, contractual or other applicable S&H requirements; • ensure that all projects have a full-time safety and health coordinator duly qualified according national regulations; • stop any work in case of imminent danger to workers' safety and health.
<p>EPM: External Project Manager</p>	<ul style="list-style-type: none"> • include the minimum requirements established in the present operational procedure in contractors' tender packages; • ensure the compliance with the requirements established in the present operational procedure at the construction site; • enforce measures to guarantee that an adequate site access control does exist; • stop any work in case of imminent danger to workers' safety and health.
<p>SHC: Safety and Health Coordinator</p>	<ul style="list-style-type: none"> • ensure the compliance with the requirements established in the present operational procedure at the construction site; • report to DM any violation of the prescriptions of this procedure; • review contractors' HSP; • review and collect contractors' HSF information; • stop any work in case of imminent danger to workers' safety and health.
<p>SHSM: Safety, Health System Manager</p>	<ul style="list-style-type: none"> • ensure the compliance with the requirements established in the present operational procedure at the construction site; • communicate site's S&H performance to contractors, especially when non-conformities or any deviation are identified and corrective or preventive actions are required; • report to DM any violation of the prescriptions of this procedure; • stop any work in case of imminent danger to workers' safety and health

CON:
Contractor

- develop its Health and Safety Plan (HSP) and provide it to the SHC
- develop its Health and Safety File (HSF) and provide it to the SHC
- identify and record construction works hazards, their related risk assessments and control measures for all activities;
- implement the determined control measures, necessary to minimize the assessed risks, and to comply with legal requirements or other subscribed requirements and provide/maintain evidences of that compliance whenever requested by the DM, EPM, SHC or SHSM;
- ensure the compliance with the Construction Works SHMS requirements, not only by his workforce but also by sub-contractors and self employees under his charge, as well as visitors;
- comply with requests made by the DM, EPM, SHC and SHSM;
- ensure that the workers have sufficient safety and health training or experience to perform their tasks, before starting any work;
- make workers aware of the importance of implementing measures and complying with established procedures and legislation in force;
- implement the necessary measures at the construction works site in order to comply with the requirements established in operational procedures and cooperate with the EPM and Safety and Health Coordination for that purpose;
- draw up / revise a Maintenance and Conservation Plan for the machinery and equipment and ensure that the maintenance operations are carried out with all adequate safety and health measures;
- assure the adequate response in case of emergency, incidents and non-conformities. Support the SHC and/or SHSM when analysing the causes of these situations and implement or support the implementation of the required preventive/corrective actions;
- fill-in and maintain records that evidence the compliance with the SHMSDW requirements and provide them whenever requested by the SHC or SHSM;
- enable the carrying out of supervision visits and audits by the DM, EPM, SHC, SHSM, or other staff appointed by them;
- make sure that its hierarchy, including managers, site engineers and foremen actively and rigorously fulfil all the safety and health applicable measures and SHMSDW requirements;
- ensure sufficient Safety and Health Technicians, duly qualified (in accordance with applicable law) and with the authority to manage their personnel, that will be appointed accordingly to the number of contractor's employees (including subcontractors), according with is described in point 6.18.
- if there is only a single contractor on site, he shall ensure that the site's access control meets all this document's requirements.

Important note:

Despite any check, inspection or audit of the Development Manager (DM) or DM's appointed persons or entities, it is the Contractor' responsibility to ensure that only adequately certified and licensed equipment, material, auxiliary structures and personnel are employed and even though DM shall check, inspect, supervise, review and audit the implementation of Safety & Health conditions, this fact does not minimize any of the contractor's responsibility, accountability or liability against the local legislation and the DM.

These requirements must be included, as minimum, in the sites' Safety and Health Plans for all projects. More stringent requirements might be applicable per se. This procedure in no case consists and waiver to more stringent requirements.

6.5 Deconstruction Work Requirements

In the present description, the Safety and Health requirements to be assured at the deconstruction works are described according to the following Safety and Health subject and/or risks:

- A. DECONSTRUCTION SITE FACILITIES LOCATION
- B. DECONSTRUCTION SITE ACCESS
- C. DECONSTRUCTION SITE ORGANIZATION
- D. SOCIAL FACILITIES / OFFICES AREAS
- E. HOUSEKEEPING PLAN
- F. EQUIPMENT, MACHINERY AND AUXILIARY MEANS, INCLUDING MAINTENANCE
- G. HEIGHT FALL PROTECTION
- H. EXCAVATIONS WORKS/ PITS
- I. HAZARDOUS MATERIALS
- J. NOISE AND VIBRATIONS CONTROL
- K. MANUAL HANDLING OF LOADS
- L. PERSONAL PROTECTIVE EQUIPMENTS
- M. ALCOHOL AND DRUGS
- N. EMERGENCY PREVENTION AND RESPONSE
- O. COMPETENCE, TRAINING AND AWARENESS
- P. RISK ASSESSMENT
- Q. COMMUNICATION, PARTICIPATION AND CONSULTATION
- R. CONTRACTOR S&H TECHNICIAN
- S. HEALTH AND SAFETY FILE
- T. SANCTIONS
- U. WORKING HOURS

The lists of requirements to be assured at the construction works described in the present operational procedure do not intent to be exhaustive and therefore the contractor should specify and develop them and any other applicable legal requirements, namely when establishing the Safety and Health Plan (see chapter 5.5).

The contractor has to consider that:

Any notices, inspections, audits etc. of the owner (client) do not waive, alter, change or affect any contractor's and contractor's appointed persons and entities responsibilities, liabilities and accountabilities. In no way contractor may consider that OWNER'S effort substitute any contractor's and contractor's appointed persons and entities obligations.

When more than one contractor is on site contractor's HSP may have to be revised to capture the environment changes due to activities of the other contractors on site. The contractor is obliged to comply. The obligation of the contractor does not constitute or can support any time or cost claim.

The contractor is obliged to ensure safe access and working environment for all of the owner's personnel and the owner's appointed persons, entities etc. Failure to do this may result in delays of supervision, surveys etc. In this case any cost, delay etc. will be entirely covered by the contractor.

A DECONSTRUCTION SITE FACILITIES LOCATION

The construction facilities location should be preceded by a hazard identification and risk assessment, in order to define the most appropriate location for the different facilities and infra-structures, taking into consideration the interaction with other facilities and activities at the place within which or in the vicinity of which the construction site is going to be located.

The type of occupied facility (permanent structure, wood frame trailer, blast resistant trailer, etc.,) and appropriate orientation must also be part of that analysis.

Main rules for sitting locations:

- occupied facilities must be set up at more than 150 meters of the battery limits of a process industrial plant, flare system, or a flammable, combustible, and/or toxic storage tank;
 - if SEVESO restrictions apply, observe as applicable;
 - if special exemption to the previous rule must to be considered (this situation must be approved by SDM), it shall only accommodate direct project support workers and activities that cannot practically be accommodated elsewhere;
 - occupied facilities shall not be located within the bermed area of a storage tank;
 - occupied facilities must be capable of being evacuated during start-up and shutdown activities in adjacent facilities and process units when fire, explosion, or toxic hazardous release potential is present;
 - emergency evacuation maps, meeting point locations, and other emergency response information must be posted within occupied facilities;
 - consider all underground utilities or overhead lines before locating the site facilities;
 - ensure exit to the site from any existing road as per road class requirements;
 - the construction site must be demarcated by a fixed fence erected around its entire perimeter that must be maintained in good conditions, and keep unauthorized personnel away from the site.
 - develop and maintain a Site Facilities Layout Drawing (Site Master Plan).
-

B DECONSTRUCTION SITE ACCESS

Access to the site for workers, vehicles and equipment and delivery of goods and materials is allowed only at the official site entrances, as described in the Site Facilities Layout Drawing.

Only people working for project, i.e. contractors that are contracted for the project, including their subcontractors, or owners appointed persons and entities are authorised to enter the site. All contractors' workers shall have their own identification badge, including photo, worker's full name and employer, assurance reference and company, emergency contacts. This badge shall always be visible when present on site. People without this badge will not be authorised to enter the site. These badges can be provided only by the site logistic coordinator or by the responsible entity for the access control, subject to approval by SDM/EPM/SHC.

- all visitors shall always be accompanied on site by an employee of DM, EPM, SHC, SHSM or contractors.
- children, young people (under 16 years) and animals can never have access to the site (including during deliveries).
- the speed limit on site is 10 km/h.
- there should be separated site access for staff and vehicles and, whenever possible separate pathways for staff and vehicles, in order to prevent the risk of running over.
- at site entrances, it should be assured the good visibility and safe access and provided adequate warning signage.

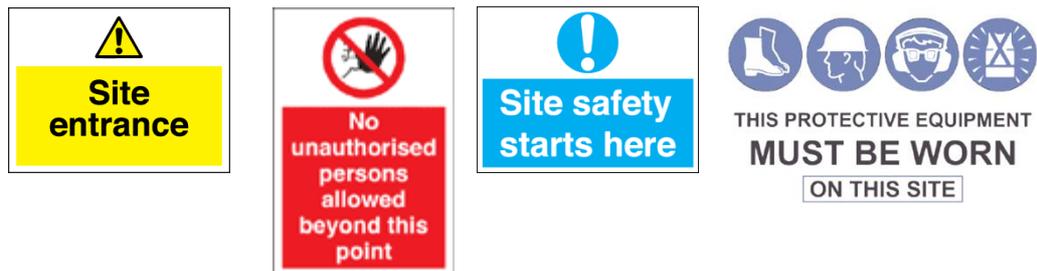


Figure 1 - Examples of warning signage at the site entrance

Workers and materials access

Remember that this site is a helmet, safety shoes and HV vest (or uniform) site for all.

Vehicles used for carrying workers and materials must be identified with the company name and may not be parked in construction areas, apart from those authorized by the DM, EPM or SHC.

Each contractor must inform its workers (or service provider) commissioned to deliveries of materials/equipment about the rules in force on site. Before starting the work on site, workers must be informed about the Safety and Health rules through a construction workers induction course.

In particular, the contractor shall make sure that the workers wear all the personal protective equipment required on site. In no case, the drivers/deliverymen should move away from their vehicles to enter any construction or working area, nor should take part in any activity on site.

Any site delivery will be rejected, if it is not performed under the supervision of the foremen of the contractor (who ordered the delivery) who is present at the site entrance gate. The unloading cannot be performed without the continuous presence of a representative of the Contractor who ordered the delivery.

DM, EPM, SHC or SHSM reserves the right, in respect of the law, to request an inspection, by the security team or any other qualified person, of all bags, tool boxes or car trucks of all contractors' workers or their subcontractors, as well as of any vehicle entering or leaving the site (including delivery vehicles).

For all drivers / operators gates the contractor shall provide helmet and high visibility vest in case they have to leave the cabin to finish the delivery.

Visitor access

To be allowed access into the site, the visitors should present the requested identification document to the security team who make their registry, provide them a badge and give back the document. The security team calls for the person receiving the visitor who must accompany them at all times.

Before starting the visit, visitors must be informed about the Safety and Health rules through a visitors' induction course.

The rules that visitors must be informed of and strictly follow are:

- The visitor should be escorted by a site worker. All their movements must be supervised by who is responsible for visitors. It should be a responsibility of the person being visited that the visitor observes all safety requirements, limiting his/her movements in function of the risk existing in the area visited.
 - They must proceed directly to the location where the visit is to take place, avoiding going into any others areas.
 - Under no circumstances can the visitor carry out any tasks without first receiving the safety induction training.
 - Visitors must wear personal protective equipment (hard hat, high visibility safety vest, safety shoes, and any other which could be required in the area where they are).
-

C CONSTRUCTION SITE ORGANIZATION

The construction site organization should be appropriately planned to well-define and signalize the areas, facilities, equipment and routes that must exist on the construction site for:

- material storage;
- waste storage ;
- machinery parking zone;
- area for the storage of inflammable and combustible liquid products;
- area for the discharge of concrete truck mixer, concrete mixer and mixer wash-water;
- social facilities / office areas;
- first-aid facilities;
- fixed machinery / equipment placement (example: cranes and radius);
- energy distribution facilities;
- traffic and emergency routes, assembly points and exits/gate(s);
- pedestrian routes;
- WC and urinals;
- drinkable water points;
- parking areas;
- fixed plants (e.g. batch plants);
- overhead lines;
- underground facilities.

The various site areas must be indicated in the Site Facilities Layout Drawing (which should be drawn up by the contractor, validated by the SHC and approved by the EPM/DM) and must be respected.

If there is only a single contractor on site this shall develop and maintain the Site Facilities Layout Drawing, unless stated otherwise by DM/EPM. If there is more than one contractor the Site Facilities Layout Drawing should be developed and maintained by the SHC or the contractor that the DM designates for this purpose.

Some rules applicable to the site layout should be considered:

- plan emergency evacuation routes and location of fire fighting equipment;
 - provide access roads and plan circulation areas within the works area/site;
 - provide designated car parking areas only for authorized vehicles;
 - provide wheel-washing basin for vehicles at the exits of the site;
 - provide post notices at the various works areas to show the locations of the first-aid facilities, and the emergency procedure and legal notices at conspicuous locations;
 - provide adequate warning of overhead or underground utilities;
 - provide sufficient lighting at the workplaces and pathways;
 - provide lighting on display boards or external fencing for public safety;
 - provide area for Waste storage (see Chapter 3 of TI.E946.04 - Waste Management);
 - provide and maintain proper drainage and means of sewage disposal (See Chapter 3 of TI.E946.04 - Wastewater Management;).
-

The areas reserved for pedestrian are separated from the roads dedicated to vehicles. Pedestrian walk-ways are provided to allow access to the constructions and working areas from the sanitary/office areas. These areas must be respected by all workers on site. The walk-ways are prepared (in terms of drainage, lighting...) and protected against any falling of objects/materials. All work above, under or near these ways will be carried out only with formal approval by SHC.

D SOCIAL FACILITIES / OFFICES AREAS

The location of these facilities shall be placed near an entrance of the site.

The site facilities available to all workers, (i.e. toilets, showers, changing rooms and canteen), shall be of sufficient size, according to number of employees using them, and will be installed by the contractor.

When there are multiple contractors, the DM will appoint one to ensure the installation and maintenance of social facilities. Other solutions may be foreseen in the contract, providing that it is ensured a space for social facilities, for each contractor.

The placement of social facilities shall comply with the legal applicable requirements, considering the following aspects described thereof.

Changing rooms and lockers

Appropriate changing rooms must be provided for workers if they have to wear special work clothes and if, for reasons of health or propriety, they cannot be expected to change in another area. If changing rooms are not required as referred, each worker must be provided with a place in which he can lock away his own clothes and personal belongings.

Changing rooms must be easily accessible, be of sufficient capacity and be provided with seating.

Changing rooms must be sufficiently large and have facilities to enable each worker, where necessary, to dry his working clothes as well as his own clothing and personal belongings and to lock them away.

If circumstances so require (e.g. dangerous substances, humidity, dirt), facilities must be provided to enable working clothes to be kept in a place separate from workers' own clothes and personal belongings.

Provisions must be made for separate changing rooms or separate use of changing rooms for men and women.

Site Facilities Layout Drawing define that no person working on the site can go from the gate directly to the work site before passing the change rooms facilities to change and take the PPE.

Sanitary Facilities

Suitable showers in sufficient number must be provided for workers if required by the nature of the work or for health reasons.

A sufficient number of suitable washbasins with running water (hot water if necessary) must be provided in the vicinity of the workplaces and the changing rooms. The showers must also be equipped with hot and cold running water and be individually separated from each others.

Where the rooms housing the showers or washbasins are separate from the changing rooms, there must be easy communication between the two.

Special facilities with an adequate number of toilets and washbasins must be provided for workers in the vicinity of workplaces, rest rooms, changing rooms and rooms housing showers or washbasins.

Rest rooms and / or accommodation areas

Where the safety or health of workers, in particular because of the type of activity carried out or the presence of more than a certain number of employees as well as the remote nature of the site, so require, workers must be provided with easily accessible rest rooms and/or accommodation areas.

Rest rooms and/or accommodation areas must be large enough and equipped with an adequate number of tables and seats with backs for the number of workers concerned. If there are no facilities of this kind, other facilities must be provided in which workers can stay during interruptions in work.

Smoking isn't allowed, however if possible specific areas may be fitted for it. In that case protection of non-smokers should be taken against discomfort caused by tobacco smoke.

Canteen

Specific areas for meals must be provided, which shall be sheltered to weathering. The area shall be equipped with tables and seats in sufficient number for all workers, considering the schedule defined for meals.

In case it is determined to have a canteen, it is required the following conditions:

- washbasins with one tap for each 10 canteen users (based on sitting numbers);
- close to the canteen, it shall be considered the installation of equipment necessary for meals preparation (kitchen);
- if it is expected the use of combustion equipment, should be exist a chimney for smokes.
- emergency doors must open outwards;
- if cooking is provided using gas, the gas bottles should be placed in a covered, protected and well-ventilated area. The gas installation should have a project or a responsibility term by a qualified/certified technician.

Drinking water should be provided in the canteen and near other working locations, in sufficient quantities considering the number of workers.

It is expressly prohibited to prepare and take meals out of the places indicated for it.

Place for posting information

In the construction site shall exist a protected board, placed in a visible location accessible for all workers, where relevant information concerning safety and health in construction works shall be disclosed.

The information shall be displayed in local language. Additionally the most relevant information should be placed as well in English and other languages spoken in the project.

Ventilation, temperature and natural and artificial lighting

If air-conditioning or mechanical ventilation equipments are used, they must operate in such a way that workers are not exposed to draughts which cause discomfort.

Any deposit or dirt likely to create an immediate danger to the health of workers by polluting the atmosphere must be removed without delay.

The temperature in rest areas, rooms for staff, toilets, washrooms, canteens and first-aid rooms must be appropriate to the particular purpose of such areas.

Workplaces must as far as possible have sufficient natural light and be equipped with the means of providing artificial lighting which is adequate for the purposes of protecting workers' safety and health.

It must be possible for workers to open, close, adjust or secure windows, skylights and ventilators in a safe manner. When open, they must not be positioned so as to constitute a hazard to workers.

E HOUSEKEEPING PLAN

The entire construction site should be kept in good order and in a satisfactory state of cleanliness.

Every contractor and subcontractors must implement a housekeeping plan. The daily cleaning, work team monitor procedure, stock up and storage system, etc. shall be described in it.

Common rules for all the contractors are:

- material that could be damaged by water must be upper side protected and should not be placed directly on the soil,
- material will be identified with a label stating the name of its owner,
- storage of hazardous products in designated areas according to the associated risks,
- once the work day is finished, proper housekeeping shall be done,
- use metal bins for oily and greasy rags and store all highly flammable materials in appropriate bins, racks or cabinets. The metal bins for storing oily and grease rags should be covered with lids. Welders must have a bin to collect any left-over,
- maintain lockers, canteens and washrooms clean at all times,
- keep all pathways, staircases, workplaces and storage areas clear and unobstructed at all time,
- stack raw materials and finished products clear of pathways and means of evacuation,
- do not leave tools on the floor, or in any location where they can be easily dislodged. Provide proper storage, such as tool boxes or containers for tools and equipment,
- do not obstruct lighting and ventilation, any electrical power point and fire fighting equipment,
- keep windows and light fittings clean,
- the floors of workplaces should be kept dry and in a non-slippery condition,
- provide and maintain proper drainage system to prevent water ponding,
- protruding nails in boards or walls should be removed or bent over so that they do not constitute a hazard to people,
- post "no smoking" and "no fire" signs in areas with high fire risks e.g. paint stores, woodworking area, fuel storage areas or wherever it is forbidden,

The contractor must take the environmental needs into consideration.

F EQUIPMENT, MACHINERY AND AUXILIARY MEANS

Every machine, tool, equipment or auxiliary element that is going to be used to perform a work at any given project must comply with the local regulations.

The machinery and equipment will be subject to a work permit, prior to the entering on the construction site, according to the Technical Instruction "TI.946.01 - Authorization on Work, Maintenance and Conservation of Machinery / Equipment".

The contractor should be aware and keep a record of the equipment and machinery presented on site. It should be verified that it follows all applicable requirements, has manufacturer's owner manual in the local language and in the language understood by the operator (if applicable), CE trademark (or any other homologation certificate) and CE conformity declaration.

All tools/machines shall be of good quality, maintained and checked in conformity with the applicable legal regulations. "Home-made" tools are NOT allowed, exceptions are made only under the written acceptance of the SHC and after assessing that all requirements are being fulfilled and as long as no other feasible alternative are available.

Installations, machinery and equipment, including hand tools whether power-driven or not, must be:

- properly designed and constructed taking accounts, as far as possible, of the principle of ergonomics;
- kept in good working order;
- used solely for the work for which they were designed;
- operated by workers who have received appropriate training.

Protective devices and circuit-breaker shall work properly and must not be locked or bypassed.

Installations and equipment under pressure must be checked and subjected to regular tests and inspections in accordance with existing legislation.

The Contractor shall prepare suitable storage areas, provided with Shelves' (fixed to the floor and ceiling or to the walls) and toolboxes, with non-slippery pavement.

Some operations with machinery or equipment may need the issuing of a permit or authorization to work, according to the Safety and Health Coordinator.

Machinery operating

- All heavy machinery that shall be periodically inspected according to the legislation and manufacturer's manual and should have the conformity certificate and other related documentation on date (e.g. maintenance records).
 - If during the work, a machine turns out to have its documentation out-of-date, it will be immediately stopped up to the delivery of the updated one.
 - In the deconstruction site, if a machine is found that does not have a site entry authorization (according to TI.946.01), it will be removed from the site immediately.
 - All heavy machinery shall be driven by qualified and authorized staff considering the applicable legal requirements. All manoeuvres involving machines in the construction site will be conducted with qualified and trained staff. In a situation of insufficient visibility, a signaller must help the operator/ driver, using, if necessary, a radio link.
-

Lifting equipment and handling

- Each contractor shall provide its own lifting and handling equipment.
- Any lifting equipment must have a valid third party certification. If not applicable in a country, DM shall specify the requirements for such an inspection.
- Slings and operators must be qualified and authorised.
- The provision of lifting equipment by a contractor to another one shall be subject to a written agreement, which shall specify the operating range and the responsibility of every single contractor.

All lifting devices and accessories, including their component parts, attachment, anchoring and supports, must be:

- properly designed and constructed and sufficiently strong for the use to which they are put;
- correctly installed by qualified technicians with an installation report and testing before they are put into service, according to the local legislation;
- correctly used;
- maintained in good working order;
- checked and subjected to periodic tests and inspections in accordance with local legislation;
- operated by qualified workers who have received appropriate training.

All lifting devices and accessories (e.g. straps, chains, and pallets) must clearly display their maximum load values, in such a way that it is possible to identify the characteristics essential for safe use, and may not be used for other than their intended purposes.

Working equipment which is not designed for lifting people but which might be so used in error must be appropriately and clearly marked to this effect.

All manoeuvres will be supervised by a qualified and trained person. Slings arrangement shall be performed by qualified and trained staff.

The use of lifting platforms requires the presence of at least two qualified operators appointed by the contractor, in a way that one of them may at all times be able to operate the emergency controls in case of accident. When the equipment is being moved, one of the operators shall remain outside and near the base of the platform.

Any lifting carried out with a mobile crane verifying at least one of the hereunder conditions:

- load > 50 tons;
- load > 85% of the crane capacity;
- lifting requiring more than one crane;
- lifting of any non-rigid structure/material.

Is a "critical lift" considered, requiring the prior approval of the SHC, as well as the preparation by the contractor of a detailed lifting plan, defining among others: equipment; personnel; steps of lifting; communication means; risk assessment; technical sketch of the lift and means involved.

The above lifts are considered "critical lifts" and require the prior approval of the SHC.

When work equipment for lifting loads is installed permanently, its strength and stability during use must be assured, concerning in particular, the loads to be lifted and the stress induced at the mounting or fixing point of the structures.

Permanently installed work equipment must be installed in such a way as to reduce the risk of the load:

- striking workers;
- drifting dangerously or falling freely;
- being released unintentionally.

Work equipment for lifting or moving workers must be such as to:

- prevent the risk of the car falling, where one exists, by suitable devices;
- prevent the risk of the user himself falling from the car, where one exists;
- prevent the risk of the user being crushed, trapped or struck, in particular through inadvertent contact with objects;
- ensure that people trapped in the car in the event of an incident are not exposed to danger and can be released.
- The cranes must be provided with an automatic device with sound alarm that gives a warning if the wind speed is higher than 70 km/h. In these cases the use of the crane must be stopped. According with the nature of the work and equipment to be used (specifications of manufacturer) a lower wind speed can be adopted.

Scaffolding (fixed or not)

Except if a contractor is contractually in charge of all scaffoldings installation, every single contractor shall make available to its staff suitable scaffolding or work platforms for any operations at heights. The scaffolding shall be selected in such a way as to prevent any overloading and for a uniform distribution of the loads.

All scaffolding must be properly designed, constructed and maintained to ensure that it does not collapse or move accidentally. Mobile scaffolding must be secured against spontaneous movements.

Assembly and disassembly operations of scaffolding shall be carried out by competent staff, according the applicable legal requirements established. Assembly instructions shall include wind brace, operating range, access means and the distribution and resistance of anchors, with or without covering.

According to the local legislation, a calculation note validated by a competent control body shall be requested by the Safety and Health Coordinator.

Scaffolding must be inspected by a competent person:

- before being put into service;
- subsequently, at periodic intervals (at least once a week);
- after any change or period without use, exposure to bad weather or any other circumstance which may have affected its strength or stability.

All scaffolding shall be provided with a visible sign that displays that it has been controlled, usable, as well as the authorised users.

Work platforms, gangways and scaffolding stairways must be constructed, dimensioned, protected and used in such a way as to prevent people from falling or being exposed to falling objects.

The access to different floor levels of the site should be done by appropriate fixed scaffolding stairs.

Ladders must be sufficiently strong and correctly maintained. They must be correctly used, in appropriate places and in accordance with their intended purpose. They must be used only as an access mean and never as a work platform.

Minimum rules (non-exhaustive) for the structure, assembly and work platform of scaffoldings:

- use of certified scaffoldings only, which comply with the applicable legislation;
- use of metal scaffoldings only;
- ensure a stable and uniform assembly (e.g. attention must be paid to the stability, resistance and slope of the soil where the scaffoldings are assembled, to the vibrations produced in their vicinity and to ditches existing on the ground next to them). The need for foundations should be assessed;
- inspection after storm or bad weather or after more than a week of non-use;
- no safety device or component can be removed or blocked;
- signage and bordering or protected pathways from the scaffoldings is mandatory in order to protect people, vehicles and moving machinery or pedestrians;
- prevention of electrical risks;
- assembly should be made from down to the top, after confirming the stability of the lower levels and the correct fixing and tightness of the components;
- the scaffoldings should at least support a load of three times of the weight of workers and materials foreseen to be placed on it;
- the scaffoldings should be provided with two guard rails (upper and middle) , at 1,05 and 0,60 meters high and a toe board 0,15 meters high, or with the height established by the local legislation;
- the work platforms should have adequate dimensions (e.g. 60 cm wide) and should not have a distance of more than 20 cm from the building wall. In case of more than 20 cm guard rails have to be installed as stated above;
- the access to the work platform should be safe;
- the stages should be fully boarded;
- ensure the scaffold from overturning or collapsing. Final inspection by a contractor's competent person is required before scaffold can be used.

Inspections

- The contractor shall ensure that where the safety of work equipment depends on the installation conditions, it shall be subject to an initial inspection (after installation and before first being put into service) and an inspection after assembly at a new site or in a new location by competent staff within the meaning of national laws and/or practices, to ensure that the work equipment has been installed correctly and is operating properly.
-

- The contractor shall define a programme for periodic inspections to electrical/pneumatic machines, electrical tools, lifting / hoisting / stretching / dragging elements and portable ladders. All these inspections must be recorded.
- The results of inspections must be recorded and kept available to SHC, SHSM and of the authorities. They must be kept for a suitable period of time, at least during all construction works period.
- The work equipment must be accompanied by physical evidence that the last inspection has been carried out.

Equipment and machinery maintenance

- The equipments used on-site are subject to the identification and definition of the maintenance and conservation operations that will be carried out (plan).
 - The maintenance and conservation plan should include the tasks to be carried out, the schedule, noise level, vibrations level (mentioned by the manufacturer and/or the measured value) among others.
 - The contractor is responsible for identifying the maintenance needs based upon equipment manuals, the information given when setting up equipment, history and experience acquired in corrective and preventive maintenance.
 - The contractor draws up / reviews a Maintenance and Conservation Plan based on information collected / compiled previously. The contractor is responsible for keeping the equipment in good working order and for complying with the Maintenance and Conservation Plan.
 - The contractor should fill and maintain the Maintenance Plan and Records for the equipment and machinery. For this purpose form TIF.946.04.02 "Maintenance and Conservation - Plan and Record" can be used. If another form or maintenance plan/book exists, this can be used instead for this purpose and after approval by the SHC / SHSM.
 - The Maintenance Plan and Records for the equipment should, whenever possible, be kept with the equipment.
 - The maintenance operations, whenever possible, should be carried out outside. If they have to be carried out on-site, they must occur in a specific location and Safety and Health practices defined for equipment maintenance (such as collective and individual protection) should be followed.
 - In this case, the contractor must ensure that all the original protection eventually removed from the equipment / machinery, during the maintenance operations, are reassembled.
 - The SHC or SHSM can evaluate the suitability and fulfilment of the Maintenance and Conservation Plan, as part of the Safety, Health and Environment Supervision of the Site.
 - If machinery using internal combustion engines is used in or nearby closed spaces, enough ventilation should be provided in order to reduce the CO level to minimum levels.
-

Electrical extension and plugs

- The electrical extensions and plugs used by the contractor shall be certified according to the use it is intended.
- Only heavy duty cables, extensions, accessories, plugs etc. are allowed on site. Non-complying items will be removed from site without notification.
- All generators, local panels will be equipped with a circuit automatic broker (relay), otherwise they will be removed from site without notification.
- Poor muffing of cables, modifications and the alike are not allowed and they will be removed from site without notification.

All electrical panels should be kept closed at all times.

An electrical engineer will appointed to plan check, supervise and control the entire power system on site. This person will be allocated by the contractor, unless otherwise settled by SDM/EPM. In case of more than one contractor is on site this person should be allocated by the owner.

Maintenance permits (Lock-Out / Tag-Out (LOTO))

Before any work of maintenance machinery / equipment, the contractor shall ensure that there is no power, fluids or mechanical movements and that such machinery / equipment cannot be accidentally restarted before the end of the work. The contractor should comply with LOTO procedures established for the construction site and maintain the adequate evidences and records.

The machinery / equipment concerned by the LOTO will be locked by mean of a visible mechanical device.

Access to the different shutdown components and emergency stop devices shall be always kept free.

G HEIGHT FALL PROTECTION

The contractor should take adequate actions to prevent any worker on a deconstruction site from falling from a height of 2 m or more, which include the provision, use and maintenance of one or more of the following safety measures:

- working platforms;
- guard-rails, barriers, toe-boards and fences;
- coverings for openings;
- gangways and runs;
- safety nets;
- personal protective equipment.

In all circumstances, collective equipment against the risk of fall (handrails, safety net, platforms) when working at heights, is a priority compared to any personal protection equipment. Each contractor is responsible for setting up, servicing and reinstalling all protective devices. These devices shall be maintained by the contractor in conformity with the instructions of their manufacturers.

Where special circumstances of the work make it impractical to provide working platforms, scaffolds and other means of fall prevention, suitable and adequate safety nets and safety full body harnesses shall be provided. If it is impracticable to provide safety nets, suitable and adequate safety harnesses shall be provided.

All activity at height when no collective equipment is set-up, shall be performed with full body harness, shock absorber and life line. The life line will be tied-up to a safe and compliant anchor point, possibly fitted with an anti-fall system when required.

Any person on a deconstruction site liable to fall from less than 2 m but the injuries so caused may be serious, similar measures to prevent falls as described above shall be taken.

A safety full body harness shall be used for fall protection because it could reduce injuries to the waist caused by the shock from a fall. In addition, use shock absorbing device as far as practicable.

Wear safety full body harnesses and attach them to suitable anchor points for:

- rigger works;
- works performed from suspended working platforms or work cages;
- climbing permanent ladders that are provided with a fall arrest system.

Properly maintain all safety nets, safety full body harnesses and other equipment provided for prevention of falls of person.

The safety full body harness anchor point should be directly above and the lanyard shall be left with the minimum free length. All anchor points and all safety full body harnesses shall conform to applicable standards, such as EN 353, EN 355, EN 358, EN 360, EN 361, EN 363 and EN 364.

Use full body harnesses of the smaller drop. They are made to two drop limits (i.e. lanyard lengths), one is 0.6 m for close work and the other is 2 m for providing greater freedom of movement.

All safety equipments for fall protection should be controlled and verified according the manufacture's instructions.

All safety full body harnesses should be registered and should be maintained a record of its periodical maintenance.

H EXCAVATIONS WORKS / PITS

Planning:

Historical investigations of the plot are necessary in the run-up process. As-built infrastructure documentation (plans) should be evaluated/ reviewed at public providers.

If available, aerial pictures should be evaluated. A plan of existing supply lines (media and service pipes) have to be drawn up.

All excavations must be considered in order to prevent:

- existing buried utilities that can be damaged or cause injury;
- vehicles and equipment to overturn;
- vehicles and equipment to fall into;
- personnel to fall in;
- materials to fall in;
- flood;
- side collapse;
- personnel to work without appropriate PPE if defined as confined space.

Whenever applicable (country and/or state based) the site has to be examined by the explosive ordnance disposal service and clearance needs to be reported.

In the case of finding explosive ammunitions, the police and fire department must be informed immediately and all works suspended immediately. The site/area must be safeguarded until arrival of the special forces of the authorities.

By soil expertise it must be clarified whether the development site is tainted or contaminated. If necessary, separate refurbishments / disposals have to be carried out under expert supervision.

By infrastructure documentation foundations / bases of neighbour buildings have to be checked for stability.

The bearing capacity of the building lot is to be explored and to be documented by a soil expertise.

Contractor's competent engineer must check geotechnical study and supervise excavation works to verify sides stability, shoring needs etc.

Building pit:

- Excavations shall be barricaded at a minimum 0,50 meters from edge and subject to soil qualities, depth and activities in the area.
 - The building pit needs to be sloped steeply or has to be erected with secure setting. All around the building pit a guard rail / fall protection needs to be erected or it needs to be marked off at sufficient distance. For that purpose all necessary specifications stated in the soil expertise and in the respective regulations by the competent authorities (whenever applicable) have to be implemented mandatory.
 - The access routes to the building pit have to be carried out by stair turrets or ladders, each of them separated for vehicle traffic/ loads and pedestrians. Should be guaranteed access points every 15 meters.
 - In cases of specials works e.g. dewatering, high pressure injections, anchor works, girt works; individual investigations regarding risk potential have to be done. They have to be coordinated by the contractor and approved until start of work by the authorities and the site S&H coordinator.
-

I HAZARDOUS MATERIALS

Hazardous products management within the site shall be done according to the required Environmental Management System procedures and technical instructions, in respect to:

- requirements of the storage area;
- containers and storage conditions;
- rules for supplying and refilling operations;
- signalling and action to be taken in an emergency.

Some main rules for storage are listed below:

- storage containers shall comply with local and national regulations (e.g. permits above a certain volume of storage) and mandatory requirements (see Chapter 10 of TI.E946.04 - Storage and Supply of Inflammable Liquid Products and Fuels);
- in general, no fuel storage is allowed on site, except for small internal combustion equipment (e.g. portable generators). For smaller equipment the maximum quantity allowed on site is 100 litres, unless a licensing is obtained according to applicable legislation (see Chapter 10 of TI.E946.04 - Storage and Supply of Inflammable Liquid Products and Fuels);
- different types of hazardous products should be stored separately;
- the contractor should keep proper records of all hazardous products delivered, stored, and used on site;
- all containers should be clearly labelled to indicate contents and associated risks. Never use a wrongly labelled container for hazardous products;
- smoking shall be strictly prohibited in the vicinity of the storage and handling place of flammable and combustible products;
- provide adequate fire extinguisher equipment in the area, at least two (6 kg) ABC chemical powder extinguisher in each storage area;
- ensure proper ventilation;
- do not mix containers and content.

For the handling of the hazardous products the contractor should follow some rules:

- the contractor shall inform the SHC and the SHSM, before starting, about any activity involving the use of hazardous products that may generate toxic gases or vapours;
 - the contractor shall maintain on site the Material Safety Data Sheets for the hazardous products used for its activities;
 - the Material Safety Data Sheets contains relevant information which shall be communicated to the users regarding the safe use, transfer, storage, and disposition of these substances, including personal protective equipment, as well as the first aid actions in case of accidental contact (inhalation, projection, contact with the skin);
 - before handling hazardous products the foremen/ S&H technician should check if the adequate personal protective equipment (PPE) is available and the worker should use it during the operation;
 - all accidental exposure to hazardous products, even considered as minor, shall be immediately reported to the SHC/SHSM.
-

J NOISE AND VIBRATIONS CONTROL

The construction site workers noise and vibrations exposure should be object of risk assessment, with particular attention to:

- the level, type and length of exposure, including any exposure to impulsive or impact noise, and whether the worker belongs to a particular risk group;
- where possible, effects on workers' health and safety resulting from interactions between noise and vibrations, and noise and work-related substances that can harm the ears;
- risks to workers' health and safety from failing to hear warning signals or alarms;
- the extension of exposure to noise beyond normal working hours under the contractor's responsibility;
- the information on noise and vibrations emission provided by manufacturers of work equipment;
- the existence of alternative work equipment designed to reduce the noise and vibration emission;
- relevant information from health surveillance;
- the availability of suitable PPE;
- the nuisance to the environment and the neighbourhood.

The risk assessment of site workers noise and vibrations exposure should be considered in construction site activities risk assessment (see point 6.16 in this document).

In some cases the construction site activities risk assessment results require a noise and vibrations assessment. This should be performed by a competent person, according to the local legal requirements, who should be responsible to carry out a detailed noise and vibrations assessment of the workplace and operation. This competent person shall give instructions on the necessary protection measures to be observed by the site workers, including the use of suitable types of ear protections. The equipment used for noise and vibrations assessments should be calibrated according to the legal requirements.

Preventive and protective measures should be taken where a worker is likely to be exposed to noise and vibrations, according to the action value limits established in the law, such as:

- make workers aware from noise and vibrations risk exposure;
- provide proper PPE to the workers and assure its use;
- implement engineering control measures (example: barriers, absorbing materials,);
- controlling ground-borne noise and vibration by using floating slab measures;
- implementing work schedules that control exposure to noise and vibrations.

Workers should be made aware of noisy areas by suitable warning signs and the requirement of wearing suitable ear protectors.

The contractor should assure the noise and vibrations control and reduction at source by improving maintenance, replacing noisy and vibrating machines, screening with noise and vibrations absorbing material, making changes to the process, controlling machine speeds, using cutting oils and hydraulic breakers.

K MANUAL HANDLING OF LOADS

In respect to manual handling loads the contractor shall include this issue in the induction course, according to the local legal requirements. All workers shall be trained in the proper methods of lifting and carrying loads. Some rules for this kind of operation shall be communicated by the contractor for the workers:

- always use mechanical equipment instead of manual handling, as far as possible;
- assess the number of workers required to handle or lift the load safely, and arrange them;
- handling hazardous materials, the workers shall be informed of the hazards and the safety precautions;
- where team work is required, select the people whose ages and physical builds are compatible for teaming up. Co-ordinate the actions of the team members by giving necessary instruction/signal;
- always lighten or suitably shape the load for manual handling, as far as possible;
- clear pathway from obstruction and tripping hazards;
- stack and secure goods safely on trucks, otherwise they fall off and injure people passing by;
- always use proper protective equipment such as gloves, safety shoes, etc.

Contractors shall provide equipment to assist the manual handling loads, including: Wheelbarrow; Pallet Truck box; Cupping-glass; Winches/ Pulleys; others appropriate for the type of materials to be transported considering the distance to be covered.

L PERSONAL PROTECTIVE EQUIPMENTS

Each contractor must provide their workers with Personal Protective Equipment (PPE), as well as training for their adequate use and maintenance, according to the applicable legislation. Moreover, safety equipment must have the EC trademark or equivalent outside Europe and comply with the applicable normalisations standards.

Minimum equipment required, in any area, will be:

- 1) safety hard hat (helmet);
- 2) safety footwear (Shoes: S3 as minimum for civil work);
- 3) high visibility safety vest or high visibility uniform.

Each contractor, while at the construction / deconstruction site must define a PPE distribution plan, including the frequency of delivery, according to each function working at the construction site. The contractor should maintain a record of all PPE delivered to the workers.

The provision of special PPE must be considered only after all measures for removing or controlling safety or health hazards have been proved reasonably impracticable. Some rules for the definition and distribution of PPE must be considered by the contractors:

- ensure that sufficient PPE is provided and that they are readily available for every person who may need to use them;
- the PPE shall provide adequate protection and comfort for continuous use and shall be comply with the applicable standards or technical specifications;
- ensure that the workers make full and proper use of the PPE provided;
- provide instruction and training for the proper use and care of any specific PPE where necessary;
- provide proper storage areas for all PPE to ensure that their protection conditions are properly maintained and they remain clean enough. Facilities where workers can leave their belongings, deposit their PPE and change their work clothing should be provided;
- all workers who have been issued PPE shall ensure their cleanness and good condition and report immediately any damage to the management for replacement;
- the contractors must have sufficient spare units of PPE per visitors, in a different variety of sizes to suit different individuals.

Protective Clothing

- wear impermeable overalls, gloves and dust or other proper masks when working or handling lead and lead based products including lead paint, and other harmful chemicals, which may be absorbed through intact skin.
 - do not wear overalls that are worn or saturated with oil. They should be clean and close fitting clothing, changed before returning home and washed frequently.
 - avoid loose sleeves or belts and keep loose clothing buttoned up.
 - wear waterproof protective overalls when entering a manhole where there is possible contact with sewage or unlined tunnels with unknown drippings.
-

Head Protection

- no person shall enter a construction / deconstruction site unless he is wearing a suitable safety helmet for protection against falling objects and heavy blows and shall conform to EN 397 or equivalent.
- correctly adjust the head harness so that head protection will stay on while bending over and yet will not be so tight that the harness makes a mark on the forehead.
- provide identification labels to all helmets, to prevent random exchange among wearers, with one helmet exclusive to each worker.
- inspect helmets for cracks or sign of impact or rough treatment before each usage. Destroy, remove and replace all worn, defective or damaged helmets. Further, safety helmets for which the validity as recommended by the manufacturer, usually 3 years, have expired shall not be used and shall be replaced independently of their condition.
- destroy any helmet that has received a severe blow since it substantially reduces the protection offered by the helmet even without any apparent defects.
- prevent safety helmets from being dropped, thrown or used as supports.
- unattended helmets will be removed from site without notification.
- when using safety harness, the helmet must be properly fixed to the head.

Safety Footwear

- provide and wear suitable footwear for work and ensure that all safety footwear conforms to EN 344 and EN 345 or their equivalent.
- for workers at electrical facilities, or where electrical hazard exists, safety footwear with electrical resistant soles shall be used as appropriate.
- keep shoe or boot lace knots tight.
- the welders must use adequate safety footwear for welding works (resistant to fire).

Hand Protection

Wear suitable gloves and clean them after use when:

- working or handling Shed metal and other objects, which have sharp edges and corners;
- cutting with a knife or other cutting edge;
- rolling film;
- welding and cutting;
- avoiding electrical shock;
- providing better grip while handling oily components;
- lifting manhole covers and engaged in manual handling of materials and equipment, to provide better a grip; and
- avoiding heat burn;
- avoiding direct contact with hazardous products.

Do not wear gloves where there is a risk of them becoming entangled in moving parts of machinery.

Wash hands properly with disinfectant soap and clean water before drinking, eating or smoking. Wash hands immediately after each operation requiring it.

Breathing Protective Equipment

Suitable protective breathing equipment should be worn when:

- sanding and rubbing down wood, filling materials and old paint;
- spray painting;
- steam cleaning;
- cleaning cooling coils and filters with high pressure jets;
- works involving silica dust, lead, and other hazardous products (asbestos!);
- works in a confined space.

Ensure the use of suitable breathing protective equipment. The protection is measured by the type of filter that must be use and the degree of inward leakage that occurs when used. These indications are given in the applicable standards.

The filters for particles are classified according three classes:

Class 1 – dust filter (FFP1);

Class 2 – solid and liquid irritant aerosols, such as silica (FFP2);

Class 3 - solid and liquid toxic aerosols, such as asbestos (FFP3).

The filters for gases and vapours are classified into four groups:

Filter Type	Color	Protection
A	Brown	organic vapors
B	Gray	certain gases and vapors
E	Yellow	sulfur dioxide and other acid gases
K	Green	ammonia and its organic derivatives

All breathing protective equipment, with the exception of disposable types, require cleaning and inspection after use and before wearing by another person. Cartridges and filters have a limited life which can vary depending upon the environment in which they are used and manufacturer's recommendations should be closely followed.

Hearing protection

The ear protectors must ensure an adequate attenuation of sound for the worker, according the legal requirements established.

The attenuation provided by the ear protector should guarantee that the noise exposure of the worker is less than 80 dB(A), but it must be avoided the excessive protection (under 65 dB(A)).

The ear protectors could be ear plugs or ear muffs, which are selected in accordance of legal requirements and with EN 352 and EN 458.

Eye Protection

Suitable and appropriate eye or face protection should be worn when:

- grinding and cutting with an abrasive wheel, which is driven by mechanical power;
 - dressing abrasive wheels;
 - internal and external turning, other than precision turning, of non-ferrous metal and cast iron;
 - welding and cutting;
 - loading and unloading a live cartridge into a cartridge operated tool, operating and doing repairs or examinations to a cartridge operating tool when it is loaded;
 - handling sewage, molten metal, acids, alkalis, and other hazardous or corrosive materials, whether liquid or solid, which are injurious to the eyes;
 - cleaning sward, dust, etc. with steam;
 - any process involving the use of laser beams;
 - cutting or breaking, chipping or scaling of rock, metal, concrete or glass product;
 - grit-blasting;
 - any operation where there is a risk of injury to the eyes from flying particles.
-

M ALCOHOL AND DRUGS

Transportation, consumption and sell of drug and alcohol are strictly prohibited in the entire construction site.

The contractor must ensure the prevention and control of alcohol and drugs for all workers of the construction site, by:

- appropriate information about drugs and alcohol prohibition and its consequences for safety and health;
- random drugs and alcohol testing to the workers.

In case of drug and alcohol influence suspecting, the Safety and Health Coordinator can order to contractor the appropriate testing of suspected workers, if allowed by law.

Any person visibly suspected to be under influence of drug or alcohol or in case of positive results in drug or alcohol testing, should be:

- immediately removed from the works area;
 - accompanied to his locker room;
 - placed under the responsibility of his foremen or safety and health technician, who will decide the necessary measures to be taken.
-

N EMERGENCY PREVENTION AND RESPONSE

Internal emergency plan or specific procedures must be elaborated by the contractor and validated by the Safety Health Coordinator or elaborated by the Safety Health Coordinator with the information provided by the contractors when there is more than one contractor on site.

This plan or procedures should be implemented and communicated to all contractors' workers and other people present on site as well as external emergency entities (e.g. civil protection, firemen).

Whenever new workers join, safety and health induction courses must be provided. The main organizational guidelines for emergency are summarised as follows.

First-aid organization

First-aiders shall be properly trained and in sufficient number, according to the table hereunder. All first-aiders shall have a sign on their helmet, so that they can be quickly identified when needed.

Contractor's employees (*)	1-30	31-60	61-100	>100
Number of first-aiders	1	2	3	4

(*) including all subcontractors

- the contractor must ensure that first aid can be provided, and that the staff trained to provide it can be called upon, at any time.
- measures must be taken to ensure that workers who have had an accident or have suddenly been taken ill can be removed for medical treatment.
- first-aid equipment must be available at all places where working conditions so require. This equipment must be suitably marked and easily accessible. There should be a specific and dedicated room for first aid assistance.

Required documents

The following documents must be available on site:

- the "emergency phone list" shall be posted up in the site offices, notice boards, near the telephones;
- the updated list of first-aiders;
- the updated list of first-aid kit and/or medical equipment available on site.

Instructions for minor accidents

First of all, a qualified first-aiders will use the first-aid instruments available on site in case of slight injuries (assistance shall be recorded):

- immediately alert the defined emergency/first aid team;
 - accompany the injured person to the place where the first-aid instruments are (even if close to the injury location);
 - notify the SHC, SHSM and the EMP.
-

Instructions in case of serious accidents

- immediately contact the emergency services (site or external) as mentioned in the "emergency phone list",
- if necessary, take the injured away from any other escalating hazards (e.g. electricity, falling),
- cover the injured, to prevent them from getting cold,
- if necessary, ask the intervention of a first-aider to revive the injured or stem the bleeding,
- help the arrival of external first-aiders by placing some staff at the entry, for easier access (empty roads, indicate the safe routes, etc.).

Fire-fighting

- the contractor provides the fire-fighting equipment required for his activity, according to the applicable legal requirements.
- the contractor shall make his workers familiar with the use of this equipment, fire alarm and evacuation procedures.
- within all teams, a sufficient staff (considering the workers on site and the layout of the work areas) shall be trained to be site fire team. This staff shall be at least:

Contractor's employees (*)	1-20	21-50	51-100	>100
Number of trained staff to use fire-fighting equipment	1	2	3	4

(*) including all subcontractors

The following minimum fire extinguishers (chemical powder) should be placed on site:

- all equipment and vehicles shall have dry powder fire extinguishers;
- the parking area, should at least, have a dry powder fire extinguishers;
- in areas where electrical risks exist, there must be at least one CO2 extinguishers (2 kg);
- two 6 Kg dry powder fire extinguishers per each fuel storage tank;
- one 6 Kg dry powder fire extinguishers per each office;
- two appropriate fire extinguishers per storage area for flammable products (according with the type and amount of stored products);
- two 6 Kg dry powder fire extinguishers for all welding and hot works.

Place the fire extinguishers at a safe distance from a possible fire. Type, size and number of fire extinguishers are to be reviewed by the contractors and SHC.

Note: If DM decides to designate an entity to provide fire extinguishers and take care of their maintenance, due to the presence of more than one contractor, this does not minimize any of contractors' responsibilities towards these requirements, namely in contractors' working areas.

Instructions in case of alarm

- The most important organizational guidelines are presented below.
- When alarm bell are heard, drivers shall park their vehicles on the side of the road and stop them immediately. It is forbidden to leave a vehicle with its engine running.
- In case of alarm, the site must be evacuated to reach the nearest assembly point (check with the Site Facilities Layout Drawing), taking into consideration the direction of the wind.
- Before evacuating the site, the workers shall stop all vehicles and engines, turn off the equipment producing flames and adopt all the necessary safety measures to prevent any accident.
- Evacuation will occur following the specified walk-ways, under the responsibility of the staff appointed to evacuation control, who shall count the presents after leaving the hazardous area, and informing EPM if someone is missing.
- The EPM and the Safety and Health Coordinator shall be informed without delay.

Evacuation conditions

- The construction site should be provided with audible alarm bells in all places that could be evacuated in case of total emergency.
- In case of fire, the construction site workers should be able to inform immediately an element of the fire-fighting team.
- In case of an out of control fire the contractor's Works Responsible / Emergency Coordinator should be contacted, who must decide for the total or partial evacuation of the construction site.

Information, training and drills

- In addition to the initial training, drills should be organized on site periodically (every 6 months) during the execution of the work, in order to evaluate if the emergency procedures and response equipment are effective and operational.
- Records shall be maintained of the training and drills performed.

Emergency Maps

The Emergency Plans should include at least the identification of:

- fire Fighting and First Aid Equipment;
- escape Routes and Meeting Point;
- fire Instructions;
- captions;
- emergency contacts.

The Emergency Floor Maps are developed by the contractor and validated by the SHC. These should be included in the Internal Emergency Plan. When there is more than one contractor on site, the SHC should update or draw up the Emergency Floor Maps, with information provided by contractors. However, if contractors are undertaking works in different areas, they have the responsibility of making and updating the Emergency Floor Maps.

O COMPETENCE, TRAINING AND AWARENESS

The contractor should comply with the Construction Works Safety, Health and Environment Management System procedures related to competence, training and awareness and therefore ensure at least the following:

- construction workers induction course – This is mandatory for all workers and necessary for obtaining the access badge and the authorization to work on site. In this induction course general risks and preventive and protective measures, environmental awareness and emergency response at the construction site, as well as all usual risks should be addressed;
- visitors induction course – This is mandatory for all visitors and necessary for obtaining the authorization to enter the site. General risks and preventive and protective measures, environmental awareness and emergency response at the construction site should be addressed;
- training and professional qualification – to be assured by the contractor so that the workers have sufficient safety and health training or experience to perform their tasks, before starting any work. Examples:
 - emergency response – first aid and fire fighting;
 - loads moving and lifting (manual and mechanical);
 - working at heights;
 - machinery safety (work authorization, lock out, tag-out);
 - electrical risks;
 - work in confined places;
 - welding and metal cutting.

The contractor shall ensure the distribution of the safety and health training/awareness material. Records shall be maintained of the training performed (e.g. list of participants).

Furthermore, the contractor should allow their staff and workforce appointed to attend any training or awareness session promoted by the SHC or SHSM.

P RISK ASSESSMENT

For all activities, the contractor has to prepare a method statement. Method statement has to be reviewed by the contractor's H&S technician to identify and assess the risks and define the safety measures and the safe work method. The risk assessment must be elaborated by a working team, according to the defined in the SP.S931.01 procedure system.

Risk Assessment should consider and cover:

- any work or activity to be undertaken within and for the purpose of the PROJECT;
- any equipment to be used;
- any structure permanent or auxiliary to be erected, used or dismantled;
- any material to be used;
- the overall area and activities undertaken within it;
- any other factor, such as weather conditions, night shifts etc.

The contractor is obliged prior to commence any activities on site to conduct a Hazards-Identification exercise followed by a Works Specific Risk Assessment (WSRA), subject to the specific method of the works and to define the safe work method. The contractor has to include the WSRA in the HSP. The WSRA must be validated by the SHC prior to the commence of any works. Contractor shall comply with any comments by SHC.

Q COMMUNICATION, PARTICIPATION AND CONSULTATION

The contractor should comply with the Deconstruction Works Safety, Health and Environment Management System procedures related to communication, participation and consultation and therefore ensure at least the following:

- monthly deconstruction management meeting – participation of the contractor’s management in this monthly meeting with the DM, EPM, SHC and SHSM to talk exclusively about work in progress and associated safety and health subjects;
- weekly deconstruction coordination meeting - participation of the contractor’s works responsible, foremen and S&H technicians in this weekly coordination meeting EPM, SHC and SHSM. Others relevant attendees may join it depending on the subjects to be discussed. Among others, a discussion shall be made about: S&H observations/findings and weak points; definition of prevention and protection actions analysis of the results obtained; incidents and necessary actions to prevent them; high risk works and works that could interfere with external parties that will be carried out in the following week and planning of any additional measures;
- weekly S&H technicians meeting - participation of the contractor’s S&H technicians in this weekly meeting with the SHC and SHSM to focus on the S&H most significant observations/findings and measures requiring enforcement;
- extra coordination meeting – whenever needed (daily if required), the participation of the contractor’s Works Responsible shall be required on a coordination meeting with the EPM, SHC and/or SHSM. Depending on needs or on subject to discuss, other relevant staff or worker’s representative(s) can participate or make enquiries. In this meeting, it will be studied the works that will be carried out during the next days.

Evidences of all these meetings must be recorded (e.g. meeting minutes).

Apart from these the participation in these meetings, the contractor should maintain an up-to-date safety and health notice board at the entrance of their main office and at the canteen, changing rooms or lockers, should place safety and health posters, banners at relevant workplaces and provide flyers, as well as a suggestion box in order to promote the participation of the workers and ensure the reply to them.

Contractor S&H Technicians

The contractor shall appoint site's S&H technician(s), taking into account the construction site phase and the number of the contractor's workers. They must be duly qualified (in accordance with applicable law) and have authority to manage the Contractor's personnel regarding S&H aspects. Nevertheless the number of S&H technician(s) cannot be lower than what is established in the tables presented hereunder.

Deconstruction Site Phase	Gutting / Decontamination and Demolition		
Contractor's employees (*)	21 - 50	51 - 200	Above
Contractors' S&H Technicians(**)	1	2	To be defined by DM or EPM, but above 2

Deconstruction Site Phase	Groundwork / Excavation		
Contractor's employees (*)	21 - 100	101 - 200	Above
Contractors' S&H Technicians(**)	1	2	To be defined by DM or EPM, but above 2

(*) including all subcontractors

(**) full time basis

For the cases not covered above, contractors' S&H technician minimum allocation must be no less than 50% of his time, unless approved otherwise by the DM after suggestion of the SHC or EPM.

[The number and time allocation of the S&H technicians to be present during construction works should be validated by the SHC during the project phase and according to the site's project specifications and foreseen works.]

The site S&H technicians have a dedicated single function, to frame all the S&H activities (can accumulate with Environmental activities though) carried out by his contractor's personnel and its subcontractors; presence on site, risk prevention, relations with DM/EPM/SHC, S&H administrative tasks, etc. They must be S&H professionals, whose competence has to be validated by EPM, SHC or SHSM before they start their activity.

If the contractor has more than a safety professional on site he has to appoint one of them has the coordinator/practitioner of the works undertaken by the contractor and its subcontractors, all of them will have to satisfy any legal requirements that may be required for their positions.

R HEALTH AND SAFETY FILE

The contractor must supply, to the SHC, unless established otherwise by the DM, the necessary elements to the elaboration of the deconstruction Health and Safety File, according to a defined procedure.

As long as the contractor does not supply the necessary elements to the elaboration of the Health and Safety File, the owner may refuse the provisory reception of the deconstruction.

(see above chapter 5.5)

S SANCTIONS

Considering the importance of the S&H requirements for risk prevention on the construction site, if any person or contractor fails to enforce these rules/requirements, the SDM or EPM will implement the required coercive measures according to the seriousness of the event.

The SDM / EPM understands that any unsafe action cannot be repeated because whenever detected and the contractor notified about, corrective measures are to be taken to avoid recurrence.

Several levels of actions have been defined according to the magnitude of the seriousness of the situation:

Level 0:

- oral warning: Verbal communication to the contractor

Level 1:

- written warning to the contractor
- person involved shall attend the induction course

Level 2:

Can be triggered if a Level 1 warning has reoccurred for the same situation:

- removal of the person involved from the site
- implement corrective action

Level 3:

Triggered whenever a Level 1 and Level 2 actions are not solved:

- exclusion of the contractor from the site

These measures will be detailed and specified in the written contract between DM and the contractor, supplier or independent worker.

T WORKING HOURS

The contractor can work with more than one shift provided he has obtained local permits as per local law and ensures rest/free time for its employees.

7 Summary and Conclusions

Apparently the risk of a lethal incident in deconstruction work is many times higher than in other construction branches. An unsustainable situation like this urgently requires appropriate improvement measures which are able to reduce the risk of fatal consequences for workers and non-involved third parties.

Worldwide efforts to improve the occupational safety situation in general have led to the development of several tools, aids and standards. A very popular and widespread standard is the OHSAS Series - a complex and comprehensive management system for occupational health and safety that is already used in many businesses. Those standards are pre-defined systems that represent a kind of basic framework for an intended safety and health organization in order to initiate a comprehensive consideration of occupational health and safety aspects during the entire deconstruction process.

The implementation of a management system such as OHSAS 18001 in a given project needs a variety of adjustments to ensure the operational structure for the standard's purpose.

As one of the first requirements to be met the system's aim and scope must be defined by the top management. Functions and responsibilities attributed to the project's stakeholders have to be achieved as a further important step. Finally operational work requirements are to be derived in order to ensure a customised performance of any person involved in a deconstruction project realization. After all a predictable and consistent documentation of the entire management system is essential to make everyone familiar with the requirements and his own responsibility and performance within the system. Not least a detailed and profound documentation is needed to approve the compliance with existing legal and systemic requirements.

Taken all into account, an adapted management system can be an integral option to improve the current safety and health situation in the context of deconstruction projects. However implementation and success of a management system depend on the provided resources and the participation of any person involved in the project.

This present report tries to allocate a "Safety and Health Management System for Deconstruction Work" as a complete solution on an organisational level based on OHSAS 18001 standards and the author's practical experiences with the implementation of safety and health management systems in the construction branch.

8 References

Achmus, M. and J. Kaiser, F. tom Wörden (2004): Bauwerkerschütterungen durch Tiefbauarbeiten, Grundlagen – Messergebnisse – Prognosen, Informationsreihe Bericht 20, Institut für Bauforschung e.V., Hannover

Allgemeine Verwaltungsvorschrift zum Schutz gegen Baulärm – Geräuschimmissionen - vom 19. August 1970

Arbeitsschutzgesetz (ArbSchG) – Gesetz über die Durchführung von Maßnahmen des Arbeitsschutzes zur Verbesserung der Sicherheit und des Gesundheitsschutzes der Beschäftigten bei der Arbeit (7. Aug. 1996), <http://www.gesetze-im-internet.de/arbSchG/>

Arbeitsstättenverordnung (ArbStättV) – Verordnung über Arbeitsstätten (12. August 2004), <http://www.umweltbundesamt.de/laermprobleme/publikationen/baulaerm.pdf>

Bica, I. and A. Dimache, I.lancu, D. Gaitanaru, O. Ciugulea, R. Gogu, M. Algreen, A. Rein, N. Fatin-Rouge, M. A. Mohamed, J. Reinhard, W. Böhm, M. Stalder, J. Krupanek, M. Kalisz, E. Martac: Preliminary Characterisation of TIMBRE Model Sites and Identification of Possible Constraints, February 2012

BAuA - Bundesanstalt für Arbeitsschutz und Arbeitsmedizin (Herausgeber): Arbeitsschutz bei Abbrucharbeiten, 6. überarbeitete Auflage. Dortmund, Juli 2010, <http://www.baua.de/de/Publikationen/Broschueren/A22.pdf>

Betriebssicherheitsverordnung (BetrSichV) – Verordnung über Sicherheit und Gesundheitsschutz bei der Bereitstellung von Arbeitsmitteln und deren Benutzung bei der Arbeit, über Sicherheit beim Betrieb überwachungsbedürftiger Anlagen und über die Organisation des betrieblichen Arbeitsschutzes (27. September 2002), <http://www.gesetze-im-internet.de/betrSichV/index.html>

Bundesbodenschutz- und Altlastenverordnung (BBodSchV) v. 31.07.2009, letzte Fassung 24.02.2012, <http://www.gesetze-im-internet.de/bundesrecht/bbodsSchV/gesamt.pdf>

Commission Directive 2012/46/EU of 6 December 2012 amending Directive 97/68/EC of the European Parliament and of the Council on the approximation of the laws of the Member States relating to measures against the emission of gaseous and particulate pollutants from internal combustion engines to be installed in non-road mobile machinery Text with EEA relevance, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:353:0080:01:EN:HTML>

Council Directive 1980/779/EEC of 15 July 1980 on air quality limit values and guide values for sulphur dioxide and suspended particulates, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31980L0779:en:HTML>

Council Directive 1989/391/EEC of 12 June 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work, <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31989L0391&qid=1397214821471&from=DE>

Council Directive 80/1107/EEC of 27 November 1980 on the protection of workers from risks related to exposure to chemical, physical and biological agents at work, <http://eur-lex.europa.eu/legal-content/DE/TXT/PDF/?uri=CELEX:01980L1107-19950101&rid=1>

Council Directive 1988/642/EEC of 16 December 1988 amending Directive 80/1107/EEC on the protection of workers from risks related to exposure to chemical, physical and biological agents at work, <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31988L0642&from=DE>

Council Directive 1998/24/EEC of 7 April 1998 on the protection of the health and safety of workers from the risks related to chemical agents at work (fourteenth individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC): <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31998L0024:EN:HTML>

DIN ISO 9613-2 – Akustik – Dämpfung des Schalls bei der Ausbreitung im Freien – Teil 2: Allgemeines Berechnungsverfahren (ISO 9613-2: 1996)

DIN 4150 – Erschütterungen im Bauwesen mit Teil 2: Einwirkungen auf Menschen in Gebäuden (1999-06) und Teil 3: Einwirkungen auf bauliche Anlagen (1999-02)

Directive 2002/44/EC on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (vibration), http://eur-lex.europa.eu/resource.html?uri=cellar:546a09c0-3ad1-4c07-bcd5-9c3dae6b1668.0004.02/DOC_1&format=PDF

Directive 2003/10/EC on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (noise), <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32003L0010&qid=1397217277995&from=DE>

Directive 2009/104/EC concerning the minimum safety and health requirements for the use of work equipment by workers at work, <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0104&qid=1397217408806&from=DE>

Directive 1997/68/EC of the European Parliament and of the Council of 16 December 1997 on the approximation of the laws of the Member States relating to measures against the emission of gaseous and particulate pollutants from internal combustion engines to be installed in non-road mobile machinery (OJ L 59, 27.2.98), <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31997L0068:EN:HTML>

Directive 2000/14/EC of the European Parliament and of the Council of 8 May 2000 on the approximation of the laws of the Member States relating to the noise emission in the environment by equipment for use outdoors, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:2000L0014:20051227:EN:PDF>

Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2000:327:0001:0072:EN:PDF>

Directive 2002/49/EC of the European Parliament and of the Council of 25 June 2002 relating to the assessment and management of environmental noise, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2002:189:0012:0025:EN:PDF>

Directive 2002/88/EC of the European Parliament and of the Council of 9 December 2002 amending Directive 97/68/EC on the approximation of the laws of the Member States relating to measures against the emission of gaseous and particulate pollutants from internal combustion engines to be installed in non-road mobile machinery, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32002L0088:EN:NOT>

Directive 2004/35/EC of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32004L0035:EN:HTML>

Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (2008/98/EG), <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:312:0003:0030:en:PDF>

Directive 2009/148/EC of the European Parliament and of the council of 30. November 2009 on the protection of workers from the risks related to exposure to asbestos at work, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32009L0148:EN:NOT>

Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:152:0001:0044:en:PDF>

Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) Text with EEA relevance, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32010L0075:EN:NOT>

EN ISO 9001 Quality Management Systems – requirements (last edition 2008-12)

EN ISO 14001 Environmental Management Systems – requirements (last edition 2009-11)

Environmental protection act of 27th April 2001 – "Ustawa z dnia 27 kwietnia 2001 r. - Prawo ochrony środowiska (Dz. U. z 2001 r. Nr 62, poz. 627 i Nr 115, poz. 1229 oraz z 202 r. Nr 74, poz. 676, Nr 113, poz. 984 i Nr 153, poz. 1271)

Erste allgemeine Verwaltungsvorschrift zum Bundes-Immissionsschutzgesetz (Technische Anleitung zur Reinhaltung der Luft. – TA Luft) vom 24. Juni 2002, <http://www.bmu.de/themen/luft-laerm-verkehr/luftreinhaltung/ta-luft/>

Federal recycling management act of 24th February 2012 – "Gesetz zur Förderung der Kreislaufwirtschaft und Sicherung der umweltverträglichen Bewirtschaftung von Abfällen (Kreislaufwirtschaftsgesetz KrWG) v. 24.02.2012", http://www.gaa.baden-wuerttemberg.de/servlet/is/16033/1_2_1.pdf

Gaitanaru, D. and P. Hagemann, J. Krupanek, M. Kühne (2013): Milestone 52 Conclusion of all laboratory and field Tests regarding the Quality of building rubble, 13.03.2013.

Gefahrstoffverordnung (GefStoffV) – Verordnung zum Schutz vor Gefahrstoffen (26. November 2010), http://www.gesetze-im-internet.de/bundesrecht/gefstoffv_2010/gesamt.pdf

- Gesetz zur Ordnung des Wasserhaushalts (Wasserhaushaltsgesetz, WHG) v. 31.07.2009, letzte Fassung vom 24.02.2012, http://www.gesetze-im-internet.de/bundesrecht/whg_2009/gesamt.pdf
- Gesetz zum Schutz vor schädlichen Bodenverunreinigungen und zur Sanierung von Altlasten (Bundesbodenschutzgesetz BBodSchG), 17.03.1998, letzte Fassung v. 24.02.2012, <http://www.gesetze-im-internet.de/bundesrecht/bbodschg/gesamt.pdf>
- Gesetz zum Schutz vor schädlichen Umwelteinwirkungen durch Luftverunreinigungen, Geräusche, Erschütterungen und ähnliche Vorgänge (Bundesemissionsschutzgesetz BImSchG) v. 15.03.1974, letzte Änderung 24.02.2012, <http://www.gesetze-im-internet.de/bundesrecht/bimschg/gesamt.pdf>
- Government Decision no 124/2003 regarding the prevention, reduction and control of environment pollution with asbestos (Official Journal no.109 of 20.02.2003), Romania
- Government Decision no. 734/2006 amending GD 214/2003 (Official Journal no.519 of 15.06.2006), Romania
- Hagemann, P. and M. Kühne (2012): EcoSid Hunedoara, Investigation on Building Rubble Regarding its Re-Use, 1st Short Report, 16th February 2012
- Hagemann, P. and J. Krupanek, M. Kalisz, M. Kühne, D. Gaitanaru, S. Bartke (2013): Cost- and environmentally friendly strategies to recycle building rubble, relevant factors for estimation of costs and assessment of re-use or deconstruction of buildings, FP7-ENV-2010.3.1.5-2-TIMBRE-265364 deliverable 5.2, 31st March 2013, www.timbre-project.eu/tl_files/timbre/Intern/4%20Work%20Packages/WP8/Deliverables/Timbre_265364_D5.2_V2.pdf
- Hagemann, P. and M. Kühne, S. Bartke (2013): Prediction and minimization of emissions during deconstruction measures – Technical Guideline –, FP7-ENV-2010.3.1.5-2-TIMBRE-265364 deliverable 5.3, 30th September 2013, http://www.timbre-project.eu/tl_files/timbre/Intern/4%20Work%20Packages/WP8/Deliverables/timbre_265364_D5.3_v3.pdf
- Hagemann, P. and J. Krupanek, M. Kalisz, M. Kühne, M. Stalder, S. Bartke (2012): Report on recent practice and regulations concerning re-use and deconstruction of buildings in the EU, FP7-ENV-2010.3.1.5-2-TIMBRE-265364 deliverable 5.1, 30th June 2012, www.timbre-project.eu/tl_files/timbre/Intern/4%20Work%20Packages/WP8/Deliverables/Timbre_265364_D5.1_V3.pdf
- Länderarbeitsgemeinschaft Abfall (2003): Anforderungen an die stoffliche Verwertung von mineralischen Abfällen – Technische Regeln –, Mitteilungen der Länderarbeitsgemeinschaft Abfall (LAGA) Nr. 20, 06.11.2003 http://www.mugv.brandenburg.de/cms/media.php/2318/tr_laga.pdf
- Lippok, J. and D. Korth (2007): Abbrucharbeiten – Grundlagen, Vorbereitung, Durchführung, 2. Auflage, Verlagsgesellschaft Rudolf Müller GmbH & Co. KG, Köln.
-

Messung, Beurteilung und Verminderung von Erschütterungsimmissionen Gem. RdErl. d. Ministeriums für Umwelt und Naturschutz, Landwirtschaft und Verbraucherschutz - V B 2 - 8829 (VNr. 4/00), d. Ministeriums für Wirtschaft und Mittelstand, Energie und Verkehr – IV A 6 – 46-63, u. d. Ministeriums für Städtebau und Wohnen, Kultur und Sport – II A 4 – 850.1 v. 31.7.2000,
https://recht.nrw.de/lmi/owa/br_bes_text?anw_nr=1&qld_nr=7&ugl_nr=7129&bes_id=1002&val=1002&ver=7&sg=0&aufgehoben=N&menu=1

National Occupational Safety and Health of Romania Maria Purcherea 2007, ILO (International Labour Organisation, United Nations),
http://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---safework/documents/policy/wcms_187952.pdf

Nature conservation act of 16th April 2004 – "USTAWA z dnia 16 kwietnia 2004 r. o ochronie przyrody Dz.U. 2004 Nr 92 poz. 880"

Neununddreißigste Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes Verordnung über Luftqualitätsstandards und Emissionshöchstmengen vom 2. August 2010 (BGBl. I S. 1065), http://www.gesetze-im-internet.de/bundesrecht/bimschv_39/gesamt.pdf

OHSAS 18001 – British Standard for occupational health and safety management systems from July 2007

Ordinance of the Ministry of Environment of 9th September 2002 on standards for soil quality and ground quality "standards Rozporządzenie Ministra Środowiska z dnia 9 września 2002 r. w sprawie standardów jakości gleby oraz standardów jakości ziemi.(Dz. U.02.165.1359 z dnia 4 października 2002 r.)",
<http://isap.sejm.gov.pl/DetailsServlet?id=WDU20021651359>

Ordinance on the procedure of proof for disposal of waste of 20th October 2006 – "Verordnung über die Nachweisführung bei der Entsorgung von Abfällen (Nachweisverordnung - NachwV) vom 20. Oktober 2006", www.gesetze-im-internet.de/bundesrecht/nachwv_2007/gesamt.pdf

Ordinance on European waste Catalogue of 10th December 2001 – "Verordnung über das Europäische Abfallverzeichnis (Abfallverzeichnisverordnung, AAV) v. 10.12.2001", www.gesetze-im-internet.de/bundesrecht/avv/gesamt.pdf

Proposal for a directive of the European Parliament and the Council establishing a framework for the protection of soil and amending Directive 2004/35/EC /* COM/2006/0232 final - COD 2006/0086 *,
<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2006:0232:FIN:EN:PDF>

Rozporządzenie Ministra Infrastruktury z dnia 6 lutego 2003 r. w sprawie bezpieczeństwa i higieny pracy podczas wykonywania robot bodowlanych, Dz. U. Nr. 47, poz. 401

Schutzmaßnahmen für Tätigkeiten in kontaminierten Bereichen TRGS 524, Bundesministerium für Arbeit und Soziales, Februar 2010,
<http://www.baua.de/cae/servlet/contentblob/665890/publicationFile/61141/TRGS-524.pdf>

Sechste Allgemeine Verwaltungsvorschrift zum Bundes-Immissionsschutzgesetz (Technische Anleitung zum Schutz gegen Lärm-TA Lärm) vom 26. August 1998, <http://www.umweltbundesamt.de/laermprobleme/publikationen/talaerm.pdf>

SR 832.311.141 Verordnung über die Sicherheit und den Gesundheitsschutz der Arbeitnehmerinnen und Arbeitnehmer bei Bauarbeiten (Bauarbeitenverordnung, BauAV), <http://www.admin.ch/ch/d/sr/8/832.311.141.de.pdf>

TRBS 1111 – Risk assessment and safety assessment (15 September 2006), <http://www.baua.de/de/Themen-von-A-Z/Anlagen-und-Betriebssicherheit/TRBS/pdf/TRBS-1111.pdf? blob=publicationFile&v=3>

TRBS 1201 – Inspections of work equipment and systems requiring monitoring (August 2012), <http://www.baua.de/de/Themen-von-A-Z/Anlagen-und-Betriebssicherheit/TRBS/pdf/TRBS-1201.pdf? blob=publicationFile&v=5>

TRBS 1203 – Competent Persons, general requirements (March 2010), <http://www.baua.de/de/Themen-von-A-Z/Anlagen-und-Betriebssicherheit/TRBS/pdf/TRBS-1203.pdf? blob=publicationFile&v=7>

TRBS 2111 – Mechanical Hazards, <http://www.baua.de/de/Themen-von-A-Z/Anlagen-und-Betriebssicherheit/TRBS/TRBS-2111.html>

TRBS 2121 – Falling Hazards, <http://www.baua.de/de/Themen-von-A-Z/Anlagen-und-Betriebssicherheit/TRBS/TRBS-2121.html>

Technical guidelines for dangerous materials: Asbestos, deconstruction, remediation and refurbishment measures TRGS 519 of March 2007 – "Technische Regeln für Gefahrstoffe: Asbest Abbruch-, Sanierungs- oder Instandhaltungsarbeiten TRGS 519, Bundesministerium für Arbeit und Soziales, März 2007", www.baua.de/cae/servlet/contentblob/665968/publicationFile/47882/TRGS-519.pdf

Technische Regeln für Gefahrstoffe, Arbeitsplatzgrenzwerte, TRGS 900, Bundesministerium für Arbeit und Soziales, Januar 2006, <http://www.baua.de/de/Themen-von-A-Z/Gefahrstoffe/TRGS/TRGS-900.html>

Technische Regeln für Gefahrstoffe Abbruch, Sanierungs- und Instandhaltungsarbeiten mit alter Mineralwolle TRGS 521, Bundesministerium für Arbeit und Soziales, Februar 2008, <http://www.baua.de/de/Themen-von-A-Z/Gefahrstoffe/TRGS/TRGS-521.html>

Technische Regeln für Gefahrstoffe Asbest Abbruch-, Sanierungs- oder Instandhaltungsarbeiten TRGS 519, Bundesministerium für Arbeit und Soziales, März 2007, <http://www.baua.de/de/Themen-von-A-Z/Gefahrstoffe/TRGS/TRGS-519.html>

Technische Regeln für Gefahrstoffe Mineralischer Staub, Bundesministerium für Arbeit und Soziales TRGS 559, Februar 2008, <http://www.baua.de/de/Themen-von-A-Z/Gefahrstoffe/TRGS/TRGS-559.html>

Technische Regeln für Gefahrstoffe Tätigkeiten mit potenziell asbesthaltigen mineralischen Rohstoffen und daraus hergestellten Gemischen und Erzeugnissen TRGS 517, Bundesministerium für Arbeit und Soziales, Februar 2013, <http://www.baua.de/de/Themen-von-A-Z/Gefahrstoffe/TRGS/TRGS-517.pdf>

TRGS 517 Technical guidelines for dangerous materials with potentially asbestos containing raw materials and related mixtures and products, http://www.baua.de/de/Themen-von-A-Z/Gefahrstoffe/TRGS/pdf/TRGS-517.pdf?_blob=publicationFile&v=5

TRGS 519 Technical guidelines for dangerous materials: Asbestos, deconstruction, remediation and refurbishment measures, http://www.baua.de/en/Topics-from-A-to-Z/Hazardous-Substances/TRGS/pdf/TRGS-519.pdf?_blob=publicationFile&v=3

TRGS 521 Technical guidelines for dangerous materials: remediation and refurbishment measures with old mineral wool, http://www.baua.de/en/Topics-from-A-to-Z/Hazardous-Substances/TRGS/pdf/TRGS-521.pdf?_blob=publicationFile&v=2

TRGS 524 Protection measures for activities in contaminated areas, <http://www.baua.de/de/Themen-von-A-Z/Gefahrstoffe/TRGS/TRGS-524.html>

TRGS 559 Technical guidelines for dangerous materials: Mineral dust, <http://www.baua.de/en/Topics-from-A-to-Z/Hazardous-Substances/TRGS/TRGS-559.html>

TRGS 900 Technical guidelines for dangerous materials: Working place thresholds, <http://www.baua.de/de/Themen-von-A-Z/Gefahrstoffe/TRGS/TRGS-900.html>

Usawa z dnia 7 lipca 1994 r. Prawo budowlane

Water act of 18th July 2001 – "Ustawa z dnia 18 lipca 2001 r. Prawo wodne. Dz.U. 2001 nr 115 poz. 1229"

Zweiunddreißigste Verordnung zur Durchführung des Bundesimmissionsschutzgesetzes (Geräte- und Maschinenlärmschutzverordnung – 32. BImSchV) vom 29. August 2002, http://www.gesetze-im-internet.de/bundesrecht/bimschv_32/gesamt.pdf

Annex: Contributors to the report and Disclaimer

Contributors

This report is the result of discussions between all partners of the TIMBRE Work Packages 5 and 4 – as well as taking into account recommendations of the Advisory Board. It has been prepared by A. Hesse (GE) with contributions of P. Hagemann (GE), M. Kühne, and S. Bartke (UFZ). It has been edited by S. Bartke (UFZ).

If you have any further questions about this report and the research leading to it,
then please contact:

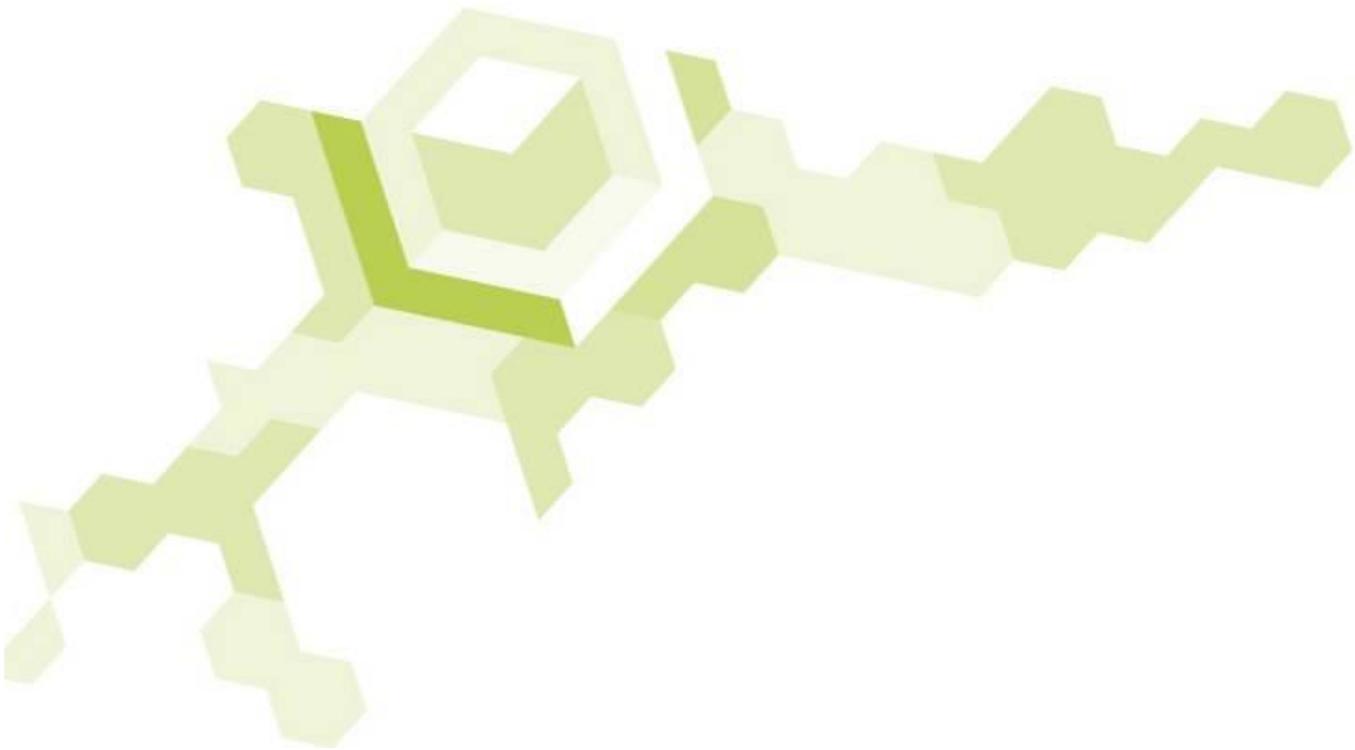
Manfred Kühne, Email: kuehne@geoexperts.de
Andreas Hesse, Email: hesse@geoexperts.de

Disclaimer

This document is aimed at assisting brownfield regeneration stakeholders. It is provided for information purposes only and its contents are not intended to replace consultation of any applicable legal sources or the necessary advice of a legal expert, where appropriate.

This document has been produced in the context of the TIMBRE Project. The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7 2011-2014) under grant agreement no 265364.

All information in this document is provided "as is" and no guarantee or warranty is given that the information is fit for any particular purpose. The user, therefore, uses the information at its sole risk and liability. For the avoidance of all doubts, the European Commission has no liability in respect of this document, which is merely representing the authors view.



timbre acknowledges the received funding from the European Community's Seventh Framework Programme – Theme ENV.2010.3.1.5-2 Environmental technologies for brownfield regeneration under grant agreement no 265364 (2011-2014)