HEALTH AND SAFETY IN CONSTRUCTION

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HEALTH AND SAFETY IN CONSTRUCTION

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This manual is part of the Construction Managers’ Library – a set of books related to the wide area of management in construction. The books were created within the Leonardo da Vinci (LdV) projects No: PL/06/B/F/PP/174014; 2009-1-PL1-LEO05-05016 and 2011-1-PL1-LEO05-19888, entitled: “COMMON LEARNING OUTCOME FOR EUROPEAN MANAGERS IN CONSTRUCTION, phases I, II and III – CLOEMC)”. Warsaw University of Technology, Civil Engineering Faculty, Department of Construction Engineering and Management was the Promoter of the Projects.

The following organisations were Partners in the CLOEMC I Project:
- Association of Building Surveyors and Construction Experts (Belgium),
- Universidad Politécnica de Valencia (Spain),
- Chartered Institute of Building Ireland (Ireland),
- Polish Association of Building Managers (Poland),
- Polish British Construction Partnership Sp. z o.o. (Poland),
- University of Salford (Great Britain),
- Chartered Institute of Building (Great Britain).

The objective of this project was to create first, seven manuals conveying all the information necessary to develop civil engineering skills in the field of construction management.

The following manuals have been developed in CLOEMC I (in the brackets you will find an estimate of didactic hours necessary for mastering the contents of a given manual):
M1: PROJECT MANAGEMENT IN CONSTRUCTION (100),
M2: HUMAN RESOURCE MANAGEMENT IN CONSTRUCTION (100),
M3: PARTNERING IN CONSTRUCTION (100),
M4: BUSINESS MANAGEMENT IN CONSTRUCTION ENTERPRISE (100),
M5: REAL ESTATE MANAGEMENT (100),
M6: ECONOMY AND FINANCIAL MANAGEMENT IN CONSTRUCTION (240),
M7: CONSTRUCTION MANAGEMENT (100).

The manuals created for the purposes of the library are available in three languages: Polish, Spanish and English. The manuals may be used as didactic materials for students of postgraduate courses and regular studies in all three languages. Graduates from the courses will receive a certificate, which is recognized by all organisations – members of the AEEBC, association of construction managers from over a dozen European countries.
Polish representative in the AEEBC is the Polish Association of Building Managers, in Warsaw.

Partners of the CLOEMC II project were:
- Technische Universität Darmstadt (Germany),
- Universidade de do Minho (Portugal),
- Chartered Institute of Building (Great Britain),
- Association of European Building Surveyors and Construction Experts (Belgium),
- Polish British Construction Partnership (Poland),

Within the second part of the project the following manuals were developed:
M8: RISK MANAGEMENT (130)
M9: PROCESS MANAGEMENT – LEAN CONSTRUCTION (90),
M10: COMPUTER METHODS IN CONSTRUCTION (80),
M11: PPP PROJECTS IN CONSTRUCTION (80),
M12: VALUE MANAGEMENT IN CONSTRUCTION (130),
M13: CONSTRUCTION PROJECTS – GOOD PRACTICE (80),

The manuals were prepared in four languages: Polish, Portuguese, German and English.

Partners of the CLOEMC III project were:
- Technische Universität Darmstadt (Germany),
- Universidade de do Minho (Portugal),
- Chartered Institute of Building (Great Britain),
- Thomas More Kempen University (Belgium),
- Association of European Building Surveyors and Construction Experts (Belgium),
- Polish Association of Building Managers (Poland),

Within the third part of the project the following manuals were developed:
M14: DUE-DILIGENCE IN CONSTRUCTION (100),
M15: MOTIVATION AND PSYCHOLOGY ASPECTS IN CONSTRUCTION INDUSTRY (100),
M16: PROFESSIONALISM AND ETHICS IN CONSTRUCTION (100),
M17: SUSTAINABILITY IN CONSTRUCTION (100),
M18: HEALTH AND SAFETY IN CONSTRUCTION (100),
M19: MANAGING BUILDING PATHOLOGY AND MAINTENANCE (100).
The manuals were prepared in five languages: Polish, Portuguese, German, French and English.

The scope of knowledge presented in the manuals is necessary in activities of managers - construction engineers, managing undertakings in the conditions of the modern market economy. The manuals are approved by the European AEEBC association as a basis for recognising manager qualifications. Modern knowledge in the field of management in construction, presented in the manuals, is one of prerequisites to obtain EurBE (European Building Expert) cards, a professional certificate documenting the qualification level of a construction manager in EU. The manuals are designated for managers - construction engineers, students completing postgraduate studies “Management in construction” and students completing construction studies. Postgraduate studies are a recognised program, and graduates receive certificates recognised by 17 national organisations, members of AEEBC.

More information:
- about the project: www.leonardo.il.pw.edu.pl
- about the EURBE CARD: www.aeebc.org
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CHAPTER 1

INTRODUCTION - LEARNING OUTCOMES

(P. O. NOWAK)

This manual has two main goals. One of them is to provide a tool, which can be used to address the OSH issues faced by working people in the construction industry and local authorities managing infrastructure projects. As a guide and source of reference for OSH in construction industry, this course becomes the foundation upon which to build better OSH initiatives within the construction industry, while intervening and preventing jobsite deaths, injuries and illnesses. The other main goal of this manual is to describe the importance of quality management and social environment and its effect on the future prosperity of construction companies. It tries to answer how firms can prepare to effectively compete and develop on the market in the face of rapid economic, political and social changes, based on quality management procedures. In the new global market, product characteristics, expressed in quality terms, are the major basis for business survival. Manufacturers, retailers, vendors and consumers all need a common understanding of what constitutes acceptable product quality. An additional objective of this manual is to share knowledge between civil engineers and managers. Based on the manual, they shall find out what practical implications the presented topics and questions may have for their workplaces or companies.

This manual presents EU regulations related to Health and Safety in construction and presents procedures related to H&S rules implementation in construction companies. Chapter 5 presents differences for H&S rules for services and works. In chapter 6 information about health and safety plans is presented. Chapter 7 shows a number of case studies, showing problems relating to H&S, underlining reasons for accidents, safety procedures and guidelines how to avoid accidents in the future. Appendices show: a comparison between ISO 9001, ISO 14000 and OHSAS 18001 and an example of the project management team job descriptions: duties and responsibilities.
CHAPTER 2
PREFACE
(J.C.TEIXEIRA)

The construction industry is regarded as unique in what concerns health and safety. Although there are many aspects similar to other industries, construction has its share of unique hazards. Year after year, the construction industry is one of the most dangerous ones, with more than one thousand construction workers dying on the job each year in the European Union (EU-15). For this reason, the focus on OSH (occupational safety and health) in the construction industry has increased in the last two decades, although a greater emphasis has been placed on safety, for several reasons. Moreover, the lessons learned by European companies from Japan and newly industrialised countries of South-East Asia, as well as the recent success of the US economy, suggest that we are undergoing a radical change in management thinking – the change of the management paradigm. The characteristic elements of that paradigm are: customer focus strategies aimed at maximising value to customers, process oriented and horizontally managed organisations with strong leadership, support by empowered teams and, last but not least, a built-in process of continuous improvement as a vital part of constant change and organisational learning.

One of the mostly referred to factors of the above mentioned transformation is the QM (Quality Management) idea; the next step is the TQM (Total Quality Management) concept (sometimes described as a philosophy). Today TQM is implemented by more and more companies throughout the world, which integrate TQM in every process. The same also applies to construction companies. In Europe, the rise in interest came with the development of ISO quality assurance standards, that are part of the TQM process management, convincing more and more practitioners, that implementing TQM (despite its complexity) is a must for their success and survival in the turbulent marketplace since the turn of the last century, and the beginning of the current new century. Saying this, it seems logical that civil engineers and managers should at least get acquainted with the general aspects of Quality Management.
CHAPTER 3
STANDARDS AND LEGAL REGULATIONS RELATED TO SAFETY AND HEALTH
(J. C. TEIXEIRA)

3.1 ILO DIRECTIVES

In this section, standards from International Labour Organisation (ILO) and from Occupational Safety and Health Administration (OSHA) are analysed. Moreover, several directives issued by the European Union are considered: introduction of measures to encourage improvements in the safety and health of workers at work; implementation of minimum OSH requirements at temporary or mobile construction sites; measures to encourage improvements in the OSH at work of workers with a fixed duration employment relationship or a temporary employment relationship; protection of young people at work; improvements in the OSH at work of pregnant workers and workers who have recently given birth or are breast feeding.

Directives issued by the International Labour Organisation (ILO) are excellent instruments for developing a culture of OSH in companies. These standards are practical recommendations to be used by people in charge of OSH in the workplace. They are written to be easily adapted to the different types of organisations, activities and countries. They advise the different countries to issue their own national and specific directives for certain sectors and activities.

In 1998, the ILO ordered the International Occupational Hygiene Association (IOHA) a comparative study of standards management systems of safety and health in use; from their analysis, the 2001 ILO Directives were developed.
The management system structure is based on the cycle of planning, execution, verification and action. The main characteristics of this standard are:

- It is not mandatory.
- It does not intend to replace the national laws, regulations, and standards.
- Its application does not demand certification.

Its objectives, at a national level, are:

- To create a national frame for a management system of OSH.
- To assess voluntary initiatives, in order to reinforce the fulfilment of the regulations and standards.
- To assess the development of specific directives on management systems of OSH.

At an organisation level, its objectives are:

- To assess the integration of a management system of OSH into the organisation.
- To motivate the organisation’s members so that they apply the suitable principles and methods of OSH, looking for continuous improvement.

### 3.2. OHSAS 18001 SPECIFICATIONS

OHSAS Specifications are a set of international voluntary standards related to the management of safety and health. OHSAS 18001 were published in 1999. They constitute a tool that eases the integration of OSH requirements with quality requirements (ISO 9000) and environmental management requirements (ISO 14000). OHSAS 18001 were elaborated to be applicable to industries and organisations of every type and size, without concerning their geographic, social or cultural origin. The aim of OHSAS 18001 is to establish the requirements of the occupational OSH management system that allows identifying and evaluating the occupational risks. Furthermore, they intend to define the organisational structure, functions, responsibilities, activity planning, processes, procedures, resources, records, etc. This way, the OSH policy and its management system can be developed, implemented, reviewed and maintained.

OHSAS 18001 have three main objectives:

- To minimise occupational risk to employees and other agents.
- To improve business performance.
- To assist organisations to establish a responsible business policy.
The structure of the management system states the bases on the following activities:
- Definition of a business policy of OSH.
- Identification of occupational risks and the related legal norms.
- Establishment of objectives and programs to assure the continuous improvement.
- Verification of the system performance.
- Improvement of the system.

The stages to obtain OHSAS 18001 certification are:
- Planning: process and analysis of documentation.
- Audit: checking the effective implementation of the pre-established requirements.
- Granting: the certificate is granted by a three year period.
- Pursuit: audits are made to verify that the conditions of the certification remain.

The main differences between OSHA Specifications and ILO Directives are:
- OHSAS Specifications present a greater level of exigency.
- The monitoring of the system is more explicit in the ILO Directives.
- The workers involvement is greater in the ILO Directives.
3.3. DIRECTIVE 89/391/ECC “ON THE INTRODUCTION OF MEASURES TO ENCOURAGE IMPROVEMENTS IN THE SAFETY AND HEALTH OF WORKERS AT WORK”

This Directive considers the followings aspects:
- The state members’ systems, related to OSH, differ widely and need to be improved.
- The national provisions on the subject, which often include technical specifications and/or self-regulatory standards, may result in different levels of OSH protection.
- The incidence of accidents at work and occupational diseases is still too high.
- The preventive measures must be introduced or improved immediately in order to safeguard the OSH of workers and to ensure a higher degree of protection.
- In order to ensure an improved degree of protection, workers and/or their representative must be informed on the risk to their OSH, and on the measures required to reduce or eliminate these risks.
- Workers must also be in a position to check that the necessary protective measures are taken.

The aim of this directive is to introduce measures to encourage improvements in the OSH of employees at the workplace. It contains general principles concerning the prevention of occupational risks, the protection of OSH, the elimination of risks and accident factors, the information, the consultation, balanced participation of workers and their representatives, as well as, the general guidelines for the implementation of these principles. This directive applies to all sectors of activity, both public and private (construction, industrial, agricultural, commercial, administrative, service, educational, cultural, leisure, etc.).
3.4. DIRECTIVE 92/57 ECC
“IMPLEMENTATION OF MINIMUM SAFETY AND HEALTH REQUIREMENTS AT TEMPORARY OR MOBILE CONSTRUCTIONS SITES”

This Directive has been adopted considering the followings aspects:
- Temporary or mobile construction sites expose workers to particularly high levels of risk.
- Unsatisfactory architectural and organisational options and poor work site planning have played an important role in more than half of the occupational accidents occurring on construction sites.
- In each member state, the authorities responsible for OSH must be informed, of the start of the execution of the works.
- Self employed persons and employers may jeopardize the OSH of the other workers.

This Directive lays down minimum safety and health requirements for temporary or mobile construction sites that means any construction site at which building or civil engineering works are carried out. It does not apply to drilling and extraction in the mineral extracting industries.
3.5. DIRECTIVE 91/383 ECC “SUPPLEMENTING THE MEASURES TO ENCOURAGE IMPROVEMENTS IN THE SAFETY AND HEALTH AT WORK OF WORKERS WITH A FIXED DURATION EMPLOYMENT RELATIONSHIP OR A TEMPORARY EMPLOYMENT RELATIONSHIP”

This directive has been adopted because workers with a fixed duration employment relationship or temporary employment relationship are more exposed to accidents at work and occupational diseases than other workers. These risks can be reduced through adequate provision of information and training from the beginning of employment.

3.6. DIRECTIVE 94/33 ECC “ON THE PROTECTION OF YOUNG PEOPLE AT WORK”

The purpose of this directive is to assure that:
- The minimum working or employment age must not be lower than the minimum school leaving age and, in any case, not lower than 15 years of age.
- Employers guarantee that young people have working conditions which suit their age.
- Young people are protected against economic exploitation and against any work likely to harm their health, physical, mental, moral or social development, or to jeopardise their education.
3.7. DIRECTIVE 92/85 ECC “
ON THE INTRODUCTION OF MEASURE
TO ENCOURAGE IMPROVEMENTS
IN THE SAFETY AND HEALTH
AT WORK OF PREGNANT WORKERS
AND WORKERS WHO HAVE RECENTLY
GIVEN BIRTH OR ARE BREAST
FEEDING”

The aim of this directive is to implement measures to encourage improvements in the OSH of pregnant workers and workers who have recently given birth or who are breastfeeding.
CHAPTER 4
DOCUMENTATION AND CERTIFICATION PROCEDURES FOR SAFETY AND HEALTH
(J.C. TEIXEIRA)

4.1. OHSAS 18001

Documentation and certification procedures of this manual are based on the specification OHSAS 18001. The basic documents of all management systems are the manual and the procedures.

4.2. MANUAL

The manual indicates what is necessary to do in prevention, related to commitments acquired in the preventive policy and the objectives of the company. The content of the manual is the following:
- Organisation.
- Risks evaluation and control.
- Prevention planning.
- Objectives and goals.
- Participation of workers.
- Performances control.
- Documentation.
- Interrelation with other implanted management systems.
- Audits.
- System revision.
4.3. PROCEDURES

The procedures indicate what is necessary to do, how and when; they also state the responsibilities of the people and the departments of the organisation in their execution and control. They are the management system documents that establish the process to reach the objectives and the goals fixed in the prevention policy. The procedures reflect the steps to execute an activity related to the safety and health of workers. The most common procedures of management systems of prevention of occupational risks are:

- Issuing, controlling and revision of procedures.
- Risks assessment and risk communication.
- Planning of preventive action.
- Coordination between units of the company and the prevention service.
- Elaboration of statistical data.
- Communication and workers' participation and delivery of information.
- Notification of occupational accidents and incidents.
- Investigation of occupational accidents and incidents.
- Supervision of work methods, control of contractors and subcontractors.
- Monitoring of health.
- Complementation of workers files in prevention.
- Prevention of labour risks in the changes of work position.
- Control of the design of new facilities and equipment.
- Audits, evaluation and revision of the prevention management system.

In the documentation of the management system, it is common to have general procedures to unify criteria at the time of writing up specific procedures. The procedures must conserve the following structure: aim, scope, references, definitions, accomplishment, goal and responsibilities, registration list and attachments. The company, throughout the progress of works, complies with its duties under all approved codes, relevant safety and health legislation. Where specific legislative requirements do not exist, the contractor complies with guidance provided by the codes of practice or industry standards as a minimum standard. For the certification procedure, the company submits the following documents: policy, planning, objectives, management program, application and performance, management supervision, audit, certification award, and monitoring.
CHAPTER 5
SAFETY AND HEALTH FOR WORKS AND SERVICES IN CONSTRUCTION
(J. C. TEIXEIRA)

5.1. GENERAL PRINCIPLES OF PREVENTION

The preventive activity during the stages of designing, preparing the project and work execution, includes the following general principles of prevention:

- Avoiding risks.
- Evaluating the risks which cannot be avoided.
- Combating the risks at source.
- Adapting the work to the individual, especially regarding design, the choice of work equipment and the choice of working and production methods.
- Adapting to technical progress.
- Replacing the dangerous with the non-dangerous or the less dangerous.
- Developing a coherent overall prevention policy which covers technology, organisation of work, working conditions, social relationships and the influence of factors related to the working environment.
- Giving collective protective measures priority over individual protective measures.
- Giving appropriate instructions to workers.

The general principles of prevention during the project execution stage will be applied, as the following:

- Keeping the construction site in a good order and in a satisfactory state of cleanliness.
- Choosing the location of workstations bearing in mind how the access is obtained to these workplaces, and determining routes or areas for the passage and movement of equipment.
- Conditions under which various materials are handled.
- Technical maintenance, pre-commissioning checks and regular checks on installations and equipment with a view to correcting any faults which might affect the safety and health of workers.
- Layout areas for the storage of various materials, particularly dangerous materials or substances
- The conditions under which the dangerous materials are removed.
- The storage and disposal or removal of waste and debris.
- Cooperation between employers and self-employed persons.
- Interaction with other industrial activities at the construction site or in its neighbourhood.

5.2. INVOLVED AGENTS

For the right operation of the preventive action, the following agents appear in the construction process:
- Client: any natural or legal person for whom a project is carried out.
- Project supervisor: any natural or legal person responsible for the design and/or execution and/or supervision of the execution of a project, acting on behalf of the client.
- Coordinator for safety and health matters at the project preparations stage: any natural or legal person entrusted by the client and/or project supervisor, during preparation of the project design.
- Coordinator for safety and health matters at the project execution stage: any natural or legal person entrusted by the client and/or project supervisor, during execution of the project.
- Employer: any natural or legal person who has an employment relationship with the worker and has responsibility for the undertaking and/or establishment.
- Worker: any person employed by an employer, including trainees and apprentices but excluding domestic servants.
- Self-employed person: any person different from the employer and worker whose professional activity contributes to the completion of a project.
5.3. DUTIES OF THE CLIENT AND PROJECT SUPERVISOR

In order to preserve safety and health on the construction site, the client and his representative have the following obligations:

- The client or the client representative appoints one or more coordinators for safety and health matters, for any construction site on which more than one contractor is present.
- The client or the client representative ensures that prior to the setting up of a construction site, a safety and health plan is drawn up.
- The design coordinator, or where appropriate the client, takes account of the general principles of prevention during the stages of designing and preparing the project.
- In the case of construction sites, on which work is scheduled to last longer than 30 working days and on which more than 20 workers are occupied simultaneously, or on which the volume of work is scheduled to exceed 500 person-days, the client or the project supervisor will communicate a prior notice drawn up to the competent authorities before work starts.
- The prior notice must be clearly displayed on the construction site and if necessary, periodically updated.
- The content of the prior notice is:
  1. Date of forwarding.
  2. Exact address of the construction site.
  3. Client (name and address).
  4. Type of project.
  5. Project supervisor (name and address).
  6. Safety and health coordinators during the project preparation stage (name and address).
  7. Coordinator for safety and health matters during the project execution stage (name and address).
  8. Planned date of the work starting on the construction site.
  9. Planned duration of work on the construction site.
 10. Estimated maximum number of workers on the construction site.
 11. Planned number of contractors and self-employed persons on the construction site.
 12. Details of contractors already chosen.
5.4. DUTIES OF COORDINATORS

The coordinator for safety and health matters during the project preparation stage has the following duties:

- Coordinate the implementation of the general principles of prevention and safety considered by the project supervisor, or the client.
- Prepare a file appropriate for the characteristics of the project containing relevant safety and health information.
- Draw up, or cause to be drawn up, a safety and health plan setting out the rules applicable to the construction site concerns.
- The safety and health plan will have to include specific measures concerning work which falls within one or more of the following categories:
  1. Risk of burial under earth, falls, engulfment in swampland or falling from a height, where the risk is particularly aggravated by the nature of the work or processes used or by the environment at the place of work or site.
  2. Risk from chemical or biological substances constituting a particular danger to the safety and health of workers or involving a legal requirement for health monitoring.
  3. Ionising radiation requiring the designation of controlled or supervised areas.
  4. Near high voltage power lines.
  5. Exposing workers to the risk of drowning.
  6. Wells, underground earthworks and tunnels.
  7. Drivers having a system of air supply.
  8. By workers in caisson with a compressed-air atmosphere.
  10. Assembly or dismantling of heavy prefabricated components.

The coordinator for safety and health matters during the project execution stage has the following duties:

- Coordinate implementation of the general principles of prevention and safety.
- Coordinate implementation of the relevant provisions in order to ensure that employers and, if necessary for the protection of workers, self-employed persons apply the principles of prevention.
- Where required, follow the safety and health plan.
- Make, or cause to be made, any adjustments required to the safety and health plan to take account of the progress of the work and any changes, which have occurred.
- Organise cooperation between employers, including successive employers on the same site, coordination of their activities with a view to protecting workers and preventing accidents and occupational health hazards and reciprocal information, ensuring that self-employed persons are included in this process where necessary.
- Coordinate arrangements to check that the working procedures are being implemented correctly.
- Take the necessary steps to ensure that only authorised persons are allowed onto the construction site.

5.5. EMPLOYERS’ OBLIGATIONS

In order to preserve safety and health on the construction site, the employers have to consider the following aspects:
- Ensure the safety and health of workers in every aspect related to the work.
- Take the measures necessary for the safety and health protection of workers, including prevention of occupational risks and provision of information and training, as well as provision of the necessary organisation and means.
- Be in possession of an assessment of the risks to safety and health at work, including those facing groups of workers exposed to particular risks.
- Decide on the protective measures to be taken and, if necessary, the protective equipment to be used.
- Keep a list of occupational accidents resulting in a worker being unfit for work for more than three working days.
- Draw up, for the responsible authorities and in accordance with national laws and/or practices, reports on occupational accidents suffered by his workers.
- Take into account directions from the coordinator(s) for safety and health matters.
- Take measures that are in line with the minimum safety and health requirements for construction sites.
- Consult workers and/or their representatives and allow them to take part in discussions on all questions relating to safety and health at work.
- Ensure that each worker receives adequate safety and health training, in particular in the form of information and instructions specific to his workstation or job: on recruitment, in the event of a transfer or a change of job, in the event of the introduction of new work equipment or a change in equipment, in the event of the introduction of any new technology.
- The training will be adapted to take account of new or changed risks, and repeated periodically if necessary.

5.6. WORKERS' OBLIGATIONS

Workers have, in accordance with their training and the instructions given by their employer, the following duties:
- Take care, as far as possible, of his own safety and health and that of other persons affected by his acts or commissions at work in accordance with his training and the instructions given by his employer.
- Make correct use of machinery, tools, dangerous substances, transport equipment and other means of production.
- Make correct use of the personal protective equipment supplied to them and, after use, return it to its proper place.
- Refrain from disconnecting, changing or removing arbitrary safety devices fitted, e.g. to machinery, tools, plant and buildings, and use such safety devices correctly.
- Inform the employer immediately about any work situation they have reasonable grounds for considering that represents a serious and immediate danger to safety and health and of any shortcomings in the protection arrangements.
- Cooperate, in accordance with national practice, with the employer, as long as may be necessary to enable any task or requirement imposed by the competent authority to protect the safety and health of workers at work to be carried out.
- Cooperate, in accordance with national practice, with the employer, as long as may be necessary to enable the employer to ensure that the working environment and working conditions are safe and do not pose a risk to safety and health within their field of activity.
5.7. SELF-EMPLOYED PERSON’S OBLIGATIONS

Workers have, in accordance with their training and the instructions given by their employer, the following duties:

- Take care, as far as possible, of his own safety and health and that of other persons affected by his acts or commissions at work in accordance with his training and the instructions given by his employer.
- Make correct use of machinery, tools, dangerous substances, transport equipment and other means of production.
- Make correct use of the personal protective equipment supplied to them and, after use, return it to its proper place.
- Refrain from disconnecting, changing or removing arbitrary safety devices fitted, e.g. to machinery, tools, plant and buildings, and use such safety devices correctly.
- Inform the employer immediately about any work situation they have reasonable grounds for considering that represents a serious and immediate danger to safety and health and of any shortcomings in the protection arrangements.
- Cooperate, in accordance with national practice, with the employer, as long as may be necessary to enable any task or requirement imposed by the competent authority to protect the safety and health of workers at work to be carried out.
- Cooperate, in accordance with national practice, with the employer, as long as may be necessary to enable the employer to ensure that the working environment and working conditions are safe and do not pose a risk to safety and health within their field of activity.
CHAPTER 6
HEALTH AND SAFETY PLAN
(J. C. TEIXEIRA)

6.1. LEGAL ASPECTS

In most countries in the European Union, the prevention of occupational risks in construction is performed in the framework of the Community Directive No. 92/57/EEC (Temporary and Mobile Construction Site Directive), that has been transposed to the internal law of these countries, following its publication in 1992 - the Decree-Law No. 273/2003 of 29 October transposed the Directive into the Portuguese law. Most internal laws introduce new functions, ascribe new responsibilities to construction stakeholders and stipulate a set of essential documents for the prevention of occupational risks on construction sites. The Portuguese law, for example, introduces new actors in the construction process, namely, the health and safety coordinators (H&S Coordinators) and explains their duties and obligations. Additionally, the law stipulates four essential H&S prevention documents, namely, the Health and Safety Plan (H&S Plan), the site opening notice, the safety prevention procedures and the project file, and explains the contents of each of these documents. This section explains the scope and contents of the H&S prevention documents. However, their scope and content have had to be adapted to the specifics of the internal law in each country therefore the details on the preparation of these documents varies across countries. The Portuguese law was followed in the remaining part of this section.

6.2. THE HEALTH AND SAFETY PLAN

The H&S Plan is a document of great importance to gather all relevant information and advice on health and safety during the construction phase of the project. Actually, this is done through two documents in some European countries, three documents in other countries and a single document still
in other countries. The transposition of the Temporary and Mobile Construction Site Directive to the Portuguese Law system adopted a single type of H&S Plan, but with a dynamic character because it evolves throughout the construction process, successively incorporating the participation of various project stakeholders. The Plan should be seen as the result of the work of the H&S Coordinators regarding the prevention of occupational risks during the construction phase and not as a stray document. In order to support the development of the H&S Plan, the H&S Coordinators shall be appointed by the project owner in order to participate, within their competence, in the occupational risk prevention. Regarding the design phase, the Portuguese statute explicitly mentions, in Article 3:

"The health and safety coordinator at the design phase" or design safety coordinator, in brief, is "a person or entity who performs the coordination tasks on health and safety issues during the design phase, as established "in this statute," and may also participate in “the preparation of the negotiation process for construction and other preparatory acts for project implementation, on the topics concerning health and safety at work".

According to the same law, "the health and safety plan is mandatory in construction works requiring design and involving special hazards or site opening notice". The design safety coordinator must "develop the health and safety plan for the project or, if the plan is developed by another person assigned by the project owner, provide for its technical validation". According to Article 9, "the owner must appoint a design safety coordinator for the project:

a) If the design is developed by more than one subject, since their architectural options or technical solutions involve technical complexity for the integration of the general principles of occupational risk prevention or the work to be performed involves special risks;

b) If two or more companies are expected for project implementation (construction), including the main contractor and its subcontractors."

The H&S Plan is intended to be developed and specified by the performing entities (e.g., contractors) responsible for design implementation on site, "in order to supplement the measures provided", so as to finalise the H&S Plan for the execution of the work. Analysing these precepts, it is concluded that, under Portuguese law:
1. The H&S Plan for the project is mandatory, in practice, in almost all construction projects, since:

Special construction risks can nearly always be identified in construction works. Indeed, special risks include those "that put workers at risk of burial, sinking or falling from heights, particularly aggravated by the work nature or means used, or the environment of the work post, or the work situation, or the site". Once the works referred to are generally present in construction, and it is not clear under what circumstances one may consider those risks "particularly aggravated," developing the plan turns out to be the safest option, in case of doubt.

The site opening notice is mandatory in most works of some significance, because they often involve “a total working period of over 30 days, and at any time, the simultaneous use of more than 20 workers” or "a total of more than 500 days of work, corresponding to the sum of days of work provided by each of the workers”.

2. The Authority for Work Conditions "may order the developer to deliver the H&S Plan for the project".

3. The design safety coordinator is liable for preparing the H&S Plan, or at least for its technical validation, since:

Rare are the works for which a single designer is needed - including in the design team, not only architects and engineers but also other professionals such as cost estimators, surveyors and drawers.

The design team seldom may state that its design solutions are free of "technical complexity for the integration of general principles of occupational risk prevention" or that the work does not "involve special risks".

In practice, there are very few works in which only one company is involved, "including the general contractor and its subcontractors"; therefore it is difficult for the design team to assume this at the design phase.

4. It is unclear in the law, the concept of "works subject to design". Current practice in Portugal is considering private projects that require preliminary administrative control by municipal entities (public works are necessarily subject to design). But the progressive administrative simplification that has been felt in this country over the last few years leaves out of preliminary control various projects of considerable dimension and hazards. Therefore, it seems
safer to consider projects requiring design as those involving one or more technical designers, only excluding the maintenance works and other of minor relevance (small walls, small external fittings, equipment installation, etc.).

Note that "wherever there are works for which the health and safety plan is not mandatory... but involving special risks ... the contractor shall develop safety prevention procedures for the construction activities involving such risks and ensure that workers are aware of the contents of those forms" The contents of health and safety procedures are specified in law.

The health and safety procedures should include the following elements:

- a) The identification, characterisation and duration of the work;
- b) The identification of actors on site, relevant to the work in question;
- c) Preventive measures to be adopted regarding the work being performed and corresponding risks;
- d) Information on the conditions on site and surrounding area, including geological, hydrological and geotechnical, the aerial or underground infrastructure networks and activities that may take place on site with implications on the prevention of occupational risks associated to the work execution;
- e) The procedures to be adopted in emergency situations.

It is the responsibility of the design safety coordinator on site to analyse the suitability of health safety procedures and propose adequate changes.

The H&S Plan is part of the organisation’s quality management system. Therefore, it is a document subject to registration, as well as its changes and additions, attaching documents, detailed drawings, etc.

The recording models for preparing, checking and approval may be as follows:

```
<table>
<thead>
<tr>
<th>Performed by:</th>
<th>Checked by:</th>
<th>Approved by:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Susana Sousa</td>
<td>José Teixeira</td>
<td>Pawel Nowak</td>
</tr>
<tr>
<td>2012-12-10</td>
<td>2012-12-10</td>
<td>2012-12-10</td>
</tr>
</tbody>
</table>
```
The recording models for the plan editing and revision may be as follows:

<table>
<thead>
<tr>
<th>Date</th>
<th>Edition</th>
<th>Revision</th>
<th>Reviewed</th>
<th>Inserted</th>
<th>Withdrawn</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012-12-10</td>
<td>1</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

It is customary to enter this information on the document cover page.

As for the plan contents, the supporting elements are as follows:

1. The health and safety plan for the project should be supported by the design elements and other conditions established for the execution of work relevant to occupational risk prevention planning, including:
   a) The type of building, the intended use, the architectural options, the technical settings for the structure and other building components, recommended technical solutions, products and materials to be used, written documents and drawings should be included, if relevant to occupational risk prevention;
   b) The features of geological, hydrological and geotechnical terrain, the aerial or underground infrastructure networks, activities that may take place on the site or in its vicinity and other surrounding elements that may have implications on the work performance;
   c) The specifications on the organisation and implementation schedule of the work to be included in the contract notice;
   d) The specifications on the development of the health and safety plan if several entities perform parts of the work.
And the topics to be included are:

1. The health and safety plan should realise the risks highlighted and risk prevention measures to be adopted, taking into special consideration the following aspects:
   a) The types of work to be performed;
   b) The health and safety management on site, specifying the areas of responsibility of each stakeholder;
   c) The methodologies relating to construction processes, as well as the materials and products that are defined in the project or in the specifications;
   d) The phases of the work and the execution schedule of the various works;
   e) Special risks to the safety and health of workers;
   f) Aspects to observe in the management and organisation of the supporting site.

In view of the above, there is not a pre-established model for the plan, each safety coordinator adopting the most suitable form as long as it complies with the law requirements. In the following sections, an organisation model for the H&S Plan is presented, according to Portuguese law. It is organised into the following chapters and corresponding sections of the text.
### 6.2.1 Introduction

This chapter aims to briefly describe the purpose and content of the H&S Plan, establish guidelines for the management of health and safety on site, and set up rules to perform the work. The objectives of the Plan, may be summarised as follows:

- Carry health and safety information from the design stage to the implementation phase of the project, evidencing the concerns and solutions for the prevention of occupational risks identified by the design team under the guidance of the design safety coordinator;
- Include relevant information on the prevention of occupational risks to which companies must meet in drawing up their construction offers;
- Allow the project owner (assisted by the design safety coordinator) to evaluate the offers from competitors from the occupational health and safety viewpoint;
- Indicate the structure for the development of the H&S Plan, its specifications and contents;
Remove or reduce, through the planning of all activities, the probability of spontaneous work situations contributing to accident risk on the increase;

Contribute to information availability on site on training in occupational health and safety through the involvement of all stakeholders;

Reduce the number of accidents and incidents during construction.

The liability for health and safety management lays firstly on the project owner that uses this chapter to set up the guidelines that must be followed in view of the prevention of occupational risks while performing the work. In general, these guidelines are reflected in the following type of commitments made by the project owner:

- Maintains through the site safety coordinator, permanent monitoring on safety conditions on site premises and plant, in order to introduce improvements that may be deemed necessary.

- Requires that all staff involved in any site activity has received specific training and information on health and safety at work.

- Requires every employer to keep updated and implemented, a safety manual depicting the general and specific rules for each job post for safe behaviour of its employees.

- Requires that companies make their suppliers comply with safety rules implemented on site and express their acceptance of these.

- Requires that the company keeps an emergency plan continually updated and tested, in collaboration with external entities, so that the consequences of hazards may be minimised.

- Requires compliance with all applicable laws and regulations on health and safety at work, and with the measures recommended in the H&S Plan.

Concerning the rules for proper work execution, it is customary to include in this chapter a set of references to the liability of the performing organisation, including:


- The liability of the performing company on the registration of subcontractors and self-employed personnel.
To the minimum health conditions concerning the exposure of workers to noise risks.

The specific issues of the work in question, highlighting the most relevant aspects that may condition the proper work execution.

Some general rules that may especially condition proper work execution, for example:

"No work can be started without the risks involved in it and preventive measures are contemplated in the health and safety plan."

Note, finally, that the interpretation, adaptation, specification and implementation of the H&S Plan must be made taking into account the remaining documents which constitute the design (written documents and drawings) of the different technical areas (architecture, engineering, etc.).

6.2.2 Applicable law

This chapter presents a listing of community directives, national diplomas and most importantly national standards regarding health and safety at work. Generally, reference is made to an appendix of the main document, although stressing that this list is not exhaustive.

6.2.3 Features of design and construction

This chapter presents the characteristics of the project and the conditions for the execution of work deemed relevant for occupational risk planning and prevention.

- **Site characteristics and its environment**, covering the following aspects:
  - Description of the type of project to erect and its intended use.
  - General description of the work: Contains a brief description of the solution designed with reference to architectural options and technical solutions adopted, and the products and materials to be used. The most relevant parts of the design for occupational risk prevention are usually attached to this document. Pictures, photographs, topographic, maps and so on, may also be included, if necessary.
  - The state of design development: Clarifies if there are parts of design not yet fully developed.
  - The site determinants: Includes a brief description of the project execution place and lists the conditions and the environment that may have implications in the work execution, including
geological features, hydrological and geotechnical features, infrastructure affected by construction, accessibility and proximity to sensitive urban facilities (schools, hospitals, etc.).

- **Interference with other activities:** Refers to interference with the execution of activities taking place at the same point in time or surroundings (e.g., risk of accidental fall of materials on neighbouring properties).

- **Construction processes and technologies:** Discusses the general processes and construction technologies provided. Parts of the design relevant to occupational risk prevention are usually attached to this document.

- **Procedures in case of emergency:** Stresses the need to develop emergency procedures and reference to the service centres close to the construction site as primary indication for the performing organisations;

**Entities involved in the design and execution of the work:**
This information is also required in the site opening notice. Note that part of the information required for this effect is not available at the time of writing the H&S Plan and has to be left open, for example, the identification of contractors, the health and safety coordinator on site, etc.

### 6.2.4 Safety organisation on site

This chapter begins by framing the security work in the organisational model proposed and next states various aspects of the practical organisation of safety on site. Consultation documents to the construction companies (or tender, if applicable) may ask bidders to provide information about these issues, which can be evaluated for the purpose of contractor selection.

#### 6.2.4.1 Organisational risk prevention structure during construction

This point presents the organisational structure for risk prevention on site. This organisational structure should reflect and realise the guidelines and commitments established by the project owner as mentioned in Chapter 1 of the H&S Plan (see section 2.1). The flowchart of Figure 6.1 is an example of a structure of this type.
In this figure, the health and safety coordinator on site emerges as a representative of the project owner for the subjects concerned, working in conjunction with the project manager. The figure assumes a performing entity only (general contractor), providing on-site services for occupational health and safety (OHS), the representative of the workers, and a structure that ensures the provision of first aid (FA), fire fighting (FF) and emergency evacuation (EE). The figure also mentions several subcontractors of the main contractor, each having its own OHS structure, similar to the general contractor and its own OHS representative. If there is a health and safety committee at work, companies’ and independent professionals’ representatives will sit on it.

6.2.4.2 Records

The records are critical to monitoring and control of health and safety on site. The records typically required for the performing entity, are:

- Records of subcontractors, self-employed and employees.
o Records evidencing the disclosure of the H&S Plan to all companies and / or independent workers involved on site.
o Declaration of adherence to the H&S Plan by all project stakeholders.
o Records of the distribution of personal protective equipment, possibly including a brief description of that equipment.
o Records of the plant on site, including information about it, the state of use at acquisition, the EC declaration of conformity, reference to the instruction manual and/ or installation conditions (in local language), verification reports (regular and overtime) performed by a competent authority, certificates of inspection, performed by an accredited instance (where applicable), insurance records, conditions of use of plant installed on site (including any restrictions on use of their maximum capacity), statements of the professional qualification of operators (when applicable) and certificates of medical fitness of operators (when not included in the records of the other workers).
o Records of inspection and prevention, including procedures and records of nonconformities and preventive actions.
o Records of the medical fitness of workers issued by the occupational physician.
o Records of accidents and accident rates (duration, frequency, severity and incidence) and the appropriate statistical analysis.
o Records of the training of workers, particularly the welcome session, training sessions during their stay in work, in particular, on the prevention of accidents and occupational diseases, the use of personal protective equipment and first aid.
o Records of dangerous materials, products, substances and preparations.

Records mentioned above use formats that the H&S Plan may suggest (e.g.: by types of sheets to be included in an annex to the plan) and must be sent to the site safety coordinator on a monthly basis. The need to produce these records (and assemble the whole system of monitoring and control) must be evidenced in the specifications of the work available to companies from the consultation phase.
6.2.4.3 Development of the health and safety plan for the construction phase

This subchapter provides information for the performing organisations for the development and specification of the H&S Plan for the construction phase, in order to complement the measures forecasted at the design phase. This subchapter has a great relevance when parts of the work are performed by different performing entities, because it is important to specify the scope of work of each of them according to their responsibilities in construction.

6.2.4.4 Development of the project file

The project file is a document required by the project owner and includes useful elements to take into account in future works after construction finishes, in order to preserve the health and safety of performers, and includes technical information regarding equipment installed relevant to the prevention of risks of use, storage and maintenance. This subchapter provides the information necessary for performing entity for the provision of the information needed to produce the project file.

6.2.5 Risk evaluation and preventing measures

This chapter discusses the works to be carried out and analyses, for each of them, the health and safety risks for workers involved during construction and the corresponding preventive measures to be adopted. The most common risks and the corresponding protective measures are usually listed in an Annex in the form of "Risk Assessment Sheets". During the plan adaptation phase, the performing entities should complete the list of identified works with others, if necessary.

6.2.6 Health and safety management on site

The purpose of this chapter is to address the management of safety and health on the site, fulfilling the risks identified in this field and specifying the preventive measures to be adopted. The chapter firstly deals with the responsibility of those involved in the works and then with the site design and with the organisational measures for implementing on site. This complies with the provisions in b), d) and f) of paragraph 2 of Article 6 of Decree-Law no. 273/2003.

6.2.6.1 Areas of responsibility of stakeholders

This subchapter deals with the areas of responsibility of those involved in work on the prevention of occupational risks. Essentially, it refers to applicable law. The Decree-Law n. ° 273/2003 addresses, in Section IV of Chapter II,
the obligations of stakeholders in the project, namely, the owner of the work (article 17), the designer (article 18), the H&S Coordinator (article 19), the entity performing (articles 20 and 21), employers (articles 21 and 22) and self-employed workers (article 23). Additionally, it is customary to call the attention of the performing entities for the compliance with applicable legislation, primarily to the Legal Framework for the Promotion of Health and Safety at Work (Law n. 102/2009 of 10 September), to the Labour Code (Law n. 7/2009, of 12 February), to the Regime Organisation and Operation Activities on Occupational Safety and Health in the Workplace (Decree-Law No. 109/2000 of 30 June) Law and to other legislation specific to the construction activity. It is customary to recall, in this regard, the provisions of the law when several companies develop activities in the same workplace (Article 16 of Law no. 102/2009 of 10 September):

1. When several entities, establishments or services develop simultaneous activities with their employees in the same workplace, the employers shall cooperate in health and safety prevention, taking into account the nature of activities performed by each of them.

2. Notwithstanding the responsibility of each employer, the following entity shall ensure health and safety to all workers:
   a) The user entity, in the case of temporary worker;
   b) The cessionary company, in the case of occasional work;
   c) The owner of the facilities used by workers providing contract services;
   d) In all other cases, the contractor undertaking the work or service for which it should ensure coordination of other employers by organising health and safety at work.

3. The user company or contractor of the work or service must ensure, that the successive performance of activities by third parties on its premises or by using its equipment does not constitute a risk to the health and safety of workers or temporary workers, or workers ceded occasionally.
6.2.6.2 Site design

This subchapter provides indications on how the design of the site should be developed and presented by the performing entity. This is an essential part for preventing labour risks, that will be evaluated by the coordinator of the work. The project shall include:

- A general description;
- Plant of local constraints, including networks of existing infrastructure on site (survey);
- Infrastructure diversion design;
- Plant of overall deployment at convenient scale, containing all necessary information about the facilities and equipment adopted and their location;
- Signalling and circulation;
- Other parts deemed necessary for perfect clarification of the site.
Annex I of Decree-Law n.º 273/2003 highlights the following aspects for site management and organisation:

<table>
<thead>
<tr>
<th>Identification of situations likely to cause risk, which could not be avoided during the design phase and the corresponding preventive measures.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation and operation of temporary technical networks, including electricity, gas and communications, water supply infrastructure and waste disposal systems.</td>
</tr>
<tr>
<td>Delimitation, accesses, horizontal and vertical circulations and permanence of vehicles and people.</td>
</tr>
<tr>
<td>Mechanical and manual handling of loads.</td>
</tr>
<tr>
<td>Facilities and equipment to support production.</td>
</tr>
<tr>
<td>Information on materials, products, substances and preparations for use on site.</td>
</tr>
<tr>
<td>Planning the activities aiming to avoid risks inherent to their succession or overlapping in space and time.</td>
</tr>
<tr>
<td>Work scheduling.</td>
</tr>
<tr>
<td>Security and evacuation measures.</td>
</tr>
<tr>
<td>Site cleaning and housekeeping.</td>
</tr>
<tr>
<td>Site layout measures.</td>
</tr>
<tr>
<td>Cooperation arrangements between the performing entity, sub-contractors and self-employed.</td>
</tr>
<tr>
<td>Information dissemination to stakeholders, including contractors, subcontractors, health and safety and technicians.</td>
</tr>
<tr>
<td>Social facilities for staff employed on site, including dormitories, showers, changing rooms, toilets and canteens.</td>
</tr>
</tbody>
</table>

6.2.6.3 Work phases and schedule

The planning stage is very important for the prevention of occupational risks. This subchapter is intended to alert the performing entity on some aspects of the work plan that should be developed during the work preparation phase, and that the site safety coordinator work will analyse.
From the occupational risk prevention point of view, the intention is to check, among other situations, periods with higher incidence of concurrent jobs, where the risk of accidents is higher. This information will also be reflected in the corresponding manpower schedule and equipment throughout the development of the work, will also support the assessment of accident rates.

6.2.6.4 Organisational measures

In order to prevent workers’ safety and health risks, organisation measures must be implemented for the effective prevention of occupational risks.

This sub-chapter is about relevant mandatory measures of this type that should be complemented by contractors and implemented on site. Examples are as follows:

- Implement safety hygiene and health supporting services on site.
- Put in place the commission of hygiene and safety at work (when applicable).
- Adapt the H&S Plan from the design phase to the construction phase, in order to specify it to construction activities to be performed.
- Create an identification system for site workers.
- Implement an information and training system for site workers, comprising:
  - rules of conduct (order, discipline, conflict avoiding, etc.);
  - general safety procedures;
  - occupational risks of each construction task and appropriate preventive measures;
  - working methods, tools and equipment appropriate to each task;
  - correct use of site equipment and equipment distributed to workers (EPI, for example).
- Ensure appropriate qualifications or skills of workers assigned to each task.
- Establish, update and disseminate the first aid plan, including the updated name list of the first respondents team.
- Ensure adequate access to work areas, in conditions of permanent circulation.
- Assure that the equipment control is by a competent person.
- Organise and implement measures to protect health.
- Adopt the necessary measures for individual and collective protection.
- Prepare periodic reports (monthly, for example), covering health and safety topics, namely:
  - actual health and safety conditions on site;
  - composition of the working teams;
In the development and specification of the H&S plan for the execution of the works, contractors shall explain the means to ensure cooperation between the various stakeholders at work, bearing in mind the requirements established for health and safety. This includes the specification of the information and training system of all site workers on the prevention of occupational risks.

6.2.6.5 Information and communication

This sub-chapter is about how the management system should be implemented in the work so as to ensure that material information relating to the prevention of occupational risks is adequately communicated to all stakeholders on site. Examples of components of this system:

- Training and information dissemination sessions for workers (cited above).
- Meeting between stakeholders.
- Regular reporting on health and safety topics.
- Efficient telecommunications system.
- Notices.
- Newsletters.

In the scope of the development and specification of the H&S Plan for work execution, contractors will specify and articulate the information and communication management system between all stakeholders on site for occupational risk prevention. This necessarily includes the procedures for reporting accidents and incidents on site.

6.2.6.6 Cooperation models on site

This sub-chapter is about the modalities of cooperation on health and safety management to be implemented by performing entities (including subcontractors, suppliers and employees). Examples of these forms of cooperation:

- Systematic coordination meetings between performers and client representatives on site.
- Appointment of contractor’s representatives for health and safety.
- Analysis of the performing entities safety systems and their fitness to the works.
- Work organisation and managing the movement of workers and equipment.
- Limitation of hazardous co-activities, listing possible risks and implementing preventive measures.
- Selection of workers who, through their somatic characteristics, may perform work in areas of higher risk.
- Coordination of a first aid service on site with the local health infrastructure, including through:
  - the dissemination of information to the emergency services nearby;
  - the creation of spaces for casualty evacuation and conducting evacuation drills;
  - the coordination of accident simulation exercises with the local civil protection.

Performing entities may complement or suggest other cooperation modalities in the H&S Plan beyond those mentioned above, and include any corrective action when elementary standards are violated.

6.2.6.7 Collective protective equipments

This sub-chapter refers to the collective protective equipment forecasted at the design phase and may be supplemented or replaced by the performing entities.

6.2.6.8 Personal protective equipments

This sub-chapter refers to personal protective equipment (PPE) either mandatory, permanent or temporary as planned during the design phase.

6.2.6.9 Visitors plan

This sub-chapter refers to the preparation of the visitors plan. This plan is intended to prevent risks that authorised visitors may possibly face when entering into the work of authorised persons not involved in the implementation process and should therefore receive instructions and personal protective equipment appropriate to conduct the visit safely. Visiting by unauthorised persons should be prohibited, posting up for this purpose, adequate warnings on all accesses to the work. The visitors plan should include:
- A list identifying the stakeholders and those responsible in work.
- Identification of the companions of the visits.
- Identification of PPE that visitors must use during the visit.

The information contained in this chapter shall be updated by the entities performers in the adjustment of the H&S Plan at work.
6.2.6.10 Emergency plan

This sub-section intends to draw contractors’ attention to the legal obligation of establishing the appropriate measures to take into account of an accident or disaster (fires, explosions, earthquakes, floods), according to the characteristics of the work and its surrounding. The emergency plan should include emergency procedures (including the measures in rescue and evacuation plan) and show the integration with the system of reporting of accidents and incidents, the system of emergency lighting and first aid services of the yard.
6.2.7 Special risks

In this chapter, the materials and the works identified with special risks are listed, in accordance with the description of Article 7 of Decree-Law n.º 273/2003, and appropriate preventive measures are considered. The content of this article is listed below:

The health and safety plan should also provide for appropriate measures to prevent health and safety risks to workers on site, arising from works:

a) That put workers at risk of burial, sinking or falling from heights, particularly aggravated by the nature of the activity or any means or the environment of the working post, or the work situation, or the site;

b) Exposing workers to chemical or biological agents likely to cause occupational diseases;

c) Exposing workers to ionising radiation, when it is mandatory to designate controlled or supervised areas;

d) Carried out in close proximity to power lines of medium and high voltage;

e) Carried out on railways or roads in use, or in its vicinity;

f) Diving equipment or risk of drowning;

i) In wells, tunnels, galleries or compressed air boxes;

j) Involving the use of explosives, or possibly originating risks following from explosive atmospheres;

k) Assembly and disassembly of prefabricated elements or others, the shape of which may put workers at serious risk;

l) That the owner, the author of the project or any of the safety engineers justifiably considers likely to constitute a serious risk for workers’ health and safety.

This complies with the provisions in subparagraph e) of paragraph 2 of Article 6 of the same law. Annex II lists the works with special risks and Annex III materials handling which involves special risks and the respective preventive measures in both cases. In the adaptation phase of the H&S Plan,
the performing entity must complete this list with other documents or materials, and present the corresponding preventive measures.

### 6.2.8 Development of the H&S plan by the performing entities on site

This chapter refers to the way the performing entities must undertake the development and specification of the H&S Plan for the execution of the work, as provided in paragraph 1 of article 11 of Decree-Law no. 273/2003.

1. The performing entity shall develop and specify the health and safety plan of the project to complement the measures envisaged during the design phase, taking into account, particularly:

   a) The project conditions and other elements resulting from the contract with the project owner relevant to the safety and health of workers during the execution of the works;

   b) Concurrent or incompatible activities arising on site or in its vicinity;

   c) The processes and construction methods, including those requiring detailed planning of safety measures;

   d) The equipment, materials and products to be used;

   e) The program for the works, the involvement of subcontractors and self-employed, including the delivery dates of their participation on site;

   f) Specific measures relating to particular risks;

   g) The project site, including access, circulations, cargo handling, storage of materials, products and equipment, fixed facilities and other support for the production, technical networks, waste removal, signalling and social facilities;

   h) Information and training of workers;

   i) The emergency system, including measures for the prevention, control and fire fighting, rescue and evacuation of workers.

According to paragraph 2 of Article 11, the H&S Plan for the execution of the works must follow the structure given in Annex II of the Decree-Law n. 273/2003. Additionally, because the H&S Plan for the execution of the works results from the development and specification of the design
phase H&S Plan, there are advantages that the structure adopted for the former meets the organisation requirements of the latter.

This was being referred to in the text of the previous sections and is summarised below.

<table>
<thead>
<tr>
<th>Organization of the H&amp;S Plan for the execution of works (Annex II of the Decree-Law n. 273/2003)</th>
<th>Sections in this text</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Assessment and prioritisation of risks reported to the construction process, covering operation by operation, according to schedule, predicting the risks corresponding to each operation by reference to its origin, and appropriate prevention measures that should be represented graphically if necessary.</td>
<td>6.2.5</td>
</tr>
<tr>
<td>2. Site design and specification, containing information on signalling, circulation, use and control of equipment, load handling, support for the production, technical networks, collection and disposal of waste, storage and control of access to the site</td>
<td>6.2.6.2</td>
</tr>
<tr>
<td>3. Health and safety requirements according to which the work should be carried out.</td>
<td>6.2.1</td>
</tr>
<tr>
<td>4. Detailed schedule of the works.</td>
<td>6.2.6.3</td>
</tr>
<tr>
<td>5. Constraints to the selection of subcontractors, independent professionals, suppliers of materials and work equipment.</td>
<td>6.2.1; 6.2.6.6</td>
</tr>
<tr>
<td>6. Guidelines issued by the performing entities to its subcontractors and independent professionals on site for the prevention of occupational risks.</td>
<td>6.2.1; 6.2.6.6</td>
</tr>
<tr>
<td>7. Means to ensure cooperation between the participants on site, taking into account the requirements established on health and safety.</td>
<td>6.2.6.4</td>
</tr>
<tr>
<td>8. Information and communication management system for all participants on site for the prevention of occupational risks.</td>
<td>6.2.6.5</td>
</tr>
<tr>
<td>9. Information and training system for workers on site for the prevention of occupational hazards.</td>
<td>6.2.6.4</td>
</tr>
<tr>
<td>10. Emergency procedures, including evacuation and rescuing measures.</td>
<td>6.2.6.10</td>
</tr>
<tr>
<td>11. Reporting system of accidents and incidents on site.</td>
<td>6.2.6.5</td>
</tr>
<tr>
<td>12. Procedures for passing the site coordinator the information required to develop the health and safety file.</td>
<td>6.2.4.4</td>
</tr>
<tr>
<td>13. Social facilities for workers, in accordance with the legal requirements, including dormitories, showers, changing rooms, toilets and canteens.</td>
<td>6.2.6.2</td>
</tr>
</tbody>
</table>
The H&S Plan for the execution of work must contain the elements listed in Annex III of the Decree-Law n.º 273/2003:

1. Parts of the design relevant to the prevention of occupational hazards.

2. Detail and specifications for the work presenting special risks.

3. Site organisation chart defining roles, tasks and responsibilities of participants.

4. Records relating to the prevention of occupational hazards, such as equipment and facility control, models of evaluation reports on safety conditions on site, templates for the investigation of accidents and notification of subcontractors and independent workers.

5. Records of coordination activities, stating:

   a) The activities of the safety coordinator related to:

      the promotion and verification of compliance with the health and safety plan by the performing entity, subcontractors and independent workers involved on site;

      the coordination of the activities of the performing entity, subcontractors and independent workers, in view of the prevention of occupational risks;

      the promotion of information on occupational risks and their prevention amongst project participants on site.

   b) The activities of the performing entity regarding:

      the promotion and compliance with the safety and health plan, as well as the obligations of employers and self-employed;

      the compliance of subcontractors acting as employers;

      the compliance of independent workers:

      meetings between actors on site for the prevention of occupational hazards, indicating dates, participants and subjects treated.

   c) Audits carried out on site, including information on dates, auditors, main topics addressed, identified risks and preventive measures recommended.

According to the law, it is the H&S Coordinator’s liability to validate in technical terms, the development and specification of the H&S Plan.
undertaken by the performing entity. Then, through the final approval of the owner, those developments and specifications integrate the H&S Plan for the execution of the work. The law admits partial approval of the H&S Plan, particularly if future works are not yet fully known, therefore preventing risk assessment and corresponding preventive measures to be set up for those works. However, the parts of the plan corresponding to works to be performed must be completed before those works start on site, i.e. no works can be possibly undertaken if not covered by the Plan.

6.3 CURRENT PROCEDURES AND GOOD PRACTICES IN PORTUGAL

The transposition of Temporary and Mobile Construction Site Directive for Portugal introduced deep changes in national regulations concerning the occupational risk prevention in construction. In the years following the first transposition (held by Decree-Law No. 155/1995, of July 1), the impact was limited because former practices were maintained in most projects and construction works. There is a set of reasons for this, namely the lack of dissemination of the new regulations and the lack of awareness of construction stakeholders (despite efforts made); the delay in training of the new actors (H&S Coordinator) and the lack of health and safety training of technicians; the resilience of the owners and the traditional conservative industry; the difficulty of implementing the new regulation in many small businesses; the lack of supervision by the competent authorities; the regulation was excessively demanding and difficult to implement in practical terms (especially in small building projects) and partially entered into disregard.

Nevertheless, the adoption of the new regulations has had positive impacts on construction sites throughout the country (dissemination of individual protection equipment, better collective protection equipment, improved site organisation, more dignified staff facilities, etc.). Public authorities were the first to adhere (by conviction or imposition), forcing designers to fulfil H&S obligations at the design phase and contractors to actually implement preventive measures on site and to force their subcontractors to act likewise, therefore creating a virtuous cycle that started showing positive results. Private clients and smaller companies followed, however there was some resistance.

The publication of the current regulations (Decree-Law n. 273/2003 of 29 October) refined the former statute and allowed for the implementation of H&S principles on construction sites more efficiently. Actually, over the last ten years a favourable evolution on the compliance of H&S principles can
be recognised on Portuguese construction sites, especially on the following aspects:

- The appointment of the H&S Coordinator at the design phase by the project owners is frequent nowadays although this function is generally committed to the design team (both on public and on private projects), without further formalisation. The appointment of the H&S Coordinator during the construction phase is frequently committed to the supervisor of the works (or to the supervisory team), when it exists. This tends to be the case of public projects whereas in private projects without supervision (small works in general), the project owner contracts a consultant to perform this function.

- Preventive documents of occupational risks are widespread for construction projects, largely because of the prevailing legal requirements. Looking at each of the documents analysed in this chapter, it can be stated that:

  - the prior notice is generally produced.

- The H&S Plan is generally prepared at the design phase, both in public and private projects. For public projects, this is a mandatory document for launching a tender; for private projects, it is a mandatory document for the legalisation process with competent authorities (municipalities). Because of this requirement, many private owners understand that the H&S Plan is only necessary for construction works requiring authorisation from authorities, and not in other cases. The quality of H&S Plans is variable: For public projects it is good or fair, at least; for private projects it tends to be acceptable but poor documents may possibly be found, lacking relevant specific information and using too much information copied from previous similar documents.

- The development and specification of the H&S Plan made by performing entities (i.e., contractors) is often made, validated by the H&S Coordinator at the construction phase and subsequently approved by the project owner. The accuracy used for this work depends on the contractor, obviously because some companies work better than others. But is also dependent on the accuracy demanded by the H&S Coordinator because he/she is responsible for validating the document. On larger works, the H&S Plan for project execution is usually an appropriate document; in smaller projects, especially promoted by private owners, poor quality or underdeveloped H&S Plans may still be found.
In view of the above, it can be concluded that the prevention of construction occupational risks in Portugal has had a favourable evolution, particularly following the transposition of the Temporary and Mobile Construction Site Directive for the Portuguese internal law. This has introduced new actors and forced the systematisation of new procedures, by requiring the production of a set of documents aimed at preventing occupational risks on construction sites. Finally, it is worth noticing that health and safety at work is also a cultural issue and that the evolution of prevention follows its own path, conditioned by the progressive awareness of society and the need for legal compliance – but the change is not an automatic process, it takes time.

6.4 BIBLIOGRAPHY

CHAPTER 7

CASE STUDIES

7.1 CASE STUDY 1

(J. C. TEIXEIRA)

This case describes a common mistake, which is usually made by technicians preparing the safety and health plan.

ADYCORSA is interested in contracting an engineer in order to be a coordinator for safety and health matters for the Main Office building project placed inside the Valencia Port. The participants must fulfil the following requirements:

- Civil engineer.
- Training in OSH.
- Driving licence.
- Immediate availability.

Vincent Faus is a young engineer that fulfils these requirements and he is selected by the client. Today is his first day at work and he does not have any labour experience because he has never worked in the construction industry. He starts reading the technical prescriptions for the project. His first task is to determine the content of the safety and health plan. Later, he will have to apply it to each specific activity. Vincent takes the safety and health plan for a highway project as a baseline to write his specific plan. When he finishes the plan, his boss reviews it and writes the following letter to Vincent:

Dear Vincent,

For our company, your work of elaborating the safety and health plan for the Main Office building project in the Valencia Port, is very important.

Nevertheless, you have made many mistakes in your first draft and it is necessary to review it completely and thoroughly because you just copied and pasted the basics from another project.

Your main function consists of drawing up a safety and health plan and, moreover, setting out the rules applicable to this specific project,
thus taking into account the proper activities. This plan must also include
detailed specifications concerning the construction work to be done,
and the exact risks that depend on these activities.
You have one week for finishing this corrections and presenting a proper plan.
Yours Sincerely,
Pere Picot
Project Manager

7.2 CASE STUDY 2
(J. C. TEIXEIRA)

Maria Benlloch is an architect. She has been working in a construction company
for four years. Her company wants to be certificate d in OSH.
For this certification, it is necessary to have the basic documentation
of all management systems: the manual and the procedures.

Pepa Mompó was the person responsible for the manual. She defined risks,
evaluating and control, prevention planning, objectives and goals, audits, etc.
For certification purposes, the company does not have the necessary procedures
yet, but it has the manual ready. Only some procedures are needed and Maria
is responsible for this part.

Procedures must indicate what is necessary to do, how and when. They show
the steps needed to execute an activity related to OSH and must follow
this structure: aim, scope, references, definitions, accomplishment, goal
and responsibilities, registrations list and attachments.

Maria prepares the procedure on steel formwork for concrete structures, and she
requires the approval of her supervisor for continuing her work. When Maria
shows her work to Pepa, he likes it, thus Maria can continue with the other
procedures.

Please explain, step by step, the contents of the procedure on wood formwork
for concrete structures that María should write down.
7.3 CASE STUDY 3: GROUP ACCIDENT DURING CONSTRUCTION OF THE NATIONAL STADIUM IN WARSAW (K. KACZOREK)

7.3.1 Description of the project

The Kazimierz Górski National Stadium in Warsaw is definitely one of the most important construction projects completed in Poland in the 21st century. The cost of the whole undertaking amounted to over 1.75 billion zloty. Construction of the facility started on September 29th, 2008 on the site of the former 10th Anniversary Stadium in Warsaw. The opening ceremony was held on January 29th, 2012. The inauguration was accompanied by the soccer game Poland-Portugal.

Technical documentation of the project was developed by a consortium consisting of the following entities: JSK Architekti Sp. z o.o., Gerkan, Marg und Partner International GmbH, in cooperation with Schlaich Bergermann & Partner GmbH responsible for engineering development. A consortium was required also for the purpose of construction of the facility. Works were performed by the companies: Alpine Bau Deutschland, Alpine Construction Polska, PBG SA and Hydrobudowa Polska SA. The facility is not only used for sports events, but is also allowed to organise cultural events, or music concerts. What is more, it serves for commercial, office, accommodation and catering purposes as well. The total cubic volume of the stadium without its roof is over 100,000 m$^3$. The total area of the facility is 203,920 m$^2$. The span of the roof structure is 240x270m. The spire on top of the structure is suspended at a height of 100 m above the lawn. The underground parking lot located under the pitch slab can accommodate 1765 vehicles.

All this data allows one to appreciate the enormous scope of the whole undertaking. A total of 1200 workers participated in the construction. With this number of workers, accidents are likely to happen. Unfortunately,
they could not have been avoided. In this chapter, the first accident will be discussed, in which two workers lost their lives.

![Aerial photo of the construction site, June 14th, 2009](image)

**Figure 7.1** Aerial photo of the construction site, June 14th, 2009

### 7.3.2 Description of the accident

On December 1st, 2009, a little more than one year after the construction works began, the first fatal accident happened during construction of the facility. Two men aged 42 and 47, did not go home this day, like they used to every day after work. Apart from the legal and economic character of the incident, one should also, or rather first and foremost, consider the human tragedy. Each of those men had a family, and was a loving husband and father. Despite assurances of the spokeswoman of the general contractor, nothing will bring the victims back to their loved ones. Could this tragedy have been foreseen? Could the accident have been prevented? In the following part of this chapter, I shall attempt to analyse in detail the causes, course and consequences of the accident. I shall also attempt, even partially, to answer the questions asked.

### 7.3.3 The first stage of the accident – initiation stage

The initiation stage means all factors which had even a small impact on the occurrence of the situation and led to its tragic outcome. In total, as many as ten such factors can be listed. It is difficult to establish which one was decisive. Still, it can definitely be said that none of them should have taken place.
The above-mentioned factors/facts are:
- Using of the set “basket and crane” started in October, but was not reported to the Office of Technical Inspection.
- The load bearing part of the basket was not adapted to the crane hook.
- A replacement part (4 lines) was used instead of a proper crane hook.
- Lack of proper security measures for the workers in case of a break or release of the load bearing part of the basket.
- Lack of proper authorisations to operate lifting slings for workers installing the lighting (the accident victims).
- Lack of medical exams for the workers to be admitted to work at heights (the accident victims).
- No representative of the consortium having direct supervision.
- At the time of the accident, a lack of a qualified, competent slinger who was absent and was substituted by another worker.
- Failure of two latches in the sling.
- Elevation of the element by the crane operator without the slinger’s approval.

Figure 7.2 Photo of the severed basket carried out by the rescue team
7.3.4 THE SECOND STAGE OF THE ACCIDENT – REALISATION STAGE

In this part, I shall focus mainly on the course of the catastrophe. According to the findings of the National Labour Inspectorate, two workers were installing lighting lamps in one of the concrete staircases located above the structure lab. When installation of one of the lamps was completed, the basket with the electrical fitters started to move towards the other wall. During transportation, the platform with the two workers broke off. The event occurred at a height of 18 metres. After a fall from this height, the basket hit the concrete surface at a speed of 68 km/h. The first worker died on site, the other one – several hours later at the hospital.

Figure 7.3 Photo from the rescue operation conducted on December 1st, 2009 on the construction site of the National Stadium in Warsaw
7.3.5 The third stage of the accident – consequence stage

The first and obvious consequence of the accident is the discussed death of two workers. Furthermore, three accusatory motions were submitted to the state’s attorney’s office, regarding:
- President of the company employing the crane operators,
- Owner of the company whose employees died,
- Foreman responsible for work organisation.

Furthermore, 10 penalty notices were issued. The total value of all notice amounts is 15.5 thousand zloty. Also, four motions for taking disciplinary action by the employers were submitted. After the accident, all works were suspended on EURO construction sites, where baskets were used such as the one participating in the tragedy.

7.3.6 Analysis of the accident causes

Having analysed individual stages of the accident, one should focus again on the causes of the accident. They can be divided into three groups, depending on their origins: technological, organisational and human.

Technological causes:
- The load bearing part of the basket not adapted to the crane hook.
- Failure of two latches in the sling.
- Lack of proper security measures for workers in case of a break or release of the load bearing part of the basket.

Organisational causes:
- No representative of the consortium having direct supervision.
- No verification of medical exams for the workers to be admitted to work at heights (the accident victims).
- No verification of licenses and trainings of workers.
- Lack of specified procedures to approve the set “basket and crane” for operation.
- Lack of training for persons having direct supervision, regarding operation of the crane.

Human causes:
- Lack of care for one’s own and co-workers’ life.
- Neglect of obligations by the work supervisor.
- Thoughtless ignoring of the risk.
- Lack of imagination.
- Agreeing to dangerous substitute solutions.
- Lack of knowledge of rights and obligations within the scope of Health and Safety, regarding the operation of the crane.

### 7.3.7 Conclusions

The question must be asked again: could this accident have been avoided? Today, it is difficult to provide a definite answer. It is much easier to answer the question: what was missing? These were mainly organisational neglects and lack of imagination of the parties participating in the whole event.

It is possible that the accident could have been prevented if only the number or intensity of work of the supervising persons had been increased. This we will never know, the only thing left is to draw conclusions from this difficult lesson, and not to allow similar situations to happen in the future.

![Photo of the completed and operational National Stadium in Warsaw](image)

**Figure 7.4 Photo of the completed and operational National Stadium in Warsaw**
7.4 CASE STUDY 4: HOW TO CREATE A GOOD SAFETY AND HEALTH PROTECTION PLAN STEP BY STEP

(K. KACZOREK)

7.4.1 General information on the safety and health protection plan

A Safety and Health Protection Plan (BiOZ) is the most important document protecting the health of all human parties which can are present on the construction site. It is created based on provisions of construction law, health and safety regulations, fire protection regulations, national standards, and internal documents introduced by construction companies. Legal acts which constitute the main basis of Health and Safety Protection Plans are:

- Art. 21a, section 1 of the act dated 7 July 1994 Construction Law (uniform text: Journal of Laws.06.156.1118 as amended),
- Regulation of the Minister of Infrastructure dated 23 June 2003 on information regarding safety and health protection and the safety and health protection plan (Journal of Laws.120.1126).

A Safety and Health Protection Plan is required for construction works conducted for more than 30 days while employing at least 20 workers, or the labour intensity exceeding 500 man days, and also in the case of construction works the organisation, course or location of which pose a high risk of occurrence of a threat to the safety and health of people. Quoting the Construction Law, such works include:

- the character, organisation or location of which pose a particularly high risk of occurrence of a threat to the safety and health of people, in particular of being buried under ground, or falling from heights;
- during which effects of chemical substances or biological agents occur, posing a threat to the safety and health of people;
- posing a risk through ionising radiation;
- conducted in the vicinity of high voltage lines or active communication lines;
- posing a risk of workers drowning;
- conducted in wells, underground and in tunnels;
- conducted by drivers of vehicles powered from overhead power lines;
- performed in caissons, with atmosphere generated from compressed air;
- requiring use of explosives;
- performed during assembly and disassembly of heavy prefabricated parts.

The structure of the Safety and Health Protection Plan proposed in this chapter consists of three basic parts: a title page, a descriptive part and a drawing part. It should be noted that the descriptive part will be discussed in more detail which is due to its more universal character.

Depending on the undertaking, it can be freely modified by removing descriptions considered useless for the given contract. The drawing part should be created with an emphasis on the individual character and uniqueness of the project. Therefore, with regard to the second part, only a summary list of required items will be provided which should be included in the drawings attached to the Safety and Health Protection Plan.

7.4.2 Title page

The title page should include information such as:
- name and address of the facility under construction,
- name and surname, or company name of the investor, and their address,
- name and surname, and address of the site manager responsible for development of the Safety and Health Protection Plan,
- name and surname, and address of the person, or name and address of the entity obliged by the site manager to develop the Safety and Health Protection Plan (the site manager does not develop the Safety and Health Protection Plan personally).

7.4.3 Descriptive part

The descriptive part shall consist of four main groups:
- basic data,
- detailed scope of construction works mentioned in art. 21 a section 2 of the act dated 7 July 1994 – Construction Law,
- general Health and Safety requirements of the construction site,
- environmental protection of the construction site.
7.4.3.1 Basic data

The descriptive part shall start with presentation of the basic data:

- Presentation of the scope of works for the whole construction undertaking, and the order of completion of individual facilities.
- List of existing structures which shall be subject to adaptation or demolition.
- Indication of elements of plot or land development which can pose a threat to the safety and health of people.
- Information regarding expected hazards occurring during construction works, with specification of the scale and types of hazards, and the place and time of their occurrence (for the purpose of transparency, an optimum solution is presentation of this item in the form of a table – an example is provided at the end of the chapter, in the List of Tables, as “Table 1”).
- Information on separation and marking of the construction site, according to the hazard type.
- Information on the manner of instructing workers prior to commencement of particularly hazardous works (in this case, transparency and efficiency of implementation can be greatly increased through presentation in the form of a table - an example is provided at the end of the chapter, in the List of Tables, as “Table 2”).
- Specification of the method of storing and moving materials, products, substances and hazardous preparations at the construction site.
- Indication of technical and organisational measures to prevent threats resulting from performing construction works in areas of increased threat to health, or in their vicinity, including measures ensuring safe and efficient communications, allowing for quick evacuation in the case of fire, emergency and other threats (recommended is the table form - an example is provided at the end of the chapter, in the List of Tables, as “Table 3”).
- Indication of the place to store construction documentation and documents necessary for proper operation of machines and other technical equipment.

7.4.3.2 Detailed scope of construction works

Particularly useful in this section will be the Regulation of the Minister of Infrastructure dated 23 June 2003 on information regarding safety and health protection and the safety and health protection plan (Journal of Laws.120.1126), as mentioned in section “2.1 General information on the Safety and Health Protection Plan”. Listed in paragraph 6 of this legal act are works mentioned
It is recommended to prepare a table where, using a “YES/NO column”, one can quickly and efficiently point out types of works, included in the scope of works, with increased level of threat generation. A table developed on the basis of the above mentioned legal acts is provided at the end of the chapter, in the List of Tables, as “Table 4”.

7.4.3.3 General Health and Safety requirements at the construction site

General Health and Safety requirements at the construction site means any information relating to issues not mentioned so far, which have a significant impact on the safety of the parties present at the construction site. Each item included in this section should be described individually for the given construction project. However, in spite of the individual description of the items, their number and names will be mostly the same or very similar. Therefore, it is worth pointing out these items by listing them in detail:

- Health and Safety information board.
- First aid kits, first aid treatment.
- Health and Safety, and Fire Protection signs, as well as information boards.
- Health and Safety of workers representing the General Contractor.
- Technical documentation regarding machines and equipment.
- Basic Health and Safety documents and procedures at the construction site (suitable instructions, declarations and other documents of importance from the point of view of Health and Safety).
- Technical work safety (obtaining of all the required permits and compliance with provisions of the Polish law).
- Movement at the construction site.
- Specified rights and obligations of the Health and Safety Coordinator at the construction site.
- Adopted rules of interoperability and cooperation between individual entities in the construction process.
- Health and Safety issues regarding works performed by Subcontractors.
- Specified procedures of reporting and handling cases of work-related accidents or events potentially leading to accidents.
- Securing of the place of work.
- Health and Safety regulations for works in excavations.
- Health and Safety regulations for works at heights.
- Health and Safety regulations for assembly and disassembly of prefabricated elements.
- Health and Safety regulations for works including a risk of electrical shock.
- Health and Safety regulations for works conducted with mechanised equipment.
- Health and Safety regulations for works on ceilings and roofs.
- Health and Safety regulations for vehicles and vehicle traffic.
- Health and Safety regulations regarding hazardous and noxious substances.
- Health and Safety regulations for protection of third parties after the end of work.

Naturally, this list can be modified as needed – both shortened and extended. However, the main objective of this part of the study was to present the basic and most common items included in the section “General Health and Safety requirements at the construction site”.

7.4.3.4 Environment protection at the construction site

Environment protection is one of the key aspects of rational management of the investment process. Therefore, the Safety and Health Protection Plan must include a mention of the basic rules of protecting the surrounding environment. The main issues of environment protection which should be specified in the Safety and Health Protection Plan are:
- Rational waste management.
- The manner of storing chemical materials.
- Protection of the ground surface, as well as water and sewage management.
- Environment protection (securing of the surrounding environment according to provisions of the Polish law).

7.4.3.5 Change Log – updating the Safety and Health Protection Plan

If the Safety and Health Protection Plan is to be really good and useful, it is necessary to allow the possibility to introduce updates. During construction, some problems are due to arise. They, in turn, require suitable modifications of the initial concepts, starting from necessary additions and small changes in the documentation up to wide-ranging actions taken as a result of finding interesting items from an archaeological point of view. Therefore, a tool is required which will allow one to introduce changes to the Safety and Health Protection Plan.
A solution can be a Change Log. It includes all the necessary information, required for proper updating of the Safety and Health Protection Plan. A Change Log specimen is included at the end of the chapter, in the List of Tables, as “Table 5”.

7.4.4 Drawing part

The drawing part, like the first developed descriptive part, should be prepared according to the legal acts listed in section “2.1 General information on the Safety and Health Protection Plan”. Usually, it is made on a copy of the plot or land development plan. Its main purpose is to supplement, through partial illustration, the descriptive part. Items ensuring transparency of the drawing part are:

- Legible map legend.
- Proper marking of factors which could potentially pose a threat.
- Presentation of the location of fire protection means, including parameters of utilities connections, outlet points, cut-off valves and access roads.
- Presentation of the location of rescue equipment (including floating equipment, if justified by the type of works), necessary when conducting construction works.
- Presentation of the location and marking of borders of internal and external protection zones, resulting from separate provisions, such as warehousing and storage zones of hazardous materials, products, substances and preparations, operation zones of mechanical and auxiliary equipment.
- Presentation of the location of auxiliary production sites, such as for example, production nodes of cement and asphalt concrete, prefabricates.
- Presentation of solutions for passageways, transportation for construction purposes and site fencing.
- Presentation of the location of sanitary facilities.

7.4.5 List of tables

In this section, tables mentioned in previous sections are presented. These are:

- Table 1 – “Examples of threats expected to occur during performance of construction works at the construction site”.
- Table 2 – “Example of a detailed preliminary training program”
- Table 3 – “Example of technical and organizational measures to prevent threats resulting from construction works in high hazard zones or in their vicinity”
- Table 4 – “Types of high-hazard works”
- Table 5 – “Change Log”.

### Table 7.1 Examples of threats expected to occur during performance of construction works at the construction site

<table>
<thead>
<tr>
<th>Type of hazard</th>
<th>Preventive measures</th>
<th>Hazard level</th>
<th>Place and time of hazard occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persons falling into excavations</td>
<td>Excavations shall be secured with security barriers, and they shall be marked, with safe entrances and exits to and from the excavations provided</td>
<td>Excavations shall be conducted at about 30% of the total area of the construction site</td>
<td>Construction stage from ..... to.....</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Excavations for various types of installations, conducted at about 10% of the construction site</td>
<td>Vicinity of buildings under construction in the period from ..... to .....</td>
</tr>
</tbody>
</table>

### Table 7.2 Example of a detailed preliminary training program

<table>
<thead>
<tr>
<th>No.</th>
<th>Detailed topic</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Discussion of the construction site development plan.</td>
<td>..... min</td>
</tr>
<tr>
<td>2.</td>
<td>Discussion of the scope of duties and responsibilities of workers at the construction site.</td>
<td>..... min</td>
</tr>
<tr>
<td>3.</td>
<td>Discussion of hazards present at the construction site, methods of securing works and reducing occupational risk, as well as rules of using personal protection measures during work.</td>
<td>..... min</td>
</tr>
</tbody>
</table>
### Table 7.3 Example of technical and organisational measures to prevent threats resulting from construction works in high hazard zones or in their vicinity

<table>
<thead>
<tr>
<th>No.</th>
<th>Name of the high health hazard zone</th>
<th>List of technical and organisational measures preventing threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Hazard zone of people falling from heights</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Hazard zone of objects falling from heights</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Hazard zone of excavation walls without strutting falling down</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Hazard zone of people falling into excavations</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Fire hazard zone</td>
<td></td>
</tr>
</tbody>
</table>

### Table 7.4 Types of high-hazard works

<table>
<thead>
<tr>
<th>No.</th>
<th>Type of work/detailed scope</th>
<th>YES/NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Construction works, the character, organisation or location of which poses a particularly high risk of a threat to health and safety of people, in particular of burial under earth falls or falling from a height:</td>
<td></td>
</tr>
<tr>
<td>a</td>
<td>Excavations with vertical walls without strutting, more than 1.5 m deep, and excavations with safe wall inclination, more than 3.0 m deep</td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>Works which entail the risk of falling from a height of over 5.0 m</td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>Demolition of structures over 8 m high</td>
<td></td>
</tr>
<tr>
<td>d</td>
<td>Works performed within the area of operational industrial facilities</td>
<td></td>
</tr>
<tr>
<td>e</td>
<td>Assembly, disassembly and maintenance of scaffolding next to high and high-rise buildings</td>
<td></td>
</tr>
<tr>
<td>f</td>
<td>Works performed with the use of cranes or helicopters</td>
<td></td>
</tr>
<tr>
<td>g</td>
<td>Conducting works on bridge structures using the method of pushing the structure onto supports</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Type of work/detailed scope</td>
<td>YES/NO</td>
</tr>
<tr>
<td>-----</td>
<td>---------------------------------------------------------------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>h</td>
<td>Assembly of construction components of bridge structures</td>
<td></td>
</tr>
<tr>
<td>i</td>
<td>Concreting high construction components of bridges, such as abutments, pillars, and pylons</td>
<td></td>
</tr>
<tr>
<td>j</td>
<td>Foundation of bridge supports and other piled structures</td>
<td></td>
</tr>
<tr>
<td>k</td>
<td>Works performed under or next to power lines, at a distance measured horizontally from extreme power lines being less than:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.0 m – for lines with the nominal voltage not exceeding 1 kV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5.0 m - for lines with the nominal voltage over 1 kV, but not exceeding 15 kV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10.0 m - for lines with the nominal voltage over 15 kV, but not exceeding 30 kV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15.0 m - for lines with the nominal voltage over 30 kV, but not exceeding 110 kV</td>
<td></td>
</tr>
<tr>
<td>l</td>
<td>Construction works conducted in harbours and piers during ship movement</td>
<td></td>
</tr>
<tr>
<td>m</td>
<td>Works conducted on water retaining structures, with the backwater level above 1 m</td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>Works performed next to railway lines</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Construction works during which chemical or biological substances are active, constituting a risk to safety and health of people:</td>
<td></td>
</tr>
<tr>
<td>a</td>
<td>Works performed at a temperature below -10°C</td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>Works consisting in removal and repair of construction products, including asbestos</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Construction works posing a threat through ionising radiation:</td>
<td></td>
</tr>
<tr>
<td>a</td>
<td>Renovation and demolition works on facilities of nuclear power industry</td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>Renovation and demolition works on facilities where technological processes with the use of isotopes were conducted</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Construction works conducted in the vicinity of high voltage power lines or active communication lines</td>
<td></td>
</tr>
<tr>
<td>a</td>
<td>Works conducted at a distance measured horizontally from extreme lines being less than 15.0 m – for lines with the nominal voltage of 110 kV</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Type of work/detailed scope</td>
<td>YES/NO</td>
</tr>
<tr>
<td>-----</td>
<td>--------------------------------------------------------------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>b</td>
<td>Works conducted at a distance measured horizontally from extreme lines being less than 30.0 m for lines with the nominal voltage over 110 kV</td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>Construction and renovation of railway lines (track and track substructure works)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Construction and renovation of the overhead line system and the power line for the overhead line system, and electrical power equipment</td>
<td></td>
</tr>
<tr>
<td>d</td>
<td>Construction and renovation of lines and equipment of the rail traffic management system</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Construction and renovation of telecommunications, radio telecommunications and computer networks, connected with the rail traffic management</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Construction works posing a risk of workers drowning:</td>
<td></td>
</tr>
<tr>
<td>a</td>
<td>Works conducted in water or underwater</td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>Assembly of construction components of bridge facilities</td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>Foundation of bridge supports and other piled structures</td>
<td></td>
</tr>
<tr>
<td>d</td>
<td>Works conducted on water retaining structures, with the backwater level above 1 m</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Construction works conducted in wells, underground and in tunnels:</td>
<td></td>
</tr>
<tr>
<td>a</td>
<td>Works conducted in tanks, channels, inside technical facilities and other hazardous closed spaces</td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>Works connected with constructing pipeline ducts under obstacles, using tunnelling, ramming or similar methods</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Construction works performed by drivers of vehicles powered from overhead power lines – works during construction, renovation and demolition of track ways</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Construction works performed in caissons, with compressed air atmosphere – works during construction and renovation of wharf and bridge crossings</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Construction works requiring the use of explosives:</td>
<td></td>
</tr>
<tr>
<td>a</td>
<td>Earthworks connected with moving or compacting soil</td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>Demolition works, including making holes in existing construction components of facilities</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Construction works involving assembly and disassembly</td>
<td></td>
</tr>
</tbody>
</table>
Table 7.5 Change Log

<table>
<thead>
<tr>
<th>No.</th>
<th>Type of work/detailed scope</th>
<th>YES/NO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>of heavy prefabricated components – works with loads exceeding 1.0 t</td>
<td></td>
</tr>
</tbody>
</table>

### 7.5 CASE STUDIES: WORKS AT HEIGHTS

(J.ROSŁON)

#### 7.5.1 Introduction

Pursuant to the survey conducted by the Polish Labour Inspection (PIP), the employees of the construction sector are the professional group with the highest exposure to accidents, including fatal accidents.

Among the accidents (including fatal ones), the dominating reason is a fall from height, with the majority of accidents taking place during work and with participation of a material factor - scaffolding.
Fig. 7.5 The parties injured in the accidents examined by PIP occurring in Poland in 2012 - according to the professions (selected professional groups with the highest number of injured parties). Own development based on the PIP report for 2012
Fig. 7.6 The victims of fatal accidents examined by PIP occurring in Poland in 2012 - according to the professions (selected professional groups with the highest number of injured parties). Own development based on the PIP report for 2012.
Fig. 7.7 The victims of fatal accidents examined by PIP occurring in Poland in 2012.
Own development based on the PIP report for 2012
The most common reasons for accidents connected with a fall from height (including accidents taking place during work and with participation of a material factor - scaffolding) were:

- lack of railings or their improper assembly,
- lack of protection of passages or access routes,
- failure to protect technological holes,
- lack of the required personal protection measures (protecting the employees against falling),
- lack of scaffolding acceptance,
- assembly performed by persons without authorisations,
- improper work decks,
- lack of communication ducts,
- old, worn scaffolding,
- lack of obligatory training for the users of scaffoldings.
Examples of incidents
(All the incidents presented below were described on the PIP website)

1. The workers of a renovation company executed reinforcement of the reinforced concrete beam (ceiling beam). They worked at the height of 8 m above the ground level, but none of them had any protection against a fall from height (Fig. 7.9).

![Fig. 7.9 Working at elevated heights without protection](http://www.pip.gov.pl)

At the same construction site, it was detected that the workers working on the scaffoldings did not have personal protection measures against a fall from height, moreover they did not have the qualifications to perform these works and the necessary medical certificates allowing them to work at elevated heights. The scaffoldings did not meet the OHS requirements (lack of railings and vertical bracings - Fig. 7.10).
Fig. 7.10 Irregularities during work at scaffoldings


Consequences: The labour inspectorate issued a decision suspending the works and the employer was punished with a fine. However, the entire situation could have ended with an accident or even death of an employee/employees.

2. At the construction site in Poznań, during dangerous roofing works at a height of about 7 m, none of the employees were protected against a fall from height (Fig. 7.11).
3. Similarly, as in the first case, circumstances caused an accident at the construction site in the łódzkie province. Two workers were assembling gutters during the construction of a sport facility. The construction manager allowed work on unfinished scaffolding. The work deck was made of single planks (width was decreased two times in relation to the manufacturer’s instructions), there were no railings and the workers did not use the safety lines protecting them against falling.

When one of the workers, who was drilling holes for gutter clasps, lost his balance and began to fall, his colleague attempted to catch him by grabbing his jacket. Unfortunately, because of the above defects, both of them fell on the ground from a height of 8 m.
Consequences: The labour inspectorate issued a decision suspending the works, the employer was punished with a fine and was addressed with four applications. Unfortunately, as a result of the accident, both workers suffered damage of their pelvic bones. Additionally, one of them broke his wrist and suffered damage of five spine vertebrae.

4. It should be noted that falls from height do not only refer to the workers, but also to the people supervising them. A president of one of the Polish housing cooperatives was injured in an accident with grave consequences. He visited renovation works on the roof of a three-storey building. However, he did not have any individual safety measures, did not pass medical examination and an appropriate OHS training, which is necessary in order to perform works at elevated heights.

Consequences: As a result of the fall, he suffered numerous internal injuries (including damage of the brain, lungs and heart), as well as fractures. The injured party died four days after the accident.

5. Pursuant to the surveys conducted by PIP, the accidents at work are particularly common among the workers beginning work at the construction sites (Fig. 7.12).
“up to one year” in detail:

Fig. 7.12 Injured parties in accidents examined by PIP - according to work seniority at the facility in the years 2010 - 2012.

Own development based on the PIP report for 2012
A young worker was disassembling eternit roof plates, when he fell on a concrete floor from a height of 7 m. It was his fourth day at work. In accordance with the findings of the labour inspector from Łódź: the worker removed the protective reins for a moment to take off his shirt. Unfortunately, at that moment, the plate under him cracked and he fell to the ground. The OHS inspector found that the accident was indirectly caused by a lack of proper preparation and training of the young employee. Moreover, the employer failed to provide proper working decks, which were necessary because of insufficient durability of the roof plates.

Consequences: *As a result of the accident, the worker suffered damage to his internal organs and head. Additionally, the inspector punished the employer with a fine.*

6. Consumption of alcohol by the workers may be another reason for accidents - falls from height. Construction inspectors from Opole were forced to suspend roofing works at the construction site, where an accident occurred. The workers were nailing wooden patches to the roof, when they heard a scream. One of their colleagues fell from the roof. Pursuant to the findings of the inspectorate, the worker did not use protective reins and the scaffolding was inconsistent with the regulations (it comprised of a ladder loosely resting on the building, located at the highest level of the scaffolding). Additionally, as it turned out after transporting the injured party to the hospital, he was under the influence of alcohol (1.5 per mille).

Consequences: *The injured person died in the hospital because of grave damage to his internal organs. The inspector suspended the works and punished the roofing company with a fine.*

7. Improper assembly of scaffoldings may also prove dangerous. In the described case (during insulation of a residential building in Białystok, Poland), the assembly instruction of the manufacturer was not observed. Additionally, the works were performed by persons without proper qualifications and the construction manager incorrectly completed the scaffolding acceptance protocol.
Strong wind caused tearing of part of the scaffolding (with length of 45 m and height of 15.5 m) from the building (Fig. 7.13 and 7.14). Fortunately, no one was injured because the scaffolding collapsed on Sunday, when there were no people working on it at the time. No third parties were injured, for example children playing outside.

While examining the collapsed scaffolding and its remaining parts, the inspectors determined that the accident was caused by improper assembly of the scaffolding to the building. The anchors (Fig. 7.15) were assembled with an angle inconsistent with the manufacturer’s instructions (not perpendicularly) and the number of used anchors was twice lower than the number recommended by the manufacturer. It was also important that the anchors were placed irregularly and partially outside the building outline.
The inspectors determined that the persons assembling the scaffolding were not prepared and qualified for the job. However, the most important factor was that the construction manager personally supervised assembly of the scaffolding (knowing about the lack of competences of the employees) and entered data inconsistent with the actual situation to the acceptance protocol.
Consequences: The inspector suspended use of the scaffolding and punished the employer with a fine. Injuries of the workers and third parties were miraculously avoided.

8. A grave accident occurred at a construction site in Sosnowiec. The inspection found that the workers did not have written employment contracts and did not use any protections against falls from height. Moreover, the construction manager was absent.

The accident occurred when a worker was assembling boarding for ceiling beams. He fell from a height of 4 m while removing nails from the boarding, standing on a ladder. A moment later he was taken to the hospital by an ambulance.
The inspection found a number of irregularities in employment of the workers by the construction company and in the OHS procedures applied by the company.

![Irregularities at the construction site in Sosnowiec](http://www.pip.gov.pl)

**Fig. 7.16 Irregularities at the construction site in Sosnowiec**

*Source: PIP - http://www.pip.gov.pl*

As presented on fig. 7.16 (above). The carpenter moved directly along the boarding structure, without any protection measures (individual or collective).

The places near the ceiling corners (fig. 7.17) were not protected, the same as the places near staircases. Further inspections found more irregularities: makeshift stairs made of hollow bricks, unlighted rooms, water in the social rooms.
Consequences: The inspector suspended construction works until the moment the appropriate protections were provided, together with lighting and removal of water from the social rooms. The inspector also ordered development of the appropriate work instructions and charged a penalty on the employer. In the accident, the employee suffered the damage of two neck vertebrae, a fracture of the knee and the skull. The case was submitted to the labour court.

9. The inspectors suspended the works on the roof of a shopping centre in Białystok. At a height of 10 m over a concrete floor, three workers were transporting roofing paper to the roof without any measures protecting them against a fall from height (Fig. 7.18).
Consequences: The inspector suspended the roofing works and punished the employer with a fine.

10. It also happened that the construction companies only pretend to observe the orders of the inspectors. An example is a construction site visited by a labour inspector from Rzeszów.

During the inspection, he found that improperly located scaffolding was used, which structure was against the OHS regulations and the requirements of the Polish Norms (Fig. 7.19). Use of the scaffolding was suspended and the responsible person was charged with a fine.
However, the employer did not draw appropriate conclusions from the inspection. During another inspection of the site, a month later, the same scaffolding, inconsistent with the regulations, was moved to a different location at the site (Fig. 7.20). Additionally, the people working on it did not have personal protection measures.
Fig. 7.20 Improperly located scaffoldings 2

Consequences: The inspector issued two orders (7 decisions), suspended the works and charged the employer with a penalty.
### 7.6 CASE STUDIES: ANALYSIS OF ACCIDENTS AT WORK

(J. SOBIERAJ)

<table>
<thead>
<tr>
<th>Accident date</th>
<th>March 29th, 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place and circumstances of the accident</td>
<td>Construction site, facilities, the employee was cutting boards using a circular saw. When moving the board while cutting, his hand came into contact with the cutting disc.</td>
</tr>
<tr>
<td>Victim</td>
<td>Concrete placer – steel fixer aged 54</td>
</tr>
<tr>
<td>Contract of employment</td>
<td>For unlimited period, full-time</td>
</tr>
<tr>
<td>Preventive screening</td>
<td>Yes</td>
</tr>
<tr>
<td>Preliminary OHS training</td>
<td>Yes</td>
</tr>
<tr>
<td>Periodic OHS training</td>
<td>Yes</td>
</tr>
<tr>
<td>Position-related training</td>
<td>Yes</td>
</tr>
</tbody>
</table>
| Cause of accident | - No instructions at the worksite  
- No confirmation of qualifications  
- No inspection of working order of equipment and tools with electric drive  
- No supervision and assessment of threat |
<p>| Effect of accident | Complete amputation of finger V and partial amputation of fingers II – IV of the left hand with injury of the extensor tendons and the flexor tendons of the left hand |
| Preventive recommendations | Apply all protective measures as foreseen by the producer of the machine (Operation and Maintenance Manual). Ensure effective supervision of employees in terms of compliance with occupational health and safety provisions. |</p>
<table>
<thead>
<tr>
<th>Accident date</th>
<th>July 26th, 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place and circumstances of the accident</td>
<td>[illegible]…of the roof. The employee tried to enter the roof using a partially disassembled scaffolding</td>
</tr>
<tr>
<td>Victim</td>
<td>Roofer aged 32</td>
</tr>
<tr>
<td>Contract of employment</td>
<td>For a trial period (1 month), part-time</td>
</tr>
<tr>
<td>Preventive screening</td>
<td>Yes</td>
</tr>
<tr>
<td>Preliminary OHS training</td>
<td>Yes</td>
</tr>
<tr>
<td>Periodic OHS training</td>
<td>Yes</td>
</tr>
<tr>
<td>Position-related training</td>
<td>Yes</td>
</tr>
</tbody>
</table>
| Cause of accident    | - No instructions concerning particularly dangerous works performed at heights  
                        - No protocol of acceptance and everyday inspection of the scaffolding  
                        - No doctor’s certificate approving working at heights  
                        - No individual measures of protection against a fall from heights  
                        - No constant supervision of works at heights  
                        - No confirmation of trainings and familiarity with risk assessment results |
<p>| Effect of accident   | Fracture of the ribs VII – IX on the left, rupture of the liver, rupture of the small intestine, post-traumatic acute abdomen |
| Preventive recommendations | Verify the occupational risk on the position “construction worker – roofing works” taking into account the causes of the accident suffered by the employee. Compliance with instructions of the scaffolding producer with regard to mounting. Ensuring of proper supervision of employees in terms of OHS. |</p>
<table>
<thead>
<tr>
<th>Accident date</th>
<th>March 1st, 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Place and circumstances of the accident</strong></td>
<td>Equipment and transport base, loader fixing. The employee was unscrewing the cover screws in a standing position, one of his legs was placed on the bumper and the other on the frame. He fell down after losing balance, when the wrench slipped off the screw head.</td>
</tr>
<tr>
<td><strong>Victim</strong></td>
<td>Mechanic aged 59</td>
</tr>
<tr>
<td><strong>Contract of employment</strong></td>
<td>For a limited period, full-time</td>
</tr>
<tr>
<td><strong>Preventive screening</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Preliminary OHS training</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Periodic OHS training</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Position-related training</strong></td>
<td>Yes</td>
</tr>
</tbody>
</table>
| **Cause of accident** | - No training/ instructions for renovation works at heights  
- No working platform to secure the employee against a fall  
- The employee was not aware of the threat  
- No supervision of the works conducted  
- No assessment of occupational threat for renovation works using heavy construction equipment |
| **Effect of accident** | Rupture of the cranial basis due to a fall from 1.2 m |
| **Preventive recommendations** | Assessment of occupational risk for the position of a mechanic.  
It is necessary to add provisions concerning threats associated with working at heights; ensure the proper organisation of the workplace; add information to the workplace instructions concerning threats associated with working at heights due to renovation of machines and technical equipment.  
Ensure proper supervision of employees in terms of OHS. |
<table>
<thead>
<tr>
<th><strong>Accident date</strong></th>
<th>May 16th, 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Place and circumstances of the accident</strong></td>
<td>[illegible] … Manual laying of sandwich panels of the slab roof on the 2nd floor by shifting them manually</td>
</tr>
<tr>
<td><strong>Victim</strong></td>
<td>Tinman – roofer aged 29</td>
</tr>
<tr>
<td><strong>Contract of employment</strong></td>
<td>For an unlimited period, full-time</td>
</tr>
<tr>
<td><strong>Preventive screening</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Preliminary OHS training</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Periodic OHS training</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Position-related training</strong></td>
<td>No written confirmation</td>
</tr>
</tbody>
</table>
| **Cause of accident** | - Lack of instructions for particularly dangerous works  
- Lack of constant supervision of dangerous works  
- Lack of preventive screening of employees working at heights  
- Improper securing against a fall  
- Lack of assessment of threat to employees (roofers)  
- No work organisation plan for particularly dangerous works |
| **Effect of accident** | Injury of the skull and brain, death in hospital on 20.05.11 |
| **Preventive recommendations** | Specify detailed OHS requirements for particularly dangerous works (works at heights with specification of OHS requirements for works performed on flat roofs characterised by small inclination and on roofs with substantial slope.  
Discontinue performance of works consisting of assembly of sandwich panels on the roof structure components at the construction site of the service building until the proper technical means are provided to eliminate the threat of fall from heights. Confirm the preliminary training of employees on OHS by issuing cards in accordance with the legal provisions in force; document in writing the fact of completion of the workplace-related trainings prior to commencement of works on the building site. |
<table>
<thead>
<tr>
<th><strong>Accident date</strong></th>
<th><strong>September 20th, 2011</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Place and circumstances of the accident</strong></td>
<td>Construction of a shopping and service building, disassembly of the table form from the frame scaffold</td>
</tr>
</tbody>
</table>
| **Victim** | 1) Bricklayer aged 53  
2) Locksmith-welder aged 33 |
| **Contract of employment** | 1) and 2) for an unlimited period, full-time |
| **Preventive screening** | 1) and 2) Yes |
| **Preliminary OHS training** | 1) and 2) Yes |
| **Periodic OHS training** | 1) and 2) Yes |
| **Position-related training** | 1) and 2) Yes |
| **Cause of accident** | - Inappropriate scaffolding, lack of protocol of acceptance of scaffolding  
- Lack of workplace training for employees  
- Improper work organisation – no supervision  
- No assessment of occupational risk  
- Lack of proper work qualifications of employees |
| **Effect of accident** | 1) Injury of the head with numerous lesions of the brain tissue, death on 24.09.2011  
2) Bruising of the ribs, pelvis, left side and the right knee |
<p>| <strong>Preventive recommendations</strong> | Perform risk assessment for particularly dangerous works and inform employees of the assessment results; for works at heights, ensure individual and collective means of protection; apply the proper scaffoldings, according to the manual of the producer, ensure the proper supervision of employees in terms of OHS. |</p>
<table>
<thead>
<tr>
<th>Accident date</th>
<th>July 2nd, 2011</th>
</tr>
</thead>
</table>
| Place and circumstances of the accident | Multi-family building  
Finishing works on the elevation from a scaffolding with an incomplete traffic path. Entry to higher working levels was through windows of individual apartments |
| Victim              | General construction worker aged 23 |
| Contract of employment | For a limited period, full-time |
| Preventive screening | Yes |
| Preliminary OHS training | Yes |
| Periodic OHS training | Yes |
| Position-related training | Yes |
| Cause of accident   | - Lack of protocol of acceptance of scaffolding  
- Incomplete scaffolding not in working order  
- No safe passages through the scaffolding  
- No supervision of works at heights |
| Effect of accident   | Injury of the spine, fracture of left hand and injuries of internal organs |
| Preventive recommendations | Provide the scaffolding with safe entry and exit facilities at all levels.  
Perform assessment of risk and get the employees familiar with the results.  
Ensure proper supervision of employees in terms of OHS. |
**Place and circumstances of the accident**
Renovation of a drainage ditch alongside a district road; when passing by next to a working backhoe loader, the employee slipped and fell under the wheels of the backhoe loader, lifted during operation (improper stabilisation).

**Victim**
Assistant aged 20

**Contract of employment**
For a limited period, full-time

**Preventive screening**
Yes

**Preliminary OHS training**
Yes

**Periodic OHS training**

**Position-related training**
Yes

**Cause of accident**
- No fencing around the backhoe loader work area
- Improper organisation of the worksite
- No supervision of the works performed
- No assessment of occupational risk

**Effect of accident**
Fracture of the pelvis and injury of the left foot due to slipping, falling and crushing by the backhoe loader wheels

**Preventive recommendations**
- Develop a user manual for German backhoe loaders in Polish language;
- Entrust machine operation to employees with proper qualifications;
- Ensure supervision and proper work organisation during performance of earthworks, prevent access of employees to the bucket of the machine;
- Develop a list of dangerous works;
- Perform risk assessments for individual workplaces.
<table>
<thead>
<tr>
<th>Accident date</th>
<th>February 4th, 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Place and circumstances of the accident</strong></td>
<td>Construction site; the employee, remaining in the non-secured part of the excavation, was strengthening the walls using single wooden boards with expanders; improperly stored excavated material resulted in loosening of the excavation wall, covering the employee completely</td>
</tr>
<tr>
<td><strong>Victim</strong></td>
<td>Water and sewage system fitter aged 44</td>
</tr>
<tr>
<td><strong>Contract of employment</strong></td>
<td>For an unlimited period, full-time</td>
</tr>
<tr>
<td><strong>Preventive screening</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Preliminary OHS training</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Periodic OHS training</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Position-related training</strong></td>
<td>Yes</td>
</tr>
</tbody>
</table>
| **Cause of accident** | - No training and instructions provided for earthworks  
- No familiarity with the threat  
- No organisation of the workplace (lack of a designated place for excavated material)  
- No boarding to secure the excavation against loosening of the ground  
- No supervision of the works performed |
<p>| <strong>Effect of accident</strong> | Fracture of the femoral bone of the left leg and rupture of the pelvis due to complete coverage in a non-secured excavation after loosening of the wall |
| <strong>Preventive recommendations</strong> | - Elimination of use of open-work wall supports in excavations; secure excavation walls exclusively from secured excavation sections, excavated material is to be stored in a proper location; develop and implement instructions for safe performance of earthworks; ensure proper supervision with regard to compliance with safe work procedures. |</p>
<table>
<thead>
<tr>
<th>Accident date</th>
<th>August 16th, 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place and circumstances of the accident</td>
<td>Construction site, unloading of pallets containing ceramic tiles from a truck (crane); the employee changed the position of the moving pallets manually, without using manipulators. His hand was caught between the lifting sling rope and the pallet</td>
</tr>
<tr>
<td>Victim</td>
<td>Floor and wall tile layer aged 54</td>
</tr>
<tr>
<td>Contract of employment</td>
<td>For a limited period, full-time</td>
</tr>
<tr>
<td>Preventive screening</td>
<td>Yes</td>
</tr>
<tr>
<td>Preliminary OHS training</td>
<td>Yes</td>
</tr>
<tr>
<td>Periodic OHS training</td>
<td></td>
</tr>
<tr>
<td>Position-related training</td>
<td>Yes</td>
</tr>
</tbody>
</table>
| Cause of accident | - No assessment of occupational risk  
- No training for the riggers  
- No auxiliary equipment (manipulators) |
| Effect of accident | Lacerated wound of finger I, II, III, IV of the right hand, resulting in amputation of distal phalanges of fingers III and IV, fracture of base bone of finger IV of the same hand |
| Preventive recommendations | - Use manipulators to direct the movement of a pallet hanging from a lifting sling;  
- Ensure proper supervision of employees in terms of OHS  
- Perform risk assessment and get the employees familiar with the results |
<table>
<thead>
<tr>
<th><strong>Accident date</strong></th>
<th><strong>August 17th, 2011</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Place and circumstances of the accident</strong></td>
<td>Construction site, assembly of boarding under piles</td>
</tr>
</tbody>
</table>
| **Victim** | 1) general construction worker aged 36  
2) general construction worker aged 21 |
| **Contract of employment** | 1-2) for unlimited period of time, full-time |
| **Preventive screening** | 1-2) Yes |
| **Preliminary OHS training** | 1-2) Yes |
| **Periodic OHS training** | 1-2) Yes |
| **Position-related training** | 1-2) Yes |
| **Cause of accident** | - No organisation of workplace and identification of safety conditions  
- No assessment of threats due to use of the wall as a support  
- No proper security and auxiliary equipment |
| **Effect of accident** | 1) bruising and superficial injury to the skin  
2) bruising and superficial injury to the skin |
| **Preventive recommendations** | - Develop and implement instructions for safe performance of works, taking into account the causes of the accident described  
- Use appropriate equipment for work at heights  
- Ensure proper supervision of employees in terms of OHS |
<table>
<thead>
<tr>
<th><strong>Accident date</strong></th>
<th>May 15th, 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Place and circumstances of the accident</strong></td>
<td>Waste treatment plant, the victim attempted to enter the mobile scaffolding, placed on a slope, to take the tools from it. When he entered the working platform, the scaffolding started to move and he fell down</td>
</tr>
<tr>
<td><strong>Victim</strong></td>
<td>Bricklayer – carpenter aged 45</td>
</tr>
<tr>
<td><strong>Contract of employment</strong></td>
<td>For a limited period, full-time</td>
</tr>
<tr>
<td><strong>Preventive screening</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Preliminary OHS training</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Periodic OHS training</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Position-related training</strong></td>
<td>Yes</td>
</tr>
</tbody>
</table>
| **Cause of accident** | - No assessment of threat and a safe work manual  
- Incomplete mobile scaffolding not in working order  
- No means of security against fall  
- No supervision of works and equipment used |
| **Effect of accident** | Fracture of the bones of the heel and ankle of the left leg |
| **Preventive recommendations** | - Follow the manual of the producer for assembly and security of mobile scaffoldings; develop and implement a manual for safe performance of works for all positions  
- Ensure proper supervision of the safe performance of the works |
<table>
<thead>
<tr>
<th><strong>Accident date</strong></th>
<th>March 23rd, 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Place and circumstances of the accident</strong></td>
<td>Transmitter tower, height ca. 40 m, Assembly of the antenna support structure</td>
</tr>
<tr>
<td><strong>Victim</strong></td>
<td>Welder – structure assembler aged 47</td>
</tr>
<tr>
<td><strong>Contract of employment</strong></td>
<td>For a limited period, full-time</td>
</tr>
<tr>
<td><strong>Preventive screening</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Preliminary OHS training</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Periodic OHS training</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Position-related training</strong></td>
<td>Yes</td>
</tr>
</tbody>
</table>
| **Cause of accident** | - No instructions for working at heights  
- No assessment of risk  
- No workplace-related training  
- Failure of the employee to use a means of protection against a fall |
| **Effect of accident** | Multi-organ injuries, immediate death due to fall from height |
| **Preventive recommendations** | - Direct employees working at heights must do training on the proper use of personal protection means during works associated with construction, development and modernisation of mobile telephony transmitter towers;  
- ensure proper supervision of employees in terms of OHS. |
<table>
<thead>
<tr>
<th><strong>Accident date</strong></th>
<th>June 27th, 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Place and circumstances of the accident</strong></td>
<td>Production floor, mechanical gate shear for cutting of metal sheets. When picking up the cut metal sheets at the rear of the machine the victim behaved recklessly and put his hand under the cutting knife. At the same time, the gate shear operator turned the machine on.</td>
</tr>
<tr>
<td><strong>Victim</strong></td>
<td>Production employee aged 19</td>
</tr>
<tr>
<td><strong>Contract of employment</strong></td>
<td>For a trial period (3 months), full time</td>
</tr>
<tr>
<td><strong>Preventive screening</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Preliminary OHS training</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Periodic OHS training</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Position-related training</strong></td>
<td>Yes</td>
</tr>
</tbody>
</table>
| **Cause of accident** | - Improper organisation of the workplace  
- No workplace training and instructions for operation of the gate shear  
- No safety switch  
- No threat assessment |
| **Effect of accident** | Amputation of three fingers of the right hand |
| **Preventive recommendations** | - Ensure access to safe collection of cut metal sheets; follow the cutting knife user manual;  
Ensure proper supervision of the safe performance of tasks. |
<table>
<thead>
<tr>
<th>Accident date</th>
<th>September 12th, 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place and circumstances of the accident</td>
<td>Medium voltage line 15kV. Maintenance works conducted from the elevator bucket were commenced without making sure that the voltage was switched off. Employee 1 suffered from electric shock, employee 2 attempted to help him and was injured by electric shock as well (both employees were inside the elevator bucket at the time).</td>
</tr>
</tbody>
</table>
| Victim              | 1) electrician  
  2) electrician |
| Contract of employment | 1-2) for an unlimited period, full-time |
| Preventive screening | 1) yes, with prohibition of work at heights  
  2) yes |
| Preliminary OHS training | Yes |
| Periodic OHS training | yes |
| Position-related training | No information available |
| Cause of accident | - No safe work manual for particular conditions of threat of electric shock  
  - Lack of direct supervision of particularly dangerous works  
  - Lack of medical screenings and licenses of the Polish Electricians Association  
  - Failure to switch off voltage within the grid section subject to maintenance |
| Effect of accident | 1) Death due to electric shock  
  2) Burns of the left and right hand and back |
| Preventive recommendations | - Allow work to be performed only by employees who have the valid certificates of no contraindications for employment on a given position; document the OHS trainings completed; train employees performing work in locations posing a particular threat to human life and health; ensure proper supervision of the appropriate performance of works.  
  - Ensure proper coordination of the works performed. |
<table>
<thead>
<tr>
<th>Accident date</th>
<th>October 5th, 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place and circumstances of the accident</td>
<td>Batching plant, cleaning of the concrete mixing unit after completion of work.</td>
</tr>
<tr>
<td>Victim</td>
<td>Construction machine operator aged 34</td>
</tr>
<tr>
<td>Contract of employment</td>
<td>For a limited period, full-time</td>
</tr>
<tr>
<td>Preventive screening</td>
<td>Yes</td>
</tr>
<tr>
<td>Preliminary OHS training</td>
<td>Yes</td>
</tr>
<tr>
<td>Periodic OHS training</td>
<td>Yes</td>
</tr>
<tr>
<td>Position-related training</td>
<td>Yes</td>
</tr>
</tbody>
</table>
| Cause of accident | - No workplace-related training and no authorisation to operate the mixing unit.  
- Allowing work to be performed by employees under the influence of alcohol.  
- Lack of supervision of employees.  
- No limit switch that would prevent turning on the mixing unit after opening of the cover. |
<p>| Effect of accident | Injury of both legs at the thigh level, with open fracture of the left femoral bone and deep rupture of the muscles of the right thigh. |
| Preventive recommendations | - Providing of a limit switch at the cover of the mixing unit, switching the machine off after the cover is lifted – compliance with minimum requirements; ensuring of visible and clear marking of the main power switch; prevention of work being performed by employees under the influence of alcohol; ensure proper supervision of safety during performance of works. |</p>
<table>
<thead>
<tr>
<th><strong>Accident date</strong></th>
<th><strong>July 24th, 2012</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Place and circumstances of the accident</strong></td>
<td>Construction of warehouse, concreting using a concrete pump located on an engine vehicle.</td>
</tr>
</tbody>
</table>
| **Victim** | 1) driver – mechanic aged 39  
2) construction worker aged 42  
3) construction worker aged 25 |
| **Contract of employment** | 1-2) for an unlimited period, full-time; 3) for a limited period, full time |
| **Preventive screening** | 1-3) Yes |
| **Preliminary OHS training** | 1-3) Yes |
| **Periodic OHS training** | 1-2) Yes 3) - |
| **Position-related training** | 1) No 2-3) Yes |
| **Cause of accident** | - No workplace-related training for the bulb pump operator.  
- Failure to maintain the proper distance between the extension arm and the medium voltage line.  
- No risk assessment and work instructions for particularly dangerous conditions.  
- No supervision of the works conducted. |
| **Effect of accident** | Temporary inability to work due to electric shock. |
| **Preventive recommendations** | - Re-assess occupational risk and communicate it to all employees;  
- Ensure direct and effective supervision of occupational health and safety;  
- Ensure coordination of performance of works posing a particular threat to life and health of the employees. |
<table>
<thead>
<tr>
<th>Accident date</th>
<th>September 5th, 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place and circumstances of the accident</td>
<td>Construction of a technical building; during concrete pouring and compacting while constructing the roof, the boarding supports were damaged, which resulted in the falling of the entire structure, concrete and the workers</td>
</tr>
</tbody>
</table>
| Victim | 1) construction worker aged 39  
2) plasterer – painter aged 52  
3) carpenter aged 32  
4) construction worker aged 48 |
| Contract of employment | 1) for a limited period 2-4) for a limited period, all: full-time |
| Preventive screening | Yes |
| Preliminary OHS training | Yes |
| Periodic OHS training | 1) yes 3-4) - |
| Position-related training | Yes |
| Cause of accident | - No work organisation plan.  
- No OHS training.  
- No supervision of employees.  
- No occupational risk assessment. |
| Effect of accident | 1) fracture of vertebral body L2  
2) fracture of 6 ribs  
3) bruising of right knee and right elbow  
4) fracture of vertebra Th12 |
| Preventive recommendations | - Inform plant employees of occupational risk associated with individual workplaces; ensure proper OHS supervision of employees – the construction manager is to undergo training. |
### Accident date

| December 20th, 2012 |

### Place and circumstances of the accident

Supermarket construction. The victim was mounting the lifting slings under the roof from the MP600 working platform. He was shifting the platform without lowering it down, pushing the roof structure (the truss). One of the wheels fell into an unsecured hole in the floor – the platform became unstable and it fell together with the employee.

### Victim

Construction machine operator

### Contract of employment

For an unlimited period, full-time

### Preventive screening

Yes

### Preliminary OHS training

Yes

### Periodic OHS training

Yes

### Position-related training

Yes but not documented properly

### Cause of accident

- No assessment of workplace-related threats.
- Movement of working platform occupied by a worker.
- No identification of threats.
- No workplace-related training (MP600 operation).
- No supervision of the works being performed.

### Effect of accident

Fracture of femoral bone cervix

### Preventive recommendations

- Specify the detailed OHS requirements for performance of particularly dangerous works; equip the mobile scaffolding type MP 600 with longitudinal and perpendicular curbs.
- Use mobile scaffoldings in accordance with the producer’s manual.
- Ensure direct supervision of organisation and performance of particularly dangerous works.
<table>
<thead>
<tr>
<th><strong>Accident date</strong></th>
<th>October 13th, 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Place and circumstances of the accident</strong></td>
<td>Construction site Preparation of a truck-mounted crane for work (assembly of extension arm); the victim was pinched under the extension arm component being mounted while the operator tightened the extension arm rope.</td>
</tr>
<tr>
<td><strong>Victim</strong></td>
<td>Driver - mechanic</td>
</tr>
<tr>
<td><strong>Contract of employment</strong></td>
<td>For a limited period, full-time</td>
</tr>
<tr>
<td><strong>Preventive screening</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Preliminary OHS training</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Periodic OHS training</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Position-related training</strong></td>
<td>Yes, only as a driver – mechanic (no confirmation of participation in training on assembly and disassembly of equipment)</td>
</tr>
<tr>
<td><strong>Cause of accident</strong></td>
<td>- No workplace-related training and no authorisation issued by the Office for Technical Supervision. - Lack of proper professional background. - Lack of cooperation and supervision of crane operator. - Lack of supervision and control of the works performed. - Lack of assessment of threats.</td>
</tr>
<tr>
<td><strong>Effect of accident</strong></td>
<td>Chest injury, fracture of rib V and VII on the right, hematoma, pneumothorax, bruising of a finger</td>
</tr>
<tr>
<td><strong>Preventive recommendations</strong></td>
<td>- Limit truck-mounted crane disassembly works DEMAG only to employees who have the additional certificates in this regard issued by the Office for Technical Supervision; ensure direct supervision of performance of particularly dangerous works.</td>
</tr>
</tbody>
</table>
### Accident Date
March 22nd, 2011

### Place and Circumstances of the Accident
Construction site, the victim (suffering from attack of epilepsy) fell into an unsecured excavation when gathering tools from the site after completion of work.

### Victim
Construction worker aged 23

### Contract of Employment
For a trial period (3 months) – the contract in the files has not been signed by the parties.

<table>
<thead>
<tr>
<th>Preventive screening</th>
<th>none</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preliminary OHS training</td>
<td>none</td>
</tr>
<tr>
<td>Periodic OHS training</td>
<td>none</td>
</tr>
<tr>
<td>Position-related training</td>
<td>none</td>
</tr>
</tbody>
</table>

### Cause of Accident
- Excavations were not secured
- No periodic workplace-related OHS training
- No preventive medical screening

### Effect of Accident
Scratching of epidermis of the head.

### Preventive Recommendations
- Use fencing – balustrades at excavations during earthworks; prevent work being performed by employees, who have not undergone preventive screening, OHS training, who have not signed contracts of employment and who are not using safety helmets.
<table>
<thead>
<tr>
<th>Accident date</th>
<th>May 29th, 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Place and circumstances of the accident</strong></td>
<td>Construction site. When climbing onto the truck-mounted crane (for the purpose of maintenance), the victim slipped on the support beam of the crane and fell down from a height of 1.5 m on his head.</td>
</tr>
<tr>
<td><strong>Victim</strong></td>
<td>Crane equipment maintenance worker aged 35</td>
</tr>
<tr>
<td><strong>Contract of employment</strong></td>
<td>For an unlimited period, full-time</td>
</tr>
<tr>
<td><strong>Preventive screening</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Preliminary OHS training</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Periodic OHS training</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Position-related training</strong></td>
<td>Yes</td>
</tr>
</tbody>
</table>
| **Cause of accident** | - No assessment of threats associated with maintenance works.  
- No security against fall from height.  
- No personal protection means (helmet).  
- Improper organisation of workplace.  
- No threat identification. |
<p>| <strong>Effect of accident</strong> | Immediate death |
| <strong>Preventive recommendations</strong> | - Assess threats associated with particularly dangerous works and inform the employees of the results; for works at heights, provide individual and collective means of protection; ensure proper supervision of employees in terms of safe work. |</p>
<table>
<thead>
<tr>
<th>Accident date</th>
<th>June 15th, 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place and circumstances of the accident</td>
<td>Construction of an umbrella roof, installation of trapezoidal metal sheets on the roof</td>
</tr>
<tr>
<td>Victim</td>
<td>Roofer’s assistant aged 27</td>
</tr>
<tr>
<td>Contract of employment</td>
<td>For a limited period, full-time (oral agreement)</td>
</tr>
<tr>
<td>Preventive screening</td>
<td>no</td>
</tr>
<tr>
<td>Preliminary OHS training</td>
<td>no</td>
</tr>
<tr>
<td>Periodic OHS training</td>
<td>no</td>
</tr>
<tr>
<td>Position-related training</td>
<td>no</td>
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</table>
| Cause of accident | - No workplace-related training.  
- No threat assessment.  
- No supervision of particularly dangerous works.  
- No security against fall from height. |
| Effect of accident | Death due to falling from a height of 5 m to the steel structure at level 0. |
| Preventive recommendations | - Prevent access by non-trained employees, who fail to use individual means of protection;  
- Ensure constant supervision of employees with regard to safe work. |
<table>
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<tr>
<th><strong>Accident date</strong></th>
<th>November 9th, 2011</th>
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<tr>
<td><strong>Place and circumstances of the accident</strong></td>
<td>Construction of a detached house. Works on the roof of the 1st floor + 3.3m; employee walking on the floor fell into an unsecured hole in the roof.</td>
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<td><strong>Victim</strong></td>
<td>Tinman – roofer aged 34</td>
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<td><strong>Position-related training</strong></td>
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</table>
| **Cause of accident** | - No assessment of threat.  
- Unsecured service holes.  
- Failure to apply personal means of protection.  
- No supervision of the works performed.  
- Failure of the victim to proceed carefully. |
| **Effect of accident** | Fracture of hip bone, bones of the right hand, bruising of the head, cutting of superciliary arch. |
| **Preventive recommendations** | - Ensure proper securing of holes in the roofs, prevent work being performed by employees failing to use personal protection means; ensure constant supervision of employees with regard to compliance with OHS. |
7.7 CASE STUDIES:
ANALYSIS OF AN ACCIDENT DURING THE CONSTRUCTION OF THE VASCO DA GAMA BRIDGE IN PORTUGAL

(J. C. TEIXEIRA)

Figure 7.21 - Vasco da Gama Bridge

The “Vasco da Gama” bridge crosses the river Tagus in the region of Lisbon, Portugal. At the time of opening, this was the longest bridge in Europe and the ninth in the world, with 17.3 km. The span of the central section is about 420 m long. The bridge was built as an alternative to the previous bridge (“25 de Abril” bridge) situated a few kilometres downstream. The project was divided into four parts, each of which was built by different companies and supervised by an independent consortium. The project took 18 months for design and pre-construction preparation and 18 months for construction on site and involved up to 3300 workers simultaneously. Because the bridge life expectancy was set to 120 years, the bridge was designed to withstand wind speeds of 250 km / h and an earthquake 4.5 times stronger than the historical Lisbon earthquake in 1755, estimated at 8.7 on the Richter scale. The bridge had a cost of about 900 million euro; unfortunately, however, it also had a cost of eleven fatal accidents during its construction.
On the 10th of April, 1997 at 12.15, on the board of the North Tower of the bridge, a serious accident occurred driven by the falling of the deck form traveller from a height of about 50 metres, causing death and serious injuries to several personnel.

At the stage of advancement, the form traveller only supports its own weight suspended from the deck section already concreted through four sets of devices like the one in figure 7.24. The device consists of a steel beam C, connected to the deck by high strength steel bars 5 to 7 and an element E suspended from the beam. The connection bars cross the deck beam through holes left open during concreting. Bars 1 to 4 are fixed to the tray only after the car advances so as to enable the subsequent construction operations.

The accident occurred due to the lack of installation of the bottom nuts of bars 6 and 7 of the upstream device C (figure 7.24). It was also found that one of the bars has not been fully introduced because the tube allowed its passage through the deck beam and was blocked in its lower part by cement slurry. Actually, at the time of the accident the traction that should be supported
by bars 6 and 7 in perfect working conditions, only had to be absorbed by bar 8 (figure 7.24), unable to hold the entire structure, therefore leading to the collapse of the formtraveller, as depicted in figure 7.25.

Figure 7.23 - Accident location

Figure 7.24 - Formtraveller scheme
Figure 7.25 - Formtraveller collapse

Figure 7.26 - Suspension structure after the accident
The constant changes in the routine of the workers and the lack of organisation in the workplace generated the loss of attention by those responsible for the ongoing operations, because before the forward operation of the formtraveller, no inspection was performed.

The human factor and the lack of inspection were determinants for the accident in this case, while the existence of checklists by itself does not guarantee the security in work execution; it is also necessary to ensure the real involvement of the inspector in charge. Additionally, it is extremely important to correctly fill out the check lists specific to each particular operation, containing the main verifications to be made before the operation starts. In this case, the cause of the accident would have been detected on time and the lack of safety would have been corrected, therefore preventing the accident occurrence.
APPENDICES

APPENDIX 1: COMPARISON BETWEEN ISO 9001, ISO 14000 AND OHSAS 18001

OHSAS 18001 is compatible with the ISO 9001:1994, ISO 9001:2000 (Quality) and ISO 14001:1996 (Environmental) management systems standards, in order to facilitate the integration of quality, environmental and occupational health and safety management systems by organisations.

Appendix 1. Correspondence between OHSAS 18001, ISO 14001:1996 and ISO 9001:2000 (according to the British Standards Institution)

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APPENDIX 2: EXAMPLE OF THE PROJECT MANAGEMENT TEAM JOB DESCRIPTIONS: DUTIES AND RESPONSIBILITIES

In this chapter the duties and responsibilities of the personnel of the Project Management Team are presented, forming only the general framework of assignments. Personnel shall be expected to show additional initiative and good will to adjust further to the Team for the benefit of the Construction Project, to assure the achievement of the goal of providing the Construction Project on time, to the satisfaction of the Employer and with profit to the Company.

As a result of the above, Project Management can at any time assign to the personnel of the Project Management Team any additional temporary and/or permanent duties.

The general objective of the duties and responsibilities allocation system is to create a coherent and professional TEAM.

PROJECT MANAGER (PM)

Duties and responsibilities of the PM are defined in the Contract. Jointly with the DPM, he is responsible directly to the Managing Board of the Construction Company for the running and the success of the Project.

DEPUTY PROJECT MANAGER (DPM)

Is responsible for the correctness of all procedure of operation and decision making of the Project Management Team, all in accordance with the principles of the Contract and resolutions of the Managing Board.

The DPM will undertake specific duties and responsibilities as the Project proceeds. At the beginning of the process his specific responsibilities include co-ordination with the Chief QS and his team to assure the correct procedures for quantity control and Subcontractors and Contractor Monthly Statements.

The DPM shall be available 2 times a day for short meetings with the PM to keep one another informed and to sign various documents as necessary.

SECRETARY (PMS)

He/she shall be responsible for matters of post and correspondence as described in the foreword.
He/she shall be responsible for the filing system.

All secretarial duties.

Report to the PM any requirement for additional administrative staff if overloaded e.g. fax operator/receptionist, translator, etc.

Establish good working relationships with his/her colleagues and other persons with whom the assignment is to be carried out (FIDIC Engineer, Employer, Subcontractors representatives, Local Authorities, Building Control etc.).

Be available and prepared for PM Co-ordination Meetings.

CONSTRUCTION MANAGER

He/she will be one of the Section Engineers.

Shall take up the duties and responsibilities as required by Polish/Portuguese Building Law.

Shall be the custodian of the Construction Diary.

Shall interview and recommend to PM/DPM person responsible for Health and Safety at Work.

Establish good working relationships with his/her colleagues and other persons with whom the assignment is to be carried out (FIDIC Engineer, Employer, Local Authorities, Building Control etc.)

Be available and prepared for the FIDIC Engineer Co-ordination Meetings.

Be available and prepared for PM Co-ordination Meetings.

COMMERCIAL MANAGER (CM)

Report directly with all matters to the PM.

Leads the CM team.

Duties are those defined in the Contract, and also specifically, he shall be responsible for all commercial matters and reports related to the JV Board, the Employer and the Main Contractor.

Establish good working relationships with his/her colleagues and other persons with whom the assignment is to be carried out (FIDIC Engineer, Employer, etc.).

He is to be conversant with the Main Contract conditions and Subcontract conditions as far as all commercial matters are concerned.
He should be available to help the DCM in preparation of Subcontract Agreements.

He is to take up the duties of the DCM at the time of his illness or holidays.

Be available and prepared for the FIDIC Engineer Co-ordination Meetings if and when requested to attend.

Be available and prepared for PM Co-ordination Meetings.

DEPUTY COMMERCIAL MANAGER (DCM)

Duties are those assigned to him fairly and judiciously by the CM, and particularly, he shall be responsible for all commercial matters related directly to subcontractors, namely preparation and compiling with relevant Section Engineer and QS Subcontract Agreements, subsequent compilation with QS section of Subcontractors Monthly Statements, checking of subcontractors invoices and presenting them for PM/DPM authorisation for payment, correct timing of subcontractors payments.

Establish good working relationships with his/her colleagues and other persons with whom the assignment is to be carried out (FIDIC Engineer, Employer, etc.).

He is to be conversant with the Main Contract conditions and Subcontract conditions as far as all commercial matters are concerned.

He is to take up the duties of the CM at the time of his illness or holidays.

Be available and prepared for the FIDIC Engineer Co-ordination Meetings if and when requested to attend.

Be available and prepared for PM Co-ordination Meetings.

ACCOUNTS/ADMINISTRATION (AA)

Performs his/her duties in the CM section.

To be responsible for the salaries of all personnel.

To be responsible for ordering and purchasing, serving the requirements of the JV Management Team, make sure that there are no shortages of supplies.

To be responsible for administration and associated cost control of the daily running of support facilities serving the requirements of the Site Camp (security, rubbish disposal, lunches, water, electricity, telephones, etc.).

Arrange tickets, travel, boarding for personnel, as required and instructed.

To arrange occasional parties or other special social events.
To follow press and to be a keeper of any press releases concerning the Project.

To keep Driver/Supply/Maintenance man busy.

Report with assigned budget and expenditure to CM.

Be available and prepared for PM Co-ordination Meetings.

**CHIEF QUANTITY SURVEYOR (CQS)**

Report directly with all matters to PM.

To be conversant with Main Contract Conditions, particularly as far as all QS control, measurements and associated procedural matters are concerned.

To be conversant with Subcontract Agreement Conditions, particularly as far as all QS control, measurements and associated procedural matters are concerned.

To define and be conversant with Subcontract Agreement quantity definition and measurements conditions.

Establish good working relationships with his/her colleagues and other persons with whom the assignment is to be carried out (FIDIC Engineer, Employer, etc.).

Be available and prepared for FIDIC Engineer Co-ordination Meetings as and when requested to attend.

Be available and prepared for PM Co-ordination Meetings.

Be conversant and experienced with all matters of quantity surveying and control on behalf of the General Contractor.

Prepare and establish with the PM and relevant Section Engineer, a strategy of cost controlling for each subcontract package.

Obtain offers from manufacturers, suppliers, distributors, quarries, transport companies, asphalt makers etc. sufficient for full control of assigned duties.

Prepare blind BoQ’s for each package of subcontracted works. Establish budget for each package of subcontracted works.

Obtain in association with DCM and SE offers.

Prepare a mirror of offers and analyse them.

Decide with the PM/DPM and relevant SE award of subcontract.

Establish with FIDIC Engineer QS methods and procedures of quantity recording.
Control and record quantities of executed works.
Provide DCM with monthly summary of executed quantities of works and their value.
Prepare feasibility of special projects such as Concrete Plant, etc.
Assigns judiciously and fairly, responsibilities to other members of his team.

QUANTITY SURVEYOR (QS)
Performs his/her duties in the CQS section.
Carries out responsibilities assigned by the CQS within the scope of his/her professional qualifications.
Substitutes for any of his/her colleagues in times of illness or holidays.
May be asked to substitute for the CQS in times of his illness or holidays.
Be available and prepared for the FIDIC Engineer Co-ordination Meetings if and when requested to attend.
Be available and prepared for the PM Co-ordination Meetings.

SECTION ENGINEER (SE)
Reports directly with all matters to the PM.
To be conversant with the Main Contract Conditions as far as all technical, QS control and procedural matters are concerned.
To be conversant with Subcontract Agreement conditions.
Establish good working relationships with his/her colleagues and other persons with whom the assignment is to be carried out (FIDIC Engineer, Employer, Local Authorities, and Building Control etc.).
Be available and prepared for the FIDIC Engineer Co-ordination Meetings as and when requested to attend.
Be available and prepared for the PM Co-ordination Meetings.

He/she will be assigned defined areas of responsibility (for ex. External Sanitary System, Roads, Internal Tele-technical Installations, etc.).
He/she shall analyse the Technical Project for assigned works and establish critical path constraints.
Compare with the QS section the differences between Technical Project and Tender Design documentation – report any discrepancies affecting the cost to the PM.

Establish with the QS the method of quantity controlling both on the Subcontractor and Employer side.

Assist the QS in preparation of the Open BoQ’s for the purpose of Subcontract negotiations and subsequently, when filed as Subcontractor’s Offer forming a part of Subcontract Agreement.

Establish required access to the works. Such an undertaking is to be included in the Technical Conditions of the Subcontract Agreement.

Prepare Technical Conditions of the Subcontract Agreement defining the scope of works and associated preparatory and preliminary undertakings (storage place for materials, parking place for plant, etc. obtain from the Subcontractor his Method Statement defining at least assigned plant and personnel organisation).

Establish on the basis of the Main Programmes, a detailed Programme of subcontracted works, co-ordinate critical path of programming with programming of his other assignments and assignments of other Section Engineers.

Obtain from Subcontractors confirmation of the Programmes before signing of the Subcontract Agreements.

Assure himself/herself as to the ability of the Subcontractors to carry out the assigned works.

Establish procedures of carrying out of subcontracted works (samples, tests, geodetic and geological surveying, quantity surveying, part commissioning, final commissioning, Handing Over).

Collate all information as expected from the Contractor to evidence correctness of works carried out (certificates, tests, sign B, concrete sample tests, manufacturers guarantees for materials and evidence of the correct installation of the works).

Supervise the works carried out.

Bring to the attention of the PM any reasons for possible claims (time and money) or additional costs.

M&E SERVICES COORDINATOR (ME, SE)

His/her duties are those as defined for the Section Engineer.
In addition, the responsibilities include technical appraisal and co-ordination of Section Engineers assigned for External Sanitary and Rainwater sections.

He/she will have available in the team assigned External M&E Engineer and Buildings M&E Engineer. M&E Services Co-ordinator shall assign their respective duties and responsibilities and be responsible for the progress of the team.

BUILDINGS M&E ENGINEER (BME)

His/her duties will consist of those of the Section Engineer’s duties and responsibilities as assigned to them by the M&E Services Co-ordinator.

Be available and prepared for PM Co-ordination Meetings.

DESIGN COORDINATOR (DC)

There will be a Design Drawings cell, under the care of the Design Co-ordinator, where all available from FIDIC Engineer matters related to design information will be deposited, recorded, scheduled and dealt with.

He/she will provide a detailed list of available Projects and prepare this for the FIDIC Engineer’s sanctioning.

He/she will prepare the list of missing design information upon receipt from the FIDIC Engineer complete documentation and inform relevant SE and CQS.

He/she will receive orders for preparing copies of design packages from relevant SE and CQS and prepare this within 1 working day.

He/she will check that the sets of copies are complete and confirm this with his/her initial mark on each copy.

Gradually as works proceeds, he/she will be responsible for the adding of any As-built changes preparing As-built design documentation in a number of sets as defined in the Contract or as established with the FIDIC Engineer.

To collect from the relevant SE and collate all documents proving quality of executed works, installed plant, fixtures, fittings and materials, any maintenance manuals, guarantees, proposals of maintenance contracts from suppliers etc., eventually forming an integral part of the As-Built documentation.

Be available and prepared for PM Co-ordination Meetings.
DRIVER/SUPPLIES/MAINTENANCE (DSM)

Be fully disposable and available for his duties, primarily for PM/DCM requirements, subsequently as requested by the SE, ME, CM, CQS and disposed by the AA.

To provide supplies for the requirement of the Site Camp Offices as directed by the AA.

To carry out small maintenance and repair works within the Site Camp.

To be responsible for order and cleanliness of the Site Camp.

To attend to some administrative and other arrangements for the staff that cannot otherwise be done within normal working hours.

OTHER PERSONNEL

Other personnel may be engaged when it becomes obvious that it is needed.
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