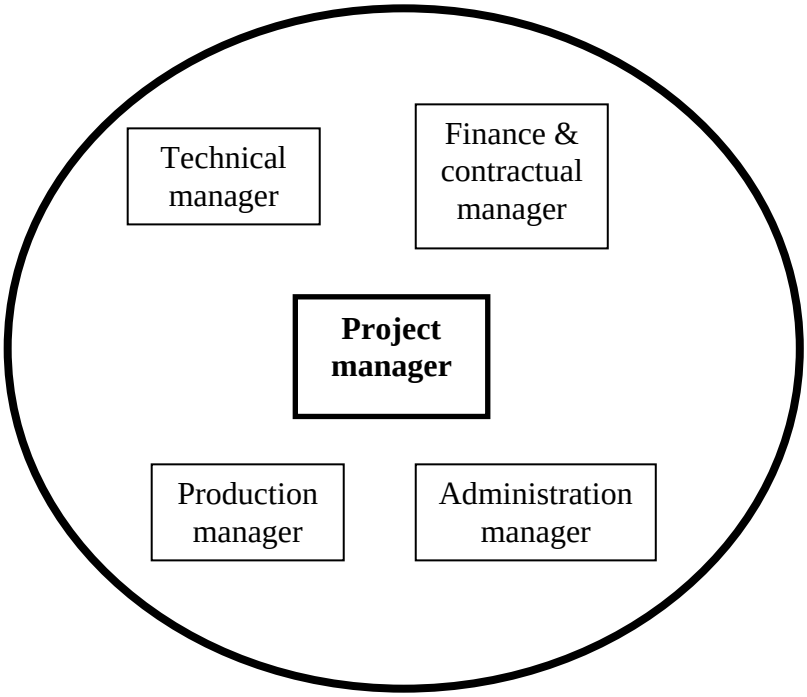
ILO CONSTRUCTION OS&H

A free, comprehensive, international, digital training package in occupational safety and health for the construction industry

THEME SUMMARY 5:
PRINCIPLES OF SAFE PROJECT MANAGEMENT



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1 PREFACE

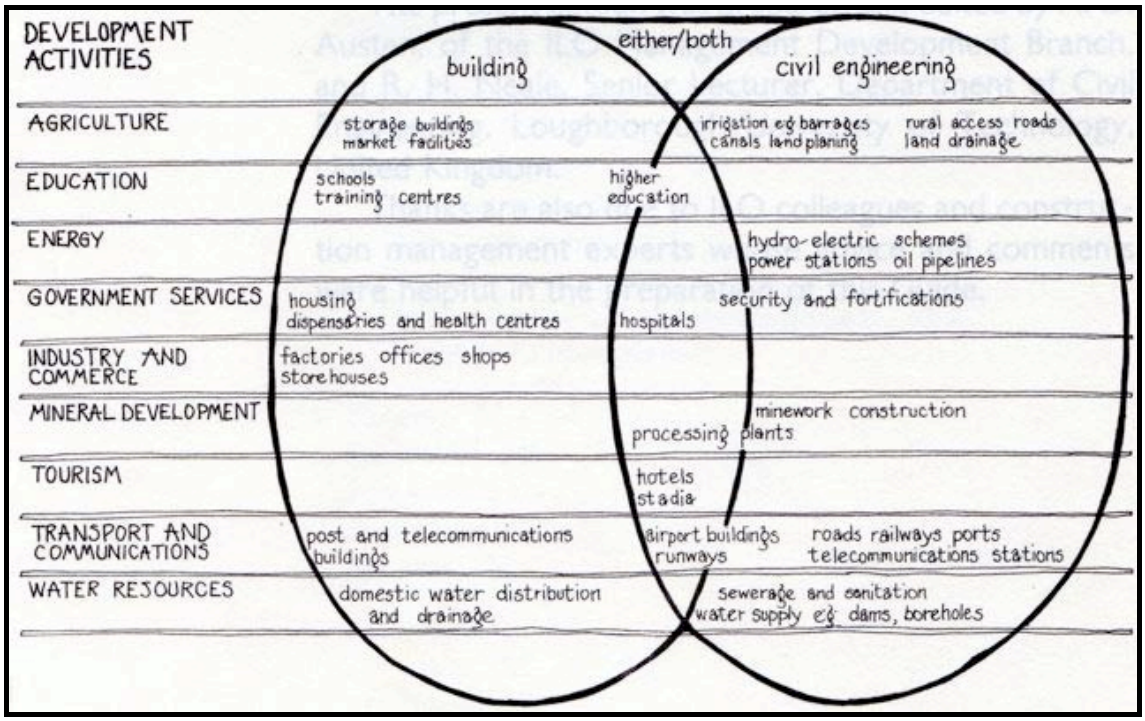
Construction OS&H is set within a project management context, but the principal focus is on OS&H so this context will only be described briefly as a specific subject. It should be noted also that project management is mentioned fairly frequently throughout this training package, so it is entwined in the general principles and practices advocated.

This Theme Summary is largely based on the following ILO books:

1. "Managing construction projects: A guide to processes and procedures". Edited by A D Austen and R H Neale (1984)

2. "Managing international construction projects: an overview". Edited by R H Neale (1995)

The first book was written to accompany a series of ILO training courses in African countries and has been translated into a number of languages. It provides general guidance on the management of construction projects with specific reference to developing countries, emphasising the crucial importance of the construction industry in national development – for example by providing facilities for education, transport, water supply and industry - as shown in the diagram below.



The second book is the final (No 7) volume in the ILO's *International Construction Management Series*. Both have been fully reviewed by international experts during their development.

In addition, the following book is very useful to **Construction OS&H** since it is in the form of a textbook with extensive student learning elements, which make it useful for the Tutor:

"Construction safety management" by Tim Howarth and Paul Watson (2008)

Details of these three books are given in the "Relevant elements of the Knowledge Base" Section of this Theme Summary. They will be referred to in this Summary as the 'ILO Guide', the 'ILO Overview' and 'Howarth and Watson' respectively.

The contents of this Theme Summary are as shown in the table above.

2 PROJECT ORGANISATION AND MANAGEMENT FUNCTIONS

General principles of management

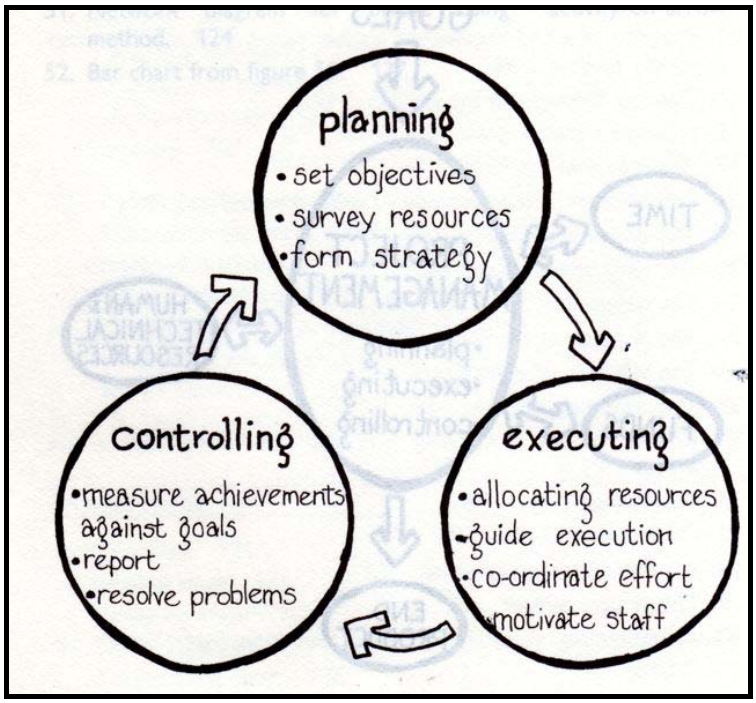
"We define management as the process of designing and maintaining an environment in which individuals, working together in groups, accomplish efficiently selected aims."
[Koontz and Weihrich (See the ILO Overview, p11)].

There is general agreement, developed and maintained over a long period of time, that there are six 'functions of management':

Planning functions
Planning: setting objectives and deciding on future courses of action
Organising: establishing an intentional structure of roles for people to fill in an organisation
Staffing: Filling, and keeping filled, the positions in the organisation structure

Executive functions
Leading: influencing people so that they will contribute to organisation and group goals
Coordinating: "The essence of management"; the achievement of harmony of individual efforts towards the accomplishment of group goals
Controlling: measuring and correcting the actions of subordinates

The ***process*** of managing has three fundamental elements, as shown in the diagram below. These elements form a continuous 'managerial cycle', driving forward towards an agreed goal. It is important to understand that management is not a static function, and that all managers have to be involved in this continuous process.



These principles are wholly consistent with a philosophy of good OS&H practices:

- From the definition of management, one of the 'selected aims' should be to preserve the safety, health and general well-being of all the people involved. This relates closely to 'policy' as explained in Theme Summary 7: "Processes and systems"

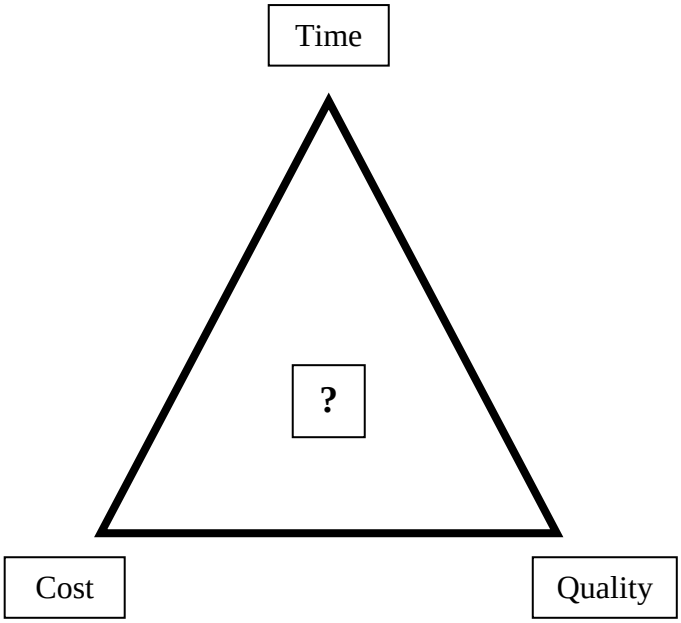
- All six managerial functions should embrace effective OS&H

- All three elements of the managerial process should be employed to ensure effective OS&H performance.

Construction project management

Unlike the management of a factory, which runs at a 'steady state' for much of its existence, construction projects are essentially managed by transitory organisations. Projects have a distinct start and end, often with some very intensive activity in between. This is especially true of most construction projects.

The 'basic view' of the key goals of a construction project is given in the diagram below: the 'project triangle' of quality, cost and time. The project triangle attempts to show that it is difficult to achieve all three goals simultaneously; for example a fast time scale (short project duration) may well result in more cost that a project run at a slower pace; and a low cost project may have to compromise on quality. Essentially, as the management compromise (the question mark box within the triangle) moves closer to achieving one of the three goals, it moves further from the other two.



The basic view 'project triangle' of quality, cost and time

This 'basic view' represents a very common but very limited view of a project, and a more comprehensive view has to be taken in order to manage a construction project effectively.

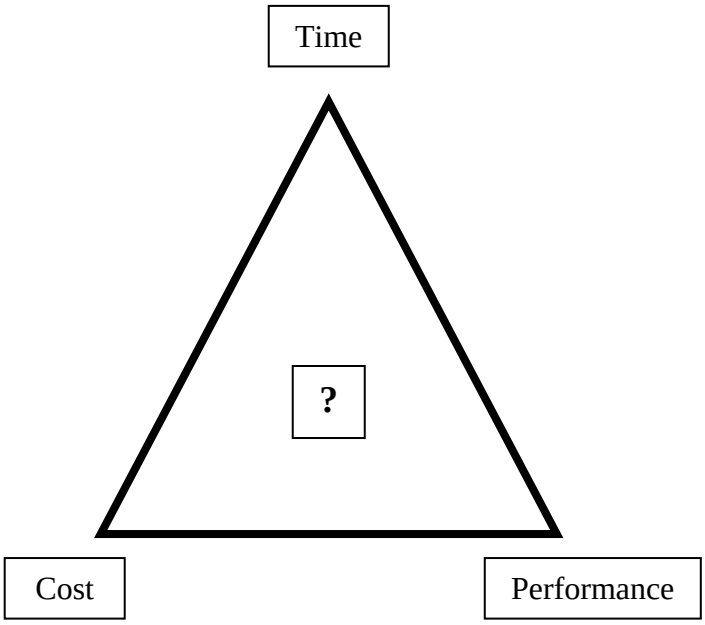
Firstly, although attention during the project development and implementation stages may well be on performance cost and time, the reality is that when the project is complete the client, and many of the other parties involved, tend to forget that a project may have been delivered quickly and cheaply, and will be much more concerned with the quality of the finished facility.

Secondly, modern management methods may reduce the degree of compromise required (i.e. the dimensions of the project triangle are reduced). These methods include 'value management' techniques that aim to improve value-for-money, and planning and control techniques that enable faster project delivery without compromising quality.

Thirdly, the project triangle is a narrow economic view of a project, and so is inadequate within the context of Corporate Social Responsibility (CSR), which was discussed in the Theme Summary 1: "Fundamental principles".

A more comprehensive approach is required, sometimes expressed by the term 'triple bottom line' of 'people, planet, profit', based on economic, ecological and social measures, which originates in the UN to express an approach to international development that is much broader than economic development.

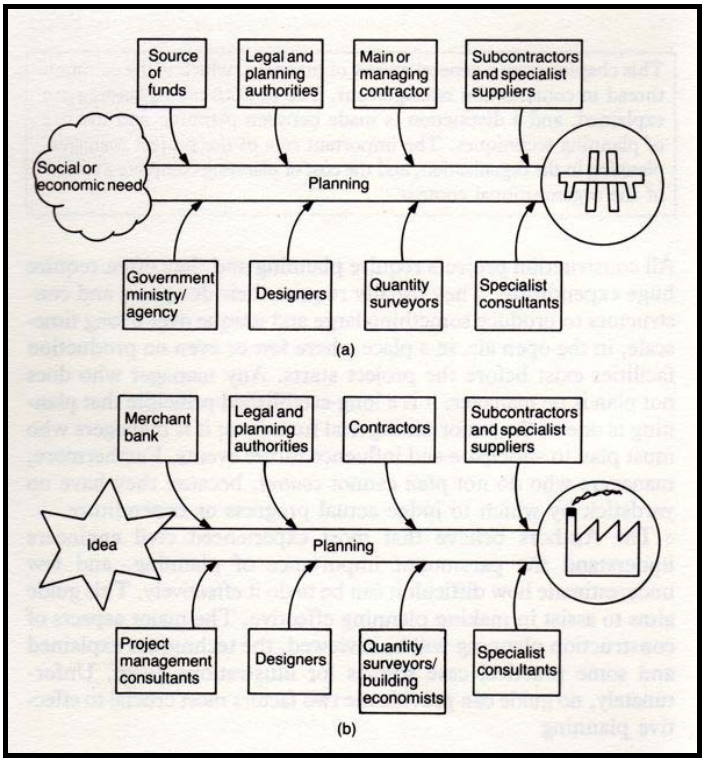
The central issue therefore is 'Performance'. The 'project triangle' will feature as an important concept in almost all construction projects, and reality will often force compromises. But one of the common features of the construction industry is that this project triangle is the only consideration, and that the other two 'bottom lines' are optional additions.



The fundamental philosophy of **Construction OS&H** is that 'Performance' must include effective measures of good OS&H; often it does not, and this is what **Construction OS&H** is intending to change.

Project managers and project teams

The diagram below gives examples of people and organisations whose activities must be planned and coordinated during a project. The examples are for a possible public sector project and also for a new private manufacturing facility.



(From "Construction Planning", by Richard H Neale and David E Neale. see Knowledge Base below)

This diagram indicates the complexity of these relationships, and how they are drawn together in a common purpose by effective planning. The role of a project manager is to provide the essential human linkage.

Project managers are essential to the Executive Functions of management, especially *Leading*. Most construction projects will require a number of project managers, who must work together effectively. The main project managers will be:

- Client's project manager, who will manage the whole project on behalf of the client, from start to finish

- Design team's project manager, who will work with the client's project manager and manage the whole design team and its specialist advisors

- Construction company's project manager, who will manage the whole project within the construction contract, including all the subcontractors and suppliers

These project managers have a very significant responsibility for the implementation of effective measures for OS&H.

Much has been written about project managers, but an old study, taken from the ILO Overview, is reproduced in the table below, and has stood the test of time. Of especial importance to OS&H is the finding that participative decision-making produces the best results.

Summary of major research findings regarding the human element in project management

There is no single panacea in the field of project management. Some concepts and principles work well in some environments, while others are more suited to different environments.

It is important to vest the project manager with as much authority as the environment permits. Once vested with this authority, the project manager is well-advised to use expertise and work challenge as influence modes, rather than formal authority.

Project organizational design must be tailored to the specific task and the environment, but higher levels of authority for the project manager result in less probability of cost and time overrun.

The confrontation or problem-solving approach is generally more successful than the smoothing approach or the forcing mode of conflict resolution.

Participative decision-making styles are generally more successful than other styles. Commitment, teamwork and a sense of mission are important areas of attention in project management.

To attain high levels of perceived success, effective coordination and relations patterns are extremely important. Also, success criteria salience and consensus among the client, the contractor and the project team are important.

Source: B. N. Baker and D. L. Wilemon, 1977.

The key qualities of an effective project manager include:

- Good team leader, builds good relationships
- Has an open and honest management style
- Good communicator - “management as a performing art”
- Focuses on results, has a ‘sense of mission’
- Technically competent - understands the construction process
- Financially competent - understands project income and costs
- Confident & resilient - “when the going gets tough, the tough get going”
- Understands management systems and uses them effectively

Essentially, this means that the project manager:

- Needs to have real authority, but should only use it when absolutely necessary
- Can only be effective if all parties agree on the aims and objectives of the project - client, designers and construction companies must all share the same view of the project

Project management organisation

Much has been written on management structures for construction projects, but fundamentally most medium to large projects require a project manager and four immediate sub-ordinate managers. This basic requirement applies to both clients’ and contractors’ project management.

As stated above, the **project manager** has the overall responsibility for managing and leading the project. If she or he does not take a leading role in implementing good OS&H practices and systems it will be difficult to implement them throughout the project. Instead, implementation will have to rely on rules, regulations and external requirements and inspections, which can never be as effective as wholehearted support from senior managers.

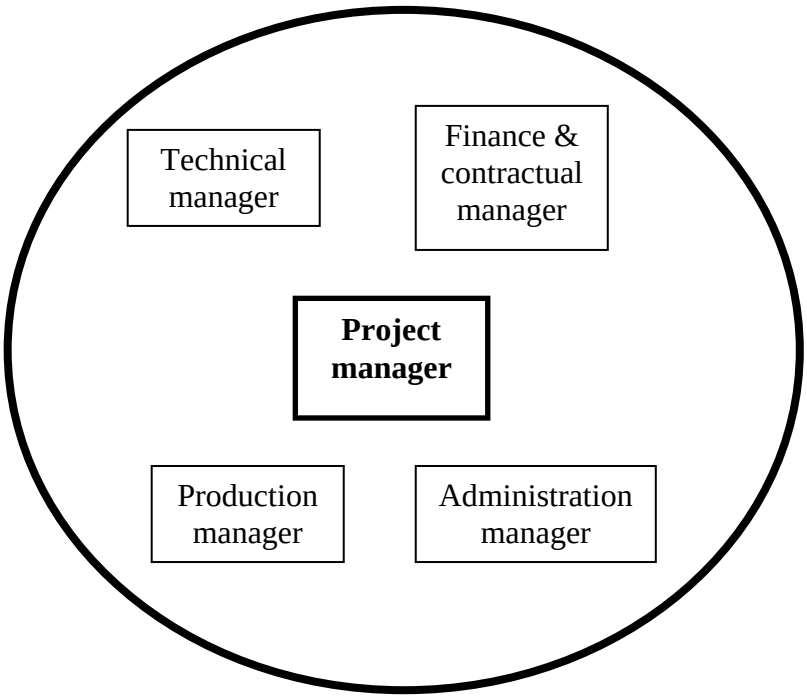
The **production manager** is responsible for the practical delivery and physical production of the project, and will therefore have a very direct influence on OS&H.

The **finance and contractual manager** is responsible for controlling the financial aspects of the project, and since this is often based on the agreements made in the contracts and specifications, this role has to include the contractual aspects of the project. The contract documents should contain robust requirements for OS&H, some of which will have to be paid for explicitly, so the manager can have a very powerful influence on OS&H.

The **technical manager** will have responsibility for sound implementation of all the technical aspects of the project, including the technical aspects of hazard and risk analysis and method statements to ensure that all the work on the project is conducted safely and in a healthy environment.

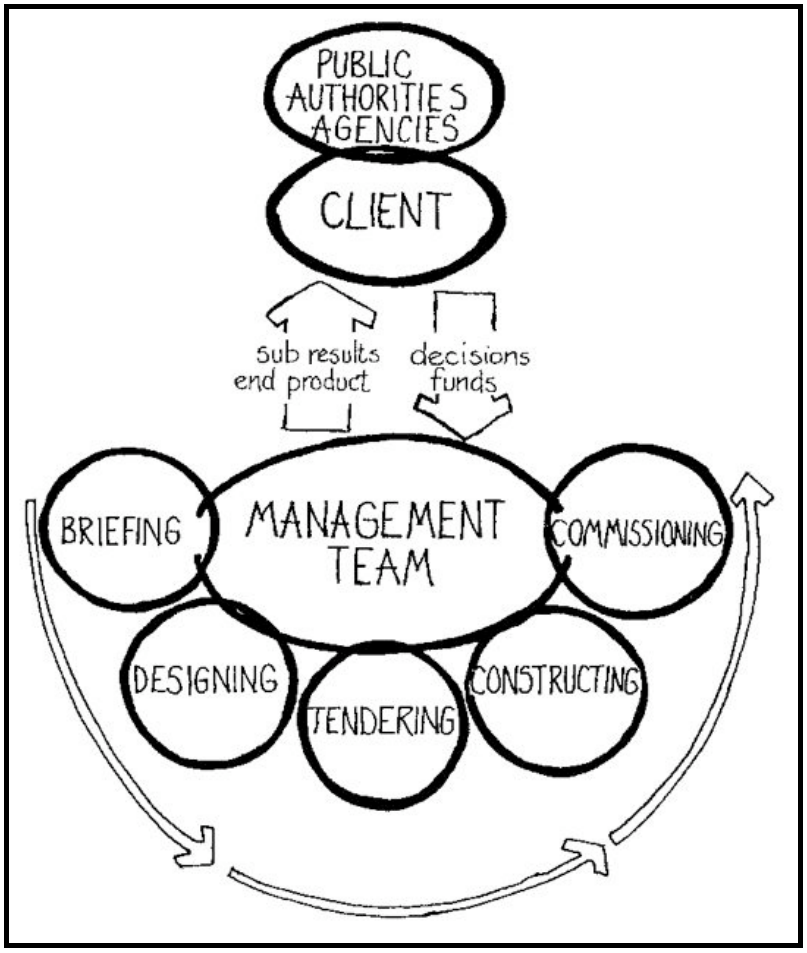
The role of the **administration manager** is becoming increasingly important and challenging. During the past few decades, legislation and the development of business systems (including quality assurance and OS&H) have dramatically increased the scope and workload of administrators, so the person who leads and controls the administration needs to be at the same level of importance as the other three managers who report to the project manager. This manager has prime responsibility for implementing and maintaining all OS&H policies and systems.

The diagram below shows these five managers in the form of a team, in which the project manager is the senior member and leader, and the others have equal authority and responsibility.



This organisation would have been expressed differently 30 or 40 years ago, because it would have been based on the concept of a 'line-and-staff' organisation, in which the production manager would have had a more senior, 'line' responsibility to the project manager and the other three managers would have acted in support, as 'functional managers'. This management structure derives from military structures in which front line soldiers fight the battle and all other parts of the army act in support. This may or may not be the way in which the military still organise themselves, but in terms of modern construction project management it is obsolete and the most effective management structures are much looser and based on teams and teamwork, all working together to achieve the project's objectives.

The ILO advocated this principle of team-working as the basis for project management in the early 1980s (see Austen and Neale 1984), as shown in the diagram below, and its relevance has been reinforced during the past three decades or so.



3 STAGES OF CONSTRUCTION PROJECTS

The stages of a typical construction project, run within a 'traditional contract' in which the design is completed then the contract is let through competitive tendering, are shown in the 'project matrix' below, together with the project teams associated with them. The shading gives an indication of the intensity of their involvement.

PROJECT TEAMS	PROJECT STAGES				
	Briefing	Design	Procurement	Construction	Commission
Client					
Designers					
Contractors					
Other consultants					
Sub-contractors					
Suppliers					

Projects do not necessarily run in this sequence of stages; for example, in a design and build project, procurement would precede design and the contractor would be involved quite intensely in the design stage. Nevertheless, the stages shown are a useful simplification because all these five stages will usually form part of the project process.

The 'project matrix' will be discussed in more detail in the Theme Summary 6: "Planning and control for OS&H".

4 CREATING A GOOD PREVENTATIVE OS&H CULTURE

Care must be taken when using the term 'OS&H culture', because it can raise complex issues of definition and interpretation. For example, the following passage is taken from an ILO report of a survey in 2005:

Several respondents, in particular workers' organizations, take the view that the reference to "safety culture" proposed by the Office is problematic. The term is considered to be closely linked with the concept of "behavioural safety" which shifts responsibility for OSH away from the employer onto the worker. Although this inference was not intended by the Office, the proposed Conclusions use the term "preventative safety and health culture" (used in the 2003 Conference conclusions) instead.

(International Labour Conference, 93rd Session, 2005. Report IV (2) Promotional framework for occupational safety and health. http://www.ilo.org/public/english/standards/relm/ilc/ilc93/pdf/rep-iv-2.pdf)

The term 'preventative safety and health culture' is used, therefore, throughout **Construction OS&H**.

Bearing this in mind when reading about 'culture', a very useful explanation of the term is given on the web site of the United States Department of Labor, Occupational Safety and Health Administration (OSHA): (http://www.osha.gov/SLTC/etools/safetyhealth/mod4_factsheets_culture.html).

"Culture is a combination of an organization's: attitudes, behaviors, beliefs, values, ways of doing things, and other shared characteristics of a particular group of people."

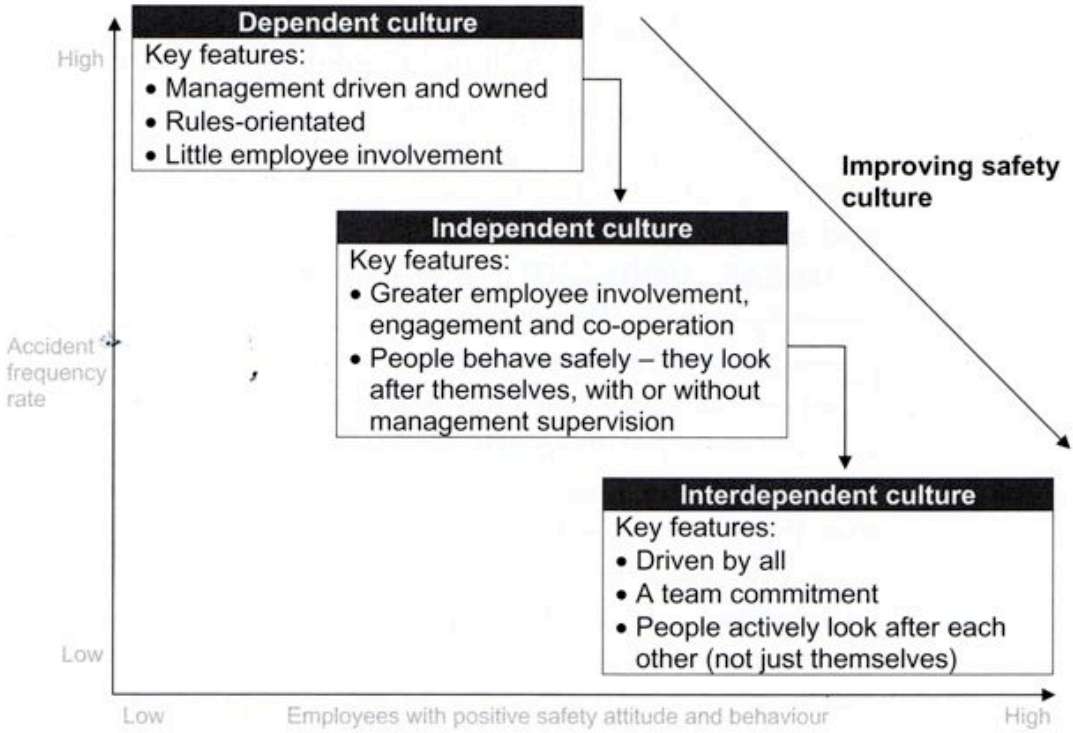
OSHA's web site also provides a very informative and comprehensive explanation of "Creating A Safety Culture" under the following headings:

1. *Why do you want a strong safety culture?*
2. *What is a safety culture - how will it impact my company?*
3. *Building a safety culture*
4. *Obtain Top Management "Buy-in"*
5. *Continue Building "Buy-in"*
6. *Build Trust*
7. *Conduct Self Assessments/Bench Marking*
8. *Initial Training of Management-Supervisory*
9. *Establish a Steering Committee*
10. *Develop Site Safety Vision*
11. *Define Specific Roles*
12. *Develop a System of Accountability*
13. *Develop Measures*
14. *Develop Policies for Recognition*
15. *Awareness Training and Kick-off*
16. *Implement Process Changes*
17. *Continually Measure performance, Communicate Results, and Celebrate Successes*
18. *On-going Support*

(The ILO is grateful to OSHA for the use of this quotation. It is 123 words long, so has been used under the convention of 'Fair Use' which allows a maximum of 400 words to be used without seeking formal permission.)

All those who are involved in managing construction projects should read the full document, which is freely downloadable at: http://www.osha.gov/SLTC/etools/safetyhealth/mod4_factsheets_culture.html.

Howarth and Watson devote a whole chapter of their book to this subject, and the diagram below illustrates different cultures. This diagram emphasis that central principle of **Construction OS&H** – that close cooperation and real participation of all involved will result in improved OS&H performance.



"The safety culture of a construction organisation is informed and shaped by the attitudes, values and behaviour of all people involved with the organisation or project"

(The ILO is very grateful to Professor Paul Howarth and Tim Watson for permission to use this diagram and quotation.)

5 ENFORCING GOOD OS&H BY PROCUREMENT AND CONTRACTS

Introduction

It is recognised that many measures are needed to improve safety and health in construction, including a strong legal and policy framework, an effective inspectorate and training of workers, supervisors, contractors and health and safety managers in construction. It is often argued that the monitoring and enforcement of health and safety regulations is solely the responsibility of public labour inspection. However, the large number and wide dispersion of construction sites and the scarce resources available for public labour inspection means that it is impossible to inspect all worksites. Therefore, linkages between employment law and procurement process and the terms and conditions of the contract can be used as complimentary mechanisms for ensuring compliance with legislation. Procurement procedures and contract documents act as important mechanisms to remind the parties to the contract of their obligations under the law. This can raise the standard of OS&H on individual projects and has the potential to raise standards in the industry more generally.

The ILO and organisations in the construction industry, notably the construction Trade Unions, have been advocating measures to improve OS&H through legislation and policy initiatives; improved training, skills certification and worker participation; better planning and coordination of construction projects, including better selection and control of subcontractors; and through the use of health and safety management

systems. It is only in recent years that attention has begun to focus on achieving good OS&H performance starting "upstream" with the procurement process rather than trying to tackle it only during the construction phase itself.

Methods of contracting

The two main methods of letting contracts for construction projects in use throughout the world are 'single prime contractor' and 'design-build'.

Single prime contracts are the most common form of construction contracting. In this process, the contract documents are usually prepared by a consultant (architect/engineer/cost consultant) for the client (but this may of course be done by the client's own team). There is usually a direct contract between the client and the consultant(s). The contract documents are then made available to a number of qualified bidders, and the winning contractor enters into a 'prime contract' with the owner. The 'prime contractor' then enters into a series of subcontracts with other contractors in order to undertake the work. So, the client has a prime contract with the consultant and a separate prime contract with the prime contractor (sometimes referred to as the general contractor).

In a **design-build contract**, a single firm provides both the design and construction services. The client issues a contract to the firm to provide all of the design and construction services for the entire project. If a design-build contract is extended further to include the selection, procurement, and installation of furnishings and equipment, it is called a 'turnkey contract.' Once again, most of the work is done by subcontractors.

There are variations on these methods of contracting. For example, a client may employ a construction manager to handle the contract process and manage the whole project. The project manager enters into a series of contracts, including those with specialised contractors to carry out the work. Generally, the work is divided into 'work packages' which are reasonably distinct parts of a project: for example, ground-works, structure, cladding, etc.

In recent years, project owners in the construction industry have placed greater emphasis on contractor OS&H qualifications as a means for promoting construction site safety. Careful examination of safety issues in the bidding process has become more common. Increasingly, public procurement laws are being amended to allow the acceptance of other than the lowest bid, on the basis of 'best value', with a view to achieving better working conditions, health and safety and other social objectives. It is becoming more widely recognised that previous practices requiring acceptance of the lowest bid is no guarantee of value for money.

Regardless of the method of contracting, OS&H hazards must be identified, controls must be implemented and maintained, and records must be established in order to minimise injuries and illnesses and to ensure compliance with legal requirements.

OS&H in contract documents

It is increasingly common for clients with projects involving complex safety and health risks to incorporate preventative requirements into the contract administration process. These requirements often begin with the contractor pre-qualifying prior to bidding and then progressing through the aspects of actual construction work. The early integration of OS&H criteria into the contractual process has become relatively common today, at least in developed countries, but this has largely been the result of the efforts of progressive clients and construction firms. There has not been a specific, commonly used reference source that offers guidance on how to effectively accomplish this integration.

To best understand the opportunities to incorporate OS&H requirements into contract documents, the client should be familiar with their content and purpose, concentrating on the documents where OS&H requirements can be integrated. Clients must be familiar with terms like "technical specifications", "general conditions", "instruction to bidders," and other terms frequently used when discussing contract documents.

The Contract Documents generally comprise three parts:

1. Bidding Requirements. These describe any bid solicitation, Instructions to Bidders (instructions and procedures to be followed by bidders in preparing and submitting their bids, for use when competitive bids are solicited for construction of a project); Standard Bidding Documents (SBDs), which are the forms to be completed to submit bids), and other information available to bidders. These are requirements that bidders must address in order to prepare and submit a responsive bid, and these can include Labour Clauses on H&S in the SBDs as well as client's requirements on H&S in the Instructions to Bidders.

2. Contracting Requirements. These describe the actual agreement between the client and the prime contractor, including certificates, General Conditions of Contract (this document is an integral part of the contract, setting forth the rights, responsibilities, and relationships of the owner, contractor, and architect); any supplementary conditions [Conditions of Particular Application (CoPA)] that may be imposed on a specific project, and the Bill of Quantities, itemising pay items. These documents can include H&S requirements in the CoPA and H&S pay items can be included in the Bill of Quantities (BoQ).

3. Construction Documents. These describe all plans, drawings, Technical Specifications, addenda, and other information associated with the actual construction of a specific project. This section of the Contract Documents is often referred to as the Plans and Specifications, and it is in the Technical Specifications where H&S requirements can be addressed in greater detail.

Standard forms of bidding and contract requirements

There are many bid and contract packages around the world, which have been assembled by individual Clients or procurement entities or in country procurement systems. Among the most widely used and internationally recognized forms of contract are those published by the International Federation of Consulting Engineers (Fédération

Internationale des Ingénieurs-Conseils (FIDIC); seeOrganisation fror http://www.fidic.org/). More than 25,000 copies of FIDIC's contract forms are supplied every year. These are: Design, Build and Operate Projects; Plant and Design – Build; EPC Turnkey projects; Short Form of Contract; and, finally, Conditions of Contract for Construction, which is also known as the Red Book, and is used by the World Bank and other Multilateral Development Banks (MDBs) in their lending for infrastructure and development projects. These are drafted by Consulting Engineers in consultation with the UN, Organisation for Economic Co-operation and Development (OECD), MDBs, World Trade Organisation (WTO), ILO, Contractors Associations, the BWI and others. They contain essential Labour Clauses concerning hours of work, wages and health and safety. These documents are used as the Works Contract at the end of the procurement process, and they establish the relationship between the client, the prime contractor and other contractors, and the role of the client's representative, or consultant.

However, the OS&H clauses contained in these bidding and contract documents are very basic and general and there is very little guidance on how to improve OS&H practices and performance throughout the procurement process, or on how to integrate OS&H into all the Contract Documents.

A contractual process for clients

The development of contract documents integrating OS&H and the range of options that could be considered for incorporation into the specific project is summarized briefly below. This follows the 'normal' process of construction projects.

First steps before tendering

From the initial inception of the project, the client should develop and disseminate a clear policy and strategy for safeguarding the safety and health of the workers on the construction project. The policy should be widely publicised so that procuring officers and potential bidders fully understand the client's priorities. .

Selection of consultants

Consultants act on behalf of the client in planning and designing a project and in supervising its construction. They have a responsibility for ensuring that the project is designed, constructed and maintained with minimum risk to the health and safety of the workforce. It is important for the client to remind potential consultants of their responsibility and to set out clearly what will be expected of them.

In a call for expressions of interest, it is important to state the client's objectives for protecting health and safety throughout the design, construction, maintenance and use of the project. The evaluation criteria for short-listing should include objective measures of the consultant's understanding of the major causes of accidents and ill-health on construction sites, including qualifications, courses attended and experience, as well as knowledge of national health and safety legislation and international standards. Consultants should demonstrate their record of performance on past projects, and competence in undertaking risk assessments and identifying prevention measures.

Those submitting full proposals should show how they will meet these objectives in the planning, design and supervision of the project. This should include a proposal for a project-specific Health and Safety plan (HASP) at the design and planning stage and the system for evaluating and managing the OS&H performance of the prime contractor and subcontractors during the selection, bidding and construction phases of the project.

Design Phase

During the design phase, the consultant and other members of the team developing specifications begin the process of translating a vision into an actual construction project. The client will have to stipulate in detail to the contractor the range of acceptable conditions for every aspect of a project. In addition to the technical specifications, the contract must set out responsibilities, rights, and relationships of the client and contractor, and others that may be involved in the project.

Several H&S standards now address specific responsibilities of clients and consultants that must be met as part of the contracting process. These include Health and Safety Management Systems, Hazards Communication, Confined Space Entry and other Permit to Work systems for hazardous tasks, or hazard-specific matters such as working with asbestos, scaffolding or crane erection.

In the United Kingdom, the Construction Design and Management (CDM) Regulations issued in 1994 (see Knowledge Base), set out specific responsibilities for the owner, designer, general contractor, and subcontractors for all construction projects, except very small projects. Requirements include a Safety Planning Supervisor to be appointed to the project and a health and safety management plan to be developed during the design phase.

The consultant should consider OS&H issues during the design phase by incorporating health and safety requirements in the contract for construction and specifying these requirements in the technical specifications. By including OS&H requirements in the contract documents, the contractor is required to implement health and safety activities during construction. The technical specifications should detail the minimum health and safety requirements and the means by which the client verifies compliance during construction.

Procurement (or bidding) phase

Once the contract documents have been prepared, an invitation is made to contractors who may be potential bidders. The client may want to include key OS&H criteria in the Invitation to Bidders, such as contractor pre-qualification criteria (prequalification is explained below). Once an apparent lowest cost or best value responsible bidder is identified, the client may want to require contractor participation in a pre-award meeting so that OS&H performance standards and acceptance criteria are clearly understood before entering into the actual contract. OS&H considerations need to be included for the bid package and invitation to bid, pre-bid meetings, bid review, evaluation and contractor selection, and contract award.

Pre-Construction Phase

The client may require pre-project meetings of stakeholders; project specific risk assessments; and/or require that roles and responsibilities of key actors be defined during this phase. At this point, contractor OS&H submissions must be evaluated against the acceptance criteria incorporated in the specification. The client should decide before the bidding phase what level of activity to require during the Pre-Construction Phase, based upon the complexity and hazards of the project.

Construction Phase

All of the training, permits, submittals, meetings, reporting, job site inspections, and other activities necessary to verify that safety and health hazard controls will be implemented in the construction phase must be established in the contract documents. The contractor demonstrates that the detailed Health and Safety Plan outlined in the specification is being followed while performing the work, and that the selected approach achieves the goals in the specification. The contract documents must establish the contractor's OS&H responsibilities and the client's right to observe the work and receive specified information.

Contractor pre-qualification and selection

In response to serious concerns and liabilities about OS&H, a growing number of construction clients are using qualification-based contractor selection, in which OS&H performance is increasingly considered a determining factor. Clients and construction managers are using contractor OS&H performance criteria in contracts in order to minimise liability, project delays, property damage, workers' compensation costs, and in response to corporate commitments to improve workers' health and safety. Clients should focus particular attention on these construction health and safety risks when initiating a construction project. Increasingly, such risk assessments are performed by contractors in response to requirements incorporated into the bid documents or as a client-required deliverable in the design-build process. Integrated design-build contracts as well as design-bid-build contracts can effectively incorporate many aspects of OS&H at the design phase.

The aim is to improve health and safety practices from design phase, through the bidding and construction phases, all the way to post-construction activities, such as cleaning and maintaining the building. The specific criteria appropriate in a given contract must be evaluated in the context of contractor arrangements and contracting methods. Within the public sector, procurement laws, public bidding laws and associated regulations can include a variety of standards.

Pre-qualification is the first step in identifying responsible candidates for inclusion on the list of firms to invite to bid on the project and may be conducted in two phases: general (relating to the organization as whole) and task/project specific.

Phase 1: General Pre-qualification

This type of prequalification addresses requirements that can be satisfied in advance of any procurement action. Potential contractors are pre-qualified based on certain general criteria, not specifically related to the services and activities involved in the actual work to be contracted. General pre-qualification usually includes information such as past performance indicators as:

- Injury and illness statistics
- Compliance or violations of OS&H laws and regulations
- Enforcement histories
- Insurance ratings
- 'Near miss' incident rates
- Inspection regimes

Phase 2: Project-Specific Pre-qualification

Project-specific prequalification reviews the contractor experience on identical or very similar projects doing essentially the same tasks that are anticipated. This includes their contractor's present capabilities, such as:

- OS&H management systems and programmes
- Project specific OS&H plans
- Safety training provided to management and workers
- Availability and qualifications of construction safety managers and staff
- Training to be provided
- Inspection processes

Detailed review of OS&H in contract conditions

The general conditions of the contract define the overall OS&H responsibilities and requirements for contractors. These provisions are contained in a separate Clause of the contract. In general, these OS&H conditions require the contractor to be responsible for initiating, maintaining, and supervising all safety precautions and programs, while complying with all applicable laws and regulations.

General Prime Contractor and Subcontractor OS&H Requirements

The prime contractor receives payment from the client for services rendered. The prime contractor may employ one or more subcontractors to perform some or all of the work. The client has a direct contractual relationship with the prime contractor, who then has individual contractual relationships with subcontractors. The general conditions of the contract between the client and the prime contractor, as well as the contract between the prime and lower-tiered subcontractors, must clearly define the OS&H responsibilities and requirements for each party. These 'flow down' provisions are requirements of the contract between the client and the prime contractor and must 'flow down' to all subcontractors. The prime contractor is responsible for implementing the overall health and safety programme for the construction project, verifying the implementation of the subcontractor's health and safety programme.

In no case shall the prime contractor be relieved of overall responsibility for compliance with the requirements for all work to be performed under the contract. To the extent that subcontractors agree to perform any part of the contract, they also assume responsibility for complying with the standards in this part of the work. In the case of subcontracted work, the prime contractor and any subcontractor or subcontractors have joint responsibility. For this reason, a common provision in the contract between the prime and subcontractors is that the subcontractor is responsible for OS&H compliance.

Therefore, the prime contractor's contract with the client should also include a provision that requires the prime contractor to conduct a health and safety selection process on subcontractors. The client's contract with the prime contractor should also contain the right to review OS&H documents and to visit the project site while work is ongoing.

Pre-construction and regular coordination meetings between the owner and the prime contractor, as well as between the prime contractor and lower-tiered subcontractors should be specified in the contract documents to allow for sufficient health and safety planning, risk assessment, and coordination during the course of the project.

OS&H work plans and schedules

The prime contractor should be required, in a clause clearly stated in the contract, to submit their company health and safety policy and a project specific health and safety plan (HASP) addressing all applicable OS&H requirements. The detail and complexity of the HASP will be dictated by the size and complexity of the project. Normally, the prime contractor is responsible for preparing the project-wide HASP that addresses potential hazards that may be present on the worksite (e.g fall protection risks and requirements). This project-specific HASP details the hazards posed by construction, the means and methods to be used for preventing or controlling them, and provides adequate safeguards for all construction workers. The prime contractor should require subcontractors to submit a project specific HASP addressing the tasks they will perform.

The specification for the HASP should also indicate how the contractor will address any specific hazards identified in the scope of work. Contractors that do not effectively assess hazards and protect their employees should be excluded from bidding by using safety and health performance and information as selection criteria.

To the extent possible the plan should include risk assessments for each phase or task of the work. This should address the basic steps to perform each phase of work, the hazards associated with each step and a description of how the contractor plans to prevent or control the risks.

On some projects, it is important that the contractor demonstrates they have written procedures to perform certain tasks or types of work. If the scope of work includes work activities such as confined space entry, use of hazardous chemicals, excavations, construction of scaffolds, etc., the contractor should be required to submit their operating procedures for the work.

In the contract, the prime contractor should also have a qualified safety officer at the project site responsible for implementing the HASP. The safety officer should be required to attend all project safety meetings and participate in all activities outlined in the HASP. The prime contractor should require subcontractors to designate a qualified safety representative at the project site with the responsibility for implementing each subcontractor's HASP.

The prime contractor should be required to provide a detailed schedule of work activities with their bid, with the duration of each work activity shown. The prime contractor should require similar schedules from its lower-tiered subcontractors and integrate these into a master schedule for the project. The prime contractor's schedule should be required in the contract documents to be maintained current with updated schedules provided to the client at regular intervals.

The proposed hours of operations and days per week the contractor is allowed to work on site is usually stipulated in the contract documents. OS&H issues should be considered in the overall project schedule, because the work schedule and construction sequence is likely to have heath and safety impacts. For example, the amount of night work and overtime should be kept to a minimum to better prevent incidents that can result from fatigue and inadequate lighting. Seasonal considerations should also be taken into account; health and safety concerns to consider may include heat stress, cold stress, inclement weather, biological hazards (e.g. poisonous plants, insects, and animals), and other concerns.

Another safety hazard that should be considered during schedule development is the prevention of falls. Timely erection of permanent stairways and handrails may prevent slips, trips, and falls associated with temporary stairs and scaffolds. The schedule should be designed so that a permanent stairway is constructed at the beginning, or as close as possible to the start of construction. The schedule could also specify that permanent handrails be erected along with the structural steel. The scheduled installation fire protection devices, such as automatic sprinkler systems, fire walls, and fire doors should be planned for the earliest possible time during construction. The permanent electrical systems and equipment should also be installed at the earliest time in the project to control hazards posed by temporary electrical systems.

Employees

The contractor should be required to submit Curriculum Vitae (CVs) of key personnel identified in the specifications. Bidders should be required to submit CVs for key positions, such as:

- Site Supervisor. The CV should demonstrate that the person has appropriate training, experience, and qualifications to execute the project safely.

- OS&H specialist personnel. The CVs should demonstrate adequate training, experience, and qualifications to execute responsibilities.

- 'Competent Persons'. Some activities have to be supervised by 'competent persons'. These activities include scaffold erection, excavation work and confined space entries. 'Competent persons' for specific activities should be submitted for review, and should demonstrate training, experience, and authority on the project to carry out their responsibilities.

The prime contractor's employees and those of their subcontractors should be required to provide written documentation that they have completed all appropriate health and safety training before working on site. This will include health and safety orientation training, and any specific project health and safety training and hazardous operation training.

The prime contractor and subcontractors should be required to hold regular safety meetings to instruct their employees on all project-related safety procedures and to provide appropriate personal protective equipment to their employees, provide training in its use and enforce the use of the protective equipment.

OS&H incidents

In the contract with the client, the prime contractor is usually required to notify the client immediately following any OS&H incident, with a detailed written report and to comply with reporting and record-keeping requirements. The prime contractor flows-down the accident notification and reporting requirement to subcontractors, so that all incidents that occur during the course of the project are reported and investigated in a timely manner.

OS&H Pay Items

Although the general costs of operating good OS&H should be incorporated in the contract costs, there will be items in many contracts that enable the contractors and sub-contractors to be paid for compliance. These 'pay items' should be specified in the contract documents, in particular the acceptance by the client of the prime contractor's HASP for the project. These pay items are usually paid as a lump sum, but may also be itemised in a Bill of Quantities.

OS&H pay items may include:

- Different hourly rates for personnel to work in upgraded levels of personal protective equipment (such as respiratory protection)

- A lump sum for providing a qualified full-time health and safety officer for the duration of the project

- A lump sum for establishment and proper functioning of an OS&H Committee

- A lump sum for contractors and personnel attending any required OS&H orientation training

- A unit rate or lump sum for specific air monitoring, air sampling and analysis required to implement industrial hygiene or air quality monitoring, as may be required by the technical specifications

Project Specific Hazards Information

In order to initiate effective OS&H processes and procedures during the contract, specific hazards should be identified in the contract documents. These may include:

- Areas where the work or a portion of the work is to be performed is defined as a confined space

- Any potential fire, explosion or possible release of toxic or hazardous materials associated with the work or in the area where the contractor will be working

- Information related to emergency response and evacuation plan, such as:
  - Alarm systems
  - Evacuation routes
  - Areas of safety and assembly points

- Any hazardous materials or chemicals that are used in the area the contractor may be working, signs and symptoms of exposure, special protective equipment requirements, and copies of specifications for those materials or chemicals

- Known or suspected areas that may have hazardous materials or hazardous contaminants that could affect the contractor's employees or others by the contractor's work, such as the presence of asbestos, lead-based paint, or soils contaminated with hazardous materials

- The presence of other contractors that may be performing work in the same area and any hazards associated with their work such as:
  - Welding or cutting
  - Use of heavy equipment
  - Heavy lifts or use of cranes

- The presence of underground pipes or cables, overhead electrical power-lines

- Construction or demolition activities in an existing structure that could pose a structural collapse hazard if the contractor is not made aware of the existing structure’s loading conditions and structural integrity

- Any health and safety requirements specified such as:
  - 100% fall protection
  - Use of hard hats, safety glasses, gloves, respiratory protection and safety footwear
  - Collection and maintenance of Material Safety Data Sheets for hazardous chemicals brought to the site

- Any special work permit requirements such as:
  - Hot work permits needed to coordinate use of spark and flame producing activities such as welding, grinding, or torch cutting
  - Excavation permits to coordinate excavations and ensure the contractor has all needed information for a safe excavation
  - Lock Out/Tag Out permits to coordinate the lock out or tag out of equipment
  - Scaffold erection and inspection to allow all contractors to understand the status of scaffolds present on a project
  - Lift permits to coordinate lifts with cranes
  - Chemical use permits that coordinate the use of chemicals or other materials on a project that could expose other site personnel to airborne hazards such as fumes, vapours, mists, dust, fire or explosion hazards

- The client or prime contractor should require contractors to document implementation of their health and safety programme and address requirements for personal protective equipment, chemical hazard communication, performing periodic health and safety inspections, emergency response procedures, tool and equipment inspections, fire protection, vehicle safety, and site security.

Licences, Certifications and Training Documentation

The contractor should submit copies of all licences, certifications, and training documents. These would include:

- Company and individual employee licenses for work as a general contractor, contractor or specialty work, such as asbestos abatement, crane and equipment operators, or other work that requires specific licenses

- Certificates of inspection for cranes or other heavy equipment

- Certificates of insurance indicating the contractor is adequately insured for general liability and workers' compensation

- Certification and training documentation in key areas such as welding, electrical work, confined space entry, hazardous waste, site health and safety, asbestos abatement, crane and equipment operations, scaffold erection, excavations, etc.

Implementing the OS&H requirements of the contract during the project

Induction

New employees and visitors to the project should be required to attend an initial OS&H induction that covers the site-specific rules and procedures that must be followed and the disciplinary action that may result if such procedures are not respected.

Inspections

The purpose of OS&H inspections is to ensure that the project is performed in accordance with established standards. There are different types of inspections: self-inspections, equipment inspections and formal safety and health audits. Each contractor on site should be required to perform daily OS&H inspections of their respective work area. In addition, the prime contractor should conduct a minimum of weekly walkthrough inspections of the entire work site and note problems that need to be corrected. These must be communicated to the respective sub-contractors and followed up to ensure that incidents of lack of compliance are corrected. All inspections need to be documented to provide a record of what was found and corrective actions needed or taken. Copies of all inspection reports and follow-up actions should be submitted to the client.

The contract documents should reflect that the client has the right to perform site inspections and observations of construction operations. The purpose of these types of inspections is typically for the owner to have a mechanism to ensure that contractual safety and health obligations are being satisfied throughout the performance of the work.

Site OS&H Meetings

Since conditions are constantly changing on site, regular site meetings are essential to the OS&H performance on the site. The contractor should conduct the meetings but the client will want to establish the right to attend these meetings to help monitor compliance with the contract.

Weekly safety meetings should be held by all contractors and sub-contractors on the site to review safety conditions and ensure any corrective actions are taken. The prime contractor should be required to be at all of these meetings to hear the concerns that are raised and to make sure they are addressed in a timely manner.

Safety Documentation

Numerous documents are created as part of the OS&H processes. These documents are useful during the construction phase to monitor and continuously improve safety performance. Requirements for safety documentation must be incorporated into the contract documents.

Incident/injury reporting

Contractors and sub-contractors should be required to provide to the client immediate notification of incidents (including ‘near miss-events’) and injuries. The contractor should be required to conduct an investigation of the incident to identify the root causes and corrective actions to prevent further incidents (accidents). Submittal of the investigation report by the prime contractor should be required within 24 hours

Hazardous work permit system

Depending on the nature of the site, a hazardous work permit system may be instituted on site to ensure that essential precautions are followed when working in a hazardous area. Such permits may include confined space entry permits, hot work permits, or work at height permits. Such site-specific hazards and procedures should be included in the project specification and discussed in the initial project safety orientation meeting. Any applicable hazardous work permit system should be specified in the solicitation documentation.

6 RELEVANT ELEMENTS OF THE KNOWLEDGE BASE

Title	Managing construction projects: A guide to processes and procedures
Author(s)	Edited by A D Austen and R H Neale
Type of source	Book, 158 pages
Publication or other source details	International Labour Office, Geneva
Date & ISBN/ISSN	1984. 92-2-103553-0
Summary of contents	Introduction A building project A civil engineering project Organisation and management functions Planning Procurement Control Health and Safety Communication and reporting Planning techniques Appendices: checklists, job description for a project manager, glossary, select bibliography
Comments on relevance	Although now an old book, it provides a clear and straightforward review of the topic in an international context, much of which is still relevant. It forms the basis of the project management element of **Construction OS&H**
Other information	Note that Chapter 8 gives a simple review of OS&H under the following headings: Objectives; participants; principal factors; activities; causes of accidents; project management team functions.

Title	Managing international construction projects: an overview
Author(s)	R Neale (Ed)
Type of source	Book, 239 pages
Publication or other source details	International Labour Office, Geneva. International construction management series No 7
Date & ISBN/ISSN	1995. 92-2-108751-4 & 4020-0142
Summary of contents	An edited book with contributions from Richard Neale, Williams Sher, Alistair Gibb and Simon Barber Chapters 1: Construction project management 2: Project management organisation 3: System support for projects 4: Control of quality and quality assurance 5: Site layout and facilities 6: Key considerations for site layout and facility planning 7: Construction site safety 8: Planning case studies 9: Cost analysis case study
Comments on relevance	A useful but very general book, apart from the case studies which are quite detailed. This is the last book (No7) in the series so some detailed case studies were seen to be useful. The planning case study has been adapted to provide an integrative project on OS&H for **Construction OS&H**
Other information	See Tutor's Guide for more on the content of this book.

Title	Construction safety management
Type of source	Book and PowerPoint Presentation
Publication or other source details	Tim Howarth, Paul Watson Paperback, 216 pages, Wiley-Blackwell http://eu.wiley.com/WileyCDA
Date & ISBN/ISSN	2008. ISBN: 978-1-4051-8660-5
Summary of contents	An up-to-date textbook on the subject. Very oriented towards being used in an educational course, contains exercises and questions. The web site offers a PowerPoint Presentation on site induction and self-assessment questions. Contents: Introduction: Health and Safety – Overriding Principles. Chapter 1 The Safety Performance of the UK Construction Industry. Chapter 2 The Legal Framework and Enforcement of Construction Health and Safety. Statutory Instruments. Chapter 3 UK Construction Health and Safety Law. Chapter 4 The Construction (Design and Management) Regulations 2007. Chapter 5 Key Site Health and Safety Hazards and Control Measures. Chapter 6 Principles and Practice of Health and Chapter 7 Managing for Health and Wellbeing. Chapter 8 The (Principal) Contractor's Health and Safety Management System. Chapter 9 Promoting a Positive Health and Safety Culture.
Comments on relevance	Entirely based in a UK context, but contains generally useful materials.

Title	The construction (Design & Management) Regulations 2007
Type of source	This is a legal document approved by the UK Parliament.
Publication or other source details	Crown copyright 2007 UK: The Stationary Office Limited
Date & ISBN/ISSN	This is an Act of the UK Parliament Came into force 6 April 2007
Summary of contents	Comprehensive statutory instrument. Known as the 'CDM Regs', these regulations impose very strong safety and health requirements on clients, designers and contractors, and set out ways in which this function must be organised and implemented. Although specific to the UK, a substantial amount of this document is of general application.
Comments on relevance	Very relevant throughout