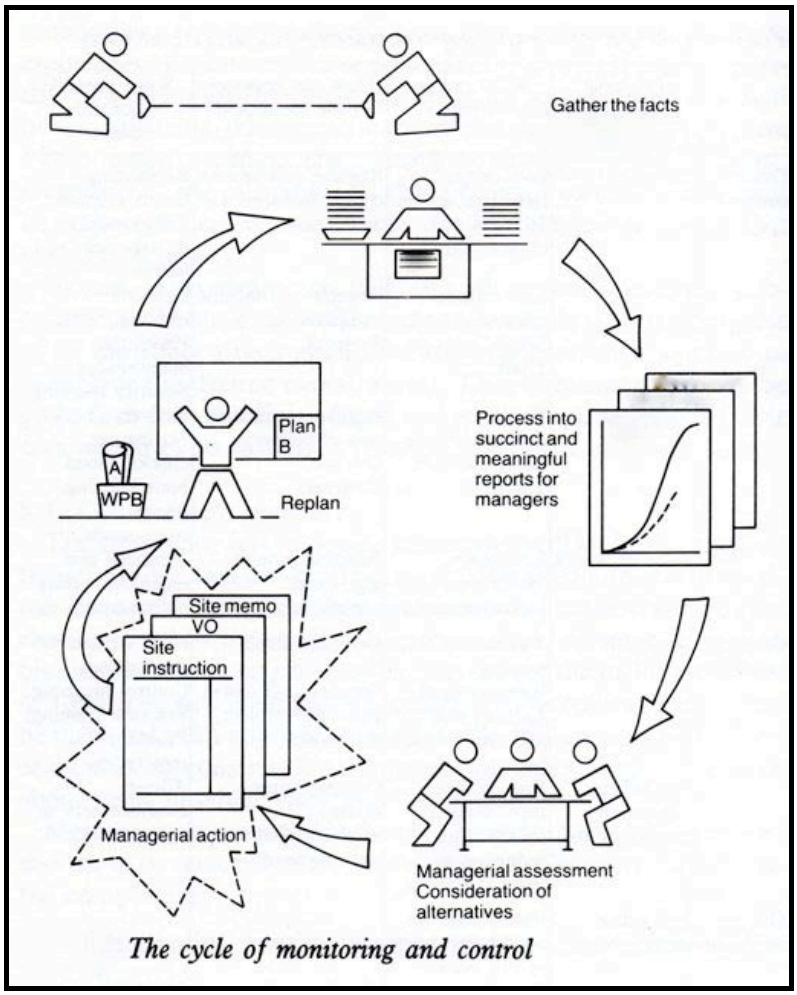
ILO CONSTRUCTION OS&H

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

THEME SUMMARY 6:
PROJECT PLANNING AND CONTROL FOR OS&H



(From "Construction Planning" by Neale & Neale)

Summary of content	
1.	Preface
2.	General principles of project planning and control
3.	OS&H by design as a key element of project planning and control
4.	OS&H performance measurement and management
5.	Role and responsibilities of safety specialists
6.	Relevant elements of the Knowledge Base

1 PREFACE

This Theme Summary reviews the theory and practice of project planning and control, within the context of effective OS&H. It begins with an explanation of the general principles, and this is followed by a description of how designers can assist in making construction safer. Planning alone is not enough; there has to be good follow-up, so performance measurement and management is discussed. As construction projects and the legislation governing them become more complex, there is an increasingly important need for specialists in OS&H, and a description of their contribution concludes this Theme Summary.

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

This Theme Summary is largely taken from two ILO books and a specialist book on construction planning:

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

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

3. "Construction Planning". By Richard H Neale and David E Neale.

The first book – 'the 'ILO Guide' - was devised as an accompaniment to a series of ILO training courses in African countries, and has been translated into a number of languages. The second book – the 'ILO Overview' - is the final (No 7) volume in the ILO's International Construction Management Series. Both were fully reviewed by international experts during their development.

The third book was written as a partnership between a lecturer in construction management and the chief executive of a medium sized construction company, so it is based on a good blend of theory and practice.

A fourth book has provided some useful information on planning for OS&H:

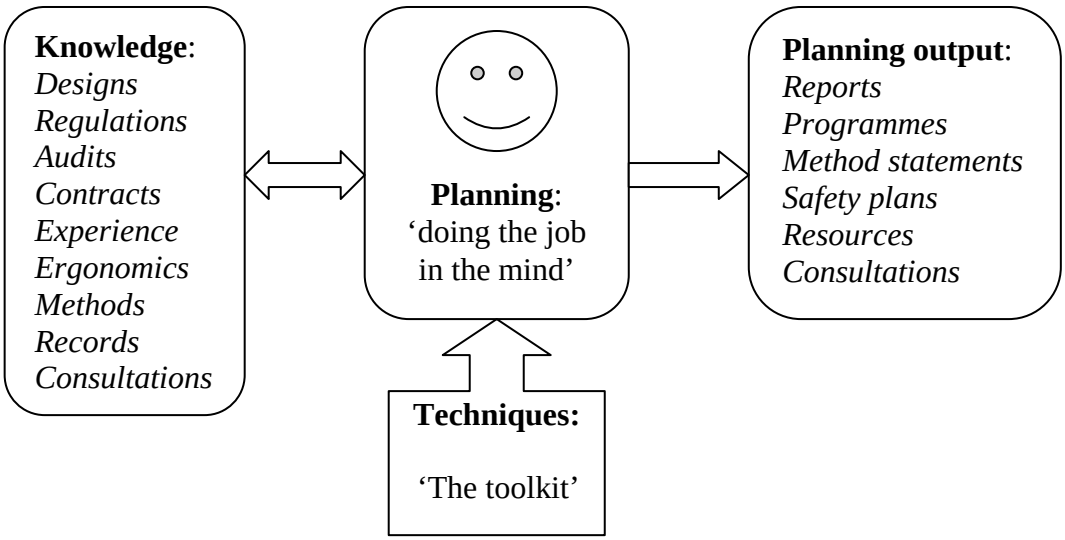
4. "Construction safety management" by Tim Howarth and Paul Watson.

Details of all four books are given in the "Relevant elements of the Knowledge Base" Section of this Theme Summary.

Finally, a Section on 'OS&H by design as a key element of project planning and control' has benefited from the excellent web site of the USA OSHA Alliance 'Design for construction safety': http://www.designforconstructionsafety.org/. This is also summarised in the "Relevant Elements of the Knowledge Base".

2 GENERAL PRINCIPLES OF PROJECT PLANNING AND CONTROL

The diagram below illustrates the construction planning process.



The process has four main elements.

Knowledge is the key to good planning and a large amount of data is often available, especially in the 'digital age'. All those who are or will be involved will usually have some knowledge to contribute to the plan, including experienced workers. This knowledge is usually explored through project team discussions, analyses and technical plans.

Planning is the mental process of thinking through how the work will be done, by whom and with what machinery and equipment. A common and dangerous approach is to plan entirely on the basis of the technicalities of construction and then 'try to make it safe' afterwards. OS&H should be at the forefront of this process of building in the mind, through continually asking such questions as: 'who will do this?"; 'how will they get to it?'; 'what safety precautions will be required?'; 'what training or instruction will be needed?'.

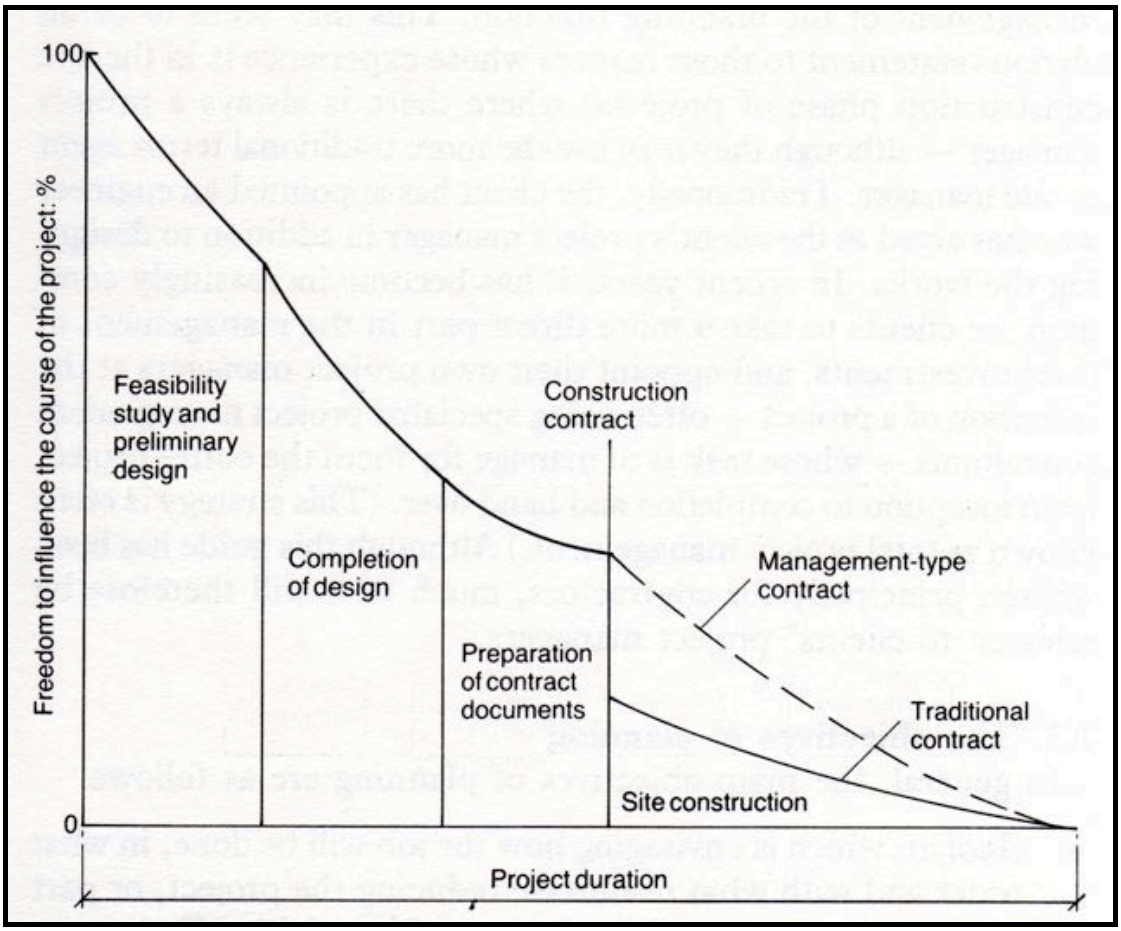
Techniques include commonly used construction planning techniques (the planning 'toolkit') but also hazard and risk analyses and method statements, and 'toolbox' meetings to brief the workers. Construction planning techniques are described in Chapter 10 of the ILO Guide; one reviewer described this Chapter as 'a masterpiece of clarity' so no attempt will be made to re-write it; it is a recommended component part of **Construction OS&H**. Hazard and risk analysis and method statements are explained in Theme Summary 7: "Processes and systems".

Planning output is the completed analyses for implementing the construction of the element of the work under consideration. This output must include formal requirements for consultation, explanation, and approval for each part of the work before it is executed.

There are two major OS&H considerations when planning a construction project: the importance of early decisions and the level of detail.

Early decisions

The diagram below illustrates how the ability to influence the course of a project diminishes as the project progresses. At the very beginning of a project, the client, designers and the project managers may have almost a 'blank sheet of paper', but after contracts have been let and work has started, any changes can become wasteful and expensive.



(From "Construction Planning" by Neale & Neale)

An example of an early decision is given in the two photos below, which show the installation of the cladding of a major building. An early decision was made to prefabricate the cladding, rather than to erect it piece-by-piece, *in-situ*. So, the whole construction process of erecting scaffolds and causing workers to assemble complex combinations of components outside and often at height was removed to the relatively safer and climatically kinder environment of a factory, and the erection process became an exercise in lifting and installing quite large elements.

Lifting a panel from the special frame on the low-loader.

(From Chartered Institute of Building (CIOB) "Prefabricated modules in construction")

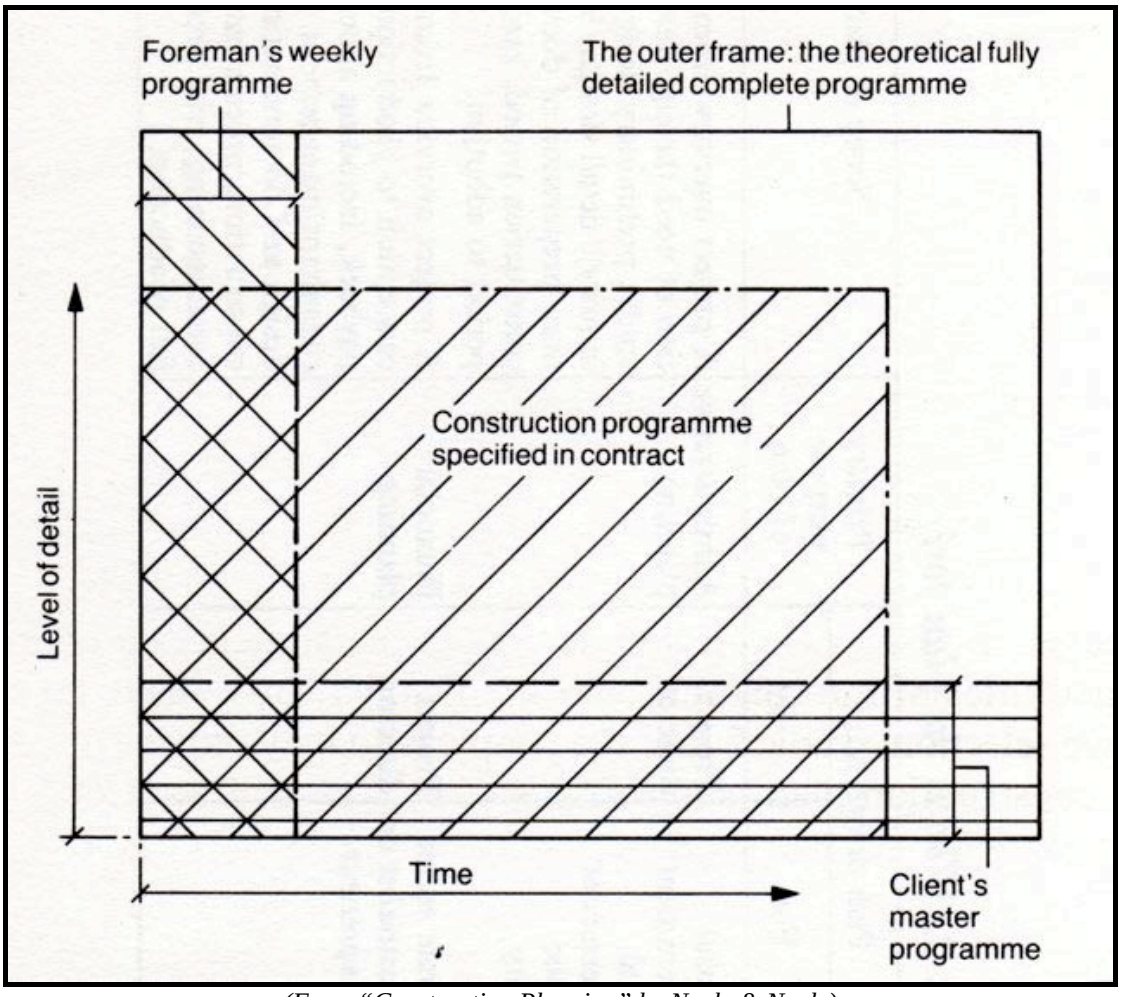

Panel being hoisted into position.

(From CIOB "Prefabricated modules in construction")

Whatever the comparative benefits and problems may have been for these two alternatives, the OS&H assessments would have been dramatically different. In practice, although the prefabricated alternative appears to be more dangerous, the methods used were considered to offer a safer overall solution and the erection team had an excellent safety record.

Level of detail

It is impossible to plan large projects in detail at the outset. The task is too great, the uncertainties considerable and as the project teams' understanding of the project deepens as the work progresses, better solutions may be found. So, planning has to be done in a progressive way, suitable for the time scale and the level of detail required by those who have to implement the plans. This is illustrated in the diagram below.



(From "Construction Planning" by Neale & Neale)

Thus, the OS&H planning philosophy must be to try to assess major hazards and risks at an early stage of the project, so that major decisions can be taken with occupational safety and health in mind, which should aid the detailed hazard and risk analysis at the supervisory level as the construction work is physically undertaken.

3 OS&H BY DESIGN AS A KEY ELEMENT OF PROJECT PLANNING AND CONTROL

The importance of 'early decisions' in the planning of OS&H means that the designers' role in **Construction OS&H** is crucial. Designers can have a substantial influence on the overall safety and health of the employees on a project, but the necessary systematic processes and techniques do not yet exist.

A useful starting point is the USA 'Prevention through design' (PtD) web site:
http://www.designforconstructionsafety.org/concept.shtml

"What PtD is:

- *Explicitly considering the safety of construction workers in the design of a project*
- *Being conscious of and valuing the safety of construction workers when performing design tasks*
- *Making design decisions based in part on how the project's inherent risk to construction workers may be affected*
- *Including worker safety considerations in the constructability review process*

What PtD is not:

- *Having designers take a role in construction safety DURING construction*
- *An endorsement of future legislation mandating that designers design for construction safety*
- *An endorsement of the principle that designers can or should be held partially responsible for construction accidents*
- *Implying that the vast majority of U.S. design professionals are currently equipped to design for construction safety"*

This web site also provides a link to the Australian 'CHAIR' web site:
http://www.workcover.nsw.gov.au/Publications/OHS/SafetyGuides/Pages/chairsafetyindesigntool.aspx

"CHAIR (Construction Hazard Assessment Implication Review) is a tool to assist designers, constructors, clients and other key stakeholders to come together to reduce construction, maintenance, repair and demolition safety risks associated with design."

The USA 'Prevention through design' (PtD) web site also offers a PowerPoint presentation "Design for Construction Safety (DfCS) 2 to 4 Hour Course".

The concept is best illustrated through examples.

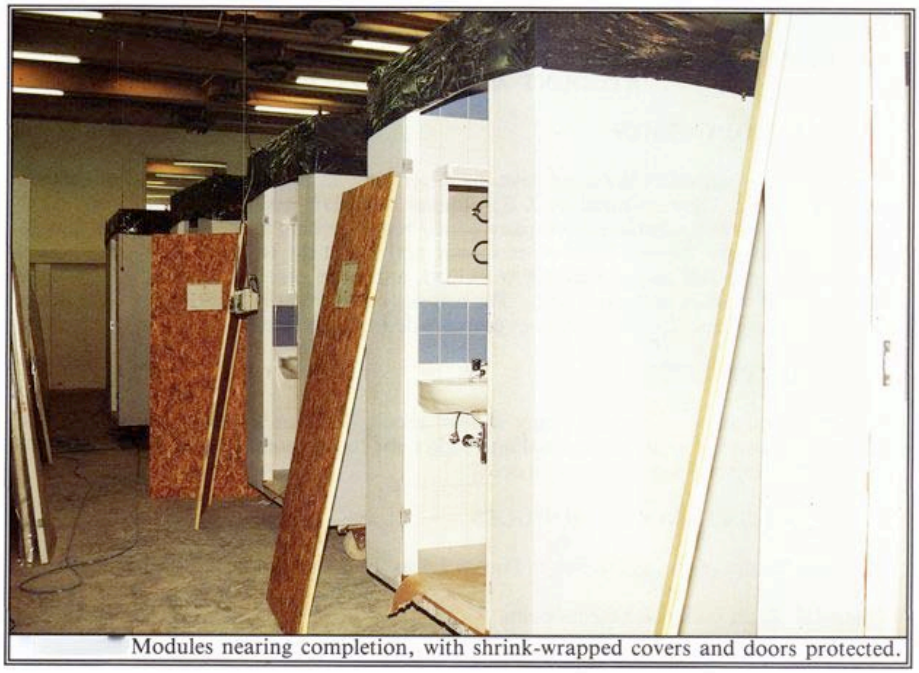
Prefabrication or off-site construction

The photos of the prefabricated cladding panels shown in Section 2 above are a good example of how the construction process can be moved from the site to a factory. A second case study from the same research project is shown in the three photos below.

A company in Denmark specialises in the manufacture of off-site bathroom units for hotels and similar applications. The units are absolutely complete when they leave the

factory, and are transported by road all over Europe. When they reach the building under construction, they are lifted onto a platform at the appropriate floor by a crane and moved down the corridor on a specially made trolley. This is a well-planned operation and has a very good safety record.

The workers benefit from factory rather than site conditions, and the ergonomic advantages are obvious from the third photo; had it been on site the tiler would be working in cramped conditions on his knees.



Modules nearing completion, with shrink-wrapped covers and doors protected.

(From CIOB "Prefabricated modules in construction")

Modules installed at corridor end of rooms, forming most of the end wall.

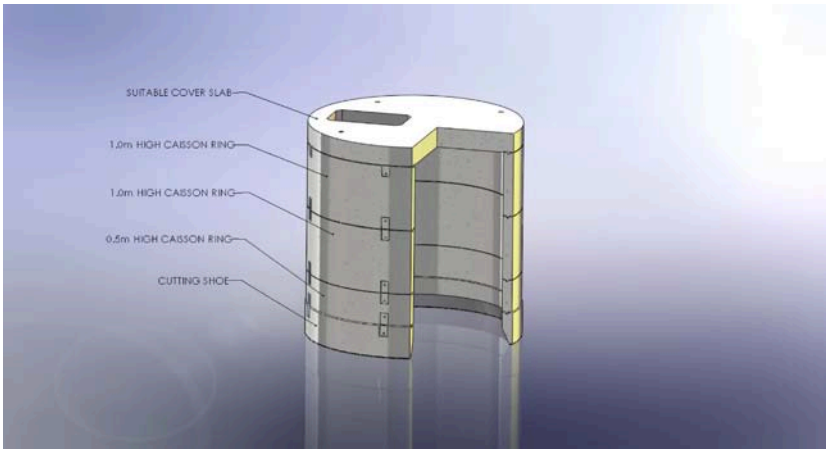
(From CIOB "Prefabricated modules in construction")

Tiling the base, before fitting the walls. Much easier than working on site.

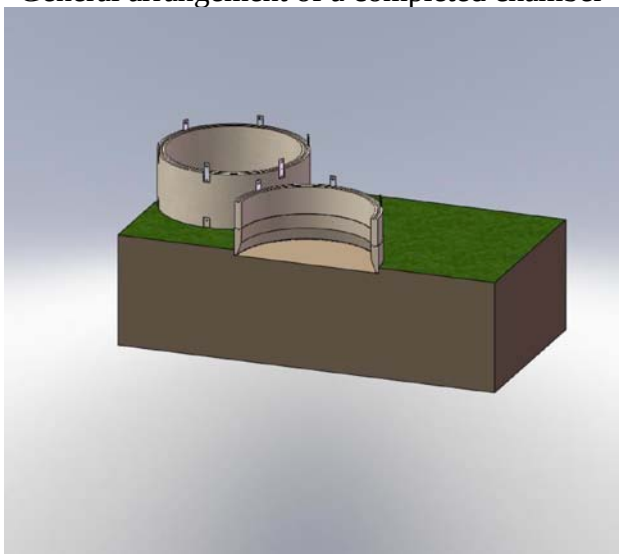
(From CIOB "Prefabricated modules in construction")

Use of caissons for working below ground level

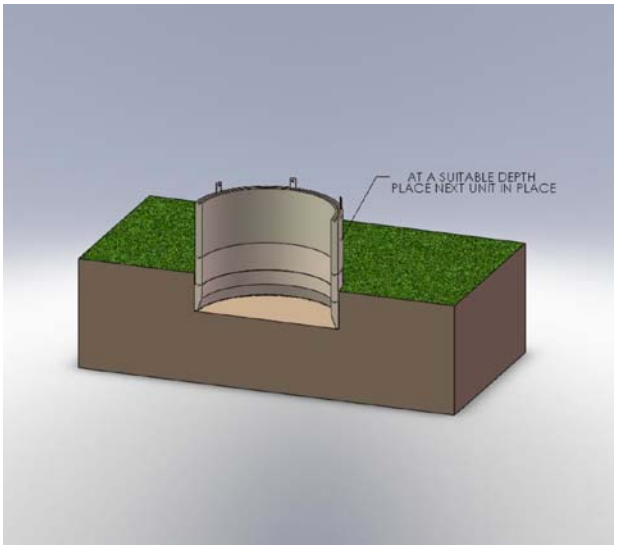
A further example of prefabrication is shown below. In the construction of manholes to give access to drainage systems, the conventional method is to excavate a suitably sized hole then build the manhole upwards from the base with pre-cast concrete rings. The method shown in the box below allows the rings to be pre-assembled on the ground, with the rings sitting on top of a concrete or steel 'cutting shoe' that is slightly bigger than the external diameter of the manhole. The manhole is then excavated relatively safely from the inside, and it slides into the ground under its own weight as the excavation proceeds. Thus the ground is supported throughout by the permanent structure (the concrete rings) so eliminating the need for temporary supports. (Note: this is a good technique but, as the principal author of **Construction OS&H** discovered on one project, it requires skill to execute effectively.



General arrangement of a completed chamber



Starting with the shoe and a ring, excavation can start



Another ring is added as the chamber goes down

An actual installation, showing bulk excavation using a grab on an excavator

Hand excavation at the cutting shoe,
allowing the caisson to sink in a controlled way

The ILO is very grateful to Milton Precast, and especially Linda Curson, for the five images above. They can be contacted at:

Milton Pipes Limited
Cooks Lane
Sittingbourne
Kent ME10 2QF
United Kingdom
www.miltonprecast.com

[The parent company is now CPM Group Ltd: www.cpm-group.com]

'Trenchless pipelaying'

Laying pipes in the ground usually requires excavating a trench to the required depth and laying the pipes in it. Trench-work is one of the most dangerous construction activities, so methods to eliminate it will be beneficial.

Some excellent literature is available for free download from:
Pipe Jacking Association
10 Greycoat Place
London SW1P 1SB
Telephone +44 (0) 845 0705201
Facsimile +44 (0) 845 0705202
Email andrew.marshall@pipejacking.org

For example: Guidance For Designers:

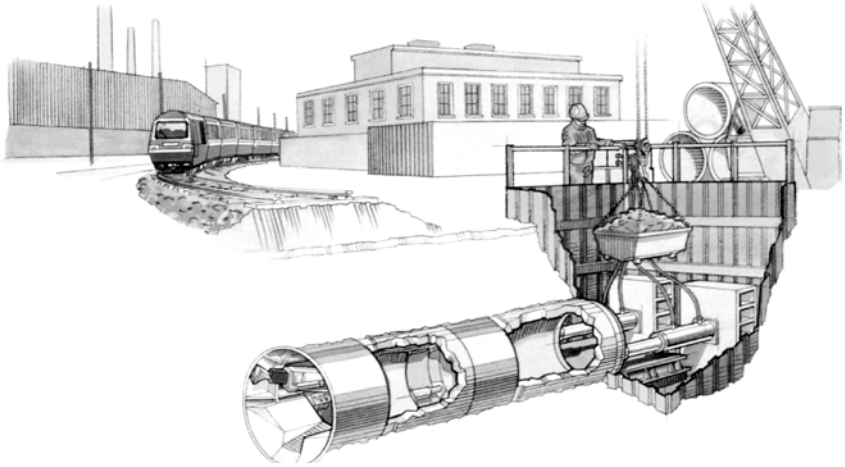
- An introduction to pipe jacking and microtunelling design
- Tunnelling and Pipe Jacking: Guidance for Designers
- Preferred Pipe Sizes
- Guidance on the design of hand excavated pipejacks

Some excellent research papers are also available from this web site.

This is a very helpful organisation and the ILO would like to express its appreciation of the contribution it has made to Construction OS&H.

The following explanation is taken from a section from the Association's web site entitled "About the technique"

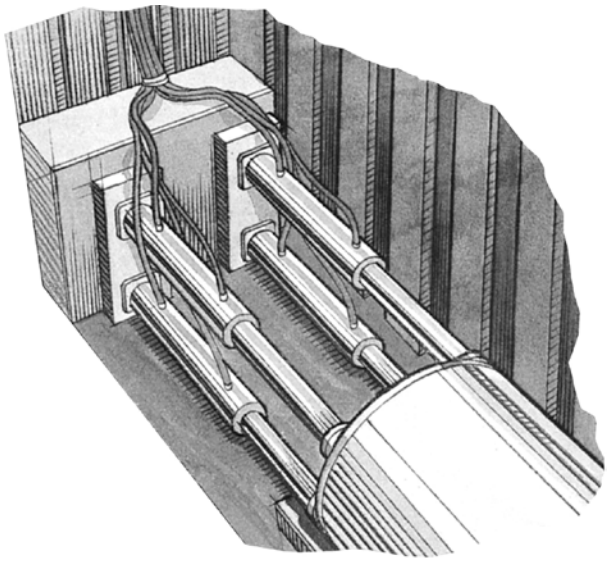
"Pipe jacking, generally referred to in the smaller diameters as micro-tunnelling, is a technique for installing underground pipelines, ducts and culverts. Powerful hydraulic jacks are used to push specially designed pipes through the ground behind a shield at the same time as excavation is taking place within the shield. The method provides a flexible, structural, watertight, finished pipeline as the tunnel is excavated. The pipe jacking technique and its components have been subject to extensive and ongoing research at leading UK universities including both Oxford and Cambridge.



There is no theoretical limit to the length of individual pipe jacks although practical engineering considerations and economics may impose restrictions. Drives of several hundred metres either in a straight line or to a radius or a series of radii are readily achievable. A number of excavation systems are available including manual, mechanical and remote control. Pipes in the range 150mm to 3000mm can be installed by employing the appropriate system. Construction tolerances are comparable with other tunnelling methods, and the pipe jacking method generally requires less overbreak than segmental tunnels and provides ground support and reduces potential ground movement.

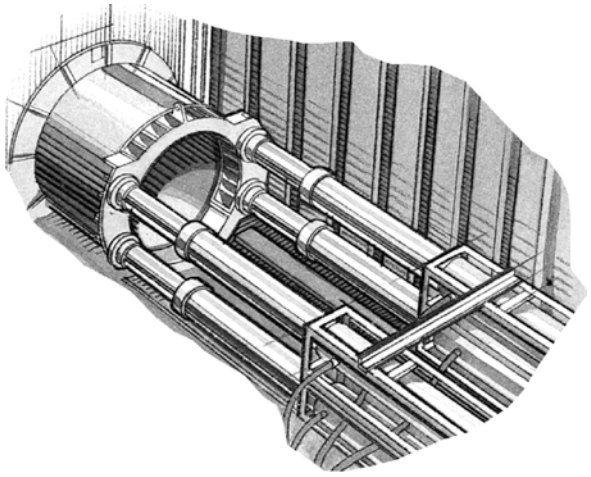
Mechanical excavation methods are similar to those employed in other forms of tunnelling. Shields, excavation and face support can be provided for a wide variety of ground conditions.

In order to install a pipeline using this technique, thrust and reception pits are constructed, usually at manhole positions. The dimensions and construction of a thrust pit vary according to the specific requirements of any drive with economics being a key factor. Pit sizes will vary according to the excavation methods employed, although these can be reduced if required by special circumstances.



A thrust wall is constructed to provide a reaction against which to jack. In poor ground, piling or other special arrangements may have to be employed to increase the reaction capability of the thrust wall. Where there is insufficient depth to construct a normal thrust wall, for example through embankments, the jacking reaction has to be resisted by means of a structural framework having adequate restraint provided by means of piles, ground anchors or other such methods for transferring horizontal loads.

To ensure that the jacking forces are distributed around the circumference of a pipe being jacked, a thrust ring is used to transfer the loads. The jacks are interconnected hydraulically to ensure that the thrust from each is the same. The number of jacks used may vary because of the pipe size, the strength of the jacking pipes, the length to be installed and the anticipated frictional resistance.



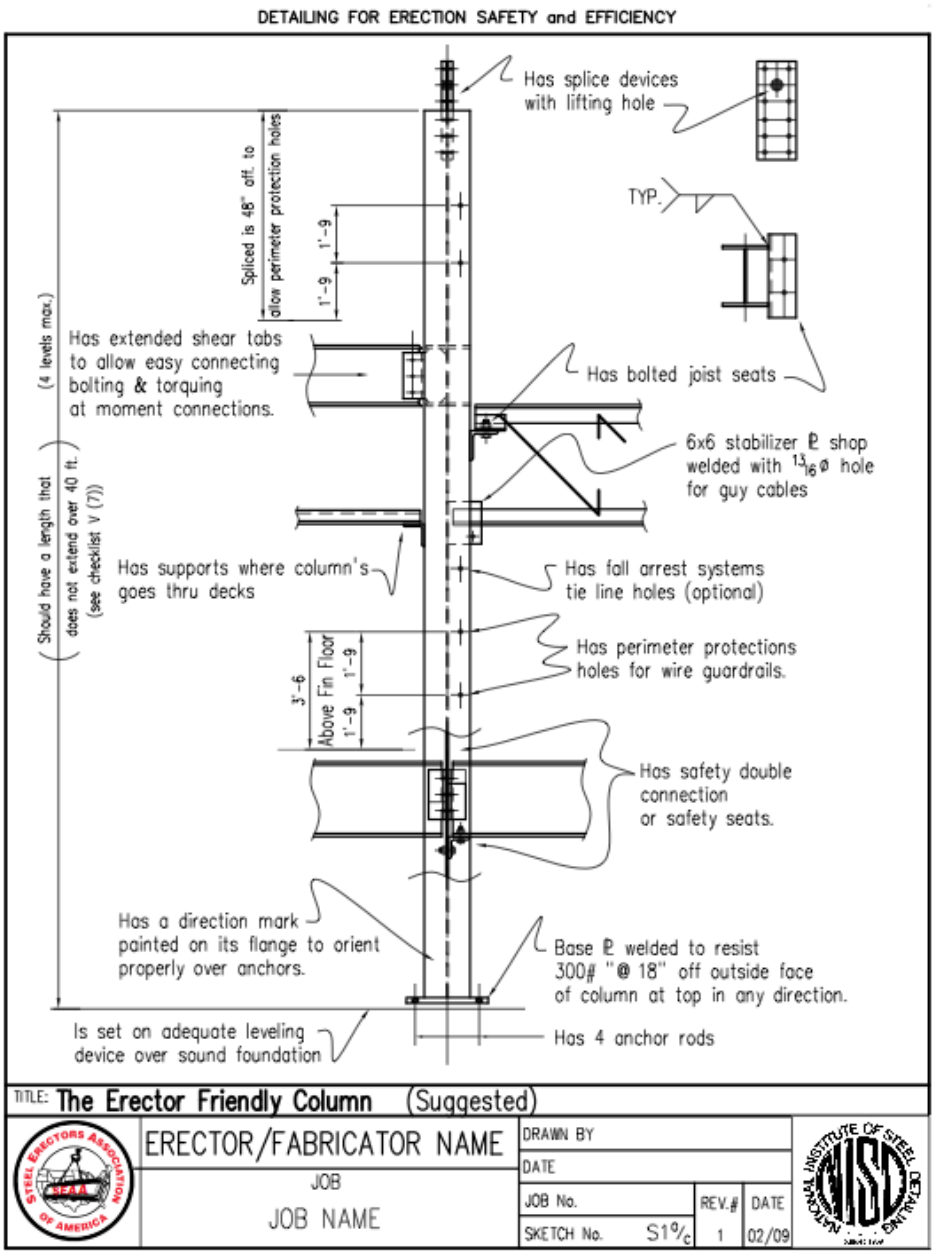
A reception pit of sufficient size for removal of the jacking shield is normally required at the completed end of each drive. The initial alignment of the pipe jack is obtained by accurately positioning guide rails within the thrust pit on which the pipes are laid. To maintain accuracy of alignment during pipe jacking, it is necessary to use a steerable shield, which must be frequently checked for line and level from a fixed reference. For short or simple pipe jacks, these checks can be carried out using traditional surveying equipment. Rapid excavation and remote control techniques require sophisticated electronic guidance systems using a combination of lasers and screen based computer techniques.

When the pipejack or microtunnel is carried out below the water table it is usual to incorporate a headwall and seal assembly within each thrust and reception pit. The use of these items prevents ingress of ground water and associated ground loss, and retains annular lubricant."

A good practical example is shown on the web site of the Drainage Services, Department of the Government of Hong Kong Special Administrative Region: (http://www.dsd.gov.hk/EN/Sewerage/Technology_Employed/Pipe_jacking___Microtunneling/index.html). This site also provides some photographs of the technology in action.

The 'erector friendly column'

The prefabricated and trenchless pipelaying examples showed how some common hazards could be avoided. The erector friendly column shows how a simple steel component can be made in such a way that it becomes easier and safer to erect. These drawings were provided by the National Institute for Steel Detailing [http://www.nisd.org] and the Steel Erectors Association of America [http://www.seaa.net/]. The ILO is very grateful for the enthusiastic support provided by these organisations.


DETAILING FOR ERECTION SAFETY and EFFICIENCY
Has splice devices with lifting hole
TYP.
Spliced is 48" aff. to allow perimeter protection holes
1'-9
1'-9
(4 levels max.)
Has extended shear tabs to allow easy connecting bolting & torquing at moment connections.
Has bolted joist seats
6x6 stabilizer ℄ shop welded with 13/16ø hole for guy cables
Should have a length that does not extend over 40 ft. (see checklist V (7))
Has supports where column's goes thru decks
Has fall arrest systems tie line holes (optional)
3'-6
Above Fin Floor
1'-9
1'-9
Has perimeter protections holes for wire guardrails.
Has safety double connection or safety seats.
Has a direction mark painted on its flange to orient properly over anchors.
Base ℄ welded to resist 300# "@ 18" off outside face of column at top in any direction.
Is set on adequate leveling device over sound foundation
Has 4 anchor rods
TITLE: The Erector Friendly Column (Suggested)
ERECTOR/FABRICATOR NAME
JOB
JOB NAME
DRAWN BY
DATE
JOB No.
REV.#
DATE
SKETCH No. S1%c
1
02/09

DETAILING FOR ERECTION SAFETY and EFFICIENCY

COLUMN CHECKLIST:

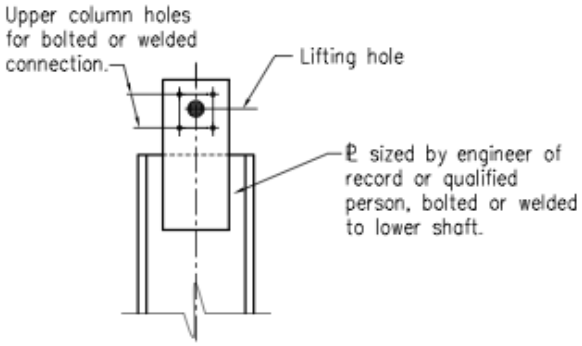
1) Single shaft when possible (Lengths under 40' preferred)

2) If spliced, 4'-0" above finish floor to accommodate perimeter safety cable. (Also better position to weld or bolt)

3) Bolted splices preferred. (Verify method with erector/fabricator)

4) Prepare upper column for field welding if splice requires welding.

5) All tiered columns shall have lifting device or hole (2"ø min.) for hoisting into place. (See sketch S6 for other suggested details)



BEAM TO COLUMN CHECKLIST:

1) All double connections at column webs or beam webs over columns must have staggered clip or beam seat for erection.(SEE DETAIL)

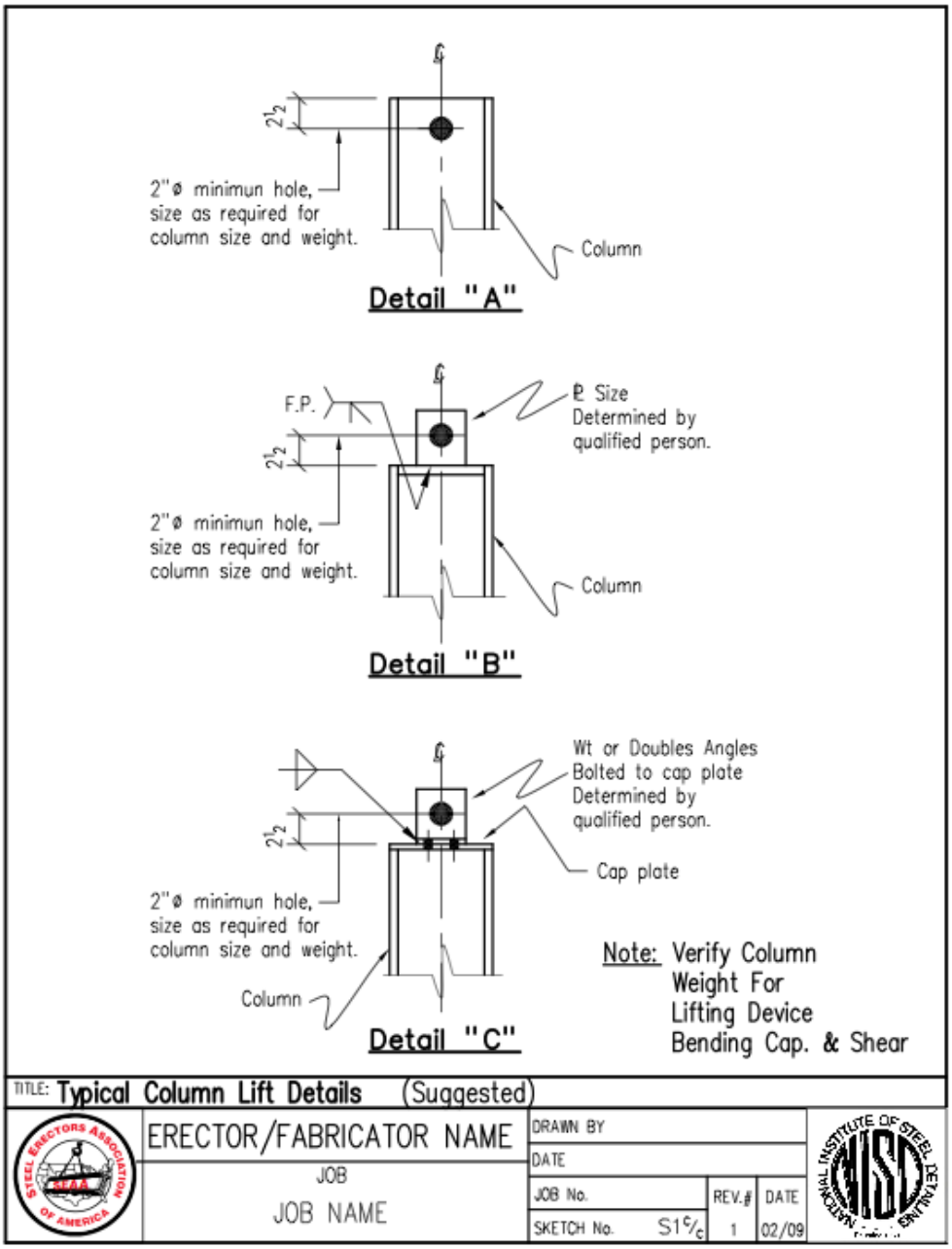
2) Utilize permanent bolts at beam webs for moment connections, when possible

3) Minimum (2) bolts req'd at each end of beam for erection.

TITLE: **Column/Beam To Column Checklist** (Suggested)

ERECTOR/FABRICATOR NAME	DRAWN BY			
	DATE			
JOB	JOB No.	REV.#	DATE	
JOB NAME	SKETCH No. S1b/c	1	02/09	

DETAILING FOR ERECTION SAFETY and EFFICIENCY



Other examples

These examples are taken from an article by John A. Gambatese, Department of Civil, Construction and Environmental Engineering, Oregon State University, which was downloaded from the PtD web site:

- Indicate on the contract drawings the locations of existing underground utilities and mark a clear zone around the utilities. Note on the drawings the source of information and level of certainty on the location of underground utilities.
- Design parapets to be 42 inches (1.07m) tall. A parapet of this height will provide immediate guardrail protection and eliminate the need to construct a guardrail during construction or future roof maintenance.
- Design columns with holes at 21 and 42 inches (0.54 and 1.07m) above the floor level to provide support locations for lifelines and guardrails.
- Design special attachments or holes in members at elevated work areas to provide permanent, stable connections for supports, lifelines, guardrails, and scaffolding.
- Design perimeter beams and beams above floor openings with sufficient strength to support lifelines. Design connection points along the beams for the lifelines, and note on the contract drawings which beams are designed to support lifelines, how many lifelines, and at what locations along the beams.
- Design domed, rather than flat, skylights with shatterproof glass or add strengthening wires.
- Locate rooftop equipment away from the building perimeter to reduce fall hazards while installing the equipment and during future maintenance.

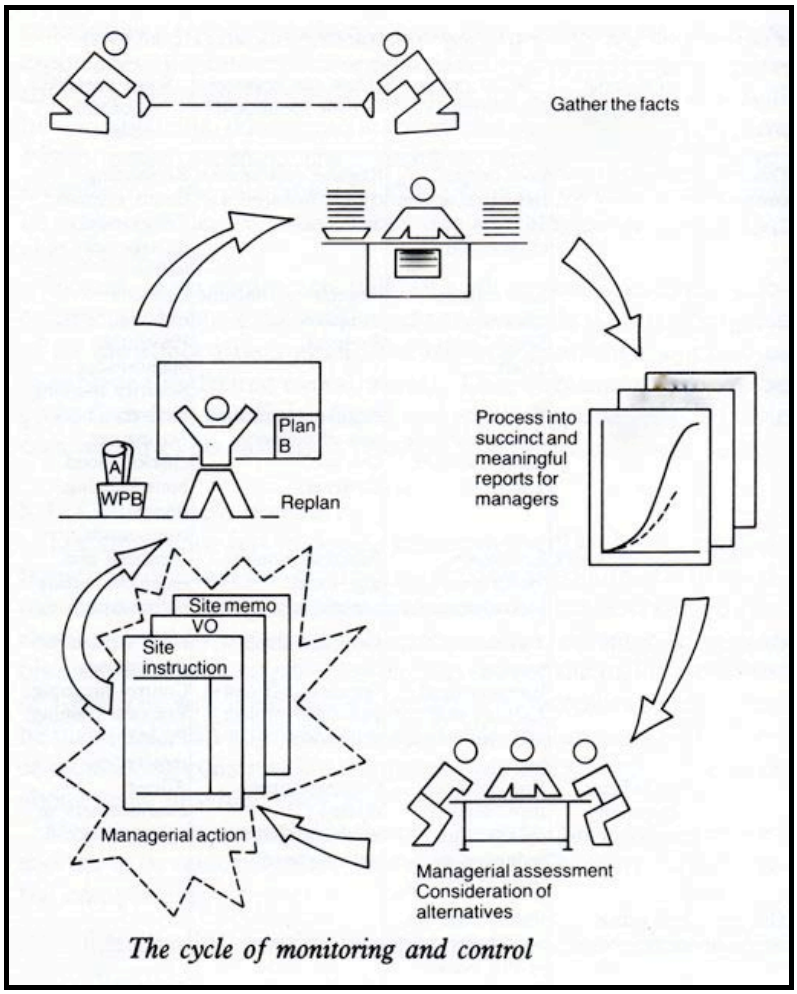
OS&H by design

This is a process, similar in many ways to processes from ‘value engineering’ and ‘buildability’. In fact, OS&H by design should be a central part of the whole process of ‘design development’, through which preliminary designs are refined and improved through a process of review by experts and representatives of all those who will be involved. It must be part of the systematic process of hazard and risk analysis described in **Construction OS&H**, within the cycle of monitoring and control described in the next Section.

4 OS&H PERFORMANCE MEASUREMENT AND MANAGEMENT

The cycle of monitoring and control

The diagram below illustrates the general process of measuring and managing performance – the 'cycle of monitoring and control'. As emphasised in other Theme Summaries of Construction OS&H, this has to be a continuous and relentless process if improvements are to be made and good OS&H performance is to be achieved.



(From "Construction Planning" by Neale & Neale)

One of the surprising aspects of most plans made during a construction project is that they are – generally – optimistic, so this cycle has the added benefit of bringing more realism into the process.

This cycle relies on making plans based on facts and data, and comparing actual performance against the planned performance in order to keep the project on target. The fundamental basis for the overall management of a project is the 'Project Brief', and the fundamental basis for managing OS&H is the 'Safety and Health Plan'. These two documents are described in the following sections.

The project brief

The project brief should be a clear, comprehensive and succinct statement of the client's requirements of the project, and the context within which it will be provided. It is the result of the client 'doing the job in the mind'. The brief will usually include the following:

- General introduction to the client and the other organisations involved
- General statement of intention (i.e. an outline description of the key characteristics of a building)
- Location and its implications (e.g. topographic, climatic, social)
- Feasibility and cost studies, leading to the cost plan
- Requirements of authorities and permissions (e.g. planning permission, diversion of utilities)
- Safety and health policy
- Contract documents
- Designs, appropriate to the form of contract
- Overall programme for the whole project
- Other important issues (such as the requirements of fund providers)

Briefing is often not done well, and this leads to problems in the implementation phase of a project. Producing a good brief is very challenging because many issues have to be raised and analysed, and it often involves a significant number of people and organisations. Nevertheless, producing the brief is one of the prime functions of the client's project manager, and eliminating some of the problems at source will reward the effort.

A major failing of many otherwise good project briefs is a complete absence of any consideration of safety and health. Many briefs are mainly technical and legal documents that focus on the 'deliverables' of cost, time and functionality. Under the influence of 'triple bottom line' or 'people, planet, profit' initiatives, OS&H is becoming more prevalent, but the philosophy of **Construction OS&H** is that this must be a major consideration in all project briefs, and consequently in all contract and other relevant project documents. It is through the project brief that the client of a construction project can begin to exert pressure to achieve a zero incident project.

The 'ILO Overview' gives guidance on a good project brief as shown in the table below (from Table 5, page 25).

Characteristics of a good project brief

Functions	Attributes
A channel of instruction To convey decisions and information between the client and all the other parties involved	*Clarity* Purposes of the brief should be made clear and carefully distinguished from one another
To stimulate discussion To facilitate the setting of priorities, analyses, problem identification and information flow. It should provide a collective "thinking through"	*Priorities* The degree of importance or firmness of particular items should be shown; which requirements are likely to be necessities, which are no more than wishes
A record To record decisions, information, agreements, etc.	*Consistency* The brief should be consistent within itself, and with any other related projects
A tool for evaluation The brief should provide the yardstick against which the achievements of the designers and project managers can be measured	*Completeness* At any stage in the development of the brief it should be complete as far as the team's understanding and expectations have developed
A basis for estimating resources The brief should include a specific and quantified estimate of all the major resources that will be required, and an overall budget under about 20 headings	*Realism* The brief should be realistic in terms of aims, resources, context and quality to be achieved (clients tend to expect more than they can afford)
A contractual document The brief will form the technical specification for the agreement between the client and designers, project managers and possibly other parties (such as specialist suppliers)	*Relevance* The brief should contain only information and decisions directly relevant to the project
A living document The brief should be developed, in very clearly defined stages, to reflect the progress of the understanding and exploration of the project, and amended to incorporate new knowledge	*Logic* The brief should have a logical structure and presentation. It should distinguish between what the client expects from the project, and how it is intended to achieve these expectations. It should work from the genearl to the particular
	Flexibility The brief should be specific enough for decisions and actions to be taken but flexible enough to encourage exploration of problems, options and uncertainties
	Scope The scope of the project must be carefully defined.

Source: O'Reilly, 1987.

The occupational health and safety plan

This is the crucial document at the centre of the 'cycle of monitoring and control'.

An **OS&H Plan** is an essential platform for the management of OS&H. A search on the Internet will reveal that there are many different interpretations of what is meant by this term, depending on such factors as the project itself, its location, who or what the plan is for, and individual experiences. Considering the 'project matrix', below, it is

clear that a number of plans will be required, for those involved and also for the stages of the project.

THOSE INVOLVED	PROJECT STAGES				
	Briefing	Design	Procurement	Construction	Commission
Client	ŏ	ŏ	ŏ	ŏ	ŏ
Authorities	**?**	**?**	**?**	**?**	**?**
Project managers	ŏ	ŏ	ŏ	ŏ	ŏ
Local residents	&	&	&	&	&
Designers		ŏ			
Contractors			ŏ	ŏ	ŏ
Other consultants	ŏ	ŏ	ŏ	ŏ	ŏ
Sub-contractors			ŏ	ŏ	ŏ
Suppliers	ŏ	ŏ	ŏ	ŏ	ŏ
Workers	&	&	**&**	**&**	**&**
Users	**?**	**?**	**?**	**?**	**?**

A possible range of OS&H Plans could be as follows:

ŏ **Client**: must have an OS&H Plan which applies throughout the whole project

? **Authorities**: must have a project-specific OS&H Plan if directly engaged in the project, for example provision of utilities or supervising the diversion of road-works.

ŏ **Project managers**: must lead the development and use of OS&H Plans within their areas of responsibility.

& **Local communities**: may need to be consulted in the development of OS&H Plans.

ŏ **Designers**: must have their own OS&H Plan and also comply with the Client's OS&H Plan.

ŏ **Contractors**: must have detailed OS&H Plans for the whole of their works, and these plans must be consistent with the Client's and Designers' OS&H Plans.

ŏ **Sub-contractors**: must have detailed OS&H Plans for the whole of their works, and these plans must be consistent with the Client's, Designers' and Contractors' OS&H Plans; Contractors have responsibility for the OS&H Plans of their subcontractors.

ŏ **Early involvement of suppliers**: may have involvement in these stages so must have detailed OS&H Plans for the whole of their materials, components, equipments and works, and these plans must be consistent with the Client's, Designers' and Contractors' OS&H Plans; Contractors usually have responsibility for the OS&H Plans of their suppliers.

ŏ **Suppliers**: must have detailed OS&H Plans for the whole of their materials, components, equipments and works, and these plans must be consistent with the Client's, Designers' and Contractors' OS&H Plans; Contractors have responsibility for the OS&H Plans of their suppliers.

& **Early involvement of workers organizations**: this will have a positive effect on all OS&H plans.

& **Worker involvement:** an essential and beneficial part of the development and implementation of all OS&H Plans.

This may seem to be a formidably complicated list, and there is no doubt that on major projects the management of the OS&H processes and procedures becomes a major managerial and administrative activity. Furthermore, in attempting to offer comprehensive guidance, many texts and papers describe very complex systems and procedures. Nevertheless, in the belief that complex systems are difficult to implement in a widespread and effective way, one of the aims of Construction OS&H is to offer straightforward and uncomplicated advice on ways to improve OS&H, so a basic list of essential elements of an **OS&H Plan**, which will be applicable to all the plans indicated above, is offered below.

Essential elements of an OS&H Plan

Title page
A clear statement of the project that the plan is prepared for, the organisation it was prepared for and who prepared it.

Authorisations
The plan must be formally approved, authorised and 'signed off' by an authorised person or persons.

Introduction
A brief summary of the parties involved, the project itself, its location, preparatory studies, preliminary programme and any important or exceptional features. Summary of principal OS&H factors. Aims of the OS&H plan and if possible, measurable (i.e. SMART[1]) objectives.

OS&H procedures
All major parties named (e.g. the main contractor's plan would name the client, designers, main contractor and major sub-contractors and suppliers). Responsibilities set out within a specific organisation structure with specific responsibilities for each named position. Compliance statement in regard to legal regulatory framework. Role of OS&H specialist (if designated).

OS&H hazard and risk assessments
Physical, chemical and biological hazards for each element of the project covered by this plan (sometimes called a 'task hazard analysis'). Summary of the assessments and decisions made.

Technical controls
Processes and practices for developing, approving and authorising the technical aspects of the work (for example, for designing, approving and authorising scaffolding, and systems for regular inspections).

[1] There are many interpretations of this acronym, but in this case it has been taken to mean Significant, Measurable, Achievable, Results-focussed and Time-based

Working practices
Processes and practices for providing access, egress, safe working conditions, assessment of employees competence and physical suitability; safe use of plant and equipment; personal protective equipment; inspections and performance checks of materials and equipment.

Welfare
Provision of adequate facilities for general welfare, rules of behaviour, accident and first aid, and security.

Training
Summary of training to be provided, derived directly from the above sections (e.g. compliance with the recommendations of the hazard assessments; use of personal equipment; induction).

Consultation and communication
Clear and comprehensive processes and procedures for consulting with all involved in an informed and structured way and for communicating approved methods and precautions.

Review, audit and corrective action
A structured and detailed set of procedures and documents for the 'cycle of monitoring and control'. Must include reporting and recording procedures and the management of this information.

Point to remember

No safety policy or plan is workable without assigning a specific duty:

To a specific person

To be completed at a specific point of time

The safety policy and plan must be transmitted down the line to the workers – it is their safety that the plan is intended to safeguard.

(From: ILO Safety, health and welfare on construction sites: A training manual)

5 ROLE AND RESPONSIBILITIES OF SAFETY SPECIALISTS

Every construction company of any size should appoint a properly qualified person (or persons) whose special and main responsibility is the promotion of safety and health. Whoever is appointed should have direct access to an executive director of the company. His or her duties should include:

- *the organization of information to be passed from management to workers, including those of subcontractors;*
- *the organization and conduct of safety training programmes, including induction training for all workers on the site;*
- *the investigation and review of the circumstances and causes of accidents and occupational diseases so as to advise on preventive measures;*
- *acting as consultant and technical adviser to the safety committee;*
- *participation in pre-site planning.*

To carry out these functions the safety officer should have experience of the industry and should be properly trained and qualified and, where such exists, should be a member of a recognized professional safety and health body.

(From: ILO Safety, health and welfare on construction sites: training manual)

Construction OS&H gives a comprehensive description of OS&H management, demonstrating the extent and complexity of good OS&H practices. From this body of information it will be obvious that large construction projects will benefit from specialist advice and administrative support. The following possible activities have been taken from the Theme Summaries:

Advisory role
Briefing
Policy
Organisation
Consultations
Legal and regulatory
Contractual
Hazards and risk
Project planning
Design development
OS&H planning
Emergency and incident response
Project welfare facilities

Administration role
Hazard and risk analysis
Authorisations
Monitoring and reporting
Review
Audit
All OS&H systems (including records and reporting)
ICT applications (including communications systems)

For these reasons, many construction organisations employ specialists, either as direct employees or as specialist consultants. Their position in the organisation varies, but it is generally the case that, in serious circumstances, they have direct access to the Chief Executive, by-passing the normal management structure. This ensures their independence and reinforces senior management commitment. There is an argument that specialist consultants may be more independent than direct employees, but consultants will usually have fixed term but renewable contracts so this argument may not be very robust.

What is fairly clear is that becoming an OS&H specialist presents career opportunities, as the following two examples show.

Example 1

"Employment change. Employment of occupational health and safety specialists and technicians is expected to increase 9 percent during the 2006-16 decade, about as fast as the average for all occupations, reflecting a balance of continuing public demand for a safe and healthy work environment against the desire for smaller government and fewer regulations. Emergency preparedness will continue to increase in importance, creating demand for these workers. More specialists will be needed to cope with technological advances in safety equipment and threats, changing regulations, and increasing public expectations. In private industry, employment growth will reflect overall business growth and continuing self-enforcement of government and company regulations and policies."

(United States Department of Labor, Bureau of Labor Statistics: http://www.bls.gov/oco/ocos017.htm#emply)

Example 2

The ILO is grateful to the Construction Safety Network for permission to reproduce this advertisement. Note also that there is a very good cartoon on their web site: http://www.safetynetwork.bc.ca/csn_resources/index.cfm

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	Construction Planning
Author(s)	Richard H Neale and David E Neale
Type of source	Book, 160 pages
Publication or other source details	Engineering management series, Thomas Telford Ltd, Thomas Telford House, 1 Heron Quay, London E14 9XF
Date & ISBN/ISSN	1989. 0 7277 1322 1
Summary of contents	Part 1: Context and strategy 1 Construction planning in context 2 Early decisions Part 2: Techniques, procedures and methods 3 Planning techniques 4 Resources 5 Monitoring and control Part 3: Planning in practice 6 Putting planning into practice 7 Case studies
Comments on relevance	Generally relevant but also the source of the ‘Drainage Chamber’ assignment.
Other information	A basic planning book, written by a university lecturer and the CEO of a medium size construction company, blending theory and practice.

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	Design for construction safety
Type of source	Web site of the USA OSHA Alliance
Publication or other source details	http://www.designforconstructionsafety.org/
Summary of contents	What DfCS is: • Explicitly considering the safety of construction workers in the design of a project. • Being conscious of and valuing the safety of construction workers when performing design tasks. • Making design decisions based in part on how the project's inherent risk to construction workers may be affected. • Including worker safety considerations in the constructability review process.
Comments on relevance	This web site is a huge training resource with very useful PowerPoint presentations, documents and good links

Title	Prefabricated modules in construction
Author(s)	Richard Neale, Andrew Price and William Sher
Type of source	Research report in the form of a book, 55 pages
Publication or other source details	Chartered Institute of Building, Ascot, United Kingdom
Date & ISBN/ISSN	1993. ISBN 1 85350 061 9
Summary of contents	This is a research report and the main content is six case studies from actual projects. Executive summary Introduction Research objectives Research methodology Report structure Conclusions and recommendations Summaries of the case studies • Bathroom modules for a hotel • Bathroom modules for student accommodation • Bed/bathroom modules for a military base • Toilet modules for a large building • Cladding panels fro a large building • Boiler house for a retail store, sited on the roof Appendix: transport of large loads
Comments on relevance	Prefabrication is relevant to 'safety by design', described in Theme Summary 6 'Project planning and control for OPS&H'
Other information	For a more detailed description of the cladding case study, refer to: A G F Gibb and R H Neale. "Management of prefabrication for complex cladding: case study". Journal of Architectural Engineering, American Society of Civil Engineers, Vol 3, No 2, June 1997.

Title	ILO Safety, health and welfare on construction sites A training manual
Author(s)	ILO
Type of source	Training manual, 134 pages
Publication or other source details	ILO Geneva, International Labour Office Can be downloaded from: http://www.ilo.org/public/english/protection/safework/training/english/download/architecture.pdf
Date & ISBN/ISSN	1995. ISBN 92-2-109182-1
Summary of contents	Preface 1. Introduction 2. Safety organization and management 3. Site planning and layout 4. Excavations 5. Scaffolding 6. Ladders 7. Hazardous processes 8. Vehicles 9. Movement of materials 10. Working positions, tools and equipment 11. The working environment 12. Personal protective equipment (PPE) 13. Welfare facilities Annexes 1. Safety, health and welfare on construction sites: Check-list 2. The Safety and Health in Construction Convention, 1988 (No. 167), and Recommendation, 1988 (No175)
Comments on relevance	This is a comprehensive manual, which follows the contents of ILO C167 very closely. Extracts have been used in Construct OS&H, especially in the technical sections.
Other information	It has been Downloaded as ILO Safety, health and welfare on construction sites: A training manual