

## **ILO CONSTRUCTION OS&H**

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

### **THEME SUMMARY 15: INTEGRATION & CONCLUSION**



**Job done!**

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## 1 PREFACE

**Construction OS&H** provides a comprehensive and wide-ranging review of current thinking and good practices. It is based on a ‘systems approach’ and systematic principles and procedures have been described. In actual practice, the reality of managing a construction project requires many of these principles and practices to be applied simultaneously in an ‘integrated’ way. In addition, OS&H has to be managed within the whole of the project, and so OS&H systems have to be applied alongside other systems, such as quality assurance and technical compliance with drawings and specifications.

This concluding Theme Summary is mainly about integration. It begins with a brief review of the principles of systems integration, taken largely from a research and development programme led by Professor Alan Griffith. A series of Checklists then draws together the key content of the Theme Summaries, giving an overview of the principal factors to be considered for OS&H. These are followed by a major assignment, “The Project”, through which course participants will apply what they have learned to a real or realistic construction project. This Theme Summary concludes with a case study of a collapsed excavation in Uganda, in which eight workers died. This case study shows that poor OS&H has a very adverse effect on the client, the design teams, the contractor and of course the workers and their families. All parties to a construction contract must co-operate, therefore, to eliminate avoidable ‘accidents’ and strive towards ‘zero incidents’.

## 2 SYSTEMS INTEGRATION

(See reference to Professor Alan Griffith, in Section 8: Relevant elements of the Knowledge Base, at the end of this Theme Summary).

All management systems have a similar ‘anatomy’. They:

- Advocate a ‘whole organisation’ view
- Have a well-defined framework
- Develop formal directives and operating procedures
- Are pro-active, seeking to be preventative or quickly re-active, rather than retrospective in the actions that they expect
- Have measurable indicators of success
- Have formal audit and review procedures

Management systems are based on standards, which have the following key features:

- Policy
- Aims and objectives
- Programmes
- Documentation
- Working procedures
- Record keeping
- Audit and review

To be useful, a management system should:

- Be simple to understand, interpret and implement by the people who work with and around it
- Give reliable and consistent outcomes
- Be capable of being translated into easily conducted sets of procedures and tasks

An integrated management system has four levels of documentation:

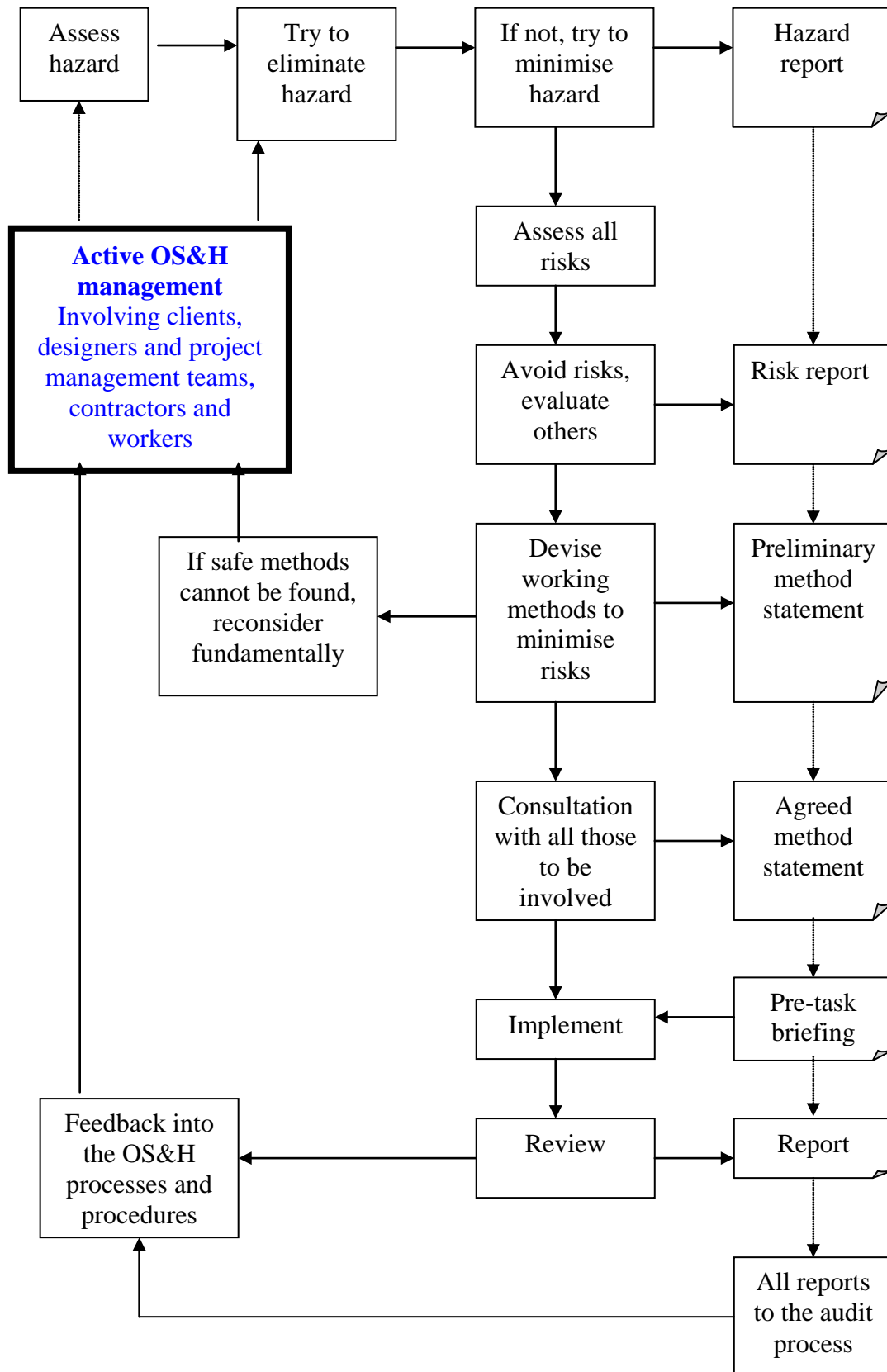
1. System manual
2. Management procedures
  - Technical support services
  - Company support services
  - Project management
  - System management
3. Working instructions
4. Project plans

### Conclusion on systems integration

Although Construction OS&H has argued strongly that a systems approach is vital to providing a safe and healthy environment, it must be recognised that OS&H systems must be designed and implanted within the framework and operating practices of other systems within an organisation. Systems designed in isolation will fail, through confusion, duplication of information, demands for excessive effort, and consequential inaccurate information. Since most modern systems follow a similar ‘anatomy’, this should not be too difficult.

As reminders, the following diagrams, which have been used previously in **Construction OS&H**, illustrate the essential elements of OS&H management systems.





### 3 GENERAL PROPOSAL FOR TRAINING OBJECTIVES FOR THE FOUR GROUPS OF 'ACTORS'

At the conclusion of a **Construction OS&H** training programme the participants should have acquired attitudes, skills and knowledge (ASK) that they did not have before coming on the programme. These are expressed in a set of 'behavioural objectives' (that is, objectives based on what the participants are actually expected to do at the end of the programme) for each group of participants (Clients, Design & Project Management Teams, Construction companies and Workers). These objectives are re-stated below, and they feed directly into the requirements of the 'Concluding assignment' or 'Project'. In order to assist participants in this assignment, the next section also gives a set of checklists, which are also arranged in the same way as the objectives.

#### Clients

At the end of this course, you should be able to:

- Make a persuasive argument for the active involvement of the clients of construction projects in ensuring that all those involved in the project will be in a safe and healthy environment
- Propose a project management organisation for a given project to ensure that all those involved in the project will be in a safe and healthy environment
- Draft an Occupational Safety and Health (OS&H) Policy for a specific organisation
- Draft an outline for a comprehensive OS&H management system for a specific organisation
- Identify the main hazards and risks for a specific project
- List the main items for an OS&H Policy for a specific construction project
- List the main items for an OS&H Plan for a specific project
- Brief designers on the contribution that they can make to OS&H for a specific project
- Propose the main issues to be covered by OS&H contract clauses for a specific project
- Write an outline specification for an OS&H management system for a specific project
- Make a general plan for the layout and welfare facilities for a specific project

## **Design & Project Management Teams**

At the end of this course, you should be able to:

- Make a persuasive argument for the active involvement of the designers and project management teams of construction projects in ensuring that all those involved in the project will be in a safe and healthy environment
- Propose a project management organisation for a given project to ensure that all those involved in the project will be in a safe and healthy environment
- Draft an Occupational Safety and Health (OS&H) Policy for a specific organisation
- Draft an outline for a comprehensive OS&H management system for a specific organisation
- Identify the main hazards and risks for a specific project
- List the main items for an OS&H Policy for a specific construction project
- List the main items for an OS&H Plan for a specific project
- Make an assessment of the ways in which the designs of a specific project may be improved to enhance the OS&H of the construction work of the project
- Propose the main issues to be covered by OS&H contract clauses for a specific project
- Write an outline specification for an OS&H management system for a specific project
- Make a general plan for the layout and welfare facilities for a specific project, reflecting the OS&H aspects of the design and management of the project

## **Construction companies (Contractors)**

At the end of this programme, you should be able to:

- Give a persuasive presentation to major subcontractors employed by construction contractors for their projects to persuade them to adopt good occupational safety and health practices and procedures
- Propose a project management organisation for a given project to ensure that all those involved in the project will be in a safe and healthy environment
- Draft an Occupational Safety and Health (OS&H) Policy for a specific organisation
- Draft an outline for a comprehensive OS&H management system for a specific organisation
- Identify the main hazards and risks for a specific project
- List the main items for an OS&H Policy for a specific construction project
- List the main items for an OS&H Plan for a specific project
- Write an outline specification for an OS&H management system for a specific project
- Make a general plan for the layout and welfare facilities for a specific project
- Identify the personal protective equipment that would be needed for a specific workplace and construction process
- Identify the main hazards that may arise from the use of a specific commonly used item of plant or equipment and explain how to minimise the risks that may arise
- Identify the main hazards that may arise from the use of a specific commonly used construction process and explain how to minimise the risks

## **Workers**

This programme is intended to provide flexible training materials for Trade Unionists and workers in the building trades who are interested in strengthening their own activities on health and safety at work and who wish to improve their knowledge of safe and healthy ways of working on construction sites.

The activities provided in this programme can be used to train with:

- Trade Union Health and Safety Representatives
- Discussion groups of workers and Union members

The main aims are to:

1. Identify the main health and safety problems in our workplaces
2. Develop a Trade Union approach to occupational health and safety
3. Investigate hazards and risks at work on construction sites
4. Develop skills in the safe and healthy use of common plant and equipment
5. Develop skills in working in safe and healthy ways when working on common construction site activities
6. Build workers' involvement, awareness, and support on occupational safety and health
7. Develop Trade Union organisation to ensure that employers eliminate or control risks
8. Develop confidence, knowledge and skills

Training on health and safety for workers should be:

- Motivating
- Active
- Democratic

It should be action oriented so that it will:

- Lead to practical action in the workplace
- Improve health and safety conditions for workers



## 4 CHECKLISTS

### The **Construction OS&H** system to eliminate ‘preventable OS&H incidents’:

- Senior management commitment
- Strong policies
- Comprehensive participatory processes and procedures
- A systematic way of assessing and managing hazards and risks
- Well-developed preventative safety culture
- Good project briefing
- Strong contract clauses in all contracts
- Effective OS&H plans by all parties involved
- Effective OS&H processes and procedures
- Safety through design of the permanent works
- OS&H as a central part of project planning and organisation
- Safety conscious design of the temporary works
- Competent management and supervision
- Safe materials and components
- Safe plant and equipment
- Good workplace design
- Good welfare facilities

### Policy and systems

A progressive and continual process of:

- Developing OS&H policy
- Organising to implement the policy
- Planning and taking OS&H actions
- Monitoring and evaluating the results
- Taking further action for continual improvement

All the organisations involved in a construction project should have a written and agreed OS&H policy. The policy must be:

- Written specifically by and for the organisation
- Formulated with the participation of employees and their representatives
- Adopted positively at all levels, especially by senior management
- Clearly stated and effectively communicated to all
- Continually reviewed and up-dated

The policy should include the following:

- A strong commitment to protecting the safety and health of all members of the organisation
- A statement of compliance with all relevant laws, regulations and agreements
- A management structure of organisation and responsibility
- Comprehensive consultation processes and procedures
- Comprehensive review, audit and feedback processes, and a firm commitment to continual improvement

- Compatibility with other management systems or embedded in them

### **The project brief**

The project brief should be a clear, comprehensive statement of the client's requirements of the project: 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 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
- Occupational 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)

### **Essential elements of an OS&H plan**

- Title page
- Authorisations
- Introduction
- OS&H procedures
- OS&H hazard and risk assessments
- Technical controls
- Working practices
- Welfare
- Training
- Consultation and communication
- Review, audit and corrective action
- 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.

An effective OS&H plan should comprise:

- Clear, measurable and prioritised objectives
- A plan for achieving each objective
- A process for assessing achievements against the objectives
- Specification of the human, physical, financial and environmental resources required
- Improving OS&H performance usually requires changes, so it is important to have a plan for 'managing change'

## **Method statement**

The Method Statement is of crucial importance to effective OS&H management. This should comprise, as a minimum requirement, a clear, fully documented and agreed statement of the way in which a specific construction element shall be built, taking into account such aspects as:

- The assessment of the hazards and risks inherent in this element
- The sequence of construction and the plan of work
- The materials and components to be used
- The construction plant and equipment to be used
- Temporary works and their possible effects on the finished element
- Provision of safe access, egress and work places
- The sequence of dismantling, removal and, in some cases, disposal of all the plant, equipment, temporary works and waste
- A full statement of compliance with the policy and other requirements of the OS&H plan
- A full statement of all those who will be involved, their roles and confirmation that all have been fully consulted and properly briefed

## **Key qualities of an effective project manager**

- 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

## **Functions of Trades Union safety representatives**

- Talking to workers and union members, and taking up their complaints with management
- Involving, informing, and consulting workers and Union members on their priorities, and agreeing strategies for tackling risks
- Systematically inspecting the workplace on a regular basis
- Investigating accidents, ill-health and near misses
- Consulting with management
- Monitoring the employer’s performance on health and safety
- Making representations, and negotiating with the employer to ensure the safety and health of workers
- Talking to Government health and safety inspectors
- Participating in joint management - Union safety committees in the workplace

### **Functions of OS&H committees**

- Conduct regular inspections and surveys on safety and health
- Respond to workers' concerns on OS&H
- Make reports and recommendations to improve compliance with law and standards
- Propose policies, work plans, projects and activities to reduce accidents and illness
- Propose and organise training programmes for the workforce
- Promote and support activities on OS&H
- Follow up progress of proposals
- Report on results achieved, point out obstacles and problems
- Investigate, record and report on all accidents, ill-health and near misses
- Propose regulations on health and safety
- Organise occupational health services

### **Workplace trades union representatives & ILO agreements**

- The right to make representations to the employer on these matters and to negotiate
- The right to be consulted over health and safety arrangements
- The right to be consulted about the use of technical advisers by the employer and to call in technical advisers
- The right to accompany health and safety authority inspectors when they inspect the workplace and to make complaints to them when necessary
- Participation, and equal representation, in the Joint Health and Safety Committee

## 5 PROJECT

### Purpose, aims and objectives

A modular programme gives great flexibility in the ways in which a course can be presented and updated, but one of the difficulties created is that the information is presented in a series of distinct blocks, whereas in real life many issues and facts have to be taken into account together. Therefore, this project is a concluding assignment which aims to integrate some of the main aspects of the course, while at the same time allowing course participants to apply the knowledge that they have gained in the course to a realistic project. This should also provoke some good discussion between the participants and the Tutor.

In addition, the participants' work can serve as an indication of the effectiveness of the course.

Ideally, the Tutor would base this assignment on an actual, local construction project, and the participants would visit the site and collect real information on which to base their work. An example of such a project is shown below in two pictures from a course run by the ILO in Tanzania on the management of the construction of rural health centres. The course participants were taken to the project and, working in groups of four, they presented their analysis of the problems in a very informative discussion session.



*(Photo: Richard Neale)*



*(Photo: Richard Neale)*

If a local project is not available, the Tutor could use the project given below. It is taken from the ILO book “Managing international construction projects”, as summarised in Section 8: “Relevant elements of the Knowledge Base, at the end of this theme summary.

This project follows a recommended pattern for an assignment for course participants and generally this pattern may be used for all assignments in the course.

### **Description of the construction project**

The project is in two parts:

**Part 1** is a general description and should be used for all the four courses (for Clients, Designers, Construction companies and Workers) in **Construction OS&H**.

**Part 2** offers a simple method statement for construction, based on ‘strategy rules’, which is not really relevant to Clients but will be relevant - in different ways - to the other three ‘actors’.



**Part 1: General description****LUFBRA RESERVOIR****Introduction to the project**

The reservoir to be constructed is shown in Drawings R/01/36/1 to R/01/36/4

It is a rectangular reinforced concrete box, with a central dividing wall to facilitate cleaning and repairs while in use. It will be constructed on Beacon Hill, near the market and university town of Lufbra. The estimator's report of his site visit is reproduced below, and an extract from the instructions to tenderers on the following page.

**WINDMILL CONSTRUCTION****INTERNAL MEMORANDUM****ESTIMATOR'S REPORT ON LUFBRA RESERVOIR**

Lufbra Reservoir is described in Drawings R/01/36/1 (Location Plan); R/01/36/2 (Site Plan); and R/01/36/3 (General Arrangement). The client is the Burleigh Brook Water Authority, whose engineer is well-known for his strict enforcement of the contract documents, and the R.E. is expected to be Mr. E.R. Stephenson, who is known to us as a hard but fair man.

The site is at Beacon Hill, in attractive countryside. The existing access track is adequate for most forms of transport, but large or heavy vehicles may have some difficulties. Water and electricity supplies may be easily obtained. The first two metres of excavation (below top soil) will be in boulder clay, the remainder in weathered and heavily fissured granite. The contractors who built a neighbouring reservoir found that "the rock could be loosened by powerful ripping equipment - just", according to the engineer. All excavated material may be incorporated into the site landscaping. The underfloor drain is a simple 150 mm dia. drainage pipe surrounded by no-fines concrete.

The walls are of constant height, both floor and roof having a similar plan shape. Details of the valve chamber are given in Drawing R/01/36/4. There are no restrictions on the dimensions or volumes of concrete pours, although the engineer has indicated possible pours, as a guide only.

Construction methods are shown on our drawings WC/90/16/1 - and useful production information has been obtained from the records of Woodhouse and Thorpe Acre Reservoirs.

Site investigation shows that there are no water problems on this site.

The power line across the site can be isolated for a period not exceeding 6 months.

There is a reasonable supply of labour in Lufbra, five miles away.

The contract duration is 12 months, starting on 1st April 1990; I think we can complete this project in 9 months, so saving 3 months' overheads.



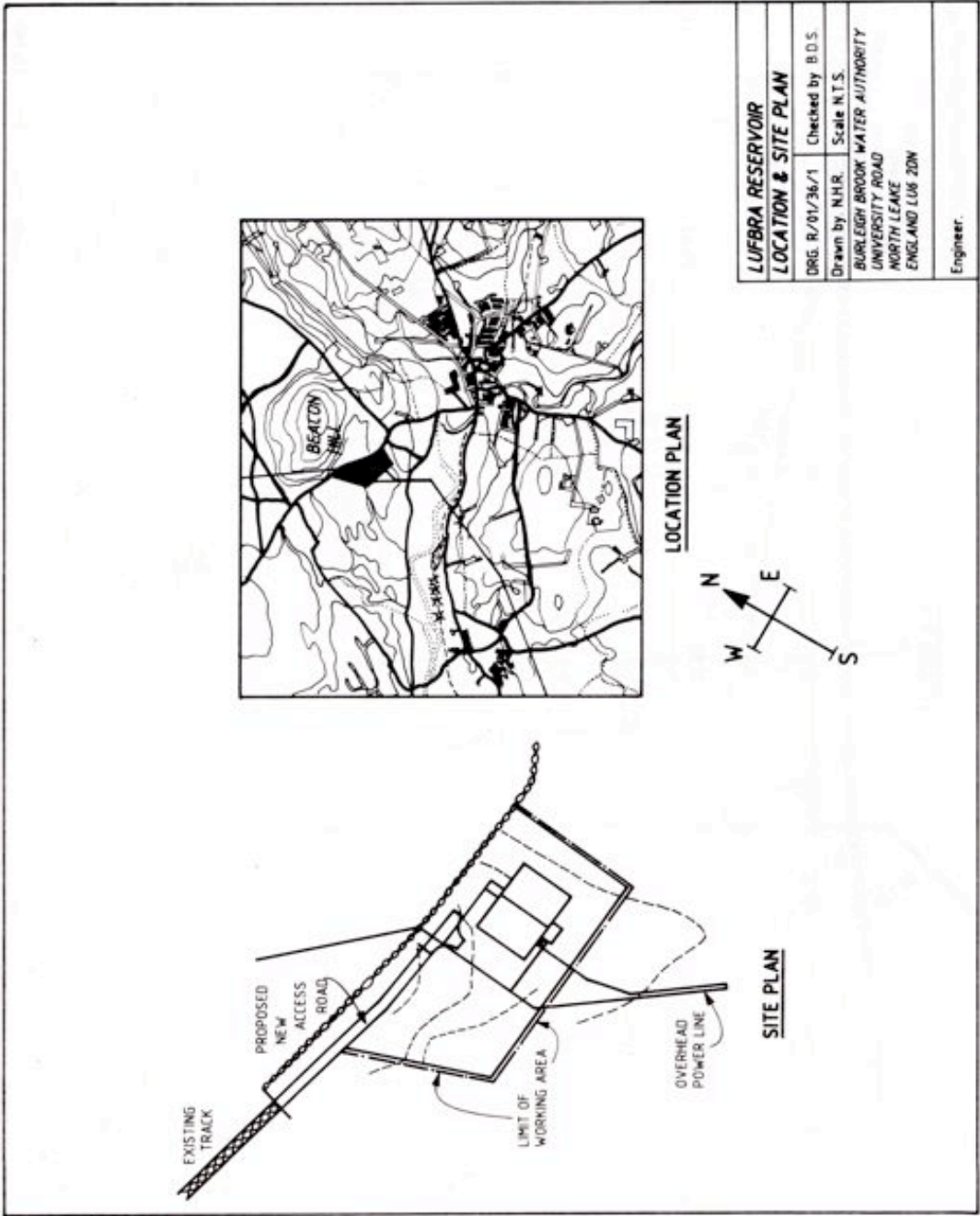
F.M. Phillips  
Chief Estimator

2nd February 1990

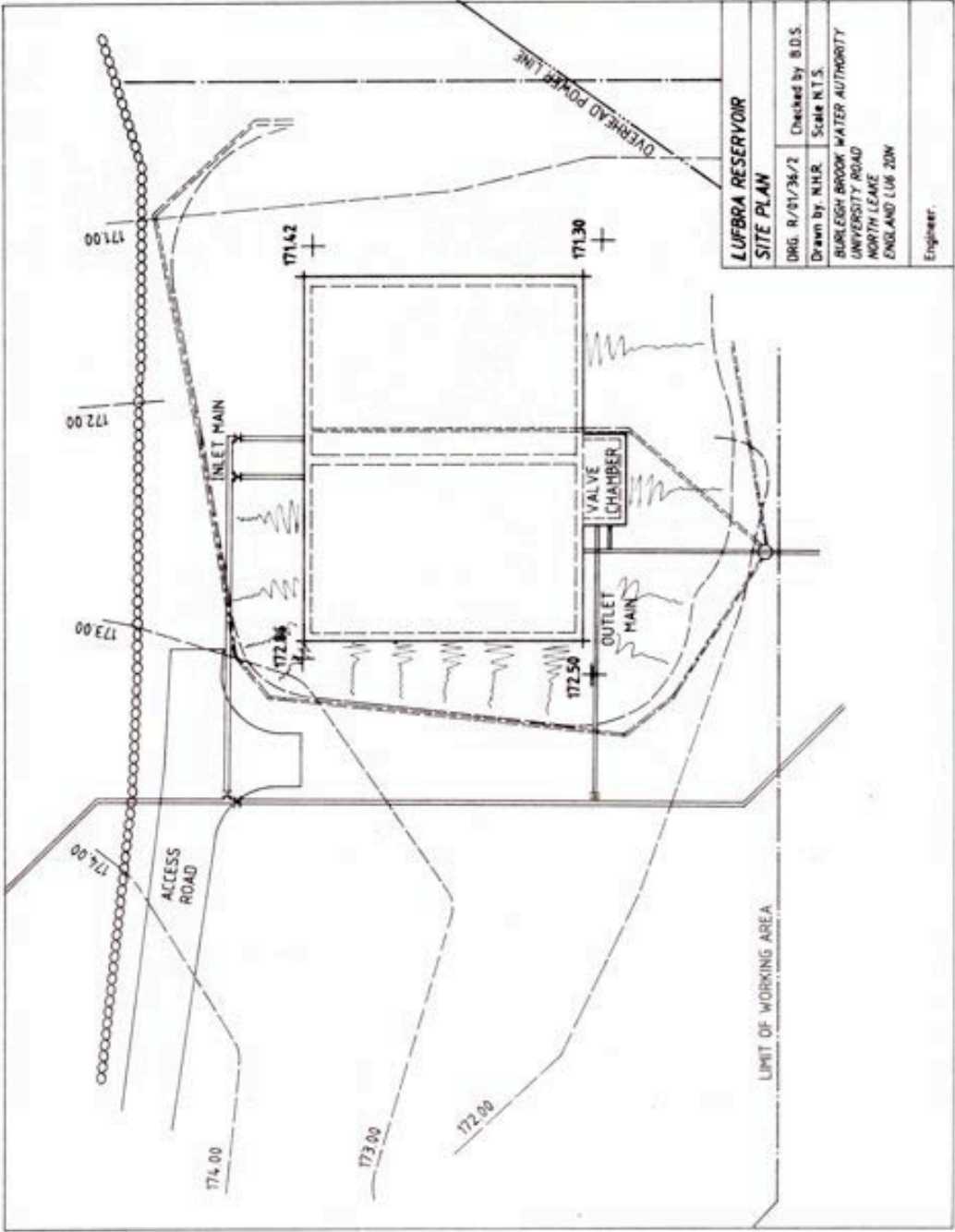
**Author's note:**

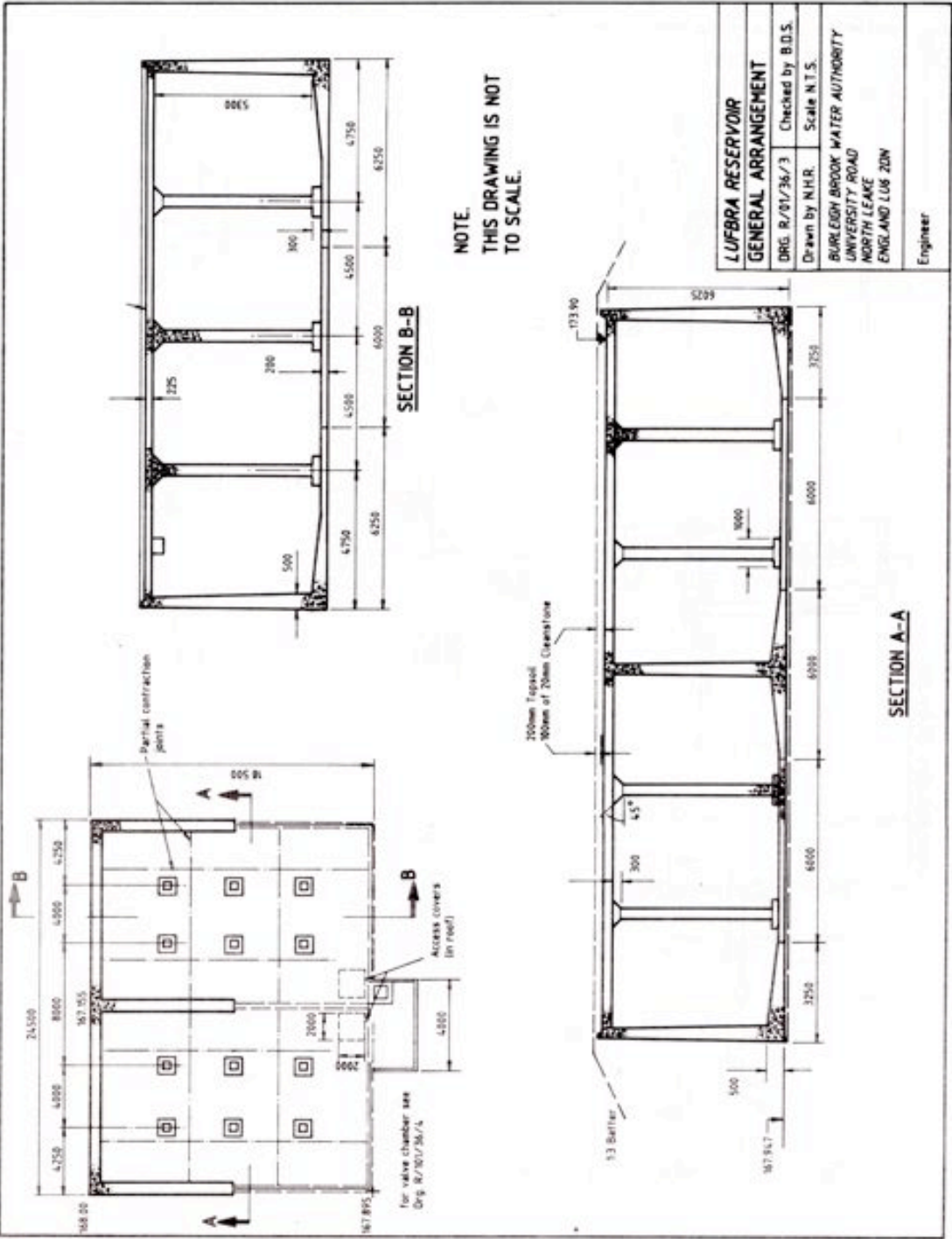
RE: "In the form of contract used for this project, an 'Engineer' was appointed by the client to have overall responsibility for the investigation and design of the project, and to supervise its construction. The Resident Engineer represents the Engineer on the site of the works."

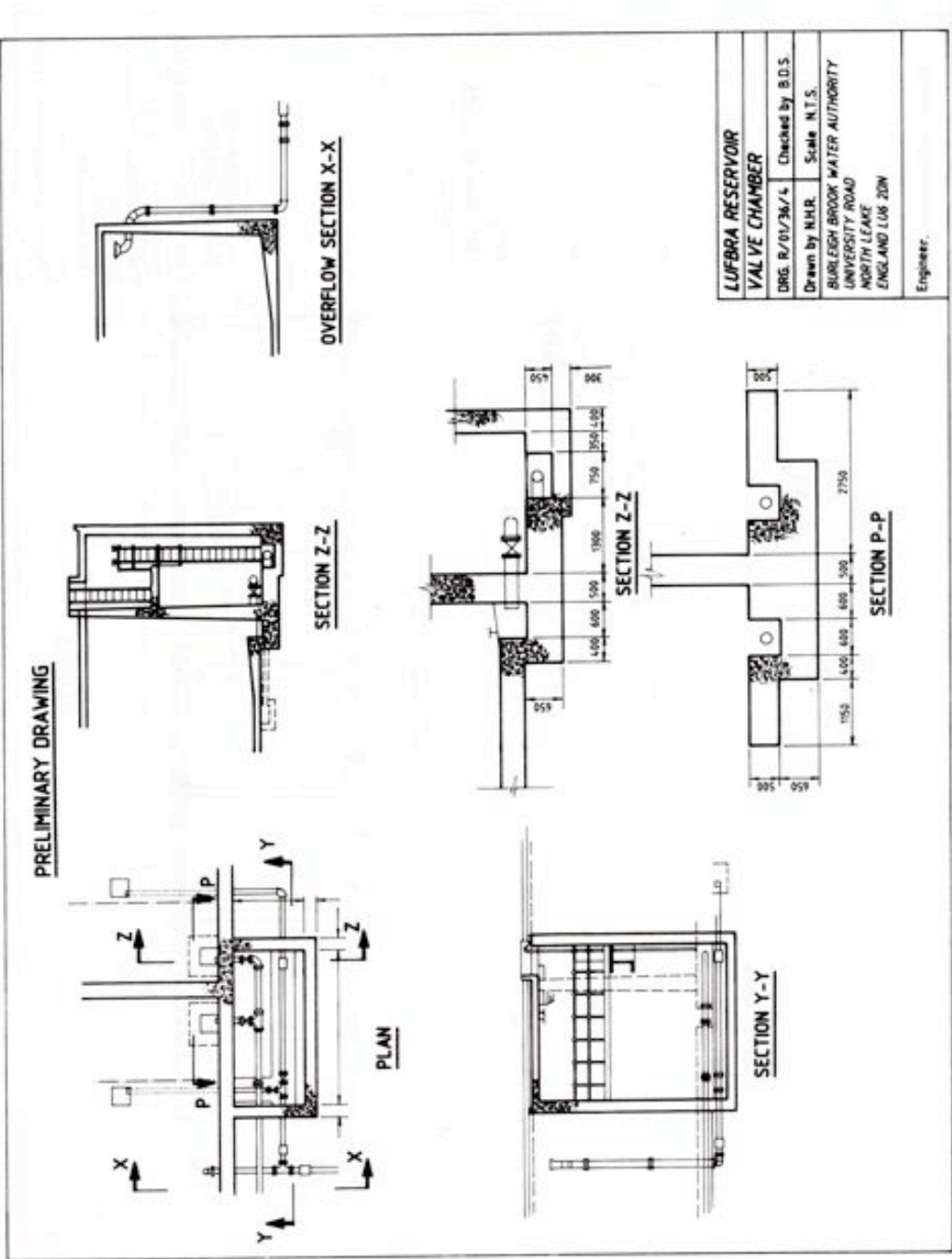
No fines concrete: "This is a form of lightweight concrete obtained when fine aggregate is omitted, i.e. consisting of cement, water and coarse aggregate only" (A. M. Neville: *Properties of concrete*, p. 544, Pitman, London, 1977).











**Clients and the Design and project management teams will not get Part 2**

***Part 2: Simple method statement for construction, based on 'strategy rules'***

**Construction strategy**

The joint layout and pour design for the floor, walls and roof are shown by sketches on the following pages. The contractor chose to use crawler-mounted mobile cranes and to leave out some floor and wall panels to allow the crane to be used within the reservoir. Wall formwork is illustrated. Using this information, strategies can be developed for the sequence of construction of the floor, walls and roof.

The strategy is summarized tersely in boxes below.

**Access to excavation**

Must have a ramp for access of people, small equipment, etc., also for removal of spoil from rock-ripping.

Can make ramp

through valve chamber, which goes to base of reservoir

or

through drains, which is nearer to access road but not as deep as valve chamber.

Spoil from rock excavation can be used to make a good roadway around excavation, so that whole reservoir can be easily served by a crane from top of bank.

**Floor**

Column base reinforcement details enable the floor to be kept clear until columns have to be erected.

May start floor before bringing any cranes to site. Direct discharge from ready-mixed concrete trucks recommended.

Floor reinforcement details do not impose a sequence of pours. The detailing is very good for "constructability".

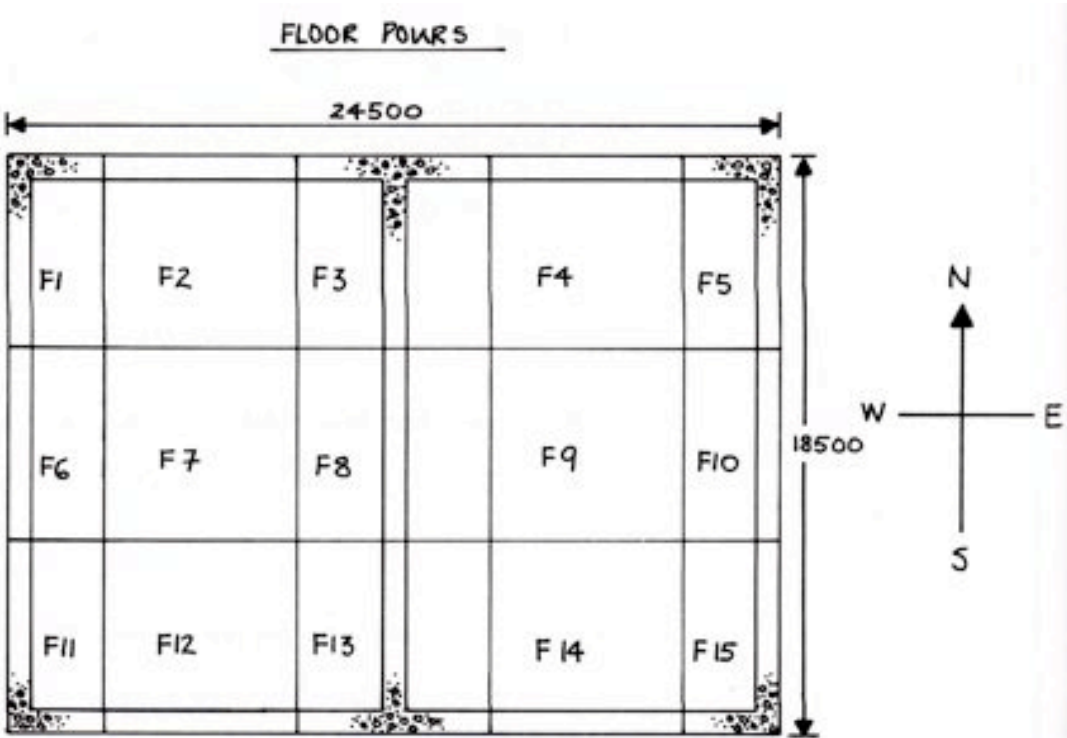
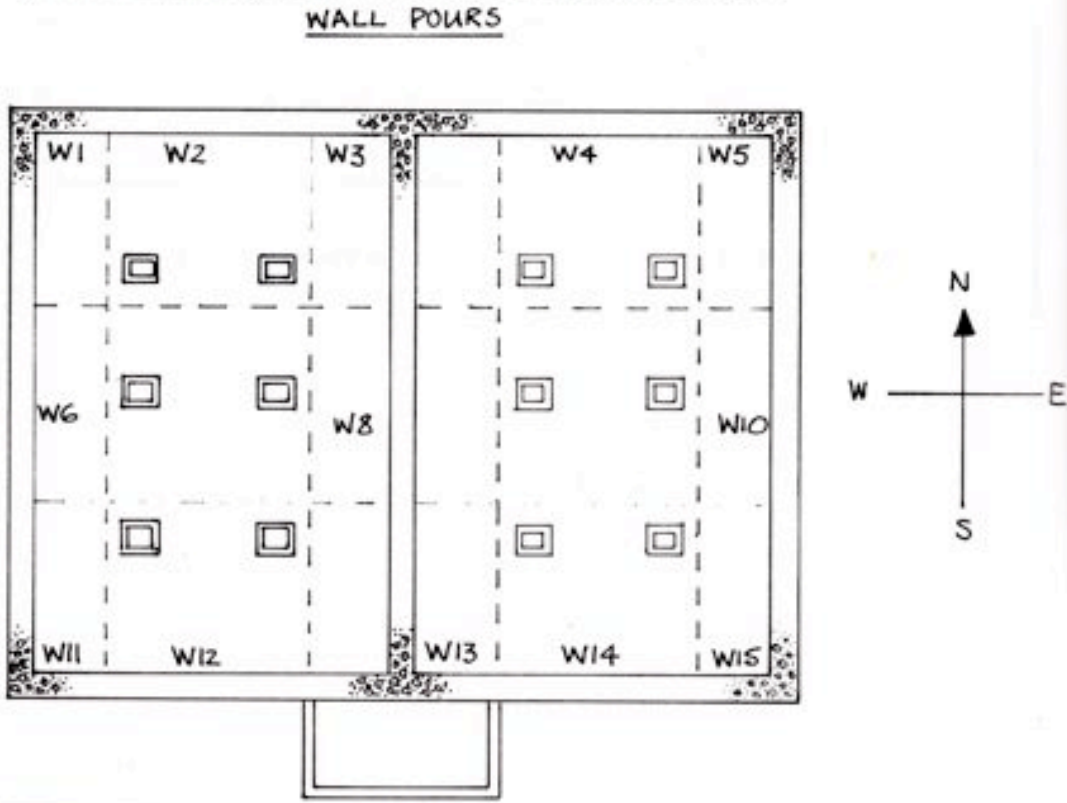


Figure 38. Joint layout and concrete pours for reservoir walls





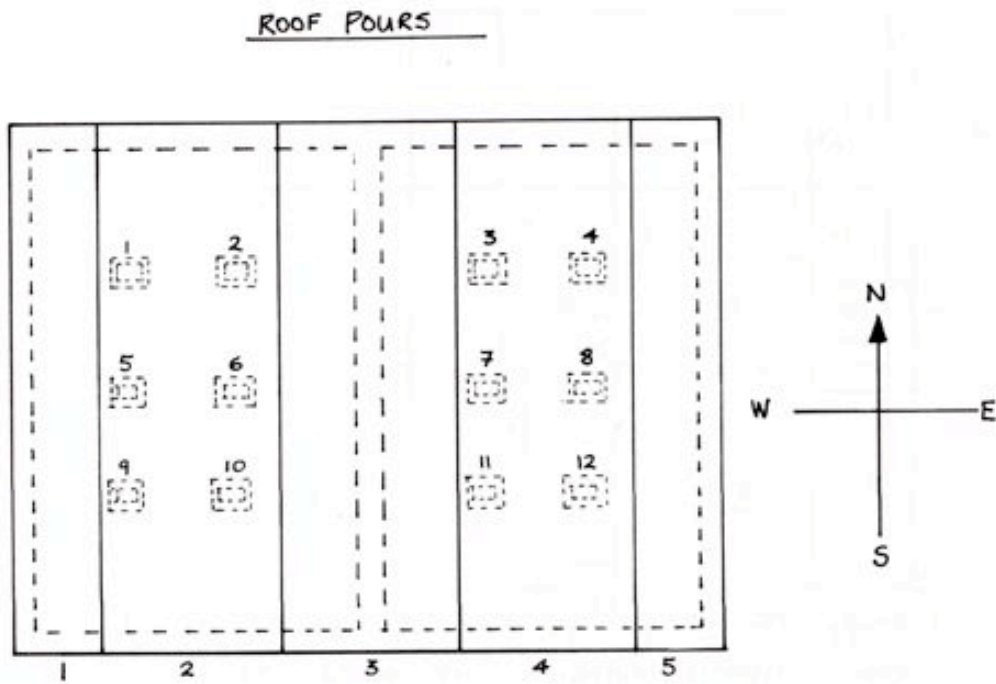
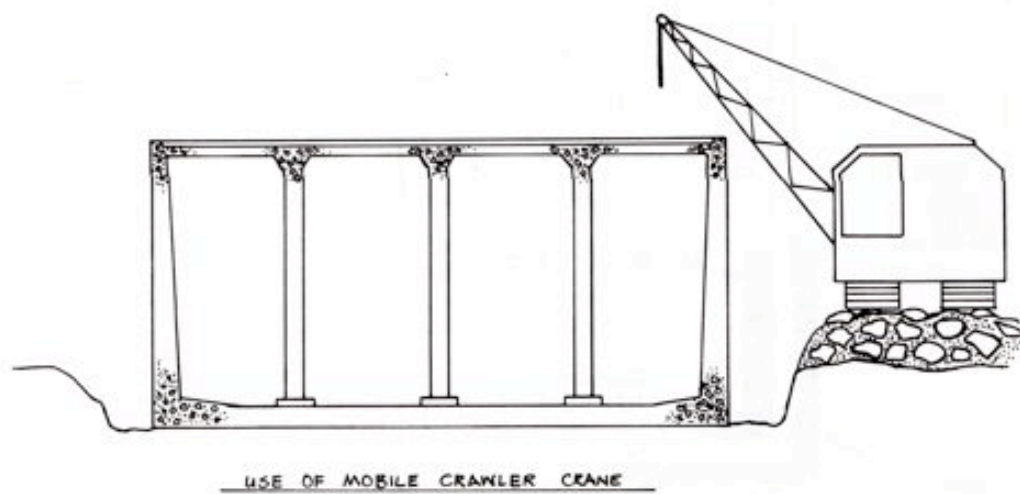
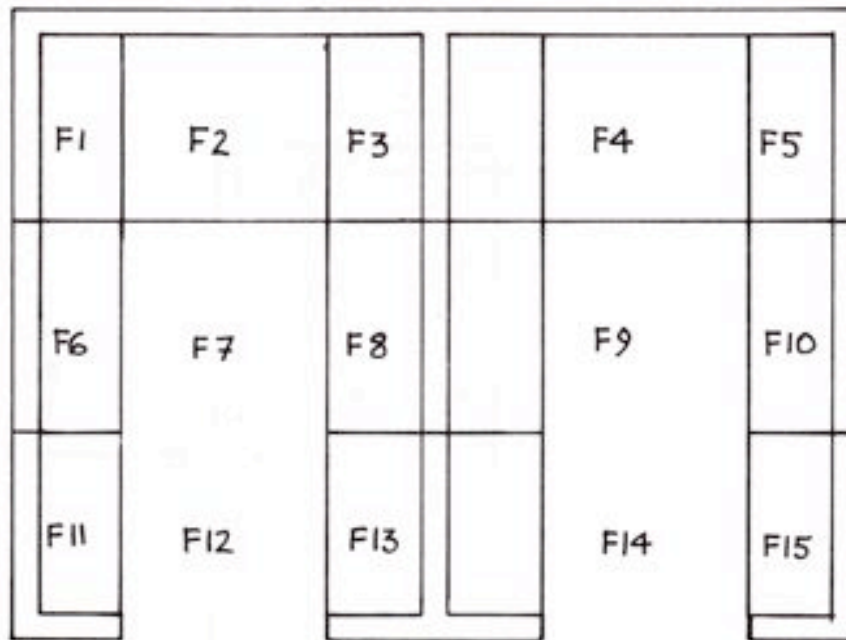


Figure 40. Access for mobile crawler crane around the reservoir

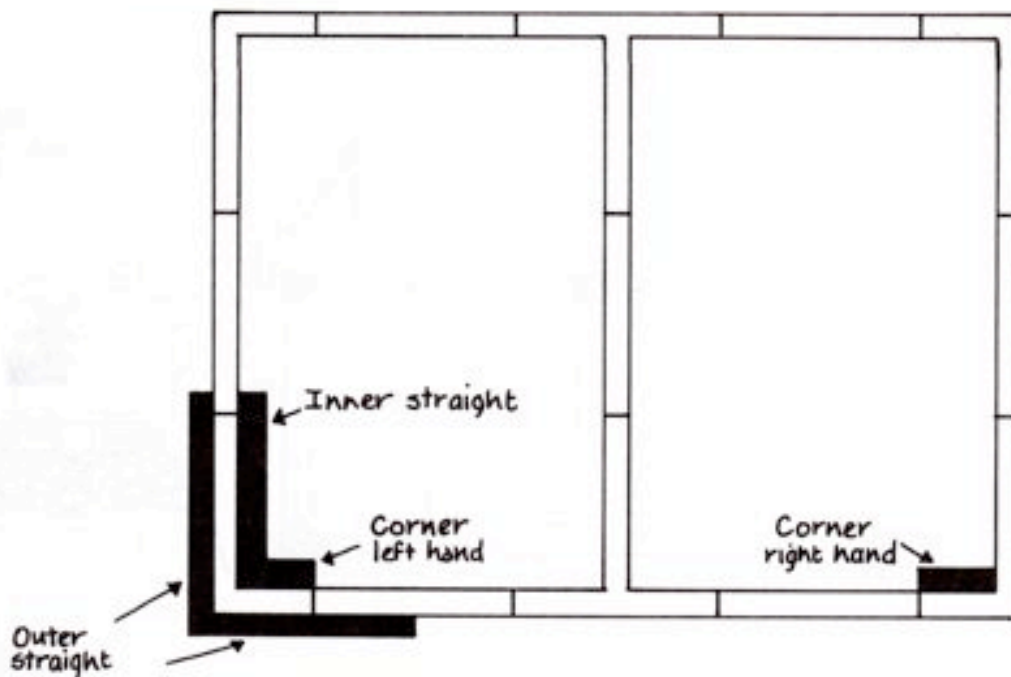


Access to centre of reservoir



Pours F7, F9, F12 and F14 concreted last, to enable concrete trucks to drive into the reservoir

Wall formwork



WALL POURS AND WALL FORMS  
2 "Inner straights" required for tees

### **Walls**

There are three types of pour:

straight walls;

corners, which are handed because of the internal wall taper;

tee-shaped-junctions between the cross wall and the side walls.

The easiest way is to make corner forms – right- and left-hand – which also form the inside of the wall on the shortest sides of the corners and tees. Each such form could be used for two tees and two corners, according to the handling. To form a tee requires a pair of such sections, plus three straight panels for the remaining, longer faces. This is the minimum number of panels required. (Note that these longer straight sections will also be used on the straight sections of wall.)

### **Valve chamber**

Forming the section of reservoir adjacent to the valve chamber will damage the forms, because of the provision of starter bars for the valve chamber walls. Therefore, this should be in the last reservoir wall pour.

A special form should be made for the base of this section of wall, enabling the pipes to be built in easily. The main wall form then sits on this in the same way as for the previous wall bases.

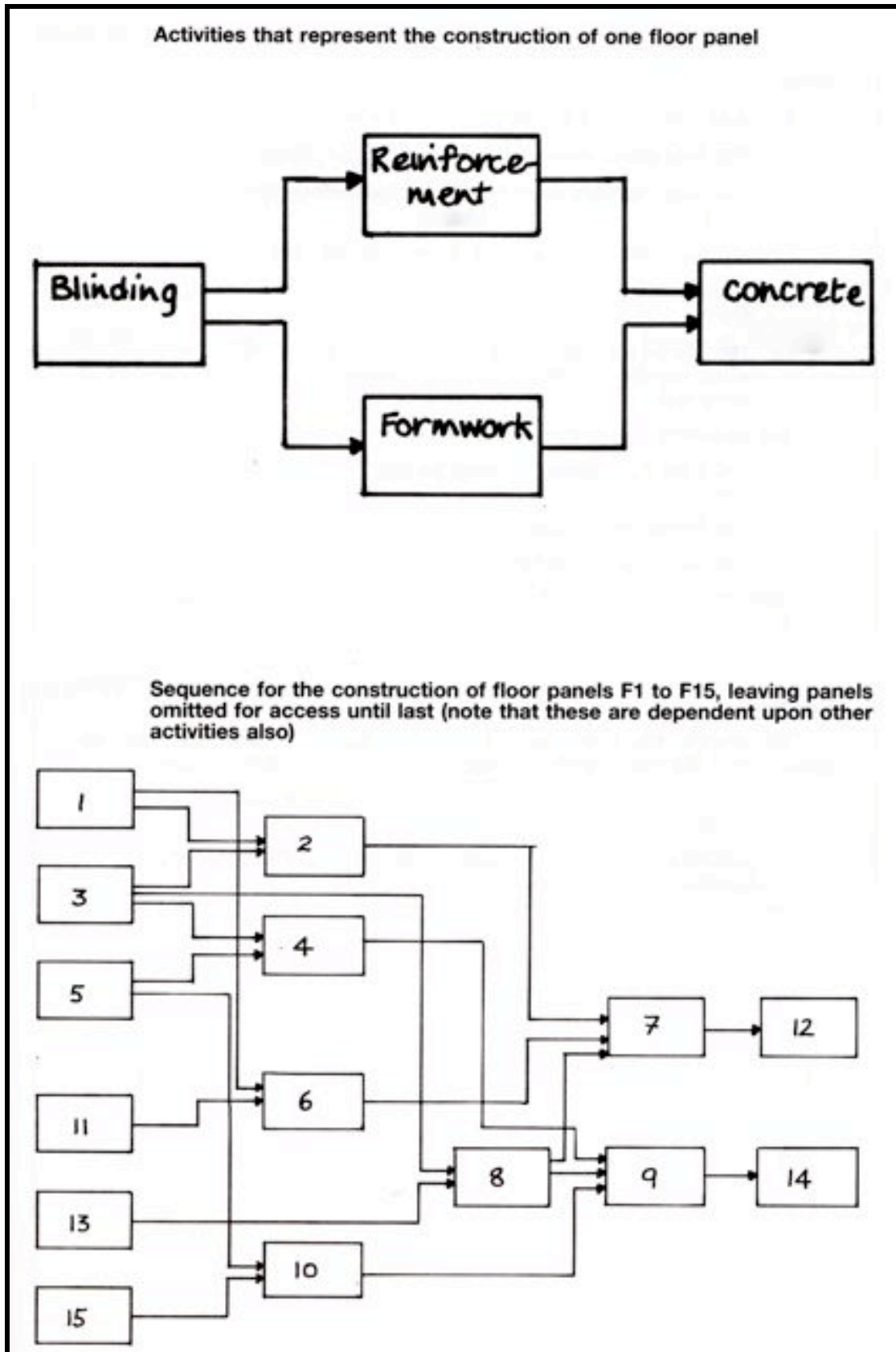
### **Columns and roof**

Columns may be most easily erected before the main soffit falsework and formwork is erected, using small and independent scaffolds. This gives more flexibility when planning.

A variety of pours and sequences is possible. Note that all support material has to be removed through the access hatch.

One of the key factors is the striking time of the falsework, as required by the specification; this is dependant on the air temperature during the curing period, but we have assumed two weeks.





### **Walls**

The walls will follow a similar pattern to the floor. The rules are:

The floor panel under the wall must be completed.

Tees and corners must be completed before infilling with straight walls.

Walls 12 and 14 are used for access, so are done last.

Formwork must be manufactured before the wall formwork may be started.

The starter bars for the valve chamber walls will damage the forms when panels 13 and 12 are cast. Therefore these panels should be done last.

The sequence of events for each of the panels is quite straightforward:

Once the floor panel has been concreted, the reinforcement can be fixed.

The formwork can then be erected.

The panel can finally be concreted.

(With the walls it is not possible to fix the steel and erect the formwork at the same time.)

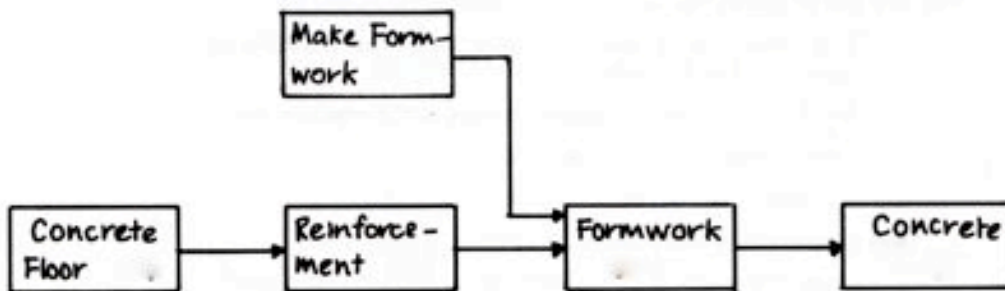
### **Columns**

To simplify the plan, the columns are paired to give six activities, according to the floor panels they occupy. The construction rules are:

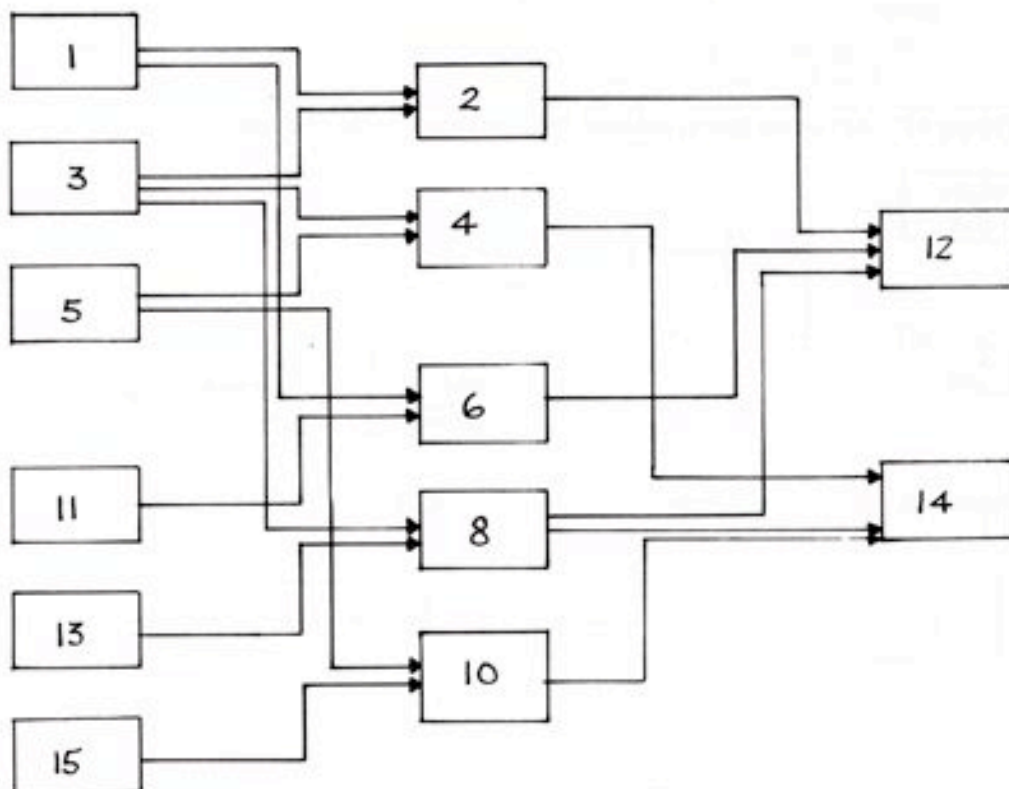
the floor under the column must be complete before the column can be started;

columns must be completed before the scaffold for the roof is started.

Activities that represent the construction of one wall panel



Sequence of wall pours W1 – W6, W8, W10 – W15



### Roof

The roof will be poured in five strips, moving from east to west; the first and last pours being half width. The following rules will be adopted:

Supporting walls and columns must be completed before any scaffolding is erected.

Scaffold must be completed before soffit erection starts.

Reinforcement can follow closely behind the soffit formwork.

The sequence of panels will be 1, 2, 3, 4 and 5.

The sequence of activities is, therefore, as follows:

when the walls and columns are complete, the scaffolding can be erected;

the roof soffit and reinforcement are worked on simultaneously, with a lead of one day to ensure the reinforcement will have a form to lay on;

the panel is concreted;

curing and striking follows on.

#### Notes:

Curing and striking have been combined in one activity. A more accurate representation would be to use separate activities, where the curing activity is given a seven-day-week calendar.

The scaffolding cannot be erected for the next panel until it has been struck from the previous panel.

#### Activities that represent the construction of one roof panel

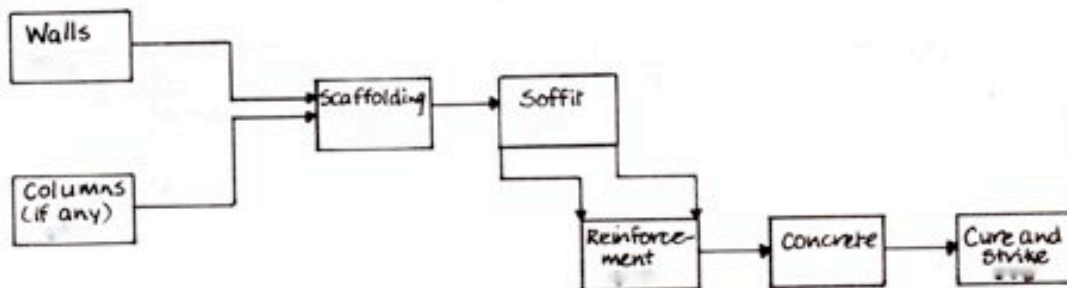
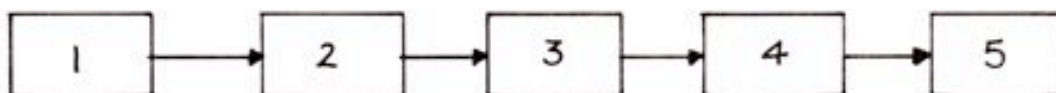


Figure 48. Sequence for the construction of roof pours P1 – P5



## **Construction project and contract organisation**

### **Client**

The Burleigh Brook Water Company is a regional water company based entirely in the catchment of a major river. It serves 6 million people.

### **Contract**

A 'traditional' contract, in which the Client engaged a Designer and let the contract to a main contractor on a fixed price but re-measured for the actual work done.

### **Contractor**

SafeWork Construction is a medium sized construction company that specialises in high quality concrete work. It is based in the same region as the Client. It employs 40 people in its Head Office and about 40 project management staff on its various sites. Almost all the work is subcontracted but because SafeWork is a specialist in high quality concrete work it employs 30 highly skilled concrete workers directly on permanent contracts.

### **Subcontractors for this project**

These include:

- Diversion of the electricity line by the authorised authority
- Site facilities, including catering and welfare
- Permanent and temporary fencing
- Excavation, general groundwork and landscaping
- Roadworks
- Pipework and drainage
- Steel reinforcement
- Concrete formwork
- Control equipment

### **Employment of the workforce**

Apart from the project management team and the specialist concrete workers, all the workforce will be employed by the subcontractors, most of whom will in turn employ most of their workers on a contractual basis rather than by direct employment.

### **Suppliers for this project**

These include:

- Pipework, from a company nominated by the Client
- Control equipment, from a company nominated by the Client
- All plant and equipment used by the main contractor will be hired
- The sub-contractors will supply their own materials, plant and equipment

## Course participants' tasks

Course participants will work in groups of three or four during the periods shown in the course timetable. Their tasks should be related directly to sections of the Theme Summaries, and these sections should be used as a framework for assessing the participants' solutions. Examples of suitable tasks are given in each of the four example courses.

## Reporting and recording

- Each group will nominate a reporter who will present the work of the group.
- The presentations will be followed by discussion leading to clear conclusions and recommendations.
- Each group will write a succinct, illustrated report of their work, which will be copied for all participants and retained by the Tutor.
- The Tutor will summarise the conclusions and recommendations and provide each participant with a copy.

The reporting and recording documents from the above will be used by the Tutor to assess the learning of the participants against the information taught during the course and this will form an element of the evaluation of its effectiveness.

## Specific aspects of this project

**Construction OS&H** does not offer prescriptive solutions because it endeavours to provide a basis for discussion and also to encourage OS&H to be safeguarded through systematic assessment and action, rather than the application of ready-made solutions. The fundamental basis for assessing the solutions to assignments proposed by participants of **Construction OS&H** training events is to match them to the checklists provided in Section 4 above. Nevertheless, a few key suggestions for consideration for the Lufbra Reservoir Project are offered below.

1. The site is on top of a hill, so exposure to weather may be a hazard.
2. The access track is narrow, so moving plant and vehicles may be a hazard.
3. The site is isolated so good welfare facilities will be required
4. The electricity power line can only be isolated for six months, but the contract duration will be at least nine months.
5. The site is in a rural area, so it must be securely fenced against the public but also animals before any work starts.
6. There are large excavations, which will cause hazards.
7. There are trench excavations, which will cause hazards.
8. Large panel formwork will require crane lifting, probably by tracked mobile cranes
9. Work on the walls, columns and roof will require good workplace design
10. The roof will require edge protection at all stages of construction
11. Thought should be given to the use of prefabricated sections for valve chambers and roof
12. Large volumes of concrete may require concrete pumps
13. There will be work in confined spaces (valve chambers and manholes)



## 6 COURSE EVALUATION

### Reminder of the Construction OS&H process of training evaluation

(taken from the Tutor's Guide's Introduction)

1. Simple 'tests' to establish the participants' knowledge, attitudes and perhaps, skills, at the beginning and end of the programme, perhaps also during a long programme. This process gives some indication of the effectiveness of the training, and may also assist the trainers to relate to the participants' specific needs and ambitions. These need not be given as formal 'tests', but embedded in exercises which form part of the training.
2. End of programme questionnaire and discussion (the discussion element is important because it requires the participants to justify and elaborate on their written opinions). Did the programme achieve its stated aims and objectives? Did the participants find it to be interesting, relevant and stimulating? What were the most/least useful elements?
3. Action plans. Participants are required to draft an action plan which describes how they will implement some (ideally all) of what they have learned.
4. Follow-up. Ideally, about three months after the training event, the trainers should contact the participants (or a sample of them) and perhaps their employers to review the implementation of the action plans, **Construction OS&H**; to assess how the materials taught have been used; and what broader effects it has had on the individual's job and on employers and others.

Examples of each of these four elements of evaluation are given in each of the four model courses, but the following are offered as templates which can be adapted by the Tutor for specific training events.

### 1 Simple tests

Fundamentally, all the evaluation must be related to the objectives. So, each **preliminary quiz** should seek knowledge from the participants about each of the training objectives; for example, if there are five training objectives, there should be one or perhaps two questions about each. The same quiz is repeated at the end of the training event, so the knowledge gained can be easily assessed. This process is illustrated clearly in the four model courses.

## 2 End of programme questionnaire and discussion

### Questionnaire

The general modular structure described in the Tutor's Introduction is reproduced below.

General modular structure for a five-day programme			
Module title	Time (hours)	Relevant Themes	Comments
Introduction	2		
A:	4		
B:	4		
C:	4		
D:	4		
E:	4		
F:	4		
G:	4		
H:	4		
I: Project	4 (or 8)	15	8 hours is better
Concluding	2	15	
Modular total (class hours)	40 (44)		

A simple questionnaire can be constructed in the form of a table, below.

Module	[Letter]	[Title]			
	Excellent				Poor
Score	5	4	3	2	1
Presentation					
Content					
Engagement					
Comments					

A set of tables in this form may be compiled covering all of the modules in the event, and given out at the end of the training programme for completion by participants. Their use is clearly illustrated in the model courses.



Three questions are asked for each module, which ask the participant to rate each of the following elements of the way in which a module was taught:

1. The **presentation** of the module, in terms of its visual and spoken delivery and general organisation.
2. The actual **content** of what was taught, in terms of its relevance and general interest to the participant.
3. How the tutor **engaged** with the participants in terms of discussion, exercises and generally making the participants feel motivated and respected.

Finally, a space is left for general comments.

The scoring system from 5 (excellent) to 1 (Poor) allows an overall score to be calculated. Participants should tick one box for each of the three elements of the assessment. In view of the wide-ranging nature of the subject and the possible diversity of the participants, an overall average of 3.5 to 4 should be considered to be very commendable.

An example of a completed module evaluation table is shown below. (This is the sort of evaluation to aim for!).

Module	G	Welfare & project site			
	Excellent				Poor
Score	5	4	3	2	1
Presentation	<input type="radio"/>				
Content	<input type="radio"/>				
Engagement	<input type="radio"/>				
Comments <i>I found the module very interesting and useful. The tutor explained it all very clearly and the handouts were good. I enjoyed the discussions and the exercises. It was all very relevant to my job and I shall certainly use quite a lot of it when I return to work.</i>					

## Discussion

The following is a task sheet for an end of programme discussion.

---

This activity is to find out how generally effective the workshop or seminar has been. It is an opportunity for you to help us to improve future courses.

### **ACTIVITY: Evaluation**

#### **AIMS**

To help us to:

- Find out to what extent the aims of this training event have been achieved.
- Decide how the effectiveness of this training event could be increased.

#### **TASK**

Discuss the following questions and summarise your group's view on a chart:

- Taking the event as a whole, did the different sessions meet your needs and interests?
- Which sessions or parts of the event were most valuable to you and why?
- Which sessions or parts of the event were of less or no interest to you and why?
- What suggestions would you want to make for future events?
- Is there any other comment you would like to make?

Elect a spokesperson to report back.

### 3 Personal actions plans

The following is a task sheet for the development of personal action plans.

---

#### **Your Action Plan**

Here is an activity to help you use what you have learned on this course.

##### **ACTIVITY: Your personal action plan**

###### **AIMS**

To help you to:

- Work out a plan for future activity on health and safety.
- Identify the steps that you can take to involve, educate and inform all those at your place of work.
- Think about the support you will need.

###### **TASK**

Draw up in outline:

- Your own personal action plan for the next six months. Be realistic but try to achieve some real changes. Keep the plan in writing so you can refer back to it after the course.
- A report back for your work colleagues to identify what you have learned from this training event and how it will help to tackle risks at work.
- A report back to your supervisor and senior management, with suggestions for future action on health and safety.

Prepare a report back to the rest of the participants with your main points.

#### 4 Follow-up

The form below is a simple way of assessing how much of the material taught in the training event has been applied by each course participant (or each of a sample of participants) in practice. It should of course, be used to stimulate a broader discussion on the effectiveness of the training event, which should be summarised and recorded for future use. This should not be a postal exercise; after an agreed period of time (say three months) the Tutor should visit the participants if possible, but otherwise should discuss it by phone [or in the digital spirit of **Construction OS&H**, perhaps by using Skype (www.skype.com)].

Module	Proportion used [tick ☐one box for each module]			
	All of it	Most of it	Some of it	None of it
A: [Title]				
B: [Title]				
C: [Title]				
D: [Title]				
E: [Title]				
F: [Title]				
G: [Title]				
H: [Title]				
I: [Title]				
Please give any examples of how you have applied something that you learned, which have had a practical improvement to OS&H in your organisation.				

## 7 CONCLUDING CASE STUDY

The case study is the collapse of the side of an excavation for a large building project, which killed eight people (seven on site and one later in hospital).

The case study shows a photo and gives extracts from the preliminary report by the Ugandan official investigation team.

The ILO is grateful to Evelyn Katusabe of the Occupational Safety and Health Department, Ministry of Gender, Labour and Social Development, Uganda, for providing this case study.

**The building as planned.**



**The collapse**



According to one worker interviewed on site who declined to identify himself, the accident occurred at around 11:30am on 14<sup>th</sup> October 2008. He said that at the time of the accident occurrence, workers were reinforcing the excavation with iron bars and wood. Further, there was a compactor that was reportedly compacting soil close to the cave in point. He also said that there had been a spate of soil cave-in the past including one that occurred on 30<sup>th</sup> September 2008 in which part of the site offices collapsed into the excavation.

### **Observations at the scene**

The team observed the following:

- The plot comprising of the site had been excavated to nearly 100%. The excavation was about 15m deep and nearly vertical.
- Most parts of the excavation base up to the height of about 7m bore strutting of metal and wood, with the exception of the western part immediately to the site offices and the eastern part where there is a main trucks' gate. In addition, the rest of the excavation above the strutting had a plaster covering of about 2inches (as viewed at the point of collapse).
- At the western part there seemed to have been a previous cave in, downing part of the site offices, as cleavage markings were observed from the site office structure.
- Near to the accident point was an excavator with fresh stamp marking on the ground an indication that it was in use probably at the time the accident occurred.
- Above the accident point was a house that also caved into the site with the soil cave-in.
- On site, seven (7) bodies were recovered and two injured workers taken to hospital. There were reports that could not be independently confirmed by the investigation team, that one of the injured workers had also passed away in hospital. The identities of the dead and injured could not immediately be established.
- Further, terms and conditions of employment of the workers could not be established.

### **Contractor compliance with the OSH Act, 2006**

- Pursuant to Section 40(2) of the OSH Act, the site was notified to the Commissioner for Occupational Safety and Health on 12<sup>th</sup> May 2008.
- In addition, the Contractor, ROKO Construction Ltd, submitted to the Department of Occupational Safety and Health a Construction Phase Safety, Health and Environment Plan for the project. This was in compliance with Section 14 of the OSH Act. The Construction Phase Safety, Health and Environment Plan for the project was reviewed for adequacy and a response requesting the Constructor to further submit safety method statements for particular operations among others was sent on 14<sup>th</sup> July 2008 as the Plan was inadequate. To date, we have not received a response from ROKO Construction Ltd.

### Issues that could have contributed to the accident occurrence

- The presence of a house is an indication of disturbed ground and therefore special attention needed to be undertaken. Further, the water run-off from the house enabled water percolation in the ground which could have been compounded by the rainy season.
- An excavation of such magnitude could have been undertaken progressively i.e. section by section proceeded by strutting and backfilling. It should also be noted that the previous cave-in at the site was an indication of poor methods of work. The steps taken to prevent the reoccurrence are yet to be established.
- The methods of excavation protection were inadequate and did not provide protection to the ground level.
- Seemingly, the excavator vibrations and rumbling at the time of the accident could have triggered the chain of events.

### Progress of investigations

Further investigations shall be undertaken and there is a need to work with other stakeholders to establish the circumstances of the accident and propose actions to avoid reoccurrence of such tragedies. In addition, it shall be established how the safety, health and environment plan was operationalised on site.

### Conclusions by **ILO Construction OS&H**

This is a clear case of inadequate support to a major excavation, and also failure to take due care not to make it even more unsafe by restricting the movement of plant and equipment at the surface near to the excavation. No realistic hazard and risk analysis or method statement would have allowed this excavation to proceed in this way.

### The case study shows that everyone involved suffers through such incidents.

The **clients'** dream of an impressive building has been tarnished by such loss of life and the project will be delayed considerably while the excavation is cleared. The OSH investigation takes place and the excavation process is re-engineered to provide a safe method of working.

The **designers** have allowed unsafe practices, which has will have damaged their reputation as competent supervisors of construction work on behalf of their clients. In addition, the question has to be asked about the need for such a deep basement in ground of this nature and whether a different design of the building would have provided similarly useful areas and facilities which were easier and safer to build. If in fact the deep basement was necessary, the designers may have considered the use of such construction methods as contiguous piling, which supports the ground while constructing the wall and eliminating the need for working space, reduces the excavated volume which offsets the cost to some extent.

The **contractor** will suffer increased costs, delays, legal action and compensation costs, and may find it difficult to attract good workers to a site with such a reputation. In a tightly regulated procurement system, the contractor may find it more difficult to get future work.

And of course it was eight **workers** and their families who suffered the ultimate loss. Surely this is a good example of the need for worker participation in the construction process?

**THIS CASE STUDY EMPHASISES WHY THE TRAINING OFFERED BY ILO CONSTRUCTION OS&H IS SO IMPORTANT TO ALL THOSE INVOLVED IN CONSTRUCTION PROJECTS WORLDWIDE.**





## 8 RELEVANT ELEMENTS OF THE KNOWLEDGE BASE

Title	Developing an integrated quality, safety and environmental management system
Author(s)	A. Griffith
Type of source	Journal paper
Publication or other source details	Construction Information Quarterly (a journal of the Chartered Institute of Building, Ascot, SL5 7TB, UK)
Date & ISBN/ISSN	Vol 1 Issue 3 1999 (No ISSN appears in the journal)
Summary of contents	The paper provides a research-based explanation of project quality, safety and environment issues, and in particular the concept of an integrated management system (IMS). The paper provides a basic introduction to the principles of IMS, to its application and to the issues that it raises for the future management of the construction process. Current issues and concerns are discussed and some pioneering applications reported.
Comments on relevance	This is an important subject because OS&H systems cannot be implemented in isolation; they must be designed to work alongside other project management systems.
Other information	See also: "Contractors' experiences of integrated management systems" by A. Griffith and K. Bhutto. Proceedings of the Institution of Civil Engineers, Management, Procurement and Law 161, August 2008, pp 93-98. Paper 800049

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 <b>Construction OS&amp;H</b>
Other information	See Tutor's Guide for more on the content of this book.