SECTION II.7

MANAGING PROJECT RISKS

1. WHAT ARE RISK ANALYSIS AND RISK MANAGEMENT?

Any uncertainty in the scope of the Project, the cost of delivery and time scale for delivery, will present either a risk or opportunity. By identifying uncertainty, and managing it, risks can be mitigated and opportunities capitalised upon.

It is important to emphasise that from the perspective introduced by the seven principles much of what in the construction industry is normally called "risk" should be in fact defined as inefficiency and waste ("muda", in the terminology of lean thinking). A supply chain management approach by definition reduces risk by "designing out" many of the inefficiencies and uncertainties related to the design and construction processes and interfaces between activities and people. At the same time, the collaborative environment produced by the application of the principles and disciplines described in this Handbook allows a project team to manage residual risk and uncertainties successfully. This effort is supported by two related activities: Risk Analysis and Risk Management.

Risk analysis is the investigation and identification of risk, an assessment of the likelihood of its occurrence, and its potential impact on the Project together with the development of response strategies. The application of risk analysis will help to prioritise the Project objectives and assist in recognising the importance of any constraints and consequences and their impact upon the Project

Risk Management is a planned and structured process aimed at helping the project team make the best decision at the right time. Risk management may also be defined as the continual process of monitoring and responding to risks throughout the inception, design and construction process, with the objective of minimising their adverse effect upon the Project. The management of risk is a systematic attempt to give proper consideration to what may happen in a Project

A well implemented risk strategy will enable the team to have a greater understanding of the Project and will have tangible benefits with regard to

a) reduced out-turn costs / time
b) a better and earlier understanding of the Project
c) Improved decision making
d) Accountable and auditable decision making procedure
e) Improved communication and team working
f) Increased confidence of a successful outcome

2. LINKS AND INTERFACES WITH OTHER PROJECT ACTIVITIES

Risk analysis and management, whilst having a clearly structured methodology and procedures, is an integral part of the overall management of a project in order to

achieve the best response, many elements of decision making must be embraced as an integral part of risk mitigation For instance the risk response may involve

HOLD	A risk is retained by a party when other options are less desirable than managing the risk
AVOID	The removal of the cause of a risk
REDUCE	Managing or designing out a potential risk or reducing a potential loss via an insurance policy
TRANSFER	Transferring a risk through contract
SHARE	More than one party is assigned an identified portion of a potential risk

It is essential that the purpose and parameters of risk analysis and management and their ownership within the project are clearly defined and understood in concept by all members of the team

All members of the team should be familiar with the concepts of Risk Analysis and Management, and where applicable relevant team members should be trained in the application of the requirement for their particular discipline

3. WHO CARRIES OUT RISK ANALYSIS AND MANAGEMENT

Risk Management is not one person's concern; it belongs to the project team. The strategy for managing risks has to be owned by the Project team; roles and responsibilities have to be defined for all team members.

Each identified risk has to be allocated to the party best able to assess its consequences and make an appropriate allowance over it. If a risk is transferred, the control associated with that risk should automatically be transferred with it
It is essential to the successful implementation of Risk Management that roles are clearly identified to maintain and control the overall management of risk throughout the Project.

The single body appointed to maintain and control the overall management of Risk is generally known as the Risk Manager. Depending upon the specific circumstances of the Project, the inaugural Risk meeting may be carried out by a separate Risk Facilitator, or, that role may be carried out directly by the Risk Manager.

4. THE MECHANICS OF RISK ANALYSIS AND RISK MANAGEMENT

4.1 RISK ANALYSIS

Risk Analysis involves the following techniques:

- Identification
- Classification
- Risk Register
- Quantification and Modelling
- Response

4.1.1 Identification

The identification of risks is an essential phase of the risk management process as no action can be taken on a risk if it has not been recognised. Identification may take the form of one or some of the following techniques

Brainstorming	- Random lateral thinking as to what could happen
Interviews	- A more formal approach which allows specific subjects to be discussed in detail whereby pre-circulated questions are discussed within a small group.
Questionnaires	- A combination of historical and job specific questions that are circulated for responses to achieve a consensus of opinion. Generally to be used with other identification methods.
The Delphi Technique	- Circulate questions to the team, monitor results, re-circulate etc. to obtain consensus.

To assist with auditing and monitoring, each risk identified should be referenced to a Risk Category and issued with a unique number within that Category.
To assist in the identification of risks it is recommended that the Risk Facilitator refers to a check-list of typical risks as an 'aide-memoire' during brainstorming sessions. A prompt list may be identified from: network of programme activities, what can go wrong lists , safety statistics, design, construction, operation. Typical Risk Categories are:

1. Third Party	Planning requirements, government involvement, local agreements, pressure groups, adjoining owners.
2. Site Risks	Access restrictions, existing occupants, existing buildings, boundaries/wayleaves, security, existing services, statutory undertakings, ground conditions, phasing of work, antiquities, human remains.
3. Client Risks	Statement of requirements, time scales, financial, statutory requirements, client regulations, approval

		procedures, change in requirements, approval procedures, communications.
4.	Design Risks	Interpretation of brief, design and development errors, time scales, estimating / pricing errors, design team experience, professional negligence, liquidation / insolvency, management of design, completeness of documents.
5.	Construction Risks	Procurement route, programme, variations, price, disputes and claims, site management, workmanship, accident / injury, liquidation / insolvency, latent defects, material supply, approval period, statutory bodies, weather.
6.	External Risks	Market conditions, political changes, force majeure, funding approval, rival projects

4.1.2 Classification

Classification is a process that will prioritise those risks which will have most damaging effect on the project and would therefore require further analysis and mitigation. Risks can be graded to reflect:

Probability, that is, the likelihood of occurence; the estimation of probability is a form of judgement, so it should reflect the judgement of the whole team rather than that of one individual only.

Consequence- that is, the effect upon the project

Both risks and consequences are graded numerically and added or multiplied to form a risk score. The final risk score indicates the relevant significance of the identified risk.

Score 2-3 = Risk averse
Score 4-5 = Risk neutral
Score 6-10 = Risk seeking

	CONSEQUENCES					
	Insignificant ———					Catastrophic
PROBABILITY		1	2	3	4	5
Improbable	1	2	3	4	5	6
	2	3	4	5	6	7
	3	4	5	6	7	8
	4	5	6	7	8	9

Highly Probable	5	6	7	8	9	10

The above exercises would enable the project team to focus their attention upon those risks that are likely to cause the greatest concern.

4.1.3 Risk Register

The Risk Register is generally compiled from the results of the identification and classification tasks. Aspects to be recorded in the Risk Register at this stage will include:

- Category
- Item Reference
- Description
- Risk Raised by whom and when
- Probability
- Consequence
- Aggregate Risk Grade

Provision should be made for inclusion of the following after further considerations by the Team:

- Response and Comments
- Owner and Action Date
- Status

An example of a typical risk register is reproduced in fig. 1.

4.1.4 Quantification and Modelling

Quantification is an essential stage in the risk management process for setting realistic programme and risk allowance levels. Quantitative risk assessment will inevitably require more detailed consideration of probability and consequence so that it can be quantified and analysed statistically. Where appropriate the quantitative risk outcome should be linked to a cost model.

There are several techniques for obtaining a quantitative assessment of risk:

- Simple arithmetic analysis
- Probabilistic analysis
- MERA (root mean squared method)
- Decision trees
- Sensitivity analysis
- Influence diagrams
- Monte Carlo Simulation (and Latin Hyper Cube Sampling)

The tools and techniques of quantitative analysis are not mutually exclusive and a combination of them may be used. Detailed examples of the various analytical techniques are considered to be beyond the scope of this Draft Guidance Note. The modelling is carried out to establish the cost risk allowance and time implications to establish a level of confidence.

Ref	*Brief description*	*Trigger event*	*Inter depend. (ref.to)*	*Pb*	*Effect*	*Impact*		*Responses, Mitigation status*		*Owner*	*State*	*Comment Actions*
						ARA	*MLRA*	*Current*	*Previous*			
Cl.01	Client change of requirements pre-contract			50%	T,C,Q	8,000	30,000	A	N/A	PS	I	
Cl.02	Client change of requirements post-contract			50%	T	20,000	50,000	A	N/A	All	I	
Cl.03	Contractor's claim			50%	T,C	10,000	40,000	A	N/A	PS	I	
...												
D 01	Design development			50%	T,C,Q	10,000	50,000	A	N/A	PM	I	
D.02	Additional M&E Requirements			50%	T,C,Q	10,000	25,000	A	N/A	PM	I	
...												
S .01		Ground investigation	S.12	50%	T,C	10,000	20,000	A	N/A	PM	I	
S .02	Demolition work requires special treatment (e.g., asbestos)	Site survey		50%	T,C	10,000	25,000	A	N/A	PM	I	

Cl.= Client Risk
D= Design Risk
S= Site Risk

T= Time
C= Cost
Q=Quality

A= assessed
M= Managed Out
D= designed Out
S= Shared /Transferred
I= Ignored

I= Initial /Intuitive
C= Considered
F =Final

Figure 1: **Example of Risk Register**

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4.1.5 Response

Upon satisfactory completion of the identification and assessment stages, the risks need to be responded to. The response may be seen as a future plan of action involving considered and agreed methods of dealing with risk.

A prerequisite of Risk Management is that the responsibility of a risk should only be assigned to those best able to manage it. Implicit with the responsibility is the management of that risk, together with the monitoring and communication of updating other team members of the progress of a risk.
An active risk response may require the application of one, or a combination of the following:-

Hold- The risk is retained by a party when other options are uneconomic, unacceptable or undesirable. By effective management the risk should be contained within predetermined levels.

Avoid	- This mitigation involves the removal of the cause of a risk. This may be by adopting an alternative course of action, or reducing a risk to an insignificant level, but in extreme cases may result in project abortion.
Reduce	- A risk may be reduced by providing adequate protection to reduce the likelihood of a risk. This may be achieved by managing or designing out a potential risk or reducing a potential loss via an insurance policy.
Transfer	- The control of a risk may be transferred to other parties through contract conditions or insurance policies. The intention of transferring a risk is to assign it to those best able to manage that risk; an incentive should be involved to ensure proper management of the risk.
Share	- Risks are shared with other parties when the risk is beyond the control of one party. It is important that each party knows the value of the portion of risk for which they are responsible.

4.2 RISK MANAGEMENT

Risk Management involves the following:

- Allocation of Responsibilities
- Implementation
- Monitoring
- Risk Allowance Management

4.2.1 Allocation of Responsibilities

As previously stated the allocation of responsibility for risk is an essential part of risk management. The responsibility for the overall management of risk lied firmly with the Risk Manager. By definition he is responsible for the implementation of a suitable regime and compliance therewith. Under the direction of the Risk Manager individual risks must be managed by the most appropriate person or party empowered to take the management action necessary to mitigate the potential impact of a risk. Individual managers of risk will be required to report on action taken, results achieved and consequential risks that may have arisen. These reports will be forwarded directly to the Risk Manager on prescribed forms to assist with efficient interpretation of information.

4.2.2 Implementation

It is the responsibility of the Risk Manager to provide the framework to enable the Team to implement Risk Management. The tasks, responsibilities and accountabilities must be easily understood by all to an extent suitable to their role within the Project Team.

It is important that the information and results generated throughout the Risk Management process are presented with the following criteria in mind:

- ☐ understandable
- ☐ recognisable
- ☐ concise
- ☐ logical
- ☐ consistent
- ☐ updateable

4.2.3 Monitoring

In order to realise its full potential risk management should be undertaken at the earliest point possible. The Risk Register should be constantly updated to provide a useful audit trail of the risk showing how they were dealt with and what the cost of the action was. It is essential that periodic reports include an executive summary which will highlight the main areas of change and concern and summarise the current status of the Project in terms of anticipated outcome.

4.2.4 Risk Allowance Management

The remaining risk (after management action has been taken to reduce risk through appropriate economic risk response measures) is known as the residual risk exposure. The best estimate of the most likely cost or time effect of this residual risk must be provided for in stage estimates; this is the Project Risk Allowance.

Having adopted risk management, contingency levels should be a clear reflection of the risk exposure of a Project. When consequential costs do not result in the full expenditure of the risk allowance any savings should be reflected in revised budgets.

Collaborating for the Built Environment (Be) – www.beonline.co.uk
Be is an independent body formed from a merger of the Reading Construction Forum and the Design Build Foundation in 2002. Its 100 member organisations come from the demand and supply chains of the 'industry formerly known as construction', ranging from public sector and private sector clients and developers to contractors, designers, consultants, specialists and suppliers. It leads research and implementation activities in support of a vision of delivering integrated built environment solutions through collaborative working.

Contact Don Ward (Chief Executive):
(E) don.ward@beonline.co.uk (W) www.beonline.co.uk
PO Box 2874, London Road, Reading RG1 5UQ. (T) 0870 922 0034

Collaborative Working Centre – www.collaborativeworking.co.uk
The Collaborative Working Centre of Be is a not-for-profit organisation set up from members of the team that facilitated *Building Down Barriers* to provide consultancy, training and other continuous improvement services to support the development and implementation of collaborative working.

Contact Neil Jarrett or Vassos Chrysostomou (Directors):
(E) neil.jarrett@collaborativeworking.co.uk or vassos@collaborativeworking.co.uk
c/o PO Box 2874, London Road, Reading RG1 5UQ. (T) 0870 922 0034

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