Victoria University of Technology

RISK APPORTIONING IN ENGINEERING AND BUILDING CONTRACTS IN AUSTRALIA

BY

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TITLE OF THESIS: Risk Apportioning in Engineering and Building Contracts in Australia.

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DECLARATION: This is a minor thesis submitted as partial fulfilment of the requirements for the award of Master of Engineering. It consisted of a 12 month part time research study conducted by the author. The work contained in this thesis is the original work of the author with clear recognition given where other sources of material have been used to confirm a viewpoint or act as a comparison. No portion of the work in this thesis has been submitted in support of an application for another degree at this or any other University or Institution.

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ABSTRACT

This thesis is an investigation of current practice in respect of risk apportioning in engineering and building construction contracts in Australia.

Current literature on this topic suggests effective and responsible risk apportioning is not taking place but rather that parties controlling contracts have adopted a philosophy of risk shifting. Risk shifting is a practice carried out by the party initiating the contract where an identified risk is shifted onto the other party to the contract, regardless of whether it can influence or control the risk.

The thesis details a study conducted on 50 industry contracts that, through an examination of risk provisions, determined that a high level of risk shifting was being practised in the engineering and building construction industries in Australia. A comparative study on North American experience was also reviewed to gain an understanding of the broad extent of such practice.

The thesis also reviews current literature on this topic and provides a brief summary of literature items found to be particularly relevant to the study undertaken.

Recommendations are presented from the findings of the study, along with general recommendations from the literature reviewed.

The thesis concludes with comments by the author as to the reasons why change to current practices are necessary.

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1.0 INTRODUCTION

Both the engineering and building construction industries have evolved in terms of their development of conditions of contract. This evolution has been influenced by commercial practices, technology and the law. This is particularly the case over the last two decades where prior to this period most contracts were developed in-house by company employees or legal firms with experience in this area. Over the latter period many standard form contracts have emerged developed by such representative groups as, the Standards Association of Australia, the Master Builders Federation of Australia, the Royal Australian Institute of Architects and others. Most of these contracts have been progressively modified as a result of commercial and legal developments with the aim to improve their effectiveness for the parties using them.

Apart from these efforts little attempt has been made to guide parties in respect of suitable risk apportionment.

Current literature on this topic suggests Australian industry, like a number of similar overseas industries, is conducting itself poorly in respect of suitable risk apportionment. Risks are either being allocated to a party not capable of adequately controlling them or the risk is not being specifically addressed.

Risks poorly allocated can reduce their chance of being minimised, increase project costs and cause time delays. They may also heighten the potential for disputes and increase the volatility of a project.

Contracts where risks have not been acknowledged and hence unapportioned appear to be developed by parties who are either ignorant of their potential or are prepared to leave the risk lie and only act if it eventuates. This action is not usually one of accepting the consequences if the risk does eventuate but often develops into a dispute as some of the damage is attempted to be offset onto the other party to the contract.

Effective risk apportionment begins with a full assessment of all applicable risks associated with a particular contract, followed by an assessment of the most suitable party capable of controlling or influencing each risk. The assessment may be influenced by each parties experience, capability, resources and attitude to the risk.

Naturally, a contractor's or consultant's main aim in a contract is to maximise its profit. The owner to reduce its project cost. Both parties should be prepared to modify these objectives if through a reallocation of risk a mutual benefit to both parties may be produced. Suitable apportionment of each risk therefore should play an important role in the assessment and adjustment of a tender price.

1.1 OUTLINE OF THESIS

This thesis is an investigation of current Australian practice in respect of risk apportionment in engineering and building contracts.

The thesis primarily consists of a study of 50 recently used contracts applicable to the engineering and building construction industries.

It commences with definitions of the terms used throughout the thesis as well as an explanation of risk provision terms associated with the contracts studied.

The thesis covers a review of current literature on risk apportionment and although it does not present a detailed analysis of this literature it does provide a brief summary of literature items found to be particularly relevant to the study undertaken.

The methodology used in the study is explained. It includes the following:

- How the study was conducted in terms of data collection, etc.
- Study limitations.
- Areas that require further study.
- Method of analysis of study results.
- Criteria of results assessment, including an explanation and the use of the NPWC/NBCC Risk/Obligation Allocation model.

Results of the study have been presented in a number of tables and graphs to facilitate comparison and aid analysis.

An analysis is made of:

- Contracts between owners and contractors.
- Contracts between owners and consultants, including project/construction managers.
- A comparative study (Bhuta's North American Study).

The thesis concludes with recommendations resulting from the findings of the study and literature review.

1.2 OBJECTIVES OF THESIS

The primary objective of the thesis was to study the practice of risk apportionment in Australian engineering and building construction contracts with the view to determining whether risks are being apportioned in a suitable manner. The criteria of suitability is explained in Section 6.

The study primarily reviews lump sum fixed price contracts but also includes several cost plus contracts. No distinction is made between these types of contracts as the study investigates a series of risk provisions that relate equally to both styles of contract. Likewise various combinations of contracts were included, such as: 'design only', 'construct or supply only' and 'design and construct'. Contract parties incuded, owners, contractors, consultants and project/construction managers.

A secondary objective was to carry out a comparison of the results of the study conducted in this thesis with results of a similar study conducted by Bhuta in Canada and the USA in 1991. The comparison of results was of particular interest because of the similar engineering and building construction environments of the countries studied.

A final objective was to review current literature to determine if any other similar studies had been completed in this area and also review current experience.

2.0 DEFINITION OF TERMS

The following common terms have been used in this thesis and in reference to the analysis of the contracts in the study conducted. The terms have been defined by the author in respect of their general meaning and context to this thesis.

2.1 RISK

A risk may be defined as the probability of an event occurring coupled with the consequence if it does occur. Within the context of this study risk is primarily considered as a negative attribute. In real life however, along with negative risks positive risks, with positive outcomes may also occur. For example, as a result of a design review a better and more economic design may result.

In this thesis the terms Obligations/Responsibilities and Risk of a particular item are used interchangedly. The obligations/responsibilities reviewed in this thesis are associated with or meant to include risk arising out of these actions.

2.2 OWNER

Owner, Principal, Client refers to the party who generally initiates the contract and therefore the party for whom the execution of the contract is being effected.

2.3 CONTRACTOR

Contractor refers to the party generally bound in contract to execute the work under the contract.

2.4 LUMP SUM CONTRACT

A lump sum contract refers to a contract where an agreed price has been determined for the execution of the work and performance of the obligations by the parties before the execution of the contract.

Lump sum contracts are predominantly used where a clear scope of work, whether it be design and construct or construction only, is available and agreed between parties.

There are two kinds of lump sum contracts:

- Fixed Price Contracts

This type of contract has no facility for Rise and Fall or cost adjustment.

- Lump Sum Contracts, subject to Rise and Fall

This type of contract is subject to Rise and Fall or cost adjustment.

2.5 COST PLUS CONTRACT

A cost plus contract where the execution of the contract work is reimbursed to the party carrying out the work either on the basis of a fee or percentage over and above the final cost of all expenses incurred. Expenses include costs of labour, materials, on and off site work and related overheads, costs of hiring equipment, etc.

2.6 ENGINEERING INDUSTRY

Engineering Industry refers to that area of industry generally involved in civil and mechanical engineering projects. Design and construction of projects such as roads, bridges or dams and process chemical manufacturing plants.

2.7 BUILDING CONSTRUCTION INDUSTRY

Building Construction Industry refers to that area of industry involved in the design and construction of buildings and associated works in terms of industrial and or commercial developments and to a minor extent, in this thesis, domestic developments.

3.0 EXPLANATION OF RISK PROVISIONS

The terms outlined below have been used to describe risk provisions in the contracts studied. The nature of the risk is explained for each provision.

It is difficult ascribing one explanation or definition when, in a number of cases these terms within a variety of contracts, may be given different meanings. In a legalistic sense, the only way of dealing with this would be to ascribe each term a definition in accordance with its actual meaning to a particular contract. In the context of this thesis and in trying to understand the nature of risk apportionment, this would both be onerous and unhelpful.

In order to account for differences between the various contracts analysed a generalised explanation has been ascribed to each term. Explanations have been, where possible, derived in meaning from standard condition contracts such as AS2124-1986 and NPWC Ed 3 - 1981.

3.1 DESIGN

The nature of risk in this provision is in respect of whether the design will satisfy the requirements specified in the contract in terms of adequately carrying out the function intended. Design normally includes specifications as well as plans and drawings. It generally, involves the provision of specialist professional services from a range of disciplines.

3.2 DISCREPANCIES IN DOCUMENTS

The nature of the risk in this provision is in respect of the consequences that may result from discrepancies, ambiguity, omissions or errors found in contract documents, including drawings and specifications, and any other contract documents. Consequences may include increased costs and or delaying contract program.

3.3 QUALITY MANAGEMENT

The nature of risk in this provision is in respect of the party executing the works conforming to the standards of material and workmanship specified in the contract.

Where standards are specified a defects liability period is also generally specified. It normally commences on the date of practical completion and lasts anywhere from three months to a year. During this time the party who executed the works is obliged to rectify any defects notified to it in writing. This latter provision must be specifically nominated to apply in the manner outlined.

3.4 SECURITY/RETENTION

The nature of the risk in this provision is in respect of whether security shall be provided to ensure due and faithful performance of the contract.

Security/Retention is most commonly in the form of a Bank Guarantee or the holding of Retention Monies.

Although normally provided by the contractor, in some contracts, these roles may be reversed and the owner may have to submit a Bank Guarantee to the contractor/consultant to ensure it will provide sufficient contract funding.

Retention Money is a form of security in which the owner retains a percentage of each progress payment made in the contract during the course of the work. A percentage of this retainer is released upon practical completion and the balance is released upon the expiration of the maintenance or warranty period.

3.5 INSURANCES

The nature of risk in this provision is in respect of the proper and sufficient provision of the applicable insurance coverage.

3.5.1 Workers Compensation and Employer's Liability

Workers Compensation and Employer's Liability - refers to that insurance that provides cover to the insured (usually a contractor and most often nominated to cover sub-contractors) against liability, loss, damage, claim, demand, action, suit or proceeding, costs and expenses as a result of personal injury or the death of any person employed by the contractor or by any sub-contractor in or about the execution of the work under the contract or the performance of the contract.

3.5.2 Public Liability

Public Liability - is insurance that covers liability to the public in respect to personal injury to or death arising by accident of any person whomsoever (apart from workers covered under Workers Compensation) and in respect of any loss or damage whatsoever arising by accident to any property real or personal where the accident arises out of or is caused by the execution of the works.

3.5.3 General Property and Works

General Property and Works - this insurance, usually referred to as Contract Works Insurance covers the respective rights, interests and liabilities of the parties involved in the works and property for which they are responsible and whilst on or adjacent to the site of the works.

3.5.4 Professional Indemnity Insurance

Professional Indemnity Insurance - covers any claim arising out of or incidental to any negligent act, error or omission by a consultant/contractor, its agents, employees, sub-contractors throughout the execution of the work.

Professional Indemnity Insurance in the context of the industries studied primarily relates to parties, such as design consultants, who provide a design function.

3.6 OWNERS LIABILITY AND INDEMNITY

The nature of the risk in this provision is in respect of the owner being exposed to:

i) Loss of or damage to property of the owner, including existing property in or upon which the work under the contract is being carried out.

ii) Claims by any person against the owner in respect of personal injury or death or loss of or damage to any property.

There are normally provisions attached to such clauses in contracts, including:

- The contractors liability to indemnify the owner shall be reduced proportionally to the extent that the act or omission of the owner may have contributed to the loss or damage.

- Damage which is the unavoidable result of the construction of the works in accordance with the contract.

3.7 FORCE MAJEURE

The nature of the risk in this provision is in respect of a force majeure event occurring. Force Majeure events are events or circumstances that are normally regarded beyond the reasonable control of the party executing the Works of the contract, usually the contractor. They generally include the following events, but do vary to some degree, particularly with in-house contracts.

a) Fire and/or explosion outside the control of the contractor.

b) Strikes or lockouts or other labour disturbances beyond the control of the contractor.

c) Acts of statutory authorities or Governments in Australia.

d) Acts of Governments outside Australia.

e) Acts of God.

f) Hostilities or acts of war whether declared or not.

g) Civil commotion.

h) Acts of the public enemy.

i) Delays caused by the owner or its representatives.

The primary purpose of a Force Majeure provision is to provide, in the case of a Force Majeure event, an extension of time to the date of practical completion of the contract.

3.8 LATENT CONDITIONS

The risk in this provision is in a latent condition occurring.

"Latent Conditions are:

(a) Physical conditions on the Site or its surroundings, including artificial things but excluding weather conditions at the Site, which differ materially from the physical conditions which should reasonably have been anticipated by the contractor at the time of the contractor's tender, if the contractor had:

i) examined all information made available in writing by the owner to the contractor for the purpose of tendering; and

ii) examined all information relevant to the risks, contingencies and other circumstances having an effect on the tender and obtainable by the making of reasonable enquiries; and

iii) inspected the Site and its surroundings; and

(b) Any other conditions which the Contract specifies to be Latent Conditions" AS2124 - 1986.

3.9 INDUSTRIAL RELATIONS

The risk in the following provisions is in respect of the occurrence of industrial relations disputes or actions that cause disruption to the performance of the contract execution.

Industrial relations disputes can affect a project in causing an extension of time to the project and or cause delay costs.

3.9.1 Industrial Relations Disputes in General

Industrial Relations Disputes in General - refers to contract related disputes in connection with the performance of the works that may cause an extension of time to the project and or cause delay costs. An example of such disputes are: demarcation disputes, site allowance disputes, reduction in labour or working hours.

3.9.2 Strikes or Lockouts Beyond Control of Contractor

Strikes or Lockouts Beyond Control of Contractor - any strikes or lockout (not arising from any act or omission of the contractor or not arising whether directly or indirectly from the Works) in respect to any National issue directly affecting the works or by virtue of any strike whatsoever directly caused by the acts or omissions of the owner in a manner which might reasonably be expected to result in a delay in the Works reaching completion.

3.10 INCLEMENT WEATHER

The risk in the following provisions are the occurrence of inclement weather or the effects of inclement weather.

Inclement weather may be defined in a contract as weather conditions or effect of weather conditions that are outside what would normally be predicted for the time and location of the Works.

3.10.1 Costs Due to Inclement Weather

This provision is associated with delay costs that result from an extension of time being given to a project due to inclement weather or the effects of inclement weather.

3.10.2 Delays Due to Inclement Weather

This provision is associated with the granting of an extension of time being given to a project due to inclement weather or the effects of inclement weather.

3.11 DELAYS IN REACHING PRACTICAL COMPLETION

The risk in this provision is in not reaching practical completion in accordance with the date of practical completion specified in the contract, due to a cause not covered under the provisions of the contract.

"Practical completion is that stage in the execution of the work under the Contract when, generally speaking:

a) The Works are complete except for minor omissions and minor defects...

b) Those tests which are required by the contract have been carried out and passed.

c) Documents and other information required by the Contract have been completed" AS2124 - 1986.

If the contractor fails to reach practical completion by the Date for Practical Completion, the contractor shall be indebted to the owner for damage costs. These costs are usually detailed in an annexure in the contract in the form of liquidated and ascertained damages.

3.12 TERMINATION AND SUSPENSION

The risk in this provision is in respect of disrupting the execution of the contract or completely terminating the contract.

It refers to one or both parties right to terminate or suspend the works in the contract. Such terminations or suspensions do not generally reduce the rights and liabilities of the parties to recover damages.

3.13 DEFAULT

The risk in this provision is in respect of each party performing its duties and obligations in accordance with the contract.

If a party breaches or repudiates the contract they are committing an act of default.

On the part of the contractor such breaches may include but are not limited to:

a) Suspension of work without due cause.

b) Failing to proceed with due expedition and without delay.

c) Failing to use the materials or standards of workmanship required by the contract.

d) Failing to comply with a direction of the superintendent.

e) Failing to provide evidence of insurance.

On the part of the owner such breaches may include but are not limited to:

a) Failing to make a payment.

b) Failure by the superintendent to issue a Certificate of Practical Completion.

c) Failing to produce evidence of insurance.

d) Failing to give the contractor possession of sufficient of the Site.

(Source of reference AS2124 - 1986).

3.14 MEDIATION AND ARBITRATION

The risk in this provision is the occurrence of a dispute arising between parties to a contract, in the absence of a formalised dispute resolution mechanism.

If a dispute arises out of or in connection with the contract, including covering rectification or frustration of the contract, then a dispute resolution mechanism could be used. Such a mechanism may involve a procedure to be followed which may include a provision of notices to the other party within a set period outlining the nature and details of the claim. The other party may be obliged to respond to such notice again within a set period. If the matter still remains unsettled it may be referred to a third party nominated in the contract for determination.

4.0 LITERATURE REVIEW

A variety of current national and international literature was reviewed on the topic of risk apportionment in contracts.

The aim in reviewing this literature was to see what other studies had been done in this area and consider what was being suggested by practitioners in this field as best practice.

Two recent studies were found, one by Bhuta (1991) and the other by Uher (1990). A comparison of the findings of Bhuta's study was made with findings of the study in this thesis. This was possible because of the similar styles of both studies. Uher's study, specifically of Australian sub-contract conditions of contract was not directly comparable because of the different natures of the studies. However, Uher's findings were of interest in terms of what it suggested is currently being practised in risk apportionment in sub contracts.

What follows is a summary, generally in point form, of that literature regarded as most relevant to the research in this thesis.

4.1 BELEV (1989)

Belev in a paper entitled "Minimising Risk In High Technology Programs" discusses the need for minimising risk from a cost engineer's perspective.

Risk has to do with uncertainty, probability, and the need for contingency planning. The management of risk (and its minimisation) is the preparation for possible adverse events in advance (the pro-active approach) rather than responding when they occur (the reactive approach).

Uncertainties in most programs are numerous and also often interrelated. This tends to result in underestimation of risk and makes it difficult to be confident in identifying and prioritising the risks.

He defines risk as the probability of an event occurring and the significance of the consequence. Risk is a function of both the probability and the consequence of failure.

There is a high degree of subjectiveness in evaluating risk. It is highly dependant upon an individual's perception of what is personally acceptable.

A prerequisite to developing a high level of control over a project is to establish a contracting policy and risk philosophy. These requirements translate into program management procedures and contract provisions.

The contract type is extremely important and therefore the selection should not be underestimated. The major consideration in the selection of the contract type is whether or not the service can be performed or the item made.

A firm fixed-price contract should be used when the risk involved can be predicted with an acceptable degree of certainty.

The following factors will provide guidelines as to the type of contract:

- The Nature of the Work - A high ratio of development and fabrication tends to create a higher degree of risk.

- Experience - Confidence in the cost estimate is proportional to the experience in estimating costs for similar work.

- Negotiation Environment

- Time Available - Confidence in the estimate increases in proportion to the time allowed in its preparation.

- Risk Philosophy - relates to risk sharing or risk shifting.

  Specifications/data inaccurate or ambiguous can result in costly and time consuming problems during contract performance.

  One reason engineers/contract administrators feel frustrated with the concept of risk is the failure to recognise the breadth of the concept.

Assessment Ground Rules:

- Risk should be quantified.
- The consequence of the risk should be determined as a direct cost.
- Risk should be taken only where there is an opportunity for gain and if the opportunity measurably exceeds the risk.
- Definitive risk assessment must surface the root cause of concern.
- There are three ways to mitigate risk:

  1) Accept it
  2) Transfer it
  3) Reduce it

Types of Risk:

- Technical Risk - High risk programs are by definition on the leading edge of technology where the only certainty is uncertainty.

- Design Risk - Caused by intangible design requirements.

- Cost and Schedule Risk - Cost and schedule growth is the difference between the estimated program cost and schedule, and the actual cost and schedule.

- Funding Risk

- Supportability Risk

- External Risks - Regulatory, environmental, socio economic impacts.

  Problems with high technology projects arise due to proceeding into production with:

  - designs that are not stable (high engineering change rates)
  - designs that are difficult to produce
  - inadequate or incomplete production planning
  - inefficient manufacturing processes or equipment
  - unproven manufacturing processes.
  - unsatisfactory performance from suppliers.

Risk Handling Techniques:

- Avoidance - selecting the low risk choice represents a risk avoidance decision.

- Risk Control - recognition of the risk and a need to minimise its effects through the process of monitoring and correcting the condition. It requires planning.

- Risk Assumption - conscious decision to accept the consequences of a risk.

- Risk Transfer - involves sharing or complete transferring through contract conditions, ie. type of contract, warranties, insurance.

Risk Assessment Model - a five step methodology may be used as a decision - aiding device (not a decision making device). It provides a mechanism for evaluation.

1) Breaking down the tasks to be accomplished into manageable components or attributes. A work breakdown structure.

2) Estimating the utility factor, that is the relative importance of the specific attribute to the overall project.

3) Developing a utility function or curve which describes the utility values as a function of some descriptive variable (i.e. reliability in terms of mean time between failure).

4) Estimating the risks associated with attaining the utility valves chosen for each attribute.

5) Developing options to avoid or overcome obstacles to success and to compare alternative paths, solutions, or concepts.

Steps 1-3 develops hierarchial matrix with weights assigned to various attributes of the matrix.

Step 4 alternative concepts, design or schedules are scored through use of the matrix to help decide which are best. These assessments can take the form of point estimates or probability distributions.

Step 5 effective accomplishment will depend on the engineers skills and abilities. This step may involve accepting an increased risk in areas where the pay off will be greater or even to assume greater total overall risk if the potential benefits outweigh the possible consequences of failure.

4.2 BHUTA (1991)

In a paper entitled "Management of Risk In Projects" Bhuta discusses the nature of risk apportionment in respect of a study conducted in the United States and Canada in 1991. His study included the review of 45 contracts ranging in value from just over $1 million to more than $300 million. He reviewed Design and construction contracts related to the Building and Oil Industries.

Bhuta's preliminary analysis indicated:

a) Most pre 1988 contracts were biased against contractors, by them having been assigned the majority of risks in the contracts studied.

b) In respect of insurance: 9% of owners expected each main contractor and subcontractor to provide all insurances i.e. some projects ended up being covered 4 or 5 times.

Some progressive contracts had the owner cover all insurances. Each contractor only had to cover their own staff and equipment.

Piecemeal contracting kept the owner in doubt if not ignorant of the nature/extent and quality of cover.

c) Enlightened project managers and owners said they never liked to take a contractor to the court whether they were right or wrong.

- Owner may tarnish business image.
- Lose attracting good reliable contractors and the owner would ultimately have to pay higher on future projects.

d) One of the main obstacles was the attitude of legal contract advisers. They still believe in an adversarial approach (mainly based on mistrust and taking the worst case scenario rather than most probable).

Bhuta suggests:

The owner must take a lead role in risk apportionment because the owner initiates and determines the project's nature and scope. It also commits the land to a long term use. The owner may well be hoisted with most of the risks of unsatisfactory end results. However, the owner also has the unique ability to transfer or allocate most of the risks.

Recommendations that resulted from his study include carrying out the following procedure to facilitate effective and equitable apportionment.

a) List and classify all possible risks that may arise in a specific project.

b) Assign each particular risk to the party best equipped to bear it.

c) Develop clear and concise contracts and unambiguously divide the responsibilities.

d) Conduct a buildability review before the tender process or finalisation of the selected contractor's tender price.

e) Incorporate a mechanism for quick dispute resolution between the parties up front.

f) Plan channels for communications within the project team as well as with other outside parties.

g) Pre-plan for permits/authority approvals.

h) Recognise that the cost of design preparation is a very small component of cost, yet the design and documentation is a very large determinant of the cost.

Bhuta suggests, if properly managed, the distribution of risk among the project team (the owner, architect, including consultants, contractors and project/construction manager) could be shared so that the owner's ultimate cost would be reduced. An improved risk apportionment (allocation) would benefit all members of the project team.

4.3 CASNER JR. (1988)

"In a perfect world the Engineer never alters his drawings, the owner never changes his mind, the contractor always operates at 100% efficiency and mother nature behaves herself. Unfortunately, this world does not exist. In the real world the engineer, owner, contractor and mother nature combine to make change". Casner Jr.

Claims Preventions

It is most important that both owners and contractors recognise what is fair and reasonable and adhere to this in their contractual relationship.

Prudent Management - in drafting of contract documents.

- Many owners still view harsh contract clauses as the best defence against claims.

- Harsh and unfair contracts discourage responsible bidders but attract bidders willing to take any chance and who expect to make up their losses via claims.

- Additionally, ambiguous language or exculpatory clauses almost always result in conflict.

A good contract will clearly define the roles and responsibilities of both parties and will assign risk to the party best able to assume and control that risk.

Assigning risks to the contractor that it cannot control often leads to claims, and a court may even deem that the assignment is unenforceable.

Defective and deficient contract documents.

- Responsibility traditionally lies with those who developed them.

- Contract documents are never perfect, however they should be reasonably free of error, although this may be a subjective judgement.

What is the Contractor's responsibility regarding ambiguity or errors in contract documents?

- The Contractor has a duty to seek clarification of an ambiguity only when it is obvious.

- The Contractor is not normally required to seek out possible ambiguities or errors.

Owner to prevent deficient contract documents:

- Care in preparation of drawings/specifications.

- Give adequate lead time for good design.

- Avoid lump sum contracts if the design is incomplete.

- Select a design firm that is well experienced and that can demonstrate an effective internal quality assurance system.

- Sufficient priority must be given to critically important elements of the design effort (including top level management attention and periodic design reviews.

4.4 FRANKEL & LAZARUK (1991)

Frankel & Lazaruk are involved in the area of Risk Management and in a recent paper entitled "Preventing Legal Problems During Construction" suggested some ways in which risks could be minimised.

They have suggested that the contractual phase of a project is the best time for risk managers to deal with construction risks. Delays, cost over-runs, change orders, design omissions and errors are just some of the liability concerns associated with construction projects.

Ambiguities and lack of proper coordination prompt disputes and litigation.

They emphasised the need for the Risk Manager to have a clear understanding of the following issues:

a) Whether the party assuming the risk burden is capable of handling it?

- Does the firm have the proper insurance coverage?
- Is it financially secure?
- Are human resources stable?
- Has the firm successfully completed the design and construction of other projects of a similar scope?

By contractually assigning risks to entities that cannot assume such responsibility, the Risk Manager may be creating a false sense of security.

b) During contract negotiations the following terms must be clearly defined:

- Scope of Services;
- Fees;
- Degree of responsibility accepted by each party for each risk.

c) Dispute resolution is an important issue that should not be over looked. After all disputes are an inevitable part of every construction project normally arising over ambiguities in design drawings and contact documents.

Contractors looking for change orders to increase revenue can seize upon alleged ambiguities in contracts as a means to achieve this. To avoid costly, lengthy, and protracted litigation to resolve disputes a mediation clause should be included in each contract:

- It does not require extensive preparation that is often needed for arbitration or litigation.
- It is an attempt to assist parties to reach a settlement by focusing on the issues.
- It can make recommendations that forge the parties toward resolution.
- It is not binding which can often help parties achieve their own settlement.

4.5 KONARSKY (1990)

In a brief article on Risk Management Konarsky reminds the Risk Manager of the need to read the fine print in contractual agreements.

Effectively identifying, defining and transferring risks to reduce or control them necessitates the use of various types of contracts and commercial leases. Konarsky suggests that nearly every business transaction requiring a written agreement between parties has incidental language that shifts some exposure or financial responsibility to another party.

4.6 KORMAN & SETZER (1991)

Korman and Setzer in a paper on risk apportionment entitled "Sticking It To The Other Guy" claim that unabashed risk-shifting is flourishing in construction contracts in the USA. With jobs growing scarcer in some markets, companies are torn between working or walking away from one-sided contract terms covering delays, indemnification and differing site conditions.

The amount and type of risk-shifting varies widely depending on the nature of the job and location.

They discuss different government agencies in the USA and suggest State and Local Public Works agencies are more likely to say "take it or leave it" than their counterparts in federal agencies or the private sector. "Many agencies take the attitude that when you buy the job, you buy all the risk connected with the job", says Art Prado, executive director of the Contractors Association of Western Pennsylvania, Pittsburgh. They claim that Government risk-shifting reached its zenith in 1989 with the circulation of draft model contracts written by the National Association of Attorneys General. Designers and contractors saw the document series as a naked attempt to shift liability to them. For designers, the risks included those associated with job site safety which generally is considered outside the designers control and therefore not included in most standard contracts. The NAAG subsequently withdrew the series but the language continues to appear in agreements developed by state and local agencies around the country.

Korman & Setzer suggest model documents are part of the means for setting up more equitable contracts. However, the model contracts are only a starting point. Many attorneys treat the modification process as a contest, says Justin Sweet, Professor of Law at the University of California at Berkeley. He claims that "if they have the power to put risk onto the other party they will".

Guidelines already exist for equitable allocation of risk. For example, the Construction Industry Institute suggested in late 1988 that the parties in lump sum contracting avoid using onerous, broad-form indemnity provisions and consequential damage clauses that shift all risk onto the contractor. This advice appears to be being heeded. Joseph Trimble, Senior Vice President for Fluor Corp., see's owners softening on risk-shifting mechanisms. "Owners are realising that (these clauses) are costing them money either in contingencies, fewer bidders or excessive project costs", he says.

4.7 KOZEK & HEBBERD (1989)

Kozek and Hebberd in a paper entitled "Share The Risk" suggest that owners sharing construction risks with their contractors, may be able to ward off large dollar claims and obtain lower contract bids.

They cite the American Environmental Protection Authority as an organisation who has embodied this philosophy of risk sharing.

They suggest pure risk shifting involves causing the other contracting party to bear the full consequences of unanticipated events. In risk shifting the owner attempts to limit its costs and time exposure to the price and time stated in the contract. In doing so, the owner must assume that it is likely to be paying a contingency premium built into the price. The contingency is the price paid to avoid future risk of additional costs.

Effective risk sharing means an owner is willing to assume the risk of increased costs in the future due to unanticipated events in exchange for a contract price (today). That price is, in theory, lower since the contractor did not have to include a contingency in the contract price for the unanticipated event. Many of the EPA model sub-agreement clauses fall into this category.

Many contracts contain a site investigation clause specifying that the contractor must view the site. Then with a disclaimer on the owners part the burden of investigation is put on the bidder. As a result, the bidder may increase its bid to cover the possibility of a differing site condition.

The owner in essence is paying the contractor for differing site conditions regardless of whether or not they were encountered.

4.8 NPWC/NBCC (1990)

In May 1990 a report titled 'No Dispute' was published by a Joint Working Party of the NPWC and NBCC after extensive research of the Australian construction industry. The Joint Working Party comprised senior representatives from all major groups within the industry, with the aim to propose changes to current practices that would achieve a reduction in claims and disputes among parties.

<u>General Recommendations:</u>

The following is a brief summary of the issues in the report under the heading of Risk Allocation. It does not do justice to the report in terms of detailing many of its more specific recommendations.

General recommendations suggested in respect of risk apportionment are:

- Owners should not ask a contractor to price unquantifiable risk that is within its control. It could negotiate, however, with a contractor in respect of the contractor baring responsibility of a neutral risk.

- Clear identification of obligations and/or risks is essential.

- The industry should use the methodology adopted by the Risk/Obligation Allocation Model to facilitate a rationale assessment of risks/obligations.

- Standard Form Contracts should where possible be used and where amended, such amendments, should be clearly identified.

- General Conditions of Contract should be seen as allocating "obligations" rather than "risks".

- Obligations and/or risks within the control (owner/contractor) should be borne by the respective party.

Claims Administration:

Delay costs implications should be identified by a pre-statement of known costs i.e. a resource schedule, hire rates.

Each obligation put on the contractor should be paid for by the owner.

If the owner requires the contractor to take a risk or carry an obligation, the owner must ensure that the contractor has the authority to control or influence that risk or obligation. There should be no discrepancy between responsibility and authority.

Objectives:

The objectives of the sub-committee on Risk Allocation of the NPWC/NBCC were to:

- "Develop principles to allow parties to make informed decisions by assisting them to:

    1) Identify and understand their obligations and any consequent risks.

    2) Decide which party is best able to manage each of those obligations and/or risks.

    3) Facilitate that party to assume each obligation and/or risk for proper reward".

Allocation Principles:

The basic principles of allocating obligations and/or risks for all projects, adopted by the sub-committee, are those expounded by international construction lawyer Max Abrahamson. They are as follows:

A party to a contract should bear a risk where:

- The risk is within the party's control.

- The party can transfer the risk e.g. insurance.

- The preponderant economic benefit of controlling the risk lies with the party in question.

- To place the risk upon the party in question is in the interests of efficiency, including planning, incentive and innovation.

- If the risk eventuates, the loss falls on that party in the first instance and it is not practical, or there is no reason to cause expense and uncertainty by attempting to transfer the loss to another.

Standard Form Contracts:

"Standard forms of contract are preferred by the industry to contracts that are individually drafted for each project, if for no other reason than that as both parties are more likely to be familiar with the obligations assumed by each party using a standard form, they will thereby reduce incidences of dispute caused by concealing obligations in unfamiliar documents.

Similarly, standard form contracts should preferably be used without amendments, but where amendments are incorporated they should be clearly identified by:

- Making hand-written amendments to the standard printed form or;

- By filling out an annexure to the Conditions of Contract; or

- By specifying Special Conditions of Contract in the specification.

Standard form contracts that have been developed through consensus by industry bodies representative of the whole industry are preferred to contract forms that have not been negotiated with industry bodies because:

- They are recognisable;

- Precedents exist as to their interpretation;

- They appeal to the widest range of contractors and owners; and

- They generally have an equitable share of obligations and/or risks.

Given the wide range of contract strategies available, and the special requirements of particular projects, it is considered that a standard allocation of obligations and/or risks for all projects is inappropriate. It is therefore inappropriate to aim for a standard General Conditions of Contract which is rigid in allocating each obligation and/or risk to a particular party. The General Conditions are required to be flexible so that the obligation and/or risks can be allocated to suit the particular circumstances of the project.

It is desirable that a standard General Conditions should include alternative and optional clauses, with the owner being required to clearly define which clauses are applicable for a given project in the tender documents by filling out appropriate annexures to the document. In this way, tenderers will become familiar with the standard document and can readily identify which obligations and/or risks have been allocated to each party".

Risk Allocation Model:

The risk/obligations allocation model is intended to be used as a starting point about which parties may establish those best suited to manage a risk/obligation. The model is not exhaustive and certainly capable of a range of views. It does however allow parties to a proposed contract to assess whether:

i) the allocations are appropriate to the particular project, or

ii) once each of the obligations and/or risks has been priced, the owner may wish to assume greater risk, or

iii) the contract documentation reflects the bargain struck by the parties.

The model is primarily based on the allocation of risks/obligations between a contractor and owner in a traditional construction only contract. Further work is required to make it more applicable to other types of contracts e.g. project management, or design and construct type contracts.

The model lists the items (events, acts or omissions) along with a particular score in respect to that level of control over the item by the owner or contractor.

Refer to Appendix 3 for a fuller explanation of this model.

4.9 UHER (1991)

Uher has carried out research in the area of risk apportionment and completed a number of studies in Australia particularly in respect to sub-contract contracts. He has written a number of papers on this topic.

Uher provides the following advice in respect of contracts in general:

- To succeed contractual arrangements must be clear, fair and equitable to ensure effective and dispute free contractual performance.

  A contract should state the:

  - rights
  - responsibilities
  - description of extent of works
  - timing
  - quality standards
  - price

- Projects hampered by delays/cost overruns are generally caused by contract conditions that are:

  - Unclear
  - Contradictory
  - Ambiguous
  - Incomplete

  Such contracts create and promote:

  - protracted disputes
  - further frustrate and cause delays/costs

Onerous subcontract conditions can increase client risk of:

- Insolvency of sub contractor
- Increased level of claims and disputes
- Cost cutting measures that decreases quality of work

As most construction activities are performed by subcontractors, the smooth execution of subcontracts is an important factor in the overall development.

Uher's 1990 survey of sub contracts indicate that a risk allowance of up to 7.6% of contract price is included in sub contractors tenders.

In respect of sub contract agreements clients generally:

- Distance themselves in terms of responsibility
- Unaware of onerous clauses
- Ignorant of what is taking place

Inequitable contractual arrangements between general contractor and sub contractor will impact on performance of the project being executed.

Uher provides the following advice in respect of sub-contract contracts:

- Conditions of Subcontract should clearly state:

  - Terms of payment
  - Security deposits and retentions
  - Times for commencement and completion
  - Variations procedure
  - Delay implications and costs of delays
  - Liquidated damages

- Conditions of sub contract should be framed, such that:

  - They are equitable to both parties in terms of risk allocation
  - They have rights and obligations clearly described
  - If non performance occurs the injured party should be able to make a claim
  - They have a satisfactory procedure for dispute resolution

Uher and Rinneson (1984) from a study conducted suggest sub contractors have an arduous task in negotiating fair conditions and even harder task getting them applied.

Uher's (1990) survey suggests sub contractors are very aware of the onerous conditions placed on them. In summary; 67% of sub contractors labelled conditions as unfair - 83% expressed concern about the impact on their profitability.

The most feared sub contract conditions (in order of importance):

1) Terms of Payment

   'Pay when paid' - no guarantee as to when payment is to be made.

   Also head contractors right to withhold, reduce or defer payment of any sums due, if 'valid' reason given (abused). (Moss 1986: Humphrey, 1985).

2) Extension of Time

   Commonly entitled only to EOT delays to date of practical completion of head contract works. If the head contractor is granted EOT, this is often denied to the sub contractor.

   However sub contractors were particularly successful in securing EOT for:

   - variations (87% success)
   - inclement weather (83%)
   - industrial disputes (60%)
   - clients (55%)
   - architects (53%)
   - authorities (51%)
   - general contractors (40%)

3) Rise and Fall

Theoretically, where a 'rise and fall' clause is deleted from the sub contract conditions, the prudent contractor will assess the risk associated with likely causes of delays, etc., however, generally they are unable to assess accurately the magnitude of the risk (and also minimise its effect).

- Uher 1990 survey found the majority contained no rise and fall clauses. Escalation of labour and material costs due to inflation were borne by the sub contractor.

- The client ultimately pays for escalation costs. By excluding rise and fall from head contract (and hence sub contract) the client denies itself the opportunity to control costs.

- Risk of paying too much if contractors and sub contractors made allowance in excess of inflation.

- Increase risk level of contractors and sub contractors under estimating allowance - resulting in bankruptcies - poor quality, etc.

- Risks should be assigned and borne by those parties who are able to control them.

- On short term contracts (6 months) both contractors and sub contractors should be able to predict quite accurately rate of inflation, etc. but longer than this it may become very difficult and hence the client should provide a rise and fall provision.

4) Liquidated Damages

Appears practically in all sub contracts to compel the sub contractor to complete the work by the completion date in the sub contract.

Uher (1987) examined 267 contracts. All contained liquidated damages clauses and 95% were delayed (1/3 covered by sub contractors). Surprisingly only once was a liquidated damages clause used against an offender.

Its insertion into contracts appeared to be intended purely as a threat without conscious intent to apply it. However, the risk of possible liability is too great to ignore therefore sub contractors make a risk allowance in their bid prices.

5) Delay and the Cost of Delays

Common practice for the general contractor to delete clauses which impose upon it any obligations to compensate a sub contractor for delays. At the same time other clauses that operate in reverse condition are left in.

Uher's (1990) survey identified:

- industrial matters (including safety)
- competency of general contractor
- inclement weather

as main causes of risk.

Sub contractor made allowances between 0% to 4.1%.

Bromilow (1970) and Levido et al (1981) found a major cause of delays were variations.

6) Other Subcontract Conditions

Other conditions that raised sub contract risks:

- Completeness of contract documents. Lack of information during bidding. They do not get an understanding of the full picture and hence need to make some risk allowance.
- Acceptance of responsibility. Unsuspecting sub contractors may be manoeuvred into accepting responsibility for the work normally performed by the general contractor.
- Negative variations whether done deliberately or not reduce the value of sub contractors works.
- Retention not released. It is used as a form of security but it also provides an incentive for the sub contractor to complete the works on time and quality. It is common practice for general contractors to hold retention on sub contractors regardless of the nature of the works.

  Runeson and Uher (1986) regarded retention as an unnecessary contributor to higher costs. Their research showed only larger sub contractors were willing to trade retention for lower bid prices.

5.0 STUDY OF CURRENT AUSTRALIAN PRACTICE

5.1 OUTLINE OF STUDY

The study involved the review of 50 contracts used in the engineering and building construction industries over the last five years.

The contracts were investigated to determine the method of risk apportionment between the following parties:

- Owners (Principals)
- Contractors (including, sub contractors)
- Consultants (including, architects, etc)
- Project/Construction managers.

The study was based on eighteen commonly encountered risk provisions applicable to the parties above.

A determination of apportionment practice was made using a risk/obligation model. An assessment rating was applied to each provision in order to judge whether it had been effectively apportioned.

The study was aimed at viewing general risk apportioning practices across the industries outlined both on large scale and small scale projects.

Findings of the study are outlined in Section 6.0.

5.2 METHODOLOGY

By its nature the study is a limited sample of industry contracts.

To make the study most effective the contracts used were selected to ensure the sample was:

a) As random as possible. Contracts studied were from thirteen separate organisations. Each of these organisations provided a variety of contract types.

   The aim in seeking participation from as many organisations as possible was to avoid biasing the sample.

b) Not weighted in a particular area i.e.

   - Commercial
   - Government
   - Majority large in value
   - Majority small in value

c) As current as possible. To enable this to be achieved only contracts used since 1987 were studied. The majority of contracts were post 1989.

5.2.1 Data Collection

In order to carry out this study a number of organisations were approached and asked to provide contracts for analysis. This led to the collection of 50 contracts from both commercial and government enterprises.

A profile of each contract reviewed appears in Table 1. This table classifies each contract in terms of its:

- Date of execution
- Approximate contract value
- Industry
- Nature of contract (i.e. lump sum, cost plus)
- Basis of contract (i.e. standard form, in-house)

A brief outline of each contract studied appears in Appendix 1.

After classifying, each contract was examined in terms of the specific risk provisions detailed in Table 2.

The nature of risk apportioned to each party in respect of specific provisions, was then tabulated.

Table 2 is a Risk Apportionment Schedule that houses all data collected.

CONTRACT NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
CONTRACT EXECUTION:																									
1987							X	X																	
1988																							X		
1989		X	X																X		X				
1990									X	X				X			X			X		X		X	
1991	X										X	X	X		X										X
1992				X	X	X										X		X							
CONTRACT VALUE:																									
$10K - $100K				X						X								X							
$100K - $300K											X														
$300K - $1M	X								X					X										X	
$1M - $10M		X			X	X										X	X		X	X	X	X	X		X
$10M - $50M							X					X	X		X										
$50M - $100M																									
$100M - $300M			X					X																	
INDUSTRY:																									
General Engineering	X	X					X											X							
Building Construction			X	X	X	X		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X
NATURE OF CONTRACT:																									
Fixed Lump Sum	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Cost Plus																									X
Other			X																						
BASIS OF CONTRACT:																									
Standard Form	X	X			X	X		X	X			X					X	X	X				X		
In-house			X	X			X			X	X		X	X	X	X				X	X	X		X	X

TABLE 1: CLASSIFICATION OF CONTRACTS STUDIED

CONTRACT NUMBER	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
CONTRACT EXECUTION:																									
1987									X	X															
1988	X					X												X					X		
1989		X		X										X	X	X	X		X					X	
1990					X			X			X	X													
1991			X										X												
1992							X													X	X	X			X
CONTRACT VALUE:																									
$10K - $100K	X	X										X													
$100K - $300K					X		X	X			X					X				X	X	X			X
$300K - $1M			X	X						X					X		X	X	X					X	
$1M - $10M													X	X											
$10M - $50M						X			X																
$50M - $100M																									
$100M - $300M																									
INDUSTRY:																									
General Engineering		X	X				X	X	X											X		X	X	X	X
Building Construction	X			X	X	X				X	X	X	X	X	X	X	X	X	X		X				
NATURE OF CONTRACT:																									
Fixed Lump Sum		X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X
Cost Plus	X										X														
Other																									
BASIS OF CONTRACT:																									
Standard Form	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X		X	
In-house				X																	X		X		X

TABLE 1: CLASSIFICATION OF CONTRACTS STUDIED (CONTINUED)

6.0 ANALYSIS OF STUDY RESULTS

6.1 DISCUSSION OF RESULTS

Apportionment data collected in the study is tabulated in Table 2. This table indicates which party actually bore responsibility of each risk provision for the 50 industry contracts studied.

From this table the results of the study were broken into two distinct categories for evaluation:

a) Contracts between Owners and Contractors (A & B parties). Refer to Table 3.

b) Contracts between Owners and Consultants, including Designers and Project/Construction Managers (A & C, A & D parties). Refer to Table 6.

The distinction was necessary to provide a more accurate analysis.

Approximately 80% of contracts studied were between owners and contractors while the remaining 20% were between owners and designers/consultants or owners and project/construction managers.

There are a number of risk provisions that are not applicable to both groups. For example, the majority of contracts between owners and designers, such as architects, did not contain provisions such as Force Majeure or Industrial Disputes as part of their contracts. Likewise, contracts between owners and contractors did not include the provision of Professional Indemnity Insurance as it is a provision not normally applicable to these parties.

Therefore to include the both groups within the same analysis would only serve to bias the results of some provisions.

6.2 RISK/OBLIGATION ALLOCATION MODEL

The first stage of the analysis made an assessment as to which party would best be apportioned each risk provision.

The principles of a Risk/Obligation Allocation model developed by NPWC/NBCC joint working party was used in concept as the main criteria of this assessment. This model gives an initial arithmetic weighting of risk in favour of one or other parties assuming the risk associated with specified risk provisions.

The principles of the model were confirmed by the findings of the literature review in this thesis as a suitable basis for establishing an apportionment strategy.

The model in its present form considers only the relationships between owners and contractors. Further work is necessary on the model to incorporate relationships between owners and consultants, such as, designers and those who provide other services to a project and who traditionally act as agents of the owner within a project team.

A model based on the NPWC/NBCC model, but that includes the specific risks reviewed in this study, including those associated with consultants, was developed and appears in Table 4.

All assessments have been made on a general basis, not considering in detail project particulars, such as, design parameters, cost breakdowns, resource capabilities of parties, that could have an effect on the risk assessment in certain cases. Therefore the circumstances of a particular project, or negotiation between parties, may have led to results different from those suggested in this assessment.

An explanation of the NPWC/NBCC model as described in 'No Dispute', has been copied with permission and appears in Appendix 3.

The assessment criteria that the model of this study is based on is:

a) Whether the risk is within the parties control.

b) Whether the party could transfer the risk.

c) Which party would gain the preponderant economic benefit.

d) Which party is most suited in terms of efficiently handling and planning minimising risk.

e) If loss falls there would be no reason to transfer risk as it is best endured by selected party.

Table 4 displays how the assessment of each risk provision was determined.

										*				*					*				*	*
CONTRACT NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Design	A	A	B	B	B	B	B	A	B	A	A	A	A	C	B	B	B	B	B	A	A	A	A	C	C
Discrepancies in Documents	A/B	A/B	B	B	B	B		A	A		A	B	B		B	B	A		A	A	A/B		B		
Quality Management	B	B	B	B	B	B	B	B	B	A	B	B	B	C	B	B	B	B	B	D	B	B	B	C	A
Security/Retention	B	B	B		B	B	B		B	A	B	B	B	C	B	B	B	B	B	D	B	B			
Workers Compensation Ins.	B	B	B		B	B	B	B	B	D	B	B	B	C	B	B	B	B	B	D	B	B	B		
Public Liability Insurance	B	A	B	B	B	B	A	A	B	D	A	A	A	C	B	A	B	B	B	D	A		B		
Professional Indemnity Ins.		B	B							D		B		C						D					C
Contract Works Insurance	A	A	B		B	A	B	A	B	D	A	A	A		B	A	B	B	B	D	A	B	B		
Owners Liability and Indemnity	B	B	B	B	B	B	B	B	B	D	B	B	B	C	B	B	B	A	B	D	B	B	B	C	
Force Majeure	A/B	A/B	A/B	B	A/B	A/B	A/B	A	A/B		A/B	A/B	A/B		A/B		A	A	A/B	D	A/B	A/B	A		
Latent Conditions	A	A	B	B	A	A	B	A	A		A	B	B		A	B	A	A		D	B	A	A		A
Industrial Relations Disputes in General	B	B	B	B	B	B	B	B	B		B	B	B		B		B			D	A/B	B	A		
Strikes or Lockouts beyond Control of Contractor	A	A	A	B	A	A	B	A	B		A	B	B		B	B	A			D	A	B	A		
Costs Due to Inclement Weather	B	B	B	B	A	B	B	B	B			B	B		B	B	B	A/B		D	B		A		
Delays Due to Inclement Weather	A	B	B	B	A	A	B	B	A/B			B	B		B	B	A	A		D	A		A		
Delay in Reaching Practical Completion	B	B	B	B	B	B	B	B	B	A	B	B	B	A	B	B	B	A	A/B	A	B	B	A	C	A
Termination and Suspension	B	A/B	B	B	B	B	B	A/B	A/B	A/D	B	A/B	A/B	C		B	B	A	B		B	B	A/B	A/C	A/C
Default	A/B	A/B	B	B	A/B	A/B	B	A/B	A/B		B	B	B	A/C	A/B	A/B	A/B	A/B	A/B		B	B	A/B	A/C	
Mediation and Arbitration	A/B	A/B	A/B	B	A/B	A/B	A/B	A/B	A/B		A/B	A/B	A/B	A/C	A/B	A/B	A/B	A/B	A/B	A/D	A/B	A/B	A/B	A/C	A/C

A = Owner B = Contractor C = Designer/Consultant D = Project/Construction Manager * = Contracts Reviewed in Category b), Refer to Section 6.1

TABLE 2: RISK APPORTIONMENT SCHEDULE

* * *

CONTRACT NUMBER	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Design	A	C	A	A	B	A	B	A	A	A	A	A	A	A	A	A	A	A	A	B	B	B	A	A	B
Discrepancies in Documents	A	C	A		A	B	A	A	A/B	A	A	A	B	A	B	A	A	A	A	A		A	B		B
Quality Management		A	B		B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B		B
Security/Retention			B			B	B		B	B		B	B	B	B	B	B	B	B	B	B	B	B		B
Workers Compensation Ins.	D		B		B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Public Liability Insurance	A	A	B		A/B		A	B	B	A	B	A	B	A	A	A	B	B	B	B	B	B	B	B	B
Professional Indemnity Ins.		A																							B
Contract Works Insurance	A	A	B		B	B	A	B	B	A	B	A	B	A	A	A	B	B	B	B	B	B	A	B	B
Owners Liability and Indemnity	A	A/C	B	A	B	B	B	B	B	B	B	B	B	B	B		B	B	B	B	B	B	B	B	B
Force Majeure	A	A	A		A	B	A/B	A/B	A/B	A				A/B	A/B	A/B	A/B		A/B	A/B		A/B	A/B	A/B	
Latent Conditions	A	A	A		A	A	A	A		A	A	A	A	A	A	A	A	A	A	A/B		A/B	B		
Industrial Relations Disputes in General	A		B		A	B	A	A		A		B	A	B	B	A	B	B	B	B		B	B		
Strikes or Lockouts beyond Control of Contractor	A		B		A	B	A	A		A		A	A	A/B	A/B	A	A/B	A	A/B	A		A	B		
Costs Due to Inclement Weather	A		A		A	B	A	B	B	A		A	B	B	B	B	B	A	B	B		B	B		
Delays Due to Inclement Weather	A		A		A	B	A	A	A	A		A	A	A	A	A	A	A	A	B		B	B		
Delay in Reaching Practical Completion	A	A	A		B	B	B	B	B	B	A	A	B	B	B	B	B	A	B	B	B	B	B	B	B
Termination and Suspension	A/D	A	A/B	A/D	A	B	A/B	A/B	A/B	A/B	A/B	A/B	A/B	A/B	A/B	A/B	A/B	A/B	A/B	A/B		A/B	B		B
Default	A/D	A/C	B	A/D	A/B	A/B	A/B	A/B	A/B	A/B	A/B	A/B	A/B	A/B	A/B	A/B	A/B	A/B	A/B	A/B		A/B	B	B	B
Mediation and Arbitration	A/D	A/C	B	A/D	A/B	A/B	A/B	A/B	A/B	A/B	A/B	A/B	A/B	A/B	A/B	A/B	A/B	A/B	A/B	A/B		A/B	A/B		

A = Owner B = Contractor C = Designer/Consultant D = Project/Construction Manager * = Contracts Reviewed in Category b), Refer to Section 6.1

TABLE 2: RISK APPORTIONMENT SCHEDULE (CONTINUED)

6.3 ASSESSMENT RATING

The following rating system was specifically devised for this study to aid analysis and enable practical conclusions to be derived from the quantitative analysis.

The assessment rating works on the principle of comparing the percentage associated with the party selected as being most suitable in terms of bearing responsibility of a risk, with an assessment rating score.

The assessment rating scores are as follows:

0 - 50%	=	Very Poor
51 - 70%	=	Poor
71 - 90%	=	Reasonable
91 - 100%	=	Good

These percentage scores are a qualitative means of assessing the nature of polarisation of results.

Ideal results are those polarised and in favour of the most suitable party to bear a risk. For example, if owners are chosen the most suitable party to bear a risk provision and the results show that in 99% of the cases studied owners did actually bear the risk, this would indicate a 'good' result according to the assessment rating score. If however, owners only bore the risk in 42% of the cases studied then this figure used in the assessment rating would correspond to a 'very poor' score.

If the percentage is high in terms of the assessment rating it indicates that there is a clear distinction in respect of the suitable apportionment of the risk provision studied. If the percentage is low it indicates that this distinction is less clear and that a significant number of contracts had poorly apportioned the risk provision.

6.4 FINDINGS BETWEEN PARTIES A AND B

For the comparison of results between Parties A and B, specific information relating to these Parties, derived from Table 2, was formatted into Table 3. Using then the results from Table 4 and applying the assessment rating of Section 6.3 Table 5 was formed.

The results from Table 5 show the risk provisions studied fall into the following rating categories:

Very Poor: Discrepancies in Documents, Strikes or Lockouts Beyond Control of Contractor, Delays Due to Inclement Weather.

Poor: Latent Conditions, Force Majeure, Industrial Relations Disputes in General, Costs Due to Inclement Weather, Termination and Suspension, Default.

Reasonable: Security/Retention, Delays in Reaching Practical Completion.

Good: Quality, Workers Compensation Insurance, Owners Liability and Indemnity, Mediation and Arbitration.

Table 5 displays a wide range of results in terms of the way risks were apportioned in the contracts studied. In virtually every contract studied various risks were poorly apportioned in one way or another. This is understandable to some extent, as has been pointed out, the nature of the study undertaken has generalised most suitable practice and it is acceptable therefore in certain cases such generalities may not apply.

Allowing some latitude therefore, it is suggested that those provisions covered in the categories of 'good' and 'reasonable' have been suitably apportioned.

On the contrary those provisions covered in the categories of 'poor' and 'very poor' have been unsuitably apportioned.

The findings indicate that the majority of the risk provisions studied in fact were unsuitably apportioned.

NO.	RISK PROVISION	%A	%B	%A/B	%UNACKNOWLEDGED
1	Design	60	40	0	0
2	Discrepancies In Documents	45	33	10	12
3	Quality Management	0	98	0	2
4	Security/Retention	0	83	0	17
5	Workers Compensation Insurance	0	98	0	2
6	Public Liability Insurance	33	60	2	5
7	Contract Works Insurance	38	60	0	2
8	Owners Liability and Indemnity	2	96	0	2
9	Force Majeure	16	5	62	17
10	Latent Conditions	64	19	5	12
11	Industrial Relations Disputes in General	16	62	2	20
12	Strikes or Lockouts Beyond Control of Contractor	44	26	9	21
13	Costs Due to Inclement Weather	19	62	2	17
14	Delays Due to Inclement Weather	50	31	2	17
15	Delays In Reaching Practical Completion	15	83	2	0
16	Termination and Suspension	5	36	52	7
17	Default	0	29	69	2
18	Mediation and Arbitration	0	5	88	7

TABLE 3:
RISK APPORTIONMENT % SUMMARY
BETWEEN PARTIES A & B

Notes 1. %A = Percentage of contracts risk provision carried by the owner

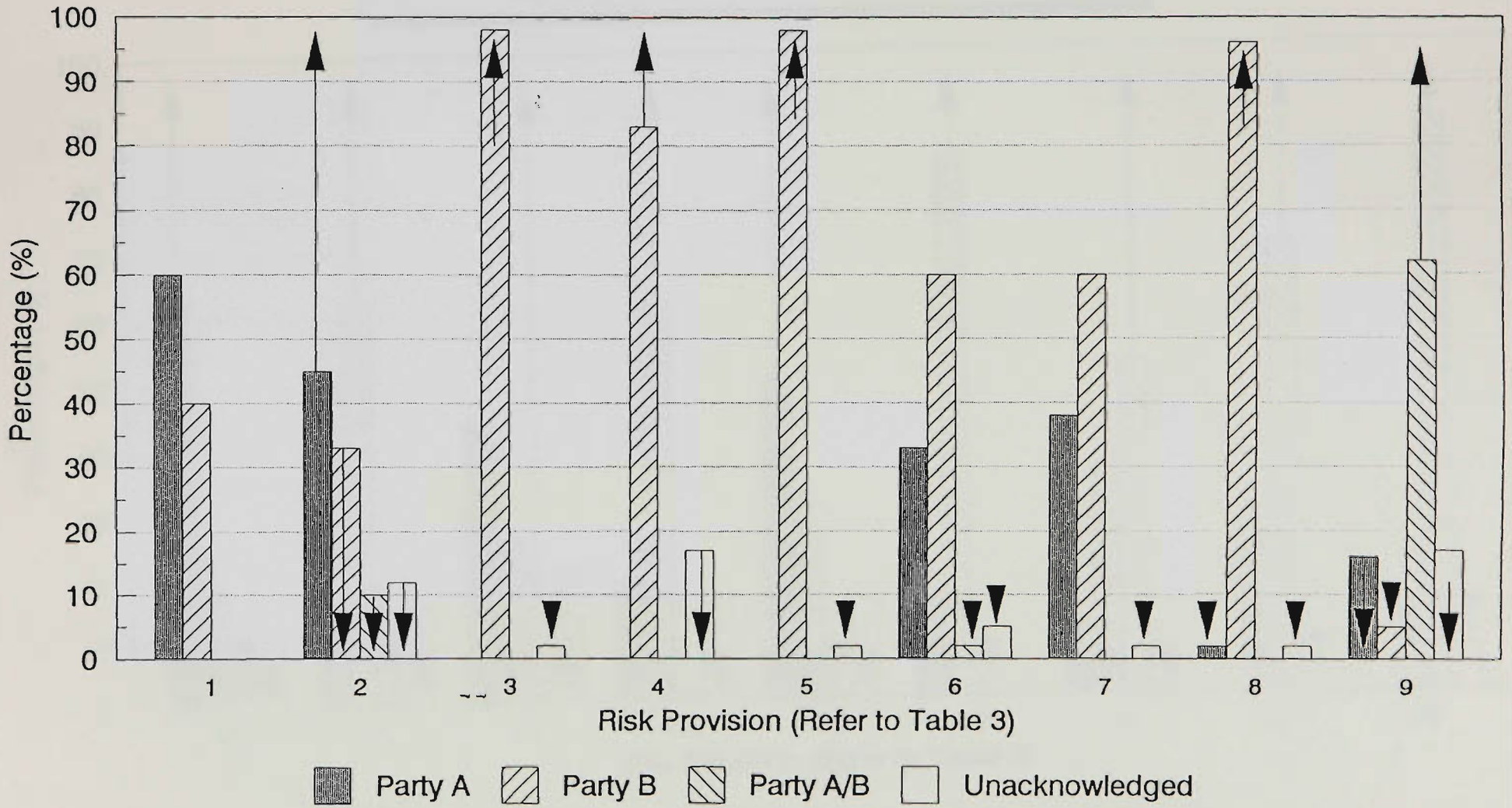
%B = Percentage of contracts risk provision carried by the contractor

%A/B = Percentage of contracts risk provision is shared by both parties

% Unacknowledged = Percentage of contracts risk provision is unacknowledged

2. "A" refers to Owners. "B" refers to Contractors.

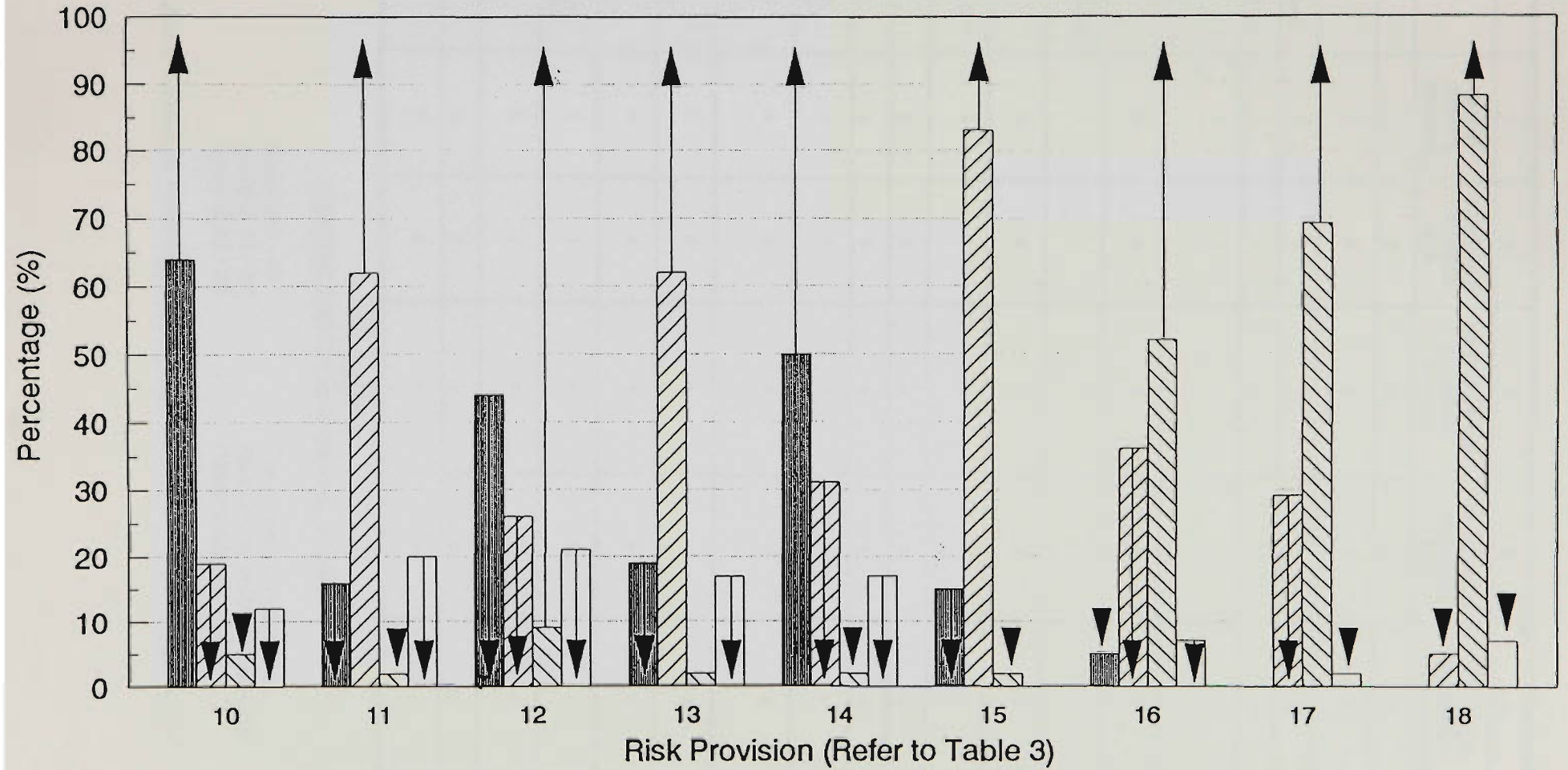
FIGURE 1
PERCENTAGE OF RISK PROVISIONS APPORTIONED TO PARTY A OR B OR A/B OR UNACKNOWLEDGED



Notes: 1. ⟶ Apportionment Assessment:
Arrow indicates direction of recommended practice

2. "A" refers to Owners
"B" refers to Contractors

FIGURE 1 (Continued)
PERCENTAGE OF RISK PROVISIONS APPORTIONED TO PARTY A OR B OR A/B OR UNACKNOWLEDGED



Notes: 1. ⟶ Apportionment Assessments:
Arrow indicating direction of suggested practice

2. "A" refers to Owners
"B" refers to Contractors

	1	2	3	4	5	
EVENT	WITHIN PARTY'S CONTROL	PARTY CAN TRANSFER RISK	PREPONDERANT ECONOMIC BENEFIT	EFFICIENCY - PLANNING - ETC.	LOSS FALLS - NO REASON TO TRANSFER	SCORE
Design	3	3	3	3	3	15
Discrepancies in Documents	5	5	5	5	5	25
Quality Management	1	1	1	1	1	5
Security/Retention	1	1	1	1	1	5
Workers Compensation Insurance	1	1	1	1	1	5
Public Liability Insurance	3	3	3	3	3	15
Professional Indemnity Insurance	1	1	1	1	1	5
Contract Works Insurance	3	3	3	3	3	15
Owners Liability and Indemnity	1	1	1	1	1	5
Force Majeure	3	3	3	3	3	15
Latent Conditions	3	3	5	4	5	20
Industrial Relations Disputes in General	1	1	1	1	1	5
Strikes or Lockouts Beyond Control of Contractor	3	2	3	2	3	13
Costs Due to Inclement Weather	2	2	2	1	2	9
Delays Due to Inclement Weather	4	4	4	4	4	20
Delays in Reaching Practical Completion	1	1	1	1	1	5
Termination and Suspension	3	3	3	3	3	15
Default	3	3	3	3	3	15
Mediation and Arbitration	3	3	3	3	3	15

TABLE 4:
RISK/OBLIGATION ALLOCATION MODEL

Notes: 1.

Score of 5 - 10	=	Contractor's obligation/risk
Score of 10 - 20	=	Neutral or shared obligation/risk
Score of 20 - 25	=	Owner's obligation/risk

2. Table 4 is based on the principals of NPWC/NBCC's model, refer to Appendix 3.

NO.	RISK PROVISION	* MOST SUITABLE PARTY	# % FROM TABLE 3	+ ASSESSMENT RATING
1	Design	Either	-	-
2	Discrepancies in Documents	Owner	45	Very Poor
3	Quality	Contractor	98	Good
4	Security/Retention	Contractor	83	Reasonable
5	Workers Compensation Insurance	Contractor	98	Good
6	Public Liability Insurance	Either	-	-
7	Contract Works Insurance	Either	-	-
8	Owners Liability and Indemnity	Contractor	96	Good
9	Force Majeure	Shared	62	Poor
10	Latent Conditions	Owner	64	Poor
11	Industrial Relations Disputes in General	Contractor	62	Poor
12	Strikes or Lockouts Beyond Control of Contractor	Shared	9	Very Poor
13	Costs due to Inclement Weather	Contractor	62	Poor
14	Delays due to Inclement Weather	Owner	50	Very Poor
15	Delays in Reaching Practical Completion	Contractor	83	Reasonable
16	Termination and Suspension	Shared	52	Poor
17	Default	Shared	69	Poor
18	Mediation and Arbitration	Shared	88	Good

TABLE 5:
RESULTS ASSESSMENT BETWEEN PARTIES A AND B

Notes: 1. * = Refers to party selected as most suited to bear responsibility of risk provision.

\# = % From Table 3 associated with *.

\+ = Assessment rating:

0 - 50%	=	Very Poor
51 - 70%	=	Poor
71 - 90%	=	Reasonable
91 - 100%	=	Good

2. "A" refers to Owners. "B" refers to Contractors.

6.5 FINDINGS BETWEEN PARTIES A AND C/D

For the comparison of results between Parties A and C/D, specific information relating to these Parties, derived from Table 2, was formatted into Table 6. Using then the results from Table 4 and applying the assessment rating of Section 6.3 Table 7 was formed.

The results from Table 7 show the risk provisions studied fall into the following rating categories:

Very Poor: Discrepancies in Documents, Quality Management, Security/Retention, Workers Compensation Insurance, Professional Indemnity Insurance, Owners Liability and Indemnity, Delays in Reaching Practical Completion.

Poor: Termination and Suspension, Default.

Reasonable: Mediation and Arbitration

Good: Nil

The above findings suggest there is a lack of suitable risk apportionment being practiced between the parties studied.

It is likely that these findings are too liberal in their overall suggestion and need to be considered in light of the following:

a) These findings relate to only 20% of the 50 contracts studied.

b) A significant finding within this study was the very high number of risk provisions that were unacknowledged. In order to make a comparison of the parties under consideration it was necessary to exclude 'unacknowledge' risks. If these risks were fully acknowledged, because of their high number, would change the outcome of the results and hence conclusions reached.

It is therefore necessary to temper the conclusions drawn with the above qualifications.

NO.	RISK PROVISION	%A	%C/D	%A/C/D	% UNACKNOWLEDGED
1	Design	50	50	0	0
2	Discrepancies In Documents	25	13	0	63
3	Quality Management	38	38	0	25
4	Security/Retention	13	25	0	63
5	Workers Compensation Insurance	0	50	0	50
6	Public Liability Insurance	25	38	0	38
7	Professional Indemnity Insurance	13	50	0	38
8	Contract Works Insurance	25	25	0	50
9	Owners Liability and Indemnity	25	38	13	25
10	Delays in Reaching Practical Completion	75	13	0	13
11	Termination and Suspension	13	13	63	13
12	Default	0	0	63	38
13	Mediation and Arbitration	0	0	88	13

TABLE 6:

RISK APPORTIONMENT % SUMMARY

BETWEEN PARTIES A AND C/D

Notes: 1. %A = Percentage of contracts risk provision carried by the owner

%C/D = Percentage of contracts risk provision carried by a consultant or a project/construction manager.

%A/C/D = Percentage of contracts risk provision was shared amongst above parties.

% Unacknowledged = Percentage of contracts risk provision was unacknowledged

2. "A" refers to Owners. "C/D" refers to Consultants/Project and Construction Managers.

NO.	RISK PROVISION	* MOST SUITABLE PARTY	# % FROM TABLE 6	+ ASSESSMENT RATING
1	Design	Either	-	-
2	Discrepancies in Documents	Owner	25	Very Poor
3	Quality Management	Consultant	38	Very Poor
4	Security/Retention	Consultant	25	Very Poor
5	Workers Compensation Insurance	Consultant	50	Very Poor
6	Public Liability Insurance	Either	-	-
7	Professional Indemnity Insurance	Consultant	50	Very Poor
8	Contract Works Insurance	Either	-	-
9	Owners Liability and Indemnity	Consultant	38	Very Poor
10	Delays in Reaching Practical Completion	Consultant	13	Very Poor
11	Termination and Suspension	Shared	63	Poor
12	Default	Shared	63	Poor
13	Mediation and Arbitration	Shared	88	Reasonable

TABLE 7:

RESULTS ASSESSMENT BETWEEN PARTIES A AND C/D

Notes: 1. * = Refers to party selected as most suited to bear responsibility of risk provision.

\# = % From Table 6 associated with *.

\+ = Assessment Rating:

0 - 50%	=	Very Poor
51 - 70%	=	Poor
71 - 90%	=	Reasonable
91 - 100%	=	Good

2. "A" refers to Owners. "C/D" refers to Consultants/Project and Construction Managers.

6.6 COMPARISON OF RISK APPORTIONMENT STUDIES

6.6.1 Outline

A comparison between the study conducted in this thesis, known as Young's study, and a similar study undertaken by Bhuta in 1991 in North America was carried out.

Bhuta conducted a study of 45 building construction and oil industry contracts in the United States and Canada. The contracts studied ranged in value from $1 million to over $300 million.

This comparison was thought worthwhile attempting as Australia, Canada and the United States have similar in nature engineering and building construction industries and therefore it was anticipated that both studies would confer.

The comparison was made on contracts only between owners and contractors because the significant majority of contracts in both studies related to these parties.

The data under comparison is tabulated in Table 8 and displayed in graphical form in Figure 2. The data was subject to the assessment rating detailed in Section 6.3. The results of the assessment are tabulated in Table 9.

Refer to Appendix 2 for table outlining Bhuta's Risk Apportionment Study.

It is important that the results of this comparison be treated cautiously and tempered in terms of inferring absolute conclusions.

The following qualifications are applicable:

a) Both studies are not directly comparable without some interpretation being applied. Only those provisions thought to be similar in meaning were compared. Refer to Table 8 'Comparison of Studies' for list of risk provisions included in comparison.

b) The party regarded as most capable of bearing responsibility of a particular risk is indicated in Table 9 and is based on the Risk/Obligation model developed for Young's study, refer to Table 4.

c) Similar exclusions of contracts from Young's study were made with Bhuta's study. Those contracts between parties other than owners and contractors were excluded in order to provide more accurate results. Five contracts were excluded from Bhuta's study of 45 contracts and 9 from Young's study of 50 contracts.

d) Bhuta's study in the form reviewed was without definitions of various risk provisions. Therefore a judgement was made based on headings that inferred a similar intent as to the risk provisions defined in this thesis.

e) Young's study showed a significantly higher number of risks unacknowledged. If the risk wasn't dealt with in the contract it was left unacknowledged in the data collection. It is unclear whether Bhuta's study used the same strategy or whether risks that existed, yet unacknowledged, were treated as being the responsibility of the Owner.

A different strategy in recording data in this manner would effect the percentage outcomes of results.

COMPARISON OF STUDIES		BHUTA'S - NORTH AMERICAN STUDY				YOUNG'S - AUSTRALIAN STUDY			
NO.	RISK PROVISION	%A	%B	%A/B	%UNACKNOW-LEDGED	%A	%B	%A/B	%UNACKNOW-LEDGED
1	Workers Compensation Insurance	15	83	0	3	0	98	0	2
2	Comprehensive General Liability Insurance	23	70	5	3	38	60	0	2
3	Force Majeure	10	55	23	13	16	5	62	17
4	Termination and Suspension	10	75	15	0	5	36	52	7
5	Default	70	0	30	0	0	29	69	2
6	Owners Indemnity Bond	0	100	0	0	2	96	0	2
7	Time and Cost Overrun	3	95	3	0	15	83	2	0
8	Risk Management and Quality Management	5	80	15	0	0	98	0	2
9	Arbitration and Mediation	5	30	60	5	0	5	88	7

TABLE 8:

COMPARISON OF STUDIES

Notes: 1. %A = Percentage of contracts risk provision carried by the owner.

%B = Percentage of contracts risk provision carried by the contractor.

%A/B = Percentage of contracts risk provision is shared by both parties.

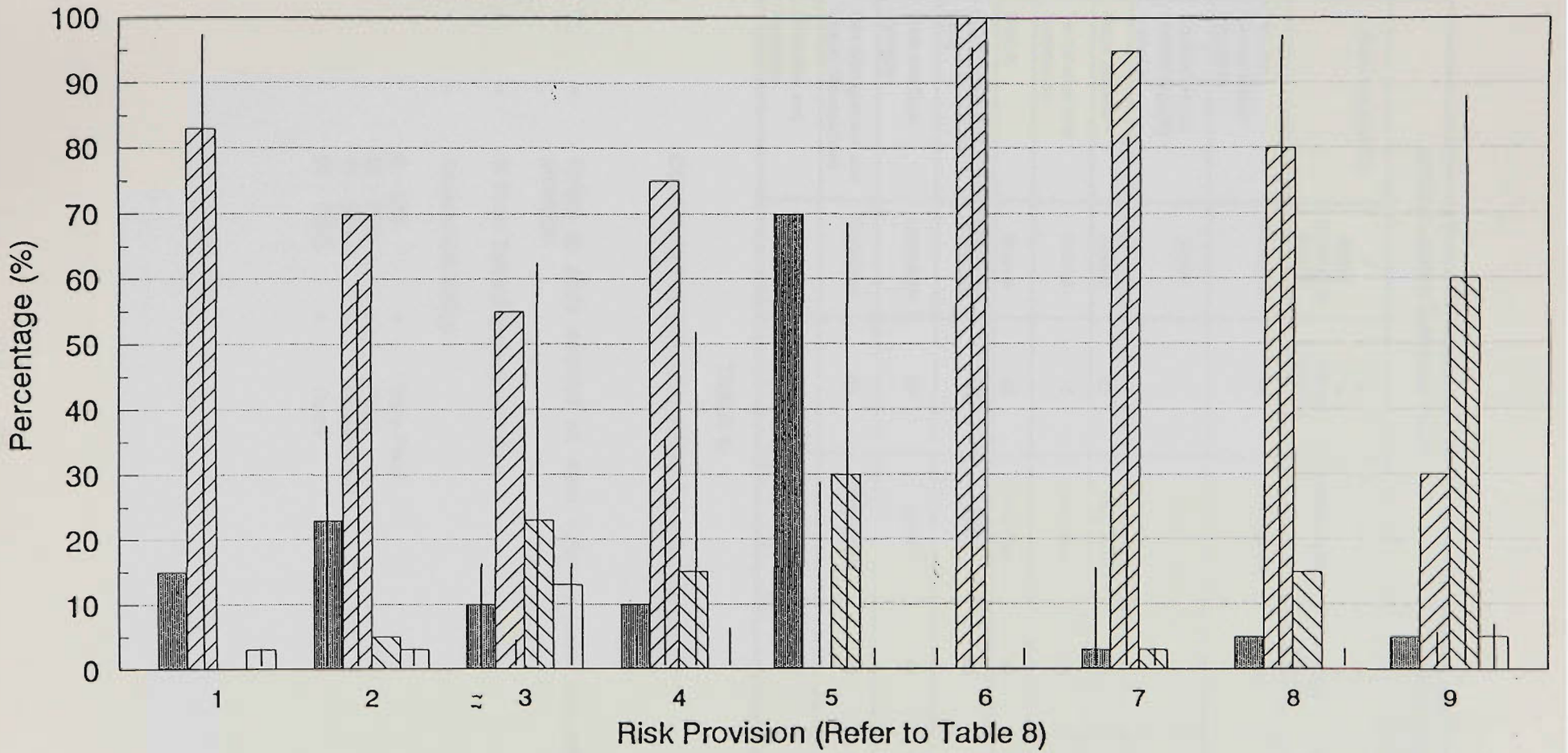
%Unacknowledged = Percentage of contracts risk provision is unacknowledged.

2. Refer to Section 6.6.1 for qualification of comparison.

3. Shaded Area Refers to Party most capable of bearing risk responsibility.

4. "A" refers to Owners. "B" refers to Contractors.

FIGURE 2: COMPARISON OF STUDIES: PERCENTAGE OF RISK PROVISIONS APPORTIONED TO PARTY A OR B OR A/B OR UNACKNOWLEDGED



	BHUTA'S - NORTH AMERICAN STUDY				YOUNG'S - AUSTRALIAN STUDY	
NO.	RISK PROVISION	* MOST SUITABLE PARTY	# % FROM TABLE 8	+ ASSESSMENT	# % FROM TABLE 8	+ ASSESSMENT
1	Workers Compensation Insurance	Contractor	83	Reasonable	98	Good
2	Comprehensive General Liability Insurance	Either	-	-	-	-
3	Force Majeure	Shared	23	Very Poor	62	Poor
4	Termination and Suspension	Shared	15	Very Poor	52	Poor
5	Default	Shared	30	Very Poor	69	Poor
6	Owners Indemnity Bond	Contractor	100	Good	96	Good
7	Time and Cost Overruns	Contractor	95	Good	83	Reasonable
8	Risk Management and Quality Management	Contractor	80	Reasonable	98	Good
9	Arbitration and Mediation	Shared	60	Poor	88	Reasonable

TABLE 9:

COMPARATIVE REVIEW - RESULTS ASSESSMENT

Note: * = Refers to party selected as most suited to bear responsibility of risk provision.

\# = % From Table 8 associated with *.

\+ = Assessment rating:

0 - 50% = Very Poor
51 - 70% = Poor
71 - 90% = Reasonable
91 - 100% = Good

6.6.2 Findings of Comparison

Both studies showed a significant number of similarities in their results and on the whole concurred in the nature of apportionment. Some specific risks, however, did highlight differences in apportionment. These are discussed below.

Areas that showed significant differences included:

- Force Majeure

  Bhuta's study showed this risk was heavily apportioned to the contractor in 55% of cases studied. It was only shared by both parties in 23% of cases which would have been the more suitable apportioning arrangement.

  Young's study showed a significantly better result in that 62% of cases both parties shared responsibility of this risk.

  Both studies indicated the risk was unacknowledged in 13% and 17% respectively, of cases.

- Termination and Suspension

  Bhuta's study showed this risk was heavily apportioned to the contractor in 75% of cases. It was shared by both parties in only 15% of cases, which would have been the most suitable apportionment arrangement.

  Young's study showed this risk was more equitably apportioned, shared by both parties in 52% of cases. However, a significant percentage (36%) was still poorly apportioned solely to the contractor.

- Default

  Bhuta's study showed this risk was heavily apportioned to the owner (70%) instead of being more suitably shared by both parties. Both parties shared the risk in 30% of cases.

  Young's study showed quite the opposite result. The risk was shared by both parties in 69% of cases and where it was not shared it was carried primarily by the contractor.

- Arbitration and Mediation

  This risk provision in both studies was suitably apportioned in the majority of cases, however, Bhuta's study showed that in a significant number of cases (30%) the contractor was apportioned the risk. Young's study showed that the contractor was apportioned the risk in only 5% of the cases studied.

Both studies showed a number of similarities in apportionment results with respect to the provisions of: Workers Compensation Insurance, Comprehensive General Liability Insurance, Owners Indemnity Bond, Time and Cost Overruns, Risk Management and Quality Management.

Both study's results display a significant bias in apportionment towards the Contractor.

Bhuta's study demonstrated this bias more than in Young's study, both in respect to the number of risk provisions regarded as poorly apportioned as well as the percentages of cases studied.

Bhuta's study showed virtually only one case (Default) where the risk was poorly apportioned, in a significant number of contracts, to the owner.

The comparative review of the two studies showed for the most part concurrence in nature of apportionment.

Given the broad nature of this comparison, however, results should be treated with care in terms of conclusions drawn and read in context of the comparison qualifications outlined in Section 6.6.1.

6.7 SUMMARY OF OVERALL STUDY FINDINGS

FINDINGS BETWEEN PARTIES A & B:

The findings suggest those risk provisions that were of least concern, because they were being suitably apportioned were:

Quality
Workers Compensation Insurance
Owners Liability and Indemnity
Mediation and Arbitration
Security/Retention
Delay in Reaching Practical Completion

The risk provisions that showed up as having been unsuitably apportioned were:

Latent Conditions
Industrial Relations Disputes In General
Force Majeure
Costs Due to Inclement Weather
Delays Due to Inclement Weather
Discrepancies in Documents
Strikes or Lockouts Beyond Control of Contractor
Termination and Suspension
Default

The overall findings of this particular study showed the majority of risk provisions studied were poorly apportioned and primarily bias against the contractor.

FINDINGS BETWEEN PARTIES A AND C/D:

The findings in this particular study are regarded as suggestive only given the nature of the small sample size used.

The results indicated that virtually all the risk provisions were poorly apportioned and biased towards the consultants and project/construction managers.

These findings, however, must be considered in respect that a significant number of risk provisions were unacknowledged. Certainly a number of these would not be applicable to each and every contract. If they were acknowledged the study results would surely vary.

FINDINGS FROM COMPARATIVE STUDIES:

The comparative review of the two studies showed for the most part a concurrence in the nature of apportionment.

Both studies results displayed a significant bias in apportionment towards the contractor.

Bhuta's study demonstrated this bias more than in Young's study, both in respect to the number of risk provisions regarded as poorly apportioned as well as the percentages of cases studied.

7.0 RECOMMENDATIONS

Recommendations have been divided into two areas:

- Specific recommendations resulting from findings of studies.
- General recommendations from findings of literature review.

7.1 SPECIFIC RECOMMENDATIONS

The following recommendations relate to the three studies:

i) Between Owners and Contractors
ii) Between Owners and Consultants, including Project/Construction Managers
iii) The Comparison of Bhuta's Study and Young's Study

Areas where the risk provisions studied were apportioned effectively and equitably, included:

> Quality Management, Workers Compensation Insurance, Owners Liability and Indemnity, Mediation and Arbitration, Security/Retention, Delays in Reaching Practical Completion.

It is suggested such areas require little to no change other than it is recommended that they follow the guidelines outlined in Section 7.2.

Risk provisions highlighted in the study as displaying poor risk apportionment practice were:

- Discrepancies in documents.
- Force Majeure
- Latent conditions
- Industrial relations disputes in general
- Strikes or lockouts beyond the control of the contractor
- Costs due to inclement weather
- Delays due to inclement weather
- Termination and suspension
- Default

All the above provisions attributed the risk onto the contractor except the provision of Force Majeure which was primarily borne by owners.

The significant number of provisions listed suggest considerable change in attitudes and strategy is required of those drafting contracts in the engineering and building construction industries.

The following minimum recommendations apply to each provision:

- Discrepancies in Documents:

  This risk provision is clearly in the owners control and therefore should be borne by the owner. It should take particular care prior to handing over contract documents to ensure the documents are free of errors, omissions, discrepancies and ambiguities and that they are clear, concise and complete. The owner should ensure sufficient time in its planning arrangements to allow this to occur. In taking the above action the owner will minimise its risk in this area.

- Force Majeure:

  This risk provision is best shared between parties. It can be shared in the manner that costs to the contractor that result from delay caused by a force majeure event could be borne by the contractor and the actual extension of time to the date of practical completion could be borne by the owner. Neither party benefits in any way from a force majeure event but both would be somewhat capable of minimising the damages to themselves as a consequence of such an event.

- Latent Conditions:

  This risk provision is best borne by the owner as it is primarily the party most capable of controlling and hence minimising the risk in the first instance. It is the party most capable of accessing the property when it desires. It can minimise this risk significantly by insuring the contracted party is given sufficient time and free access to study the site.

- Industrial Relations Disputes In General:

  This risk provision is clearly in the contractors control and therefore should be borne by the contractor. The study showed that the majority of contractors did bare this risk, however, a less but significant portion of owners bore it also.

- Strikes or Lockouts Beyond the Control of the Contractor.

  This risk provision is best shared between parties. Neither party has direct control over such events but should be somewhat able to control their own individual damages. Therefore it is suggested that costs incurred by the contractor as a result of such industrial action could be borne by the contractor. Likewise costs incurred by the owner in terms of delay in reaching practical completion, etc could be borne by the owner.

- Costs Due to Inclement Weather:

  This risk provision should be borne by the contractor as it is most capable of controlling and hence minimising the damage of this risk.

- Delays Due to Inclement Weather:

  This risk provision should be borne by the owner as it is most capable of controlling and hence minimising the damage of this risk.

- Termination and Suspension:

  This risk provision should be shared by both parties. Both parties are capable of influencing this risk by their own actions.

- Defaults:

  This risk provision should be shared by both parties. Both parties are capable of influencing this risk by their own actions.

The recommendations outlined above require also to be incorporated with the general recommendations outlined in Section 7.2.

7.2 GENERAL RECOMMENDATIONS

The following recommendations derived from the literature review findings, are primarily directed at those initiating contracts. They are what determines a parties risk philosophy and if treated proactively will be translated into contract provisions.

- Assess all risks that may arise in a contract. Risks should be quantified in terms of costs if they did eventuate and a judgement made regarding the probability of them eventuating.

- Assign each particular risk to the party best able to control or influence risk. This may be facilitated by the use of a suitable risk/obligation allocation model, such as the NPWC/NBCC model or that suggested by Belev in the literature review of Section 4.0.

  Ensure the contract clearly and unambiguously specifies:

  - The rights of both parties
  - Responsibilities/Risks assigned to each party
  - A concise scope of work
  - The timing
  - The quality standards required
  - The cost and how it will be paid

- Standard form contracts should be adhered to where possible and, when amended, amendments should be clearly identified.

- Conduct buildability reviews, etc, before the tender process or finalisation of the selected contractors' tender price, in order to pre-empt and resolve potential problems.

- Incorporate in the contract a mechanism for dispute resolution between parties.

- Recognise that the cost of the design preparation in a contract is a small component of cost, yet the design and documentation is a very large determinant of the cost.

- Allow sufficient time for parties to complete all documentation both in the owners team, in the preparation of documents and the contractors team, in responding with a tender.

  Confidence in the accurate completion of such documentation increases in proportion to the time allowed in its preparation.

- Owners need to properly examine all insurance arrangements for the complete project they are involved in and establish the best strategy to manage such cover. If ignored owners could be paying for projects that have multiple cover.

7.3 RECOMMENDATIONS FOR FURTHER STUDY

a) A comprehensive review of legal precedence in existing case studies in terms of interpretation of risk provisions. Such interpretations by parties may influence risk apportionment philosophies and hence practices.

b) Risk apportionment practices between owners and consultants, including project/construction managers. This area was covered to a limited extent by reviewing a small number of applicable contracts. The findings in this area suggested poor risk apportionment was being practiced. A larger study concentrating on these types of contracts would clarify the initial findings in this study.

c) Development of risk/obligation allocation models in respect of apportionment practices used by consultants and project/construction managers.

8.0 CONCLUSION

Effective risk apportioning in contracts, as concluded by the study in this thesis and literature reviewed, appears to be largely ignored by practitioners in the Australian engineering and building construction industries.

Much of the rationale behind the risk shifting practice outlined is based on a lack of understanding of the consequential damage that may result from poor risk apportionment.

Many of those practising risk shifting are of the belief that they are gaining a benefit by limiting their own risk. This could be quite the contrary if the other party does not effectively deal with the risk.

Many of those drafting contracts appear to hold the view that harsh, low risk to their client, clauses are the best defence against claims. Such a philosophy can often have the opposite effect. Harsh unreasonable contract conditions may discourage responsible bidders, but attract bidders willing to take any chance and who expect to make up their losses via claims.

If a risk eventuates, carried by a party that was not capable of controlling the risk in the first place, a dispute can easily erupt, rightly or wrongly embroiling the client. Such a dispute may cause delays to a project affecting its utilisation and increasing its cost. Unanticipated dispute resolution by client's staff, consultants and solicitors may well prove expensive. 'Corner cutting' and compromising quality may also occur as a result of a party carrying a risk it does not believe it should.

Many parties accept poorly apportioned risks due to their need to secure work. They can either accept them or contest them and likely lose out on the contract. They are accepted also because it appears the status quo for such conditions are accepted across industry.

The benefits to a client and the project from effective risk apportioning may be enormous, just as the crippling and immobilising effects that can result from poor management in this area can devastate a project or that which the contract was set up to achieve. Some of the benefits are:

a) Those most capable of controlling a risk have the ultimate capability of minimising the risk eventuating.

b) It can reduce the party initiating the contracts costs, as unsuitable parties do not build high prices into contracts to cover risks they are incapable of controlling.

c) The costs associated with carrying out effective risk management may be shared in such a manner that the ultimate cost to a client would be reduced.

d) It would minimise the harmful psychological effects due to frustration and worry caused to the party who is responsible for a risk beyond their control.

e) Allay disputes. Contract conditions that are viewed by a party to be inequitable or unreasonable, by their nature, only serve to enhance the volatility of a project.

f) Minimise delays due to avoiding disputes.

g) Create more equitable and harmonious relationships between parties.

h) Increase capacity to manage and administer contracts.

i) Would encourage more competitive bids.

It is important in this present decade for Australian industry to look critically at the way it is conducting itself in this practice. This is not only a requirement driven by the current economic recession, but a genuine need to work more cleverly in order to remain competitive on world markets.

9.0 REFERENCES

Artto, K.A., "**Approaches in Construction Project Cost Risk**", AACE Transactions, Iss. 0065-7158, 1988, ppB.51 - B.5.4.

Belev G.C., "**Minimising Risk In High Technology Programs**", Cost Engineering Vol. 31 Iss 10, October 1989, pp 11-14.

Bhuta C.J., "**Management of Risk in Projects**", Engineering Management Journal Vol. 4 No. 1, March 1992, pp 15-21.

Casner Jr. H.D., "**The Cost Engineer and Claims Prevention**", AACE Transactions, Iss. 0065-7158, 1988, pp P.8.1 - P.8.8.

Frankel, J.E. and Lazaruk, K.H., "**Preventing Legal Problems During Construction**", Risk Manager, Vol. 38 Iss. 11, November 1991, pp 35-36.

Konarsky, A.M., "**The Art of Reading the Fine Print**", Risk Manager, Vol. 37 Iss. 10, October 1990, pp 69-71.

Korman, R. and Setzer, S.W., "**Sticking it to the Other Guy**", ENR, Vol. 226 Iss. 20, May 1991, pp 38-39.

Kozek, J.B. and Hebberd, C.G., "**Share the Risk**", Water Engineering and Management, Vol. 136, Iss. 6, June 1989, pp 20-24.

NPWC/NBCC Joint Working Party, "**No Dispute**", a Report published by the NPWC and NBCC, May 1990.

Uher, T.E., "**Risks in Subcontracting: Subcontract Conditions**", Construction Management and Economics, September 1991, pp 495-508.

Notes:

1. NPWC: National Public Works Conference.

2. NBCC: National Building and Construction Council.

10.0 BIBLIOGRAPHY

Androkovich, R.A., "**Relative Risk Aversion, Incentive Effects, and Risk Sharing,**" Atlantic Economic Journal, Vol. 18, Iss. 4, December 1990, pp 38-41.

Beidleman, C.R. et al, "**Using Project Finance to Help Manage Project Risks**", Project Management Journal, Vol. 22, Iss. 2, June 1991, pp 33-38.

Birnie, J. and Yates, A., "**Cost Prediction Using Decision/Risk Analysis Methodologies**" Construction Management and Economics (UK), Vol. 9, Iss. 2, April 1991, pp 171-186.

Brown, P.C., "**A Risk-Averse Buyer's Contract Design**", European Economic Review (Netherlands), Vol. 33, Iss. 8, October 1989, pp 1527-1544.

Farber, H.S. et al, "**The Role of Arbitration Costs and Risk Aversion in Dispute Outcomes**", Industrial Relations, Vol. 29, Iss. 3, Fall 1990, pp 361-384.

Green, R. et al, "**Rise and Fall and Cost Reimbursement Clauses**", Industrial Relations Research Series Number 1, Australian Government Publishing Service Canberra, April 1991.

Hiatte, D.L., "**Protecting Yourself from Liability Risks**", Consulting - Specifying Engineer, Vol. 10, Iss. 3, September 1991, pp 40-44.

Ibbs, W.C., "**Innovative Contract Incentive Features for Construction**", Construction Management and Economics (UK), Vol. 9, Iss. 2, April 1991, pp 157-169.

Lothian, M., "**The JCC Contracts - Making Practice Easier and Safer**", Architecture Australia, March 1986, pp 68-69.

Lovegrove, K., "**Builder's Handbook - Guidelines to Contracts and Contract Administration**", The Federation Press, Sydney, 1990.

Macomber, J.D., "**You Can Manage Construction Risks**", Harvard Business Review, Vol. 67, Iss. 2, March/April 1989, pp 155-165.

Porter, C.E., "**Risk Allocation in Construction Contracts**", Master of Science Thesis in Civil Engineering, University of Manchester UK, 1981.

Wallace, D., "**Hudson's Building and Engineering Contracts**", 10th Edition, Sweet and Maxwell, 1970.

APPENDIX 1

CONTRACTS REVIEWED - SUMMARY

CONTRACTS REVIEWED - SUMMARY

No.	Contract Description
1	Standard Contract - AS2124-1986 Conditions of Tender & Conditions of Contract Roads & Underground Services for a large process chemical plant, Queensland 1991
2	Standard Contract - AS2124-1981 Conditions of Contract. Mechanical Installation & Minor Civil Works. A large process chemical plant Project Newcastle. NSW (1988)
3	In-House Contract Public Corporate Building Project - Form of Contract, Deed & General Conditions of Contract (Draft 1989)
4	In-House Contract General Conditions of Contract Majority of local government works in a Council facility, Victoria (1992)
5	Standard Contract - AS2124-1986 Conditions of Tendering and Contract for a new office development, NSW (1992)
6	Standard Contract - AS2124-1986 Conditions of Tendering and Contract for a new office development, NSW (1992)
7	In-House Contract Public Authority NSW Purchase Order Conditions for the Waste Treatment Plant, NSW (1987)
8	Standard Contract - JCCA, 1985 Contract Conditions - Construction of a high rise office complex, Melbourne (1987)
9	Standard Contract - JCCB, 1985 Contract Conditions - Concrete repairs and surface coating - Multi-storey Carpark, Melbourne (1991)
10	In-House Contract Construction Management Agreement - Asbestos removal in a multi-storey building, Melbourne (1990)
11	In-House Contract Fit-out of multi-storey building - several levels Melbourne (1991)
12	Standard Contract - NPHC, Ed3, 1981 Construction Agreement, Queensland (1991)
13	In-House Contract Construction Agreement, Victoria. (1991)

14	In-House Contract Structural Engineers Agreement. Major repairs to a multi-storey development, Victoria (1990)
15	In-House Contract Building Contract - for the recladding of a multi-storey building, Victoria (1991)
16	In-House Contract Sub-Contract - Structural Steel Framing, Victoria (1992)
17	Standard Contract - AS2124-1986 Public Authority Relocation - Conditions of Contract, Victoria (1989)
18	Standard Contract- SPA SA Approved Contract Conditions of Contract for provision of Swimming Pool, Victoria (1992)
19	In-House Contract Fit out Agreement, Victoria (1989)
20	In-House Contract Fit out Management Agreement, Queensland. Manage construction of fitout of Shopping Centre. (1990)
21	In-House Contract General Conditions of Sub-Contract, Adelaide SA (1989). Design and construction of fitout of Department Store.
22	In-House Contract Standard Direct Contract, Victoria (1990)
23	Standard Contract - Royal Aust. Inst. of Architects and The Master Builder's Federation of Aust. Ed. 5b January 1971. Lump Sum Contract - Agreement and Conditions of Building Contract. Construction of a 3 storey building - laboratory, Victoria (1988).
24	In-House Contract - Agreement for Architectural Services - Tenancy Fitout Works, Victoria (1990).
25	In-House Contract - Agreement and Conditions of Engagement for Professional Consultant Services. Construction of Hospital. Admissions Unit and Adult Assessment Unit within a Hospital. (Architect is head consultant all other consultants are secondary), Sydney, NSW (1990).
26	Standard Contract - Royal Australian Inst. of Architects (Victorian Chapter), Owner/Construction Manager. Agreement Issue April 1991. Construction of a 2 storey brick residence, Melbourne (1987).

27	Standard Contract - American Institute of Architects. Standard form of Agreement between owner and architect for designated services - Ed 1977. Expansion and modification to an existing sports ground facilities, Melbourne (1991).
28	Standard Contract - JCC B 1985. Building Works Contract. Construction of main control room upgrade for large process chemical plant, Melbourne (1991).
29	In-House Contract - Project Management Conditions of Contract - The construction of a suburban office Development, Melbourne (1989).
30	Standard Contract - Uniform Housing Contract - Agreement and Conditions of Contract (UHC 1 August 1981). Construction of a doctors surgery, Melbourne (1990).
31	Standard Contract - Lump Sum Contract - Agreement and Conditions of Building Contract. Construction of a 12 storey reinforced concrete office building, Melbourne (1988).
32	Standard Contract - AS2124 - 1986 General Conditions of Contract. Supply and erection of process water pipework for aluminium works expansion project, NSW (1992).
33	Standard Contract - AS2124 - 1981 Tender and General Conditions of Contract for a swim centre development, Newcastle, NSW (1990).
34	Standard Contract - NPWC Ed 3 (1981) Tender and General Conditions of Contract for a harbour foreshore development, including wharf and buildings, NSW (1987).
35	Standard Contract - Lump Sum Contract Ed. 5b 1971 Agreement and Conditions of Building Contract. Alterations and Additions to a Bank, NSW (1987).
36	Standard Contract - Cost Plus Contract for Building Works FF/C Revised Ed 1977. Alterations and additions to a city hotel.
37	Standard Contract - Lump Sum Contract for Simple Building Works SBW1 Ed. 1988. Alterations and additions to premises.
38	Standard Contract - AS2124 - 1986 - New hospital, NSW 1991.
39	Standard Contract - JCC B 1985, Upgrade to bank, NSW, 1989.
40	Standard Contract - JCC B 1985, Proposed office building refurbishment, NSW, 1989.
41	Standard Contract - Lump Sum Contract, Alterations to bank premises, NSW, 1989.

42	Standard Contract - JCC B 1986 Ed. Construction of a school library, NSW, 1989.
43	Standard Contract - Lump Sum Contract for Simple Building Works - SBW 1 1988. Construction of residence, NSW, 1988.
44	Standard Contract - JCC B 1985. Construction of a community lodge, Brisbane, QLD, 1988.
45	Standard Contract - AS2124 - 1986. Construction of a process plant control room, Newcastle, NSW, 1992.
46	In House Contract - Design and Construction of mechanical services to office development, Newcastle, NSW, 1992.
47	Standard Contract - AS 2124 1986. Supply and Delivery of process chemical equipment.
48	In-House Contract - Supply and fabrication of plant/equipment and ancillary services for steel manufacture, NSW, 1988.
49	Standard Contract - ASCZ20-1970. Design and supply of FRP tanks for process chemical manufacture, NSW, 1989.
50	In-House Contract - Design, fabrication and supply special ridge ventilators, explosion relief vents and louvres, NSW, 1992.

Notes: 1. A schedule of the specific contracts used in this study has been included as a separate confidential attachment for examiners only. This was done to protect the anonymity of the organisations that participated in the study.

2. All standard contracts noted above were amended in one form or another by the parties to each contract.

APPENDIX 2

RESULTS OF BHUTA'S RISK APPORTIONMENT STUDY

	CONTRACT PROVISION	1	2	3	4	5	6	7	* 8	* 9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	* 28	29	30	31	32	33	34	35	36	37	* 38	39	40	41	* 42	43	44	45
1.	TYPE OF CONTRACT (Bid Risk)																																													
	i) Lump Sum	b			a	a		b	a		b		b				b	b		b			b					b				b	b	b			b				b					b
	ii) Cost Plus Fees (Schedule of rates)		a	a		a &b		a &b		a &b		a &b		c	a &b			a &b		a	b			a							b				a &b	a					a &b				
	iii) Design & Construct						b														a &b							b	b	b						b		b						b		
	iv) Project Management /Const. Manag.									a &d												a &d							d		b	b	b			b			d				d				
	v) Supply Only																								b	b	b																	b			
	vi) Design Risks			b &c	b	b	b	b	b		b	a		c	c	b	b	a	a	a	b	a	b	a	c	c	b	b	a &d	b	b	b &c	b	a	a &b	b	b	a &b	a &d	b	b	a &b	d	a	b	b &c
2	INSURANCES																																													
#	i) Workers Compensation	b	a	a	b	b	b	b	b &d	a &b	b	b	b	N/A	b	b	b	b	b	a	b	a	b	a	b	b	b	b	b	b	b	b	b	b	b	b	d	b	b	b	d	a	b	b
	ii) Employer Liability	b	a	b	b	b	b	b	c	a &b	b	b	b	c	a	b	b	b	b	a	b	a	b	a	b	b	b	b	b	b	b	b	b	b	b	b	d	b	b	b	d	a	b	b
	iii) Motor Vehicle & Third Party	b	a	a	b	b	b	b	b	a &b	b	b	b	c	a	b	b	b	b	a	b	a	b	a	b	b	b	b	b	b	b	b	b	b	b	b	d	b	b	b	d	a	b	b
	iv) Comprehensive Incl Public Liability	b	a	b	b	b	b	b	d	a &b	b	b	b	c	a	b	b	b	b	a	b	a	b	a	b	b	b	b	b	b	b	b	b	b	b	b	d	b	b	b	d	a	b	b
	v) Property Insurance incl. Acts of God	b	a	b	b	b	b	b	d	a &b	b	b	b	c	a	b	b	b	b	a	b	a	b	a	a	a	b	b	b	b	b	b	b	b	b	b	d	b	b	b	d	a	b	b
#	vi) Comp. General Liability Incl. Contr. Lia	b	a	b	b	b	b	b	d	a &b	b	b	b	c	a	b	b	b	b	a	b	a	b	a	a	a	b	b	b	b	b	b	b	a	a &b	b	b	b	d	b	b	a &b	d	a	b	b
#	3 FORCE MAJEURE	a &b	a	a &b	a &b	b	b	NIL	b	a,b,c	b	a &b	a &b	c	a &b	b	b	b	b	a	b	b	b	Nil	Nil	Nil	a &b	b	a &b	b	b	b	b	a &b	b	b	b	a &b	a &d	b	b	a	a &d	a	b	b
#	4 TERMINATION & SUSPENSION	b	a	b	b	b	b	a &b	b &d	b &d	b	a &b	b	a	a &b	b	b	b	b	a &b	b	b	b	a &b	b	b	b	a &b	a &b	b	b	b	b	b	b	b	a &d	b	b	a	a &d	a	b	b
#	5 DEFAULT	b	a &b	b	b	b	a &b	a &b	b	a,b,c	b	a &b	a &b	a &c	a &b	b	b	a &b	b	a &b	b	b	b	b	b	a &b	b	b	a &b	b	b	b	b	b	b	b	b	d	a &b	b	a &b	a &d	b	b	b
#	6 WARRANTY OR PERFORMANCE BOND	b	c	b &d	b	b	b	b	b &d	b &d	b	b	b	b &c	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b &d	b	b	b	b	b	b	b	d	b	b	b	d	b	b	b
#	7 OWNERS INDEMNITY BOND	b	b	b	b	b	b	b	b	b &d	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	d	b	b	b	d	b	b	b
#	8 TIME & COST OVER RUN	b	a	b	b	b	b	b	b &d	a,b,d	b	b	b	b	b	b	b	b	b	a &b	b	b	b	b	b	b	b	b	b &d	b	b	b	b	b	b	b	b	d	b	b	b	d	b	b	b
#	9 RISK MANAG & QUALITY MANAGEMENT	b	a	b	b	b	b	a &b	b &d	a,b,d	b	a &b	a &b	b	b	b	b	b	b	a	b	b	b	a &b	b	b	b	b	a,b,c	b	b	b	b	a,b,c	a &b	b	b	d	b	b	b	d	b	b	b
#	10 ARBITRATION & MEDIATION	a &b	a	b	b	a &b	b	a &b	b	a,b,d	b	a &b	a &b	a &b	a &b	b	b	a &b	a &b	a	Nil	a &b	b	a &b	a &b	a &b	b	a &b		a &b	b	a &b	b	a &b		a &b	b	a &b	a &d	a &b	a &b	a &b	a &d	a &b	a &b	a &b

NOTATIONS:

a = Owner
b = Contractor
c = Designers &Consultants
d = Project or Construction Managers

BHUTA'S STUDY - CANADA & USA

NOTES REGARDING COMPARISON OF STUDIES:

* Contracts excluded from comparison

\# Risk provisions used in comparison

APPENDIX 3

RISK/OBLIGATION ALLOCATION MODEL

Paper 1
ANNEXURE A

RISK/OBLIGATION ALLOCATION MODEL

8. Risk/Obligation Allocation Models (ROAM) are intended for use by any party to a contract as a starting point to determine the obligations and/or risks to be borne by any party. ROAM gives an initial arithmetic weighting of risk in favour of one or other party assuming the risk associated with the events listed in the first column. The circumstances of a particular project, or negotiation between parties, may lead to results different from those posited by ROAM.

9. The basis for this model was taken to be a project for the construction of a CBD office building for Australian Construction Services acting for a known client department. Land acquisition was assumed to be completed, and a traditional lump sum contract approach preferred.

10. Each of the items (events, acts or omissions) listed in the left-hand column has been tested against each of the Abrahamson principles.

11. A minimum score of 1 and a maximum score of 5 was possible with each confluence of item and principle. A score of 1 indicates a presumption that the event is clearly the responsibility of the Contractor; 2 that it is more than 50% the Contractor's responsibility; 3 that it is a neutral event between Contractor and Principal's responsibility; 5 that it is clearly the responsibility of the Principal.

12. The scores in each row against each item are totalled.

Score of 5 - 10	Contractor's obligation/risk
Score of 10 - 20	Neutral or shared obligation/ risk
Score of 20 - 25	Principal's obligation/risk

13. This analysis is a starting point, not exhaustive, and certainly capable of a range of views. It does however provide a starting point for allocating obligations and/or risks, and allows parties to a proposed contract to assess whether:

(a) the allocations are appropriate to the particular project, or

Paper 1
ANNEXURE A

(b) once each of the obligations and/or risks has been priced, the Principal may wish to assume greater risk, or
(c) the contract documentation reflects the bargain struck by the parties

14. In general risks/obligations scoring between 5 and 10 should always be allocated to the Contractor; risks/obligations scoring between 20 and 25 should always be allocated to the Principal; risks/obligations scoring between 10 and 20 should be allocated as agreed between the parties. The extent of such sharing depends upon the circumstances of the project and the extent to which a party has the commercial capacity to withstand a risk over which it has little control or influence.

15. As the approach was tested, its limitations became apparent, as did its attractions. Giving equal weight (and arithmetic values) to each of the five Abrahamson questions produced, in some cases, results which were contrary to the collective "common sense" of the sub-committee; in other cases the questions were not susceptible of a response (these are marked "N/A" in the model).

16. Labour relations issues tested against the model produced the most pronounced variations between empirical results and different sub-committee members' subjective assessments of what the "right answer" should be.

These variations underscore the fact that this model is just that and no more, at this stage, and that the results produced by the model are not necessarily endorsed by individual JWP members nor the organisations they represent.

17. Further work will be needed to test the theoretical assumptions of the model. In particular, each of the 5 questions will need to have varying weights assigned to them. The sub-committees preliminary view is that the 2nd to 5th questions inclusive should be treated as subsidiary to the last and that this should be reflected in arithmetic values.

Paper 1
ANNEXURE A

18. The model in its present form, in enlarging on the preliminary work, has tested the length and breadth of issues which may be "scored". Further work should be done to test the depth of issues which may be evaluated, by applying the model to other types of contract, e.g. professional Project Management, Commercial Construction Management, Design and Construct, and companion Sub- contracts for those Head Contracts.

19. Lastly, the model in its present form considers only the relationship between Principal and Head Contractor. It will be necessary to complete the picture by reviewing the relationship between the Principal and each of those other "consultants" who provide design and other services to the project and who traditionally act as agents of the Principal within the project team.

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Paper 1 - ANNEXURE B

RISK/OBLIGATION ALLOCATION MODEL NO. 1 (Lump Sum Construction only head contract)

Event	1 Within party's control	2 Party can transfer risk	3 Preponderant economic benefit	4 Efficiency - planning - etc.	5 Loss falls - no reason to transfer	Total
Feasibility						
.Land ownership	5	5	5	5	5	25
.Financial feasibility	5	5	5	5	5	25
.Planning feasibility	5	5	5	5	5	25
.Evironmental impact	5	5	5	5	5	25
.Time feasibility	5	5	5	5	5	25
.Functional and technical brief	5	5	5	5	5	25
.Project delivery system	5	5	5	5	5	25

NO DISPUTE - Paper 1 - Risk Allocation

Paper 1 - ANNEXURE B

Event	1 Within party's control	2 Party can transfer risk	3 Preponderant economic benefit	4 Efficiency - planning - etc.	5 Loss falls - no reason to transfer	Total
Design						
.Quality of client brief	5	5	5	5	5	25
.Selection of designers	5	5	5	5	5	25
.Time to design	5	5	5	5	5	25
.Design co-ordination	5	5	5	5	5	25
.Client review of design	5	5	5	5	5	25
.Planning approvals	5	5	5	5	5	25
.Budget review	5	5	5	5	5	25
.Time estimated review	5	5	5	5	5	25
.Design buildability	5	5	5	5	5	25
.Client brief review	5	5	5	5	5	25

NO DISPUTE - Paper 1 - Risk Allocation

Paper 1 - ANNEXURE B

Event	1 Within party's control	2 Party can transfer risk	3 Preponderant economic benefit	4 Efficiency - planning - etc.	5 Loss falls - no reason to transfer	Total
.Consultants fees	5	5	5	5	5	25
.Extent of design	5	5	5	5	5	25
Documentation						
.Translation of client brief	5	5	5	5	5	25
.Direction of documenters	5	5	5	5	5	25
.time to document	5	5	5	5	5	25
.Document co ordination	5	5	5	5	5	25
.Authorities/approvals	5	5	5	5	5	25
.Budget review	5	5	5	5	5	25
.Time estimate review	5	5	5	5	5	25
.Buildability review	5	5	5	5	5	25

NO DISPUTE - Paper 1 - Risk Allocation

Paper 1 - ANNEXURE B

Event	1 Within party's control	2 Party can transfer risk	3 Preponderant economic benefit	4 Efficiency - planning - etc.	5 Loss falls - no reason to transfer	Total
.Consultants fees	5	5	5	5	5	25
.Bills of quantities or equivalent	5	5	5	5	5	25
.Method of Measurement	5	5	5	5	5	25
.Extent of documentation	5	5	5	5	5	25
<u>Tendering and Selection of Contractors</u>						
.Method of inviting tenders	5	5	5	5	5	25
.Adequacy of tender time	N/A	N/A	N/A	N/A	N/A	N/A
.Issue of addenda	5	5	5	5	5	25
.Acceptance of addenda	1	1	1	1	1	5
.Clarification of identified ambiguities	5	5	5	5	5	25

NO DISPUTE - Paper 1 - Risk Allocation

Paper 1 - ANNEXURE B

Event	1 Within party's control	2 Party can transfer risk	3 Preponderant economic benefit	4 Efficiency - planning - etc.	5 Loss falls - no reason to transfer	Total
.Acceptance of alternative or non-conforming tenders by Principal(*1)	5	5	5	5	5	25
.Compliance with tender conditions	1	1	1	1	1	5
.Selection of contractor	5	5	5	5	5	25
.Selection of NSC	4	2	3	2	1	12

(*1) Note: Risk of alternative or non-conforming tender is transferred to Principal, who may accept or reject, but does not, in accepting, accept risk of design

Construction

.Programming	1	1	1	1	1	5
.Submission of priced bill	1	1	1	1	1	5

NO DISPUTE - Paper 1 - Risk Allocation

Paper 1 - ANNEXURE B

Event	1 Within party's control	2 Party can transfer risk	3 Preponderant economic benefit	4 Efficiency - planning - etc.	5 Loss falls - no reason to transfer	Total
.Giving possession of site	5	5	5	5	5	25
.Physical conditions	1	1	1	1	1	5
.Latent conditions	3	3	5	4	5	20
.Defective materials/work	1	1	1	1	1	5
.Nominated work	1	1	1	1	1	5
.Tests and samples	1	1	1	1	1	5
.Late instructions	5	5	5	5	5	25
.Contractor efficiency	1	1	1	1	1	5
.Sub-contractor efficiency (including NSC)	1	1	1	1	1	5
.Inclement weather	3	3	3	3	3	15

NO DISPUTE - Paper 1 - Risk Allocation

Paper 1 - ANNEXURE B

Event	1 Within party's control	2 Party can transfer risk	3 Preponderant economic benefit	4 Efficiency - planning - etc.	5 Loss falls - no reason to transfer	Total
.Labour disputes (*2)						
- site only	2	2	3	2	2	11
- State wide	3	2	3	2	3	13
- contractor only	1	1	1	1	1	5
- industry Unions	2	2	3	2	2	11
.Acts/Omissions of consultants/superint.	5	5	5	5	5	25
.Contactor negligence or breach	1	1	1	1	1	5

*2 Note: A result of less than 10 indicates no time extension to the contractor in any case. A result between 10 and 20 indicates a risk/obligation that may be suitable for sharing between the parties. The extent of such sharing depends upon the circumstances of project and the extent to which the parties have the commercial capacity to withstand a risk over which it has little control or influence.

NO DISPUTE - Paper 1 - Risk Allocation

Paper 1 - ANNEXURE B

Event	1 Within party's control	2 Party can transfer risk	3 Preponderant economic benefit	4 Efficiency planning etc.	5 Loss falls - no reason to transfer	Total
.Consultant/owner negligence or breach	5	5	5	5	5	25
.Force majeure	3	3	3	3	3	15
.Shortages						
- labour	2	2	2	2	2	10
- materials/plant	1	1	1	1	1	5
- finance	4	4	4	4	4	20
- off shore materials/ plant	2	2	2	2	2	10
.Legislative change after contract	3	3	4	4	3	17
.Late payment	5	5	5	5	5	25
.Insolvency - client	5	5	5	5	5	25
- contractor	1	1	1	1	1	5

NO DISPUTE - Paper 1 - Risk Allocation

Event	1 Within party's control	2 Party can transfer risk	3 Preponderant economic benefit	4 Efficiency planning etc.	5 Loss falls - no reason to transfer	Total
.Cost fluctuations	3	2	3	2	2	12
Role of Parties						
.Selection of Sub-contractors	1	1	1	1	1	5
.Sub-contact conditions	1	1	1	1	1	5
.Co-ordination	1	1	1	1	1	5
.Failure to appoint Superintendent	5	5	5	5	5	25
.Contractor breaches law	1	1	1	1	1	5
Defects/Warranties	1	1	1	1	1	5
Commissioning	1	1	1	1	1	5

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