CLASSIFICATION OF RISK MITIGATION STRATEGIES IN CONSTRUCTION PROJECTS

by

Ali Omidvar
B.A.Sc., University of British Columbia, Canada

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Abstract

This thesis proposes a classification system of risk mitigation strategies based on literature search and industry interviews. Following that, a list of generic properties was generated to describe individual strategies. In parallel, populating the properties of a large number of identified strategies was attempted. The practical implications are discussed mainly focusing on knowledge management for risk mitigation strategies.

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Terminology

In this thesis the following definitions apply:

Risk is a concept that denotes a potential negative impact to some characteristic of value that may arise from a future event, or we can say that "Risks are events or conditions that may occur, and whose occurrence, if it does take place, has a harmful or negative effect"(Holton 2004). The notion of risk in this thesis has been applied to economic and technical risks related to engineering projects.

Risk Management is a structured approach to managing uncertainty related to a threat, through a sequence of human activities including: risk assessment, development of strategies to manage it, and mitigation of risk using managerial resources. (Holton 2004).

Risk Mitigation Strategy is a type of general category of risk mitigation actions. Each risk mitigation strategy can be further broken into smaller categories. For example, financial strategies contain a broad collection of choices. This wide-ranging strategy can be further divided into option, swap, or financial bonds.

Risk Mitigation Action is a specific process or action taken by a project participant to control and mitigate the impact of risks. For example, an international construction company may decide to apply training strategies. One action item would be teaching the local regulations to the contract managers.

Risk Management Framework is a basic conceptual structure used to define the interaction, expansion, evolution, and behavior of risk mitigation strategies in relation to internal and external risks. Risk management is a continuous, proactive and systematic process to understand, manage and communicate risk from a project-wide perspective (Treasury board of Canada Secretariat 2001).

Acknowledgments

I would like to express my appreciation to my colleague Virali Patel who made a significant contribution to preparing this thesis.

Dedication

I am dedicating this thesis to my family, Ahad, Mahin, Amir, and Behnaz who supported me at all stages.

1. Introduction

Risk is an inherent part of all construction projects. Internal or external events, such as construction claims and disputes, occurrence of major accidents, and defaults on the part of one or more associated parties can pose a significant threat to the profitability and success of a project. Planning, including the use of formal risk management practices, can considerably reduce the negative impacts of risks and increase the likelihood of achieving required performance targets.

The market crash in East Asia during the late 1990s has compelled investors to seek better risk management tools. Similarly, the recent credit crunch and mortgage crises in the U.S. have reinforced the need for risk prediction and ensuring adequate risk mitigation measures. Failing insurance companies and banks are stark reminders that passive and careless risk management can strain even presumably stable institutions. The remarkable economic growth in the Middle East, India and China has highlighted the need for risk management for projects in these fast changing foreign countries. These complex business environments call for a systematic, adaptable and flexible risk management framework which accounts for the high uncertainty present in these regions.

The relatively novel public private partnership (P3) procurement model, which has gained popularity in the large scale public infrastructure projects, has additionally underlined the demand for an effective risk management. Optimum risk allocation, once the risks have been identified, is the substantial determinant in evaluating the practicality of P3. A structured approach to risk framing and risk mitigation can accelerate the process and increase confidence in results. This thesis offers an expandable and flexible structure for documenting risk mitigation strategies. Incorporating this structure in risk management can eventually be a catalyst to standardize and facilitate risk assessment.

The risk management process is an iterative one (Figure 2). It involves three broad phases:

1- Risk identification and risk assessment

2- Risk response and its execution plan

3- Management of residual risks which includes a decision making element to actively monitor progress and taking corrective actions as required.

Risk identification involves developing a list of potential threats to the project. Risk assessment entails assigning a priority value to each threat based on its effect and likelihood. Figure 1 contains one possible risk rating method. Alternative methods are described in Pinanelli (1999) and Mulholland (1999). The risk assessment phase screens out the less important risks and consequently saves on time and resources required to track and mitigate risks.

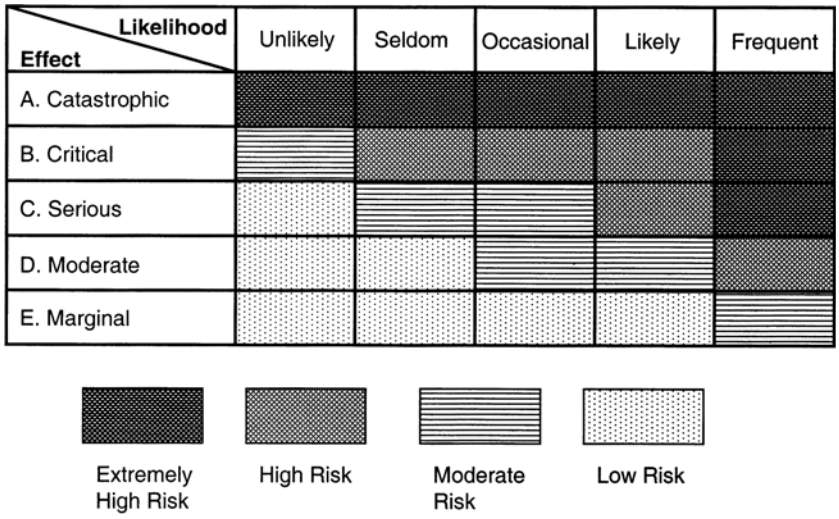


Figure 1-1: Ordinal risk matrix(Pennock et al. 2002).

The risk response phase involves generating solutions to lessen the impact or completely eliminating the adverse effects of a risk. Typical techniques to control the outcome are to eliminate, reduce, control, transfer, or retain (Edwards 1995, Miller 2001). The suitable response is selected based the project setup and the nature of the risk.

The risk mitigation execution plan is a document which describes the key personnel involved in risk mitigation strategies, cost and schedule of implementation, and alternative scenarios.

Managing and monitoring residual risks is the final step. Project managers constantly collect progress data and risk status. If the uncertainly has passed or a new one occurs, the risk execution plan should reflect the latest status. The update of the plan happens frequently in order to address the changes. Having a structured and systematic framework to implement and monitor risk strategies can be of great benefit to practitioners.

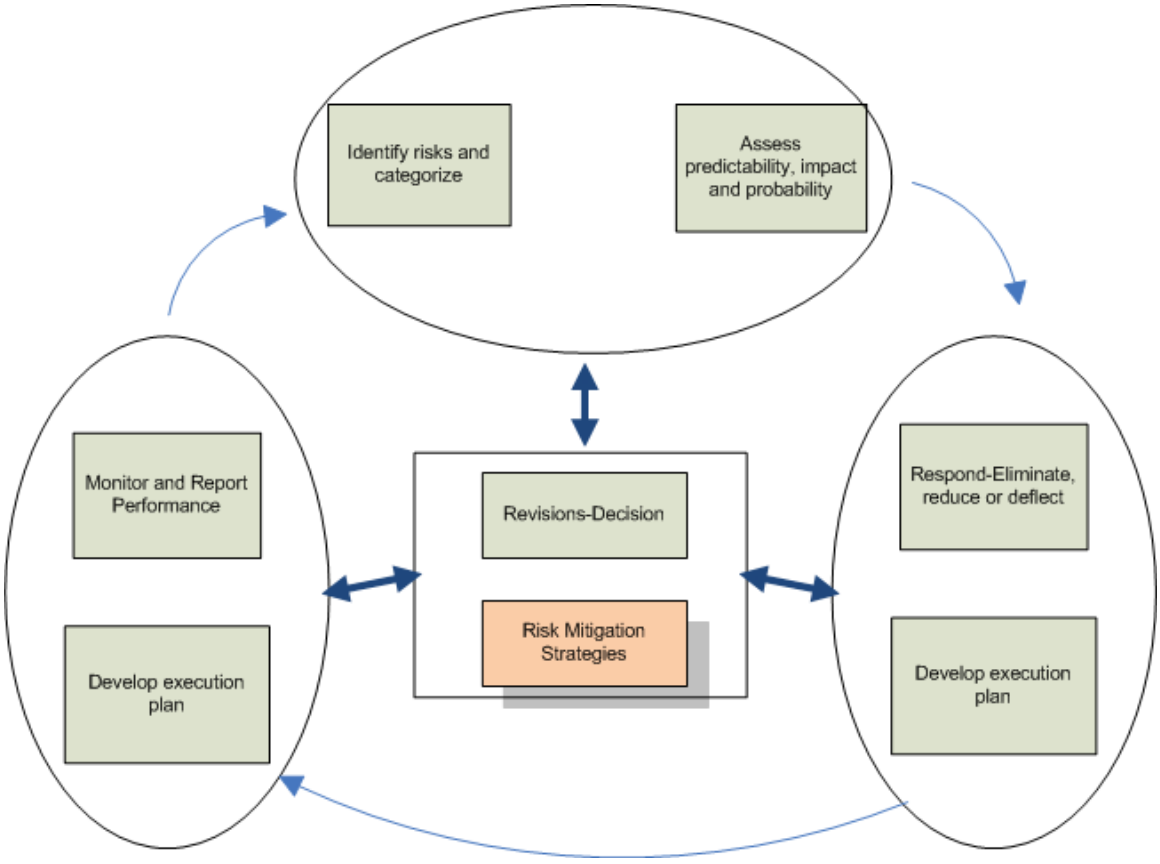


Figure 1-2: Risk Management Process

Past research and other studies have put a strong emphasis on risk identification and analysis. Many papers have described and illustrated tools and approaches such as impact

analysis, fault tree, and probabilistic methods to quantify and group risks. Meanwhile, fewer papers focus on strategies for managing risks. The need for a comprehensive repository of risk mitigation strategies is apparent. A couple of factors may contribute to this:

1- Multiple players in the construction industry
2- Knowledge of risk strategies is proprietary

Firstly, construction projects are, by default, multi-disciplinary especially in the case of large infrastructure civil or industrial projects. Not only are different sectors involved but multiple third party stakeholder groups add to the complexity and difficulty of handling projects. The participants fall in a broad range of disciplines from financial, construction, engineering, and legal to service and operation. Owners, consultants, contractors, subcontractors and third parties all pursue their own interests. Each group has their own perception and preferred way of handling risks. The majority of papers written in the area of risk mitigation strategies are narrowly focused on one sector or one perspective. The papers related to financial management discuss financial risk mitigation strategies such as swap, option, bond, or interest collar. Numerous papers look into contractual issues such as hold back, indemnity clauses, and warranties. Since the involved parties are segregated into discrete industries, published papers reflect this. An effort is required to unite these strategies by providing a holistic view of the broad spectrum of risk mitigation strategies available.

Secondly, information about risk management strategies is regarded as proprietary knowledge for engineering firms. They use this knowledge as a competitive edge over their rivals in the bidding process. This type of knowledge is very hard to earn because it takes significant resources and direct involvement in projects. As firms see little, if any, benefit in sharing their expertise, it is basically left to the academic community to create a meaningful framework and assemble mitigation strategies along with their properties.

As previously noted, some academic papers and professional guidelines are available which put together mitigation tools and strategies applicable to a limited number of risks

and a specific industry. Current knowledge is disjointed, and assembling a general comprehensive list that contains strategies from multiple disciplines would be helpful to those who are attempting to formulate an effective risk management process. However, it is not possible to compile a complete list in one attempt because of the multidisciplinary nature and the diversity of mitigation strategies. Thus, the content of this thesis constitutes the start of a journey, not the end.

This thesis aims at creating a classification of risk strategies which is editable and can evolve with the progress and demands of an individual project, as well as the experience gained by an organization as it executes multiple projects. It identifies properties which can be used to describe an individual risk strategy and compiles the properties of a large number of potential mitigation strategies (refer to Appendix 2). In addition, this thesis provides some insights on desired properties of a knowledge management tool for organizing and accessing mitigation strategies.

2. Literature Review and Research Methodology

2.1 Past Research

The topic of risk management has been discussed from multiple angles. The majority of the examined papers describes the possible risks or proposes some methods and processes to handle risks in general. Very few papers are specifically written about usage and characteristics of risk mitigation strategies. Some articles have indirectly touched on risk mitigation strategies and how they fit into the grand scheme of risk management but fail to create an adaptable and flexible classification system that can be universally applied to various projects. Some of the more useful papers found on risk mitigation strategies along with their contribution to this thesis are briefly described in the following paragraphs:

A paper on project risk management in general and risk management strategies by Raz and Michael (2001) proposes a possible breakdown of risk mitigation strategies. Supporting data were gathered through questionnaires sent to the software industry in Israel. The paper contains of a list of 38 risk management actions and strategies divided into 6 groups: Identification, analysis, planning, tracking, control, and background. The paper attempts to compare and rank the importance (by a number between 0 and 5) of these items based on the ratings received from the selected professionals. The limitation of this paper was the narrow focus of this study on software development and the high tech industry. The risk strategy list used in this study provided useful information to produce the questionnaire and strategy breakdown presented in this thesis. However, the approach and focus for the thesis is limited to collecting only risk mitigation strategies and creating an operable and practical framework rather than a general risk management process for a particular industry.

Another survey similar to the Raz and Michael survey explored the importance and effectiveness of a list of mitigation strategies applicable to risk groups such as political risks, design risks, etc for the Egyptian construction industry (Orabi & Orabi 2003). This classification can assist practitioners to select a relevant mitigation strategy after knowing

the potential risk. The paper provides a one directional mapping of strategies related to one risk. This feature has been accommodated and enhanced in this research by adding a dual directional risk mapping feature. It means that in addition to identifying the mitigation strategies applicable to risk, the proposed computer compatible framework can provide the risks treatable by a selected strategy. The other shortcoming of the Orabi and Orabi (2003) paper is that the list of items contains both risk mitigation strategies and risk mitigation actions. The paper does not distinguish between the two groups, and the risk mitigation list has no organization or structure.

A number of researchers have focused on risk and risk mitigation strategies for a specific industry. Even though the framework is valid and viable in their specific areas, they are inadequate to address a broad range of project types. For example, Wang et al. (2004) proposed and evaluated the risks and mitigation strategies associated with international construction projects. The authors outlined a list of risks, identified mitigation strategies and introduced a model to assist with the risk management process. Firstly, risks were organized into three hierarchical levels:

- Country (the function of political and macroeconomic stability) ,
- Market (availability of construction resources, complexity of regulatory process, etc.) and,
- Project level (specific to construction site such as logistics, site safety, and improper design).

Then a long list of all potential mitigation strategies was laid out. Similar to Orabi & Orabi (2003), Wang et al. do not differentiate the risk strategies from risk mitigation actions. In addition, no effort was taken to classify the risk mitigation strategies.

Jaafari (2001) analyzes the importance of integrating the life cycle view of a project into the risk management process. The paper emphasizes the need for a thorough formulation of project objectives with its life cycle view. It compares risks and their treatment from a traditional versus life cycle view. The risk list is limited to almost ten groups followed by the relevant risk mitigation strategies for each group. Practical information was presented in the next column on the deficiencies associated with each risk mitigation

strategy. The discussion on the treatment of risk formed only a small portion of the paper but the content of the risk list helped to complete the generic property list for mitigation strategies.

2.2 Methodology

The research work described herein has been carried out through two main streams of effort:

- Data collection and,
- Results development

As illustrated in Figure 3, data collection was performed through interviews and literature search. The research began with an extensive literature search of risk management strategies and notions of risk management in the construction industry. The effort later extended to similar industries such as oil and gas, nuclear energy, mining, and transportation. The results of the first run-through of the literature search were a preliminary structure and a list of strategies and their properties. The list was further polished after interviews conducted with professionals in terms of structure, practicality and completeness.

The literature search was conducted in three parallel areas:

1 Risk mitigation strategies;
2 General risk management, and
3 Views of comparable industries

The investigation of general risk management and complementary industries helped to add more meaningful and practical strategies and properties. The general risk management papers were particularly useful in developing a comprehensive list of properties of risk mitigation strategies. The research on complementary industries was essential in consolidating, combining, and revising the risk mitigation strategies.

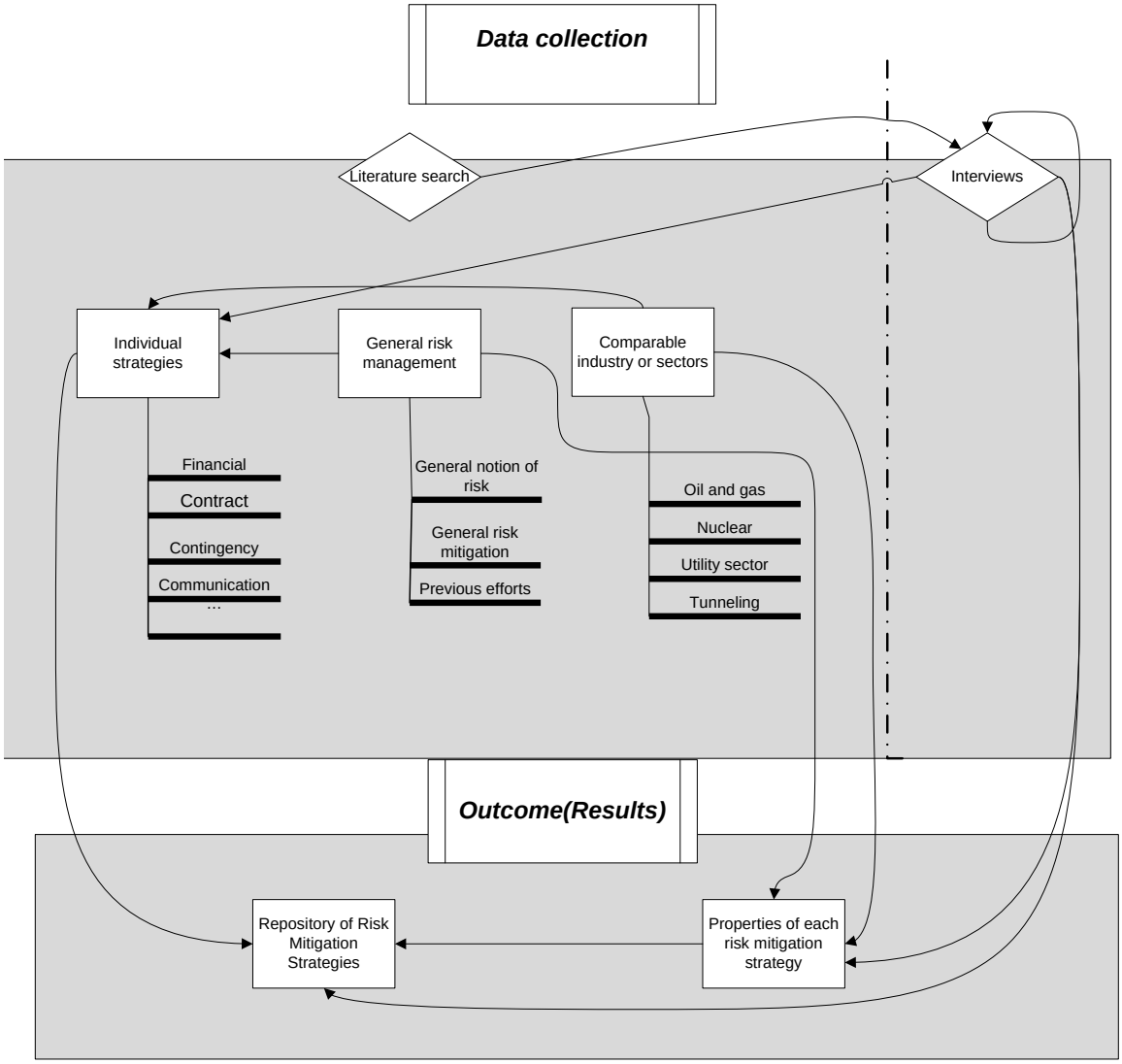


Figure 2-1: Research Methodology

2.3 Literature Search

The first phase of the literature search was carried out in order to compile the preliminary list of risk mitigation strategies. Phase two was started after the first interview was carried out. The insights received from the interview guided a broader literature search not only in risk mitigation strategies and risks in construction but also alternative views from other industries. A search to define the properties for strategies found was also performed concurrently.

For example, Van Wyk et al (2008) lay out the risks and associated responses in the case of a South African utility company. The paper describes on the risks involved for power outages at peak demand times during the operating phase and the mitigation strategies tailored for those risks. It provides useful insights into designing a pragmatic model handling risks in the power industry.

Another paper describes the considerations and challenges for identifying and treating risk involved in oil and gas construction projects in Vietnam (Van Thuyet et al. 2007). It examines the risk management process from a high level perspective by looking at possible risks, their importance, and available risk mitigation tools. Even though the analysis is very narrowly aimed at the Vietnam oil and gas industry, the pointers and risk handling strategies are commonly applicable to developing countries. In the same category of papers, Pignanelli (1999) treats the risk management phases of risk identification, risk modeling, risk evaluation, and risk response. One section has a brief procedure on how to specifically mitigate the risks in underground projects.

Based on the review of the available literature, the academic world has yet to produce a structured framework which can capture and retain knowledge related to risk mitigation strategies. There is an evident need for a system adaptable enough to cope with the challenges associated with documenting the properties of potential risk mitigation strategies and then choosing ones appropriate for a specific project type and project content.

2.4 Consultation

The data for this thesis has been assembled by the means of literature search and interviews with industry experts. A preliminary list of strategies and their organization were crafted based on an extensive literature search. The practicality of the data was later improved by soliciting feedback from experts. Four experts were involved: A P3 concessionaire from the investment banking industry, a construction lawyer, a Chartered Financial Analyst from Partnerships BC, and a chief risk representative of an industrial construction company. The questions asked were designed to shed more light on the following subjects:

- Identifying how to fit the model shown in Figure 4 into the current challenges and problems faced by industry in arranging knowledge related to risk mitigation;
- Verifying practicality of the structure;
- Seeking knowledge as to state-of-the-art strategies;
- Eliminating duplication, regrouping associated tools, and adding overlooked strategies not identified from the literature search;
- Creating properties and tests for the use of each mitigation strategy

A questionnaire was composed to provide enough context to the interviewees in terms of the thesis objective and content. The questionnaire consisted of four main sections:

1. Introduction, purpose, and questions
    a. This page included information about the purpose of the thesis work, structure of the questionnaire and some questions. Questions were designed to direct the thinking process into the direction of practical implementation and effectiveness of the proposed structure. The questionnaire was also aimed at eliciting their knowledge, experience and expertise.
2. Figure 4 was included in order to present all the categories, subcategories and individual mitigation measures in the mind map (Refer to Chapter 3 for a detailed description of the risk classification adopted).
3. The third section itemized all the tools and strategies in a master list.

4. The fourth section of the questionnaire included several illustrative examples from major categories such as insurance and financial hedges.

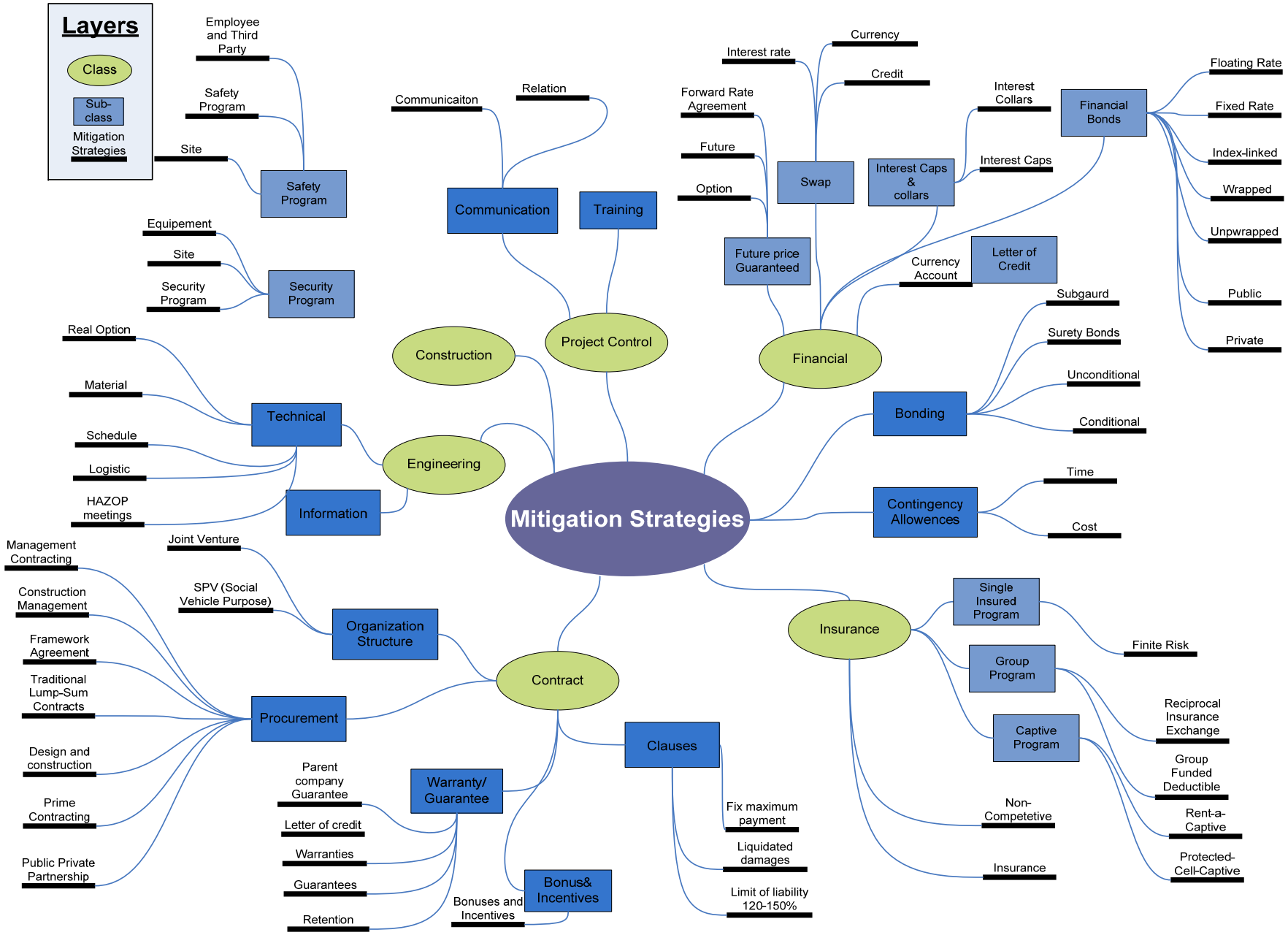


Figure 2-2: Risk Mitigation Mind Map Attached to the Questionnaire

3. Risk Mitigation Strategies

3.1 Strategies Classification

One major product of this thesis is a framework to promote knowledge management for risk mitigation strategies. By employing this structure, knowledge can be gradually accumulated, thereby facilitating the whole process of selecting an appropriate strategy. The structure creates a generic framework which is compatible with a wide range of projects. The features and requirements that have been addressed in the design of the framework structure include:

- Generic model which is transferable among projects
- Usable by all key project participant in operable form
- Suitable for software presentation
- Editable, allowing:
  - The model to be project specific
  - The content to be enhanced
  - Properties to be added
- Ability to Navigate and search

As evident in Figure 4, the literature research and industry interviews were distilled into a mind map diagram. The strategies are organized and classified within three layers: class, subclass, and mitigation strategies. The classes (ovals) are the main, independent, distinct categories such as financial, communication and technical. The sub-classes are placed under the major headers based on the typical strategy available in the market. The sub-classes themselves are broken into further underlying strategies. This diagram displays a broad spectrum of strategies in a clear and visible manner.

This breakdown of strategies addresses the risk concerns relevant to construction industries. The mitigation classes were divided to reflect the major disciplines and players involved in the construction business. The primary first layer classes are

financial, legal, insurance, engineering, construction, and project control/sales. The secondary classes were created and grouped based on the interviews and literature search.

The foregoing methodology and risk mitigation classification is not rigid and fixed. It does not dictate a defined model to the user and leaves room for adjustments based on judgment and experience. Other possible arrangements or categorization schemes can be accommodated by implementing the framework in a flexible computerized form. Depending on the degree of variation, more classes, sub classes, and strategies can be added to the suggested arrangement. In extreme cases, entirely different classes and subclasses may be created.

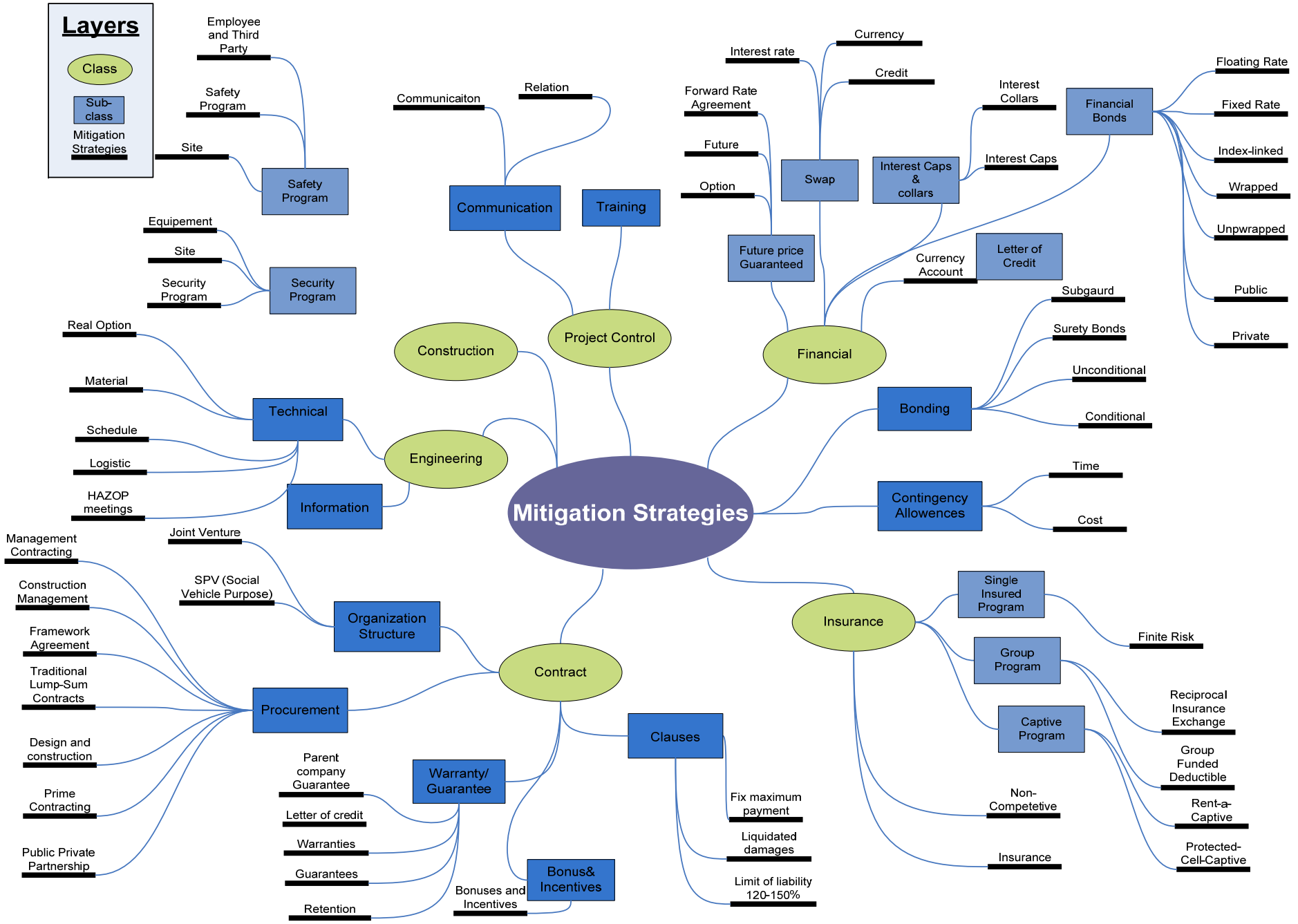


Figure 3-1: Risk Mitigation Classification

3.2 Properties of Strategies

Creating a template to contain a generic list of properties can dramatically help to organize and increase the practicality of the system. To achieve this, a list of properties was developed as shown in Table 1. The properties were first developed after an initial literature search and then further refined by incorporating the feedback from interviews with industry experts and further literature search.

Table 3-1: List of Properties

Properties	Description	Choices
Description	Gives some general information and knowledge about the mitigation strategy, the usage, and in a few cases, provides alternative strategies.	Free form
Parent	The broader classes that the strategies are categorized under. For example, escalation cost is a mitigation strategy under contract/contract clauses.	
Phase	The life cycle phase for which the mitigation strategy is appropriate. Multiple phases can be selected for some strategies. Refer to Section 3.2.1 for a detailed description.	a. Preconstruction b. Design c. Construction d. Operation/ Maintenance
Time horizon	Time horizon is the time frame of the project and the desired period of coverage: short (less than 6 months), medium (6 months to 2 years), or long term (more than 2 years). Refer to Section 3.2.2 for a detailed description.	a. Short b. Medium c. Long
Mitigation strategy type	Type of impact for mitigation strategies can be categorized into the following groups.	a. Eliminate b. Reduce

	Refer to section 3.2.3 for a detailed description.	c. Control d. Transfer e. Retain
Speed of Impact	The interval from the occurrence of a risk to the time that the risk strategy takes effect. Refer to Section 3.2.4 for a detailed description.	a. Fast b. Slow
Influenced Variable	The project measure affected by the strategy.	a. Cost b. Time c. Safety d. Performance
Typical users	A typical users property can be defined since strategies employed by owners and contractors are separate. Refer to section 3.2.5 for a detailed description.	a. Client b. Contractor c. Shared
Considerations or tests	A set of related questions and criteria are proposed to gauge the suitability of the strategies under different circumstances. This property assists the user to evaluate the effectiveness of the strategy.	Free from
Reversibility	Refer to 3.2.6 for a detailed description.	a. Yes (High) b. Yes (Low) c. No
Applicable risk	Takes into account the possible risks which can be treated with this strategy. A list of risks is made to save time for users.	Risks (Refer to Appendix 1)
Inapplicable risk	A list of inapplicable risks is assembled such that if a risk is placed in this category, the user can discard the strategy at hand immediately and search for another one.	Risks (Refer to Appendix 1)
How to apply	Suggests some standard procedures which	Free form

	may be applied for use of this strategy. In some strategies the step by step mechanism is given followed by some clarifying examples. Some of the potential resources and relevant institutions are included in the guidelines.	
Benefits	Describes the general benefits of the strategy. In a number of cases, the advantages and disadvantages can be compared with alternatives.	Free form
Limitations	Describes the general limitations of the strategy. In a number of cases, the advantages and disadvantages can be compared with alternatives.	Free form
References/ Resources	Lays out all the referenced articles and research as well as the relevant professional websites, books, guidelines, or handbooks.	Free form

3.2.1 Phase

This property shows the project phase at which this risk mitigation strategy can be employed. Most strategies are determined at the feasibility study stage but they are typically implemented or effective at a specific project phase. As the project progresses in time, the list of available strategies shrinks. This property can help the user to identify the strategies still accessible considering the phase of the project. One strategy can be applied in multiple phases. Therefore more than one option can be placed for this property.

3.2.2 Time Horizon

The importance of this property was highlighted in the interviews and later confirmed by the literature search. The time frame of the project and the desired period of coverage is an essential determinant in the type and cost of the strategy to use. For example, swaps are usually more applicable for coverage of 3 to 10 years (Redhead 2001). Any swap with a lifetime out of this range may be available but at a considerably higher cost.

Time can be measured in units of months. The given range displays the common minimum and maximum time span of the strategies in an appropriate time unit.
Both Leger at el. (1994) and Redhead (2001) emphasize the importance of coverage length for which the strategy is valid and applicable. The strategies can be categorized into: short (less than 6 months), medium (6 months to 2 years), or long term (more than 2 years).

3.2.3 The Mitigation Strategy Type

As described in the introduction, eliminate, reduce, control, transfer, or retain are the available choices to treat a risk.

3.2.4 Speed of Impact

Perera et al. (2005) discuss areas in effective communication and measuring risks. One major area is speed, which accounts for the time that a risk takes to get from its source to

the right destination. The same concept can be employed in studying and examining risk mitigation strategies. The time lag from the flagging the occurrence of a risk to taking action by those responsible for managing the risk can vary considerably for different mitigation strategies. For example, project contingency fund has a fast response time. As soon as the issue arises the money can be almost instantly released while the tools such as insurance or bonding may take a while for investigation or paper work.

3.2.5 Typical Users

Risk mitigation strategies employed by the owner are distinct from the ones used by contractors. This fact was validated by surveys conducted by (Kangari (1995) and (Loosemore & McCarthy 2008). Based on these surveys performed in the construction industry, each group of risks normally belongs to either the owner or contractor. Some risks are on the boundary and negotiations may determine responsibility for the risk. In the same way, the owners of risk strategies can be divided into two groups: client, contractor, shared.

3.2.6 Reversibility

This attribute captures the flexibility of a strategy or stopping a mitigation strategy; the ability to modify or terminate the strategy during the duration of the project. Some strategies normally come with high cancellation or change penalties. For example, purchase of a swap strategy should only be done after careful analysis in order to avoid high penalties. Therefore, swap contract can be canceled but with low reversibility. Financial options are a good example of a highly reversible risk mitigation strategy. An option acquired for a commodity such steel or oil can be easily sold in the market at any time. Even though the value of the option naturally depreciates as it approaches the maturity date, the choice to sell it in the market always exists. The reversibility of the strategy is dependent on the implementation as well. For example, a real option can involve the purchase of two burners, one gasoline and one diesel. In this situation, the real option is reversible because the decision makers could decide to refurbish and sell the secondary fuel burner. If they were to purchase a dual-fuel burner, the decision is irreversible because the alternative is integrated in the model and is inseparable from it.

3.3 Strategy Examples

The properties for risk mitigation strategies are laid out in Appendix 2. The data for each strategy was gathered as previously explained in Sections 2.3 and 2.4. The references are included in addition to the properties.

Four reasonably diverse examples are extracted to illustrate the nature of properties for a mitigation strategy. The strategies included here are:

1-Control/Contingency,

2-Financial/Interest rate collars,

3- Contract/Warranties,

4- Real options.

3.3.1 Contingency

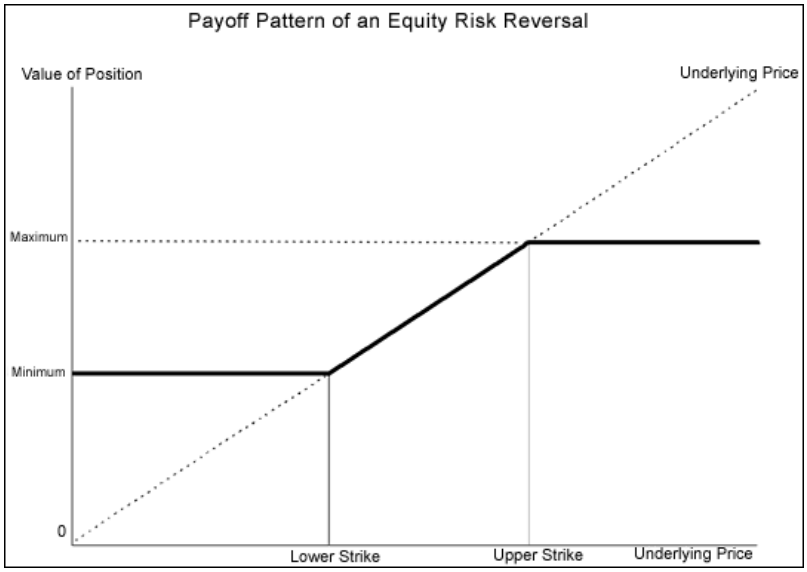
Table 3-2: Example 1 Contingency Allowances/Cost Contingency

Description
A specific provision considered on behalf of the owner for unforeseeable elements of cost within the defined project scope (i.e., known unknowns). Contingency is particularly important where previous experience related to estimates and actual costs has shown that unforeseeable events, which will increase costs, are likely to occur.
Parent
Contract
Phase
Design, Construction
Time Horizon
Project dependant
Type of Response
Retain
Impact Speed
Fast
Reversibility
Mitigated Measures
Cost
Typical Users
Client
Considerations(Tests)
▪ Do you feel a lack of knowledge about a certain aspect of the project? ▪ Is this a new project with quite a few unknown risks?

Impact on Risk Manageability
Low
Applicable Risks
▪ Contractor performance ▪ Minor Schedule changes ▪ Unknown design factors ▪ Unanticipated regulatory standards ▪ Incomplete or addition to project scope definition
Inapplicable Risks
How to Apply
Limitations
▪ The percentage figure is most likely arbitrarily arrived at and not appropriate for the specific project. ▪ There is a tendency to account for the risk twice because some estimators are inclined to include contingencies in their best estimate. ▪ A percentage addition still results in a single figure prediction of estimated cost, implying a degree of certainty that is not justified. ▪ The percentage added indicates the potential for detrimental or downside risk; it does not indicate any potential for cost reduction, and may therefore hide poor management of the execution of the project. ▪ Because the percentage allows for all risks in terms of a cost contingency, it tends to direct attention away from time, performance and quality risks. It does not encourage creativity in estimating practice, allowing it to become routine and mundane, which can propagate oversights
Benefits
References & Resources
▪ Douglas, Edward E.,III. "Contingency Management on DOE Projects." AACE International Transactions (2001): RI31. ▪ Mak, Stephen 1, Jenny 2 Wong, and David 3 Picken. The Effect on Contingency Allowances of using Risk Analysis in Capital Cost Estimating: A Hong Kong Study. ▪ Rowe, John F. "A Construction Cost Contingency Tracking System (CTS)." Cost Engineering 48.2 (2006): 31. ▪ Yeo, . Risks, Classification of Estimates, and Contingency Management. Vol. 6. [New York, N.Y.]: American Society of Civil Engineers, Engineering Management Division, 1990.

3.3.2 Financial Hedges/Interest Rate Collars

Table 3-3: Example 2 Financial Hedges/Interest Collars

Description
The interest collar is an investment strategy which limits exposure to changes in the interest rate. The collar has a combination of a cap and a floor. The buyer of a collar buys a cap option to limit the maximum interest rate to be paid and sells a floor option to partially offset the premium paid for the cap. A collar restricts interest-rate payments to a band between the strike prices of the cap and floor options.    For example, a collar range of 4% to 6% can be purchased. As shown in the graph above the lower strike is 4% and the upper strike is 6%. The user bears the interest rate risk only when the value fluctuates between 4% and 6%. As is evident on the graph the value of position follows the underlying price in the collar range (between lower strike and upper strike). At any interest rate above the upper strike or below the lower strike, fix rates will apply and consequently cap the user exposure to interest rate variations. The users will profit if the interest rate value rises above the upper strike and they will lose money in case the interest rate drops below the lower strike.
Parent
Financial Hedges
Phase
Construction
Time Horizon
Mid term
Type of Response
Transfer
Impact Speed
Fast
Mitigated Measures
Cost

Typical Users
Client
Considerations(Tests)
Since this product involves the Contractor writing an option (*i.e.* the floor) it is sometimes regarded as a higher-risk product than a swap.
Applicable Risks
Interest rate, exchange rate
Inapplicable Risks
How to Apply
Depending on how the rates are structured it is possible for a collar to be nil-cost at the outset, i.e. the cap and floor are each worth the same amount (one being bought and the other sold by the Contractor, they net-off to a nil cost). Of course, the higher the cap or the lower the floor, the lower the fee. Again, banks are the most active participants in this coverage market.
Benefits
Limitations
The total market for such instruments is generally smaller than for interest-rate swaps
References & Resources
▪ H.M. Treasury. Interest-Rate & Inflation Risks in PFI Contracts, 2006. ▪ Johnson, Robert, et al. "Simulating Currency Risk on Private Investments in Real Estate." Journal of Real Estate Portfolio Management 12.2 (2006): 91. ▪ Keith Redhead. "Exchange Rate Risk Management - Part 3." 22.5 (2001). ▪ Leger, Sylvie, and Jacques Fortin. "Hedging: A User's Manual." 127.3 (1994).

3.3.3 Warranties

Table 3-4: Example 3 Warranties

Description
Collateral warranties can be used to create a contractual relationship between a client and a subcontractor or sub consultant. This tool enables the client to pursue remediation from the other parties even after the project has been completed, if a latent defect occurs.
Parent
Contract
Phase
Construction, Operation
Time Horizon
Long

Type of Response
Transfer
Impact Speed
Low
Mitigated Measures
Technical performance
Typical Users
Client
Considerations or Tests
A guarantee on purchased goods to ensure that they are of the quality represented and will be replaced or repaired if found to be faulty. Experience shows warranty/guarantee expenditures are between 0-2% of Total Installed Cost with most less than ¼% (mixture of Lump Sum & Reimbursable Cost) Be careful about implied and explicit warranty
Impact on Risk Manageability
Applicable Risks
Equipment life, Service, Project performance
Inapplicable Risks
How to Apply
Similar to general contract warranties clauses should cover four areas: Clauses which define the norm of the industry and the acceptable standard The term for which the warrant is applicable. Dispute resolution process. This section defines the options and remedies available to the owner. Exclude liability for consequential damages to curb the possibility of getting sued for implied warranties. Example: CLAUSE I-149 – WARRANTY OF CONSTRUCTION (a) In addition to any other warranties in this subcontract, the Subcontractor warrants, except as provided in paragraph (j) of this clause, that work performed under this subcontract conforms to the subcontract requirements and is free of any defect in equipment, material, or design furnished, or workmanship performed by the Subcontractor or any lower-tier subcontractor or supplier at any tier. (b) This warranty shall continue for a period of 1 year from the date of final acceptance of the work. If SURA* takes possession of any part of the work before final acceptance, this warranty shall continue for a period of 1 year from the date SURA takes possession. (c) The Subcontractor shall remedy at the Subcontractor's expense any failure to conform, or any defect. In addition, the Subcontractor shall remedy at the Subcontractor's expense any damage to SURA* and/or Government-owned or controlled real or personal property, when that damage is the result of –

(1) The Subcontractor's failure to conform to subcontract requirements; or

(2) Any defect of equipment, material, workmanship, or design furnished.

(d) The Subcontractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Subcontractor's warranty with respect to work repaired or replaced will run for 1 year from the date of repair or replacement.

(e) SURA shall notify the Subcontractor, in writing, within a reasonable time after the discovery of any failure, defect, or damage.

(f) If the Subcontractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, SURA* shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Subcontractor's expense.

(g) With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this subcontract, the Subcontractor shall –

(1) Obtain all warranties that would be given in normal commercial practice;

(2) Require all warranties to be executed, in writing, for the benefit of the Government, if directed by SURA*; and

(3) Enforce all warranties for the benefit of the Government, if directed by SURA*.

(h) In the event the Subcontractor's warranty under paragraph (b) of this clause has expired, the Government and/or SURA* may bring suit at its expense to enforce a subcontractor's, manufacturer's, or supplier's warranty.

(i) Unless a defect is caused by the negligence of the Subcontractor or lower-tier subcontractor or supplier at any tier, the Subcontractor shall not be liable for the repair of any defects of material or design furnished by SURA* nor for the repair of any damage that results from any defect in SURA*-furnished material or design.

(j) This warranty shall not limit SURA*'s rights under the Inspection and Acceptance clause of this subcontract with respect to latent defects, gross mistakes, or fraud.

* The Southeastern Universities Research Association (SURA) is a consortium of over sixty universities across the US.

Benefits

Limitations

References & Resources

<http://law.freeadvice.com/general_practice/guarantees/>
<http://www.law.com/>
<http://www.ftc.gov/bcp/edu/pubs/consumer/products/pro17.shtm>
<http://www.ftc.gov/bcp/edu/pubs/consumer/products/pro17.pdf>

<http://www.jlab.org/div_dept/admin/business/terms_cond/I_clauses/149.pdf>

3.3.4 Real Option

Table 3-5: Example 4 Real options

Description
‘‘Real’’ options deal with physical things rather than financial contracts. Specifically, they refer to elements of a system that provide ‘‘rights, not obligations’’ to achieve some goal or activity. Generally speaking, all elements of a system that provide flexibility can be considered as ‘‘real options.’’ For example: Building a production system so that it can change easily from one input to another or from one product to another is equivalent to creating ‘‘real options.’’ Thus dual-fuel burners that can use either oil or gas give the operators of power plants the ability to switch between fuels whenever it is economical to do so. Likewise, production lines designed to switch equipment so that they can produce different products give the decision makers the right to do so when they wish.
Parent
Technical
Phase
Preconstruction
Time Horizon
Long
Type of Response
Retain
Impact Speed
Fast
Mitigated Measures
Technological advances,
Typical Users
Consultants
Considerations or Tests
Applicable Risks
Inapplicable Risks
How to Apply
The process to apply the real option contains three phases: • Discovery, during which the group attempts to identify the most interesting areas of uncertainty, which may potentially offer the greatest rewards from options; • Selection, which evaluates the possible means of providing flexibility to the system, and determines which of these options should be implemented; and • Monitoring, the process of monitoring the evolution of the uncertainties so that the organization will know when to implement.
Benefits
The real options approach to systems design attempts to manage the major risks confronting the design. In practice, it seeks out opportunities to build real options

into design, evaluates these possibilities and implements the best ones. In contrast to the conventional decision analysis that works with a predetermined set of possible decisions, the options approach seeks to identify new possible paths, to change the decision tree by adding in flexibility.

Limitations

The data available for the analysis of ‘‘real options’’ is normally far less accurate than that used in the analysis of financial options, and managers make decisions about whether to acquire a real option, for example to build a flexible manufacturing facility, only a few times, perhaps only once. Analysts of ‘‘real options,’’ however, may have little historical data to draw upon and may thus have to use speculative assumptions. In these circumstances, they know their estimates of value are approximate within bands described by sensitivity analyses, and recognize that analytic niceties that might lead to greater precision may be a waste of effort. In short, the analysis of ‘‘real options’’ leads to approximate rather than precise values.

References & Resources

Neufville Richard De. (2003) “Real Options: Dealing with uncertainty in system planning and design” Integrated Assessment Vol. 4, No. 1, pp. 26-34.

4. Practical Implications

4.1 Applications/Limitations of Classification

Risk management and risk mitigation strategies are wide ranging and vary depending on the project. Risk practitioners face complicated multi-disciplinary challenges and risks which need broader understanding of risk mitigation strategies. The risk classification provided in this thesis addresses these issues by offering a searchable, expandable, flexible, and repeatable classification.

One challenge for users is to compile a complete list of all the available risk mitigation strategies. As stated previously, the diagram shown in Figure 3 incorporates the risk mitigation strategies which were identified through the literature search and interviews. However, not all possible strategies are included, others may exist. The edit ability of the framework compensates for this drawback. Additionally, this adaptable model allows the user to modify the classes according to the most up to date availability of strategies. Some features of this classification are:

1. Searchable
2. Editable
3. Flexible

4.1.1 Searchable

After collecting the strategies and outlining the structure, the data can be transferred to a computerized database. The list can then be browsed, indexed, or organized by the content of the properties. A software based framework inherently enhances accessibility to the data.

Some fields such as Applicable Risk can take multiple entries. One risk can be repeated in multiple strategies. For example, interest rate risk can be associated with several strategies (Interest rate swap and interest rate caps). The programmable search explained above can quickly and accurately pick out the applicable strategies relevant to one risk. This ability can be extremely valuable and practical in risk management. The importance

of identifying alternatives was highlighted in Aven et al. (2007) which describes the major steps in the decision making process utilized for the offshore oil and gas industry. As an example, interest rate can be hedged by caps, swap, and future agreement. This program can filter all these strategies by searching for the keyword 'interest rate'.

4.1.2 Editability

The research and interviews suggest that development of a fixed and invariant structure of the framework for all industries is not possible. A workable and practical framework should be able to accommodate new strategies and properties associated with each industry. Categorizing risk mitigation strategies based on their disciplines with editable properties allows addition, deletion, and modification of the mitigation strategies and their properties.

4.1.3 Flexibility

The structure of the risk classification can be reorganized according to the perception of the users and the applied industry. The priority and importance of a particular risk can be significantly different across different industries. As a result the major classes can vary from one industry to another. The role of the user in the project can influence the structure of the classification as well. For example, the contractor views, analyzes, and treats risks differently from an owner. Different subsets of the master list can be constructed based on the perspective.

- Different views
- Owners
- Contractors
- Designers
- Facility managers
- Third party
- Financiers

This classification offers a feature to match the structure according to the industry and the needs of the users. For example, the mining industry can be another potential user of this framework. Currently, the safety class is only listed under construction and not under

engineering since most of the safety issues in residential construction are repetitive and similar. The regulations, codes, and standards have been established to address virtually all areas while industrial projects such as mining impose difficult and ever changing safety concerns. Each project carries its own requirements, layouts, and chemical processes which warrant stringent and rigorous safety programs. Thus the framework can readily accommodate safety under engineering.

4.2 Practical Implications

4.2.1 Knowledge Management

In addition to having a dynamic and adaptable structure in terms of strategies, the framework can easily generate and retain the specific experiences derived from historical projects. As soon as an entity such as a construction firm adopts this structure, it can start populating the forms similar to the example shown in Table 5. The top section of the form contains the information regarding the project. The following section records the type of mitigation strategies and their effectiveness. This list can be editable as well. Some properties can be added or taken away based on the practitioners' viewpoints and project circumstances.

Properties for specific instances from the undertaken projects:

Table 4-1: Knowledge Management Form

Project	
Project Name	
Project Date	
Procurement type	
Scope	
Capital cost	
Time frame	
Specialization(industry)	
Strategy	
Mitigation strategies	
Mitigated risk	
Cost of application	
Phase of application	
Maximum potential damage before the mitigation	
Maximum potential damage after the mitigation	
Actual cost after mitigation	
Actual cost before mitigation	
Lesson learned	

4 Conclusion

The available knowledge in the area of risk mitigation strategies is fragmented and limited. This thesis has contributed to formulating an effective structure to collect and utilize strategies appropriately by:

1- Suggesting a risk classification structure featuring a searchable, expandable, adaptable, and flexible risk management framework.
2- Proposing a list of properties to accurately and objectively define a risk response strategy
3- Compiling a preliminary list of properties for the risk mitigation strategies
4- Compiling a reasonably comprehensive list of risk responses along with the relevant properties.

The risk classification used in this thesis was based on the range of strategies commonly used by the market when the thesis was conducted. For practical use, the breakdown of the risk mitigation classification needs to be reviewed and updated at the start of each project, allowing strategies to be added, removed or consolidated.

Accumulation of knowledge is time consuming and resource intensive. A team of high level professionals is required in order to create and capture the knowledge. The success of this framework to a large extent relies on the commitment and persistence of users. Even though the system was refined to improve practicality through several interviews, a real life implementation is required to further improve the framework.

5 References

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Appendix 1 Risk Table

Business interruption risk	Failure to effectively plan for and recover from interruptions of operations may impair the builder's ability to meet deadlines and complete a project.
Construction accident risks	Unintentional damage on or to the construction site or key equipment resulting in delays and non completion of the project
cost overrun risk, cost escalation	Costs incurred outside of an acceptable range for a project may adversely affect return on investment or project completion.
credit risk	Inability of adequately assess the credit worthiness of counterparties, suppliers, or other key parties may result in default exposure or lack of performance
Employee/third party fraud risk	Fraudulent activities perpetrated by employees, customers, suppliers, or third parties against the builder for personal gain (e.g. theft of physical, financial, or information assets) expose the builder to financial losses.
Health and safety risks	Failure to adequately promote and protect employee's and contractor's health and safety
Interest rate risk	Inability to effectively manage the cost of capital may impair the financial viability of the project or to the builders.
Act of god	Acts of God are extraordinary interruptions of the project's progress by natural causes outside of the usual course of events that cannot be foreseen or Predicted.
Weather	"abnormal weather conditions" that cause a delay to any part of the work
Pollution risk	Accidental release of dangerous substances and/or contaminants caused inadvertently in typical activities (e.g. Bulk fuel storage leakage) can cause environmental damages (soil dispersion, sediment

	movement) and may result in significant financial responsibilities.
Products/service failure risk	Faulty or non-performing products, materials or services exposes the builder to customer complaints, warranty claims, field repairs, returns, product liabilities claims, loss of revenue, market share, and reputation
Project allocation risk	Inability or accidental omission to transfer risk to a viable third party may result in unfavorable exposure to the builder.
Site security and safety risks	Lack of security and safety procedure at the construction site(toxic material handling, site visits, and uncontrolled work environment in remote locations) can cause unexpected injuries
Supply chain risk	Inability to acquire, transport, or deploy the requirement material at the right time, location and cost(including property damage to suppliers delaying or preventing delivery) may result in delays and additional cost
Third party bodily injury risk	Inability to adequately anticipate, prevent, and militate against third party injury may result in unacceptable obligations (trespassers, neighbors).
Vandalism/terrorism risk	Vandalism, terrorist acts, sabotage, demonstrate, or theft may result in unacceptable downtime or obligations
Site condition	Unforeseen ground conditions may result in estimation risks and delays in pre/post construction operations
Contractor performance risk	Inadequate contractor (subcontractor of any tier) availability or performance, or shortage of craft labor, my result in construction delays, substandard materials, unacceptable variations from plans and specs as well as cost overrun.
Estimation risk	Inaccurate estimate with respect to the project finance, timelines, government legislation and surveying resulting in insufficient capital or project delays.
Human resources risk	Inability to attract, develop and retain competent people may inhibit the builder’s ability to execute,

	manage and monitor key business activities.
Labor/union relation risk	Strike or other collective actions may disrupt operation and achievement of objectives. Limitations in collective agreements may limit employer operational and human resource flexibilities.
Legal and regulatory risk	Failure to comply with legal, statutory and environmental regulations may result in fines and penalties, delays in projects, create unsafe work conditions or negatively impact the builder's reputation.
Quantity variation	When quantity estimates are provided in bid documents, there is a risk that the quantities may vary while the parties to the contract are locked in to bid prices(Zack 1996).
Delay and time related risks	• Owner-caused delay is assumed by the owner and will result in time and money flowing to the contractor. Contractor-caused delay is assigned to the contractor, who will either make up the time or pay late completion damages. Finally, third-party-caused delay is shared in that the contractor gets time, but no money, while the owner grants time and gives up the right to late completion damages for that time • Early use of the facility • Suspension of work • Untimely responses (Zack 1996).
Construction risks	• Changes: The contractor bears the risk that changes may be made to the work but the owner bears the risk of the time and cost effects. • Continuation of Work: The risk of having to carry on the work despite a dispute • Coordination : Coordination between subcontractors, suppliers • Defective Contract Documents: The

	risk of defective plans and specifications • Interpretation of Requirements • Means and methods of constructions • Permits and licenses • Damage to Adjacent property • Productivity • Work quality (Zack 1996)

Reference

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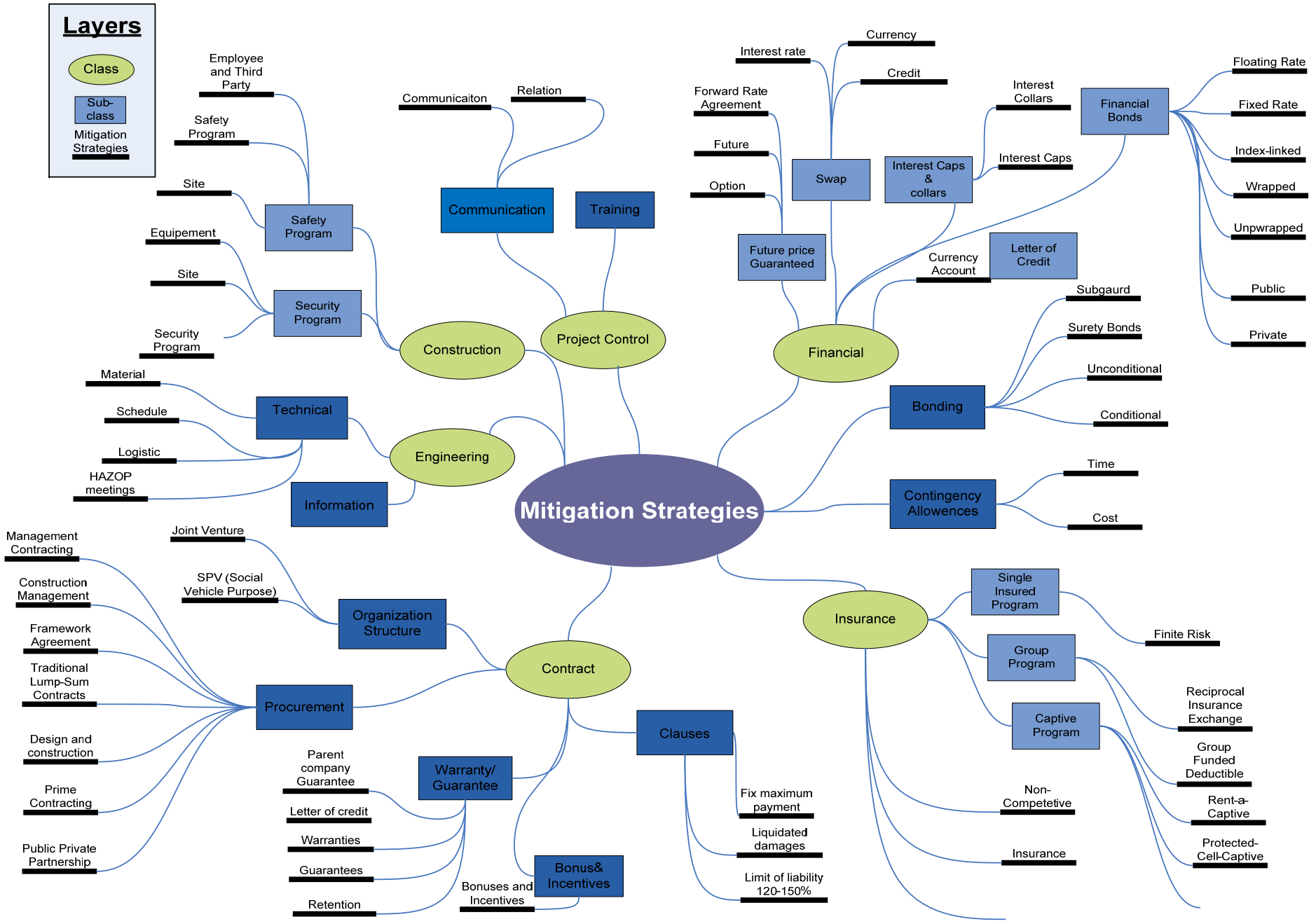
Appendix 2 Risk Mitigation Strategies


Layers
Class
Sub-class
Mitigation Strategies
Mitigation Strategies
Construction
Project Control
Financial
Engineering
Contract
Insurance
Communication
Training
Safety Program
Security Program
Technical
Information
Swap
Interest Caps & collars
Future price Guaranteed
Financial Bonds
Bonding
Contingency Allowences
Currency Account
Letter of Credit
Organization Structure
Procurement
Warranty/ Guarantee
Bonus& Incentives
Clauses
Single Insured Program
Group Program
Captive Program
Employee and Third Party
Safety Program
Site
Equipement
Site
Security Program
Communicaiton
Relation
Material
Schedule
Logistic
HAZOP meetings
Interest rate
Currency
Credit
Forward Rate Agreement
Future
Option
Interest Collars
Interest Caps
Floating Rate
Fixed Rate
Index-linked
Wrapped
Unpwrapped
Public
Private
Subgaurd
Surety Bonds
Unconditional
Conditional
Time
Cost
Joint Venture
SPV (Social Vehicle Purpose)
Management Contracting
Construction Management
Framework Agreement
Traditional Lump-Sum Contracts
Design and construction
Prime Contracting
Public Private Partnership
Parent company Guarantee
Letter of credit
Warranties
Guarantees
Retention
Bonuses and Incentives
Fix maximum payment
Liquidated damages
Limit of liability 120-150%
Finite Risk
Non-Competetive
Insurance
Reciprocal Insurance Exchange
Group Funded Deductible
Rent-a-Captive
Protected-Cell-Captive

1- Financial

1.1 Swap

1.1.1 Interest Rate

Description
This instrument enables the two companies to borrow money at the rate lower than minimum rate normally available to them in market. Assume that two companies, A and B, are planning to take loans. The goals and positions of each company has been shown in the table below: Before Agreement: Company | Position | Desired loan | Fix | Variable A | Well established | Short term at variable rate | 10% | LIBOR +1% B | Shorter history Less privileged | Long term and at a fixed rate | 14% | LIBOR+2% For mutual benefit, the two can sign a swap contract and agree to exchange interest rate. Company A requests loan at fix rate of 10% and Company B borrow at variable rate of LIBOR+2%. The cash flows of each company are explained in the table below with the agreement in place. With the swap in place, company A pays LIBOR to B. B and the extra 2%. After Agreement(exchange interest flows): Company | Chosen loan | Rate | Actual Pay | advantage A | Fix Rate | 10% | LIBOR | 1% B | Variable Rate | LIBOR+2% | 10% + 2% | 2% As the tables demonstrate, this setup benefits both A and B by 1% and 2% respectively.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users

Considerations or Tests
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
References & Resources
H.M. Treasury. Interest-Rate & Inflation Risks in PFI Constracts., 2006. Leger, Sylvie, and Jacques Fortin. "Hedging: A User's Manual." 127.3 (1994).

1.1.2 Currency

Description
A cross currency swap is a transaction executed in three stages, and is intended to eliminate the foreign exchange risk inherent to a foreign currency loan or investment. The swap begins by a translation of the capital value of the financial instrument involved. The prevailing exchange rate as well as the performance of the instrument to be translated is taken into account. This value will be used as a reference to determine the interest expense or income for the client. At the same time, the client and the financial institution agree that, when the financial instrument matures, the client's position will be settled at the rate used for the initial translation, without taking into account the actual exchange rate at maturity. For the duration of this agreement, the bank will pay or receive the interest on the instrument in foreign currency, while the client will pay or receive the interest applied to the instrument in Canadian dollars. Example: Suppose a company purchases a capital asset in a 5-million French francs debt for the year at 10%. At the time, exchange rate is 5FF for 1$CAD. The company wants to use currency swap to manage the currency risk. Stage 1: Company informs a bank about its intention and the bank translates the debt in French francs into Canadian dollars with current exchange rate. Then the bank enters into a 12 month forward contract on French francs with the company. The premium (at the rate 4.75) of the contract is added to the current loan. Loan = 5000000/5 (current EX rate) + 1000000*5/4.75 = 1052000 Stage 2: Accepting the swap contract, the bank pay the interest charges in French francs and the company pays the interest charges in Canadian dollars for 1052000 loan. Stage 3: At the maturity time, the 1052000 $CAD will exchange for 5 million French francs. With this currency swap, the value of the foreign currency will be frozen at the price of the premium paid for the forward
Parent
Phase
Time Horizon
Type of Response
Impact Speed

Mitigated Measures
Typical Users
Considerations or Tests
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
References & Resources
H.M. Treasury. Interest-Rate & Inflation Risks in PFI Constracts, 2006.

1.1.3 Credit

Description
A **credit default swap** (**CDS**) is a credit derivative contract between two counterparties, whereby the "buyer" or "fixed rate payer" pays periodic payments to the "seller" or "floating rate payer" in exchange for the right to a payoff if there is a default[1] or "credit event" in respect of a third party or "reference entity". If a credit event occurs, the typical contract either settles by delivery by the buyer to the seller of a (usually defaulted) debt obligation of the reference entity against a payment by the seller of the par value ("physical settlement") or the seller pays the buyer the difference between the par value and the market price of a specified debt obligation, typically determined in an auction ("cash settlement"). A credit default swap resembles an insurance policy, as it can be used by a debt holder to hedge, or insure against a default under the debt instrument. However, because there is no requirement to actually hold any asset or suffer a loss, a credit default swap can also be used for speculative purposes and is not generally considered insurance for regulatory purposes.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Applicable Risks
Inapplicable Risks
How to Apply
Benefits

Limitations
References & Resources
http://en.wikipedia.org/ Access: April 2008

1.1.4 Inflation

Description
The swap linked to inflation is an over-the-counter transaction between two contracting parties. They agree to exchange one or more money flows in the future. The cash flows of one party - referred to as the inflation seller - are established at the start of the contract. They involve so-called fixed rate payments. The cash flows of the other party - referred to as the inflation buyer - are still unknown at the start of the contract and will depend on the development of a specific price index. They are referred to as inflation-linked payments. The reference inflation index used for inflation-linked swaps in the euro zone is the Harmonized European Inflation or HICPXT index, published by the statistical office, Eurostat. The HICPXT index is one of the most liquid indexes. In practice, other - sometimes national - indexes are used. ***Example*** Two parties A and B agree to a seven-year zero-coupon inflation-linked swap (i.e., the standard on the Interbank market). This inflation-linked swap has a fixed inflation rate of 2.06% based on the HICPXT index. The date of the transaction is 2 June 2005. The nominal amount is EUR 10 million. Counterparty A pays a cash flow on 6 June 2012 based on two inflation indexes: [HICPXT March 2012 / HICPXT March 2005 - 1] x EUR 10 million Counterparty B pays a fixed cash flow on 6 June 2012 of: [(1 + 2.06%)7 - 1] x EUR 10 million = EUR 1,534,239 Counterparty A receives the fixed cash flow and pays a floating cash flow on the basis of the actual inflation over this seven-year period. If the actual level of inflation is lower than 2.06%, counterparty A makes a profit (inflation seller). If the actual level of inflation is higher than 2.06%, counterparty B makes a profit (inflation buyer).
Parent
Phase
Time Horizon
Type of Response
Impact Speed

Mitigated Measures

Typical Users

Considerations or Tests

Inflation buyers

Which companies and organizations suffer a loss of income if the actual inflation rate increases? Primarily insurance companies and pension funds.

Obligations vis-à-vis the insured parties or those entitled to a pension increase in line with the rate of inflation. The loss suffered by a life insurer as a result of increased inflation can be recouped on the market by buying inflation.

Indemnity insurers are also inflation buyers. They insure, for example, the indexed income of employees after an industrial accident. By buying inflation in an inflation-linked swap, they are able to hedge against future obligations and payments linked to the price index.

Other inflation buyers are private investors who, for example, want to safeguard their purchasing power or diversify their portfolio.

Inflation sellers

Which companies and organization suffer losses if the actual inflation rate decreases? Public authorities, utilities, real estate companies, distribution companies and public enterprises (such as the BBC in Great Britain) are typical inflation sellers. Their income is linked to inflation while their expenses are not, or only to a lesser degree. As a rule, they see a discrepancy between assets and liabilities.

By selling inflation in an inflation-linked swap, they are able to protect future income linked to inflation.

Applicable Risks

Inapplicable Risks

How to Apply

The three most prevalent structures are as follows:

Standard Interbank inflation-linked swap or zero-coupon inflation-linked swap
Cash flow swaps take place on the maturity date. The inflation-linked swap pays out the exact value of the cumulative inflation for a fixed capital over a long period. This inflation-linked swap fits well into an investment mix aimed at compliance with long-term, inflation-related obligations.

The year-on-year inflation-linked swap
With this swap, inflation is used on an annual basis. There is therefore no question of cumulated inflation. This structure lends itself very well to the protection of cash flow.

The inflation-linked income swap
With the inflation-linked income swap two cash flows are exchanged, each of which follows the inflation index. One party pays a fixed inflation increase annually over the period of the contract. The other party pays the actual inflation over the period of the contract. The inflation-linked income swap actually consists of a series of zero-coupon swaps.

Benefits

Today, inflation-linked swaps are a mature derivative - available at low costs in various structures depending on needs - with sufficient available volume and liquidity on the market.

Fortis has acquired many years of experience in the derivatives trade and the conclusion of inflation-linked contracts

Limitations

References & Resources

http://www.fortisbusiness.com/ Last time accessed: April 2008

1.2 Interest Caps and Collars

1.2.1 Interest Caps

Description
Interest-rate caps, under which compensation is paid if interest rates rise above a specified level. This is in effect a series of options (‘caplets’) pursuant to which the hedging counterparty pays an amount (if any) calculated by reference to the amount by which the market interest rate exceeds the cap rate on particular dates.
Parent
Phase
Design
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Cost
Typical Users
Considerations or Tests
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
One advantage of a product where payments are only ever made from the counter-party to the Contractor is that they create limited credit risk for the counter-party (*i.e.* the counter-party is not relying on the Contractor’s ability to pay further amounts beyond the option purchase price)
Limitations
this is the fact that the total market for such instruments is generally smaller than for interest-rate swaps
References & Resources
H.M. Treasury. Interest-Rate & Inflation Risks in PFI Constracts, 2006. Badger, Peter. "Financial Insurance, Interest Rate Risk, and Derivatives." 178.3 (1995).

1.2.2 Interest Rate Collars

Description
The ‘collar’ is constructed from a cap (as above) and the opposite transaction, a ‘floor’. If rates rise above the cap the Contractor exercises its option rights under the cap; if they fall below the floor the bank exercises its equivalent rights under the floor to impose a minimum level of interest payments on the Contractor.
Parent
Financial Hedges
Phase
Construction
Time Horizon
Mid term
Type of Response
Transfer
Impact Speed
Fast
Mitigated Measures
Cost
Typical Users
Client
Considerations(Tests)
Since this product involves the Contractor writing an option (*i.e.* the floor) it is sometimes regarded as a higher-risk product than a swap.
Impact on Risk Manageability
High
Applicable Risks
Interest rate
Inapplicable Risks
How to Apply
Depending on how the rates are structured, it is possible for a collar to be nil-cost at the outset, i.e. the cap and floor are each worth the same amount (one being bought and the other sold by the Contractor, they net-off to a nil cost). Of course, the higher the cap or the lower the floor, the lower the fee. Again, banks are the most active participants in this coverage market.
Benefits
Limitations
this is the fact that the total market for such instruments is generally smaller than for interest-rate swaps

References & Resources

H.M. Treasury. Interest-Rate & Inflation Risks in PFI Constracts, 2006.

Johnson, Robert, et al. "Simulating Currency Risk on Private Investments in Real Estate." Journal of Real Estate Portfolio Management 1.2 (2006): 91.

Keith Redhead. "Exchange Rate Risk Management - Part 3." 22.5 (2001).

Leger, Sylvie, and Jacques Fortin. "Hedging: A User's Manual." 127.3 (1994).

1.3 Future Price Guaranteed

1.3.1 Option

Description
A Canadian company lends $2 million (US) to an American company that will reimburse the amount three months from now in US dollars. When the loan is made, the US dollar is worth S 1 .25(Can), and the call options on Canadian dollars at $1.25(Can) for Sl(IJS) are worth SO.Ol(Cdn) per $1 (US). The company wants to protect itself against a potential decrease in the price of the US dollar without freezing its exchange rate. It therefore buys a Canadian-dollar call option at a total cost of $20,000 ($2 million x 0.01). Three months later, the US dollar is worth $1 .28(Can). The company relinquishes the option and cashes the holding gain. In this case, the option would be worth exercising only if the US dollar was worth less than $1 .25(Can).
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
▪ Options differ from forwards, futures, and swaps in that they do not oblige the holder to exchange currencies at the predetermined exchange rate. The holder has the right simply to ignore the option, and will do so if it becomes possible to exchange currencies at a more favorable rate than the predetermined one. ▪ Currency options are used to minimize foreign exchange risk while reserving the possibility of taking advantage of a favorable evolution of exchange rates. An option allows a buyer to purchase or sell the underlying currency at a predetermined price in consideration for a premium established on the basis of the risks taken by the seller (usually a financial institution). ▪ Options have to be paid for whatever subsequently happens to the exchange rate. Forwards, futures, and swaps do not have to be paid for, cash outflows only occur in the event of exchange rate movements in a particular direction. ▪ The first situation is the one in which there is uncertainty as to whether the hedged cash flow will take place. Since an option can be simply ignored if it is

not needed it is useful for such a situation.

- The corporate treasurer has a view as to the future direction of the exchange rate. If the treasurer believes that the exchange rate is more likely to move in the favorable direction than in the adverse direction, the treasurer will seek to preserve the ability to benefit from an exchange rate movement in the favorable direction. Options would be preferred to forwards or futures. Forwards and futures eliminate the possibility of profits as well as losses. If profits are thought to be more likely than losses, forwards and futures would be more likely to prevent profits than protect against losses. On balance, forwards and futures would be expected to be disadvantageous. Options can provide the same protection against loss as forwards and futures without removing the facility of making profits
- The treasurer may have no view as to future exchange rate movements but could feel that it is necessary to preserve any possibility of benefiting from a favorable exchange rate movement lest competitors have not hedged. An unhedged competitor would benefit from a favorable exchange rate movement and hence gain a competitive advantage. If an importer of Australian wine has hedged with forwards and the Australian dollar falls then that importers costs fail to fall with the Australian dollar. Unhedged competitors would benefit from the exchange rate movement. Competition could push down the price of Australian wines, undermining the profitability of the importer who had hedged with forwards

Applicable Risks

- Exchange rate
- Material price

Inapplicable Risks

How to Apply

Options are available on both OTC and exchange traded bases. OTC options generally exhibit the relative merits of forwards. They can be tailor made to the specific requirements of the customer. They can be negotiated for any amount of any currency at any predetermined exchange rate. However, once negotiated they may be difficult or expensive to withdraw from, and there is a risk that providers (sellers) of the options will default on their obligations.

Exchange traded options tend to exhibit the relative merits of futures. They are standardized so users have limited choice as to currencies, amounts of currency, and guaranteed exchange rates. However, they can be closed out by being sold at any time (subject to buyers being found), and default risk is minimal since they are guaranteed by a clearing house.

Benefits

Limitations

References & Resources

H.M. Treasury. Interest-Rate & Inflation Risks in PFI Constracts, 2006.
Ford, David N., and Shilpa Bhargav. "Project Management Quality and the Value of

Flexible Strategies." Engineering, Construction and Architectural Management 13.3 (2006): 275.
Ford, David N., Diane M. Lander, and John J. Voyer. "A Real Options Approach to Valuing Strategic Flexibility in Uncertain Construction Projects." Construction Management and Economics 20.4 (2002): 343-51.

1.3.2 Future

Description
In finance, a futures contract is a standardized contract, traded on a futures exchange, to buy or sell a certain underlying instrument at a certain date in the future, at a specified price. The future date is called the delivery date or final settlement date. The pre-set price is called the futures price. The price of the underlying asset on the delivery date is called the settlement price. A futures contract gives the holder the obligation to buy or sell, which differs from an options contract, which gives the holder the right, but not the obligation. In other words, the owner of an options contract may exercise the contract, but both parties of a "futures contract" must fulfill the contract on the settlement date. The seller delivers the underlyer to the buyer, or, if it is a cash-settled futures, then cash is transferred from the futures trader who sustained a loss to the one who made a profit. To exit the commitment prior to the settlement date, the holder of a futures position has to offset his/her position by either selling a long position or buying back a short position, effectively closing out the futures position and its contract obligations.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
▪ The first is whether there is an actively traded futures or over-the-counter market for the commodity in question. It can be applied for reinforcing bars, structural shapes, sheets and scraps. Cement would be another viable candidate. ▪ It can be employed when there is an uncertainty of when the closing date is. ▪ One implication is that futures are most suitable for the hedging of short-term, and relatively small, exposures. Nearby (close) maturities and small numbers of contracts would not normally entail liquidity problems.
Applicable Risks

- Cost of material
- Exchange rate

Inapplicable Risks

How to Apply

Benefits

- One of the advantages of futures is that they allow for flexibility in timing. A futures contract can be closed out at any time.
- Do not tie up line of credits from the bank
  A third advantage of futures, when compared to forwards, is that they can be used to hedge relatively small sums. For example, the size of a sterling futures contract on the Chicago Mercantile Exchange is f62,500. A related point is that users of futures all get the same exchange rate, irrespective of the size of their transactions.

Limitations

- They can be subject to liquidity constraints. If a hedger needs to trade futures, either to establish a futures position or to close one out, the hedger will be unsuccessful if there is no counter- party willing to trade. A hedger cannot buy if no one is willing to sell, alternatively the hedger may have to offer an exceptionally high price in order to induce someone to sell. The problem can be significant if distant maturity futures, or particularly large numbers of contracts, are involved.
- Another relative disadvantage of futures is that they can be administratively difficult. Futures are marked-to-market, which means that profits and losses are received and paid on a daily basis as they arise. The administration can be simplified by establishing a margin account from which payments can be made, or into which money is paid, on a daily basis. However, a margin account ties up funds that could be used for other purposes.
  Also futures, and their operation, are more difficult to understand than forwards

References & Resources

Casson, Peter. "The Management of Interest-Rate Risk." (1997).

1.3.3 Forward Rate Agreement

Description
Forward rate agreements (FRAs) can be used for this purpose and involve a simple agreement between the company that intends to lend or borrow and the financial institution which guarantees that, as long as the financial transaction takes place within a specified period, the interest rate applicable to it will be the one negotiated when the agreement was signed
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Forward rate agreements are generally used for short-term cash management purposes, and the resulting cash payments are usually made at the end of the hedged period Currency forwards are particularly useful for exposures that are short- to -medium term and whose timing is known with certainty. Uncertainty as to the date on which the currency would need to be bought or sold would also pose problems. Normally, forward contracts relate to a specific future date. Option date forwards allow the exchange of currency to occur between two dates, but there is a cost. The exchange rate guaranteed by an option date forward is the least favourable of the forward rates available for the future period involved. As a result, the exchange rate guaranteed could be significantly inferior to the one that would have been obtained if the date had been known with certainty Example: Forward exchange contracts result from an agreement under which a bank guarantees its client that, at a specified date or within a specified time period, it will exchange a certain quantity of a given currency at the specified rate. The buyer has to proceed with the exchange and cannot benefit under any circumstances from favourable fluctuations in exchange rates. In effect, a forward contract defers the payment of the foreign currency. Suppose that, at the beginning of February, a company agreed to purchase $1 million (US) in goods from a supplier in the United States. Payment will be made in US dollars at the beginning of June. The company wants to freeze the exchange rate that will apply when its debt matures and enters into a forward contract to buy, on June 1, $1 million (US) for $1 .21 million (Cdn). The US dollar is currently exchanged for $l.19(Cdn). Supposing that, on the settlement date, the US dollar is worth $1 .24(Cdn),The forward

contract will have generated the following saving:
Loss avoided (($1 .24- $1.21) x $1 million) $30,000
Cost of hedge (($1.21 —$1.19) x $1 million) S20,000
Amount saved: $10,000

Applicable Risks

- Interest rate
- Exchange rate

Inapplicable Risks

How to Apply

Benefits

Limitations

- a forward contract increases a bank's exposure to the possibility of default by a particular customer the potential for loans to that customer, within an overall exposure limit, is reduced.
  Forward contracts are problematical in cases in which there is uncertainty as to the size of the future transaction, or as to whether it will occur at all. If the currency exchange turns out to be unnecessary the corporate treasurer is left with a forward contract that must be honored, possibly at an unfavorable exchange rate. If the treasurer enters a forward contract to buy yen on a future date, and the purchase turns out to be unnecessary, the treasurer would lose in the event of a fall in the value of the yen. The treasurer is committed to buying yen at a price that is higher than that at which it can be sold. The unnecessary forward contract entails a currency exposure

References & Resources

1.3.4 Price Guarantee In Advance

Description
A bond is a negotiable debt instrument that pays the bondholder a rate of interest in exchange for the bondholder paying the principal amount of the bond to the issuer on issuance. During or at the end of the term of the bond the issuer repays the principal amount of the bond according to the agreed repayment profile. Full repayment may be made on final maturity (a "bullet bond") or may be made according to an agreed amortization schedule
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
▪ Debt requirement –a minimum debt requirement of approximately £50m has historically been required to make bond finance attractive. The growth in the private placement markets now makes smaller projects down to £20m, and potentially below, possible. ▪ . Maturity – due primarily to the identity of the institutions that invest in bonds, bonds can sometimes provide much longer maturities than bank debt, e.g. 35 years in some cases. A longer maturity on the underlying debt may offer the Authority the best value for money and therefore be attractive to a bidder. ▪ . Cost of prepayment - the terms and conditions of long-dated bonds include a "make-whole" provision in the event of a voluntary early repayment by the borrower. This is likely to make early redemption of the bonds expensive in comparison to an equivalent bank facility, and so it is generally assumed that bonds will not be refinanced. ▪ Flexibility - investors in bonds in the public market need to be able to sell the bonds as tradable instruments and therefore expect a certain degree of uniformity in the bonds' terms and conditions. Consequently, bond terms and conditions are sometimes perceived to be less flexible than those of bank debt. ▪ Wrapped vs. Unwrapped Bonds – The majority of PFI bonds have benefited from mono-line insurance of the project risks (a "wrap"). In

comparing the efficiency of a wrapped issue against unwrapped, the total cost of the wrapped debt including the insurance premium must be considered rather than the headline yields.

- . Comparing Bond vs. Bank Finance – To ensure a fair comparison between bond and bank finance, the Authority should insist that the forecast interest rates used for both bank finance and deposit of bond proceeds are determined by reference to the projected cashflows, rather than on average term of finance.
- . Issue Costs - many cost items will apply to both bank or bond finance. Additional cost of the road show items attributable only to bonds include rating agency fees as well as printing and the marketing cost (although frequently syndication costs on a bank deal will similarly be charged to the project company). The Contractor (and the Authority) should ensure that all up-front costs are estimated and included in the bid price so that an accurate comparison of the cost of bank versus bond can be made

Applicable Risks

Inflation: Part of the funding can be provided as an index-linked loan, in which the principal and interest payments are indexed against inflation (usually RPI). The pricing of such instruments is at a margin over the yield for index-linked gilts (*i.e.* rather than a margin over the LIBOR swap rate (for a bank loan) or fixed-rate gilts (for a fixed-rate bond)).

Inapplicable Risks

How to Apply

How to price:

- maturity;
- interest rate basis;
- underlying project strengths/mono-line guarantee6;
- size of issue;
- competing supply of bonds from other issuers; and
- general market conditions

Benefits

Limitations

References & Resources

H.M. Treasury. Interest-Rate & Inflation Risks in PFI Constracts., 2006.

1.4 Financial Bonds and Glits

1.4.1 Financial Bonds

Description
A bond is a negotiable debt instrument that pays the bondholder a rate of interest in exchange for the bondholder paying the principal amount of the bond to the issuer on issuance. During or at the end of the term of the bond the issuer repays the principal amount of the bond according to the agreed repayment profile. Full repayment may be made on final maturity (a "bullet bond") or may be made according to an agreed amortization schedule.
Parent
Phase
Pre-construction
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
▪ Debt requirement –a minimum debt requirement of approximately £50m has historically been required to make bond finance attractive. The growth in the private placement markets now makes smaller projects down to £20m, and potentially below, possible. ▪ . Maturity – due primarily to the identity of the institutions that invest in bonds, bonds can sometimes provide much longer maturities than bank debt, e.g. 35 years in some cases. A longer maturity on the underlying debt may offer the Authority the best value for money and therefore be attractive to a bidder. ▪ . Cost of prepayment - the terms and conditions of long-dated bonds include a "make-whole" provision in the event of a voluntary early repayment by the borrower. This is likely to make early redemption of the bonds expensive in comparison to an equivalent bank facility, and so it is generally assumed that bonds will not be refinanced. ▪ Flexibility - investors in bonds in the public market need to be able to sell the bonds as tradable instruments and therefore expect a certain degree of uniformity in the bonds' terms and conditions. Consequently, bond terms and conditions are sometimes perceived to be less flexible

than those of bank debt.

- Wrapped vs. Unwrapped Bonds – The majority of PFI bonds have benefited from mono-line insurance of the project risks (a "wrap"). In comparing the efficiency of a wrapped issue against unwrapped, the total cost of the wrapped debt including the insurance premium must be considered rather than the headline yields.
- . Comparing Bond vs. Bank Finance – To ensure a fair comparison between bond and bank finance, the Authority should insist that the forecast interest rates used for both bank finance and deposit of bond proceeds are determined by reference to the projected cash flows, rather than on average term of finance.
- . Issue Costs - many cost items will apply to both bank or bond finance. Additional cost of the road show items attributable only to bonds include rating agency fees as well as printing and the marketing cost (although frequently syndication costs on a bank deal will similarly be charged to the project company). The Contractor (and the Authority) should ensure that all up-front costs are estimated and included in the bid price so that an accurate comparison of the cost of bank versus bond can be made.

Applicable Risks

Inflation: Part of the funding can be provided as an index-linked loan, in which the principal and interest payments are indexed against inflation (usually RPI). The pricing of such instruments is at a margin over the yield for index-linked gilts (*i.e.* rather than a margin over the LIBOR swap rate (for a bank loan) or fixed-rate gilts (for a fixed-rate bond)).

Inapplicable Risks

How to Apply

How to price:

- maturity;
- interest rate basis;
- underlying project strengths/monoline guarantee6;
- size of issue;
- competing supply of bonds from other issuers; and
- general market conditions

Benefits

Limitations

References & Resources

Edwards, Leslie(1995). Practical Risk Management in the Construction Industry. Trans. S. H. Wearne. One ed. Vol. 1. London: Thomas Telford.

1.4.2 Floating Rate

Description
Floating Rate i.e. interest rate varies with the rate of LIBOR and is reset at the beginning of each interest period
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
References & Resources
Edwards, Leslie(1995). Practical Risk Management in the Construction Industry. Trans. S. H. Wearne. One ed. Vol. 1. London: Thomas Telford.

1.4.3 Fixed Rate

Description
Fixed Rate i.e. the interest rate is set on issuance and does not vary with any underlying interest rate
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
References & Resources
Edwards, Leslie(1995). Practical Risk Management in the Construction Industry. Trans. S. H. Wearne. One ed. Vol. 1. London: Thomas Telford.

1.4.4 Wrapped

Description
scheduled payments of principal and interest are guaranteed (in return for a fee) by a very creditworthy monoline insurer. As a result of the guarantee (or "credit wrap") the bonds are themselves rated AAA/Aaa, thus reducing the cost of borrowing
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
References & Resources
Edwards, Leslie(1995). Practical Risk Management in the Construction Industry. Trans. S. H. Wearne. One ed. Vol. 1. London: Thomas Telford.

1.4.5 Unwrapped

Description
there is no guarantor and the bonds' rating is based on the project itself. The bond pricing will, in turn, be driven by the project's rating,
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
References & Resources
Edwards, Leslie(1995). Practical Risk Management in the Construction Industry. Trans. S. H. Wearne. One ed. Vol. 1. London: Thomas Telford.

1.4.6 Public

Description
the bonds are listed on an exchange and (usually) widely distributed
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
References & Resources
Edwards, Leslie(1995). Practical Risk Management in the Construction Industry. Trans. S. H. Wearne. One ed. Vol. 1. London: Thomas Telford.

1.4.7 Private

Description
the bonds are distributed by way of a private placement. This will involve an offer to a very limited number of (occasionally sole) investors and may be unlisted. A private placement will usually require less disclosure than a public offering and is akin to a bank “club deal”.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
References & Resources
Edwards, Leslie(1995). Practical Risk Management in the Construction Industry. Trans. S. H. Wearne. One ed. Vol. 1. London: Thomas Telford.

1.4.8 Index-Linked

Description
the principal amount of the bond escalates according to movements in a selected index, commonly the RPI (all items),
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
References & Resources
Edwards, Leslie(1995). Practical Risk Management in the Construction Industry. Trans. S. H. Wearne. One ed. Vol. 1. London: Thomas Telford.

1.5 Currency Account

Description
The company borrows foreign currency against future foreign currency receipts and immediately exchanges it for domestic currency. The company has the use of the present home currency equivalent of the future foreign currency receipt. In this way, the exporting company can realize payment for the exports as soon as the export deal is made. When payment is to be made, the immediacy of the cash flow can be a disadvantage. As soon as an import deal is agreed the importing company buys foreign currency and puts it on deposit. This sum, together with the interest on it, should equal the sum required for the future payment for the imports. Hedging with instruments such as forwards or futures delays the purchase of the foreign currency until it is needed to pay for the imports. The use of a currency account ties up funds for a period during which those funds might have other uses
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Applicable Risks
Exchange rate
Inapplicable Risks
How to Apply
Currency accounts, unlike the preceding instruments, involve immediacy of cash flows. This is an advantage when the cash flow is a receipt. Forfeiting also has the advantage of providing immediacy of cash flows for exporters. An advantage that it enjoys relative to other techniques is that it provides a hedge against other risks as well as exchange rate risk. These other risks would include the risk of default by the importer. However, the hedge against the various risks comes as a cost. As the risks get greater, the sum of money to be received by the exporter from the bank gets smaller. Forfeiting is only suitable when the future cash flow is expected to occur with

certainty. There are likely to be difficulties arising if there is uncertainty as to the timing of the future cash flows. Forfeiting is only applicable to future receipts, it is not applicable to future payments

Benefits

Limitations

Currency accounts are unsuitable if there is uncertainty as to whether a future cash flow will occur. If the cash flow fails to materialize the currency account provides a currency exposure. A currency loss could have developed on the currency account during the period until the fate of the cash flow is known. However, currency accounts may provide flexibility as to timing to the extent that deposit, or borrowing, periods can be shortened or lengthened

References & Resources

Edwards, Leslie(1995). Practical Risk Management in the Construction Industry. Trans. S. H. Wearne. One ed. Vol. 1. London: Thomas Telford.

1.6 Bonding

1.6.1 Surety Bonds

Description
An agreement providing for monetary compensation should there be a failure to perform specified acts within a stated period. A construction surety bond is a financial instrument used generally when the first party (owner) has an agreement with a second party (construction company). This financial instrument serves as a guarantee to the first party from a third party (surety company) that a construction job (obligation) will be completed according to the terms and conditions within a written contract. In short, a surety bond is a risk transfer mechanism that shifts the risk of contract default from the project owner to the surety
Parent
Phase
Construction
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
(1) contractor's financial strength; (2) contractor's past experience or character attributes such as the quality of contractor's people and their experience, contractor's past work, contractor's business plan, and trust with agents; (3) contractor's capacity, work schedule to analyze job's consistency, and potential project characteristics; and (4) contractor's continuity that came as the least important factor among the others.
Applicable Risks
(1) to perform the objective of the contract; and (2) to pay all costs associated with the work. (3) bidding ▪ Contractor Performance Risk
Inapplicable Risks
How to Apply
Some helpful criteria that impact the premium for bonding: Financial Strength ▪ Accounting methods for preparing ▪ Number of days cash:

statements: ▪ Taxes paid on which of the following ▪ accounting methods basis ▪ Financial information presentation & quality ▪ Certified Public Accountant (CPA) quality ▪ Financial statements level of assurance ▪ Financial statements' confirmation with Generally Accepted Accounting Principles ▪ Cost recording & bookkeeping systems ▪ Cash flow projection plans ▪ Contractors bank reputation of cooperation ▪ Contractor's bank line of credit ▪ Line of credit amount ▪ Reliance on debt to finance operations ▪ Credit reference (D & B and NACM) reports ▪ Value of past due items ▪ Dunn & Bradstreet report rating ▪ Liquidity Measures	▪ Accounts receivable turnover: ▪ Accounts payable turnover: ▪ Current ratio: ▪ Working capital to backlog: ▪ Net Worth Measures ▪ Debt to net worth: . ▪ Fixed asset to net worth: ▪ Net worth to backlog: ▪ Sales to net worth: ▪ Profitability Measures ▪ Gross profit to sales: ▪ Overhead to sales: ▪ Overhead to net worth: ▪ Net profit before taxes to sales: ▪ Return on equity:
Past Experience/Performance/Reputation	
▪ Type of Business: ▪ Type of contractor: ▪ Business reputation and record: ▪ Management skill and organizational chart: ▪ Past experience with all prior sureties: ▪ Past job experience according to owners AlE: ▪ Work successfully completed: ▪ Past default on a contract: ▪ Past failure that caused a loss to a surety: ▪ Current or past involvement in any litigation:	▪ Contractors work done for federal/public: ▪ Contractor's subcontracted work: ▪ Are bonds required from subcontractors: ▪ References responses: ▪ Gross profit history on completed projects: ▪ Business plan for potential future: ▪ Your firm's need for this bond's premium: ▪ Contractors agency reputation: ▪ Your personal feeling about this contractors
Business Capacity	
▪ Key people educational &	▪ The gross profit margins on

experience ability:
- Project Management & field staff experience:
- Amount of largest project completed (millions):
- Past largest amount of uncomp'eted work (millions):
- Number of projects in progress:
- Amount of under (open) contracts on hand (millions):
- Estimated gross profit of total work on hand(%):
- Completion percent (%) of work in progress:
- Backlog amount ofwork in progress (millions):
- Percent of under projects that have profit fade or losses problem (%):

completed projects
- vs. the gross profit margins on open projects:
- Past similar projects in type (familiarity):
- Project location vs. contractor business location:
- Project size vs. past project sizes:
- Equipment acquisition for the project:
- Labor availability for the potential project:
- Construction materials availability:

Business Continuity

Number of years in construction business:
Acceptable business continuity plan:
Personal indemnity agreement of the principal stockholders of the company:
Existence of buy/sell agreement among the business owners:
Life Insurance payable to the corporation (in millions of dollars):

Benefits

Limitations

References & Resources

Kangari, . Construction Surety Bonding. Vol. 127. New York, N.Y.: American Society of Civil Engineers, c1983-, 2001.

1.6.2 Conditional, High Penalty

Description
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Applicable Risks
Inapplicable Risks
How to Apply

Benefits

Owner's view	Contractor's view
▪ Prequalification that can exclude bids from unqualified contractors ▪ A garauntee for completion, provided the owner itself complies with the contract	▪ A responsible management advisor with an abundant knowledge supervises the activities. ▪ A back-up behind the contractor in trouble to perform the bounded contract ▪ A partner to fight against unfair calls

Limitations

Owner's view	Contractor's view
▪ hard and time consuming to prove the claims	

References & Resources

Kangari, . Construction Surety Bonding. Vol. 127. New York, N.Y.: American Society of Civil Engineers, c1983-, 2001.

1.6.3 Unconditional, Low Penalty

Description
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Owner's view ▪ no time and cost for prequalification if enough collateral can be collected. ▪ Quick settlement of the claims ▪ with enough collateral in hand, the performance of the contractor will be a concern Contractor's view
Limitations
Owner's view ▪ Sometimes, low penalty may be inadequate to recover the loss on the oblige ▪ impossible to increase the penalty Contractor's view Extremely hard for a contractor to stop the bond issuer to pay the bond even if it has been declared an unfair call. No technical support or tie
References & Resources
Kangari, . Construction Surety Bonding. Vol. 127. New York, N.Y.: American Society of Civil Engineers, c1983-, 2001.

1.6.4 Letter Of Credit or Collateral

Description
Demanding co/lateral is an alternative for bonding. The type of collateral—cash (prepayment), letter of credit (a lien—depends on the transaction Co lateral may be difficult to obtain from the buyer who may be unable or unwilling to provide it.
Parent
Phase
Preconstruction
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
Collateral also requires some administration to maintain a secure position in the form of filing Uniform Commercial Code statements, monitoring escrow accounts, or properly executing LOG documents. It may also damage the relationship with the client it you have to collect against the co lateral
References & Resources
Kangari, . Construction Surety Bonding. Vol. 127. New York, N.Y.: American Society of Civil Engineers, c1983-, 2001.

2- Engineering

2.1 Technical

2.1.1 Material

Description
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
▪ Use alternative material ▪ Use alternate mode transportations ▪ Changes suppliers ▪ Modify specifications ▪ Advanced reservation of equipments lease
References & Resources
Dione, S., J. Y. Ruwanpura, and J. P. A. Hettiaratchi. "Assessing and Managing the Potential Environmental Risks of Construction Projects." Practice Periodical on Structural Design and Construction 10.4 (2005): 260-6.

2.1.2 Logistic

Description
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Applicable Risks
Inapplicable Risks
How to Apply
▪ Use alternate alignment ▪ Use a temporary alternative
Benefits
Limitations
References & Resources
Dione, S., J. Y. Ruwanpura, and J. P. A. Hettiaratchi. "Assessing and Managing the Potential Environmental Risks of Construction Projects." Practice Periodical on Structural Design and Construction 10.4 (2005): 260-6.

2.1.3 Schedule

Description
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Applicable Risks
Inapplicable Risks
How to Apply
▪ Reschedule work based on resource availability ▪ Schedule major work during hours of off peak traffic ▪ Change project milestones
Benefits
Limitations
References & Resources

2.2 Information

Description
Parent
Phase
Design
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Cost, time
Typical Users
Considerations or Tests
Applicable Risks
▪ A new technology ▪ Unfamiliar area ▪ sever non-performance consequences such Olympic ▪
Inapplicable Risks
How to Apply
1. Field studies Examples: a. Carry out additional geotechnical investigation b. Carryout metal detection tests c. Identify existing utilities: gas, telecom, water, sewer, and power 2. Historical studies Examples: a. Examine usage history of work site 3. Analytical studies Examples: Carry out flood frequency analysis
Benefits
Limitations
References & Resources

2.3 Real Option

Description
‘‘Real’’ options deal with physical things rather than financial contracts. Specifically, they refer to elements of a system that provide ‘‘rights, not obligations’’ to achieve some goal or activity. Generally speaking, all elements of a system that provide flexibility can be considered as ‘‘real options.’’
Parent
Technical
Phase
Preconstruction
Time Horizon
Long
Type of Response
retain
Impact Speed
Fast
Mitigated Measures
Technological advances,
Typical Users
Consultants
Considerations or Tests
Applicable Risks
Inapplicable Risks
How to Apply
The process to apply the real option contains three phases: • Discovery, during which the group attempts to identify the most interesting areas of uncertainty, which may potentially offer the greatest rewards from options; • Selection, which evaluates the possible means of providing flexibility to the system, and determines which of these options should be implemented; and • Monitoring, the process of monitoring the evolution of the uncertainties so that the organization will know when to implement.
Benefits
The real options approach to systems design similarly attempts to manage the major risks confronting the design. In practice, it seeks out opportunities to build real options into design, evaluates these possibilities and implements the best ones. In contrast to the conventional decision analysis that works with a predetermined set of possible decisions, the options approach seeks to identify new possible paths, to change the decision tree by adding in flexibility.
Limitations
The data available for the analysis of ‘‘real options’’ is normally far less accurate than that used in the analysis of financial options, and managers make decisions about whether to acquire a real option, for example to build a flexible manufacturing facility, only a few times, perhaps only once. Analysts of ‘‘real options,’’ however, may have little historical data to draw upon and may thus have to use speculative

assumptions. In these circumstances, they know their estimates of value are approximate within bands described by sensitivity analyses, and recognize that analytic niceties that might lead to greater precision may be a waste of effort. In short, the analysis of ‘‘real options’’ leads to approximate rather than precise values.

References & Resources

Neufville Richard De. (2003) “Real Options: Dealing with uncertainty in system planning and design” Integrated Assessment Vol. 4, No. 1, pp. 26-34.

3- Project Control

3.1 Training

Description
Set up training programs for employees in order to update them with new knowledge applicable to their specialty and general construction safety and security.
Parent
Phase
Construction, Operation
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Safety
Typical Users
Considerations or Tests
▪ Are new technologies involved in the design? ▪ Does the region experience limited human resource? ▪ Have new regulations been approved by authorities? Is compliance with tough regulation necessary?
Applicable Risks
▪ Natural Hazard ▪ Pre-existing conditions ▪ Undetected defects ▪ Inspections and substandard works ▪ Design deficiencies ▪ Material deficiencies ▪ Construction deficiencies ▪ Subsurface problems ▪ Site security and risks ▪ Construction accident risks ▪ Health and safety risks ▪ Human resource risks ▪ Third party bodily injury risk ▪ Third party property damages ▪ Business interruption risks ▪
Inapplicable Risks
How to Apply
▪ Train new employee ▪ Regular employee-training update ▪ Give employee access to rules and regulations ▪ Foster an atmosphere of open communication regarding potential problem ▪ Documents remediation

▪	▪ Issue regular bulletins to public on project status

Benefits

Limitations

References & Resources

Arcangeli, G., et al. "Virtual Environment for Construction Workers Instruction and Training." International Conference on Multimedia Computing and Systems -Proceedings 2 (1999): 1123-5.

Crangle, T. F. "“Zero Injury” Safety Program Implementation as Relatedto Current Construction Industry Financial Risk Management: A Successstory." Transmission & Distribution Construction, Operation & Live-Line Maintenance Proceedings, 1998. ESMO '98. 1998 IEEE 8th International Conference on (26-30 Apr 1998): 108-14.

Halsey, Gordon J. "Planning for Safer Construction Projects." Occupational Hazards 61.8 (1999): 43.

Hutchings, Ian. "Set the Record Straight." The Safety & Health Practitioner 25.2 (2007): 46.

Seitter, Dave. "Managing Risk through Employee Training." Buildings 100.6 (2006): 74.

3.2 Communication

3.2.1 Communication

Description
Parent
Phase
Design, construction, Operation
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Time and cost
Typical Users
Considerations or Tests
▪ The life cycle approach to modern contracts has resulted in a huge challenge within the industry to capture for future use the amounts of information and documentation generated which in turn has also led to the more effective use of IT ▪ They allow all necessary groups (contractors, engineers, architects, etc.) to have controlled access and automated distribution of information. ▪ Improving communication between project participants, increasing accountability, and streamlining the development process from site selection to design, construction, and operation,
Applicable Risks
▪ Contractor Performance Risk ▪ Cost over risks
Inapplicable Risks
How to Apply
▪ Engage in early discussion with public to gauge ▪ Discuss with Auditor general at preliminary stages ▪ Develop system to track contractual commitments ▪ Regular review of actual versus budget costs during project ▪ Create a compatible format for all the parties ▪ Public communication shall be a part of every construction project. Although multiple methods will be utilized, email will be the primary means of communication A construction project information web site will continue to be maintained,

including information about road closures and detours

Benefits

- PSWSs are Web-based applications that take advantage of the Internet to provide a collaboration platform to perform typical project-management tasks, such as storing and managing project information
  reduce the costs incurred by change orders, claims, and record maintenance

Limitations

- If the flow and transfer of information is to become automated then some of the communication boundaries that currently exist within the industry need to be broken down the adoption of project-collaboration software are the questions of interoperability and inter-changeability. Many owners will require vendors to provide interoperable/interchangeable software in the future
- The communication problem is exacerbated because each of the differing professions all use their own unique processes to undertake tasks although to undertake these tasks effectively they are heavily reliant upon information that has to be supplied by other parties to satisfy their own job responsibilities
  The sheer number of contractors and sub-contractors involved in larger projects also causes great difficulty for management who try to “mange” the communication amongst them.

References & Resources

Bing, Li, and Robert L. K. Tiong. "Risk Management Model for International Construction Joint Ventures." Journal of Construction Engineering and Management 125.5 (1999): 377-84.
Cox, Robert F. "Using Project-Specific Websites to Manage Construction Project Delivery." Buildings 101.4 (2007): 52.
Rahman, M. Motiar, and Mohan M. Kumaraswamy. "Joint Risk Management through Transactionally Efficient Relational Contracting." Construction Management and Economics 20.1 (2002): 45.
Sommerville, James, Nigel Craig, and Michael McCarney. "Document transfer and communication between distinct construction professionals." Office of Real Estate Research, University of Illinois at Urbana. 14 September 2004.

3.2.2 Hazard Identification

Description
Identifying the potential hazards in a structured process
Parent
Technical
Phase
Design
Time Horizon
Type of Response
Retention
Impact Speed
Influenced Variable
Cost
Typical Users
Considerations or Tests
Reversibility
Applicable Risks
Inapplicable Risks
How to Apply
Consider the following concerns: 1- Frequency 2- Consequences 3- Injury 4- Damage to third party 5- Harm to environment 6- Delay 7- Economic loss to the owner 8- Loss of good will
Benefits
Limitations
References & Resources
Eskesen, Soren Degn, et al. "Guidelines for Tunnelling Risk Management: International Tunnelling Association, Working Group no. 2." Tunnelling and Underground Space Technology 19.3 (2004): 217-37.

Sommerville, James, Nigel Craig, and Michael McCarney. "Document transfer and communication between distinct construction professionals." Office of Real Estate Research, University of Illinois at Urbana. 14 September 2004.

3.2.3 Objective Alignment

Description
A framework which assures that the client and contractor objectives are aligned.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Influenced Variable
Typical Users
Considerations or Tests
Reversibility
Applicable Risks
Inapplicable Risks
How to Apply
The activities involved are: 1- Determine client requirements and major milestones 2- Create a value management plan agreed by all parties 3- Constantly develop, update, and review the outcome
Benefits
Improve the communication
Limitations
References & Resources
Sommerville, James, Nigel Craig, and Michael McCarney. "Document transfer and communication between distinct construction professionals." Office of Real Estate Research, University of Illinois at Urbana. 14 September 2004.

3.3 Contingency

3.3.1 Contingency Allowances/Cost Contingency

Description
a specific provision considered with the owner for unforeseeable elements of cost within the defined project scope (i.e., known unknowns") Contingency is particularly important where previous experience relating estimates and actual costs has shown that unforeseeable events, which will increase cost, are likely to occur.
Parent
Phase
Design, Construction
Time Horizon
Project dependant
Type of Response
Retain
Impact Speed
Fast
Mitigated Measures
Cost
Typical Users
Client
Considerations(Tests)
▪ Do you feel lack knowledge about the project? ▪ Is this a new project with quite a few unknown risks?
Applicable Risks
▪ Contractor performance ▪ Minor Schedule changes ▪ Unknown design factors ▪ Unanticipated regulatory standards ▪ Incomplete or addition to project scope definition
Inapplicable Risks
How to Apply
▪ The amount of contingency funds can correlate with the progress of projects because of the decrease of potential risks associated with each phase. When the cleanup work is to be performed by a cost-plus award fee (CPAF) subcontractor, if the subcontractor has prepared a detailed estimate of the cleanup cost that has been reviewed and approved, a contingency of 15 to 18 percent is applied only to that portion of the cost and commitments remaining to be accrued. ▪ Carry financial contingency in budget ▪ Drew up contingency plans to be executed in the event of accidents ▪ Traditional method

a. Consider between 10% to 15% of the based line cost
b. construction work is defined by definitive remedial design but the cleanup subcontract has not been awarded, a 15 to 20 percent contingency will be applied on the estimated cost. Usually the cost estimate would be based on detail drawings and bills of material. On fixed-price cleanup subcontracts where no significant change orders, modifications, or potential claims are outstanding, a contingency of 3 to 8 percent is applied on the uncompleted portion of the work, depending upon the type of work and the general status of the subcontract

- Estimating using Risk Analysis Method(refer to Appendix…)
  a. Identify the fixed and variable risk events
  b. Attribute the probability and cost of each events

Relation between risk allowance and risk category

	Average risk allowance	Maximum risk allowance
Fixed risk	Probability x maximum cost	Maximum cost
Variable risk	Estimated separately(by project team members based on previous experiences)	Estimated separately(by project team members based on previous experiences)
Assumption	50% chance of being exceeded	10% chance of being exceeded

Example:

(1) Risk	(2) Type	(3) Probability(Fixed risk only)	(4) Average risk Allowance $x1000	(5) Max. Risk Allowance $x1000
Design Development	V		8400	12600
Additional Space	F	0.7	11760	16800
Site condition	V		525	1000
Market Condition	V		4000	8500
A/C cooling source	V		250	1250
Access road	F	0.5	250	5000
Additional Client requirement	V		1680	4200
Contract Variation	V		8400	12600

Project Co-ordination	V		500	1500
Contract Period	F	0.6	1000	1750
			36765000	

Base Estimate = $16800000
Average estimate = Base estimate + Total Average Risk Allowance
= $204,765,000

Benefits

- The percentage figure is, most likely, arbitrarily arrived at and not appropriate for the specific project.
- There is a tendency to double-count risk because some estimators are inclined to include contingencies in their best estimate.
- A percentage addition still results in a single- figure prediction of estimated cost, implying a degree of certainty that is simply not justified.
- The percentage added indicates the potential for detrimental or downside risk; it does not indicate any potential for cost reduction, and may therefore hide poor management of the execution of the project.
- Because the percentage allows for all risk in terms of a cost contingency, it tends to direct attention away from time, performance and quality risks.
  It does not encourage creativity in estimating practice, allowing it to become routine and mundane, which can propagate oversights

Limitations

References & Resources

Douglas, Edward E.,III. "Contingency Management on DOE Projects." AACE International Transactions (2001): RI31.

Mak, Stephen 1, Jenny 2 Wong, and David 3 Picken. The Effect on Contingency Allowances of using Risk Analysis in Capital Cost Estimating: A Hong Kong Study.

Rowe, John F. "A Construction Cost Contingency Tracking System (CTS)." Cost Engineering 48.2 (2006): 31.

Yeo, . Risks, Classification of Estimates, and Contingency Management. Vol. 6. [New York, N.Y.]: American Society of Civil Engineers, Engineering Management Division, 1990.

Douglas, Edward E.,III. "Contingency Management on DOE Projects." AACE International Transactions (2001): RI31.

3.3.2 Project Contingency

Description
a specific provision considered with the **contractor** for unforeseeable elements of cost within the defined project scope (i.e., known unknowns") Contingency is particularly important where previous experience relating estimates and actual costs has shown that unforeseeable events, which will increase cost, are likely to occur.
Parent
Phase
Design, Construction
Time Horizon
Project dependant
Type of Response
Retain
Impact Speed
Fast
Mitigated Measures
Cost
Typical Users
Contractor
Considerations(Tests)
▪ Do you feel lack knowledge about the project? ▪ Is this a new project with quite a few unknown risks?
Applicable Risks
▪ Contractor performance ▪ Minor Schedule changes ▪ Unknown design factors ▪ Unanticipated regulatory standards ▪ Incomplete or addition to project scope definition
Inapplicable Risks
How to Apply
▪ The amount of contingency funds can correlate with the progress of projects because of the decrease of potential risks associated with each phase. When the cleanup work is to be performed by a cost-plus award fee (CPAF) subcontractor, if the subcontractor has prepared a detailed estimate of the cleanup cost that has been reviewed and approved, a contingency of 15 to 18 percent is applied only to that portion of the cost and commitments remaining to be accrued. ▪ Carry financial contingency in budget ▪ Drew up contingency plans to be executed in the event of accidents ▪ Traditional method a. Consider between 10% to 15% of the based line cost b. construction work is defined by definitive remedial design but the

cleanup subcontract has not been awarded, a 15 to 20 percent contingency will be applied on the estimated cost. Usually the cost estimate would be based on detail drawings and bills of material. On fixed-price cleanup subcontracts where no significant change orders, modifications, or potential claims are outstanding, a contingency of 3 to 8 percent is applied on the uncompleted portion of the work, depending upon the type of work and the general status of the subcontract

- Estimating using Risk Analysis Method(refer to Appendix…)
    a. Identify the fixed and variable risk events
    b. Attribute the probability and cost of each events

Relation between risk allowance and risk category

	Average risk allowance	Maximum risk allowance
Fixed risk	Probability x maximum cost	Maximum cost
Variable risk	Estimated separately(by project team members based on previous experiences)	Estimated separately(by project team members based on previous experiences)
Assumption	50% chance of being exceeded	10% chance of being exceeded

Example:

(1) Risk	(2) Type	(3) Probability(Fixed risk only)	(4) Average risk Allowance $x1000	(5) Max. Risk Allowance $x1000
Design Development	V		8400	12600
Additional Space	F	0.7	11760	16800
Site condition	V		525	1000
Market Condition	V		4000	8500
A/C cooling source	V		250	1250
Access road	F	0.5	250	5000
Additional Client requirement	V		1680	4200
Contract Variation	V		8400	12600
Project Co-ordination	V		500	1500
Contract	F	0.6	1000	1750

Period				
			36765000	

Base Estimate = $16800000
Average estimate = Base estimate + Total Average Risk Allowance
= $204,765,000

Benefits

- The percentage figure is, most likely, arbitrarily arrived at and not appropriate for the specific project.
- There is a tendency to double-count risk because some estimators are inclined to include contingencies in their best estimate.
- A percentage addition still results in a single- figure prediction of estimated cost, implying a degree of certainty that is simply not justified.
- The percentage added indicates the potential for detrimental or downside risk; it does not indicate any potential for cost reduction, and may therefore hide poor management of the execution of the project.
- Because the percentage allows for all risk in terms of a cost contingency, it tends to direct attention away from time, performance and quality risks.
  It does not encourage creativity in estimating practice, allowing it to become routine and mundane, which can propagate oversights

Limitations

References & Resources

Douglas, Edward E.,III. "Contingency Management on DOE Projects." AACE International Transactions (2001): RI31.

Mak, Stephen 1, Jenny 2 Wong, and David 3 Picken. The Effect on Contingency Allowances of using Risk Analysis in Capital Cost Estimating: A Hong Kong Study.

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Bosher, . Integrating Disaster Risk Management into Construction: A UK Perspective. Vol. 35. London: E FN Spon, an imprint of Chapman Hall, 2007.

Douglas, Edward E.,III. "Contingency Management on DOE Projects." AACE International Transactions (2001): RI31.

4- Construction

4.1 Security Program

4.1.1 Security Program

Description
The program encompasses all the security measures to protect the site and equipments.
Parent
Phase
Construction
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Cost
Typical Users
Considerations or Tests
Is the site at a remote area?
Applicable Risks
▪ Financial loss, insurance cost ▪ Employee/ Third Party Fraud Risk ▪ Third Party Bodily Injury Risk ▪ Vandalism and terrorism risks ▪ Business interruption risk
Inapplicable Risks
How to Apply
The approaches will be explained more in the Equipment and Site section
Benefits
Limitations
References & Resources

4.1.2 Equipment

Description
It may be expensive or impossible to ensure good perimeter security at a worksite, such as road construction or larger premises. In this case the last line of defense is vehicle security. Even where good perimeter security is in place, it must be combined with good vehicle security to deter determined thieves
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Applicable Risks
The same as Security program
Inapplicable Risks
How to Apply
1.Equipment Marking
Inventory management techniques, such as having each of your units registered on a national database used by law enforcement and bearing a decal which warns thieves that this is the case, may make it less likely for your equipment to be stolen.
2.Anchoring and Immobilizing
• Equipment that must be left on site should be anchored with either chain or cable, which can be brightly painted as a deterrent. • Large equipment can be immobilized by removing wires or battery and lowering all blades or buckets. • Consider installing theft prevention devices on higher risk or higher value equipment to disable fuel, hydraulic, and/or electrical systems. • Portable equipment can be immobilized by removing tires if not being used regularly. This has the added advantage of protecting the tires. • Consider hitch protection on towed equipment or trailers, such as disabling or

removing the hitch.

3.Equipment in Transit

• Trailers and towable equipment should use quality trailer hitch or king pin locks.
• Maintain minimum fuel levels on equipment being transported. This has both security and safety advantages.
• Secure and lock equipment to the transport platform.
• Neutralize the operating controls and lock the ignition of the equipment being transported; make sure the keys for the unit being transported are not in the unit's ignition.
• If possible, remove the tongue off of the trailer.
• Plan transportation routes and schedules to avoid overnight stops wherever possible. If an overnight stop is unavoidable, try to find temporary storage facility that is secure.

4. Equipment not in Use

• Ensure that all equipment is returned to its proper place, or an otherwise secure area, upon completion of a task or at the end of the day. Avoid leaving equipment on the side of roads or in public places overnight or particularly on weekends, if possible.
• Discourage subcontractors from leaving or storing unused equipment on your site.
• Arrange/store equipment not in use in such a manner that a missing unit would be obvious, such as a single file row.
• Position larger pieces of equipment in a circular, wagon-train pattern, with generators, compressors and other small items inside the ring. Consider using lifting devices to secure smaller, more easily portable, items.
• Assign a supervisor or manager to regularly check up on equipment that must be left at a work site for an extended period. If a theft occurs, the sooner it is reported, the better the chances of recovery.
• Avoid leaving equipment on a trailer unattended. If this is unavoidable, consider unloading the unit and securing it to the trailer's hitch.

Benefits

Limitations

References & Resources

4.1.3 Site

Description
The precautionary and protective actions to prevent and deter thefts in the site.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Difficult to implement on mobile worksites(road construction) or large premises(farms)
Applicable Risks
The same as security programs
Inapplicable Risks
How to Apply
1. WARNING SIGNS
• Post “Warning; No Trespassing” signs around the perimeter of your worksite. Consider warning signs that indicate what laws will be broken and the penalty imposed if disregarded. • Post warning signs indicating that equipment on your site all have their Product Identification Numbers (PINs) recorded in a central location within your company and possibly on a national database such as NER.
2. FENCING
Fencing is your first, and in many ways best, line of protection. Its effectiveness depends on the design and quality of the installation, but other factors should be considered when installing, replacing or repairing perimeter fencing. • Use see-through material such as chain link. This allows thieves to be visible from the outside in the event they get past the fence, increasing the chances of unusual activity being noticed, and therefore deters thieves. • Keep fenced areas free of debris that may blow to, and get stuck in, the fence and inhibit visibility. Keep bushes and weeds trimmed back from the fence to aid visibility.

• If possible, fences should be at least eight feet in height (if codes allow), with posts spaced at a distance no greater than the width of the narrowest unit in the fleet, and set in concrete.
• Consider using barbed wire or razor wire at the top of fences for added security.
• Conduct routine fence inspections and promptly repair any openings.
• Do not allow random items to be piled up on either side of a fence as it may create a "climbable" condition and compromise security.

3. OTHER WORKSITE BARRIERS

• Barriers should be used when fences are not feasible or in addition to fencing to enhance security.
• Barriers can include low walls, posts, dirt berms or ditches that prevent a unit from being driven or towed off the worksite.
• Walls and berms should be no higher than three feet as that is the maximum height a police officer can see over when seated in a patrol car.
• If possible, posts should protrude two to four feet from the ground, be no more than two feet apart, and should be sunk four to six feet underground in concrete.
• Trenches or ditches should be three to four-feet deep and sloped so that most vehicles cannot be driven across.
• Consider a low fence of heavy steel pipe, two to three-feet high, anchored by posts on eight-foot centers.
• Regardless of which barrier method is chosen, all worksite entrances should have a well-secured gate.

4. GATES

• Gates should be of heavy construction, with hinge pins spot-welded to prevent easy removal.
• Construct gates so that the longest vehicle you use can be safely pulled onto the site without extending out onto a road or highway.
• Locking hardware should be consist of a case-hardened chain and a high-security padlock permanently attached to the fence, or shielded or blind locking devices should be used.
• If possible, have only one entrance/exit at the site.
• Limit access to keys for all fenced areas.

5. LIGHTING

Lighting is one of the most valuable deterrents as most thefts occur at night.
• In order to avoid a distracting glare for patrolling officers or casual observers, lights should be placed near the perimeter of the property (but far enough from the perimeter to prevent a thief from disabling the lighting) and directed toward the worksite.
• Lights should be well maintained with the changing of bulbs as needed a priority.
• In small compounds, low-cost motion sensors can be linked to lighting, but should cover the entire compound and all approaches. This may also be valuable in specific areas of a larger worksite.

6. TRAILER / OFFICE

• Keep a master record of the serial numbers on all tools, equipment, computers, fax machines, desk and cell phones, and two-way radios.
• Computers should be secured to the side of a desk or the floor using strips of metal, bolts or screws or by using newer locking devices created just for this purpose.
• Contractors should back up their computer data weekly; any back up disks or CD's should be stored off-site in a secure location.
• Use 'point of entry' or motion sensor alarms to provide added security for your trailer.
• As a deterrent, post a notice on the door or outside wall to alert thieves that some or all of the above measures have been implemented.

7. KEYS

As keys are often left in vehicles, access to keys is often unregulated, and manufacturer's keys
may work on more than one unit, thieves are often able to simply drive equipment off a worksite.
• Make it a written company policy that all keys be removed from equipment when not in
use or in storage.
• Make a note of who has access to, or is assigned, keys to equipment or the locks at your worksite.
• Consider a "Key Sign-Out Log" to record the whereabouts and possession of all keys.
• Keep all keys secured in a safe or lockable area after-hours or when not being used.

8. LOCKS

Perimeter fencing and other security devices will only be as good as the 'weakest link;' often the
lock itself.
• If padlocks are used, they should be "high security," i.e. case-hardened or laminated steel, and preferably with tamper proof guards.
• Combination locks are a poor idea due to the potential of the combinations being shared with outsiders.
• When possible, ensure that key-in cylinder locks are protected by a guard to prevent removal.
• Case-hardened chains used with padlocks should be thick enough to resist torching, saws or bolt cutters.
• Consider cable or wire rope instead of chain as it is harder to cut and requires special tools.
• Consider "blind" or enclosed locking devices on equipment doors and perimeter gates.
• Consider using gauge protectors and panel locks on your equipment.

Benefits

Limitations

References & Resources

4.2 Safety Program

4.2.1 Safety Program

Description
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
▪ Tough safety requirement ▪ Top-tier contractors driving performance improvement ▪ Major contractors and others raising safety profile
Applicable Risks
▪ Business interruption risk ▪ legal and regulatory risks ▪ Third party bodily injury risk ▪ Health and Safety risk ▪ Human resources risk ▪ Site security and safety risk ▪ Third party property damage risks
Inapplicable Risks
How to Apply
General: ▪ Educating not directing ▪ Talking the language of business ▪ Leading and not just managing safety ▪ Leading as well as lagging indicators ▪ Require daily meetings with workers where supervisors stress particular hazards which may be encountered that day ▪ mechanism for implementing the ▪ Commercial reward ▪ Simplification of documents ▪ Clearly make safety a legitimate value ▪ Secure a commitment to safety from upper management ▪ Train front—line supervisors ▪ Require regular on-site training for workers ▪ a contractor is important to have a single safety coordinator

program

Owner:

- Requiring a contractor to comply with all of the company safety rules and regulations and all applicable federal and state laws.'
- Issuing safe work permits
- Having a company representative present at the work to tell the independent contractor employees if they were doing "something wrong" and to remind them to (10 the job in a safe manner!
- I laying or exercising the right to order task to start or stop, to inspect progress of the work, or to receive reports.
- Regular attendance of an owner representative at contractor's safety meetings

Benefits

Limitations

- Cost of behavioral safety
- Cost of safety
- Squeezing of margins down the supply chain
- Resource shortages and industry skill gaps
- Lock of willingness to look outside industry and try new ideas
- Short term work and short-term planning (reactive management)
- Cost of training and management development
- View of safety as a cost, not value-adding
- Accidents do happen' attitude

References & Resources

Choudhry, Rafiq M., Dongping Fang, and Syed M. Ahmed. "Safety Management in Construction: Best Practices in Hong Kong." Journal of Professional Issues in Engineering Education and Practice 134.1 (2008): 20-32.

Crangle, T. F. ""Zero Injury" Safety Program Implementation as Relatedto Current Construction Industry Financial Risk Management: A Successstory." Transmission & Distribution Construction, Operation & Live-Line Maintenance Proceedings, 1998. ESMO '98. 1998 IEEE 8th International Conference on (26-30 Apr 1998): 108-14.

4.2.2 Employee and Third Party

Description
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Applicable Risks
Inapplicable Risks
How to Apply

Employee:

- Safety training for all non-unionized workers
- New workers assigned to more experienced workers for training
- OHSA rules and regulations training
- All third parties on site should be required to wear appropriate safety equipment (ventilators, hard hats, safety boots)
- Appropriate training on use and hazards of construction equipment
- Supervision of less experienced workers
- Personal protection equipment should be mandated
- Breathing protection should be mandated where workers are exposed to toxins
- Medical examinations should be mandated for all potential workers
- Encourage workers to be certified in first aid
- Contractors should supply detail on their injury rates, loss experience, workers. compensation, experience modifier or other data that indicates their accident history over the past 3 . 5 years
- References should be requested from projects similar to the project currently accepting bids
- Contractors to provide a copy of their health and safety program
- Educate workforce on identifying hazards
- Educate workforce on emergency

response measures

Third Party:

- All third parties on site should be required to wear appropriate safety equipment (ventilators, hard hats, safety boots)
- Policies and procedures for all causes to ensure stakeholders have been prudent in their acts
- Procedure for review of hold harmless agreements with contractors
- Proof of insurance should be mandated from all contract workers
- Background check of loss history of contract workers

Benefits
Limitations
References & Resources

4.2.3 Site

Description
Parent
Phase
Construction
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Safety
Typical Users
Considerations or Tests
Applicable Risks
Inapplicable Risks
How to Apply
▪ Signs erected indicating danger, employees only, hazard, use at own risk ▪ Construction site should be well lit, locked and/ or guarded off-hours ▪ Construction site should be maintained, cleaned, and debris removed ▪ All holes/ trenches should be fenced or blocked off ▪ Place protective fencing around the perimeter of the construction site to obstruct loose objects ▪ Traffic procedures, speed limits, and staff to direct heavy equipment ▪ Designated loading and unloading areas away from pedestrian and public vehicle pathways ▪ Construction site should be ▪ Construction sites should have proper lighting at night ▪ Vehicles should be designed with mirrors, alarms and signage where there is inhibited view ▪ Ensure proper equipment/ vehicles are used at all times ▪ Signs erected indicating danger, employees only, hazard, use at own risk ▪ Construction site should be maintained, cleaned, and debris removed ▪ Place protective fencing around the perimeter of the construction site to obstruct loose object ▪ Traffic procedures, speed limits, and staff to direct heavy equipment ▪ ▪ Impose speed limits

monitored at night	▪ Restrict hazardous material transports to off-peak hours ▪ Designated loading and unloading areas away from public property
Benefits	
Limitations	
References & Resources	

5- Insurance

5.0 Insurance

Description
Coverage by a contract binding a party to indemnify another against specified loss in return for premiums paid.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
▪ Reduction of Coverage Limits ▪ Increased use of Warranties ▪ Refusal of Coverage ▪ Non-Submitted Losses ▪ Significant Premium Increases ▪ Increase in Deductibles ▪ Insurer Exit from Class ▪ Selective Underwriting
Applicable Risks
▪ Business Interruption risk ▪ Construction accident risks ▪ Cost overrun risk ▪ Natural Hazard Risk ▪ Project allocation risk ▪ Site security and safety risks ▪ Vandalism/Terrorism risk ▪ Environmental risks ▪ Political risks ▪ Employee/Third party Fraud risk ▪ Health and Safety risks ▪ Interest rate risk ▪ Pollution Risk ▪ Products/Service failure risk ▪ Supply Chain Risk ▪ Third party bodily injury risk ▪ Political Risks
Inapplicable Risks
▪ Change in Ground Conditions risk ▪ Contractor Performance risk ▪ Human resources risk ▪ Estimation Risk ▪ Legal and regulatory risk ▪ Labor/Union Relation Risk
How to Apply
Important Parameters to check:

Parameter	Impact on Rate	Impact on Retention	Impact on Premium	Impact on wording	Total cost of risk
Operations of Insured	Direct Impact Proportional to Hazard	Moderate Impact Sever hazards require higher retention levels	Direct Impact Proportional to Hazard	Moderate Impact Sever hazards means added exclusions and warranties	Proportional to Hazard High Hazard Operations increase cost of risk
Scope of coverage	Direct Impact Proportional to the scope of coverage	Moderate Impact Higher retention for some perils.	Less than proportion Perils can be added at lower unit cost. May be submitted.	Direct Impact Scope of coverage dictates policy wording	Reduce cost of risk Reduction will be less than proportional
Exclusions	Variable impact Exclusion may/may not affect Rates	Severe impact Insured retains full exposure to loss	Variable impact Exclusion may\may not affect premium	Direct Impact Exclusion restrict scope of coverage	Increase cost of risk May\May not be more than proportional
Object of coverage	Direct Impact Proportional to Hazard	Moderate Impact Sever hazards require higher retention level	Direct Impact Proportional to Hazard	Moderate Impact Sever hazard mean added exclusion and warranties	Proportional to Hazard High hazard objects of coverage increase cost of risk
Deductible	Direct Impact Rate fluctuates proportionally to deductible to a threshold	Direct Impact Retention fluctuates proportionally with Deductible	Direct Impact Premium fluctuates to level of deductible to a threshold	Low impact Potential to add perils or remove exclusions/warranties.	Proportional Deductibles and premium need to be balanced
Underwriting Criteria	Direct Impact Proportional to Hazard determined by criteria	Moderate Impact Sever hazards require higher retention level	Direct Impact Proportional to Hazard determined by criteria	Moderate Impact Serer hazards mean restricted scope of coverage	Proportional to Hazard Criteria revealing high hazard increases cost of risk
Loss History	Direct Impact Proportional to frequency, severity and recurrence	Direct Impact Retention used by insurers to control frequency	Direct Impact Proportional to frequency, severity and recurrence potential	Direct Impact Scope of coverage reduced if prior adverse history	Proportional to History Adverse history increase cost of risk

Categorization of Subclasses

Risks	Owner	Consultant	Contractor	Subcontractor	Warp-up Covers
Injury to Contractors Employees (Health and safety risk) (Site security and safety Risk)	General Liability Or Professional Liability	General Liability Or Professional Liability	Workers Compensation	General Liability	Owner Consultant Subcontractor
Injury to subcontractors employees (Health and safety risk) (Site security and safety Risk)	General Liability Or Professional Liability	General Liability Or Professional Liability	General Liability	Workers Compensation	Owner Consultant Contractor
Injury to general public (Third party injury risk) (Site security and safety Risk)	General Liability Or Professional Liability	General Liability Or Professional Liability	General Liability	General Liability	All Parties
Physical damage to project during construction (construction accidental risk)	Builders Risk	General Liability Or Professional Liability	Builders Risk	Builders Risk	Not applicable

(Vandalism/terrorism Risk)					
Physical damage to project after construction (Product/Service Failure risk)	Property Policy	Professional liability	General Liability-Completed operation	General Liability-Completed operations	Owner Consultant Subcontractor (Completed operations)
Physical damage to Adjacent property (Third party property damage risk)	General Liability	Professional liability	General Liability	General Liability	Owner Consultant Subcontractor
Physical damage causing consequential loss (Business interruption risk)	Builders Risk Soft Costs	Professional liability	Builders Risk Soft Costs	Builders Risk Soft Costs	Not applicable
Physical Damage to contractors equipment (construction accidental risk)	Not Typically Insured	Not Typically Insured	Contractors Equipment Floater	Contractors Equipment Floater	Not applicable
Employee/Third Party Fraud Risk	3D crime Policy	3D crime Policy	3D crime Policy	3D crime Policy	Not applicable
Damaged Caused by Excusable delay (Business interruption risk (Vandalism/terrorism Risk) (change in ground condition risk) (Natural Hazard Risks) (Labor/Union Relation)	Force Majuro Policy	Not necessary	Not necessary	Not necessary	Not applicable
Damaged caused by inexcusable delay (Cost overrun risk) (change in ground condition risk) (Human resources Risks)	Delayed completion policy	Not Typically Necessary	Liquidated Damages Coverage's	Not Typically Necessary	Not applicable
Pollution Risk	Environmental Impairment Liabilities	Professional Liabilities including Pollution Liability coverage	Contractors Pollution Liability	Contractors Pollution Liability	Does not cover Polluti on losses
Contractor Performance risk	Performance Bond Contractor as Oblige	Not applicable	Performance Bond Contractor as Oblige	Not applicable	Not applicable
Material and supply risk (Supply Chain Risk)	Performance Bond Contractor as Oblige	Not applicable	Performance Bond Contractor as Oblige	Not applicable	Not applicable
Credit risk	Contractors Default Contractor as Debtor	Not applicable	Contractors Default Subcontractor as Debtor	Not applicable	Not applicable
Product/Service Failure risk	Product/completed Operation	Product/completed Operation	Product/completed Operation	Product/completed Operation	Not applicable
Estimation Risk	Performance Bond Contractor as Oblige + Construction Documents	Not applicable	No Insurance re: owner Performance Bond Subcontractor as Oblige + Construction Documents	No Insurance Available	Not applicable
Legal and regulatory risk	No Insurance Available	No Insurance Available	No Insurance Available	No Insurance Available	Not applicable

Interest rate risk	No Insurance Available	No Insurance Available	No Insurance Available	No Insurance Available	Not applicable
Project allocation risk	No Insurance Available	Professional Liability Policy	Contractual Professional Liability	Contractual Professional Liability	Not applicable

Benefits

Limitations

- Certain risks may be partly insurable, e.g. it may be difficult to find insurers for riskier areas such terrorism, gradual pollution or other long-term liabilities,
- The premium usually is based on claims experience of a pool of similar insured. In such cases, it doesn't reflect good risk control or good claims of a particular company.
- The coverage available and the premium charged can be very variable and are often subject to renegotiation on an annual basis. This may be to the detriment of an insured who doesn't may be in a position to negotiate an alternative.
- The service offered by many insurer are conceived to be poor.
- There are usually bottom end deductible and top end ceiling on cover
- No protection against criminal liabilities: no compensation for fines and prison sentences

References & Resources

Atkinson, William. "Taking Responsibility for Your Own Risk." Risk Management 49.12 (2002): 40.

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Griffis, F. H., and Symeon Christodoulou. "Construction Risk Analysis Tool for Determining Liquidated Damages Insurance Premiums: Case Study." Journal of Construction Engineering and Management 126.6 (2000): 407-13.

Harris, Craig. "Building Insurance: Boom, Bust." Canadian Underwriter 70.8 (2003): 18.

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Hickman, Ann Rudd. "Additional Insured Status: It's Not what it used to be." American Agent & Broker 77.7 (2005): 22.

Ratterman, David B. "Managing Risk: Insurance and Indemnity Clauses in Construction Contracts." Modern Steel Construction 43.4 (2003): 74-80.

5.1 Competitive Insurance

5.1.2 Business Property Insurance

Description
Covers .all risks. of direct physical damage including but not limited to fire, lightning, windstorm and hail, leakage from fire protective equipment, explosion, smoke, falling objects, impact from land or air vehicles, theft, vandalism and malicious damage.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Applicable Risks
Inapplicable Risks
How to Apply
Is there a co-Insurance Clause? Some policies are .no-co., while others are .Stated Amount., or percentage of value such as 80 per cent and 90 per cent. The Valuation Clause will either be ACV (Actual Cash Value) or Replacement Cost. Many insurers add numerous additional coverage forms for lower limits at no additional cost known as .Multi-Perils Extensions.. All policies differ in the number of extensions and the limits offered. Sub limits may exist for key coverages and should be reviewed carefully, especially when changing insurers.
Benefits
Designed for buildings, contents and equipment, this coverage will protect you from physical damage to your property caused directly by a peril.
Limitations
Here are a few examples of perils and property ***not*** covered by Property Insurance: Property not covered:

- Money, securities and precious metals
- Property in the course of transportation
- Land, water, crops and lawns
- Automobiles and machines licensed or used off premises

Perils not covered:

- Collapse
- Wear and tear, deterioration, sudden or latent defects
- Delay, loss of use, loss of market or loss of occupancy
- Release or escape of pollutants

The policy can be endorsed to add the perils of earthquake, flood and sewer back-up, subject to an increase in premium and higher deductibles.

References & Resources

March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.1.2 Builders Risk Insurance

Description
Builders Risk also provides all perils property insurance coverage, but is designed specifically for structures ***in the course of construction***, such as a phase of new homes being built in a subdivision.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
There are numerous variables that will exist for this form of coverage. Below is a checklist of the most common elements: Co-Insurance Clause Valuation Clause Rental Equipment included in limit? Rental Equipment sublimit? Additional Coverage, such as: Newly acquired equipment Equipment rented by the insured Equipment rented to the insured Loss of use Waiver of subrogation General average charges included Salvage charges included Annual reporting of owned/non-owned values
Applicable Risks
Inapplicable Risks
How to Apply
It covers the same perils as All Risks Property Insurance, but may have some ***additional exclusions***, for example: Asbestos removal Collapse (unless by insured peril)

- Pollution
- Water or flood damage
- Boiler/ Machinery
- Earthquake damage
- Normal settling
- Testing and hot testing
- Wear and tear
- Mysterious disappearance

All but asbestos removal, wear and tear and mysterious disappearance can be added by endorsement for an additional premium.

Benefits

Builders Risk also provides all perils property insurance coverage, but is designed specifically for structures ***in the course of construction***, such as a phase of new homes being built in a subdivision.

Limitations

The Builders Risk policy will include materials, fixtures, supplies and machinery to be ***incorporated into the work***. If necessary, coverage can be arranged for scaffolding, temporary structures, underground works, hard scoping or landscaping. Property typically not covered includes:

- Contractors tools and equipment
- Existing structures
- Land and water
- Bridges, dams and dikes

Property stored off premises or property in transit can be covered by a Builders Risk Policy, but usually at an additional premium and subject to a lower limit of coverage.

Builders Risk Insurance can be purchased for a specific project or on a blanket basis covering all projects undertaken in a specific year.

References & Resources

March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.1.3 Contractors Equipment Floater

Description
Although contractor's equipment, such as bobcats, tractors and cranes, are forms of property, they are not covered by an All Risks Property Policy. A special form of coverage known as a Contractors Equipment Floater is designed to protect your equipment. Similar to All Risks Property and Builders Risk insurance, Contractor's Equipment covers you for all perils of direct physical loss, except for a list of exclusions. In addition, the policy may also provide coverage for newly acquired equipment and rental reimbursement, which will cover the cost of renting equipment to replace equipment damaged by a covered peril.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations(Tests)
There are numerous variables that will exist for this form of coverage. Below is a checklist of the most common elements: Co-Insurance Clause Valuation Clause Rental Equipment included in limit? Rental Equipment sublimit? Additional Coverage, such as: Newly acquired equipment Equipment rented by the insured Equipment rented to the insured Loss of use Waiver of subrogation General average charges included Salvage charges included Annual reporting of owned/non-owned values
Applicable Risks

Inapplicable Risks
How to Apply
Benefits
Although contractor.s equipment, such as bobcats, tractors and cranes, are forms of property, they are not covered by an All Risks Property Policy. A special form of coverage known as a Contractor.s Equipment Floater is designed to protect your equipment.
Limitations
Some exclusions that appear in a Contractor.s Equipment Floater are: Mechanical breakdown or failure Wear and tear, hidden or latent defect, freezing or overheating Unexplained disappearance Weight of the load exceeding registered lifting capacity Breaking through ice or subsidence of ice
References & Resources
March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.1.4 Business Interruption Coverage

Description
Business Interruption is a form of ***indirect*** or ***consequential*** damage protection. The main purpose of Business Interruption is to provide indemnity for loss of income resulting from the loss of property damaged by a peril covered by All Risks Property or Builders Risk insurance. **Profits Form Business Interruption** This form of coverage will indemnify you for the cost of continuing to operate your business while it is shut down due to an insured loss. In addition to regular business costs, it provides the lost profit normally earned through operations and the additional expenses incurred as a result of the loss. **Extra Expense Form** Some builders would not lose revenue even if their office location was totally damaged due to a loss. This is because revenue is earned entirely offpremises. However, in such a circumstance, the Insured will incur many additional expenses to re-establish a new office and base of operations. Extra expense provides indemnity for the increase in business expense necessary to establish a new office or a temporary office to be used while the original office is repaired or rebuilt.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations(Tests)
Most forms in Canada are similar with respect to the Profits Form and Extra Expense Form. There are differences in the deductible, which ranges from 24 to 48 hours, the co-insurance clause which may be 50 per cent or 100 per cent and the indemnity period, ranging from 12 months to 24 months. Variable terms can be arranged with corresponding changes in premium.
Applicable Risks
Inapplicable Risks

How to Apply

Profits Form Business Interruption

The indemnity period begins 24 to 48 hours after the loss (a time period deductible) and continues until you are back in full operation and have returned revenue to the same level it had been prior to the loss, for a maximum of 12 or 24 months, known as the indemnity period. You will continue to be indemnified even if the policy expires before the indemnity period expires. The loss, however, must have occurred during the policy period.

Extra Expense Form

Additional expenses can include office space, leasing telephone equipment, leasing computer equipment and additional increases in overhead expenses. The key is that it provides only the ***additional*** expense. For example: Assume a business pays $1,500 a month in rent to its landlord. Following a loss, the business had to rent temporary space in another building at a cost of $2,000 per month. Depending upon conditions in the original lease, the business may not have to pay any rent to the original landlord until the office has been fully restored. In that case, the increase in expense to the business is only $500 as the insured would have been paying $1,500 even if the loss did not occur. Extra expense will cover that additional $500.

Benefits

Limitations

References & Resources

March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.1.5 Builders Risk Soft Costs Coverage

Description
This form of coverage is also a ***consequential loss*** and is usually added by endorsement to the Builders. Risk policy. It will extend the policy to cover financial losses occurring due to delayed project completion resulting from a peril insured by the Builder's Risk policy. Soft Costs are generally used to describe construction expenses not directly related to brick and mortar. Soft Costs can include loss of earnings such as rental income resulting from the delay in completion of the project. Here are some examples of Soft Costs: • ¸ Interest expense on money borrowed to finance construction or reconstruction • ¸ Loan fees and other time charges necessitated by the negotiation of a new construction loan or changes to the existing loan • ¸ Real estate and property taxes • ¸ Fees for architects and engineers • ¸ Insurance premiums for project coverage • ¸ Other professional fees such legal and accounting • The Soft Costs endorsement will be subject to some key exclusions that help define coverage and restrict it to losses ultimately resulting from an insured peril causing direct damage. The following exclusions are common: • ¸ Improvements necessary to correct construction deficiencies • ¸ Delay in opening caused by adverse weather (unless the adverse weather • first caused a direct damage loss) • ¸ Penalties for not completing the project on time • ¸ Delay beyond the reasonable time it should have taken to reconstruct the • project following the loss that caused the delay • When Soft Costs are included in coverage, the limit of coverage chosen must be the full value of all hard and soft costs of the project.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users

Considerations(Tests)
The key is determining if Soft Costs Coverage is specifically declared as covered. If so, the questions below must be answered. Each insurer will have a different approach to Soft Costs. • ¸ Included within the limit? • ¸ Included in addition to the limit? • ¸ Included as a sublimit?
Applicable Risks
Inapplicable Risks
How to Apply
There are two important conditions for coverage to apply; First, the delay in completion must be the result of a direct loss due to an insured peril. The second condition is that the loss must be .quantifiable.. The deductible is usually stated as a waiting period, similar to Profits Form coverage, which may be up to 72 hours. The indemnity period is typically 12 months, but 24 months or longer is available. The indemnity period applies even if the policy expires before the indemnity period, provided the loss occurred during the policy period.
Benefits
Limitations
References & Resources
March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.1.6 Property in Transit

Description
All Risk Property Insurance will exclude or severely limit coverage for property while in transit from one location to another. Property in Transit will cover goods while in the course of transportation from the moment the property leaves the initial point of shipment until it is delivered to its destination. This includes property held temporarily (usually defined as 30 days or less) by shippers or receivers. The policy also covers losses caused by direct damage from perils not otherwise excluded. As with All Risks Property Insurance, this policy states a list of property and perils that are not covered. The next box displays a sampling of ***excluded*** property and perils:
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations(Tests)
If coverage is attached to a Property policy, it is important to check the sublimit. Most policies offer some level of coverage, but usually very small limits. Transportation over water may be excluded or included. The Territory of Coverage is a key condition and will vary. Some coverage is for Canada only, some coverage is for Canada and the U.S.A. Finally, policies sometimes require a Locked Vehicle Warranty, which is an important constraint upon coverage.
Applicable Risks
Inapplicable Risks
How to Apply
Benefits

Limitations
Property not covered • ¸ Money, securities, precious stones • ¸ Shipment by mail or parcel post • ¸ Waterborne shipments • ¸ Property you accept while acting as a common or contract carrier, broker • or freight forwarder Perils not covered • ¸ Improper preparation for shipment • ¸ Inadequate packing • ¸ Insecure stowage when not stowed by the carrier • ¸ Unauthorized instructions to transfer the property to any person or place Property in Transit is usually added to an All Risks Property policy or a Builders Risk policy and subject to a separate limit of coverage for an additional premium. A separate Transit policy can also be purchased if desired, but that would usually increase the minimum premium required by the insurer. Property in Transit implies that there ***is no coverage for waterborne shipments*** as noted in the exclusions. If transportation overseas or oceans is necessary, a Marine Cargo policy will be required.
References & Resources
March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.1.7 Crime Insurance

Description
A Crime Policy provides coverage for five key exposure areas . Employee Dishonesty, Loss Inside the Premises, Loss Outside the Premises, Money Orders and Counterfeit Paper Currency and Depositors Forgery. This policy is known as a .Comprehensive Dishonesty, Destruction or Disappearance. policy, or .3-D. for short. **Employee Dishonesty** Known as Insuring Agreement I, this section provides coverage when an employee steals money, securities or other property from you. There are two coverage options: Form A provides a blanket limit of coverage for all employees with a twelve month reporting period. Form B provides a limit of coverage per employee and is subject to a twenty-four month reporting period. **Loss Inside the Premises** Known as Insuring Agreement II, this covers loss of money and securities that disappear or are destroyed from within your premises. This is a broad form of coverage. Where other forms of insurance for money and securities only cover burglary or robbery, this form will cover theft and disappearance. **Loss Outside the Premises** This is identical to Loss Inside the Premises, but covers money and securities that are destroyed or disappear from outside your premises. It is Insuring Agreement III. A typical example is an employee that is robbed while on the way to make a deposit at the bank. **Money Orders and Counterfeit Paper Currency** This section will provide coverage when you have accepted fraudulent money orders or counterfeit currency in payment of your goods or services. It is Insuring Agreement IV. **Depositors Forgery** Insuring Agreement V provides coverage when your checks have been tampered with. It does not provide coverage when you accept a fraudulent check. For example, if you signed a check made out to a supplier and it was later tampered with so that the payee was altered or the amount of the check was altered, you would be covered for your loss.
Parent
Phase
Time Horizon
Type of Response
Impact Speed

Mitigated Measures

Typical Users

Considerations(Tests)

All Crime Policies will offer the five insuring agreements. There is some variability in the policy wording, but coverage is generally consistent from insurer to insurer. Following is a quick check-list to consider:

- ¸ How many Insuring Agreements are offered?
- ¸ Check for Warranties
- ¸ Territory of Coverage
- ¸ Indemnity Period for Form A Employee Dishonesty
- ¸ Definition of Theft

Availability of Additional Coverage, such as:

- ¸ Credit Card Forgery
- ¸ Incoming Check Forgery
- ¸ Electronic Funds Transfer Forgery
- ¸ Extortion

Applicable Risks

Inapplicable Risks

How to Apply

Employee Dishonesty

The key benefit of this coverage is that you do not have to prove which employee committed the theft, only that an employee or combination of employees committed the act. Under Form A, the limit of coverage applies for the total amount of the loss, whereas the limit for Form B applies based upon the employees position. Consider the following example:

- ¸ An employer discovers that $100,000 has been embezzled from the company. It is learned that the theft was an equal combination of three employees . a sales manager, controller and accounting clerk.
- ¸ If the employer was covered by Form A with a limit of $100,000, the entire loss will be covered subject to the policy conditions and deductible.
- ¸ If the employer was covered by Form B with a limit of $25,000 per position, only $75,000 of the loss would be covered. This is because each position has a limit of $25,000, yet each employee in the covered position stole more than $25,000.

The key is choosing the limits of coverage. Either form will provide adequate coverage if an appropriate limit of coverage is chosen. It is easier to determine limits using Form A than it is using Form B, but Form B has a longer reporting period.

Loss Inside the Premises

The key is that if the loss is due to disappearance, the proof required must be sufficient to show that a theft occurred, not simply an error in accounting.

Other Coverage
There are some other coverage that can be added to a Crime Policy, including electronic fraud, forgery of checks received, credit card fraud and extortion.

Benefits

Limitations

References & Resources

March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.1.8 Commercial General Liability Insurance

Description
Also known in short as CGL or GL, this form of coverage indemnifies you when you are responsible to pay damages to another person or business resulting from your legal liability for causing property damage or bodily injury, including death, to that other person or business. Not only does it provide coverage for the damages you will have to pay to third parties, but it also provides coverage for your defense costs. A CGL policy will provide defense costs ***in addition*** to the limit of liability. • . For example, assume you have a $1,000,000 CGL policy. You are brought to court by a third party alleging you are responsible for $1,000,000 in damages to their property because of a fire you started with a welding torch. Assume also that you incur $125,000 in legal expenses defending yourself from this action. If you were found to be liable for the alleged damages, your insurer would pay the full $1,000,000 awarded by the court and the $125,000 in legal expenses to defend the action. It is important to note that your insurer has the right under your policy to manage your claim and your defense as it has an obvious interest in a fair, expedient and economical result.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations(Tests)
There are many other coverage forms that are available by adding them to the CGL policy through the use of endorsements. There are a number of key variables to review within a CGL policy. Here is a list of items to consider: Is there a General Aggregate Limit of Liability? What multiple of the Single Limit is the Aggregate Limit? Check extent of the Pollution Exclusion Is Contractual Liability included? If Contractual Liability is included, is it blanket or scheduled contracts only? Check for a Wrap-up Liability Exclusion

Additional Coverages, such as:

- ¸ Personal Injury Liability
- ¸ Advertising Liability

Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
References & Resources
March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.1.9 Contractual Liability

Description
The basic CGL policy does not cover liability assumed in a contract, with the exception of elevators, lease agreements and sidetrack agreements. However, a contractor such as a builder signs contracts everyday, often assuming liabilities that would normally be another person.s responsibility. This is assumed .Contractual Liability. For this reason, Contractual Liability is a coverage that should be endorsed onto your policy. It will provide coverage for liabilities you assume when entering into a contract with another party. As this is still part of the CGL policy, the damages that create your liability must still be property damage or bodily injury to a third party. • . When signing a contract with the developer of a subdivision, you may be asked to accept the liability created by any subcontractors you hire to do a portion of the work. Under normal civil law, you are not liable for the acts of independent contractors. However, by virtue of the contract you sign with the owner, you are now liable for the acts of your subcontractors. You need contractual liability to cover this situation.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations(Tests)
Standard coverage is provided only for Insured Contracts as defined in the policy, usually property leases, elevator contracts and sidetrack agreements. Other options available are Scheduled Contracts in which specific agreements are scheduled with the insurer to obtain coverage. The final variable is Blanket Contractual, which usually provides coverage for all contracts entered into by the Insured. It is important to note that since this form is attached to a CGL policy, coverage is for bodily injury and property damage arising from said contractual liability, not pure financial loss or breach of contract suits.
Applicable Risks
Inapplicable Risks

How to Apply
If the coverage is not provided as .Blanket Contractual. it most likely means the builder will have to schedule all of its contracts with the insurer. This requirement allows insurers to read all contracts and make underwriting decisions regarding corresponding coverage. This is a key condition and builders should ensure Blanket Contractual coverage is provided in order to reduce the administrative burden and margin for error within their policies.
Benefits
Limitations
References & Resources
March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.1.10 Tenants Legal Liability

Description
A key exclusion in a CGL policy is that it will not cover damage you cause to another person's property while that property is in your .care, custody or control.. When you lease space for your business, you have care, custody and control of the leased premises. However, those premises are owned by somebody else . the building owner. Therefore, any property damage for which you are liable while occupying that space is not covered by the CGL policy. By adding Tenants Legal Liability endorsement to the policy, you are given coverage for leased premises in your care custody and control. • Assume you rent office space in a ten-storey commercial office building. Improper wiring of your computer system results in a fire. The fire causes damage to the part of the building occupied by you. Your CGL policy will not cover this damage because the building was property in your care, custody and control at the time of the loss. Your Tenants Legal Liability endorsement will respond to provide the coverage you need and protect your liability to the building owner.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations(Tests)
Choosing a limit of coverage for Tenants Legal Liability can be difficult. You need to estimate the value of the space you occupy. A good rule of thumb is to purchase a limit equal to your CGL limit. However, in some cases that may not be enough. You should discuss this with your broker to determine the limit that is right for you. The main variable is the extent of coverage. It will either be Broad Form or Named Perils. There may also be a sublimit for less than the limit of Commercial General Liability.

Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
References & Resources
March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.1.11 Non-Owned Automobile Liability

Description
Although this coverage can be provided by a separate policy, it is most commonly added by endorsement to a CGL policy. It exists because of a principal of law known as .Master and Servant.. Under the common law, an employer is responsible for the negligent or careless acts of its employees, even if the employees have exceeded their authority or disobeyed direct orders of the employer. This theory of law extends to automobiles as well. When your employee uses his or her own vehicle for your business and causes property damage or bodily injury to a third party, you may be held liable.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations(Tests)
This form of coverage is provincially regulated. All non-owned automobile policies in a given province have a no variance in coverage form. There are some slight differences from province to province. The key variable for the buyer of this policy is the limit of coverage and the deductible. The limit should be sufficient to cover a total loss to the most expensive hired auto the insured may have control and custody of during the year. The deductible should be similar to the deductible the insured carries for its owned automobiles. Be mindful of policies that include endorsements restricting what type of nonowned automobiles will be covered by the policy.
Applicable Risks
Inapplicable Risks
How to Apply
Benefits

Limitations
However, your CGL policy does not cover liability arising from licensed automobiles and automobiles used off premises. Non-Owned Automobile Liability is therefore designed to protect your liability for losses caused by employees while using non-owned vehicles in connection with your business. You should always purchase a limit that is equal to your limit of CGL coverage. Non-Owned Automobile will not provide coverage for physical damage to the non-owned automobile itself as that is property in your care, custody or control. For example, a rented automobile is a non-owned automobile, but the rental company is transferring responsibility for damage to the vehicle to you, the renter. It is important to add Endorsement No. 94 . Legal Liability for Damage to Non-Owned Automobiles to the policy. This will cover you for damage caused to the non-owned automobile while in your care, custody or control.
References & Resources
March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.1.12 Owners and Contractors Protective Liability (Ocpl)

Description
This form of coverage can be purchased as a stand alone policy, or added to a CGL policy by endorsement. When it is added to a CGL policy, it is provided on an annual basis. When arranged as a stand alone policy, it is usually providing coverage for a specific project. The purpose of Owners and Contractors Protective Liability is to ensure the availability of project-specific, unimpaired insurance to protect against certain risks. Coverage applies only to the owner's liability from operations performed by a contractor and the owner's acts in connection with the general supervision of the work. The policy does not cover the owner's sole negligence for activities in connection with the project. The owner would rely on its own CGL policy for that coverage. Owner's and Contractor's Protective Liability will provide a policy for a specifically-named project. All losses assigning liability to the owner resulting from operations of the contractors will be covered by that policy. This ensures that there is dedicated coverage limits for this project, protecting the owner's CGL limits and claims history. The cost of the policy is usually transferred to the contractor, which in turn builds it into the project cost.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations(Tests)
A builder may hire many contractors to perform work on its behalf. Although the owner has its own CGL policy, claims assigning liability to the owner due to the operations of contractors may either erode the aggregate limit of the CGL coverage, or simply affect the claims performance of the CGL policy resulting in higher premium costs. As a builder, you may think, .why should my operating costs be increased or my insurance reduced due to the negligence of others?. The key variable is whether or not coverage is subject to a sub-limit within the policy. Otherwise, forms are generally consistent from insurer to insurer when endorsed to a CGL policy.
Applicable Risks

Inapplicable Risks
How to Apply
Benefits
Limitations
References & Resources
March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.1.13 Excess Liability Coverage

Description
It is prudent to ensure your business has adequate limits of Commercial General Liability insurance. In consultation with your broker, you may decide that you require a $10,000,000 limit of liability to properly protect your business from loss. For reasons such as risk tolerance, capacity to accept risk and cost/ accessibility to reinsurance, many insurers may not be willing or able to provide more than $2,000,000 or $5,000,000 of limits. Excess Liability insurance will provide the higher limits of coverage you require. The term .excess. simply means higher limits . it does not increase your scope of coverage. All of the conditions and exclusions that exist in your CGL policy will also exist in your excess policy. This is known as .follow form. protection . the form of the excess policy follows the form of the CGL or .underlying. policies.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations(Tests)
The Excess policy does not .drop down.. It is written on the basis that you have a certain amount of .underlying coverage.. For example, if you have an excess policy that notes you have an underlying CGL limit of $2,000,000, your excess policy will only respond when the $2,000,000 limit has been exhausted. For example: • . Assume you have a $2,000,000 CGL policy and an $8,000,000 excess policy. The excess policy requires that you maintain $2,000,000 CGL. If you reduced your CGL limit to $1,000,000 without the agreement of your excess policy, you do not have $8,000,000 excess of $1,000,000, you still have $8,000,000 excess of $2,000,000. If you have a loss large enough to claim against your excess policy, you will have to cover the difference between your $1,000,000 CGL limit and your $2,000,000 underlying insurance requirement. An excess policy can be written in excess of most CGL and Automobile Liability

forms, including Non-Owned Automobile Liability, Contractual Liability, Employers Liability and Workers Compensation.

Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
The form itself is fairly consistent. However, since the form follows the coverage offered by the underlying policy, it does vary in accordance with the said underlying policy. Each insurer will add its own series of restricting endorsements which further vary the coverage. The policy should explicitly provide the Excess Non-Owned Automobile forms for each province. Insurers will vary in their ability to provide excess coverage over U.S.A. and international policies.
References & Resources
March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.1.14 Umbrella Liability Policy

Description
An Umbrella policy is very similar to an Excess policy. It provides higher limits of coverage in excess of the underlying limits. The key to an Umbrella policy is that it will drop down to cover a reduction in underlying limits or even a loss that is not otherwise covered by an underlying policy. An Umbrella Liability policy is very broad and is usually defined by its exclusions. Every Umbrella policy is different. Some may exclude only a few forms of liability, where others may exclude many forms. Be sure to ask your broker to explain all of the exclusions in your Umbrella Liability policy and be sure you understand.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations(Tests)
Applicable Risks
Inapplicable Risks
How to Apply
An Umbrella policy varies in that it comes in two forms single column and dual column. coverage. The singe column policy is similar to Excess Liability Coverage in that it follows the form of the underlying policies, but it may also drop down. The dual column approach separates coverage into .Follow Form Excess Liability. in column A and .Drop Down Coverage. in column B. Although dual column coverage appears to be more comprehensive, be mindful of the exclusions added to the policy which may restrict the scope of drop down coverage available. Regardless of the approach, all policies will include an annual aggregate limit of liability It is very important that you provide your broker with a complete and accurate

description of your business to ensure your Umbrella policy does not contain any exclusion that eliminates needed coverage.
Benefits
Limitations
References & Resources
March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.1.15 Wrap-Up General Liability Coverage

Description
Wrap-up is project-specific general liability covering all participants in the project, including the owner, contractor, subcontractor, manager, consultant and architects & engineers, regardless of the ***number*** of participants. It is broad, uniform coverage dedicated solely to the specific project with a policy period that is equal to the duration of construction. The language defining .Named Insured. is very broad to ensure coverage for every participant without specifically naming each one
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations(Tests)
▪ Choosing a limit must be done carefully. The builder has to consider the total number of participants on the project, the length of the project and type of work being done. A limit that appears very high may ultimately be insufficient. Think big! Most likely the Wrap-up will be equally as comprehensive or more comprehensive than your CGL policy. However, there is no guarantee. It is important when being covered by a wrap-up policy to ensure your CGL policy does not have a Wrap-up Projects Exclusion. ▪ Check your CGL policy to ensure there are no wrap-up exclusions. There are several insurers now introducing wrap-up exclusions to CGL policies issued to contractors, including builders. At first glance, this appears okay as the wrap-up will cover you for the specific project. However, there are gaps created by the wrap-up exclusion and it is therefore not recommended. ▪ Traditional insurance requirement of larger projects may limit the number and diversity of contractors who can participate. (8.15) ▪ The risk manager are able to reduce the cost of insurance for each contractor and eliminate coverage duplications, which to together reduce the project's overall cost. (8.15) Also it allows the risk manager to create a unified safety program with consistent

measures for each contractor or job site.(8.15)

Applicable Risks

Inapplicable Risks

How to Apply

A wrap-up policy is purchased by an owner because it provides uniform coverage to all participants. It ensures all participants are covered to the same limit of coverage. Because it is project-specific, it also ensures that losses occurring at other projects do not erode the limit of coverage available at the specified project. Take this example:

- . As a builder, you may have several subcontractors working at your site.

You may want all subcontractors to carry $5,000,000 of liability coverage. However, each will have a different limit, some conforming to your requirements and some not. In addition, even if a contractor has $5,000,000 coverage, you cannot be assured that it has not caused a loss at another project site that will erode that $5,000,000 and leave less coverage available at your site.

- . By using a wrap-up policy, you can ensure all your

contractors/subcontractors have $5,000,000 of coverage and that coverage cannot be eroded by losses caused at other sites. In addition, you no longer have the administrative burden of collecting and verifying certificates of insurance from your contractors/subcontractors since you now know that they are covered by the wrap-up policy.

An added benefit of a wrap-up policy is that it will provide an extension period for losses resulting from the completed operations of contractors/subcontractors. A wrap-up will usually provide an additional period of 24 months after the expiration of the policy to cover .completed operations. losses occurring during that time.

As site owner, the key benefit is that you do not have to worry about whether or not your contractors/subcontractors continue to carry insurance, at the required limit, after the job has been completed. In addition, .completed operations. coverage is not encumbered by the aggregate limit applying to the contractors./subcontractors. own policies, although it is subject to the wrap-up policy aggregate.

Benefits

The wrap-up policy eliminates several insurance problems surrounding a construction project, such as:

- Difference in wordings
- Varying limits of coverage
- Uninsured participants
- Multiple deductibles
- Mid-project renewals
- Expired policies
- Cancelled policies
- Excessive lawsuits

- Mid-project changes
- Collection of certificates

Limitations

References & Resources

March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.1.16 Contractors Professional Liability

Description
Also referred to as errors and omissions (E&O) coverage, professional liability insurance protects against damages from professional services performed by contractors such as construction management and design-build. As a builder, you may have these exposures to consider. Coverage is provided on a Claims-Made form and is subject to many exclusions that define its scope to indemnify you for your legal liability for damages resulting from an actual or alleged negligent act, error or omission. Unlike a CGL policy, the defence costs of professional liability are included in the policy limit. It is therefore very important to choose your limit wisely. Consult with your broker.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations(Tests)
A Contractors. Professional Liability policy can be purchased on an annual basis to cover all projects the builder works on during the year, or it can be purchased on a project-specific basis. The benefit of a project-specific policy is that the limits are dedicated to actual project and cannot be eroded by losses occurring at other projects. The advantage of an annual policy is that all operations are covered; it is generally more cost effective and provides more options when project-specific coverage is needed due to a contractual obligation. Typically, a builder will purchase an annual policy to cover its basic operations. For certain key projects, depending upon the size, scope or contractual requirements, an additional project-specific policy will be purchased to allocate limits specifically for that project, or increase the available limits and add additional insureds. A builder faces professional liability exposures for a variety of different aspects of its work, some of which are listed here: • Hiring staff architects or engineers for design work • Hiring design firms as consultants or using them for design-build projects

and assuming responsibility for their work

- Providing construction management services
- Performing construction inspection services for the work of other contractors
- Loaning employees for a fee
- Advising on project financing

Homebuilding is generally a design-build delivery system and therefore this coverage is very important to builders.

Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
References & Resources
March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.1.17 Contractors Pollution Liability (Cpl)

Description
A special pollution liability policy is required because most CGL policies either exclude pollution liability completely, known as the .absolute exclusion. or provide very limited coverage that would include .hostile fire. or .sudden and accidental. losses. A hostile fire is a fire that escapes from its intended containment area. A sudden and accident loss must be discovered within 120 days of its occurrence and reported to insurers within 120 days of its discovery. Although this seems like a long time, it passes very quickly. This policy will provide defence and indemnity coverage for bodily injury, property damage and environmental clean-up costs for pollution conditions arising from the builder.s operations. The policy will respond to sudden and gradual pollution events as well as cleanup costs on and off the worksite.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations(Tests)
The policy can be purchased on an annual blanket basis or a project-specific basis and may be issued on an occurrence or claims-made form. Some operations make it obvious that a CPL policy should be procured. A builder performing environmental remediation work is a good example. Consider the many other environmental exposures on construction projects: • ¸ Construction debris containing hazardous materials (paint, tar, etc.) • ¸ Contaminants from historical use of the property or neighbouring premises • ¸ Inadequate containment and loading/ unloading areas • ¸ Soil/ groundwater contamination • ¸ Lead, asbestos, PCB.s and radioactive contamination • ¸ Midnight dumping on vacant land parcels • ¸ Sick building syndrome (carbon monoxide or bacterial air releasing from HVAC systems) • ¸ Disposal of hazardous waste generated on site • ¸ Air emissions causing offensive odours

- . Spills of chemicals and fuels
- . Lubricant oils and other fluids from field equipment

Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
References & Resources
March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.1.18 Combined Delayed Completion/Force Majeure

Description
Determining whether the cause of a delay was excusable or inexcusable can sometimes be a difficult job resulting in disputes between owners and builders. It is a key point because the builder will not be liable for excusable delays. A dispute may take a long time to settle, during which time the owner must service the construction debt, which becomes more and more costly as the project is delayed. The owner can relieve itself of this worry through the purchase of a combined policy. Under such an arrangement, the insurer agrees to indemnify the owner for losses caused by specified delays and then assumes subrogation rights against the builder alleged to be the cause of the delay under the liquidated damages clause of the builder. This allows the owner to carry on with the progress of the project without the need to first settle the dispute and increase the delay. If it is ultimately determined that the delay was inexcusable, the insurer will recover the liquidated damages from the builder.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations(Tests)
These forms are currently subject to ***very limited*** availability. There are few insurers that will offer coverage and then only in rare circumstances. As the insurance market continues to stabilize, we expect these forms will become available. There is also the option of looking to other markets, namely London, Barbados and Bermuda to arrange coverage. The Conditions include an acceptable engineering review of the project by an independent engineering firm and contract review by an independent legal firm. The premium will be expensive, ranging from 3 per cent to 7 per cent of the insurance limits. The deductible will be a waiting period in the range of 45 to 90 days after the contract completion date.
Applicable Risks

Inapplicable Risks
How to Apply
Benefits
Limitations
References & Resources
March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.1.19 Automobile Insurance

Description
Available in both the competitive and government-owned markets in Canada. Although the systems of automobile insurance vary from province to province, all automobile insurance protects against three basic segments of risk . Liability to third parties for bodily injury and property damage, accident and life insurance for the automobile occupants and physical damage to the insured vehicle. **Ontario** The Ontario system is a threshold no-fault system. All bodily injury losses in Ontario are adjusted and settled by a person.s own insurer regardless of fault unless the injuries surpass a statutory standard of serious and permanent impairment or death, in which case the injured party can pursue damages under tort law. Third party property damages continue to be settled under a tort system provided the damaged property is not another automobile. As part of the overall no-fault program, all physical damage losses in Ontario are paid by direct compensation from the insurer of the damaged vehicle regardless of fault. The claimant will be responsible for a deductible, however, in the proportion of his or her fault in the accident. **Atlantic Canada, Alberta and the Territories** All provinces and territories in this category operate tort automobile insurance systems in varying degrees. Insurance policies in these jurisdictions are divided primarily into three sections: A) Third Party Liability, B) Accident Benefits and C) Physical Damage. All third party liability loss, whether bodily injury or property damage, are settled under tort law principals. The same applies for physical damage. The loss in any accident is fully covered by the at-fault automobile.s insurer through a combination of Third Party Liability for the not at-fault vehicle and Physical Damage for the at-fault vehicle. **British Columbia, Saskatchewan and Manitoba** Each of these provinces operates government-owned no-fault automobile insurance systems. There is one insurer providing the provincial compulsory coverage - in B.C., the Insurance Corporation of British Columbia (ICBC); in Saskatchewan, Saskatchewan General Insurance (SGI); and in Manitoba, Manitoba Public Insurance Corporation (MPIC). All third party losses and physical damage losses are settled through the government insurer on a nofault basis **Quebec** In Quebec, the system is completely no-fault, but split between private insurers and the Quebec government. The Society de l.Assurance Automobile du Quebec provides all bodily injury coverage for residents of the province. There is no threshold system and no private company program for accident benefits as there is in Ontario. Physical damage losses are owned by private insurers and adjusted on a direct compensation, no-fault program. Third party property damage losses are covered by private insurers on a tort

basis provided the damaged property is not another automobile.

Parent

Phase

Time Horizon

Type of Response

Impact Speed

Mitigated Measures

Typical Users

Considerations(Tests)

There are many conditions applicable to automobile insurance. The most important condition is to declare all aspects of operations, all prior claims, all vehicles and all drivers at the time of application. Holding back any information regarding automobile insurance can result in reduced coverage, cancelled policies and inability to acquire affordable coverage in the future. Worst of all, it could void any claims.

Note that the term .no-fault. applies as an opposite term to the tort system, preventing recovery from responsible third parties. Insureds are still assessed fault in each accident, pay a deductible in proportion to their degree of fault and will have their insurance record adversely affected in proportion to their degree and frequency of fault.

Automobile policies are provincially regulated therefore all insurers in a given Province offer the identical coverage form. There are some issues to look for nonetheless, such as:

- Endorsements that may restrict coverage
- Limits offered for endorsements vary from insurer to insurer
- Forms for different Provinces will vary greatly, depending upon system of insurance particular to that Province
- Minimum deductibles
- Underwriting requirements

Applicable Risks

Inapplicable Risks

How to Apply

Benefits

Limitations

References & Resources

March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.1.20 Directors And Officers Liability

Description
Provides legal liability coverage for individual directors and officers of a corporation. The policy will also cover the liability of the corporation for indemnifying the directors and officers. The policy covers against .Wrongful Acts. This is generally any type of act by a director or officer, in the regular course of their duty as director or officer that causes financial harm to parties with an interest in the corporation including shareholders, employees, suppliers, investors and the general public.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations(Tests)
Legislation in all Canadian provinces imposes individual liability upon directors and officers for a variety of different reasons including employment practices and fiduciary responsibility for pension plans. Any person serving as a director or officer of a corporation should carry this coverage.
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
References & Resources
March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.1.21 Delayed Completion/ Liquidated Damages

Description
Delayed Completion is for Owners and Liquidated Damages is for Contractors. Each of these forms of coverage provide protection against financial loss from a delay in the project completion resulting from ***specified causes***, such as failure of a participant to perform within the construction schedule. In the case of a builder, where you are the owner and the contractor, coverage for your own failure to meet project schedule is not available. However, protection against subcontractors is possible.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations(Tests)
These forms are currently subject to ***very limited*** availability. There are few insurers that will offer coverage and then only in rare circumstances. As the insurance market continues to stabilize, we expect these forms will become available. There is also the option of looking to other markets, namely London, Barbados and Bermuda to arrange coverage.
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
References & Resources
March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.1.22 Force Majeure Insurance

Description
This policy, issued on behalf of the owner, will protect the owner against loss resulting from delayed completion due to causes beyond the control of the owner. Typical examples of such losses are: • Destruction or damage occurring off-site that effects construction. • Strikes and labour disputes. • Changes to building safety codes or emissions standards occurring during the contract period. • Any other cause that is beyond the control of all participants such as adverse weather conditions and foreign trade embargo. In other words, this coverage will only apply for an ***excusable delay***. Where an excusable delay occurs, the owner has no recourse against the builder and requires protection in some other form, namely this policy.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations(Tests)
These forms are currently subject to ***very limited*** availability. There are few insurers that will offer coverage and then only in rare circumstances. As the insurance market continues to stabilize, we expect these forms will become available. There is also the option of looking to other markets, namely London, Barbados and Bermuda to arrange coverage. The Conditions include an acceptable engineering review of the project by an independent engineering firm and contract review by an independent legal firm. The premium will be expensive, ranging from 3 per cent to 7 per cent of the insurance limits. The deductible will be a waiting period in the range of 45 to 90 days after the contract completion date.
Applicable Risks
Inapplicable Risks

How to Apply
Benefits
Limitations
References & Resources
March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.1.23 Employers Liability Insurance

Description
In all jurisdictions in Canada you are required to purchase Workers Compensation insurance from a provincially-owned corporation. In Ontario for example, the corporation is known as the WSIB . Workplace Safety and Insurance Board. It is designed to cover your liability for injury your employees incur while working for you. This is a legislated form of government insurance that you must buy. There are some employees in some jurisdictions that are exempt from Workers Compensation legislation, for example office workers in Ontario. If you have not purchased workers compensation coverage for these employees, you have no protection in the event they incur bodily injuries or death while engaged in your business. For this reason, you need Employers Liability coverage. Employers Liability provides coverage for your liability towards all employees that are not otherwise covered by workers compensation, or who may be exempt from workers compensation laws or have the ability to opt out of the provincial program at the time of a loss.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations(Tests)
Even if you carry Workers Compensation for all employees, it is wise to purchase this coverage as it will act as a contingent coverage at the very minimum. Most insurers charge a very small premium or no premium at all. Some forms provide only Contingent Employers Liability. while others offer complete Employers Liability. All policies will exclude Employers Liability for employees in the U.S.A.
Applicable Risks
Inapplicable Risks
How to Apply

Benefits
Limitations
References & Resources
March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.1.24 Inherent Defects Insurance (Idi)

Description
Construction defect litigation is a growing concern in Canada following the multitude of high award mass torts in the United States. Every province has a statutory period in which a builder warrants that its product is constructed in a workmanlike manner, free from material defects, fit for habitation, constructed in accordance with the Building Code, and also free of major structural defects. In Ontario, for example, the warranty applies against major structural defects for seven years from the purchase of the home and for most other defects for one year from the purchase of the home. Most builders, contractors and developers assume this exposure as the necessary risk of doing business.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations(Tests)
These forms are currently subject to ***very limited*** availability. There are few insurers that will offer coverage and then only in rare circumstances. As the insurance market continues to stabilize, we expect these forms will become available. There is also the option of looking to other markets, namely London, Barbados and Bermuda to arrange coverage. The policy is conditional upon the creditworthiness and work performance history of subcontractors or suppliers. There must be a default in order to trigger coverage. The policy must be purchased before a default. In other words, previously or existing defaulted subcontractors and suppliers are not covered. Another key condition is that the Insured cannot contractually pass on the responsibility for paying deductibles and co-payments. This is important because the whole purpose of the deductibles and co-payments are to ensure the Insured has .skin in the game. and will take all actions necessary to prevent default and prevent losses.
Applicable Risks
Inapplicable Risks

How to Apply
Benefits
Limitations
References & Resources
March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.1.25 Contractors/Subcontractors Default Insurance

Description
This coverage is to protect the owner/ builder against the default of performance by subcontractors and suppliers for specified insured contracts and purchase orders. A key benefit is that the actual default triggers coverage. The insurer will not question the legality of the fault, leaving it up to the courts to decide. The policy will cover the cost of completing the subcontractor's or supplier's obligations, correcting defective or non-conforming work, legal and professional expenses caused by the default and soft costs including liquidated damages, accelerations and extended overheads. Limits are per occurrence and in the aggregate. There is a single deductible, aggregate deductible and co-payment clause.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations(Tests)
These forms are currently subject to ***very limited*** availability. There are few insurers that will offer coverage and then only in rare circumstances. As the insurance market continues to stabilize, we expect these forms will become available. There is also the option of looking to other markets, namely London, Barbados and Bermuda to arrange coverage. The policy is conditional upon the creditworthiness and work performance history of subcontractors or suppliers. There must be a default in order to trigger coverage. The policy must be purchased before a default. In other words, previously or existing defaulted subcontractors and suppliers are not covered. Another key condition is that the Insured cannot contractually pass on the responsibility for paying deductibles and co-payments. This is important because the whole purpose of the deductibles and co-payments are to ensure the Insured has .skin in the game. and will take all actions necessary to prevent default and prevent losses.
Applicable Risks

Inapplicable Risks
How to Apply
Benefits
Limitations
References & Resources
March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.1.26 Environmental Errors and Omissions Liability Insurance

Description
• *Environmental errors and omissions liability insurance* is typically used by consulting or engineering firms to protect themselves from liability arising from work or recommendations made by the insured(Dione 2007).
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations(Tests)
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
References & Resources
Dione, S., J. Y. Ruwanpura, and J. P. A. Hettiaratchi. "Assessing and Managing the Potential Environmental Risks of Construction Projects." Practice Periodical on Structural Design and Construction 10.4 (2005): 260-6.

5.1.27 Environmental Remediation Insurance

Description
• *Environmental remediation insurance* covers the insured against liability claims arising from pollution generated on and/or migrating off property. This type of insurance usually covers investigation and remediation costs(Dione 2007).
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations(Tests)
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
References & Resources
Dione, S., J. Y. Ruwanpura, and J. P. A. Hettiaratchi. "Assessing and Managing the Potential Environmental Risks of Construction Projects." Practice Periodical on Structural Design and Construction 10.4 (2005): 260-6.

5.1.28 Stop Loss (Cost Overrun)

Description
• *Stop loss (cost overrun) coverage* is normally used when there is known contamination before the insurance policy comes into effect. This type of insurance involves a substantial deductible that typically covers the costs of remediation plus any cost overruns. At this point _the Stop Loss amount_, the insurance covers the remainder of costs (Dione 2007).
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations(Tests)
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
References & Resources
Dione, S., J. Y. Ruwanpura, and J. P. A. Hettiaratchi. "Assessing and Managing the Potential Environmental Risks of Construction Projects." Practice Periodical on

Structural Design and Construction 10.4 (2005): 260-6.

5.1.29 Spill Liability

Description
• *Spill liability* provides coverage for bodily injury, property damage, and cleanup costs resulting from an incident during transportation by a carrier of the named insured's product or waste (Dione 2007, McCaffery 1997).
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations(Tests)
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
References & Resources
Dione, S., J. Y. Ruwanpura, and J. P. A. Hettiaratchi. "Assessing and Managing the Potential Environmental Risks of Construction Projects." Practice Periodical on Structural Design and Construction 10.4 (2005): 260-6. McCaffery, M. _1997_. "Emerging options in environmental insurance."Pract. Period. Hazard., Toxic, Radioact. Waste Manage., 1_3_,105–106.

5.2 Self-Insured

5.2.1 Finite Risk

Description
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
▪ Finite risk works best for property or business interruption risks in situations where a severe loss is possible but not likely in any given year. ▪ The primary motivation for most insureds that have entered into finite programs is not risk transfer, rather it is smoothing of earnings or cash flow management. ▪ The fundamental difference between single insured programs and group programs is that group programs involve the sharing of risk among participating members. ▪ In practice there are very few finite risk programs in place within Canada. In the world of alternatives to traditional insurance, captives and reciprocals are much more common at least in the Canadian market. This is primarily a result of the significant cash flow commitment required (although some finite underwriters may be flexible on this issue).
Applicable Risks
Inapplicable Risks
How to Apply
A traditional finite risk program offers a single aggregate limit over a multi-year period. The policy premium, usually payable in equal instalments over the multi-year period, will accumulate to the limit and thus the program is self funded by the insured. The premium, less the underwriter.s fee and premium tax, is put into an interest-earning fund managed by the underwriter. Losses up to the policy limit are paid firstly out of the fund and then by the underwriter if the fund is not sufficient. At the end of the multi-year period, any balance

remaining in the fund can be returned to the insured or conversely the program can be rolled forward.

Finite risk is a form of self-insurance that involves a commercial insurer. Therefore it is important for an organization interested in finite risk to partner with an insurance broker that has the expertise to negotiate the terms & conditions as well as evaluate the costs and benefits of a finite program.

Benefits

The key advantage to a finite risk program is that self-insurance costs are stabilized over time and limited to the annual premium. If a large loss occurs early in the program, the underwriter will cover any shortfall in the fund. There is also the opportunity for significant return premium if losses are not triggered during the policy period. Although finite equates to self-funding, if it is combined with a sufficient excess layer of risk transfer the entire program may be accounted for as a traditional insurance policy.

Limitations

Finite programs call for significant cash commitments; most programs placed in the market involve premiums of several million dollars. Not all of the cash paid by the insured will be retained to finance future losses. Finite risk underwriters will charge a fee to cover profit, expenses and a premium for the risk transfer element of the program . these costs average about 10 per cent of gross premium. In addition to the minimum premium, most finite underwriters are located in either the U.S. or Bermuda; this raises the possibility of an additional fronting fee.
There may also be an element of opportunity cost as interest credited to the fund by the underwriter will generally be less than the return that could otherwise be earned - typically insureds will be credited prime minus 1 per cent.

References & Resources

March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.2.2 Reciprocal Insurance Exchange

Description
Reciprocals are licensed insurers. All provinces and territories have enabling legislation in place for reciprocals. Like conventional insurers that offer insurance to the public, the reciprocal will be monitored on a continual basis by the territorial Superintendent of Insurance. The reciprocal would conduct its business through an attorney-in-fact that acts as an agent of each subscriber within the program A reciprocal is an unincorporated group of organizations that contract with each other to spread the risks and losses inherent in their activities. If one member of the Reciprocal suffers a loss, all members contribute to the payment of that loss based on a pre-agreed formula. The members, typically referred to as subscribers, cover losses by paying some premium up front and agreeing to be assessed for additional premium if necessary.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
As a general observation, in Canada, reciprocals tend to be set up by not-for-profits (municipalities, universities, hospitals) and captives tend to be set up by for-profits.
Applicable Risks
Inapplicable Risks
How to Apply
The first step in establishing a reciprocal is identifying like-minded firms with similar operating exposures. There must be willingness from all parties to share risk, information and best practices towards risk management. A formal and detailed business plan will need to be developed and submitted to the Superintendent of Insurance for approval before a license is granted. A qualified consultant can assist a group in deciding which vehicle makes most

sense in their particular circumstances

Benefits
Limitations
References & Resources
March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.2.3 Group Funded Deductible

Description
A group funded deductible program is very similar to a reciprocal or group captive with the exception that there is no licensed entity formed to hold the risk of the group. Usually premium payments made by the members are held in trust. Funds can be managed by the program is insurance broker or by the association
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Group programs where members are required to buy insurance through the group are more likely to utilize a group fund than voluntary programs. It is the relationship between the members that binds the insured. There is usually no requirement for a subscriber's agreement.
Applicable Risks
Inapplicable Risks
How to Apply
In Canada, most group funded programs have been formed by franchisors, professional associations (including trade associations) and religious groups (although there are examples of all of these types of groups forming captives). In some cases, the group fund is a separate incorporated entity but not a licensed insurer.
Benefits
The advantage of group deductible relative to other options is that start-up and operating costs are minimized. The decision to form a group funded deductible over a more formal entity (captive/ reciprocal) is usually the result of the relationship between the members.
Limitations

References & Resources

March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.2.4 Captive

Description
A captive insurer is a limited purpose, wholly owned subsidiary of an organization (or a group of organizations) usually not in the insurance business. The captive's primary function is insuring some or all of the exposures and risks of its parent or its parent's affiliates and other subsidiaries. Captives are legal entities, formed by one corporate parent or a number of similar corporate parents (for example, a trade association). They are generally domiciled in offshore (foreign) or onshore (domestic) locations that have established regulatory infrastructures to support the development of captives
Parent
Phase
Design
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Captives are often viewed as the privilege of the large organization, an option available and viable only for the largest Canadian corporations. This is a misconception. In fact, there are a variety of captive configurations. The single parent captive is best suited to larger organizations ($500,000 of insurance premiums or greater), but there are also group captives and rent-a-captives available to mid-size ($250,000 of insurance premiums to $499,000 of insurance premiums) and small organizations (less than $250,000 of insurance premiums). Forming or joining a captive requires a commitment of time. For them, insurance below a certain threshold is just trading dollars with a fee attached for the insurers' expenses and profits. Rather than continue paying the insurers to pay the losses, some large companies formed their own privately owned insurance subsidiaries to cover their first layer of risk.
Applicable Risks
Inapplicable Risks
How to Apply
Benefits

Cost Stabilization
Companies saw the cost of insurance in the commercial market increase significantly during 2001 through 2003. On the other hand, the long view looking back more than 15 years since the last hard insurance market reveals that premiums were dropping almost as precipitously then as they subsequently rose. The current hard-market cycle has brought insurance rates back up to early 90.s levels. When an organization funds its own risks with a captive, those peaks and valleys can be smoothed and the overall cost should be less than in the commercial insurance market.

Cost Reduction
Premiums offered by commercial insurers theoretically include the cost of losses, the insurer.s expenses and a margin for-profit. Expense ratios for commercial insurers tend to be in the range of 30 per cent to 40 per cent of premium. In contrast, the expense ratios for a captive tend to be much lower as low as 10 to 15 per cent or even less. In addition, insurers invest premium dollars before they are paid out as losses. With a captive, investment income is captured by the owner.

Coverage Availability
In a soft insurance market, coverage is cheap and plentiful. In a hard insurance market, some coverage is expensive and sometimes not available from commercial insurers at any price. Captive owners have the ability to determine what coverages the captive will provide.

Capacity for Higher Limits from Reinsurers
Captive insurers can deal with reinsurers, often availing themselves of the expertise of reinsurance intermediaries. This provides them with the ability to purchase higher limits from sources not directly available to most insureds, perhaps more affordably than commercial insurers.

Tax Savings
If you self-insure, you need to predict and accrue for losses as soon as their potential is known, but you cannot take a tax deduction until the losses are actually paid. Under a properly structured captive arrangement, the premiums paid to the captive are tax deductible. Additionally, the captive structure accelerates the deduction for losses, as the captive is able to establish reserves for ultimate projected losses on its income statement immediately, rather than when the losses are paid. However, tax treatment of captives is a complex issue, so this is not a given. (Members should consult with a professional tax advisor for advice on this matter, but for some general information, see .Tax Implications. later in this report.)

More Control
All of the benefits addressed above lead to more control; what insurance coverage will be available, when premiums are paid, how premiums are invested, and more are within a captive owner.s control.

Limitations

Time Commitment
The process of first determining if a captive makes sense and then establishing

a captive requires a serious time commitment. Once a captive is formed, an organization may need to devote more time to the ongoing oversight of the captive.

Up-Front Cost

Determining the feasibility of a captive requires a thorough analysis of losses, claims-handling expenses, tax implications, and other factors. Most organizations do not have the in-house expertise to conduct this analysis. This means hiring someone to do the job and paying for it. If a feasibility study indicates that a captive is a viable alternative to commercial insurance, incorporation cost will be incurred.

Opportunity Cost

The funds allocated to capitalizing a captive will not be available for use as working capital, to retire long-term debt, to repurchase common stock, or to fund long-term investments that might generate a higher return.

Unacceptability to Some

Third Parties

Insurance through a captive may be unacceptable to regulators or to some vendors and customers. And some organizations require certificates or other evidence of insurance to be issued only by insurers with certain minimum ratings by one or another rating service. This .unacceptability. factor can be overcome with the use of a .fronting company. or .fronting insurer.- a commercial insurer willing to produce insurance policies and issue certificates of insurance, even though the captive pays the claim in full. Commercial insurers, however, charge a fee for this service, which increases the cost of using a captive. (See .Fronting Arrangements. later in this report.)

Risk of Adverse Loss Experience

Most captives are formed based, in part, on the assumption that future losses will be similar to past losses, but it is impossible to predict when there will be an ice storm, a major lawsuit, a terrorist attack, or some other catastrophic event. For captives writing risk not previously self-insured, by the parent or by subsidiaries, there is the potential for increased cost associated with such unexpected adverse loss experience. If a major catastrophe or a high frequency of smaller losses should occur just after a captive owner has implemented their program, it could take some time to catch up to a break-even point.

References & Resources

March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.2.5 Single Parent Captive

Description
A single parent captive is a separate legal entity that insures the risks of its parent company and the parent company's other subsidiaries. It is usually established as a subsidiary of the parent company.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
When forming a single parent captive, the owner will bear the entire cost of a feasibility study and of capitalizing the captive. The initial cost to capitalize the captive will vary according to the domicile (see .Captive Domiciles. later in this report), in accordance with the classes of insurance written and the premium volume. When a parent company shifts cash to a captive to support premium and capital requirements, there may be an "opportunity cost" associated with that transaction. That money will no longer be available to use for other purposes.
References & Resources
March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.2.6 Group Captive

Description
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
A group captive also shares the disadvantages of a single parent captive, with the added potential for poor loss experience by a fellow group member (insurance claims paid to one member impacts premiums for all members) compromising the profitability and viability of the captive. Thus, before forming a group, each member should perform extensive due diligence on all of the other organizations which may join the pool.
References & Resources
March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

5.2.7 Rent-A-Captive

Description
A rent-a-captive is, in essence, an insurer organized to insure risks of unrelated shareholders. It is generally controlled by an organization looking to profit from fees paid by participants, an insurer looking to enhance its insurance-product offerings, or an insurance broker looking to enhance its client services. Unlike single parent captives and group captives, the interests of the owner or owners do not coincide with those of the participants.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
The rent-a-captive can be an ideal solution for an organization too small to form its own single parent captive and unable or unwilling to join forces with others in the same industry in a group captive.
Applicable Risks
Inapplicable Risks
How to Apply
In a rent-a-captive, the capital provider may issue preferred shares to each participant. The agreement will outline how any dividends from good loss experience will be provided to the shareholders. Another approach is to establish a loss-experience account, where each participant benefits from (or bears) the results of a retrospective rating plan or other loss-sensitive rating mechanism. Participants pay their share of the ongoing costs associated with the rent-acaptive through a flat fee for administration. The fee is generally based on a percentage of the capital being .rented.. This will vary but likely range from 1 per cent to 3 per cent. An investment manager hired by the capital provider generally makes the investment decisions, and the capital provider may retain part of the investment

income.
Benefits
Participants can benefit from profitable underwriting, and coverage may be available for risks not insurable in the traditional insurance markets. The rent-acaptive may offer more flexibility in program design than a commercial insurer. Further, joining an existing rent-a-captive will likely take less time than establishing a single parent captive.
Limitations
On the other hand, the participant normally has to provide collateral to the full extent of its aggregate liability, through reinsurance, letters of credit, loss funds, or any alternative acceptable to the capital provider. And the capital provider may decide to withdraw from offering its facilities, so participation in a rent-acaptive may not be the long-term commitment the participant seeks
References & Resources
March. Variability in Construction Insurance and Alternative Insurance Solutions. Canada Mortgage and Housing Corporation (CMHC), 2004.

6- Contract

6.0 Contract

Description
The contractual agreements are aiming to distribute the risk among the parties. In practice, it is usually the best policy that the responsibility of the risk rest with the party best able to manage them.
Parent
-
Phase
Pre-construction
Time Horizon
Long
Type of Response
Transfer
Impact Speed
Low
Mitigated Measures
Time, Cost, Safety, Performance
Typical Users
Owner, contractors
Considerations(Tests)
The requirement to whom the is risk is being transferred: • Ability to undertake a hazardous task • Willingness to take the risk • Financial capability if the risk occurs • Continued existence and adequate finance during period of liability
Applicable Risks
Acts of God, site conditions, quantity variations, weather, defective work, construction risks, delay and time-related risks, Labor/union relation risks, safety(Zack 1996)
Inapplicable Risks
How to Apply
The first step of an effective risk management strategy is to evaluate the commission that is about to be accepted. Who are the participants? What is the project type and size? What are the budgetary and financing considerations? What are the time stipulations? What is the project delivery method? Are there any arduous terms in the contract? Are there any environmental considerations that must be examined? The risks that are associated with the commission of the project will only be uncovered after all these questions are answered in turn. Then the following clauses are used in the contract(Hankinson 2005):

Clauses that limit liability to a client. Clauses can be included in the contract under which
liability is expressly limited to a specified amount, a portion of the fee, or insurance coverage.
Appended to this liability limitation can be a indemnity against third party claims. Thus, if a
claim is made for the specified amount, liability is set to that amount and further claims stemming from third party obligations in excess of that amount are avoided.
Clauses that exclude liability for consequential damage. Clauses can also function to curb losses that stem from consequential damages. These clauses have the effect of overriding the standard of remoteness imposed by common law assessments of contractual damages.
Clauses that impose a private statute of limitations. Clauses that proscribe a date whereby liability stemming from breach is terminated can also be included to minimize risk. A private statute of limitations will effectively shorten the claim period and may bar subsequent claims that would be allowed under ordinary statute of limitations.
Clauses the control the dispute resolution process. An important tool in minimizing risk is the ability to control the process by which disputes will be resolved. Dispute resolution clauses can require that parties first attempt to resolve problems through amicable negotiations. If parties are unable to resolve problems through negotiations, mediators and arbitrators can be included as appropriate remedies in advance of litigation.

Benefits

Limitations

The challenges that may lead to disputes:
Incomplete scope definition, inappropriate contract type, poor communications and uncertainty and unrealistic expectations(Shapiro 2005).

References & Resources

Zack, James G.,Jr. ""Risk-Sharing"--Good Concept, Bad Name." Cost Engineering 38.7 (1996): 26.
Shapiro, Bryan S. "Transferring Risks in Construction Contracts." Vancouver, BC, 2005.
Hankison, Stuart B. "Managing Construction Risks." Vancouver, BC, 2005.
Al-Sobiei, Obaid Saad, and David Arditi. "Managing Owner's Risk of Contractor Default." Journal of construction engineering and management 131.9 (2005): 973.
Charoenngam, Chotchai, and Chien-Yuan Yeh. "Contractual Risk and Liability Sharing in Hydropower Construction." International Journal of Project Management 17.1 (1999): 29-37.
Deng, . Reasons Underlying a Mandatory High Penalty Construction Contract Bonding System. Vol. 130. New York, N.Y.: American Society of Civil Engineers, c1983-, 2004.
McDonald, Donald F.,Jr, and John O. Evans III. "Construction Contracts: Shifting Risk Or Generating a Claim?" AACE International Transactions (1998): L1.
Riggs, Frank E.,Jr. "Subcontract Termination: Ten Rules for Managing the Risks." Construction Accounting & Taxation 13.4 (2003): 5.
Stockenberg, Richard A. "Risk-Shifting may Even be Counterproductive." Building

Design & Construction 43.7 (2002): 35.

6.1 Bonus and Incentives

Description
The use of incentives should encourage the parties to work together to eliminate wasteful activities that do not add value for the client and to identify and implement improvements, alternative designs, working methods and other activities that result in added value. Example: • guaranteed or fixed levels of capacity, allowing the planning of investments and improvements by the provider • revenue sharing, profit sharing, or tariff reduction • commercial opportunities in related areas (carefully regulated by the customer) • opportunity for innovation: the deal gives the provider the chance to implement or devise new solutions that will improve their standing • key performance indicators (KPIs) for recognition and reward.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Applicable Risks
Inapplicable Risks
How to Apply
▪ Incentives should not be given merely for meeting the contractual requirements nor should they be made for improvements in performance that are of no value to the client (e.g. for completing a building contract three months early when the client is still committed to paying rent, rates and other charges on the existing premises). ▪ When drafting contracts, consideration should be given to how incentive arrangements might be incorporated to deliver greater value for money. Where possible, incentives should be arranged so that the party (e.g. sub-contractor or

sub consultant) primarily responsible for significant improvements in performance is rewarded accordingly, rather than the main contractor or main consultant.

- Performance targets on which incentives are based must be measurable. Clients will need to weigh up the benefits of proposed improvements, exercising appropriate judgment before agreeing to them. Quality must not suffer as a result of accepting proposed improvements.
- It is important that incentives are balanced.They should not emphasise one aspect of performance at the expense of other, perhaps less visible, aspects.The aim is value for money at all levels, rather than simple cost savings.
- Financial incentives should offer rewards to both parties that fairly reflect any investment they have to make to achieve the saving in the first place.

Target incentive mechanisms are often used where work is task based.
The provider is given the incentive to submit optimal resource estimates for a task.
This provides for the sharing, in predefined ratios, of the risks and benefits of the provider exceeding or undercutting those original estimates.

Benefits
Limitations
References & Resources

6.2 Clauses

6.2.1 Contract Clauses/Economic Price Adjustment

Description
Allows for controlled price escalation during the life of the project. Keeping in mind that fixed price contracts are prone to the most claims, particularly for complex design projects which are in excess of three years in duration, this contract could set a limit on the price escalation to be carried by the Contractor, leaving anything above that amount to the Owner. In this way, if costs increase significantly during the life of the project, the contract contains a formula and the conditions for compensating the Contractor, potentially limiting or reducing the need for claims.
Parent
Contract/Contract clauses
Phase
Preconstruction
Time Horizon
Construction
Type of Response
Transfer
Impact Speed
Slow
Mitigated Measures
Cost
Typical Users
Owner
Considerations or Tests
Applicable Risks
Inflation,
Inapplicable Risks
How to Apply
Benefits
Limitations
References & Resources
Zack, James G.,Jr. ""Risk-Sharing"--Good Concept, Bad Name." Cost Engineering 38.7 (1996): 26. Shapiro, Bryan S. "Transferring Risks in Construction Contracts." Vancouver, BC, 2005. Hankison, Stuart B. "Managing Construction Risks." Vancouver, BC, 2005.

6.2.2 Liquidated Damages

Description
Means that the loss is estimated before the contract is signed and before any breach has occurred.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Influenced Variable
Typical Users
Considerations or Tests
Impact on Risk Manageability
Reversibility
Applicable Risks
Inapplicable Risks
How to Apply
The parties agree beforehand if a certain type of breach occurs (typically a delay), damage will be fixed at a certain amount, such as $1000 per day. If the liquidated damage is unreasonably high in order to terrorize a party into performing, it will be considered a penalty and may not be enforceable.
Benefits
Limitations
References & Resources
Zack, James G.,Jr. ""Risk-Sharing"--Good Concept, Bad Name." Cost Engineering 38.7 (1996): 26. Shapiro, Bryan S. "Transferring Risks in Construction Contracts." Vancouver, BC, 2005. Hankison, Stuart B. "Managing Construction Risks." Vancouver, BC, 2005.

6.2.3 Change Order Limitations

Description
Most contract documents do not include the typical change order language the client will employ when changes to the work are formalized into written contract changes. Unless the contractor has previous experience with the client and the language it uses in change orders, the contractor may encounter language in the change order document that severely limits its ability to make a subsequent claim for added time and costs that is caused by unknown or subsequent events.
Parent
Contract
Phase
Time Horizon
Type of Response
Impact Speed
Influenced Variable
Typical Users
Considerations or Tests
Impact on Risk Manageability
Reversibility
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
References & Resources
Zack, James G.,Jr. ""Risk-Sharing"--Good Concept, Bad Name." Cost Engineering 38.7 (1996): 26. Shapiro, Bryan S. "Transferring Risks in Construction Contracts." Vancouver, BC, 2005. Hankison, Stuart B. "Managing Construction Risks." Vancouver, BC, 2005.

6.2.4 Soil Report

Description
The AlE who prepares the contract document package, used by the contractors competing for the work, will often include for "bidding purposes only" the site soils investigatory report. However, the contract documents disavow any use of the soils report for purposes of making a differing site condition claim during project execution. Besides being contrary to common sense, these types of clauses only provide a temporary refuge for the client and its representative when differing site conditions are encountered. How the owner and AlE apply such disclaimer clauses provides the contractor, who has the successful bid, with a better understanding of how it should approach problems as they arise during construction. If the client is one of those who includes many such disclaimers, and then follows through with a strict application of the clauses, then the contractor should be equally strict with following through with timely written notice, full documentation, and follow through with change order requests. This would be a clear situation where the owner's actions have a direct result on the contingencies used by the bidding contractors, with a subsequent higher price of performance.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Influenced Variable
Typical Users
Considerations or Tests
Impact on Risk Manageability
Reversibility
Applicable Risks
Inapplicable Risks
How to Apply
Benefits

Limitations

References & Resources

Zack, James G.,Jr. ""Risk-Sharing"--Good Concept, Bad Name." Cost Engineering 38.7 (1996): 26.
Shapiro, Bryan S. "Transferring Risks in Construction Contracts." Vancouver, BC, 2005.
Hankison, Stuart B. "Managing Construction Risks." Vancouver, BC, 2005.

6.2.5 Hold-Harmless Clauses

Description
Hold-harmless Clauses A hold-harmless clause, often referred to as an indemnification provision, is used to shield a party from its own negligence. While the intent of most such clauses is primarily for personal injury situations, a good attorney may argue, most often in vain, that the clause will preclude recovery for delays and impacts caused by changes to the work. Courts have, for the most part, put severe limitations on the applicability of such clauses. A common hold-harmless clause may state: Contractor covenants and agrees that it shall indemnify and hold indemnities, and all of its officers, agents and employees, harmless from any claim, loss damage, cost charge or expense, whether to any person or property or both, arising directly or indirectly out of the contractor's or any of its subcontractor's, performance of the contract, to which indemnities, or any of its officers, agents or employees may be subject or put by reason of any act, action, neglect or omission on the part of the contractor, any of its subcontractors or indemnities, or any of their respective officers, agents and emplmees.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Influenced Variable
Typical Users
Considerations or Tests
Impact on Risk Manageability
Reversibility
Applicable Risks
Inapplicable Risks

How to Apply
Benefits
Limitations
References & Resources
Zack, James G.,Jr. ""Risk-Sharing"--Good Concept, Bad Name." Cost Engineering 38.7 (1996): 26. Shapiro, Bryan S. "Transferring Risks in Construction Contracts." Vancouver, BC, 2005. Hankison, Stuart B. "Managing Construction Risks." Vancouver, BC, 2005.

6.2.6 Differing Site Conditions

Description
Most standard contracts have some form of differing site conditions clause, with many patterned after the US federal government clause that states: (a) The contractor shall promptly, and before the conditions are disturbed, give a written notice to the contracting officer of (11 subsurface or latent physical conditions at the site which differ materially from those indicated in this contract, or (21 unknown physical conditions at the site, of an unusual nature, which differ materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in the contract. (b) The contracting officer shall investigate the site conditions after receiving the notice. If the conditions do materially so differ an increase or decrease in the contractor's cost of, or the time required for, performing any part of the work under this contract, whether or not changed as a result of the conditions, an equitable adjustment shall be made under this clause and the contract modified in writing accordingly. ;c) No request the contractor for an equitable adjustment to the contract under this clause shall be allowed, unless the contractor has given the written notice required; provided, that the time prescribed in (a) above for giving written notice may he extended by the contracting officer. (el) j\o request by the contractor for an equitable adjustment to the contract for differing site conditions shall be allowed if made after final payment under this contract. The issue of differing site conditions is d \\ell-litigated issue. While most owners and contractors have experience with such events and know the possibility of extended delays and significant added costs, the parties often do not fully comply and follow through with the contract requirements. Often, notice is not timely by the contractor, or the owner ignores or does not properly investigate the issue. The owner may not provide positive directions on how the contractor is to proceed, which further delays and affects progress. Final;, little or no documentation is maintained to define the true time and cost impact of the event. In addition to the generally poor follow-through by the parties when a differing site condition is encountered, many cannot resist the temptation to "enhance" the basic differing site condition clause with additional wording used to shift all risk of the design process onto the contractor. As seen in the following section on soils reports, such

risk shifting only ends up hurting the owner, as most contractors are enough to get such egregious, exculpatory clauses thrown out in litigation.

Parent

Phase

Time Horizon

Type of Response

Impact Speed

Influenced Variable

Typical Users

Considerations or Tests

Impact on Risk Manageability

Reversibility

Applicable Risks

Inapplicable Risks

How to Apply

Benefits

Limitations

References & Resources

Zack, James G.,Jr. ""Risk-Sharing"--Good Concept, Bad Name." Cost Engineering 38.7 (1996): 26.
Shapiro, Bryan S. "Transferring Risks in Construction Contracts." Vancouver, BC, 2005.
Hankison, Stuart B. "Managing Construction Risks." Vancouver, BC, 2005.

6.2.7 No Damage for Delay

Description
The no damage for delay clause provides that the contractor is only entitled to a time extension and no money for any delays caused by the owner or its representatives. Typical language states: In the event the contractor is delayed in the prosecution of its work by an act, omission, neglect, or default of the owner, the contractor agrees to make no claim for damages for delay in the performance of this contract and that any such claim shall be fully compensated for by an extension of time to complete performance. No damages for delay clauses have been found to be enforceable with the following exclusions. 1. The clause does not pertain to delays beyond the contemplation of the parties at the time of contract execution. One could say that this would leave a door open for contractors to claim just about any type of owner-caused delay as not being contemplated. However, courts have seen fit to interpret such clauses in a very narrow manner and to the benefit of owners. In some cases, courts have seen fit to excuse just about all owner delays. 2. The clauses would not pertain where intentional fraud or bad faith causes the delay. As has been discussed previously, such claims are rare in construction litigation. 3.The clause would not pertain in the case of active interference by the owner, which provides the most common avenue of attacking the no damages for delay clause It is rare for an eager owner's agent to act in a manner free of active interference when the project experiences multiple delays and changes.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Influenced Variable
Typical Users
Considerations or Tests
Impact on Risk Manageability

Reversibility
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
References & Resources
Zack, James G.,Jr. ""Risk-Sharing"--Good Concept, Bad Name." Cost Engineering 38.7 (1996): 26. Shapiro, Bryan S. "Transferring Risks in Construction Contracts." Vancouver, BC, 2005. Hankison, Stuart B. "Managing Construction Risks." Vancouver, BC, 2005.

6.2.8 Weather Delays and Weather Days

Description
weather delays and impacts to the early phases of construction projects can result in a variety of issues concerning the ultimate timely completion of the project and the potential for liquidated damages being accessed. Depending upon the type of project and the contract language used, a contractor that makes a claim for weather-related time extensions may find that: • [n most instances, weather delays are compensable by a time extension only, and that monetary recovery is barred by contract. • Many civil works and highway construction contracts use working days instead of calendar days as the basis of determining the period of performance. Contractors used to working day contracts who then undertake calendar day contract work may be unpleasantly surprised by the process. In the working day form of contract, many contractors are not as concerned about the overall length of performance as they are about not being charged liquidated damages when they run out of working days. [n calendar day contracts the contractor may attempt to have as many days classified as noncharge weather days, and the contractor does not realize that he or she is only preventing subsequent monetary recovery. \Vorst of all, owner granted weather time extensions do not adequately recover the total time lost due to the weather and often force the contractor into a double jeopardy of having to accelerate work and ultimate be liable for liquidated damages caused by productivity impact caused delays. • Whi1e the parties may agree upon what is the baseline or number of expected monthly weather days, the parties may not agree on what constitutes a weather day that adversely impacts the principal item of work or work that is on the critical path. In many cases, the client may refuse to grant time extensions until the end of the project, forcing the contractor into uncertainty about the potential for liquidated damages being accessed. This uncertainty may require the contractor to accelerate his or her work and assume that time extensions will not be granted later
Parent
Phase
Time Horizon
Type of Response
Impact Speed

Influenced Variable
Typical Users
Considerations or Tests
Impact on Risk Manageability
Reversibility
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
References & Resources
Zack, James G.,Jr. ""Risk-Sharing"--Good Concept, Bad Name." Cost Engineering 38.7 (1996): 26. Shapiro, Bryan S. "Transferring Risks in Construction Contracts." Vancouver, BC, 2005. Hankison, Stuart B. "Managing Construction Risks." Vancouver, BC, 2005.

6.2.9 Guaranteed Maximum Payment

Description
In order increase the predictability of the cash flows, the maximum payment for each installment is fixed regardless of the project progress.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Influenced Variable
Typical Users
Considerations or Tests
Impact on Risk Manageability
Reversibility
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
References & Resources
Zack, James G.,Jr. ""Risk-Sharing"--Good Concept, Bad Name." Cost Engineering 38.7 (1996): 26. Shapiro, Bryan S. "Transferring Risks in Construction Contracts." Vancouver, BC, 2005. Hankison, Stuart B. "Managing Construction Risks." Vancouver, BC, 2005.

6.2.10 Indemnity

Description
Provisions are frequently used to determine the intent of the parties to a contract in allocation of risk. Although these provisions are often the most important in a dispute, they receive a little attention during negotiation.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Applicable Risks
Inapplicable Risks
How to Apply
Indemnities: Agreement to pay cost of losses property, damages to liability 'hold harmless' agreement: types of indemnities dealing with legal liability claims Surtees: agreement by the third party within the framework of the main contract between the two parties to pay money in the event of non-performance by one those main parties. Bonds: agreement to pay money if quality or fitness for work is not met Guarantees: agreement to provide recompense for inadequate products and services. This is a separate contract wholly outside the main contract. Insurance Liquidate damage: agreement to provide recompense for the cost of delay For other risks not caused by the action of the either party, standard form of contract usually share the risk between them. For instance, in the case of weather, the risk is often apportioned according to whether the weather condition is exceptional or otherwise, it is usually being deemed uneconomic to a client for contractors to accept and include within their tender the price of this risk
Benefits

Limitations
References & Resources
Zack, James G.,Jr. ""Risk-Sharing"--Good Concept, Bad Name." Cost Engineering 38.7 (1996): 26. Shapiro, Bryan S. "Transferring Risks in Construction Contracts." Vancouver, BC, 2005. Hankison, Stuart B. "Managing Construction Risks." Vancouver, BC, 2005.

6.2.11 Limited Liability

Description
The liability of the owner over the cost of the project cannot exceed 120% to 150% of the original contract value.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
References & Resources
Zack, James G.,Jr. ""Risk-Sharing"--Good Concept, Bad Name." Cost Engineering 38.7 (1996): 26. Shapiro, Bryan S. "Transferring Risks in Construction Contracts." Vancouver, BC, 2005. Hankison, Stuart B. "Managing Construction Risks." Vancouver, BC, 2005.

6.3 Lien

6.3.1 Lien/Lien

Description
A lien is a claim against property and is required to be registered in the appropriate land registry against title to property. The effect is to make the property difficult to sell or borrow against until the lien is removed, giving the owner incentive to deal with the claim.
Parent
Contract
Phase
Time Horizon
Type of Response
Impact Speed
Influenced Variable
Typical Users
Considerations or Tests
Impact on Risk Manageability
Reversibility
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
References & Resources

6.3.2 Lien/Trust

Description
Is a legal mechanism for separating the legal interest in property from the equitable interest.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Influenced Variable
Typical Users
Considerations or Tests
Impact on Risk Manageability
Reversibility
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
Limitations
References & Resources

6.3.3 Lien/Holdback

Description
Is a term commonly used to describe the percentage of contract that the owner must not pay to the contractor until specified period after substantial or final completion.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Influenced Variable
Typical Users
Considerations or Tests
Impact on Risk Manageability
Reversibility
Applicable Risks
Inapplicable Risks
How to Apply
The amount of holdback vary from 5 to 15 percent.
Benefits
Limitations
References & Resources

6.4 Procurement Mode

Description
The procurement strategy is primarily concerned with how design aspects are related to construction such as, who bears the design risk and controls design detail? What degree of completeness of design is required prior to the commencement of construction? All procurement strategies represent a balance between cost, time and quality control. Risk and responsibility should go together, so that the party responsible for performing a task is accountable for it and can ensure its successful outcome. The more the client chooses to allocate risk to other parties, the less control the client has over the way in which those tasks are carried out.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
• in-house resource availability and experience; • project size and complexity; • importance of timescales and possible phased completion requirements; • importance of quality and issues surrounding whole-life use of the facility; and • availability of funding (in addition to setting and agreeing the budget for the project).

Table B

Contract Strategy	INDICATIVE RISK ALLOCATION	
	Client	Contractor
Public Private Partnerships		
Design and Construct		
Prime Contracting		
Traditional		
Framework Agreements		
Management Contracting		
Construction Management		

Applicable Risks

Table A

Project Criteria		Appropriateness of Contract Strategy						
Parameter	Objectives	PPP	Traditional	Management Contracting	Construction Management	Design and Construct	Prime Contracting	Framework Agreements
Timing	Early Completion	×	×	✓	✓	✓	×	✓
Cost	Pre construction price certainty	✓	✓	×	×	✓	×	✓
Quality	Design prestige	×	✓	✓	✓	×	×	×
Variations	Avoid prohibitive cost of change	×	✓	✓	✓	×	×	×
Complexity	Technically advanced or highly complex building	✓	×	✓	✓	×	✓	×
Responsibility	Single contractual link	✓	×	×	×	✓	✓	✓
Professional Responsibility	Need for design team to report to sponsor	×	✓	✓	✓	×	×	✓
Risk Avoidance	Desire to transfer complete risk	✓	×	×	×	✓	✓	✓
Damage Recovery	Facility to recover costs direct from contractor	✓	✓	✓	×	✓	✓	✓
Buildability	Contractor input to economic construction	✓	×	✓	✓	×	✓	✓

✓ appropriate × inappropriate

Inapplicable Risks

How to Apply

Benefits

Limitations

References & Resources

6.4.1 Public Private Partnership

Description
Public Private Partnerships (PPP), particularly Private Finance Initiative (PFI) projects, are created for the provision of services and not specifically for the exclusive provision of capital assets such as buildings. For this reason it is preferable to investigate PPPs as soon as possible after a user need has been identified rather than leaving it until a conventional construction project has been selected as the solution. It is possible that a PPP may result in a solution (provision of services to meet the user need) that does not require a construction project.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
▪ The process is service rather than project focused and concentrates on the whole life of the service and associated assets. ▪ There is a single point of responsibility for service delivery. There is an opportunity to draw on a wider range of management and innovation skills.
Limitations
▪ The process will be at risk without a long-term commitment from both the Client and "service providers". ▪ The process leading up to the completion of a new building can take a long time and needs an extensive and fully refined brief at the outset. ▪ There is a significant cost to the industry in tendering which has to be recovered

by each bidder.
- Change is difficult to achieve and potentially expensive to incorporate once the contract is let.

References & Resources

Atkinson, William. "Taking Responsibility for Your Own Risk." Risk Management 49.12 (2002): 40.

6.4.2 Design and Construct

Description
In a design and construct contract, a single supplier is responsible for both the design and construction of the facility. The supplier is likely to deliver the greatest performance benefits to the client through innovation and standardization, where appropriate output specifications are used.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Do we have a defined set of goals and requirement?
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
▪ Low tendering and preparation cost to the Client. ▪ *Single point responsibility for design and cost risks*. ▪ Potential for more economical construction due to early consideration of building methods*('buildability').* ▪ Could result in a shorter overall design and construction period.
Limitations
▪ The Client's requirements must be properly specified prior to signing the contract as Client changes to the scope of the project, once let, can be expensive. ▪ The Client has little control over design and quality standards once the contract is let, as the building is specified on a performance basis. ▪ Design liability offered by design and build contractors is limited. ▪ Design and build is *unsuitable for complex, challenging projects*.

References & Resources

Berends, T. C. "Cost Plus Incentive Fee Contracting - Experiences and Structuring."

International Journal of Project Management 18.3 (2000): 165.

6.4.3 Prime Contracting

Description
Prime contracting requires there to be a single point of responsibility (the Prime Contractor) between the client and the supply chain. The prime contractor needs to be an organisation with the ability to bring together all of the parties (consultants, contractors and suppliers) necessary to meet the client's requirements effectively. There is nothing to prevent a designer, facilities manager, financier or any other organization from acting as the prime contractor.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
This may be appropriate in certain circumstances, for example where there is a continuing program of projects. It is unlikely to be appropriate for clients that infrequently procure buildings.
Applicable Risks
Inapplicable Risks
How to Apply
▪ Clients should ask prime contractors to provide details of all the parties in the supply chain, once they express an interest in being selected to tender. It may not be possible to adequately assess the technical capacity of a prime contractor under the EU procurement rules unless a significant number of the other organizations that make up the supply chain are known and taken into account during the assessment. A key part of the prime contracting route is the development of a whole life cost model before construction commences.
Benefits
▪ Centralized contact for quality, performance and compliance issues, potentially reducing reporting and bureaucracy. ▪ Risk to Client reduced by transfer of risks to the prime contractor.

- Increased opportunities for economies of scale and incentivisation.
- Can deliver cheaper buildings in both initial capital and long-term running costs.
  Facilitates continuous performance improvements and collaborative working.

Limitations

- Additional layer of costs to client due to in-house resource commitment for the duration of the project.
- Larger volume contracts could result in more serious consequences from a failure to deliver.
- Continual improvement can be difficult to measure therefore difficult to prove.
- Tender must have confidence in planning and funding of program to commit resources to bidding and supply chain management.
  It can result in poor price certainty and changes being expensive to implement.

References & Resources

6.4.4 Traditional Lump Sum Contract

Description
With this type of contract, the design team are employed directly by the client to fully develop the design prior to going out to tender. The contract is with a main contractor who has responsibility only for the construction works. If the design has been fully thought out, developed and frozen, then in theory this type of contract should provide a reasonable degree of cost certainty at tender stage. However, the need to work to tight timescales may mean that a fully developed design cannot be prepared in advance of tendering, in which case subsequent design changes will invariably lead to cost escalation
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
▪ Price certainty and transfer of risk to the main contractor is achieved at contract award provided no subsequent changes are instructed to the design. ▪ A high level of quality in design and construction is achievable as the scope of the work is prescribed on an input basis. ▪ The Client retains direct contractual relationships with the design team, cost consultant and main contractor.

Changes to the works can be evaluated on the basis of known prices obtained in competition without necessarily excessive cost or time implications.

Limitations

- The overall program may be longer due to the need to produce a fully detailed design
  before the project goes out to competitive tender and work starts on site.
- The Client must have the resources and access to the expertise necessary to administer the contracts of consultants and the main contractor.
- The consecutive timing of design and construction results in a lack of continuity between the designer and the builder (and hence less input on 'build ability). Claims for delay and disruption can arise if the design is not fully detailed prior to agreeing the contract sum or if the Client varies the design afterwards.

References & Resources

Berends, T. C. "Cost Plus Incentive Fee Contracting - Experiences and Structuring."

International Journal of Project Management 18.3 (2000): 165.

6.4.5 Framework Agreements

Description
Framework agreements (including call-off contracts) with a single supplier or a limited number of suppliers can result in significant savings to both parties particularly where a number of projects are involved. The resource implications for the client of managing more than one agreement for each type of work should be borne in mind when deciding whether to award more than one framework agreement.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Framework agreements may cover prime contracting and design and construct procurement routes. They are unlikely to be appropriate for clients that only occasionally procure buildings. They can be particularly appropriate for maintenance requirements
Applicable Risks
Inapplicable Risks
How to Apply
▪ Framework Agreements should only be used after discussions with Construction Advice and Policy Division.
Benefits
▪ no requirement for rebidding of each individual project; ▪ continuous improvement by transferring the learning from one project to another; ▪ reduced confrontation; and ▪ continuity of workflow. ▪ Ability to call off urgent requirements quickly. ▪ Ease of placing contracts and avoidance of repetition (*resource savings for*

Client).

- Further competition can still take place among the framework suppliers to meet the specific needs of the Client.

Limitations

- Client needs to be sufficiently experienced and resourced to manage concurrent contracts.
- Framework Agreements by their nature restrict the overall choice of suppliers
- Needs early and long term commitment and a continuing programme of work.
- Contract periods extending after the framework expires can reduce the incentive to perform well, especially if the contractor's services are not being renewed under the framework.
- Framework Agreements should only be used after discussions with Construction Advice and Policy Division.

References & Resources

6.4.6 Management Contracting

Description
This is a ‘fast track’ strategy which overlaps the design and construction stages and enables early work packages to be placed before the design is complete.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
▪ Early completion is possible due to a shorter overall period with overlapping design and construction activities, even in complex buildings. ▪ While the Client maintains direct control over the design team, the management and trade contractors can contribute to early design development and improve the management and build ability of the construction process ▪ The management contractor assumes some risk for the performance of the trade contractors. Changes can be accommodated in let and unlit packages provided there is little or no impact on the overall project (timetable and/or budget).
Limitations
▪ The final price and timescale are not fixed at the commencement of the works and do not become so until the last work package has been let. ▪ The Client must have the resources and access to the necessary expertise to deal with

separate design consultants and the management contractor.

- It is unsuitable for an inexperienced and/or hands off Client as there is a risk of increased
  costs and delays arising from ineffective administration.

References & Resources

6.4.7 Construction Management

Description
This is also a 'fast track' strategy where works packages are let before the design of later packages has been completed. A construction manager is appointed by the client to manage the overall contract in return for a management fee and, as with management contracting, the project can benefit from the early involvement of the contractor. The contracts for the works packages are placed directly between the client and the trade contractors, and the client can expect to have a high level of involvement during the design development and construction phases of the work. As with management contracting, the final cost will only be known once the final works package has been awarded.
Parent
Phase
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Typical Users
Considerations or Tests
Construction management was largely devised for use in the commercial development market and, while there are examples of public sector projects being successfully procured via this route, CM is generally unlikely to represent an appropriate option for public sector procurers other than in exceptional circumstances and where the client has the necessary resources and experience
Applicable Risks
Inapplicable Risks
How to Apply
Benefits
▪ Construction management should reduce the overall project timescale by allowing procurement and construction to proceed before the design is completed. ▪ The Client controls the design and changes can be accommodated in let and unlet packages provided there is little or no impact on the overall project (timetable

and/or budget).

- It can be applied to a complex building and has buildability potential. the Client contracts directly with trade contractors, which could result in lower prices and allows poor performance to be dealt with directly.
  The construction manager can build better team relationships with trade contractors and resolve disputes directly.

Limitations

• The final design, price and timescale are not fixed at the commencement of the works and do not become so until the last work package has been let.
• The Client bears most of the total risk including delays, disruption, design and its coordination
with construction; there must be a robust process for instructing and approving changes.
• The construction manager does not assume any risk other than negligence, is not responsible
for achieving programme and cannot instruct third parties.
• The design team must envisage both the totality and detail of the design at the outset,
accommodating uncertainty, procuring long lead-time items early and avoiding retrospective change.
• Clients need to be experienced, informed, decisive and have the resources to administer the contracts of the separate design team members and many trade contractors.
• Construction management consultants must be sufficiently incentivised to avoid fee
escalation; they should be experienced in CM and have good leadership skills.
• The Client should place a greater premium on risk management in CM than under other
approaches, and needs to ensure that roles and responsibilities are well defined at the outset.

References & Resources

6.5. Warranties/Guarantee

6.5.1 Warranties

Description
Parent
Phase
Construction, Operation
Time Horizon
Long
Type of Response
Transfer
Impact Speed
Low
Mitigated Measures
Performance
Typical Users
Client
Considerations or Tests
▪ a guarantee on purchased goods that they are of the quality represented and will be replaced or repaired if found to be faulty. ▪ a collateral undertaking that a fact regarding the subject of a contract is or will be as it is expressed or by implication declared or promised to be. (0.6) ▪ Experience shows warranty/guarantee expenditures are between 0-2% of Total Installed Cost with most less than ¼% (mixture of Lump Sum & Reimbursable Cost)(0.6) ▪ Be careful about implied and explicit warranty
Applicable Risks
Equipment life, Service, Project performance
Inapplicable Risks
How to Apply
Similar to general contract the warranties clauses should cover four areas: 4 Clauses which define the norm of the industry and acceptable standard 5 Period. The term in which the warrant is applicable. 6 Dispute resolution process. This section defines the options and remedies available to the owner.

7 Exclude liability for consequential damages to curb the possibility of getting sued for implied warranties.
Example:

CLAUSE I-149 – WARRANTY OF CONSTRUCTION (August 2002)

(a) In addition to any other warranties in this subcontract, the Subcontractor warrants, except as provided in paragraph (j) of this clause, that work performed under this subcontract conforms to the subcontract requirements and is free of any defect in equipment, material, or design furnished, or workmanship performed by the Subcontractor or any lower-tier subcontractor or supplier at any tier.

(b) This warranty shall continue for a period of 1 year from the date of final acceptance of the work. If SURA takes possession of any part of the work before final acceptance, this warranty shall continue for a period of 1 year from the date SURA takes possession.

(c) The Subcontractor shall remedy at the Subcontractor's expense any failure to conform, or any defect. In addition, the Subcontractor shall remedy at the Subcontractor's expense any damage to SURA and/or Government-owned or controlled real or personal property, when that damage is the result of –

(1) The Subcontractor's failure to conform to subcontract requirements; or

(2) Any defect of equipment, material, workmanship, or design furnished.

(d) The Subcontractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Subcontractor's warranty with respect to work repaired or replaced will run for 1 year from the date of repair or replacement.

(e) SURA shall notify the Subcontractor, in writing, within a reasonable time after the discovery of any failure, defect, or damage.

(f) If the Subcontractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, SURA shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Subcontractor's expense.

(g) With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this subcontract, the Subcontractor shall –

(1) Obtain all warranties that would be given in normal commercial practice;

(2) Require all warranties to be executed, in writing, for the benefit of the Government, if directed by SURA; and

(3) Enforce all warranties for the benefit of the Government, if directed by SURA.

(h) In the event the Subcontractor's warranty under paragraph (b) of this clause has expired, the Government and/or SURA may bring suit at its expense to enforce a subcontractor's, manufacturer's, or supplier's warranty.

(i) Unless a defect is caused by the negligence of the Subcontractor or lower-tier subcontractor or supplier at any tier, the Subcontractor shall not be liable for the repair of any defects of material or design furnished by SURA nor for the repair of any damage that results from any defect in SURA-furnished material or design.

(j) This warranty shall not limit SURA's rights under the Inspection and Acceptance clause of this subcontract with respect to latent defects, gross mistakes, or fraud.

Benefits

Limitations

References & Resources

http://law.freeadvice.com/general_practice/guarantees/
http://www.law.com/
http://www.ftc.gov/bcp/edu/pubs/consumer/products/pro17.shtm
http://www.ftc.gov/bcp/edu/pubs/consumer/products/pro17.pdf
http://www.jlab.org/div_dept/admin/business/terms_cond/I_clauses/149.pdf
Ndekugri, . Performance Bonds and Guarantees: Construction Owners and Professions Beware. Vol. 125. New York, N.Y.: American Society of Civil Engineers, c1983-, 1999.

6.6 Organizational Structure

6.6.1 Joint Venture

Description
Parent
Phase
Feasibility
Time Horizon
Type of Response
Impact Speed
Mitigated Measures
Safety and Time
Typical Users
Considerations or Tests
since all possible risks are difficult to foresee at the outset, unforeseen risks would need to be dealt with, using a joint risk management (JRM) strategy that continues into the post-contract stage. Given the nature of today's construction industry as a very high risk, complex, multiparty business, conflicts between the diverse participants need to be minimized through better relationships and co-operative teamwork (Dissanayaka and Kumaraswamy, 1999), where the motivation and attitudes of the project participants are critical.
Applicable Risks
▪ Natural hazards ▪ Buildability and constructability ▪ Change order evaluation and negotiation ▪ Conflicts in documents ▪ Cost of legal processes ▪ Delays in resolving contracting issues ▪ Delays in resolving disputes ▪ Public disorder ▪ Guarantee of existence ▪
Inapplicable Risks
▪ Accident at site ▪ Construction method ▪ Contractor competence ▪ Defective construction work ▪ Financial failure of the client ▪ Labor problems and disputes ▪ Labor equipment and productivity ▪ Material and equipment quality ▪ Quality of work ▪ Subcontractor failure
How to Apply

A clear ‘meeting of minds’ of the different contracting parties appears necessary.

This migration tool is applied at two stages of the project: Start up and Operation

Start Up:

It must consider the local partner’s financial and management ability, its industrial relationship, and its relationship with local government. Another effective measure is to insist on drafting a good JV agreement that clearly defines each partner’s responsibility and liability. The terms and clauses of agreement should be drafted in simple language for both partner’s employees understanding. It is also necessary to ensure that critical staffs are unbiased and experienced in joint management and have mastered the local language. It is preferable to adopt a one-partner-dominant style of management when one partner is strong enough to handle major construction works(1-Bi Ling 384).

Operation:

When the ICJV enters into the operation phase, it is critical to choose experienced and familiar subcontractors and suppliers, and to employ an influential local organization or individual, particularly as a logistic agent in a developing country to strengthen the ICJV operation. A fair engineering contract that includes time and cost adjustment clauses with its client is vital. Another measure is to maintain a good relationship with the host government and the local authorities. Finally, constructive conflict and dispute resolution techniques must be carried out throughout the life of a JV. Renegotiation needs an attitude of mutual respect and patience.

How to pick a partner?	
Partner selection	1. Resourceful and financially strong 2. Technical and management competence 3. Partner has strong relationship with host government
Agreement	1. Ensure clear terms and conditions 2. Define clear authority and responsibility 3. Accounting standard 4. Define transfer scope clearly
Employment	1. Employ local staff with bilingual ability 2. Define each staff’s scope of work 3. Select staff carefully for ICJV 4. Employ unbiased and experienced staff 5. Choose right staff for technology transfer 6.
Control	1. Allocate work to partner according to his ability 2. Maintain ICJV policies by being dominant over partner in ICJV 3. Control ICJV’s board of directors by parent company 4.
Subcontract	1. Use experienced and familiar suppliers and subcontractors

	2. Employ influential logistic agents 3. Engage local security firm 4. Subcontract to local pollution control specialist 5. Subcontractors complement the partner's shortcoming 6.
Engineering contract	1. Reimbursement classes 2. Adjustment clauses in contract 3. Specify construction extension clause in contract 4. Adopt current international conditions in contract 7. Dual-currency condition
Good Relationship	1. Comply with local culture and tradition 2. Establish good relationship with host government 3. Maintain good contact in name of ICJV 4. Ask parent companies to maintain good relationship for ICJV 5. Maintain good relationship with local environmental authority
Review and Renegotiation	1. Conflict/dispute review and renegotiation 2.
Others	1. Conduct detailed feasibility study of project 2. Appoint independent accounting auditor 3. Insure all insurable force majeure risks

Benefits

Saving cost, meet earlier completion of deadlines, safer construction environment, non-adversarial contracting, and continuity of workload
Help to protect companies in competitive market, with high risk of economic downturn

Limitations

Legal and contractual implications

References & Resources

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