Risk Assessment

Property & Business Interruption

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Agenda

- Risk Assessment Definition
- Property Risk Survey
- Property EML Assessment
- Underwriting Considerations for Risk Assessment
- Risk Presentation
- Business Interruption Risk Assessment

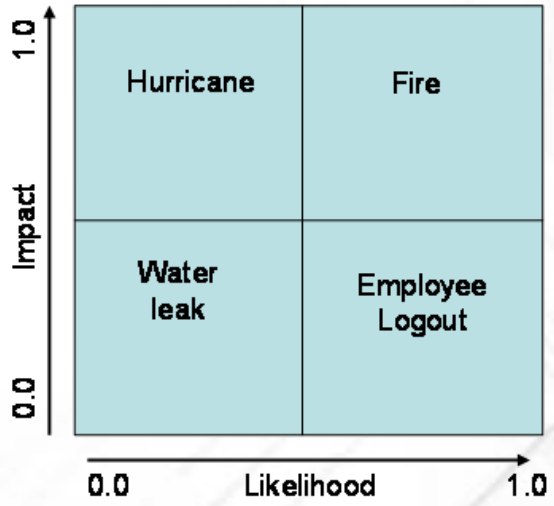
Risk Assessment - Definition

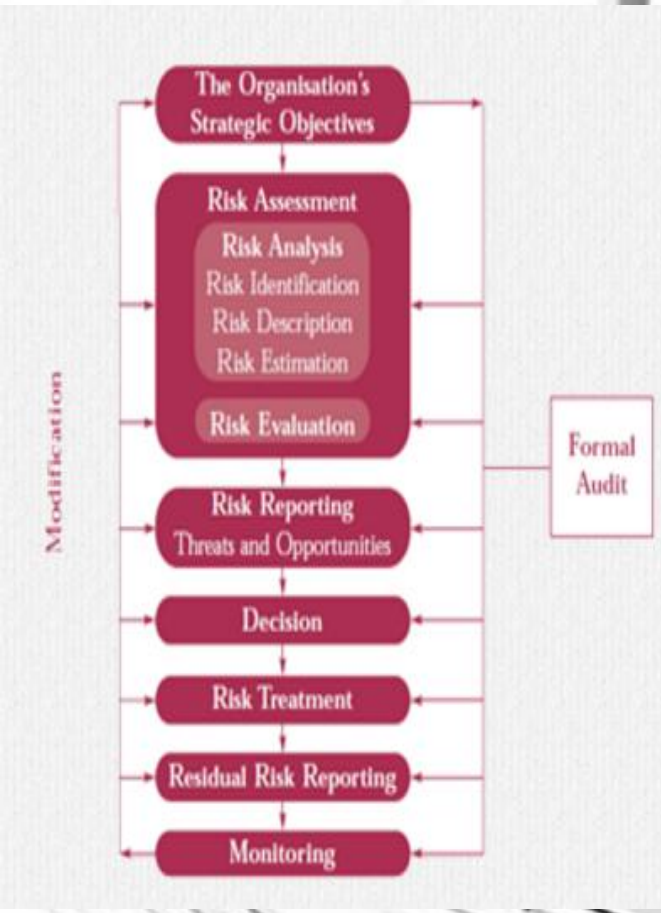
Risk assessment is the process of identifying variables that have the potential to negatively impact an organization's ability to conduct business.

Risk assessments can be:

- **Quantitative** [assign numerical values, probability / impact, calculate risk factors]
- **Qualitative** [No numerical values, simply to rank which risks pose the most danger.

Event	Likelihood (a)	Impact (b)	Risk factor (a x b)
Fire in data centre	0.7	0.9	0.63
Loss of power	0.5	0.8	0.40
Staff illness	0.6	0.5	0.30
Hurricane	0.4	0.9	0.36
Water leak	0.3	0.5	0.15
Employee forgot to log off from workstation	0.8	0.3	0.24





Property Risk Survey

Property Risk Survey

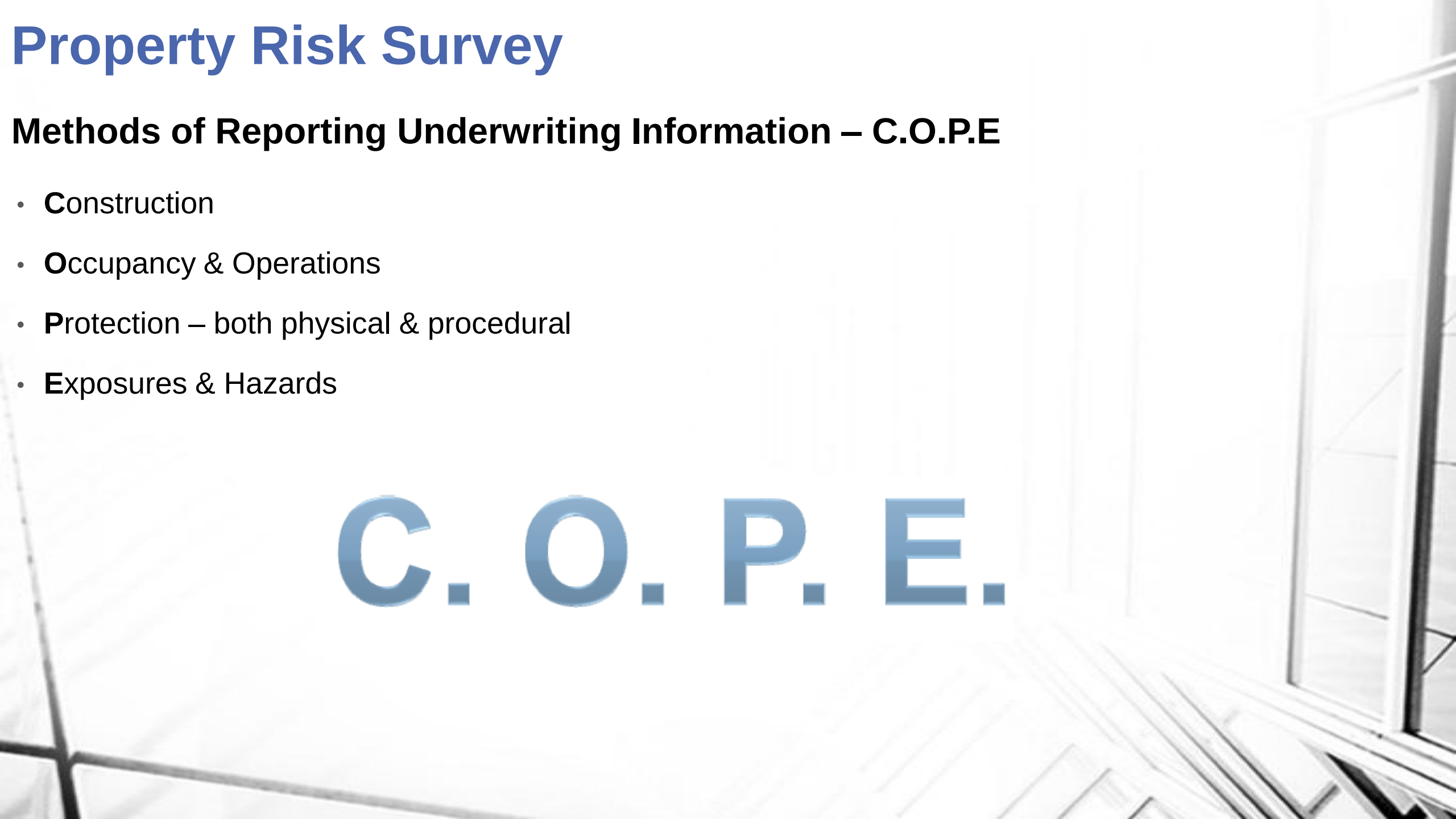
Objective

- Review site conditions
- Provide updated Underwriting information
- Provide the Client with “Risk Improvement” recommendations
- Evaluate the Client’s ‘loss prevention and control program’
- Confirm the readiness of the protection systems and programs
- Review outstanding recommendations

Property Risk Survey

Methods of Reporting Underwriting Information – C.O.P.E

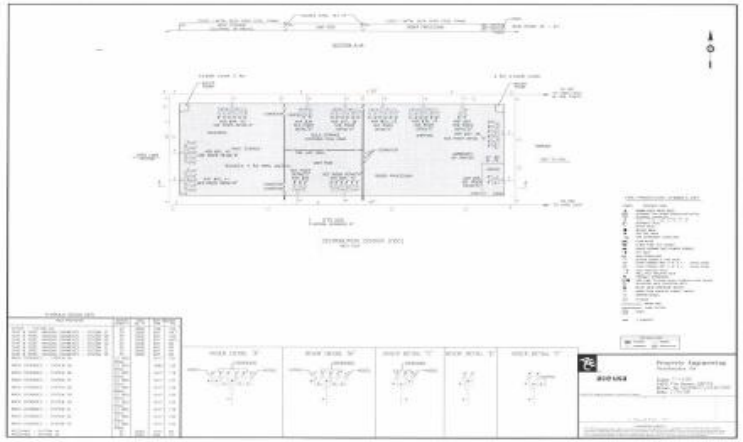
- **C**onstruction
- **O**ccupancy & Operations
- **P**rotection – both physical & procedural
- **E**xposures & Hazards



Property Risk Survey

Preparation for Site Visits

- Review previous risk reports
- Site Diagrams
- Review previous risk control recommendations
- Review technical information about risk
- Fire Equipment Tests
  - Fire Pump Tests
  - Fire Hydrant Flow Test
  - Fire Door Closure Test
  - Smoke Detection & Alarm System Test etc.
- Time management



Property Risk Survey

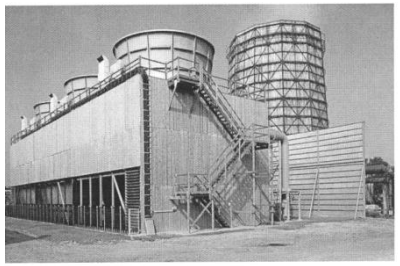
Procedures during Site Visit

- Meet Plant Management
- Review any changes in the facility
- Status of previous recommendations (if any)
- Loss History
- Loss Control Program & Self Inspection Reports (NFPA 25 / 72)
- Competence & Training of employees
- Business Continuity & Emergency Response Plan
- Procedures for handling impairments

Property Risk Survey

Site Observations & Inquiries

- Building Structure – Construction Type & Material
- Roof System – Covering, Drainage, Storage etc.
- Process Equipment
  - Cooling Towers
  - Product Storage Tanks & Bins etc.
- Smoke & Heat Venting / Exhaust
- Plant Utilities
- Operations & Processes
- Special Hazards

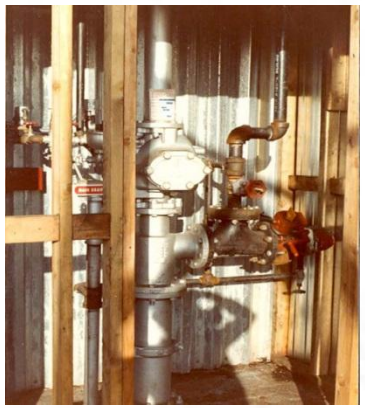


Property Risk Survey

Site Observations & Inquiries (Contd…)

- Storage of Raw & Finished Products
- Production Method & B.I Potential
- Fire Barriers
  - Fire Walls
  - Fire Doors etc.

- Fire Suppression System & Water



Property Risk Survey

Site Observations & Inquiries (Contd…)

- Site Exposures
  - On site
  - Off site
- NatCat Exposures

Earthquake

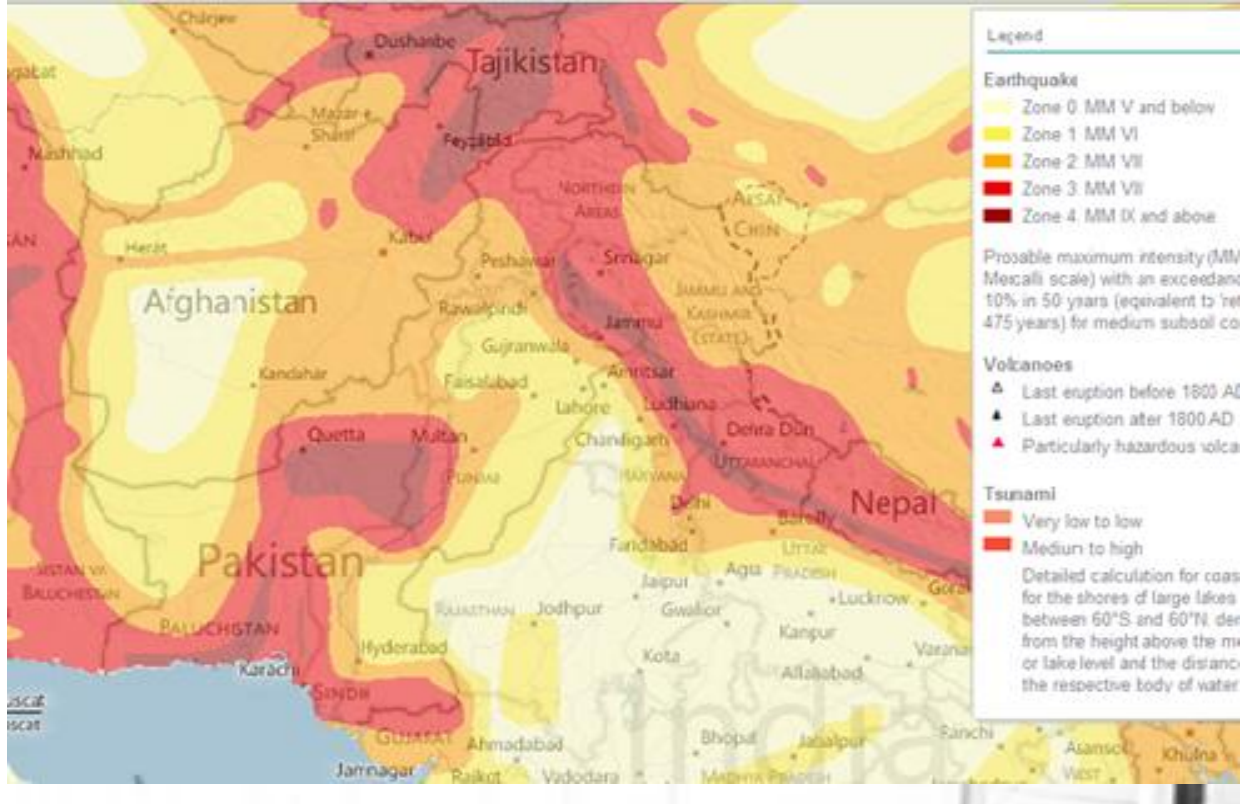
Flood

Wind Storm

Property Risk Survey

Nat Cat Exposures

- Site Global Co-ordinates [Google Earth]
- Munich-Re Nathan Online Database
  - Earthquake [Zone 0 – 4]
  - Flood
  - Tsunami etc.



Hazard Score Rating

Hazard zoning values for significant natural hazards

	low – high	hazard rating
Earthquake		Zone 1
Volcanoes		No hazard
Tsunami		No hazard
Tropical cyclone		No hazard
Extratropical storm		No hazard
Hail		Zone 2
Tornado		Zone 2
Lightning		Zone 4
Wildfire		Zone 2
River flood		Zone 100
Flash flood		Zone 4
Storm surge		No hazard

Property Risk Survey

Security

- It’s a totally changed environment
- Guards and fences – don’t work anymore
- Technology does
- CCTVs, Metal detectors, Scanners
- Employee and Visitor access
- Restricted access
- Document and electronic security

Property Risk Survey

Security

Access Control Systems

Metal Detector

Property Risk Survey

Security

Doom Camera

Explosive Detector

Walk Through Gate

Sniffer dogs

Metal Detector

Property Risk Survey

Property Loss Control – Terminologies

Hazard

"**a chemical or physical condition of a system that has the potential for causing damage** to people, property, the environment or some combination of these."

Hazard Types

Building Services Hazards

- Natural Gas Supply for Heating
- Electrical Equipment
- Boilers
- Refrigeration System

Operations & Process Hazards

- Chemical Processes
- Flammable Liquid Storage & Use
- Natural Gas Supply for Process Furnaces

Hazard Analysis

Systematic analysis of all hazards and focuses on mechanisms

Property Risk Survey

Property Risk Evaluation Report - Results

- Accurate underwriting information
- Updated status of previous recommendations
- Production, as necessary, of new loss control recommendations
- Improvement of the **Risk**, preserving the **investment**, continued **operation** and **profitability** of the Client's site

Property Risk Survey

Reference Material

- NFPA Standards + Handbooks
- FM Global Data Sheets
- Peer assistance etc.

Factory Mutual System
APPROVED

Property Risk Survey

Case Study

Risk Rating Scale

1	2	3	4	5
Unacceptable	Poor	Average	Good	Excellent

Risk Criteria	Risk Rating	Rated
Construction	1 - 5	4
Separation between Buildings	1 - 5	3
Occupancy	1 - 5	3
Housekeeping	1 - 5	1
Storage Practice	1 - 5	3
Business Interruption Exposure	1 - 5	1
Fire Protection	1 - 5	3
Site Surrounding Exposure	1 - 5	2
Nat Cat Exposure	1 - 5	2
Security	1 - 5	4
Total Points	***50***	***26***

Property EML Assessment

Property EML Assessment

“Risk”: The Client’s property (real and otherwise), or the Client’s operations and income generating ability. Also, the Perils and Hazards identified.

“Time Element Loss”: the loss of revenue due to the loss by “peril”, of a Client’s property. Often referred-to as “Business Interruption” or B.I.; the mitigation of the B.I. peril is “Business Continuity” planning.

MAS = Maximum Amount Subject: the maximum total amount of physical damage and time element loss (BI), which is expected to occur under the worst possible conditions.

Property EML Assessment

PML / NLE - Difference

Probable Maximum Loss (PML)	Normal Loss Expectancy (NLE)
- Assumes Fire occurs in the worst possible case at the worst possible time - No Sprinkler / Other Fire Protection Systems Operational - Fire Response Team fails to arrive - Only measure that restricts the loss is by adequate separation of the structure - Will produce higher estimate than the EML and will often approach 100% depending upon the departmentalization / length of the building	- Estimate of the largest loss (Excluding a Catastrophe loss) - Assuming all available protective systems are properly operational - - Loss resulting from a typical fire or explosion which was extinguished or controlled - - Results lower estimate than an EML for the same risk

Property EML Assessment

Loss Estimate Levels

Level I – Primary Protection Systems **are** functioning

Level II – Primary Protection Systems **not** functioning

Level III – No Protection Systems functioning; no manual fire fighting

Level IV – Catastrophic

Property EML Assessment

Loss Estimate Levels

Level I

A loss event in which damage is based on the nature of hazards and construction factors, and where:

- All fire protection systems are in service and functioning as designed.
- Full facility Emergency Response Team (fire brigade or Plant Emergency Organization) and Municipal Fire Department response expected.
- Credit is given to all properly maintained fire barriers up to their design duration rating. protection systems, equipment and available fire fighting services (public and private) function as intended. OR
- Construction features function as designed.

Property EML Assessment

Loss Estimate Levels

Level II

The fire protection system for the area with the largest PD/BI potential is impaired or is rendered inoperative or ineffective by the event. Adjacent fire protection systems are presumed operational unless rendered inoperative or ineffective due to structural failure. The same applies for the use of special extinguishing systems.

Credit can be given for adequate manual emergency response.

Property EML Assessment

Loss Estimate Levels

Level III

A Level III Loss Event occurs when:

- All fire protection systems throughout the entire site or facility are impaired.
- No credit is given for manual emergency response. Damage is limited only by adequate separation and/or free-standing four- hour rated firewalls or equivalent. (Equivalencies must be well defined and proven.)
- Combustible roof construction (including combustible or unknown metal deck assemblies) result in a contiguous structure loss.
- The size of this loss can approach the value of the buildings of origin

Property EML Assessment

Loss Estimate Levels

Level IV

Catastrophic Loss Events, which have the potential to affect multiple plant areas or the entire facility, are beyond the scope of this Technical Standard & Guidelines. “Catastrophic” as used in this category refers to the initiating event, not the consequences due to that event.

Typical events falling into this category would include, but are not limited to, the following:

- Massive releases of hazardous materials
- Massive detonation of explosives
- Natural hazards (floods, tidal waves, hurricanes, seismic disturbances, tornadoes, etc.)
- Falling aircraft
- Terrorism, war-driven events

Property EML Assessment

MAS Conditions

- Response of installed fire protection systems, equipment and available fire fighting services (public and private) is ineffective and the only controlling or limiting factor for controlling a fire are any installed physical barriers and existing spatial separation. The amount subject can include other perils that ensue as a result of the fire, such as explosion of flammable vapors. OR

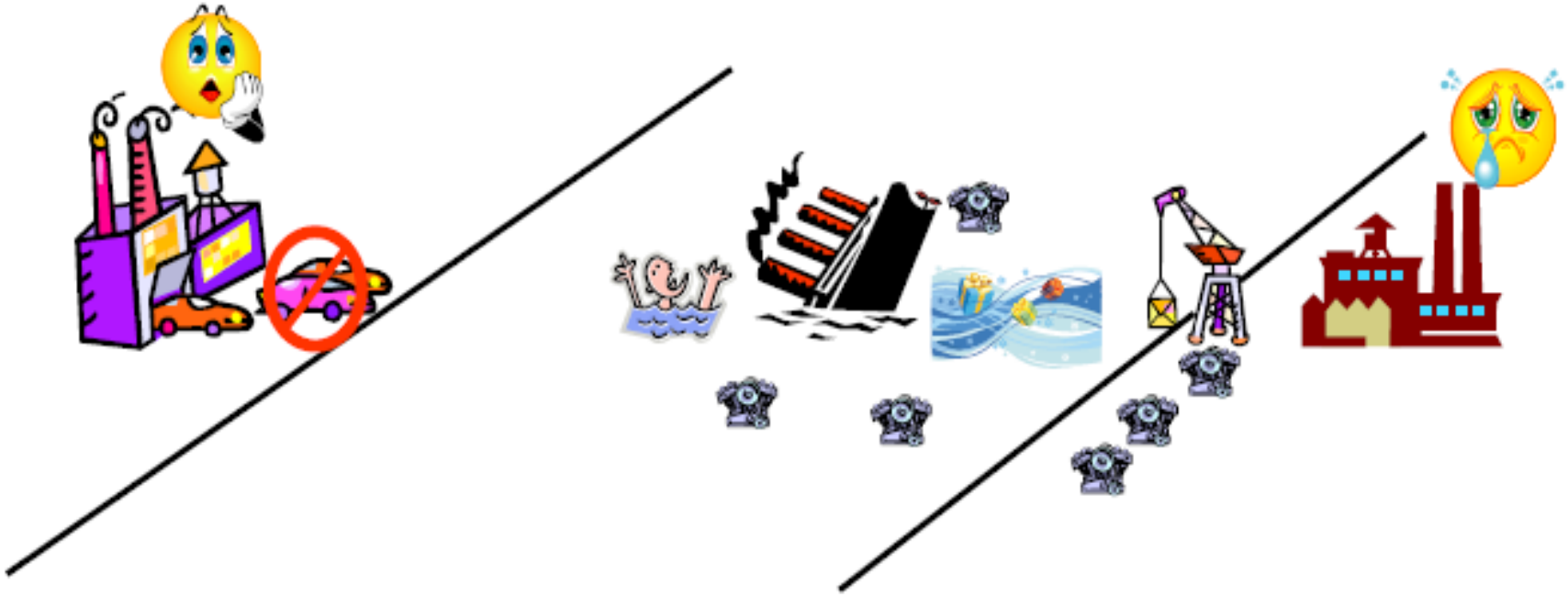
- The failure of operating controls and safety or protective devices will not shutdown or isolate the affected equipment during a fire event; the unit will run to destruction.

Property EML Assessment

Direct Loss – Property Damage (PD)

Property EML Assessment

Indirect Loss – Net Income loss (BI)

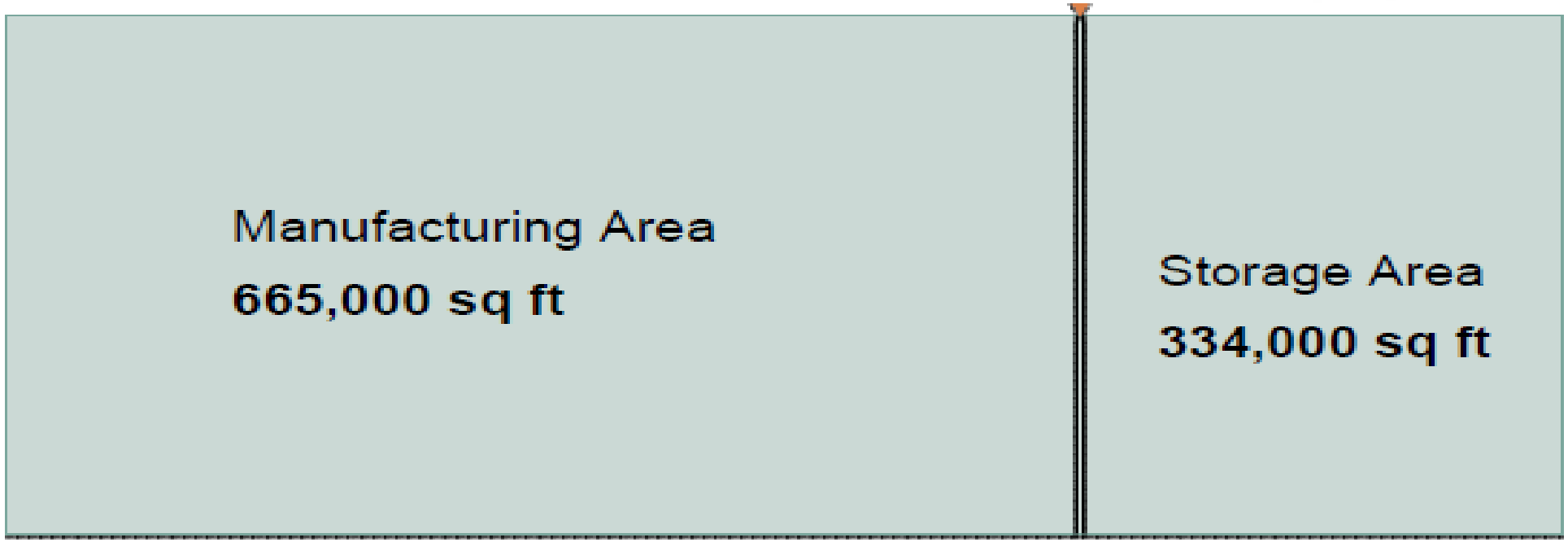


Property EML Assessment

Contingent Business Interruption – Losses to Customers / Suppliers

Property EML Assessment

EML Calculation

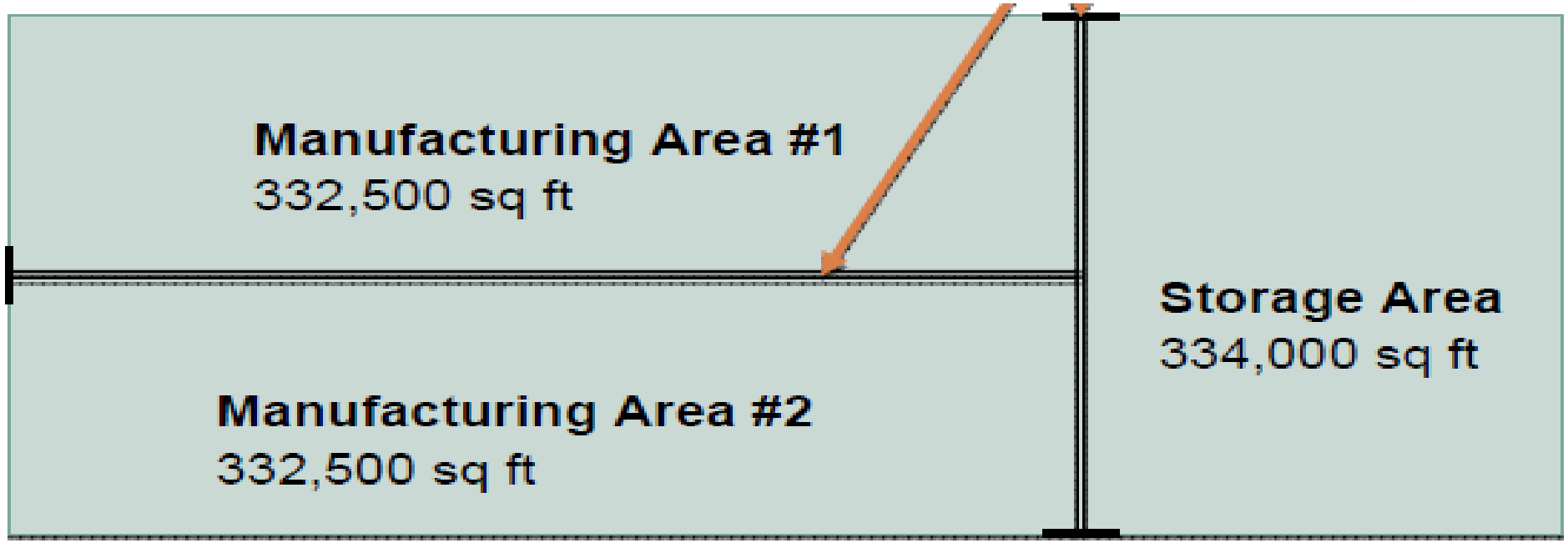


Building Value $39 million
Equipment $17 million
Product $0.5 million
B.I. $72 million
Total: $128.5 million

Bldg Value $19.4 million
Equipment $1 million
Product $49.5 million
B.I. $2 million
Total: $71.9 million

Property EML Assessment

EML Calculation



Building Value $39 million / 2
Equipment $17 million / 2
Product $0.5 million / 2
B.I. $54 million
Total: $82.3 million

Bldg Value $19.4 million
Equipment $1 million
Product $49.5 million
B.I. $2 million
Total: $71.9 million

Property EML Assessment

Loss Scenarios

For every Loss Estimate, a description of the Loss Scenario is necessary. Each Loss Scenario needs to describe:

- The event postulated
- The area where the PD is expected to occur
- The commodity or process that is involved
- Direct BI consequences for the site losing building and function/process following assumed damage to the property
- Recovery time estimate (if reliable information is available)
- Mitigating circumstances
- Contributing factors
- Salvage potential

Loss Scenarios must describe circumstances and conditions that are believed to lead to the largest total PD+BI Loss.

Property EML Assessment

Loss Scenarios

Therefore, the process prescribes identification of the largest total Loss Estimate PD+BI by comparing at least two combinations, namely:

- largest PD Loss (PD 1) with its corresponding BI Loss (BI 1)
- largest BI Loss (BI 2) with its corresponding (initiating) PD Loss (PD 2)

Property EML Assessment

PD Loss Scenarios

The property loss scenario needs to describe:

- The area where the loss is expected to occur
- The commodity or process that is involved
- Mitigating circumstances
- Contributing factors

Keep in mind that the scope of Loss Estimates in Property Risk Evaluation are NOT limited to fire and explosion, but can also cover other perils, (e.g. machinery breakdown, flood, etc

Property EML Assessment

Loss Estimate Calculation

Values

For calculation of the Property Damage Loss Estimate the values needed for the involved property in the loss scenario are:

- Building Values
- Content Values
- Values for Machinery and Equipment

The property values should preferably be accurate replacement costs, not book value or depreciated original costs.

Property EML Assessment

Loss Estimate Calculation

Level I PD Loss Scenario

The following example is for a six-story office building, with an area of 16,500 sq. ft. (1,522 m^2) per floor with an ordinary fire hazard rating, non-combustible walls and floors, and an UL listed Class A roofing system. An automatic sprinkler system is in service.

Level I Definition – Primary protection systems **are** functioning.

The Level I Loss Expectancy Scenario is based on the following assumptions:

1. All systems are in service and functioning as designed.
2. Full fire department and facility emergency organization response is expected.
3. Credit is given to all properly maintained fire barriers up to the duration rating.
4. All construction features function as designed.

Property EML Assessment

Loss Estimate Calculation

PD Scenario – Level I:

With the automatic sprinkler system in service, we would expect a fire on any of floors 2, 3, 4 or 5 of this six-story office building to be identified and result in the fire department being notified. In the time it would take for the fire department to respond and begin fighting the fire, the adequately designed automatic sprinkler systems are expected to contain the fire within a 1,000 sq. ft. (93 m^2) area.

Once the fire department arrives, they can be expected to provide adequate manual firefighting and to bring the fire rapidly under control since the combustible loading is that of a typical administrative office. Significant damage to the area where the fire occurs, along with some smoke damage to the fire floor and the floor above, water damage to the floor below, and building damage is expected. Heat and smoke damage to the main building is also expected.

Property EML Assessment

Loss Estimate Calculation

Summary of PD Scenario:

With the automatic sprinkler system in service, we can expect a fire on any of floors 2, 3, 4, or 5 of this six-story office building to be identified and the fire department notified. In the time needed for the fire department to respond and begin fighting the fire, the adequately designed automatic sprinkler system is expected to contain the fire within a 1000 sq. ft. (93 m^2) area.

Once firefighters arrive, they can be expected to provide adequate manual firefighting to bring the fire rapidly under control since the combustible loading is that of a typical administrative office. Significant damage to the area where the fire begins, along with some smoke damage to the fire floor and the floor above, water damage to the floor below, and building damage is expected. Heat and smoke damage to the main building is also expected.

Property EML Assessment

Loss Estimate Calculation

PD Calculations:

Damage Type	Damage Area	Value	% Damage	Total
Building Damage	1000 sq. ft	$100/sq. ft	10%	$10,000
Fire Damage	1000 sq. ft	$50/ sq. ft.	100%	$50,000
Water Damage – Fire Floor	2,000 sq. ft.	$50/ sq. ft.	25%	$25,000
Water Damage – Floor Below	16,500 sq. ft.	$50/ sq. ft.	10%	$82,500
Smoke Damage – Fire Floor	10,000 sq. ft.	$50/ sq. ft.	10%	$50,000
Smoke Damage – Floor Above	16,500 sq. ft.	$50/ sq. ft.	5%	$41,250
				$258,750

Underwriting Considerations for Risk Assessment

Underwriting Considerations for Risk Assessment

Categories

- Factors which affect acceptance
- Factors which affect terms

Factors which affect acceptance

1) Factors which cannot easily be changed for the better
- Proposer’s Business
- Proposer’s Premises
- Trade Process
- Heating System (fixed type)
- Other Occupants

Underwriting Considerations for Risk Assessment

Factors which affect acceptance

2) Factors which can be changed for the better

- Waste Control
- Congestion Control
- Work flow
- Maintenance
- Cleanliness
- Training
- Segregation
- Extinguishers

Underwriting Considerations for Risk Assessment

Factors which affect terms (Same as previous factors)

- Unacceptable Trade
- Acceptable Trade for Single Tenant premises
- Loss History (Worst)

Underwriting Considerations for Risk Assessment

Standard Risk Profiles and Deviations from them

Features	Standard	Deviation
Construction	Standard RCC Construction with Concrete Floor	Not built of Brick or similar walls or not roofed with incombustible material, with no concrete floor
Height	Single Storey Building	More than 01 storey with wood floors on upper storeys
Tenant	Single tenant	More than one tenant
Smoking	Prohibiting smoking on the premises	Not banned or not confined to safe designated areas
Tidiness	Sweeping out at least daily	Casual waste is allowed to accumulate
Light & Power	Only fixed mains fed electricity	No fixed main electricity
Segregation	Segregated Processing and Storage areas	Processing and Storage not segregated
Maintenance	Shutdown Plant every 2 months for routine maintenance as per OEM recommendations	Not carried out to machinery manufacturer's recommendations

Risk Presentation

Presentation of Risks for Underwriting

Presentation Format

General

- Name of Insured
- Main Address
- Addresses of other premises
- Business Description
- Renewal Date
- Quotation Validity
- Current Insurer
- Target / Expiring Premium
- Claims Experience

Property Damage

- Contingencies
- Sums Insured / Locations
- Extensions

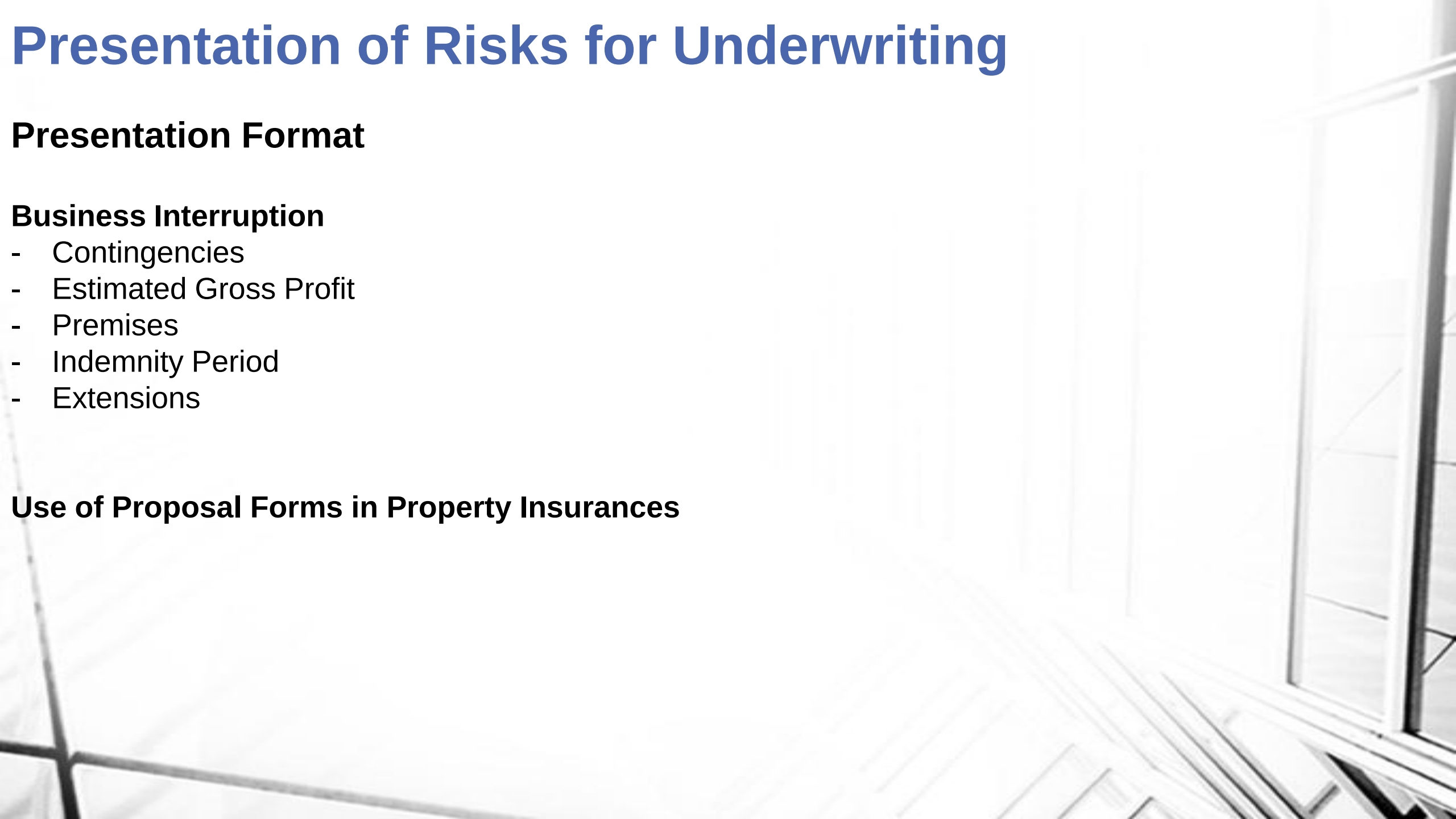
Presentation of Risks for Underwriting

Presentation Format

Business Interruption

- Contingencies
- Estimated Gross Profit
- Premises
- Indemnity Period
- Extensions

Use of Proposal Forms in Property Insurances



Business Interruption Risk Assessment

Business Interruption Risk Assessment

Business Interruption Concepts & Definitions

Business Interruption

Business Interruption (BI) has been traditionally defined in property insurance policies as the effect of a loss on a client's profit and continuing costs of operating its business.

New Exposures / Potential Impact:

- Lean Manufacturing
- Just-In-Time delivery systems
- Business process outsourcing and increase use of third-party manufacturers,

Also known as Time Element Cost

Business Interruption Risk Assessment

Business Interruption Concepts & Definitions

The main definitions are:

Time Element – A coverage that pays BI and extra expense as defined within the policy. Typically extra expense covers costs incurred for continuing operations at another location, either in-company or outside.

Direct Business Interruption (BI) – Direct BI involves the potential disruption to revenue at a client facility due to a loss at that facility. For Direct BI, the disruption is limited to the loss of production or service delivery at the specified facility.

Business Interruption Interdependency (BII) – BII involves the potential disruption to revenue at a client facility due to a loss at another client facility that is a supplier to or recipient of deliveries from the specified facility.

Business Interruption Risk Assessment

Business Interruption Concepts & Definitions

Contingent Business Interruption Interdependency (CBI) – CBI involves the potential disruption to revenue at a client facility due to a loss at a separate facility not owned or operated by the client, but acting as a supplier to or recipient from the specified facility. Particular emphasis is paid to single-source or sole-source suppliers:

Single source means that other suppliers are available but that one has been chosen for reasons of quality, price and delivery;

Sole source means that no other vendor is available.

To further refine the BI portion of time element, we can understand BI as sales that would be lost in the time following the loss, minus non-continuing (variable) expenses.

Business Interruption Risk Assessment

Business Interruption Concepts & Definitions

Related Cost Definitions

The costs related to the interruption of business are defined as:

Extra Expense – Reasonable, unusual costs incurred during the restoration of operations after a Business Interruption.

Fixed Costs – The portion of operating expense that will continue whether the plant is operating or not. This could include taxes, key employee salary, etc.

Variable Costs – Expense that can be discontinued when a facility is not in normal operation. This could include supplies, utilities, ordinary payroll, etc.

Note that the definition used here for variable costs differs from that of the variable costs used by accountants.

Business Interruption Risk Assessment

Business Interruption Approach and Structure

Approach to Business Interruption and Interdependency

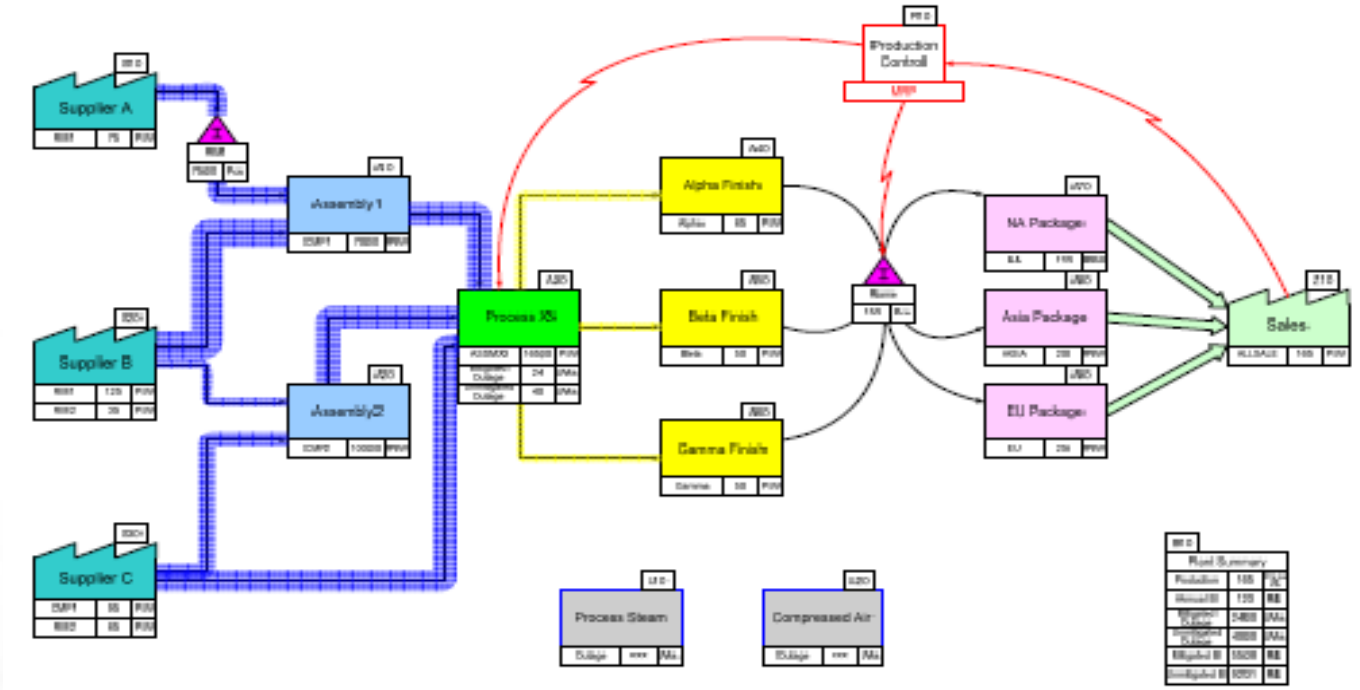
- Understand the revenue and material/information flows
- Collect the appropriate data
- Determine downtimes for critical assets
- Determine options and resources to mitigate loss
- Create loss scenarios
- Calculate severity of scenarios
- Determine actions to implement or validate solutions, related costs and next steps

Business Interruption Risk Assessment

Business Interruption Approach and Structure

Operational Value Stream Mapping

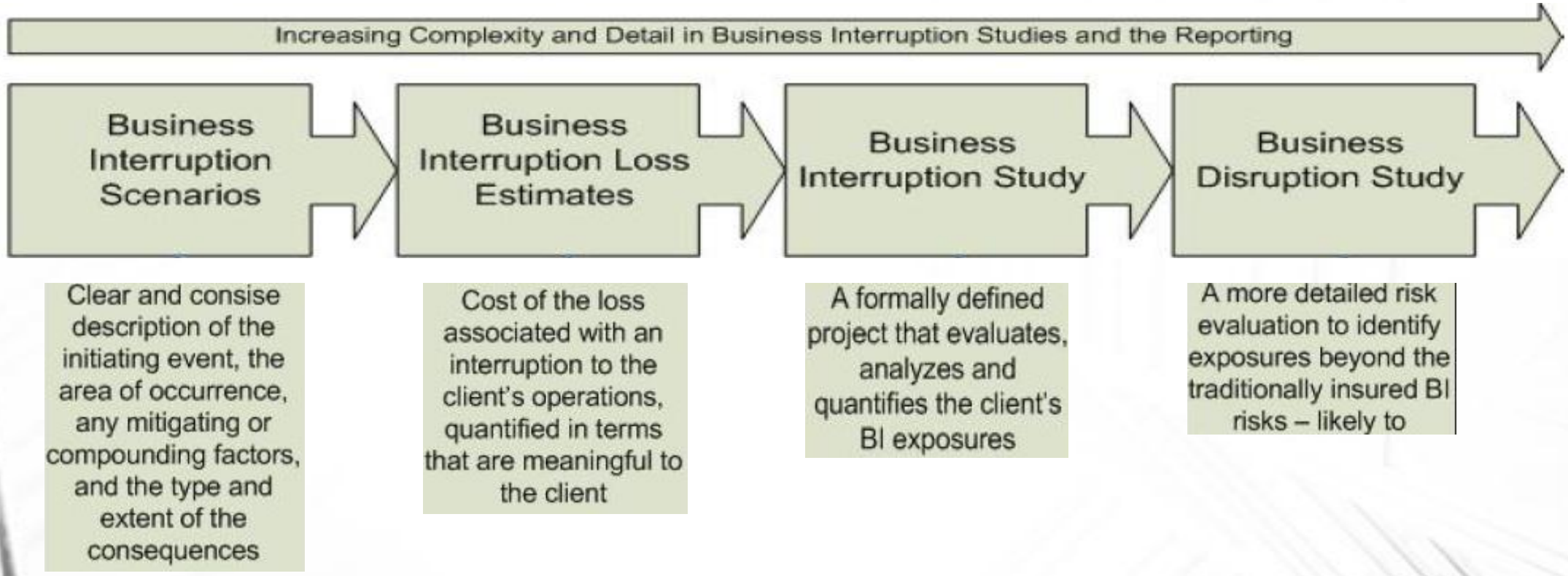
In support of our studies we can build a flow map of a client's process, product line, facility, supply chain or enterprise.



Business Interruption Risk Assessment

Business Interruption Approach and Structure

Differentiated Study and Reporting Levels



Business Interruption Risk Assessment

Business Interruption Approach and Structure

During normal operations, the following equation describes the basic financial meaning of operations:

$$\text{Revenue} = \text{Fixed Costs} + \text{Variable Costs} + \text{Profit}$$

By re-arranging this equation, we have:

$$\text{Revenue} - \text{Variable Costs} = \text{Fixed Costs} + \text{Profit}$$

The left side of this equation (R-VC) is the definition of contribution margin, and the right side (FC+P) is one of the classic definitions of BI as used in insurance contracts. Thus, contribution margin is equal to Business Interruption.

Reasonable extra expenses incurred to restore operations, raw materials and finished goods are normally recoverable costs in insurance contracts. These extra costs can be compensable by insurance to the extent that they help to reduce the overall loss. These estimated extra expenses are included as:

$$\text{BI} = \text{Revenue} - \text{Variable Costs} + \text{Extra Expenses}$$

Business Interruption Risk Assessment

Planning & Conducting Business Interruption Risk Assessment Study

Purpose

The purpose of the Business Interruption Study is to establish a consistent and repeatable methodology that:

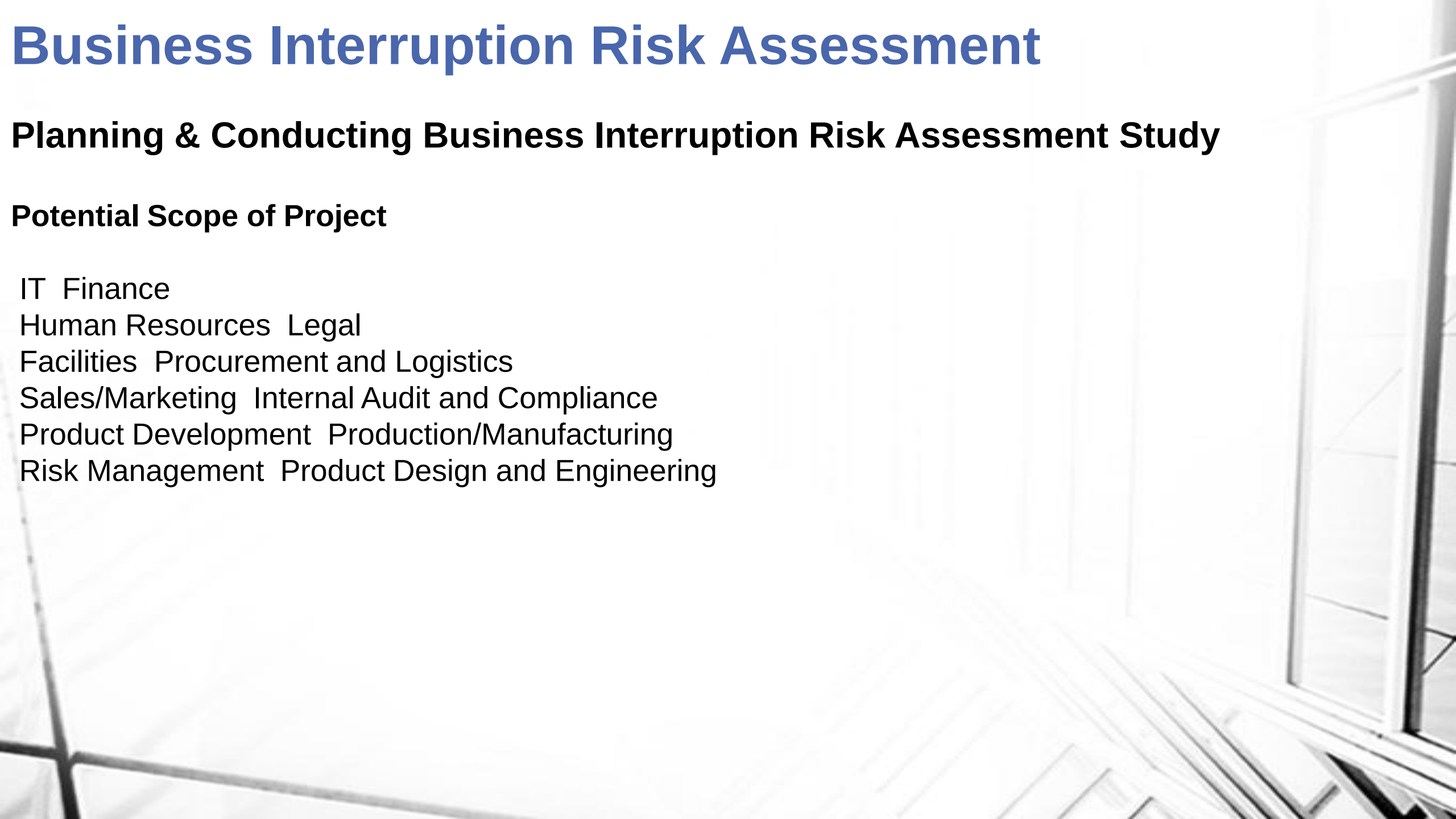
- Identifies and maps key client operations by location, profit flow or product line
- Identifies and categorizes Business Interruption risks by severity, percentage of insured value or client defined categories (high, medium, low, or otherwise defined)
- Prioritizes and quantifies the most significant risks in dollars, percentage of profits affected or other client defined terms (earnings impact, etc.)
- Identifies and considers existing mitigation strategies and their benefit to client operations or underwriters
- Clarifies loss expectancies and validates key data to support risk transfer decisions (insurance placement)
- Supports risk improvement decisions and mitigation planning by presenting cost/benefit analyses

Business Interruption Risk Assessment

Planning & Conducting Business Interruption Risk Assessment Study

Potential Scope of Project

IT Finance
Human Resources Legal
Facilities Procurement and Logistics
Sales/Marketing Internal Audit and Compliance
Product Development Production/Manufacturing
Risk Management Product Design and Engineering



Business Interruption Risk Assessment

Planning & Conducting Business Interruption Risk Assessment Study

Assessment Methodology for BI Study – Project Definition

- Project definitions, assumptions and measurement criteria (BI, gross revenue, $/share)
- Locations and operations to Include in study
- Perils and consequences to be considered
- Responsibilities for data, resources and participants
- Roles and responsibilities of key participants
- Project schedule and critical path timeline
- Project Communications Protocol
- Project success measures and review process

Business Interruption Risk Assessment

Planning & Conducting Business Interruption Risk Assessment Study

Assessment Methodology for BI Study – Data Need / Collection

- Risk data
- Operations data
- Raw material data
- On-site materials storage data
- Manufacturing data
- Distribution data

Business Interruption Risk Assessment

Planning & Conducting Business Interruption Risk Assessment Study

Assessment Methodology for BI Study – Identify Operations and Process Mapping

The process mapping steps include:

- Documentation review
- Interview sessions
- Process mapping review sessions
- Site tours

Business Interruption Risk Assessment

Planning & Conducting Business Interruption Risk Assessment Study

Assessment Methodology for BI Study –Risk Quantification, Financial Impact and Analysis

This step includes:

- Documentation review
- Risk identification questionnaire
- Interview sessions
- Group risk analysis and ranking sessions

Business Interruption Risk Assessment

Planning & Conducting Business Interruption Risk Assessment Study

Assessment Methodology for BI Study – Mitigation Strategy Analysis

- The purpose of the session will be to collectively discuss and analyze the existing mitigation strategies and quantify the associated impact.

- Off-site stock and supplies, availability of internal excess capacity, known workaround strategies (BCPs) and third-party substitution of product/service can be considered

- Estimates of costs associated with the implementation of these strategies should be provided as well.

Business Interruption Risk Assessment

Planning & Conducting Business Interruption Risk Assessment Study

Assessment Methodology for BI Study – Loss Estimate Reporting & Review

Formal loss estimates will be developed based on the process mapping, risk identification, risk analysis and risk mitigation sessions. The loss estimate reporting and review steps are given below:

- Loss Estimate Development

- Loss Estimate Review

Business Interruption Risk Assessment

BI Calculation

Annual BI = $7MM

Loss Scenario:
Fire in main warehouse facility shuts down operations. 5-month rebuild time (20 weeks).

Level I – BI Analysis

Percentage of sales affected	100%
Work-in-progress and stockpiles	1 week
Makeup capability (tent for non-sensible goods)	40% after 8 weeks set up
Extra expense (rent of tent)	TBA
Impact on variable costs	N/A

Calculation:

Sales affected: 100% and 5 months down	(20.0 weeks downtime)
Work-in-progress: 1 week	(19.0 weeks downtime)
Makeup: 40% of 12 weeks [20 weeks – 8 set-up] = 4.8 weeks	(14.2 weeks downtime)

14.2 weeks downtime = annual BI ($7MM) x sales affected (100%) x (14.2/52) = $1,911,538 – **approx $1.9MM**

Thank You