

# Applying the Risk Management Model in a Practical Setting

**BOB BLACK**



# The Four P's

- Participation
- Perspective
- Prioritization
- Presentation



# British Columbia Institute Of Technology (BCIT)

- 2<sup>nd</sup> Largest post-secondary institute in BC
- 48,000 students
- Six campuses spread across greater Vancouver
- “Dispersed City within Cities”



# BCIT HRVA Project

## Purpose

The Hazard, Risk and Vulnerability Analysis (HRVA) is intended to provide a basis from which BCIT can make risk-based decisions to address vulnerabilities, mitigate hazards, prepare for response to, recovery from and maintain business continuity.

## Objective

- Identify the hazards that threaten BCIT;
- Assess the risk of each hazard; and
- Recommend measures that can be taken to prevent or mitigate the impact of the identified hazards.



# HRVA Options

- The BC Municipal HRVA Model
  - Municipally-oriented
  - Complicated
- Use a new model – based on the Risk Management Process developed for Climate Change Adaptation



# Step 1

## Getting Started

- Identify project committee membership
- Distribute background information
- Administrative arrangements



# Project Committee

- Facilitators – 3 persons
- Burnaby Campus – 8 representatives
- Aerospace Campus – 4 representatives
- Marine Campus – 2 representatives
- Downtown Campus – 2 representatives
- Great Northern Way – 1 representative
- Mathessi Place – 1 representative

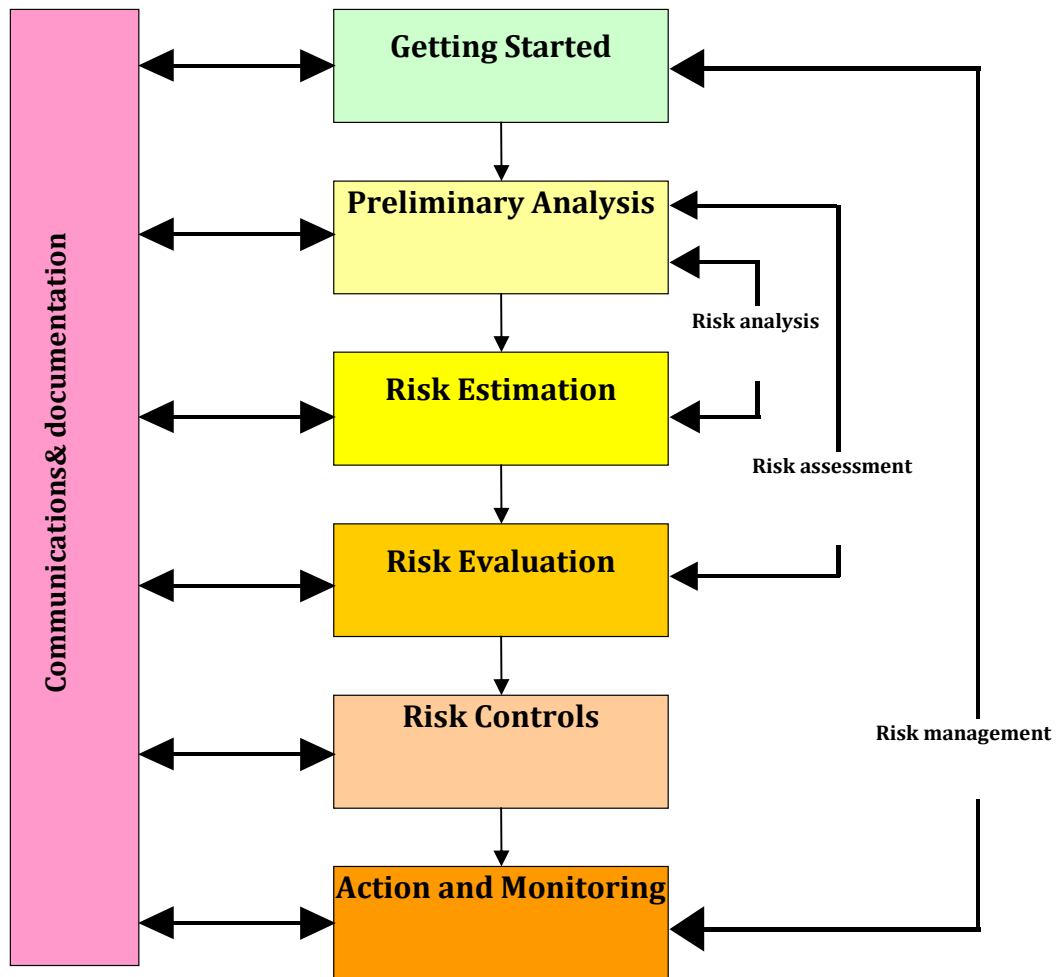


# Process Schedule

- Step 1 – April
- Step 2 – May and June
- Step 3 – July to August
- Step 4 – September
- Step 5 - October



# HRVA PROCESS



# Hazard Groups

## Per BC PEP HRVA Tool Kit

- Accidents
- Atmosphere
- Dam Failure
- Disease and Epidemics
- Explosions and Emissions
- Fire – Urban and Rural
- Fire – Wildfire and Interface
- Geological
- Hazardous Materials
- Hydrologic
- Power Outage
- Riots
- Seismic
- Space Object
- Structural
- Terrorism
- Volcanic



Through committee discussion per the previous hazard group list the following hazards were selected for further analysis:

- Accidents:
  - air crashes
  - marine accidents
  - motor vehicle crashes
- Atmosphere:
  - winter storms
  - high winds
  - heat waves
- Disease:
  - Human
  - Plant
  - Pest
- Earthquakes
- Explosions and Emissions:
  - gas pipelines
  - other explosions
- Fire – structural
- Hazardous Materials:
  - general (on-size or transport routes)
  - radiation
  - infectious materials
- Hydrologic:
  - River bank erosion
  - Flooding
- Power Outage
- Public Safety (i.e. Active Shooter)
- Structural Collapse
- Volcanic Ash Fall



# Step 2

## Preliminary Analysis

- Identify specific hazards, risks and vulnerabilities to BCIT
- Gather input regarding specific hazards to BCIT
- Begin building hazard and risk catalogue



# PRELIMINARY HAZARD AND RISK SCENARIO ASSESSMENT

**LOCATION:**

**HAZARD:**

**RISK SCENARIO:**

**VULNERABILITIES:**

**RISK CONTROL MEASURES:**

**COMMENTS:**

**Frequency:**

Very unlikely  
Occasional  
Moderately Frequent  
Often  
Certain to Occur

**Consequence:**

Very low  
Low  
Moderate  
High  
Very High



TEMPLATE

# PRELIMINARY HAZARD AND RISK SCENARIO ASSESSMENT

**LOCATION:** ATC

**HAZARD:** Airplane Crash

**RISK SCENARIO:** Plane crashes near ATC

**VULNERABILITIES:** Isolation of facility from first responders

**RISK CONTROL MEASURES:** Close coordination with local authority  
Frequent emergency drills

**COMMENTS:**

**Frequency:**

**Consequence:**

Very unlikely - X

Very low

Occasional

Low

Moderately Frequent

Moderate

Often

High

Certain to Occur

Very High - X

COMPLETED EXAMPLE



# Step 3

## Risk Estimation

Estimate the frequencies and consequences associated with each of the risk scenarios



Code	Risk Scenario	Frequency	Consequence
C1	Ice and Snow Accumulation	Occasional	Low
<b>C2</b>	<b>Earthquake</b>	<b>Occasional</b>	<b>Very High</b>
C3	Motor Vehicle (MV) Hits Building	Occasional	Very Low
C4	MV Hits Pedestrian	Moderate	Moderate
C5	MV Hits Another MV	Occasional	Very Low
C6	Explosion or Chemical Fire	Occasional	Moderate
C7	Confined Space Incident	Unlikely	Very Low
C8	Chemical Spill	Often	Low
C9	Building Flooding (External)	Moderate	Moderate
C10	Building Flooding (Internal)	Often	Low
C11	Freezing Rain	Occasional	Very Low
C12	Volcanic Ash Fall	Unlikely	Moderate
C13	Wind Storm	Occasional	Very Low
C14	Power Outage	Moderate	Moderate
C15	Active Shooter	Occasional	Very High
C16	Cyber-Terrorism	Occasional	High
C17	Public Health Emergency	Moderate	Moderate
	Etc . . . . .		



## Risk Scenarios after Step 2

Frequency Hazard	Very Unlikely to Happen	Occasional Occurrence	Moderately Frequent	Occurs Often	Certain to Occur
Hazards from risk scenario (list each)	Not likely to occur during the planning period	May occur sometime but not often during the planning period	Likely to occur at least once during the planning period	Likely to occur several times during the planning period	Happens often and will happen again during the planning period

TABLE 1: Frequency Rating



Frequency Hazard	Very Unlikely to Happen	Occasional Occurrence	Moderately Frequent	Occurs Often	Certain to Occur
Hazards from risk scenario (list each)	Not likely to occur during the planning period	May occur sometime but not often during the planning period	Likely to occur at least once during the planning period	Likely to occur several times during the planning period	Happens often and will happen again during the planning period
C1 – Ice and Snow Accumulation		x			
C2 – Earthquake		x			
C3 – MVA Hits Building		x			
C4 – MVA Hits Pedestrian			x		
C5 – MVA Hits Car		x			
C6 – Chemical Fire/Explosio		x			
C7 – Confined Space Incident	x				
C8 – Chemical				x	
C9 – Building Flooding (External)			x		
C10 – Building Flooding (Internal)				x	



Impact Degree	Social factors				Economic factors			Environmental factors			
	Health & Safety	Displacement	Loss of Livelihood	Cultural Aspects	Property Damage	Financial Impact	Impact on Institutional	Air	Water	Land	Eco-systems
Very low											
Low											
Moderate											
High											
Very High											

TABLE 2: Consequence Rating



# BCIT HRVA

## HAZARD CONSEQUENCE RATING

HAZARD: C2 - Earthquake

LOCATION: Common

Impact Degree	Social factors				Economic factors			Environmental factors			
	Health & Safety	Displacement	Loss of Livelihood	Cultural Aspects	Property Damage	Financial Impact	Impact on Institutional	Air	Water	Land	Eco-systems
Very low											
Low											
Moderate			x					x			x
High		x		x					x	x	
Very High	x				x	x	x				

Overall Consequence Rating: Very High

Overall Frequency Rating: Occasional

Comments:



# Step 4: Risk Evaluation

- Develop a process for comparing or ranking each risk scenario
- Evaluate the risks by examining them in terms of cost, benefits and acceptability, considering the needs, issues and concerns of stakeholders
- Identify unacceptable risks and prioritize them for risk reduction or control strategies



<b>CONSEQUENCES</b>	Very High		C2, C15			
	High	A1	C18	C16		
	Moderate	C12, D1, MA2/G2	C6	C9, C14, C17, C4		
	Low	C20, A2, A3, A4, MA1, M1	C1, C22, B1, C23	C21	C8, C10, C19	
	Very Low	C7	C3, C5, C11, C13			
		Very Unlikely to Happen	Occasional Occurrence	Moderately Frequent	Occurs Often	Virtually Certain to Occur
<b>FREQUENCY</b>						



**Extreme Risk: Immediate controls required: Nil**

**High Risk: High priority control measures required:**

- C2 – Earthquake
- C15 – Active Shooter
- C16 – Cyber-Terrorism

**Moderate Risk: Some controls required to reduce risks to lower levels:**

- C4 – Motor Vehicle Hits Pedestrian
- C8 – Chemical Spill
- C9 – Building Flooding (External)
- C10 – Building Flooding (Internal)
- C14 – Power Outage
- C17 – Public Health Emergency
- C18 – Large Building Fire
- C19 – Natural Gas Leak

**Low Risk: Controls likely not required:**

- C1 – Ice and Snow Accumulation
- C6 – Explosion or Chemical Fire
- C12 – Volcanic Ash Fall
- C21 – Extreme Cold
- C22 – Fuel Storage Tank Leak
- C23 – Fuel Spill/ Fire
- A1 – Airplane Hits Building
- D1 – Steam Line Leak
- B1 – Flash Flood from Guichon Creek
- MA2/G2 – Train Derailment/Chemical Release

**Negligible Risk: All other risk scenarios do not require further consideration and will not be considered further in this analysis:**



# Step 5 – Risk Controls and Finalization of HRVA

- Summarize the information identified in Steps 3 and 4 into a formal HRVA report including recommendations for risk control and monitoring.



**Earthquake.** There are three types of damaging earthquakes that occur in coastal British Columbia and which could impact BCIT: shallow or crustal earthquakes; Juan de Fuca Plate or sub-crustal earthquakes; and plate boundary or subduction earthquakes. Based on models developed by the Geological Survey of Canada estimates of earthquake-based damage, using the Modified Mercalli Intensity Scale (MMI), the following results for the Lower Mainland of BC are predicted:

MMI	Effects	Probability within 10 years
V	<i>Felt indoors by practically all, outdoors by many or most. Buildings tremble throughout. Broken dishes, glassware to some extent. Hanging objects, doors swing generally. Pictures knocked against walls or swung out of place.</i>	26%
VI	<i>Felt by all, indoors and outdoors. General excitement, some alarm. Damage slight in poorly built buildings. Fall of plaster, cracks in plaster and fine cracks in chimneys in some instances. Broken dishes, glassware in considerable quantity, as well as some windows. Overturned furniture in many instances.</i>	8.6%
VII	<i>General alarm, all run outdoors. Some or many find it difficult to stand. Damage negligible in buildings of good design, slight to moderate in ordinary buildings, and considerable in poorly built or badly designed buildings. Cracked chimneys to considerable extent and walls to some extent. Fall of plaster in considerable to large amounts. Dislodged brick and stone. Overturned heavy furniture.</i>	2.5%

Vulnerabilities	Control Measures	
	In Place	Recommended
<ol style="list-style-type: none"> <li>1. Widespread and severe structural damage</li> <li>2. Isolation of campuses due to closure of transportation and communication routes</li> <li>3. Widespread and large numbers of casualties</li> </ol>	<ol style="list-style-type: none"> <li>1. Close liaison with municipal first-response and EP agencies</li> <li>2. Maintenance of emergency depots</li> <li>3. BCIT Emergency Plan</li> <li>4. Completed facility seismic survey</li> </ol>	<ol style="list-style-type: none"> <li>1. Continued emergency training and drills</li> <li>2. Ongoing maintenance of emergency depots</li> <li>3. Continual emphasis on seismic construction</li> </ol>



**Building Flooding (External).** BCIT is subject to building flooding from intense rainfall, snowmelt and broken water mains.

Vulnerabilities	Control Measures	
	In Place	Recommended
<ol style="list-style-type: none"> <li>1. Damage to infrastructure</li> <li>2. Reduced access to facilities</li> <li>3. Cancellation or movement of classes</li> </ol>	<ol style="list-style-type: none"> <li>1. Stockpile of sandbags</li> <li>2. Staff training</li> <li>3. BCIT Business Continuity Plans</li> </ol>	<ol style="list-style-type: none"> <li>1. Enhanced training for staff on flood control</li> <li>2. Ensure contractor available on retainer</li> <li>3. Continue investigation of new flood-control measures</li> <li>4. Relocation of critical infrastructure from flood-prone areas</li> </ol>

**Flash Flood From Guichon Creek.** Guichon Creek is a waterway that flows through the Burnaby Campus. During periods of heavy rainfall it is prone to flooding, affecting nearby BCIT buildings. It is also a salmon spawning waterway that complicates flood mitigation or response planning. A major flood in 2007 caused significant damage to building SE16 and damaged 5 other buildings.

Vulnerabilities	Control Measures	
	In Place	Recommended
<ol style="list-style-type: none"> <li>1. Building flooding</li> <li>2. Damage to infrastructure</li> </ol>	<ol style="list-style-type: none"> <li>1. Stockpile of sandbags</li> <li>2. Twice daily inspections during flood season</li> <li>3. Debris screen</li> <li>4. Winch to raise primary screen</li> </ol>	<ol style="list-style-type: none"> <li>1. Early warning device for water level and flow monitoring</li> </ol>



# Project Observations

- Participation
  - 20 reps from across BCIT
  - “buy-in” to emergency planning
- Perspective
  - Input from each campus
  - Corporate knowledge
- Prioritization
  - Where to we start?
  - “Low-hanging fruit”
- Presentation
  - Graphic templates
  - Project library



# THANK YOU!

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