

Calgary

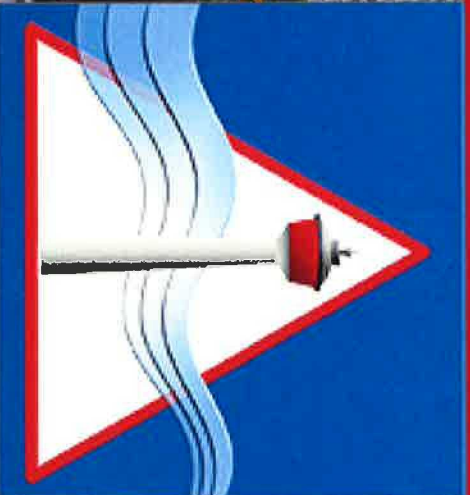


CITY OF CALGARY  
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MAR 21 2016

ITEM: C2016-0281  
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CITY CLERK'S DEPARTMENT

# Strategic Session of Council 2016 March 21 Managing Environmental Risks - Wind Planning and Development



## **Integrated Risk Management**

- I. Risk identification – wind impacts on construction sites and the built environment
- II. Risk management
- III. Strategy for ongoing management of wind related risks

## Risk event - high impact risk – Michelle Krsek

- August 1, 2009 high intensity windstorm hits Calgary without warning
- A piece of steel roofing material fell 22 stories from a construction site killing 3-year old Michelle Krsek and severely injured her brother and father.



**CBCnews | Calgary**

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### Firms fined for deadly falling debris in Calgary

CBC News Posted: 8:50 PM 2011 11 29 AM PT | Last Updated: 8:50 PM 2011 4 30 AM PT



Two of the three companies that were charged for safety violations after a piece of corrugated metal blew off a downtown construction site in August 2009 were fined \$15,000 each Monday in a Calgary courtroom.

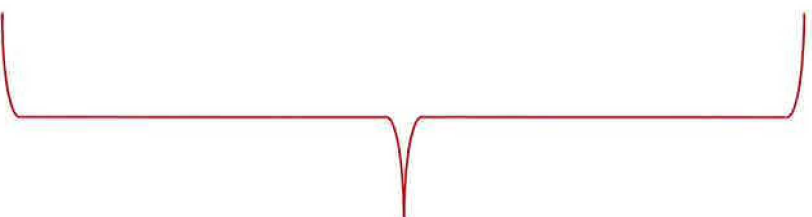
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## **Risk management strategies**

**Identification**  
**Analyze**  
**Evaluate**  
**Mitigate**  
**Communicate**  
**Monitor**

**Integrated risk management  
framework**





## The response

- “The night that Michelle Krsek died was a wake-up call of the worst kind. That was a huge event in this city, for that family and this community” (Kevin Griffiths)
- Building Regulations partnered with the construction industry and the province to address public safety around construction sites
- 1,000 years of experience over two days focused on construction site hazard identification and mitigation
- Better wind forecasting viewed as a key to managing wind related risks



## Risk identification

- Calgary routinely experiences sudden bursts of high wind gust conditions
- A review of wind gust speeds from the Calgary Airport shows that gust conditions exceed 60 km/hr over 20% of the time (2007-2011)
- Wind tunnels can stream through Calgary`s downtown high-rise corridor
- Gust conditions vary greatly at differing heights and also from site to site
- Wind gusts can cause construction and building materials to become airborne, creating a public hazard



## Risk analysis - frequency/probability of the risk

Date	Location	Incident
August 1, 2009	12 9 <sup>th</sup> Avenue SW	<ul style="list-style-type: none"> <li>• Corrugated metal blows off downtown building in high winds.</li> <li>• Kills 3 year old Michelle Krsek, injures her father and brother.</li> </ul>
September 26- 27, 2009	207 5 <sup>th</sup> Ave SW	<ul style="list-style-type: none"> <li>• Piece of scaffolding flies off downtown building during time of elevated winds.</li> <li>• No injuries reported.</li> </ul>
October 6, 2009	Spruce Place SW	<ul style="list-style-type: none"> <li>• Two by fours and a sheet of plywood blows off condo tower in SW in high winds.</li> <li>• Damage to a balcony that was under construction.</li> <li>• No injuries reported.</li> </ul>
October 6, 2009	926 5 <sup>th</sup> Ave SW	<ul style="list-style-type: none"> <li>• Sign falls off downtown building during time of elevated winds.</li> <li>• No injuries reported.</li> </ul>
April 29, 2010	Eighth Avenue Place SW	<ul style="list-style-type: none"> <li>• Piece of plywood blows off downtown building in high winds.</li> <li>• No injuries reported.</li> </ul>



## Risk evaluation - understanding the risk

Wind Speed (km/h)	Items at Risk of Takeoff
6-12	Piece of Paper; Tarp
13 - 20	Disposable Coffee Cup, Empty
21 - 30	2" Polystyrene Rigid Insulation
31 - 40	R-12 Insulation, single sheet; 3/8" Plywood Sheet; Steel Stud
41 - 50	Sheet Metal, Aluminum, 20 gauge; 1/2" Plywood Sheet
51 - 61	1/4" Nut; Swing stage 5 m long with netting
62 - 74	R-12 Insulation, single package; 1/4" Bolt
75 - 89	Scaffolding with netting 36 ft high; Drywall Sheet 5/8"
90 - 103	R-12 Insulation, pallet; Rebar, 10M
104 - 119	1" Nut
120+	2" Nut; 1" Bolt

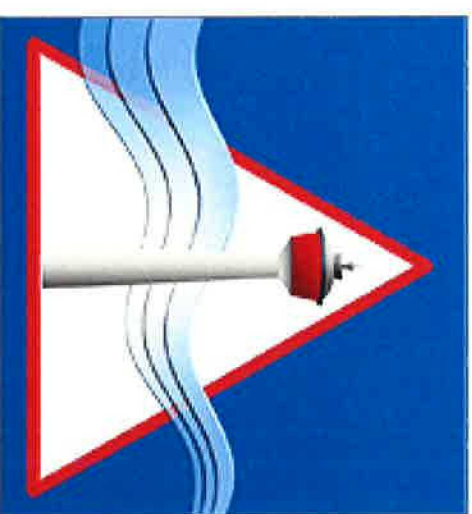


## **Risk mitigation – need for unique technology**

- National weather services provide warnings when wind speeds at ground level are predicted or measured to exceed certain critical thresholds.
- This information does not reflect the complex aerodynamic conditions of urban areas or wind speeds at different working heights which is critical for tall buildings.

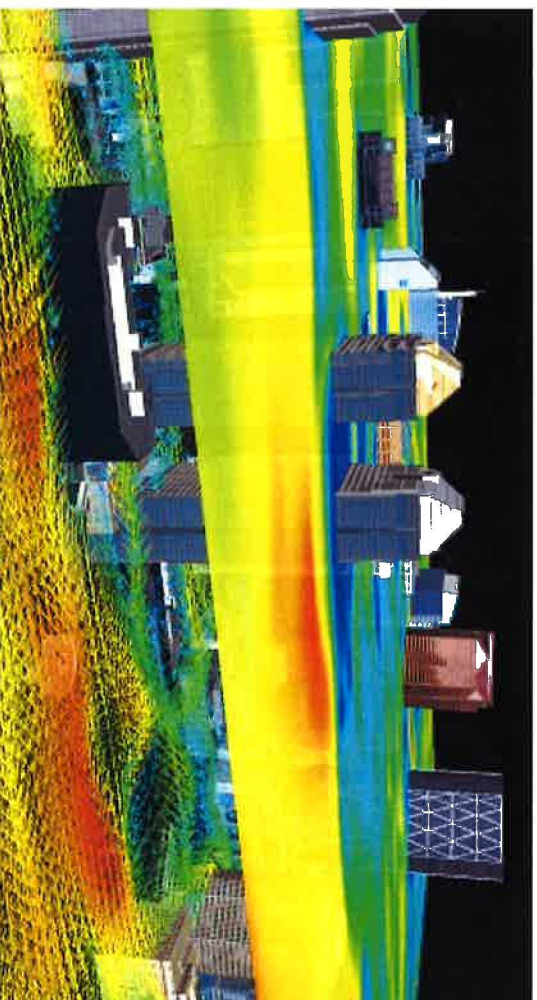
## **Risk mitigation through innovation**

- Key recommendation from industry best practices – research and develop an advanced weather forecasting system
- City awards contract to Rowan Williams Davies & Irwin Inc. (RWDI) in fall 2010



## Managing the risk - made in Calgary solution

- The RWDI proposal included the ability to be site specific and height specific in the dense urban environment of the downtown and beltline



## **Managing the risk - communication**

- The Advanced Weather Forecasting System (AWFS) goes into pilot phase July 1 2011
- Producing wind gust forecasts for the top of the Bow
- First significant test of the AWFS
  - Severe wind storm hits Calgary on November 27, 2011
- The Advanced Weather Forecasting System predicted wind gust speeds of 150km/hr 36 hours in advance of the storm





- Managing the risk – innovation and communication
- Building Regulations receives advance forecast of pending storm on Saturday November 26

## Forecast details

Forecast Date	Wind Speed	Wind Gusts at 10m	Wind Gusts at 100m	Wind Gusts at 250m	Wind Direction	Min Temp C	Max Temp C	Precipitation mm
Sat Nov 26 06:00	15	52+	59	65	S	-6	0	0
Sat Nov 26 08:00	18	57+	65	72	SSW	-4	1	0
Sat Nov 26 09:00	19	63+	72+	79	SW	-2	2	0
Sat Nov 26 10:00	20	68+	78+	85	SSW	-2	2	0
Sat Nov 26 11:00	19	62+	73+	79	SSW	0	2	0
Sat Nov 26 12:00	14	64+	69	73	S	2	3	0
Sat Nov 26 13:00	27	69+	65	67	S	3	3	0
Sat Nov 26 14:00	34	64+	64	69	S	3	3	0
Sat Nov 26 15:00	32	64+	64	70	SSW	2	4	0
Sat Nov 26 16:00	31	63+	63	68	SSW	1	4	0
Sat Nov 26 17:00	30	63+	62	72	S	1	4	0
Sat Nov 26 18:00	22	62+	71+	77	S	0	5	0
Sat Nov 26 19:00	26	63+	74+	81	S	0	5	0
Sat Nov 26 20:00	23	66+	74+	82	S	0	5	0
Sat Nov 26 21:00	21	63+	75+	82	S	0	5	0
Sat Nov 26 22:00	21	71+	75+	82	S	0	5	0
Sat Nov 27 00:00	22	72+	75+	80	SSW	1	6	0
Sat Nov 27 01:00	16	72+	75+	77	SSW	1	5	0

Sun Nov 27 01:00	24	70+	84+	92+	SSW	-1	8
Sun Nov 27 02:00	22	68+	84+	101+	SSW	-1	8
Sun Nov 27 03:00	26	92+	112+	123+	SSW	-2	8
Sun Nov 27 04:00	26	92+	108+	119+	SSW	-2	5
Sun Nov 27 05:00	31	96+	107+	111+	WSW	-2	9
Sun Nov 27 06:00	18	103+	111+	122+	SSW	-2	10
Sun Nov 27 07:00	17	109+	127+	139+	SW	1	8
Sun Nov 27 08:00	49	111+	129+	140+	WSW	4	10
Sun Nov 27 09:00	52	113+	135+	149+	WSW	6	12
Sun Nov 27 10:00	49	112+	132+	145+	WSW	9	11
Sun Nov 27 11:00	42	108+	128+	140+	WSW	9	11
Sun Nov 27 12:00	43	105+	117+	128+	WSW	8	10
Sun Nov 27 13:00	36	92+	105+	115+	WSW	6	9
Sun Nov 27 14:00	40	81+	102+	111+	WSW	5	8
Sun Nov 27 15:00	39	76+	90+	105+	WSW	4	8
Sun Nov 27 16:00	38	74+	86+	99+	W	4	7
Sun Nov 27 17:00	37	72+	84+	97+	W	3	6
Sun Nov 27 18:00	32	70+	78+	83	WNW	2	5
Sun Nov 27 19:00	27	61+	67	74	WNW	1	4
Sun Nov 27 20:00	23	58+	65	71	WNW	0	3
Sun Nov 27 21:00	18	53+	54	59	WNW	-1	1

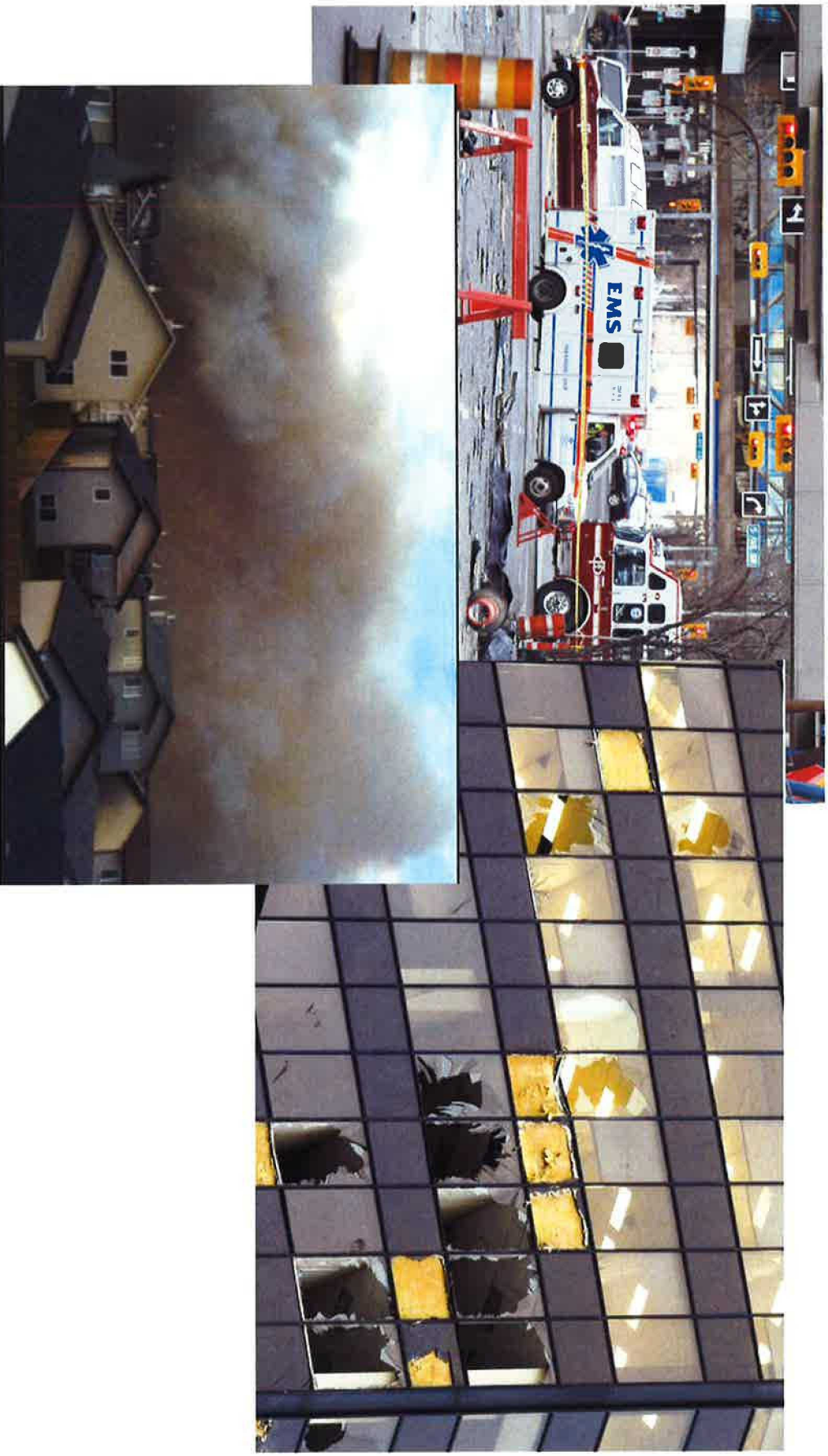


## Managing the risk – communication and preparedness

- Building Regs communicated the forecast with CEMA
- Issued a wind warning before noon on Nov 26
- CEMA also consulted with Environment Canada on the forecast
- Environment Canada issued wind warning 4pm November 26

Sun Nov 27, 05:00	16	92°	113°	123°	SSE
Sun Nov 27, 06:00	16	92°	108°	119°	SSE
Sun Nov 27, 07:00	26	88°	101°	111°	WSW
Sun Nov 27, 08:00	33	96°	111°	122°	SSW
Sun Nov 27, 09:00	18	107°	127°	139°	SW
Sun Nov 27, 10:00	37	109°	127°	140°	WSW
Sun Nov 27, 11:00	49	113°	129°	142°	WSW
Sun Nov 27, 12:00	52	113°	130°	140°	WSW
Sun Nov 27, 13:00	49	112°	132°	145°	WSW
Sun Nov 27, 14:00	48	108°	128°	140°	WSW
Sun Nov 27, 15:00	43	100°	117°	129°	WSW

## Managing the risk - advance preparedness & response





## **Ongoing management of wind related risks**

- Building Permits for work in the Downtown or Beltline regions for any proposed construction, exterior alteration, or demolition of buildings five storeys or greater must have a subscription to the Advanced Weather Forecasting System
- 48 hour forecasts are provided directly to superintendents of construction sites and any personnel the superintendent deems appropriate
- Owners, contractors and subcontractors are responsible for taking all necessary actions to ensure the safety of the public is not compromised by loose debris coming off of construction sites or from existing buildings



## **Monitoring the risk - ongoing**

- The City owns the AWFs
- The AWFs is supported by the construction industry and by the Building Owners and Managers Association
  - System is funded through building permit fees
- Forecast information is shared with the Calgary Emergency Management Agency (CEMA), who in turn may share it with other partners/agencies after verification and consultation with Environment Canada (eg the Calgary Construction Association (CCA), Building Owner Management Association (BOMA) and Canadian Home Builders Association – Calgary Region (CHBA-Calgary))

## **Managing the risk – implementing standard operating procedures**

- Environment Canada has the responsibility to advise the public of inclement weather
- The AWFS has local accurate weather forecasts and can predict wind events well in advance
- CEMA will consult with Environment Canada when the AWFS predicts 90km wind at 10m elevation
- Environment Canada reviews the forecast and if verified, a public warning will be issued
  - CEMA and Building Regulations may also issue an information bulletin as well

## **City, industry and education – focused on improvements**

- Michelle Krsek allowed for an increased collaboration with industry – safer construction sites
- Southern Alberta Institute of Technology (SAIT) develops Canada's first four year Bachelor of Science program in Construction Project Management – addressing the need for skilled PM's
- \$100,000 draw on P&D's operational reserve to establish a perpetual scholarship in Michelle Krsek's name
  - Award focused on need to increase public safety
    - » Academic achievement
    - » Community involvement
    - » Knowledge of construction safety
    - » Financial need
    - » Preference given to women



# City, industry and education – focused on improvements



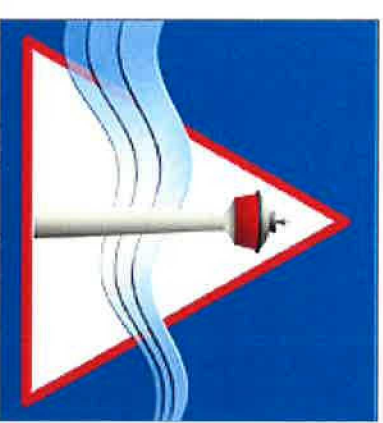
## Calgary's innovative wind warning system improves safety

OH&S

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by KATHLEEN RENNE Sep 8, 2015

August marks a somber anniversary in Calgary. It's the month, six years ago, when three-year-old Michelle Kresk was killed by a piece of metal that was blown off a downtown construction site. That's what started the proverbial wheels in motion for the City of Calgary's one-of-a-kind Advanced Weather Forecasting System (AWFS) – Envision, created by RWDI Consulting.





# Questions