

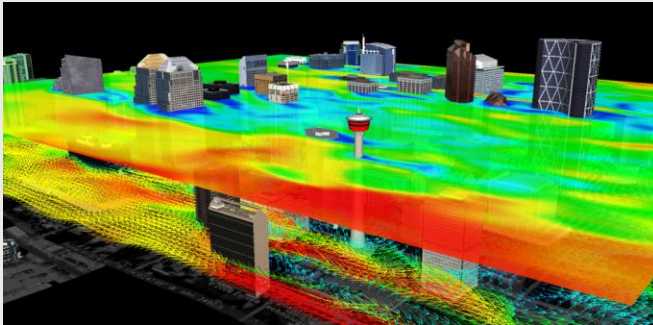
Managing Risk to Construction Projects



What is Envision?

Envision is an automated computer modelling system that combines weather forecast technology with the science of wind engineering and complex aerodynamics to provide site and height specific wind gust forecasts to contractors for tall building, bridge, and other construction sites. Some features of Envision include:

- Use of multiple weather forecasts to provide warning up to 48 hours in advance of wind gusts or adverse weather conditions that typically result in high wind gusts;
- Forecast information that can be viewed over the Internet using web browsers, smart phones, tablets, etc.;
- Automated alerts available via email or SMS;
- Available 24 hours a day.



Modelled wind flows in downtown Calgary

High winds can be very disruptive to construction sites.

Every year many injuries and millions of dollars in property damage occur as a result of high winds at construction sites. Damage and injury can occur as a result of:

- Unsecured materials being blown from structures and falling to the ground;
- Loose materials being blown into and damaging the façade of nearby buildings;
- Structural damage caused by wind loads on tarps and other coverings / fabrics;
- Crane fatigue / failures, etc.;
- Wind action on swing-stages;
- Insufficient advance warning for emergency managers.

“The wind warning system has been implemented and we received data from the system four hours before we received a warning from Environment Canada,” said Bruce Burrell, director of the Calgary Emergency Management Agency (CEMA).

Article in the Online Journal of Commerce: “Wind Warning System Helps Limit Damage in Calgary “ November 30, 2011

Are you making decisions using the best available technology?

In most jurisdictions, national weather services provide warnings when wind speeds at ground level are predicted or measured to exceed certain critical thresholds. However, 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.

Who can benefit from the System?

- Municipalities concerned about wind related accidents on construction sites;
- Construction companies and general contractors concerned about site safety;
- Heavy lift operators (e.g., bridge sections);
- Emergency responders / response personnel;
- Operations managers for structures such as an operable roof on a stadium;
- Insurance Companies.

Benefits of the System

- A high resolution, city-specific forecast;
- Forecast conditions are displayed hourly and updated every 3 hours;
- Forecasts can be delivered by email or SMS at predefined times (e.g., 6 am and 3 pm);
- Customizable alerts that allow users to specify: wind speed thresholds at one or more working heights; who receives alerts; alert frequency and delivery methods, etc.;
- Lightning prediction and detection;
- Automated incorporation and relay of National or regional Weather Office alerts (e.g., Environment Canada, US NWS alerts);
- Alerts can be delivered as an email or text message to on-site personnel, safety officers, city officials, etc.;
- Advanced auditing that keeps a record of each weather forecast, alert, and the recipients;
- Forecasts are customizable to include wind gust speed, precipitation, temperature, and other parameters.

CASE STUDY: City of Calgary, AB, Canada

RWDI is running operational forecasts for the City of Calgary to provide detailed meteorological information to Calgary's construction community. Subscriptions are mandatory and incorporated as part of the building permit issued by the City.



Alert state detected in forecast

| Forecast Date | Wind Speed km/h | Gusts@10m km/h | Gusts@50m km/h | Gusts@100m km/h | Gusts@200m km/h | Gusts@250m km/h | Wind Direction | Min. Temp. C | Max. Temp. C | Max. Precip. mm |
|---------------------|--------------------|-------------------|-------------------|--------------------|--------------------|--------------------|----------------|-----------------|-----------------|--------------------|
| Aug 10-11 21:00 MDT | 9 | GUST | GUST | GUST | GUST | GUST | ESE | 17.1 | 19.5 | 0 |
| Aug 10-11 22:00 MDT | 11 | GUST | GUST | GUST | GUST | GUST | SSE | 17 | 18.9 | 2 |
| Aug 10-11 23:00 MDT | 9 | GUST | GUST | GUST | GUST | GUST | SW | 15.4 | 18.3 | 0 |
| Aug 11-11 00:00 MDT | 8 | GUST | GUST | GUST | GUST | GUST | SW | 15.2 | 17.7 | 0 |
| Aug 11-11 01:00 MDT | 5 | GUST | GUST | GUST | GUST | GUST | SE | 14.8 | 17.2 | 0 |
| Aug 11-11 02:00 MDT | 10 | GUST | GUST | GUST | GUST | GUST | ESE | 14.4 | 16.6 | 0 |
| Aug 11-11 03:00 MDT | 9 | GUST | GUST | GUST | GUST | GUST | ESE | 13.3 | 16 | 0 |
| Aug 11-11 04:00 MDT | 5 | GUST | GUST | GUST | GUST | GUST | ENE | 12.9 | 15.4 | 1 |
| Aug 11-11 05:00 MDT | 6 | 18 | 22 | 23 | 25 | 26 | SE | 12.7 | 14.7 | 1 |
| Aug 11-11 06:00 MDT | 6 | 23 | 26 | 28 | 30 | 30 | ESE | 12.7 | 14 | 2 |
| Aug 11-11 07:00 MDT | 5 | 22 | 24 | 26 | 28 | 28 | SE | 12.5 | 13.3 | 3 |
| Aug 11-11 08:00 MDT | 6 | 21 | 23 | 24 | 25 | 26 | SE | 12.7 | 13.7 | 5 |
| Aug 11-11 09:00 MDT | 6 | 21 | 21 | 22 | 23 | 24 | ESE | 12 | 15.2 | 6 |
| Aug 11-11 10:00 MDT | 5 | 21 | 21 | 22 | 24 | 24 | ESE | 13.5 | 15.9 | 5 |
| Aug 11-11 11:00 MDT | 8 | 22 | 22 | 23 | 24 | 25 | SSE | 15 | 17.2 | 3 |
| Aug 11-11 12:00 MDT | 12 | 22 | 22 | 23 | 24 | 25 | S | 16.5 | 18.8 | 1 |
| Aug 11-11 13:00 MDT | 9 | 20 | 20 | 20 | 21 | 22 | SW | 17.3 | 19.5 | 0 |
| Aug 11-11 14:00 MDT | 10 | 17 | 17 | 18 | 18 | 18 | WSW | 18 | 20.4 | 0 |
| Aug 11-11 15:00 MDT | 9 | 20 | 20 | 20 | 20 | 20 | E | 17.9 | 20.9 | 1 |
| Aug 11-11 16:00 MDT | 8 | 51* | 51* | 54 | 58 | 59 | NW | 19.1 | 20.3 | 0 |
| Aug 11-11 17:00 MDT | 26 | 56* | 56* | 56 | 58 | 60 | E | 15.4 | 19.3 | 6 |
| Aug 11-11 18:00 MDT | 10 | 36 | 36 | 36 | 37 | 38 | ENE | 15.8 | 19.6 | 4 |
| Aug 11-11 19:00 MDT | 10 | 29 | 29 | 29 | 29 | 29 | SE | 17.5 | 19 | 0 |

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