



Climate Ready Home Guide for Calgarians

How to better protect your home and property
from Calgary's climate hazards.

May 17, 2021



Institute for Catastrophic
Loss Reduction

Building resilient communities



Disclaimer: The content of this document is for informational purposes only and cannot be construed as technical advice with respect to any particular building(s) or construction project(s). The Guide does not recommend or endorse specific products or companies. All products and measures should be installed by a professional contractor, according to manufacturer specifications and following all City Bylaws and codes.

Table of Contents

| | |
|--|-----------|
| 1 About the Climate Ready Home Guide | 2 |
| 1.1 What is this Guide? | 3 |
| 1.2 Who is this Guide for? | 3 |
| 1.3 How to Use the Guide | 4 |
| 2 Climate Hazards and Their Potential Impact On Your Home | 5 |
| 2.1 Extreme Heat | 6 |
| 2.2 Wildfires | 8 |
| 2.3 Heavy Rain and Flooding | 9 |
| 2.4 Hail and High Wind | 11 |
| 2.4.1 Hail | 11 |
| 2.4.2 High Wind | 12 |
| 2.5 Winter Storms | 13 |
| 2.6 Drought | 14 |
| 3 Climate Resilience Measures for Home and Property Renovations | 15 |
| 3.1 General Advice to Consider Before Getting Started | 17 |
| 3.2 Roof | 18 |
| 3.3 Exterior Walls and Siding | 23 |
| 3.4 Insulation | 26 |
| 3.5 Windows and Doors | 28 |
| 3.6 Landscaping and Yard | 32 |
| 3.7 Water Management | 36 |
| 3.8 Ventilation and Cooling | 38 |
| 4 Resilience Opportunities for New Construction | 39 |
| 4.1 Extreme Heat | 40 |
| 4.2 Wildfire | 41 |
| 4.3 Heavy Rain And Flooding | 42 |
| 4.4 Hail and High Wind | 43 |
| 4.4.1 High Wind | 43 |
| 4.4.2 Hail | 44 |
| 4.5 Winter Storms | 44 |
| 4.6 Drought | 45 |
| 5 Home and Property Maintenance and Resilience Tips | 46 |
| 5.1 Emergency Preparedness | 47 |
| 5.2 Annual Maintenance Check | 47 |
| 5.3 Spring Maintenance Check | 48 |
| 5.4 Summer Maintenance Check | 49 |
| 5.5 Fall Maintenance Check | 50 |
| 5.6 Winter Maintenance Check | 50 |
| 6 Additional Resources and Information | 51 |

1

About the Climate Ready Home Guide



1.1 What is the Climate Ready Home Guide?

Alberta is a hot spot for extreme weather. Hailstorms, strong wind, floods and fires – they all happen here, and they happen more often, and more severely than elsewhere in Canada. In fact, six of the 10 largest insured losses from natural disasters in Canada’s history occurred in Alberta. The 2016 wildfires in Fort McMurray were the costliest (almost \$4 billion)¹, followed by the flooding of the Bow and Elbow rivers in 2013 that devastated our City and other Southern Alberta communities (\$1.7 billion)². The severe hailstorm that struck Calgary on June 13th 2020 caused approximately \$1.2 billion dollars³ in insured losses, and further uninsured losses, and is now recognized as the costliest hailstorm in Canadian history. The majority of financial costs associated with climate hazard events stem from damages to homes and home contents, as well as temporary living expenses for displaced residents. More important than the financial losses, these events cause social and economic disruption, and particularly affect our most vulnerable people.

Climate change projections tell us that the risk associated with some extreme weather events and long term trends (or “climate hazards”) is increasing. The climate hazards discussed in this Climate Ready Home Guide (the Guide) are all becoming more common and/or more severe in Calgary because of climate change. Our Climate Resilience Strategy and Climate Adaptation Action Plan, completed in 2018, identifies the climate hazards that are being amplified by climate change, and lays out a series of actions to manage the climate risk relevant to Calgary.

For more information see [Calgary’s Climate Change Program](#).

We want to help Calgarians understand and make improvements to enhance the resilience of their home and property to the hazards that are becoming worse because of climate change. Many of the impacts of climate hazards can be reduced through upgrading or maintaining materials and components of our homes and properties, as well as through enhanced maintenance. The measures outlined in this Guide can help you save money by avoiding costly repairs and also eliminate stress and anxiety associated with responding to and recovering from a damaging extreme weather event. We hope this information will empower citizens to prepare for and take action to respond to our changing climate.

This Guide informs choices you can make during a renovation or construction project, or to your home maintenance regime to make your home more resilient to current and future climate hazards. While the National Building Code – Alberta Edition outlines the minimum required technical provisions for the design, construction and renovation of buildings in Alberta, most measures in this Guide go above and beyond those minimum required standards.

1.2 Who is this Guide for?

This Guide is designed for:

- Owners of homes in Calgary, from detached single-family homes to mobile homes.
- Tenants and renters, and their landlords.
- Home builders and renovation contractors.

This Guide is for you if you are:

- Making modest investments and minor changes around your home or property to make it more able to withstand climate hazards.
- Beginning a major home renovation and want to integrate improvements that make your home more able to withstand climate hazards.

- Constructing a new home and want to incorporate materials and practices that increase the resilience of your home to climate hazards.
- Considering changes to how you run and maintain your home or property that would make it more resilient to climate hazards.

Did You Know?

The 2016 wildfires in Fort McMurray were the costliest (almost \$4 billion)¹, followed by the flooding of the Bow and Elbow rivers in 2013 that devastated our City and other Southern Alberta communities (\$1.7 billion)². The severe hailstorm that struck Calgary on June 13th 2020 caused approximately \$1.2 billion dollars³ in insured losses, and further uninsured losses, and is now recognized as the costliest hailstorm in Canadian history.

1.3 How to use the Guide

There are various approaches to access this information.

Approach A:

If you perceive your home to be at risk from a particular climate hazard and you want to make your home more resilient to that hazard, refer to the section about that hazard (within Section 2). This will provide you with a summary of how that hazard may affect your home and identify some key measures you can take to make your home and property more resilient to that hazard.

Approach B:

If you are building a new home or renovating individual elements of your home, like the roof or siding, refer to the section about the home element that you are working on (within Section 3).

Approach D:

If you want to change how you run and maintain your home to make it more climate resilient, refer to Section 5.

Approach C:

If you are building a new home, you should also look at the additional measures and considerations provided in Section 4.

The table below will help you quickly navigate the Guide and find the sections and content you are looking for.

| I want to know how to make my home more resilient to one or more specific climate hazards. | | | Extreme heat | Wildfire | Heavy Rain & Flooding | Hail and High Wind | Winter Storms | Drought |
|--|-------------------------|--------------|--------------------|--------------------|-----------------------|--------------------|--------------------|--------------------|
| | | | Sec 2.1 & 4.1 ↓ | Sec 2.2 & 4.2 ↓ | Sec 2.3 & 4.3 ↓ | Sec 2.4 & 4.4 ↓ | Sec 2.5 & 4.5 ↓ | Sec 2.6 - 4.6 ↓ |
| I am planning a renovation to my home that includes one of more of the following elements. OR I am building a new home and want to increase the climate resilience of one or more of the following elements. | Roof | Sec 3.2 → | ✓ | ✓ | | ✓ | ✓ | |
| | Siding | Sec 3.3 → | ✓ | | | ✓ | | |
| | Insulation | Sec 3.4 → | ✓ | | | | | |
| | Windows | Sec 3.5 → | ✓ | | | ✓ | | |
| | Doors | Sec 3.5 → | ✓ | | ✓ | ✓ | | |
| | Landscaping | Sec 3.6 → | ✓ | ✓ | ✓ | ✓ | | ✓ |
| | Water Management | Sec 3.7 → | | | ✓ | | | ✓ |
| HVAC | Sec 3.8 → | ✓ | | ✓ | | | | |
| I am building a new home and want to increase climate resilience during the planning and design phase. | | Sec 4 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| I want to know how to run and maintain my home and property to make them more climate resilient. | | Sec 5 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

2

Climate Hazards and Their Potential Impact On Your Home



Our city is exposed to a variety of climate hazards. All of the climate hazards discussed in this Guide are becoming more likely and/or more severe as the climate changes. Depending on where you live in Calgary and how vulnerable your home is, you may be at greater risk. This section identifies relevant climate hazards and their potential impact on your home and property. Further information can be found in the following City resources:

- [Calgary.ca/ClimateAction](https://calgary.ca/ClimateAction) provides information about other types of actions you can take to prepare for climate change impacts, as well as actions you can take to reduce your contribution to climate change.
- Calgary Emergency Management Agency (CEMA)'s [Disaster Risk Explorer](#) provides more information about all hazards in Calgary (including those hazards that are becoming more likely and severe because of climate change).
- To learn about how to prepare and protect yourself, your family and your home from any kind of emergency in Calgary, visit [Calgary.ca/GetReady](https://calgary.ca/GetReady).

2.1 Extreme Heat



While there is no single definition of an extreme heat event, it is generally described as hot weather

conditions that have the potential to result in an unacceptable level of health effects. Environment and Climate Change Canada refers to days that reach or exceed 29°C in the Calgary region as “high heat days”, and a “heat wave” is defined as more than three days above 29°C where nighttime temperatures remain above 14°C.

Temperatures in Calgary have steadily increased over the past century and local temperatures will continue to get hotter due to climate change. Calgary’s average daily maximum summer temperatures are increasing and by the 2050s will be

approximately 4°C warmer than they are today. High heat days and heat waves will become dramatically more common in Calgary. For example, high heat days are projected to increase from 6 days per year today, on average, to an average of 28 days per year by the 2050s. Our hottest days will become much hotter (36°C by the 2050s) than what Calgarians have experienced in the past (32°C).

Extreme heat can make your indoor living environment unbearable and uncomfortable, and can lead to lethargy, reduced productivity, heat-related illnesses and, in extreme cases, fatalities. Extreme heat can also reduce air quality, amplifying concentrations of ground-level ozone (“smog”)—a pollutant

associated with a range of adverse health effects, including asthma attacks. The risk of negative health effects is higher for people who work or live outdoors or have underlying health conditions, and for children and seniors. Heat waves can also result in increased electricity demand for cooling, which can lead to power outages during periods of peak demand.

High temperatures, and large variations in temperature, can also lead to the deformation of building materials (e.g., roofing and siding) causing buckling, bowing, cracking, and sometimes breakage. In addition, some chemical processes are accelerated by an increase in temperature, which can degrade and damage concrete, asphalt and steel structures over time.

Extreme Heat Vulnerability

No matter where you live in Calgary, extreme heat hazards may affect you and your home. If you live closer to the downtown core, or in a more built-up area with minimal vegetation, you may be more vulnerable to extreme heat due to the urban heat island effect. The urban heat island effect happens because buildings and paved surfaces amplify and trap heat. In addition, cities also generate their own heat, which is released from furnaces, air conditioners, and vehicles⁴.

Consider the following questions. The more questions you answer as YES, the more vulnerable you and your home may be to extreme heat:

| | |
|---|---|
| ✓ | Do you live close to the downtown core, or in a more densely populated area with minimal vegetation? |
| ✓ | Does the interior of your home get uncomfortably hot in the summertime? |
| ✓ | Do you have older, single-pane or low-quality windows? |
| ✓ | Are most of your windows fixed and non-opening? |
| ✓ | Do you have air leaks in your windows and doors? |
| ✓ | Do you have walls or an attic that is poorly insulated? |
| ✓ | Does your property lack trees or other forms of shading (awning, covered porch, etc.) to direct sunlight? |
| ✓ | Do you have dark coloured materials on your roof, exterior walls, deck and landscaping that absorb heat? |

To reduce extreme heat impacts to you and your home, consider the following:

- If you have a flat roof or a moderately sloped roof (1:12 to 3:12 rise over run slope), or you are building new, consider a vegetated (living) roof, or consider using lighter colours that absorb less heat (Section 3.2).
- Ensure your walls and attic are well-insulated. If renovating your attic space, consider adding insulation for increased R-value (see Box 1 in Section 3.3, and Section 3.4). If replacing your siding, consider installing exterior insulation and siding options with a higher R-value (Section 3.4).
- If building new, or replacing your windows, go with triple pane windows, and windows with a low solar heat gain coefficient (Section 3.5). Ensure you have at least some windows that can open, preferably to the prevailing wind direction (south-west), to provide ventilation.
- Plant deciduous trees on the south, east and west exposures. They provide shade in the summer and shed leaves in the winter to let sunlight in (Section 3.6). Alternatively, install external shading devices, such as roller shades or awnings (Section 3.5).
- In general, planting trees and other vegetation in place of hard surfaces will lower surface and air temperatures around your home. Avoid using artificial turf, which tends to get hot.
- You can install a window air conditioner unit in rooms that cannot be cross-ventilated effectively (Section 3.8). For new homes, installing central air conditioning may also provide opportunities to filter outside air that may be contaminated with pollen, dust or wildfire smoke (Section 2.2). Remember that air conditioning units are energy intensive and running them contributes to climate change, so ideally, we should choose energy efficient A/C systems, and only use them after applying passive cooling measures.

2.2 Wildfires



Any fire that is burning strongly and out of control in an area of grass or forest can be referred

to as a wildfire. Although wildfires are a natural part of wildland ecosystems, living where wildfires can occur puts your home at risk. Calgary is not as exposed to wildfire as northern and mountain communities adjacent to large, forested areas; however, some communities in Calgary are situated beside forested and/or heavily grassed tracts of land. Due to many years of forest and grassland fire control efforts the forested areas, grasslands, coulees, river valleys and some parks in Calgary may have a high potential for fire control problems. In the past we have experienced multiple grass fires, such as those on Nose Hill. Recent wildfires in Alberta such as the Slave Lake (2011), Fort McMurray (2016) and Waterton (2017) fires are a testament to the devastating impacts of wildfires on our community, economy and quality of life.

Climate change is amplifying three major factors that influence wildfire: having dry fuel to burn, frequent lightning strikes that start fires, and dry, windy weather that fans the flames. As climate change makes summers longer, drier and hotter, and with more intense storm events, wildfire risk in Alberta will continue to intensify. Increased wildfire risk will lead to increased smoke and air quality issues in Calgary.

In an urban setting, wildfires can grow by catching trees, leaves, plants, dried grasses, and other fuels, and spread to structures, including

your home. Sparks and embers from a wildfire as far as two kilometres away from your home can also ignite materials and cause severe damage to your home.



Wildfire Vulnerability

If you live adjacent to dense, continuous forests or unmanaged grasslands, you may have an elevated risk from wildfires. Large urban parks include Nose Hill, Confederation, Edworthy, and Fish Creek Provincial Park, to name a few.

Regardless of where you live in Calgary, you have potential to be exposed to wildfire smoke.

For more information about how to protect your home and property from wildfire, visit [Alberta FireSmart](https://www.alberta.ca/alberta-firesmart)



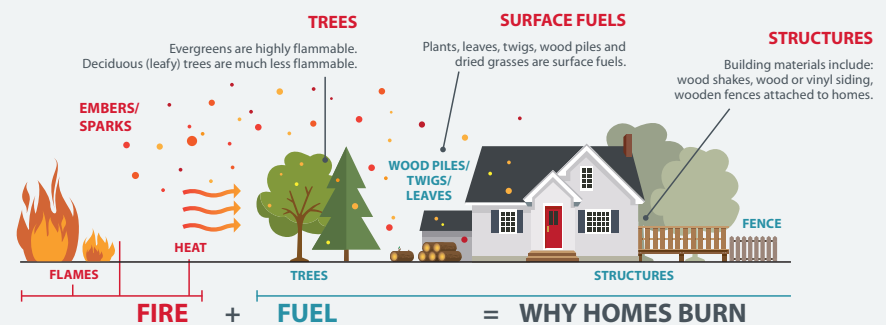
FireSmart™ and associated Marks are registered trademarks of the Canadian Interagency Forest Fire Centre (CIFFC).

Consider the following questions. The more questions you answer as YES, the more vulnerable you and your home may be to wildfire and/or wildfire smoke:

| | |
|---|---|
| ✓ | Do you live beside dense, continuous forests or unmanaged grasslands? |
| ✓ | Do you have combustible materials and/or trees in close proximity to your home? |
| ✓ | Do you have wooden shake roofing materials? |
| ✓ | Do you live on the mid to upper portion or crest of a hill or slope? (Fire moves faster uphill and may put your home at higher risk). |
| ✓ | Is your exterior siding made of wood or vinyl? |
| ✓ | Do you live in a home without an indoor air purifier? |

To reduce wildfire impacts to you and your property, consider the following⁵:

- Metal or clay tile are the best roofing materials for fire protection. Asphalt shingles can also provide excellent fire resistance, depending on the fire resistance classification (Section 3.2).
- Cement board, stucco, brick or metal are the best siding options for protection against wildfires (section 3.3).
- An indoor air purification system can protect against wildfire smoke (Section 3.8).
- Clean your roof and gutters – remove needles, leaves and other combustible materials (Section 5.4).



2.3 Heavy Rain and Flooding



In Calgary there are different types and [causes of flooding](#). [River flooding](#) can occur when

there is heavy rainfall in the mountains and foothills combined with a melting snowpack in the Spring. [Groundwater flooding](#) can occur during heavy rainfall or higher river levels. [Stormwater flooding](#) can occur during a heavy rainfall in Calgary, which can cause local [drainage issues](#).

Every time it rains or snow melts, Calgary's stormwater management system of about 60,000 storm drains and hundreds of storm ponds carry water to one of our 800 outfalls and into the rivers and creeks. In some cases, for example during a heavy rainfall event, water can accumulate in low-lying areas and impact your home and property.

While the climate resilience measures identified in this Guide may help to minimize damage from river flooding, they will not fully protect your home

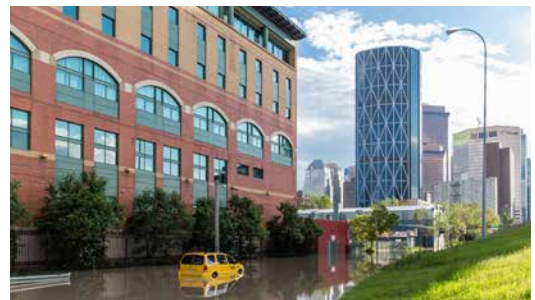
from river flooding. The measures in this Guide are primarily geared towards protecting your home from damages caused by stormwater flooding.

Visit The City of Calgary's [Stormwater Management webpage](#) for more information about our city's stormwater management system.

With climate change, the amount and intensity of extreme precipitation events will be increasing. In Calgary, for storms of less than one day in duration, we are anticipating about a 28% increase in precipitation volumes by the 2050's. We thus expect the frequency and severity of stormwater flooding to increase in the future.

For your home and property, the most common concern is basement flooding. Basement flooding can be caused by overland water entering your home through openings, sewer backup from the sanitary

or storm systems, or seepage into the basement due to changes in the groundwater table or poor lot drainage. If you have a finished basement, flooding may have a greater impact; for example, if you have furniture and expensive electronics in your basement. Flooding and water that enters your home can also cause mold to grow, leading to long-term health impacts if not appropriately addressed. In some of the worst-case scenarios, damage may occur to the structure and foundation of your home, making it unlivable. Flood waters are also frequently contaminated with debris and pollutants, including sewage.



Flooding Vulnerability

A considerable number of homes in Calgary have potential to be impacted by basement flooding.

Importantly, the climate resilience measures identified in this Guide will not protect your home from river flooding. Residential structures are unable to withstand the forces associated with even minor river floodwater depths unless specifically designed to do so. You should check the City's [flood map](#) to determine if your home is located in the floodway, flood fringe or overland flow zone of the Bow River, Elbow River, Nose

Creek or West Nose Creek. If it is, specific land use regulations apply.

For more information on official and recommended flood elevations, and the development and building regulations that apply in each designated flood zone, please refer to Calgary's [Land Use Bylaw](#), Part 3 Division 3, or contact The City's Planning Department (or call 403-268-5311).

Some of the climate resilience measures outlined in Section 3

may provide some protection if your home is located in the flood fringe or the overland flow area, and your home is inundated by shallow overland floodwater⁶.



Consider the following questions. The more questions you answer as YES, the more vulnerable your home and property may be to damage from flooding:

| | |
|---|---|
| ✓ | Check The City's Flood Map . Do you live in an area at risk of river flooding, or in close proximity to a natural water body? |
| ✓ | Do you see water ponding in your yard on a regular basis? |
| ✓ | Has your basement ever flooded? |
| ✓ | Do you have a finished basement? |
| ✓ | Are there any unsealed cracks in your foundation or basement floor? |
| ✓ | Do you have basement windows close to the ground, or below the ground (window wells)? |
| ✓ | Does the grading of your lot, or your driveway, slope towards your house? |
| ✓ | Do you have downspouts that direct water towards your home, or that drain close to your foundation walls? |
| ✓ | Do you have a sump pump? Does your sump pump operate frequently (e.g. when the river is high in Spring, or when it rains)? |

To reduce flood impacts to your home and property, consider the following:

In the home

- Avoid building living spaces in the basement.
- Choose flood damage-resistant building materials for walls and siding, flooring, and door (Section 3.3 and 3.5)?
- Repair cracks in the basement foundation.
- Install a back-flow prevention valve on your sewer pipe to help protect your home from sewage backups associated with extreme rainfall events and stormwater flooding. This can also be individually installed in basement showers, toilets, and sinks (Section 3.7).
- Install a sump pump with a back-up power source (Section 3.7).
- Install water alarms in the basement to alert you if water is backing up.

Outdoors

- Whether building a new home or landscaping your yard, improve your lot grading so that it slopes away from the house foundation.
- Install eavestroughs and downspouts if your home does not have them and ensure downspout extensions direct water at least 1.5 metres away from your house, and not toward your neighbours property (Section 3.6).
- Clean your roof, eavestroughs, downspouts and drainage gutters clear of debris by removing needles, leaves, etc.
- [Permeable concrete, asphalt and paving stones](#)⁸ allow water to readily move through and percolate into the soil are better at absorbing water and help protect against extreme heat. Whether building new or re-doing your driveway or sidewalks, consider choosing permeable materials (Section 3.6).
- Report plugged [storm drains by calling 311](#).
- If you have low spots on the street where water collects, park your vehicles on higher ground or in your driveway instead.

Visit calgary.ca/floodinfo to learn more about protecting your home from flood impacts.

2.4 Hail and High Wind

Hail and high wind events may be small in spatial extent but can produce significant, high-cost impacts. According to climate projections, the frequency and intensity of these events are likely to increase in the future, and there is increasing potential for them to occur throughout more of the year.



2.4.1 Hail

Hail is one of many hazards associated with damaging convective

storms. Hail is a form of precipitation that is made up of ice and snow. Hail stones can range from pea size to golf ball size, and up. There has been an increasing trend in hail in Alberta over the past four decades. Although climate projections for hail cannot be definitively determined⁹, it is expected that the upward trend will continue based on the increasing atmospheric energy and frequency of damaging storms. Additionally, the

increasing duration of the “hail season” or convective storm season will likely contribute to Calgary experiencing more hail events.

Calgary is located in “hail alley”, the epicentre for hailstorms in Canada. On average we get about five hailstorms per year. Most recently, the hailstorm that struck Calgary on June 13th, 2020 caused \$1.2 billion dollars in insured losses and further uninsured losses. This event was the fourth costliest insured loss in Canadian history. In addition to this event, storms in 2010, 2012 and 2014

collectively caused more than \$1.6 billion in insured losses in Alberta¹⁰.

Building envelopes will increasingly be impacted by hailstorms in at-risk areas such as Calgary. Depending on the size of hailstones, the wind speed and the duration of a storm, hail can cause significant damage to your home’s roof, exterior walls, doors and windows, and outdoor structures like porches and decks. Moreover, damage to these aspects of your home’s envelope can allow water in, leading to even more damage.

Hail Vulnerability

All communities within Calgary have potential to be exposed to hail.

The City has more information on [how to stay safe during a hail event](#) and [cleaning up and rebuilding after a storm](#).

Consider the following questions. The more questions you answer as YES, the more vulnerable your home and property may be to hail damage:

| | |
|---|--|
| ✓ | Has your home previously been damaged by hail? |
| ✓ | Do you park your vehicle (if you own one) in an unprotected area at home (e.g., not in a carport or garage)? |
| ✓ | Do you have flat or almost flat roof? |
| ✓ | Do you have skylights? |
| ✓ | Do you have aluminum or vinyl siding? |
| ✓ | Do you have an older roof with low-quality roofing material that is not impact resistant rated? |
| ✓ | Do you have older, low-quality windows that are not impact resistant rated? |

To reduce the impact to your home and property from hail, consider the following:

- If you are building new, hip roofs are the most resilient to hail damage, and the steeper the slope of your roof, the less susceptible it will be to hail damage (Section 3.2).
- If you are replacing your roof or siding, check Table 1 and Table 2, respectively, to see how well different materials perform against hail (Section 3.2 and Section 3.3).
- Purchase and install impact resistant windows and doors and put a safety film on your windows (Section 3.5).
- Install protective shutters (roll shutters or storm shutters) on the outside of your windows (Section 3.5). These will also offer protection against extreme heat events.



2.4.2 High Wind

High winds are typically defined as gusts greater than or equal to 90 km per

hour. In Calgary, the strongest winds are usually caused by severe thunderstorms, intense low-pressure centers and cold fronts, and chinooks. High wind events occur fairly frequently in Calgary and can last from minutes to hours. For example, in 2017 multiple high wind events toppled trees, downed power lines, damaged roofs, and broke windows on a number of buildings in the downtown core. Tornadoes are also possible in Calgary, but less likely.

High winds can damage a wide variety of infrastructure including homes,

buildings, traffic signals, streetlights and signs. Strong winds can turn tree branches and garden furniture into weapons, which can damage roofs, exterior walls, windows and doors. Overhead power lines are at risk during high wind events with the potential for power interruptions or outages. Areas of the city, such as the downtown core, could also be closed periodically during extreme high wind events due to falling debris. Injuries or fatalities as a result of high wind events in Calgary have been rare but have occurred.

With a changing climate, we expect to continue to experience high wind gust events in Calgary¹¹.

High Wind Vulnerability

All communities within Calgary have potential to be exposed to high winds.

Consider the following questions. The more questions you answer as YES, the more vulnerable your home and property may be to damage from high winds:

| | |
|---|--|
| ✓ | Do you have a complex roof design? |
| ✓ | Do your roofing materials (e.g., shingles) appear to be worn and/or damaged? |
| ✓ | Check your roof edge attachments. Is the edge of your roofing material (e.g., shingles) starting to peel back or is it poorly connected to the roof structure? For example, can you easily peel them back? |
| ✓ | Are your soffits, fascia and gutters old and/or showing signs of damage? |
| ✓ | Were your roofing materials installed without underlayment? |
| ✓ | Do you have a number of items stored outdoors which are not anchored down (e.g., trampoline, playground equipment, tables, etc.)? |
| ✓ | Do you have older windows and doors which are not pressure-rated or reinforced? |
| ✓ | Do you have unmaintained or unhealthy trees? These are at higher risk of failure and could cause damage to other property. |

To reduce the impact to your home and property from high wind, consider the following:

- If replacing your roof or siding, check Table 1 and Table 2 to see how well different materials perform against high winds (Section 3.2 and 3.3).
- If replacing windows or doors, consider impact resistant options or put a safety film on your most exposed windows (Section 3.5).
- Install protective shutters (roll shutters or storm shutters) on the outside of your windows (Section 3.5).
- Plant coniferous (evergreen) trees in a row on the prevailing wind side of your house (Section 3.6). If possible, trees should be planted far enough away that falling branches will not cause damage to your house.
- Properly prune and maintain trees around your house. Proper maintenance from a certified arborist will reduce the likelihood of failure.
- Securely anchor outdoor accessories and equipment.

2.5 Winter Storms



Winter storms can be defined as any precipitation event with potential to cause damage

that occurs near or below 0°C. This can include snowfall events, freezing rain, ice storms, and rain-on snow events. Winter storms can happen in the spring and fall, not just in winter. In 2014, the “Snowtember” event brought heavy snowfall in late summer and damaged half of the trees in the city. This tree canopy damage was largely a result of trees having not yet shed their leaves, in combination with the heavier snow. The 28 cm of snow that fell during Calgary’s three-day September snowstorm generated \$17.4 million in insured costs

alone – nearly as much as the City’s entire annual snow and ice control budget.

The most significant and high impact frozen and freezing precipitation events require very specific weather conditions to occur (cool season weather conditions near 0°C). They may be accompanied or followed by rainfall, as occurred in September of 2014, resulting in extremely heavy loading on trees and overhead infrastructure. In Calgary, average winter temperatures are projected to increase but still remain below 0°C, on average, by the 2080s, and winter precipitation is projected to increase. Hence, Calgary will continue to experience high impact winter storm events in future decades.

The potential increase in winter snow loading caused by rain-on-snow events can damage buildings and property. Snow and ice storms can also damage infrastructure and cause power failures (e.g., downing of overhead power lines), and result in more injuries due to increased traffic accidents or slips and falls. Around your home, a really heavy snow load or ice storm can put significant stress on your roof, with the potential to damage (collapse) your roof and cause ice dams. An ice dam is a ridge of ice that develops at the edge of your roof or around drains that prevents snow or water from melting off your roof. It is caused by heat escaping from the interior of your house.

Winter Storm Vulnerability

All communities in Calgary have potential to be exposed to winter storms.

Consider the following questions. The more questions you answer as YES, the more vulnerable your home and property may be to winter storm damage:

| | |
|---|--|
| ✓ | Has your home ever been damaged by heavy snowfall or freezing rain? |
| ✓ | Do you have flat or almost flat roof? |
| ✓ | Do you have a complex roof design with obstructions where snow and ice can collect? |
| ✓ | Do you have skylights? |
| ✓ | Is there any vegetation that overhangs your roof and contributes to blockages in roof drainage systems or that could break off and damage your roof or property? |
| ✓ | Is your attic/roof poorly insulated? If not, snow loads on your roof can melt and cause ice damming. |

To reduce impacts to your home and property from winter storms, consider the following:

- If building new, choose a roof structure with a steeper slope. More complex roof structures, and flatter roofs, are more susceptible to damage from winter storms (Section 3.2).
- If building new or replacing your roof, install a continuous underlayment of moisture or ice-and-water shield over the entire roof surface to protect against water and ice penetration (Section 3.2).
- Improve insulation and venting of your attic to reduce risk of ice damming on your roof (Section 3.4).
- After a major snowstorm check the exterior of your home, particularly the roof of your home or garage, porches, decks and other overhangs, for signs of ice damming or heavy snow load. Rake or shovel heavy snow loads off of your roof, deck or porch, and look for water leaks originating from the roof or attic area, difficult to open doors, new cracks in your drywall or plaster, or sagging on the ridgeline of your roof (Section 5.6).
- Prune trees for structural health as required by a certified arborist.

2.6 Drought



Meteorological drought is a lack of adequate precipitation over an extended period of time,

resulting in a water shortage. Climate projections of increased summer temperatures and decreased summer precipitation tell us drought conditions may become more common and widespread.

The consequences of a multi-year drought are far reaching. In addition to the impact on local agriculture, droughts affect the health of plants, wildlife, wetlands, forests, parks, open spaces, recreational facilities and private yards. Drying out of forests and grasslands

increases the risk of wildfires, which impact both local air quality and even water quality if they occur upstream of the source of Calgary's water supply.

Trees and plants also become more susceptible to pest and disease outbreaks (e.g., pine beetles) since lack of water can stress trees, limiting their ability to react to these attacks.

The City website has more information about [drought](#) in Calgary.

Drought Vulnerability

All communities in Calgary have potential to be exposed to drought, but the outdoor landscaping of some properties may be more vulnerable to drought impacts.

The City of Calgary's [Homeowner Water Guide](#) has useful information about water services in the City, where our drinking water comes from, and programs, tips and tools we offer for creating a water-efficient home and yard.

Consider the following questions. The more questions you answer as YES, the more vulnerable you and your property may be to the impacts of drought:

| | |
|---|---|
| ✓ | Do you have trees, shrubs and flowerbeds that require large amounts of water? |
| ✓ | Does your property have a large lawned area? |
| ✓ | Does your household use excessive quantities of water? (In Calgary, the average person uses about 7 cubic metres (m ³) or 7,000 litres of water per month.) |
| ✓ | Do you grow fruit, vegetables or herbs in your garden? |
| ✓ | Are cracks visible in your interior and external walls, around the corners of walls and windows? |

To reduce the impacts to you and your property, create a water efficient YardSmart yard that is suited to Calgary's climate and is more sustainable during drought conditions. Consider the following:

- Choose [drought tolerant annuals, perennials and grasses](#), and hardy trees and shrubs that thrive in Calgary (Section 3.6).
- Add a base of at least twenty centimeters (8 inches) of good quality soil for a healthy garden or lawn that retains more water and therefore requires less watering (Section 5.4). Add mulch around trees and shrubs to retain moisture and keep an even soil temperature.
- Capture and use free rainwater collected in a [rain barrel\(s\)](#) as a source of soft, warm water for your yard (Section 3.6).
- Direct runoff from downspouts and other hard areas into the landscaped areas of your property, such as rain gardens (Section 3.6).
- Help conserve water in the dry summer months by taking actions listed in Section 5.4 Summer Maintenance Checklist.

Climate Resilience Measures for Home and Property Renovations



This section contains:

- General advice for all Calgarians that own or rent a home (Section 3.1).
- Measures and practices that can be implemented to increase the resilience of your home and yard, during a home renovation project or as part of the design of a new home (Sections 3.2 through 3.8).

The climate hazards addressed by the resilience measures and practices described below are indicated with icons:



Extreme heat



Hail



High Winds



Winter Storms



**Heavy Rain
and Flooding**



Wildfire



Drought

This Guide does not provide an exhaustive list of all climate ready measures for home and yard development and improvement. Instead, it identifies key measures to reduce the impacts of the most severe climate hazards we anticipate in Calgary. The information is based on best management practices from existing accessible information¹².

3.1 General advice to consider before getting started

This section provides advice for all users before getting started with their home resilience efforts.

Talk to your insurance provider:

- Are you covered for damage from climate hazards, such as wildfire, flooding, hail, wind, freezing rain and heavy snow? Sometimes specific types of damage can be excluded depending on your policy, or policy deductibles may vary depending on the cause of damage.
- Does that coverage include other structures and belongings, or just the house itself?
- Does your policy have a deductible? Are there separate deductibles for different parts of your home coverage (e.g., a separate deductible tied to your “water damage” or basement flooding endorsement)?
- Do you have coverage for living expenses if the damage is sufficiently severe that you cannot stay in your home?
- Are discounts or other incentives available for climate ready home measures? Speak with your insurance provider to verify how installing any of the measures listed below might affect your insurance policy. Some of the measures, notably those focused on basement flooding, may make you eligible for improved coverage or savings on insurance premiums.

Talk to a professional contractor:

- Because each home is different, qualified private building inspectors may be able to offer important insights into your home’s capacity to withstand climate hazards. (City of Calgary Building Inspectors, known as Safety

Codes Officers, do not have a mandate to perform this function.)

- Whether you are landscaping, building a new fence or deck, or planting a garden, disturbing the ground on your property can cause damage to a buried utility. Before you disturb the ground, submit a locate request to [Alberta One-Call](#) to request that buried utilities on your property be located and marked.
- The City of Calgary website has detailed information about [required permits and bylaw information for residential home construction and renovation projects](#), including the types of projects and renovations that require professional qualifications.
- A professional energy advisor can provide detailed information on protecting your home from extreme heat, and also reducing your energy bills. [For more information on EnerGuide energy efficiency home evaluations, visit \[www.nrcan.gc.ca\]\(http://www.nrcan.gc.ca\)](#).
- A certified arborist can assess the health of your trees and advise on pruning for health and structure or replacement with a suitable species if at end of life.

Talk to The City:

- A development permit allows The City to review a development to see if it meets the [Calgary Land Use Bylaw](#) requirements and any other relevant policies or plans, such as area redevelopment plans and the Municipal Government Act. Development permits are required

for new projects, changes in use or additions to existing structures. Plan reviews, approvals and site inspections are provided, to ensure that development meets the approved planning, engineering and environmental policies. The process looks at land use, site development, streetscape, planning principles, densities, landscaping, transportation, parking and more. Special regulations apply for development in flood risk areas. When undertaking a new project, it is always best to consult with the [Planning Services Centre](#) to find out what kinds of permits you will need.

- A Building Permit is designed to address life and safety issues of a structure. It gives authorization to erect, demolish, relocate, alter or repair a structure, or change the use or occupancy of a space. A Building Permit application is reviewed for compliance with the National Building Code – Alberta Edition by a Safety Codes Officer prior to issuance and inspected at various phases of construction to ensure that our built environment is safe. Check the [City of Calgary website to find out if your home renovation projects require a building permit](#).
- Ensure your renovation meets (and hopefully exceeds) the National Building Code -Alberta Edition. The 2019 version came into effect on April 1 2019.
- Learn how to get prepared for any emergency at Calgary.ca/GetReady.



Infrastructure Canada’s [Climate-Resilient Buildings and Core Public Infrastructure Initiative](#) aims to integrate climate resilience into building and infrastructure design, guides, and codes, with the goal of addressing climate resilience in the National Building Code 2025 edition. The program will also result in publication of new guidance on protecting buildings and homes against hazards like wildfire, flooding, and other hazards.

If your home is damaged by a climate hazard, you should:

- Most importantly, keep you and your family safe.
- Report property damage to your insurance provider as soon as possible.
- Record information about the event the extent of damage to your home.

Information can be recorded through written documentation, photographs and/or videos, and can be used to support your insurance claim.

- If it is safe to do so, try to record any information about how flood waters entered your home (e.g., through a drain or bathroom in the

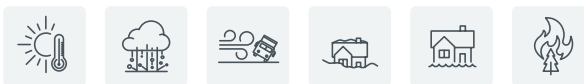
basement, from the surface, through the basement floor or walls). This information will help you understand what is needed to protect your home against future flood events. It is useful to take pictures with time stamps.

3.2 Roof

A roof includes the structure, slope, attic, and different types of roofing materials, including membranes underneath the roofing. The roof also includes items that are attached to the roof such as gutters, solar panels, or a chimney.

When planning a roof renovation (re-roofing) the climate ready measures outlined in this section can help enhance the resilience of your roof as well as help to protect the rest of your home from damage. The most important aspects of a climate ready roofing system are a durable sheathing material that is securely fastened to the roof structure, roofing underlayment, and installation of a climate ready roofing material.

Roofing Material



When it is time to replace your roof, there are several roofing material options to consider. Shingles are by far the most common roofing material, and standard, inorganic 3-tab asphalt shingles are the least expensive. If you are installing asphalt shingles and want to enhance the resilience of your roof, consider upgrading to either laminated architectural shingles, or Class 4 impact resistant shingles. Although rubber, aluminum and steel roofs are more

expensive than asphalt shingles, they can be more resilient and last longer than asphalt. Roofs made of a clay, concrete, or slate tiles are very resilient and long-lasting, but can be cost prohibitive. Wood shingles and green roofs are slightly less expensive roofing options than tiles but offer less resilience with respect to some climate hazards; respectively, wildfire and drought. Green roofs do nonetheless offer multiple co-benefits.



Most roofing materials, and asphalt shingles in particular, should be installed in warmer months. Shingles installed during the cold months are more likely to not have adhered properly and may be more vulnerable to damage from climate hazards, including blow off from moderate wind events.

Table 1 provides a description of different roofing materials, including some potential co-benefits of each material, as well as a comparison of their cost relative to the least expensive option (i.e. Standard 3-tab asphalt shingles).

Table 1: Comparative summary of roofing materials¹³

| Roofing Material | Description | Installed Costs |
|--|---|--|
| Asphalt shingles | Asphalt shingles (Standard 3-tab Class A inorganic shingles) are a popular and inexpensive roofing option. They do well in moderate wind conditions and most hailstorms because they are flexible and have a low risk of damage when debris makes contact with the roof. However, a severe storm can cause significant damage to asphalt shingles. Most asphalt shingles have a Class A fire resistance rating, which is the highest level of fire resistance. With a flame-retardant fiberglass core, these shingles provide excellent fire resistance. Most products have a life expectancy of up to 20 years. | -- |
| Laminated architectural asphalt shingles | A type of asphalt shingle built with a heavier base and multiple layers of a more refined type of asphalt. Laminated architectural shingles have the strength of multiple standard asphalt (3-tab) shingles and can withstand stronger winds and more intense weather conditions. Laminated shingles are easier to install and typically last longer than standard shingles, with a life expectancy of 30 years or more (premium shingles). Class 4 (impact resistant) shingles provide improved impact resistance, and increased resistance to tears, splits and hence water damage. Nevertheless, when exposed to large, wind-driven hail, impact resistant asphalt shingles can still experience damage. | +25% [arch. shingles] +45% [Class 4 IR] |
| White (cool) shingles | Cool roof shingles are shingles that have been engineered to have higher solar reflectance and thermal emittance properties helping to reflect sunlight and decrease the amount of heat transferred into your home. Light colored roofs reflect between 55 and 90 percent of sunlight reaching the roof surface. As a result, they lower internal temperatures, reducing heat stress and cooling bills in summer months. Lighter surfaces, if used throughout a region/neighbourhood, may also assist in reducing urban heat island. In Calgary, however, where the majority of your annual energy costs come from heating your home, installing a cool roof is not likely to save you money on your annual energy bill. A cool roof system can also be achieved by using light coloured roofing materials or painting your roof white. | +45% |
| Rubber | Rubber roofs are one of the most climate resilient roofing types, as they offer a tremendous level of impact resistance due to their energy absorbing and dispersing nature. In addition to hail they can also handle heavy rain, heavy snow and extremes in temperature and temperature variances that can cause splitting, peeling, cracking and rotting in other roofing materials. Rubber roofs offer some fire resistance but can be treated with fire-retardant to reduce their combustibility. They can last 30-50 years, requiring little maintenance if installed correctly. Rubber roofs can be made from recycled tires, sawdust, and slate dust, making them an eco-friendly option. | +80% |
| Metal roofs (aluminum and steel) | Metal is a durable, fire-resistant, lightweight roofing option that offers greater longevity, lasting up to four times longer than asphalt shingles. Metal roofs can withstand high winds and provide good protection against winter storms. Metal roofs can generally take the impact of a hailstorm; however, you can be left with visible dents if the hail is of substantial size (1.5" or greater). The type and thickness of metal material matters; steel can resist hail better than aluminum. Importantly, dents from hail do not generally affect the rest of the roof below. Metal roofing is extremely resistant to snow and ice formation, with ice sliding right off. When installed correctly metal roofing can also withstand strong winds and does a great job of preventing water from penetrating your home. Metal helps preserve a cooler temperature within your property because it can effectively reflect heat coming from the sun. It is often made from recycled metals making it an eco-friendly option. | +185% (steel) +215% (aluminum) |
| Wood shingles (Class B fire resistant) | Wood shakes and shingles are typically made from western red cedar and come in a variety of types and grades, categorized according to their level of resistance to wind, impact and fire. Wood shakes and shingles provide good insulation, helping protect your home from extreme heat (and cold) and thus reducing annual energy costs. They are also fairly durable and are not affected by things like hail. If considering wood shakes or shingles, look for a minimum of Class A or B fire resistance. Class A is difficult to achieve with cedar and requires that a Class B fire retardant-treated shake or shingle be installed above a heavy asphalt cap sheet. | +245% |

| Roofing Material | Description | Installed Costs |
|------------------|--|-----------------|
| Green roof | <p>A green roof consists of a thin layer of soil, with live vegetation established on the top of your house. They are fairly lightweight and can be installed on roofs with a pitch from 0 to 30 degrees (or steeper with appropriate provisions). For an extensive green roof, expect to pay \$1.00 to \$1.30 per square foot in maintenance costs each year for the first two to five years, to ensure vegetation becomes well established. Once the vegetation is well established, maintenance and irrigation needs will decrease significantly. Green roofs can help keep your home cooler during extreme heat events and have been shown to reduce cooling costs for buildings by as much as 25%. They also help reduce heating costs, can help reduce stormwater runoff from your property, and can improve local air quality and reduce urban heat island effect when installed in urban environments or on large, city-wide scales. Green roofs have showed significant resistance to the effects of strong winds and hail. In addition, they capture and store carbon and provide habitat and biodiversity benefits. They also provide aesthetic benefits and have been observed to enhance property values.</p> <p>For more information about green roofs in Calgary, visit: https://www.calgary.ca/uep/water/watersheds-and-rivers/erosion-and-sediment-control/green-roofs.html.</p> | +260% |
| Concrete tiles | <p>Concrete tiles have good thermal properties when compared to other tile types; they reduce the amount of heat gained by the home from sun exposure without the need for additional insulation. This reduces the thermal load by as much as 45% when compared to asphalt shingles, reducing the need for as much attic insulation and ventilation. Concrete tiles have a Class A fire rating, making them a good choice for homes in areas prone to wildfires. In contrast to clay tiles, they are less prone to cracking from freezing and thawing cycles in colder climates. They are also resistant to hail and high winds when installed correctly, but not as water resistant as slate and clay; the water absorption of concrete is higher than these other materials. In some homes, the installation of concrete tiles may require the roof framing to first be reinforced to support the added weight.</p> | +265% |
| Slate shingles | <p>Because it is a natural stone, slate shingles are extremely long-lasting (anywhere from 70 to 200 years) and provide great protection against many climate hazards, including from hail and wildfire, and from large tree branches and other debris resulting from high wind events. Another benefit of slate shingles is that they work well on sloped roofs, making them perfect for shedding snow. The density of slate can also help regulate the temperature in your home, providing protection from extreme heat and also reducing energy consumption and saving you money on your energy bills. Slate is, however, extremely heavy and can require additional structural support prior to installation.</p> | +355% |
| Clay tiles | <p>Clay roof tiles are quite resilient but can be prone to damage in large hailstorms and suffer cracking from freezing and thawing cycles in colder climates. Their resistance to high winds is largely determined by the fastening system than the material; so long as the tiles are installed correctly, they should resist high winds. Clay does a great job of blocking heat from the sun thus preventing radiant heat. Clay tiles are energy efficient, available in many types and colours and are also fire and water resistant. Like slate shingles, clay tiles are heavy and may require structural reinforcement of your roof prior to installation.</p> | +370% |

Did You Know?

Solar Panels: Solar panels are made up of a series of photovoltaic cells that collect energy from the sun and convert it into electricity that can be used to power your home, helping to reduce greenhouse gas emissions that cause climate change. They are usually placed on top of the roof, above your current roofing materials. Solar panels are built to withstand harsh weather conditions and are highly impact resistant, even when struck by hail. With an average of 2,396 hours of sunlight each year, Calgary is an ideal city for the use of solar energy!

Solar Tiles: Solar tiles, a relatively newer technology, are like small solar panels but rather than sitting on top of traditional roof tiles they are installed as part of the roof. Aesthetically, solar tiles are designed to blend in and look similar to a traditional roof.

To learn more about solar energy and photovoltaic systems, visit calgary.ca/solar.

Roof Sheathing



Roof sheathing is the panel of material (usually oriented strand board (OSB) or plywood) fastened to the structure to provide a surface for water protecting membranes and roofing material such as shingles. A roof that is sheathed completely will provide greater stability in severe wind and is better at handling the additional weight of a heavy snow event. Fire rated sheathing material can be used to bolster the fire resistance of the roof. In general, choosing a thicker roof sheathing material (11.1 mm or 7/16" in lieu of 3/8" sheathing), with longer

nails (e.g., 2.5" rather than 2") that are spaced closer together along both the edges of the sheathing panel and the interior supports (150 mm, rather than 300 mm), reduces the risk of damage associated with sheathing failure.

If the sheathing is being replaced, you should also replace your roof underlayment while the area is exposed.

Roof Underlayment



Roof underlayment is a membrane that goes over the roof sheathing. For increased resilience to climate hazards, you should install new roof underlayment when re-roofing your house. For better protection from heavy rainfall and winter storms, consider using two layers of underlayment that are cemented together, or an ice-and-water shield underlayment. Roof underlayment can be bought as a fire barrier with a class A fire rating, although not all underlayment is fire resistant. The fire resistance rating of your shingles may also depend on your underlayment, and some shingle installations may require new underlayment, according to manufacturers' instructions. Reflective roof underlayment (or a radiant barrier)

can be used to protect against extreme heat impacts and reduce cooling costs; though in colder climates it is likely to be more cost-effective to increase your attic insulation, which would also help reduce heating demand.

[Make sure underlayment](#) is installed well in roof valleys, and around your chimney and other roof obstructions (skylights, dormers, etc.), where snow and ice can collect during the winter. Roof underlayment is required by the National Building Code – Alberta Edition on the eaves of your roof to prevent ice damming and water back up into the attic¹⁴.

Eavestroughs and Downspouts



Eavestroughs are the system of gutters attached to the eave of your roof which collect rainwater that flows off your roof. Downspouts direct rainwater from eavestroughs down from your roof to the ground and away from the house. Eavestroughs and downspouts help protect your home from flooding and water damage and can help keep your building and building components (including the structure) dry; if your home does not currently have them, you should have them installed.

Recommendations for installing and maintaining eavestroughs and downspouts:

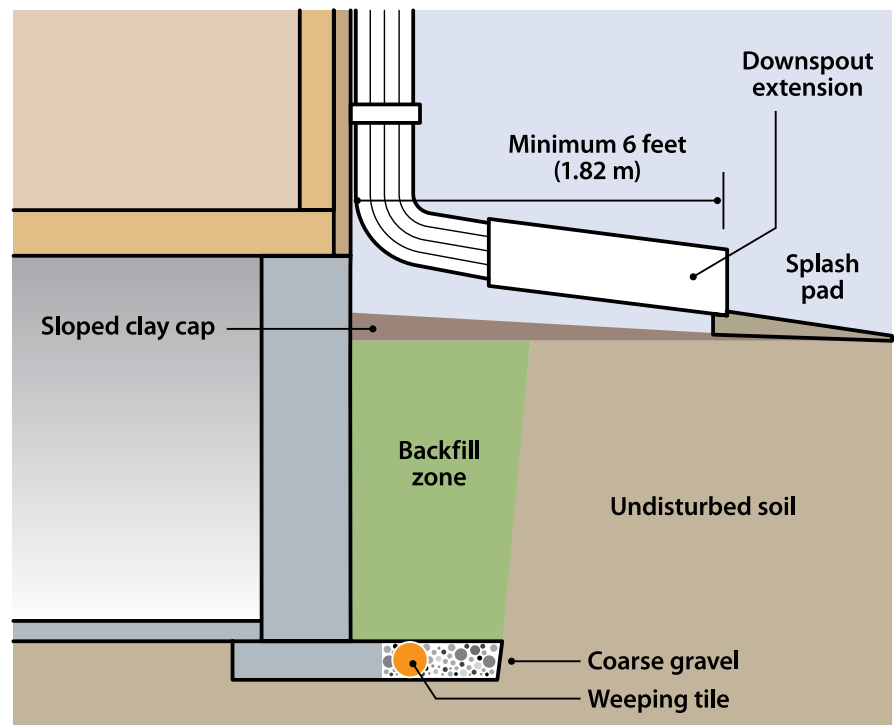
- Eavestroughs and downspouts should extend a minimum of 4'-6' (1.21 - 1.83 m) away from the foundation of your house. Water should drain onto a landscaped area so the water has the opportunity to soak into the ground. For front or backyard eavestroughs, direct the downspout extensions away from your home's foundation onto your yard and away from your neighbours' homes.
- Don't connect eavestroughs extensions or downspouts to other pipes that drain directly onto a street, lane or sidewalk. Gravel and/or other

debris can enter stormwater drains and/or water from eavestroughs or downspouts can cause gravel lanes to wash away, which may increase the chances of flooding in your community.

- Don't connect extensions from your eavestroughs to the sanitary sewer line or weeping tile. Excess water could overload pipes and cause flooding in your basement.
- To reduce excessive rainwater from running down the sides of your

house, clear leaves and other debris from your eavestroughs so that rainwater will not accumulate and seep into your basement.

- Install a rain barrel or rainwater cistern to collect rainwater from your downspout, which can then be used to water your lawn (Section 3.6 provides additional details). Make sure that the rain barrel can safely overflow away from your home and your neighbours' homes if you forget to drain it.



Extend downspouts a minimum of 4-6 feet (1.21-1.83m) away from building to prevent recirculation of roof drainage at the foundation. Source: The City of Calgary

3.3 Exterior Walls and Siding

The exterior walls of your house start at the foundation and extend to the base of your roof. Your exterior wall, and notably your siding (or cladding) material, play a major role in shielding your home from extreme weather and climate hazards, namely wildfires and damaging storms with hail, high winds and heavy rain. The climate ready measures outlined in this section can help enhance the resilience of your exterior walls and siding to these hazards. The most climate ready wall systems comprise a correctly installed durable and securely fastened sheathing material, a wall air barrier, and a climate ready siding material.

Siding Materials



If building new, or re-siding your house, there are several siding material options to consider.

Vinyl siding is the most common and least expensive cladding material. However, if you want to improve the resilience of your home, you should consider upgrading to a more resilient and durable material. Aluminum,

wood composite, fibre cement and cementitious stucco are all more robust options.

Table 2 provides a description of different siding materials, including potential co-benefits of each material installation, as well as a comparison of their cost relative to the least expensive option (standard vinyl siding).

Box 1: R-Values

The R-value is a measure of how well a two-dimensional barrier, such as a wall, window, or ceiling, resists the conductive flow of heat. The higher the R-value of a material, the better it is at insulating; protecting you from extreme heat (and cold) and also reducing your energy bills. The R-value depends on the type of material, its thickness and density. The National Building Code -Alberta Edition requires an R-value of R22 (RSI 3.08) for all above ground framed walls. Your choice of wall assembly and insulation is far more important in protecting from extreme heat (or cold) than is your siding choice.

Table 2: Comparative summary of siding materials¹⁵

| Siding Material | Description | Installed Costs |
|---|---|-----------------|
| Vinyl siding (standard) | Vinyl siding is not recommended . It is, however, the least expensive, and most common siding material in Calgary. Since vinyl is made of manufactured plastic, it quickly melts when exposed to the high heat of a wildfire. Cheaper vinyl can also get damaged by extreme heat, can crack with fluctuating weather, and is easily damaged by hail and high winds. | -- |
| Aluminum siding | Aluminum siding is quite resilient and can withstand extreme heat and wildfire. Hailstorms and debris driven by high winds can cause aluminum siding to dent or scratch but will not affect the integrity of your home. Scratched and dented panels can also be easily replaced. Aluminum siding does not crack during freezing and thawing cycles in colder climates. As with vinyl, it is possible to purchase insulated aluminum which has an increased R-value, providing greater protection against extreme heat. Aluminum siding can be environmentally friendly, containing up to 30% recycled content. Large quantities of aluminum siding can be brought to a City landfill for scrap metal recycling, and some private metal recyclers may buy scrap metal. | +35% |
| Engineered wood siding (wood composite) | Wood composite siding is a blend of wood fibre and resin that creates an aesthetic material that is resilient to most climate hazards. Wood composite siding can be fairly fire-resistant, but less so than some other materials like fibre cement board, metal and brick. It does offer good impact resistance compared to other sidings like vinyl and aluminum. Also, it handles extreme heat and freezing and thawing cycles without warping or deteriorating. | +45% |
| Insulated vinyl siding | Insulated vinyl uses a foam board backing to fill what is otherwise gaps behind the material for airflow. This provides some impact resistance against hail and high winds. Insulated vinyl siding can be tested to withstand wind pressures associated with wind speeds of up to 190 kilometres per hour ¹⁶ . Insulated vinyl greatly enhances R-value and performance in extreme heat, having an R-value of between 2.0 and 5.0, compared to 0.6 to 1.0 for standard vinyl siding. This makes it energy efficient and can help reduce your heating bills in the winter. | +60% |
| Fibre cement board | Fibre cement board is one of the most resilient siding types for wildfire, hail and high wind. Many fiber cement products carry a Class A fire rating and can withstand several hours of heat from fires before failing. Water that can accumulate from the freezing and thawing cycles can damage the siding if it is not correctly maintained (painting it with water-resistant paint). It has also been proven to stand up to the worst storms without sustaining damage. The R-Value for fiber cement is fairly low (at 0.50) and is considered below average in terms of insulation. | +65% |
| Cementitious stucco | Stucco is fire resistant because it is composed of lime, sand and cement, and will hold up well to flying debris in severe wind and hail. However, stucco does not handle moisture well, and is not ideal for protection against heavy rain or winter storms; moisture and snow can cause stucco to shrink and crack. Stucco typically has a lower R-value (around 0.2), unless you use a three-coat finish, in which case the R-value can go over 1.0 and provide protection against extreme heat. | +70% |
| Steel | Galvanized or coated steel siding is an extremely robust material and stands up well to wind, rain, hail, and winter storms. In addition, steel siding is non-combustible; it will not ignite and spread fires. As with vinyl, it is possible to purchase insulated steel siding which has an increased R-value, providing greater protection against extreme heat. | +100% |
| Natural Wood | Natural wood siding, common on older homes, is prone to damage by climate hazards, notably wildfire, high winds and hail. Wood siding can be treated with chemical flame-retardant sprays to improve its fire-resistance, but fire can still penetrate the stud cavity through the joints of the siding assembly. If you want to use wood siding on your home for aesthetic reasons, make sure to use high-quality wood, metal flashing on corners, and seal the joints well—in addition to using a water-resistant paint. | +160% |
| Bricks | Brick cladding is highly resilient against fire, hail and high winds, assuming the fastening system or mortar is adequate, and not corroded. Brick also provides great protection against extreme heat, effectively cooling your home and reducing your energy bills. | +195% |
| Stone | Stone siding is resistant to fire and will not damage in high winds. It is susceptible to cracks from freezing and thawing cycles. It is not very energy efficient unless insulated; with R-values for natural stone ranging from 0.01 to 0.41, depending on the type of stone. | +455% |

Wall Sheathing



Wall sheathing is the panel of material (usually OSB or plywood) that is fastened to the structure to provide a surface for the weather protecting membrane and siding material. Walls that are sheathed completely and properly will provide greater resilience to multiple climate hazards. It will create greater shear strength and stability in severe wind, as well as providing proper backing for weather barrier membranes on the exterior walls. Fire-rated sheathing can be used to bolster the fire resistance of a wall assembly. Plywood provides

increased resilience over OSB due to its improved water resistance and drying ability. Rigid insulation should not be used alone as a wall sheathing as it does not provide adequate lateral load resistance from high winds. In addition, wall sheathing should not be tightly sealed as the glue in a panel material can create a double vapour barrier trapping moisture inside of the wall cavity. Gaps between the panels are essential to permit breathability and allow any trapped moisture to dry out.

Wall Air Barrier



A wall air barrier is the material (typically felt paper, or polyethylene or polypropylene wrap) that goes on the outside of your wall sheathing, before you put your siding material on. Air barriers are intended to stop air leakage through differences in air pressure between the inside and outside of your home and to allow vapour to permeate through. A reflective wall air barrier can also be used to protect against extreme heat impacts. However, as with roof underlayment, if you want to reduce

energy bills all year round, you would be better advised to install more thermal insulation in the exterior walls.

An airtight home lowers heating bills, prevents cold drafts, and can help protect your home against extreme heat. If replacing your exterior siding, consider replacing or repairing the exterior air barrier too. Providing a continuous air barrier, with adequate structural support, will help resist wind and air pressure loads as well.



As per section 5.4.1 of the National Building Code – Alberta Edition, a permeable (breathable) air barrier is required to be installed on the exterior wall surface beneath the cladding to provide the principle resistance to air leakage, as well as a vapour barrier on the inside (warm side) of the wall.

3.4 Insulation

Thermal insulation is material designed to prevent heat transfer from one area to another—like in and out of your home. It can work in several different ways, but typically incorporates materials that consist of millions of tiny pockets of air; air is a very good insulator, and trapped pockets of air are what give most types of insulation their high thermal resistance or R-value (see Box 1). Properly insulating your home reduces both heating and cooling costs and improves comfort. Insulation can also dampen sound transmission and help to control noise.

Thermal insulation is usually found in walls (including basement walls) and attics, especially the outside walls of a home where heat is most likely to be gained or lost. When increasing the insulation in your home, you can

choose from many types of insulation and materials (see Box 2). The most appropriate insulator will depend on where you want to add insulation and the recommended R-values for Calgary. You must install at least the minimum

levels of thermal insulation according to the National Building Code – Alberta Edition, but you can and should exceed these values where it is both practical and economical.¹⁷

Box 2: Types of Insulation¹⁸

| Type | Material | Where Applicable | Advantages | Installed Costs ¹⁹ |
|----------------------------------|---|---|---|--|
| Blanket batts and rolls | <ul style="list-style-type: none"> Fiberglass Mineral (rock or slag) wool Plastic fibers Natural fibers | <ul style="list-style-type: none"> Unfinished walls, including foundation walls Floors and ceilings | <p>Do-it-yourself.</p> <p>Suited for standard stud and joist spacing that is relatively free from obstructions.</p> | \$0.05-0.06 per sq ft to increase R-value by 1 unit, depending on facing and material. |
| Foam board and rigid foam | <ul style="list-style-type: none"> Polystyrene Polyisocyanurate Polyurethane | <ul style="list-style-type: none"> Unfinished walls, including foundation walls Floors and ceilings Unvented low-slope roofs | High insulating value for relatively little thickness. | \$0.22-0.29 per sq ft to increase R-value by 1 unit, depending on facing and material. |
| Loose fill and blown-in fill | <ul style="list-style-type: none"> Cellulose Fiberglass Mineral (rock or slag) wool Natural wool | <ul style="list-style-type: none"> Enclosed existing wall or open new wall cavities Unfinished attic floors Other hard-to-reach places | Good for adding insulation to existing finished areas, irregularly shaped areas, and around obstructions. | <p>\$0.04-0.06 per sq ft to increase R-value by 1 unit using blown fiberglass, cellulose or mineral wool.</p> <p>Natural wool can cost 3-5 times more.</p> |
| Sprayed foam and foamed-in-place | <ul style="list-style-type: none"> Cementitious Phenolic Polyisocyanurate Polyurethane | <ul style="list-style-type: none"> Enclosed existing wall Open new wall cavities Unfinished attic floor | Good for adding insulation to existing finished areas, irregularly shaped areas, and around obstructions. | \$0.15 per sq ft to increase R-value by 1 unit (closed cell polyurethane foam). |

Exterior Wall Insulation



When replacing your siding, installing an additional layer of exterior wall insulation is an option for improving the thermal comfort of your home, reducing impacts of extreme heat, and reducing energy costs. Exterior insulation is usually mineral stone wool insulation or extruded polystyrene (XPS) insulation. Mineral wool is more effective for fire resistance, and XPS is water resistant, although mineral wool will regain its insulation value once dried out. Rigid insulation should never be used alone

for wall sheathing as it does not provide adequate lateral load resistance from high winds. (Note: Rigid insulation installed on the exterior walls within 1.2 metres of property lines may affect the allowable limiting distance between houses and therefore may not be permitted, depending on the thickness of the insulation being added. A City of Calgary Safety Codes Officer should be consulted prior to proceeding. A development permit may be required.)

Interior Wall Insulation



Interior wall insulation (between the studs in the wall) is the typical way most older homes are insulated. This is one of the main building components for maintaining occupant comfort.

National Building Code – Alberta Edition requires RSI 3.08 (R22) in the wall cavities and RSI 10.43 (R60) in ceilings below attics. You should do that and more to help keep your home comfortable, your energy bills low, and protect against extreme heat.

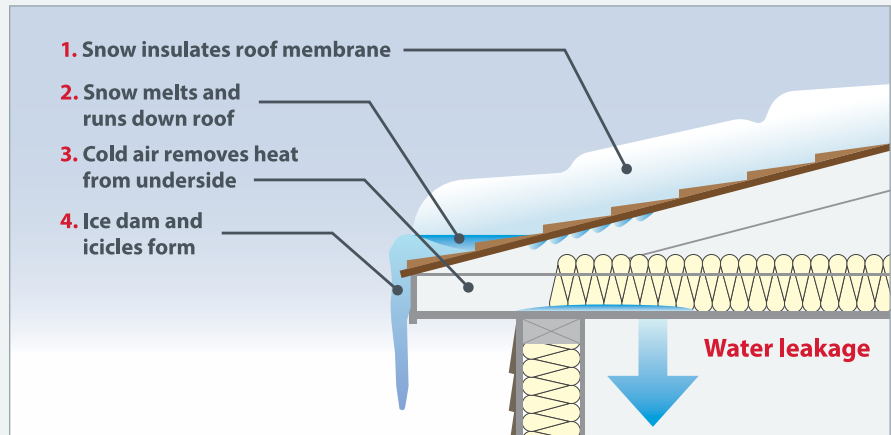
Mineral wool insulation is the most fire resistant, and spray foam insulation

is the most water resistant, although mineral wool will regain its insulation value once it has dried out if affected by water ingress through leaks in your home's envelope. Fibreglass batt or cellulose insulation is less ideal because it can clump together or slump over time, which permanently reduces the insulation value unless replaced. Ideally, in a new build situation, a homeowner should consider an exterior wall insulation option (out-board of the structure) [see exterior insulation].

Roof / Attic Insulation



Because hot air rises to escape, ensuring roof insulation is effective is one of the most important factors in protecting a home from extreme cold, extreme heat and heavy snowfall. For drywall ceilings that are nailed directly to the joists, cellulose insulation can be installed in the attic. Additional fiberglass batt insulation can be added on top to augment the insulative value. The attic of your roof must be well vented to allow for airflow to dry out any condensation, leakage or other moisture build-up. A badly vented attic can cause major moisture and mould problems as well as a loss in the effectiveness of your insulation.



Ice dams form when heat escapes from your attic or the interior of your home and melts snow on your roof. For more information, refer to the [Institute for Catastrophic Loss Reduction's Homeowner Guide to Protecting your Home from Snow and Ice Storms](#).



Icicles hanging off your roof and gutter could be a sign of poor roof and attic insulation.

3.5 Windows and Doors

Windows and doors are an integral part of your home's envelope, along with the roof, walls, foundations and floors. Doors provide access to the inside of your home and to rooms within your home. They are secured in an opening (the doorway) and held in place by doorframes, which can be constructed from a range of materials (Box 3). Windows are openings in the walls of your home that serve several functions, such as providing natural lighting and ventilation and peepholes to the outside

world. Doors and windows also play an important role in shielding the interior of your home from the elements, as well as contributing to its overall appearance. They prevent water ingress, provide fresh air during warmer months, help slow down heat loss and reduce solar heat gain, and manage noise. They are important determinants of the energy efficiency of your home. Windows, doors and skylights account for up to 25% of energy loss in your home. For that reason, energy efficient windows and doors

not only help to reduce our energy bills and keep our homes more comfortable during extreme temperatures, but they also help to reduce our contribution to climate change by reducing the amount of greenhouse gases being emitted.

For more information about choosing energy efficient models of windows and doors, visit Natural Resources Canada's web page: [Windows, doors and skylights](#).

Box 3: Door and window frame components

Door and window frames can be constructed of steel, aluminum, wood or wood composites, plastics (e.g., PVC), or polymer composites (e.g., fiberglass), or combinations of these materials. Wood frames are susceptible to moisture uptake and decay, and the sealant products often used to render metal frame components weathertight degrade with age. Properly constructed frames of any of these materials are expected to last beyond 25 years. Important considerations to ensure the longevity of window and door components are correct selection of performance specifications and proper installation practice.

Polymer-based components of windows and doors, such as the jointing compounds and preformed gaskets used to ensure the weathertightness of the window or door assembly, are more susceptible to degradation from heat and the effects of UV radiation.

Window Types



Old, inefficient windows will allow heat to escape your home in winter. They will also allow the sun's heat to enter the home in summer, making your air conditioner work harder, or if you do not have one, potentially make your home extremely uncomfortable on hot days.

Not only will this drive up your annual energy bills it will also increase your susceptibility to heat stress and related illnesses in summer. New, energy efficient windows will significantly cut down on heat loss and solar heat gain. The most efficient Energy Star® certified windows

are about 40% more efficient than standard windows.

Natural Resources Canada provides [a tool to help you find Energy Star certified products, including windows.](#)

Three key properties to look for when purchasing energy efficiency windows are:

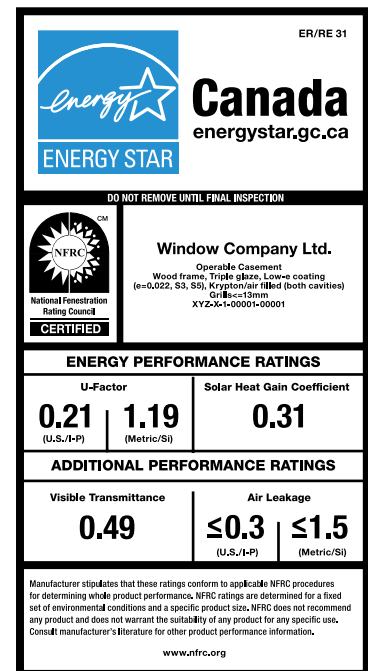
- 1. The U-factor:** This is a measure of the rate of heat loss. The lower the U-factor, the slower the heat loss (and the more energy efficient the window). Windows must have a U-factor no greater than 1.22 to be Energy Star certified.
- 2. The solar heat gain coefficient (SHGC):** This is a measure of the amount of solar radiation admitted through a window. The lower the SHGC, the more effective the window is at blocking heat gain from the sun, which can help to keep your home cooler on hot days.
- 3. The energy rating (ER):** This is a measure that includes the U-factor, SHGC, and air leakage. A higher ER indicates a more energy-efficient product. ER values normally range from 0-50. A window must have an ER of 34 or greater to be Energy Star certified.

Double vs. Triple Pane Windows: As the name implies, double pane windows have two panes of glass, while triple pane windows have three. The space between the panes of glass is usually filled with a gas, such as argon, which reduces heat gain and loss through the window. With three panes of glass, triple pane windows have even more room for the insulating gas and therefore are better than double pane windows at preserving energy while keeping your home cool in the summer (and warm in the winter).

Windows are available in a wide variety of materials, including vinyl, wood, fiberglass, aluminum, steel and wood. Windows made from metal are less energy efficient as they conduct heat more readily. Vinyl and fiberglass frames both have attractive insulating properties—they can be formed with air

pockets or interior chambers that can be foam filled to increase efficiency. While they have similar insulating properties, fiberglass units are more durable than vinyl alternatives, but cost about 10-20% more²⁰. Metal frames typically cost more than the vinyl and fiberglass alternatives. Any frame material type or design can

include high-efficiency glass and Low-e coatings (a fine metal coating on the glazing which can reduce heat loss and solar gain by as much as 30%). However, hinged windows (e.g., casements) are more air-tight than sliding windows.



Tempered glass windows are required by National Building Code – Alberta Edition where the window area exceeds 0.5 metres squared and is less than 900mm from the floor.

Replacing your older and inefficient windows will not only result in energy savings over time, it will also increase the resale value of your home²¹.

Impact Resistant (IR) Windows



Impact resistant (IR) windows are composed of both tempered glass and laminated glass. Tempered glass is heat-treated which compresses the surface and edges of the glass. This helps to make it about 5-10 times stronger than conventional glass. It is considered impact-resistant, not only because of its added strength, but also because if it does break, it shatters into small pebbles without sharp edges, reducing the risk of injury from flying glass. Laminated glass is made by bonding together two or more panes of glass with a thin layer of film or vinyl in between.

The laminated plastic acts like fly paper, catching broken glass should the window shatter during a wildfire event, high winds or a hailstorm. It is designed so that the outer pane may shatter, but the

member holds the pieces together, so the inner plane is not penetrated, preventing rain and water from entering your home.

The strongest glass is only as good as the frame that holds it in place. The window frames holding impact resistant glass are therefore generally thicker than regular residential windows and made from higher-strength materials like aluminum and vinyl. Not only is the window frame made from sturdier materials, it is also affixed better to its glass.

Impact resistant windows will cost roughly 2-3 times more than standard windows, though they will help manage solar heat gain, improve the energy efficiency of your home and reduce energy bills.

Window Films



Applied safety film is a very cost-effective solution for window (and door) glass that can help mitigate damage against high winds (and related flying debris) and hail. These films can be applied to your current glass surfaces to make them impact resistant and shatter proof, holding glass fragments in place if the window is damaged. The film should be 4mm thick minimum. Safety film can also help protect against intruders, UV rays and solar heat gain, as well as improve privacy. Films designed primarily to mitigate solar heat gain and UV infiltration are much thinner—a fraction of 1 mm.

Safety films offer a lower-cost solution to IR windows for the retrofit market; in particular, if your home has large areas of glass that would make other options prohibitively expensive or if you do not want to block views with external awning or other window attachments. However, they can reduce solar gain in the winter increasing heating costs and may increase the need for lighting.

A professionally installed safety film can cost roughly \$10-15 per sq ft of window area²². Film to block solar heat gain is a little more expensive at roughly \$12-22 per sq ft installed²³.

Window Coverings and Shading Technologies



There are a wide variety of shades, screens and blinds on the market to help control solar heat gain in your home. They can be installed inside or outside, on windows, doors, patios, decks, etc. In addition to applied films discussed above, options for the interior of your home include cellular shades, louvered shutters and blinds and roller shades, among others. Cellular or honeycomb shades, which trap air within their core, have excellent thermal properties and provide the added benefit of reducing heat loss in winter months. They also are cost competitive with other internal shading options, with an average cost of about \$240 per window²⁴.

Outside the home you can install roller shades (fabric) or roller shutters (aluminum or plastic slats) to help reduce solar heat gain. The latter provide additional protection against other climate hazards (see below). You can also

install either fixed or retractable awnings to manage solar heat gain. An additional benefit of both types of awning is that they direct water away from your home. Though, retractable awnings can be closed to enable solar gain in colder months. For the same window or door, awnings range considerably in cost, depending on the material (metals costing about 12-15% more), whether it is fixed or retractable (retractable costing about 100-200% more), and whether retraction is manual or motorized (automated retraction increases costs by about 130-300%)²⁵.

In general, planting trees and other vegetation to shade your home can be a very effective option for lowering surface and air temperatures on your property and keeping your home cooler. For more details, see the Climate Resilient Tree Planting section (Section 3.6).

Window Shutters



External window shutters are a cost-effective solution for multiple climate hazards. Roll shutters can reflect heat and prevent heat transfer through the windows (this is more effective than interior blinds). In contrast to exterior roller shades, which are typically made of fabric, roller shutters are made of interlocking aluminum or plastic slats that form a rigid protective barrier over

the window. As a result, they are also very effective in reducing impacts from wildfire, hail and high winds, preventing the glass from being blown out or debris from hitting and shattering the glass. They also offer a high degree of privacy and security. A roller shutter can cost about \$30-70 per sq ft installed²⁶.

Impact and fire-rated doors



Entry doors and your garage door should be impact doors and fire-rated to protect against wildfire, high winds and hail. These doors are made of materials that have been tested and approved to withstand severe weather. Beefed up door frames and reinforced hinges are used to keep the door in place. Garage doors in particular are often the weakest point on a home in severe wind. For severe wind protection, they can be

reinforced and laterally braced on either side, especially if there is living space above. Impact resistant garage doors are naturally heavier. As a result of the extra weight, more often than not you will need to change you springs, track attachments, hinges and rollers.

Impact-rated doors serve to both protect contents, including the door itself, as well as reduce the risk of forced entry in a high

wind or tornado event, that could result in lifting of the roof from the structure.

If you have double entry doors, install a heavy-duty bolt or slide bolt at the top and bottom of the inactive door to help them resist strong winds.

3.6 Landscaping and Yard

Lot Grading

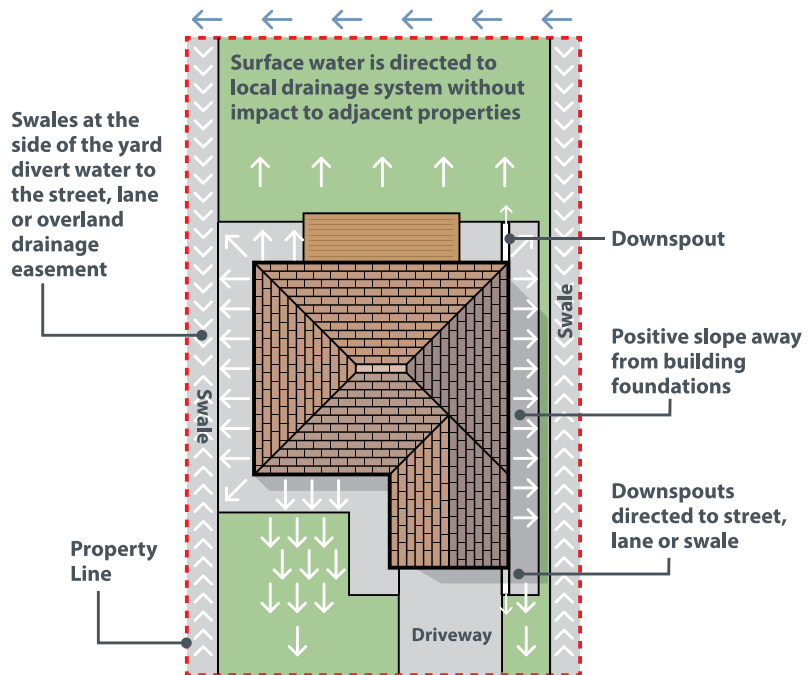


Whether building new, or landscaping your yard, one of the most effective means of protecting your home from flooding is to ensure your lot drains away from your house. If the surface of your lot doesn't slope away from your house, water can sit close to your foundation which can cause seepage issues and premature deterioration of the concrete foundation walls. In many older homes, the "backfill zone" – or the part of your yard that directly abuts your building, and that was excavated to build your foundation – may be vulnerable to settling, causing low spots directly beside your building. This is because the soil and fill that was placed back into the excavation after your basement was constructed is less compact than other soil in your yard. Make sure this area is well graded away from your home.

The City of Calgary's Lot Grading Bylaw requires a minimum of 4% slope away from your home within 1.2 meters (3.93 ft) of a your foundation wall, and a minimum of 2% slope in grassed, landscaped, or vegetated swales to

allow runoff to drain away effectively. You should ensure that your deck, fence, landscaping and other yard works to not compromise the integrity of your lot grading and drainage.

For more information, visit The City of Calgary's Lot Grading and Positive Lot Drainage (calgary.ca/lotgrading) webpage and Homeowner Guide to Lot Drainage.



Positive Lot Drainage. Source: The City of Calgary

Low Impact Development (LID)

Low Impact Development (LID) is an approach to land development that works with nature to manage stormwater runoff where it falls, treating stormwater as a resource rather than a waste product. LID preserves and re-creates natural landscape features and minimizes hard surfaces to create functional and appealing site drainage. LID includes a variety of landscaping and design practices that slows water down, spreads it out and soaks it in. These practices ultimately improve the quality, and decrease the volume, of stormwater entering our waterways. Learn more about [LID best management practices](#).

Rain gardens: Rain gardens (shallow, slightly depressed gardens that are designed to collect rain water) are a great example of a low impact development technique. Rain gardens are easy to construct, and can be planted with any combination of trees, shrubs, grasses or perennials. Rain gardens provide an attractive and very effective way to manage stormwater.

These landscaped plant beds capture and filter stormwater before it returns to our stormwater system, and eventually our rivers. When it rains, stormwater from the surrounding area is directed into the rain

garden. Plants, layers of soil and gravel filter and absorb the stormwater. The silt and other natural solids, like leaves, are collected on top of the gardens. Other pollutants (chemicals and bacteria) are filtered out and used by the soil and plants. Rain gardens protect our watershed by managing the amount of sediment and pollutants that reach our rivers from our stormwater system. Learn more about [residential and engineered rain gardens](#).

Bee Friendly Landscape



Pollinator bees and other insects are being negatively impacted by climate changes, including extreme heat and drought conditions. Provide flowering plants such as milkweed and speedwell that help bees and other pollinator insects thrive.



Visit the City website to learn about [backyard gardening for pollinators](#) in Calgary, and [creating a beautiful yard that will be resilient](#) to Calgary's changing climate.

Drought Tolerant Landscape



Plants that are naturally tolerant to drought are used in yards and gardens as they require little to no watering and will come back to life after a rainy day. To learn more about water wise plants that not only grow well and thrive in Calgary's short growing season, but are also able to survive cold winter temperatures, drying winds, and limited snow cover, visit The City of Calgary's [YardSmart webpage](#).

If you already have an existing lawn irrigation system, make sure it is properly

programmed and maintained to reduce wasted water and overwatering. Visit The City of Calgary's [Irrigation Set-Up and Maintenance webpage](#) for more details on irrigating your property. Drip irrigation, which applies water directly to the root zone of a plant, is the most efficient method for water and energy use.

Adding a base of at least twenty centimeters (eight inches) of good quality soil to your garden or lawn

can help with moisture retention and therefore will require less watering. Add mulch of five to eight centimeters (2-3 inches) to help retain moisture in the beds and around trees.

Where possible, direct downspouts into the landscaped areas of your property, such as towards trees, shrubs and rain gardens.

Climate Resilient Tree Planting



With a little research and a simple layout, it is possible to produce a landscape that will help cool your home in summer and tame the winter winds. In general, this means planting deciduous trees on the south, east and west exposures of your house, as they provide shade in the summer and shed leaves in the winter to let sunlight in. Coniferous (evergreen) trees can be planted in a row on the prevailing wind side of your house (south-west), or on the side where there is the least amount of sunshine, to protect against high winds.

When siting trees on your lot, remember to place them to avoid collisions with overhead power lines and underground utilities. Planting trees near the foundation of your house should also be avoided to reduce risk of root intrusion to your foundation and potential basement flooding.

If you live beside forested or heavily grassed tracts of land, consider selecting fire resistant trees and shrubs. Some plants are more resistant to fire; such options will likely have moist, supple leaves and watery, scentless sap.

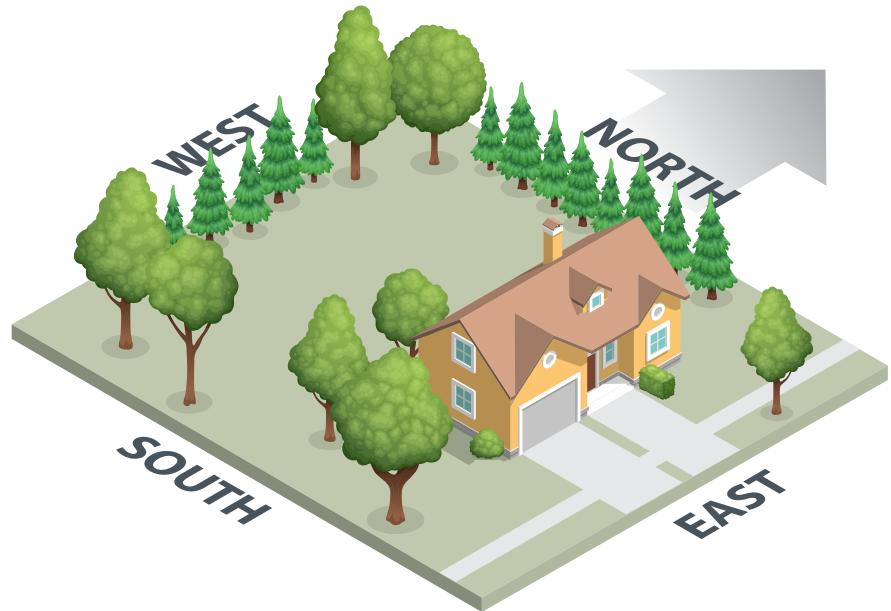
[The FireSmart Guide to Landscaping](#) provides a comprehensive list of tree

species, including their Hardiness zone, sun/shade preferences and water use requirements. Deciduous (leafy) trees that are resistant to wildfire and grow well in Calgary's variable weather include Poplar, Birch, Aspen, Maples, and Ash.

For more information about how climate change will impact planted trees and native forests in Alberta, see the

[Guide to Urban Forest Management in a Changing Climate](#).

Visit calgary.ca/trees for information on tree maintenance, planting and protection, including which trees are most climatically suitable for Calgary's climate. A healthy tree is much more likely to make it through drought-like conditions.



Plant deciduous trees to shade your roof, walls, windows, and air conditioner in the summer. Shading the west and south sides of your house is best for lowering your utility bills in the summer. In the winter the leaves will shed to let warm sunlight in. Coniferous trees can provide protection from winter winds.

Decks and Balconies



Many decks are built out of combustible materials such as wood and plastic. If your home is vulnerable to wildfire risk, your deck should ideally be built out of non-combustible material. Enclose the underside of all balconies and decks with flame resistant material such as fibre cement board.

Rain Barrels and Cisterns



Rain barrels collect rainwater from a home's downspout, which can then be used to water landscapes reducing demands on potable water supplies. Rain barrels should be emptied before winter to avoid cracking and damage to the barrel or waterspout. Rainwater cisterns are a larger version of a rain

barrel, collecting rainwater for use on the property. Rainwater cisterns are a way of reducing freshwater use and the stored water can be used for watering vegetation in the event of a water supply disruption. Make sure that the rain barrel can safely overflow away from your home and your neighbourhood's home and

toward the lawn, planted areas, or a rain garden to prevent flooding.

Visit the City website to learn more about [purchasing and using a rain barrel](#) in Calgary.



Collected rainwater is not potable, which means you should not drink it or use it on food crops.

Permeable Pavement



Permeable pavement, also known as pervious or porous paving, is a type of hard surfacing that allows rainfall to percolate through, rather than standard asphalt and concrete which are considered to be "impermeable." Recommended options include permeable interlocking concrete pavements and vegetated permeable pavements, which use plastic, metal, or concrete grids for support and hold

grass or other vegetation in place. Whether building new, or re-doing your driveway or sidewalks, permeable pavement can be used instead of standard asphalt or concrete.

Permeable pavements reduce stormwater run-off and help prevent water from ponding on your property. In doing so they filter and remove pollutants, lower runoff water

temperatures, and thereby improve water quality. They also promote evaporative cooling which reduces pavement temperatures and consequently the air temperature.

For more technical information about permeable pavement, refer to [The City of Calgary Guidelines for Permeable Pavement](#).

3.7 Water Management

Low Water Use Appliances and Fixtures



Low water use fixtures are designed to use less water while maintaining the same level of performance. Install low flow water showerheads and faucets in your home and replace your toilet with a low water use toilet when it is time for replacement.



The City of Calgary's Water Utility Bylaw and the National Plumbing Code of Canada require all renovations that require a plumbing permit to have low water use fixtures in place.

See the Calgary [Homeowner Plumbing Guide](#) for more details on low water use and fixtures.

Sump Pump(s)



Some homes have a collection basin or pit called a 'sump' in the lowest part of a basement floor. The purpose of the sump pump is to discharge water from the foundation drainage system (or weeping tiles) when it is not possible to drain your foundation drainage system directly into a municipal sewer. If your home does not have a sump pump, and you do not have moisture issues in your basement, it is unlikely you need one. If you have a sump pump, consider the following:

- Get a sense of how frequently it cycles. If it cycles frequently (e.g., daily or more frequently), you may be at high risk of flooding from pump failure, and you should consider installing a separate backup pump which triggers if the primary pump fails.
- All sump pumps should have a backup power supply installed. Do not use potable-water powered backup pumps. Instead, use a backup generator or battery backup system.
- Make sure a check valve is installed on the discharge pipe to prevent recycling of pumped water.
- Discharged water should clear the backfill zone of your foundation. If not, you may be recycling pumped water.
- Install a moisture alarm in the sump

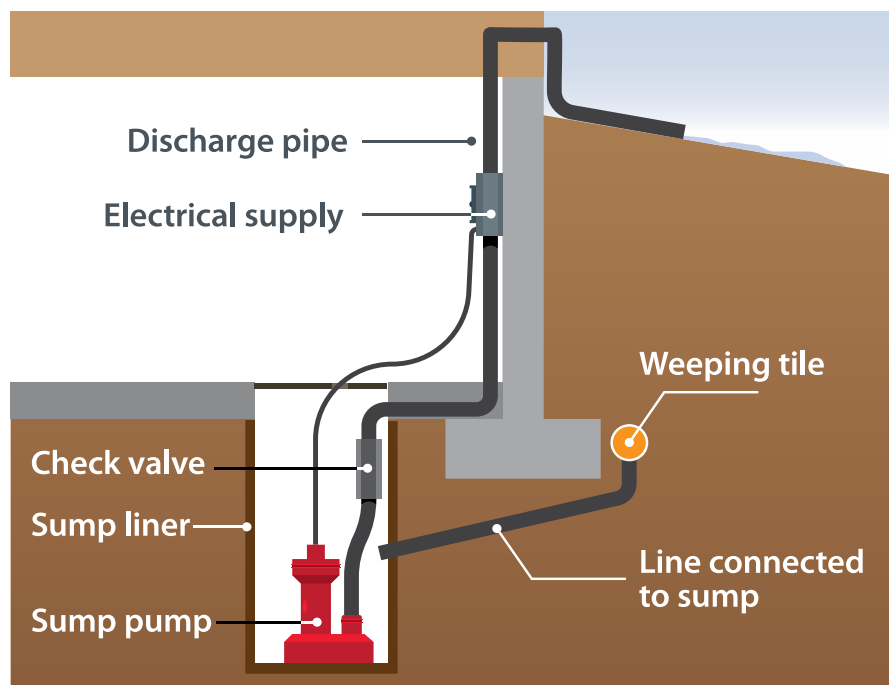
that detects water level rising to a critical level. Some types of alarms will alert smartphones. The alarm should also be set to trigger when the primary pump fails to engage.

- Ensure the sump lid has an airtight seal to prevent the ingress of Radon gas.
- Inspect and maintain your sump pump to ensure it is properly draining. You

can do this by pouring water into the sump pit and seeing whether or not the pump starts automatically.

- Replace your pump at least every 10 years.

The City website has more information about [basement flooding, including sump pump tips](#).



Weeping Tile with Sump Pump. Source: The City of Edmonton Homeowner's Guide to Flood Prevention.

Back-flow Prevention Device



When water on flooded streets drains into sewer manholes, pipes may become overloaded and back up, which may cause basement flooding. To help mitigate against sewage entering your basement, install a back-flow prevention device on your sewer pipe. This can also be individually installed in basement showers, toilets and sinks. Contact a qualified plumber and refer to The City of Calgary's [Flood Readiness Guide](#) for more information.

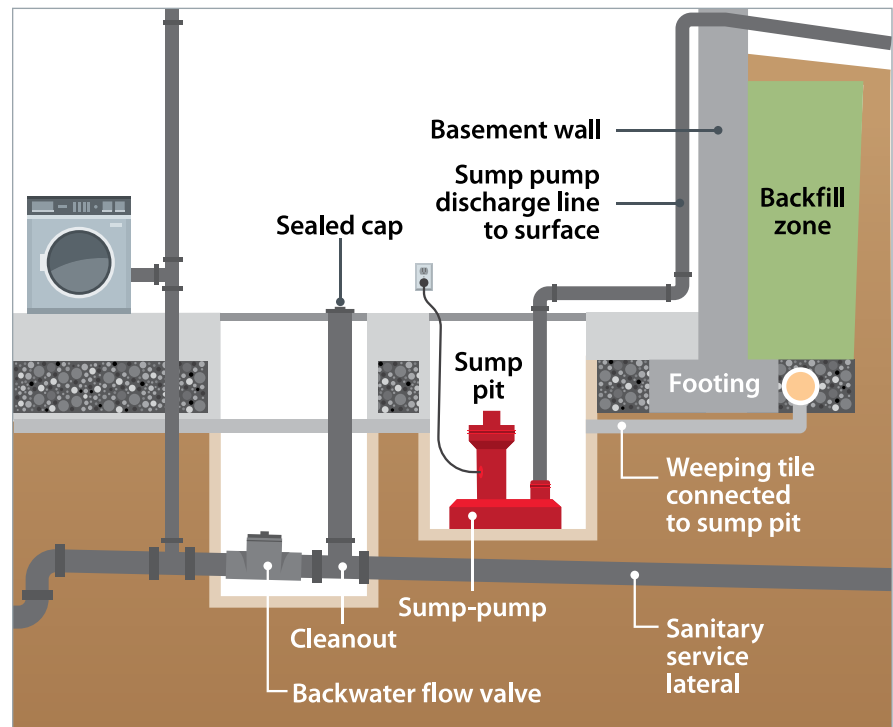
Know where your property's floor drain, clean-out sewer line and back-flow prevention device are located. (Not every home has a back-flow prevention device).

If you do not have a back-flow prevention device installed in your home, check with The City's Planning & Development Services Department on whether you require one. If you live in the flood fringe or the overland flow area (see Calgary's [flood hazard map](#)) of the Bow River, Elbow River, Nose Creek, or West Nose Creek, a back-flow prevention device may need to be installed in your home. Refer to the Land Use Bylaw to learn when one is required.

A [plumbing permit](#) is required to install a back-flow prevention device. For proper installation of back-flow prevention

devices, the grade of the valve is critical. The valve should be graded down toward the municipal sewer (at least 2% grade, but more is better) otherwise debris could build up, significantly affecting performance of the valve. If you have a back-flow prevention device installed in your home, ensure it is properly serviced and maintained.

For additional questions about plumbing requirements, please contact our Technical Assistance Centre, or email plumbing&gas.tac@calgary.ca. If you do experience a sewage backup, visit The City of Calgary's [Sewage Backup webpage](#).



Backwater valve and sump-pump.

Weeping Tiles

Weeping tile is a perforated pipe surrounding basement foundations. It is used to drain high groundwater directly onto the ground above the 1:100 year flood level elevation. For weeping tile systems that are directly connected to the storm water system, a weeping tile

backup prevention device may lessen the flow of water from entering basements when the storm sewer system overloads.

If you experience basement flooding, visit The City of [Calgary's Basement Flooding and Seepage](#) webpage.



If you live in a flood area, in accordance the Calgary Land Use Bylaw, your electrical and mechanical equipment may need to be located at or above the designated flood level. If you don't live in a flood area, this is also a good idea, if you have the option and space to do so.

3.8 Ventilation and Cooling

Heating, cooling and ventilations (HVAC) systems move air between indoor and outdoor areas, and heat and cool your home. They keep you warm and cozy in the winter and feeling cool and fresh in the summer. They also filter and clean indoor air to keep you healthy and maintain humidity at comfortable levels. The most visible components of your home HVAC system include the furnace, vents and thermostat.



Note: The City of Calgary website has detailed information about [permit requirements for heating, cooling and ventilation systems](#).

Indoor Cooling



Historically, most homes in Calgary have not had air conditioning installed, but it is becoming more common as summers have become hotter and drier. The energy costs of running an air conditioning unit can be significant and running them contributes to climate change, so ideally we should choose energy efficient A/C systems and only use them after applying passive cooling measures.

There are three main types of air conditioning to choose from²⁷:

1. Central air conditioning generates cool air from a central unit and distributes that air to the entire house through the ductwork. This is the most expensive option and may only be a practical and economical option if you are building a new home. A central unit could set you back \$3,500 to \$10,900 for a 185 square metres (2,000 square foot) home depending on whether the necessary ductwork is already installed.
2. Window units that pull air in from the outside, cool it, and push it indoors. These units sit on the windowsill. This is the least expensive option, but they only cool one room. Prices for window units vary depending on the size of the room you want to cool and thus the size of the unit. For example, you will need to spend about \$400 to \$600 to cool a 35 square metre (375 square foot) room, and \$150 to \$250 to cool a 15 square metre (160 square foot) room.
3. Split (or ductless) air conditioning units are installed on the side of the home, half inside and half outside. Split units work like window units but can cool multiple rooms. This is the mid-range cost option. Depending on the size of the unit and how easy the install is, a split unit can cost between \$2,800 and \$4,400.

Air conditioning (and heating) needs can also be met with the use of a heat pump, which is more efficient than a

standard air conditioning unit. A heat pump is an electrical device that extracts heat from one place and transfers it to another. A heat pump (geothermal systems and air-sourced heat pumps) can provide year-round climate control for your home – heating in winter and cooling and dehumidifying in summer. An air-source heat pump absorbs heat from the outdoor air in winter and rejects heat into outdoor air in summer. It is the most common type of heat pump used in Canada, however ground-source (or geothermal) heat pumps, which draw heat from the ground or ground water, are becoming more widely used .

For more information about heating and cooling your home with a heat pump, visit [Heating and Cooling With a Heat Pump \(nrcan.gc.ca\)](#).

Ceiling fans or free-standing portable units use a fraction of the electricity that air conditioning units would use and still provide occupant comfort.

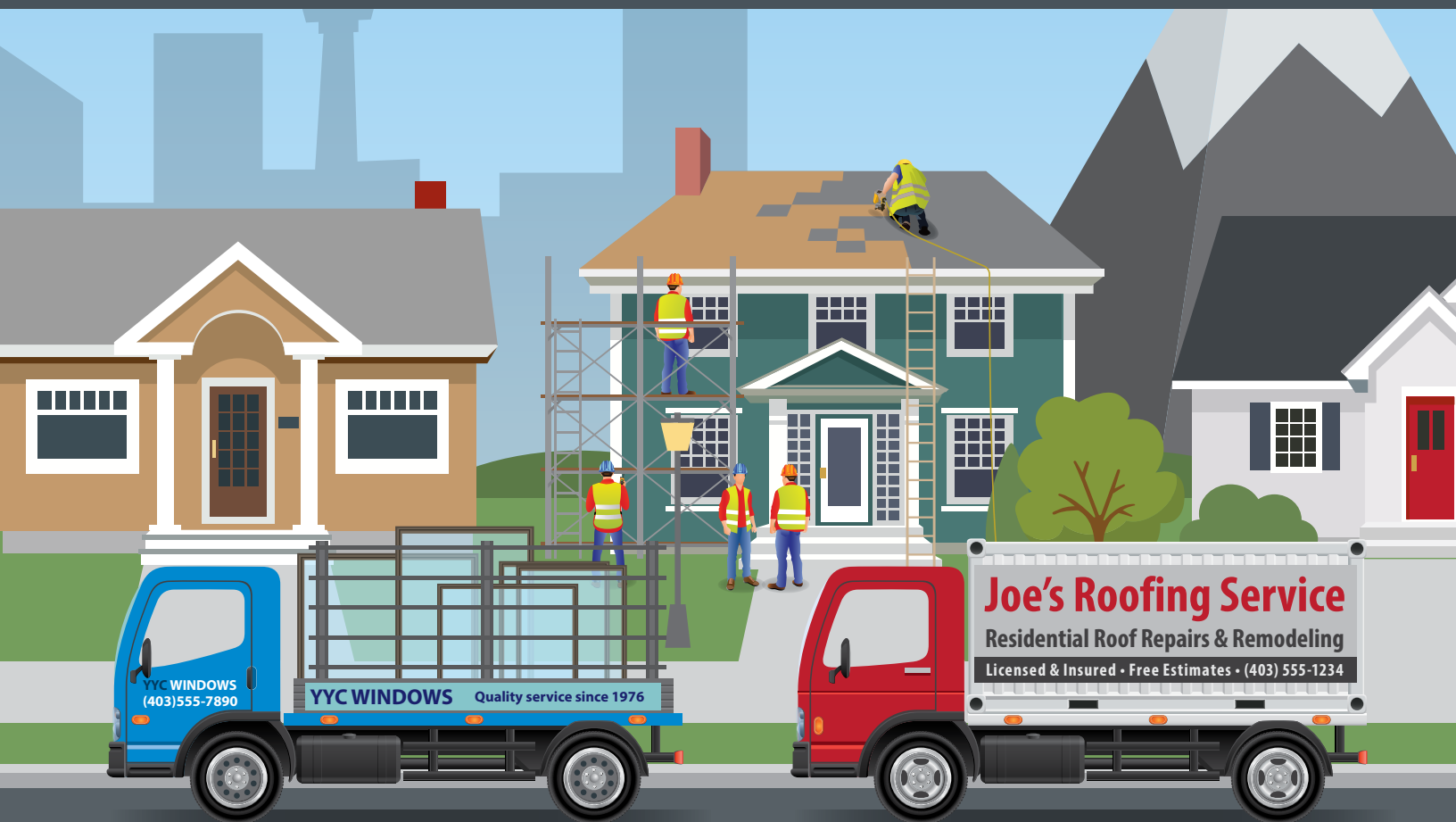
Indoor Air Purifier



If building new, or replacing your HVAC system, consider incorporating an air purifier into your central air system. Alternatively, you can purchase a free-standing portable unit. An air purifier is a device that purifies the air of particulates or gases²⁸. To protect your home from wildfire smoke, look for a HEPA (High Efficiency Particulate Air) filter, which is able to trap microscopic particles.

4

Resilience Opportunities for New Construction



This section outlines opportunities to improve your wellbeing and the resilience of your home and property during new construction. It includes planning, design and construction considerations for enhancing resilience to the climate hazards identified in Section 2 - extreme heat, wildfire, heavy rain and flooding, hail and high wind, winter storms, and drought.

4.1 Extreme heat

To protect your home from extreme heat, consider incorporating the following into the planning and design of your new home:

- Provide shading overhangs for all south-facing windows, as well as for east and west facing windows.
- Operable windows should be placed on opposite sides of building, and/or at different heights, and in each habitable room, to allow for natural ventilation.
- Incorporate glazing on windows to reduce solar heat gain for south and west facing windows.
- Maintain as many trees and as much natural vegetation cover on your lot as possible, before construction.
- Plant deciduous trees on the south, west and east side of the house to provide shading. If possible, maintaining existing trees is preferred as newly planted trees take time to establish before they provide shading.
- If choosing hardscaping materials (driveways, sidewalks, etc.), choose materials with high reflective ability ("albedo"), such as light-coloured materials, permeable pavements, or vegetation cover.
- Choose a compact building shape and open floor plan to improve energy performance and promote cross ventilation (passive cooling).
- Install an energy efficient air conditioning system to help keep your home cool. Air conditioning units are energy-intensive; keep in mind, running them can be costly and contributes to climate change.

To learn more about protecting your home from extreme heat, see the Institute for Catastrophic Loss Reduction's booklet: [Protect your home from extreme heat](#).

4.2 Wildfire

Regardless of where you live in Calgary, you are at risk of being exposed to wildfire smoke. Consider incorporating a High Efficiency Particulate Air (HEPA) purification system into the HVAC system of your home. HEPA filters are able to remove the fine particles that make up wildfire smoke.

If you are building in an area that is in close proximity to dense, continuous forests or unmanaged grasslands, implement FireSmart measures:

- Chose fire resistant roof and exterior wall materials. A Class A fire-rated roof cover offers the best protection, and can be made of metal, asphalt, clay or rubber. For siding, stucco, metal, brick, and fibre cement offer the best fire resistance²⁹.
- Ground to siding clearance should be a minimum of 15 centimetres.
- Soffits and fascia should be fitted on your eaves to reduce the risk of embers and heat reaching the wooden rafters of your home.
- Tempered, thermal (double paned) windows are recommended. Single pane windows provide little resistance to wildfire impacts.
- All doors, including garage doors, should be fire rated for fire resistant or non-combustible materials and have a good seal.
- Enclose the underside of decks and balconies to prevent the collection of flammable materials, and sheath with fire resistant materials.
- Sheds and outbuildings within 10 metres of your home should be treated the same as your home – apply the points above.
- Wooden fences create a direct path for fire to your home and should be separated with a metal gate or section next to your house.
- Plant fire-resistant trees and shrubs, which are those that have moist, supple leaves, accumulate minimal dead vegetation, have water-like sap, and have a low amount of sap or resin material.
- Liquefied petroleum gas (LPG) tanks on the exterior of your home should be on a non-combustible surface extending 1.5 metre outward in all directions, 3 metre zone where all vegetation is trimmed, clearances between LPG tank and building.

More information about protecting your home and property from wildfire can be found in the [Alberta FireSmart Homeowners Manual](#).

4.3 Heavy Rain and Flooding

The following is a summary of climate ready measures that can help protect your home and property from heavy rain and flooding³⁰:

- Appropriate site grading and drainage is the primary means of protecting your home from heavy rains and flooding. Backfill around foundation walls should be graded to prevent drainage towards the foundation after settling. Reverse slope driveways, that drain towards the house, should be avoided. [Refer to The City of Calgary's Guide to Lot Drainage](#) for more information.
- Foundation drainage and moisture protection approaches should be applied to manage groundwater that cannot be directed away from the building through site grading and drainage approaches. Most commonly, this involves installing weeping tile around the perimeter of the foundation wall footing and covering it with granular material prior to backfilling.
- Lower-than-grade windows and doors should be avoided.
- All utilities and services (such as electrical boxes/panel, furnaces, hot-water heaters and major appliances) should be raised above the basement floor as high as possible, and ideally should be located on the main floor.
- Utility penetrations should be located well above ground level to prevent water seepage into the building.
- Use low impact development (LID) practices to preserve and re-create natural landscapes that minimize hard surfaces and create functional and appealing site drainage (Section 3.6). LID includes a variety of landscaping and design practices that slows water down, spreads it out and soaks it in.

If you live in the flood fringe or the overland flow area (see Calgary's [flood hazard map](#)) of the Bow River, Elbow River, Nose Creek, or West Nose Creek,

additional [land use regulations](#) will apply. For your new home, or in some cases when adding an addition to an existing home, you should design in the following manner to prevent structural damage by floodwaters:

- the first floor must be constructed at or above the designated flood level;
- all electrical and mechanical equipment must be located at or above the designated flood level; and
- a back-flow prevention device must be installed.

Other recommendations provided by The City for new developments which can be affected by high groundwater levels include:

- Below-grade spaces should not be utilized for the storage of immovable or hazardous materials that are flammable, explosive or toxic. Below-grade spaces should be finished using flood-proof and easily cleanable materials, and may only contain easily movable items. A sump pump with battery backup should be provided in the basement.
- A separate electrical circuit should be provided for the sump pump with the operating switch located above the designated flood level.
- Building design must prevent structural damage from elevated groundwater levels (i.e., to grade). Elevated groundwater levels during a river flood may impact foundation dewatering, foundation water proofing and structural design.

Alberta Municipal Affairs and the Safety Codes Council, via the National Building Code – Alberta Edition STANDATA, provide additional information on flood mitigation measures for homes being

rebuilt in flood fringe areas. Examples include “high and dry” measures that involve elevating the home above the predicted flood level, and “wet-flood mitigation” measures which are based on the assumption that water will enter the building, and the goal is to minimize moisture damage and allow for rapid restoration of materials and equipment³¹.

For more information, visit calgary.ca/floodinfo.

4.4 Hail and High Wind

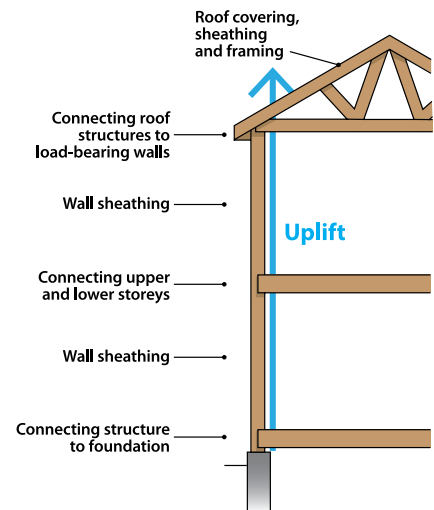
4.4.1 High Wind

Roofs are particularly exposed to damage from high winds. To protect your home from high winds, consider the following³²:

- Simple roof designs, such as a hip roof, are less susceptible to wind damage than more complex roof structures and gable end roofs. In general, roofs that are built using prefabricated, engineered trusses are considered to be more resistant to high wind impacts. The fewer obstructions you have on your roof, such as chimneys, skylights or dormers, the better.
- The steeper the slope of your roof, the more indirect the angle of impact, and the less likely you will experience high wind damage.
- Ensure your home has a secure “continuous vertical load path”.

A continuous vertical load path requires that major structural systems – including roofs, walls and upper and lower stories – are well connected, and that the entire structure is securely connected to the foundation. Ensuring that the building is securely fastened to the foundation using anchor bolts will also contribute to the continuous vertical load path of the home.

- Roofs that overhang exterior porches are prone to damage during high wind events. To protect porch overhangs from high winds, ensure supporting posts are well connected to the foundation, install additional support posts, and ensure connections at both the tops and bottoms of posts are well connected.



Elements in a Continuous Vertical Load Path. For more information, refer to the Institute for Catastrophic Loss Reduction’s [Homeowner Guide to Protecting your Home from Severe Wind](#).



Note: The City of Calgary website has detailed information about [permit requirements for uncovered decks and balconies](#).

- When selecting roofing materials, choose more wind resistant materials (see Table 1) and look for, or ask your contractor about, products that meet high wind resistance standards³³. Most importantly, make sure that your roof cover is installed properly. This would include ensuring installation during the warm months of the year.
- Choose impact resistant skylights, windows and doors.
- To avoid damage from high winds, choose thicker sheathing materials (e.g., 12.7mm or ½”), combined with longer nails that are spaced closer together along both the edges of the sheathing panel and along the interior supports.
- Garage doors rated for high winds can reduce the risk of garage door failure. Additionally, securing the continuous load path from the garage roof to the foundation will help reduce the risk of garage roof failure should a door fail during a storm.
- High winds can expose vents to high air pressure and may cause them to peel away. Use durable vents rated for high winds.
- Prune trees for structure and health by a certified arborist to prevent damage from falling branches from heavy snow.

4.4.2 Hail

To protect your home and property from hail:

- The steeper the slope of your roof, the more indirect the angle of impact, and the less likely you will experience hail damage.
- When selecting roofing materials, choose more hail resistant materials (see Table 1) and look for, or ask your contractor about, products that meet

hail and impact resistance standards³⁴.

- Choose a siding material that is more resilient to hail, such as steel, fibre cement, Cementitious stucco, or brick (see Table 2).
- Roof underlayment should be installed over the entire roof deck prior to installation of the roof cover, and a self-adhering waterproofing underlayment (ice-and-water shield) should be installed.

- Choose impact resistant skylights, windows and doors.
- Incorporate vehicle covers in your design – either a garage, carport or other covered parking space, to protect your vehicle from hail.

To learn more about protecting your home from hail, see the Institute for Catastrophic Loss Reduction's booklet: [Protect your home from hail](#) or visit their website at hail-smart.com.

4.5 Winter Storms

To protect your home from winter storms:

- Simple roof designs, such as a hip roof, are less susceptible to winter storm damage than more complex roof structures and gable end roofs. The fewer obstructions you have on your roof, such as chimneys, skylights or dormers, the fewer places for snow and ice to build up and cause ice damming.
- The steeper the slope of your roof, the more indirect the angle of impact, and the less likely you will experience damage caused by excessive rain and snow. Steep roofs are more resilient to heavy snow-fall damage such as roof collapse, ice damming and roof leaks.
- Chose water and moisture resistant roof and exterior wall materials (see Table 1 and Table 2).
- Roof underlayment should be installed over the entire roof deck prior to installation of the roof cover, and a self-adhering waterproofing underlayment (ice-and-water shield) should be installed.
- Insulate your attic to prevent snowmelt, ice damming and roof damage.
- Winter storms can lead to power outages. To protect your home from power outages, incorporate a back-up power supply into your home design.
- Prune trees for structure and health by a certified arborist to prevent damage from falling branches from heavy snow.
- While Calgary's winters are getting warmer because of climate change,

we'll still have very cold days.

Insulating your home to protect against extreme heat during the summer months has the added benefit of keeping your home at a comfortable temperature during winter months, including during cold winter storms.

To learn more about protecting your home from winter storms, see the Institute for Catastrophic Loss Reduction's booklet: [Protect your home from snow & ice storms](#).

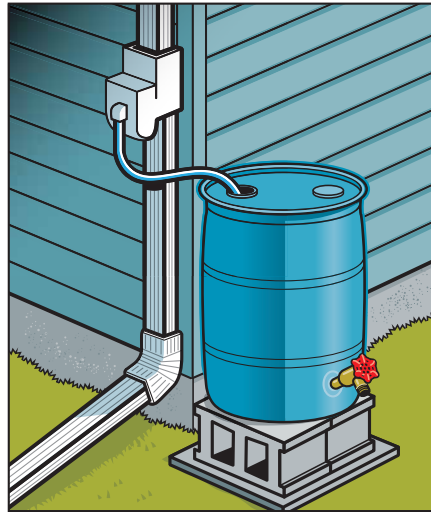
4.6 Drought

- Incorporate resilient landscaping, with minimal hard surfaces, into the design of your home. Plant drought tolerant trees, shrubs and grasses. When choosing grass type, avoid Kentucky Bluegrass mixtures which require much more irrigation and maintenance than native, drought tolerant sod species. (Avoiding hard surfaces and utilizing drought tolerant plants also helps to keep your yard and home cool). Visit Calgary.ca/YardSmart to learn more about planning a yard and garden that is climate ready, and learn more about how to conserve water while caring for your lawn [here](#).
- Incorporate a rainwater collection system (rain barrel or cistern) into your design. Learn more about capturing and using rainwater for your yard [here](#).
- Use tiered gardens, rock gardens, low water-use shrubs or flowering trees and groundcover instead of grass. These garden features use less water, require less maintenance and act as wonderful filters and sponges to help absorb rainwater.

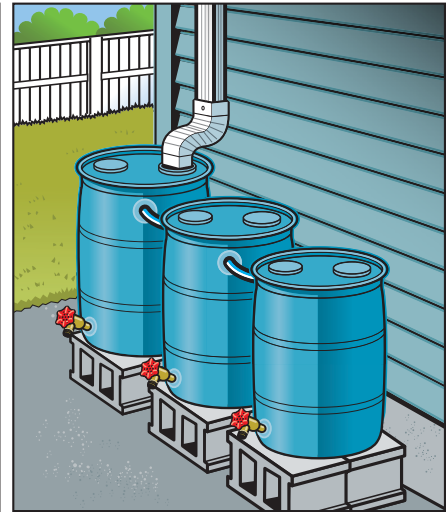
- Rainwater should be retained on site, through incorporation of permeable surfaces and water retention systems, to reduce surface runoff to the stormwater system and drying out of your lawn and garden.
- [Rain gardens](#) are a great landscaping feature that can be placed in a low-lying area of your garden. Rain gardens

are shallow depressions filled with loose soil and planted with beautiful, hardly low-maintenance water-wise plants. The rain garden will naturally filter the runoff before it enters the stormwater system.

- Select water efficient fixtures and appliances.



Rain barrel placement to capture roof drainage.



Placement of multiple barrels in series can provide additional storage.

5

Home and Property Maintenance and Resilience Tips



Your home and yard requires ongoing care and maintenance to safeguard its value, and to ensure the safety of all who live there. There are many changes you can make to how you run and maintain your home that can make it more able to withstand climate hazards. This section gives you some tips to help keep your home in tip top shape.

5.1 Emergency Preparedness

Ensure you and your home are prepared for emergencies:

- Have an [emergency preparedness Kit](#): An emergency preparedness kit gives a household the security of having certain items to help them in a disaster. This kit can include an array of items. Some important items are a radio, batteries, flashlight, first aid kit, non-perishable food and drinking water.
- Ensure you are signed up to receive [emergency alerts and notifications](#).
- Power outages can be caused by extreme heat, wildfires, flooding, hail and ice storms, high winds or winter storms. Consider having a backup battery power source, which can prevent problems when the power goes out. For more information about what to do during power outages, [click here](#).
- To learn more about how to prepare for climate hazards and protect yourself, your family and your home during a hazardous event in Calgary, visit [Calgary.ca/GetReady](https://calgary.ca/GetReady).

5.2 Annual Maintenance Check

You should inspect the exterior of your home annually, and also after a wind, hail or snowstorm. Look for:

- Broken or dead tree branches that may pose a safety hazard. Contract a certified arborist to prune.
- Broken, cracked or torn roofing materials that could cause water penetration or blow off in the next windstorm.
- Missing shingles or exposed roof deck that could allow water ingress.
- Signs of moisture and water pooling in your basement/crawl space, on your roof, and in your yard that could leak into your home.
- Water pooling near foundation walls, including in window wells and stairwells.
- Icicles hanging from your gutters in the winter. This is an indication that you have poor insulation in your attic (Section 3.4) or that your gutters are blocked with debris.
- Signs of ice damming or heavy snow load on your roof, such as water leaks originating from the roof or attic area, difficult to open doors, new cracks in your drywall or plaster, or sagging on the ridgeline of your roof³⁵. Icicles hanging from the bottom edge your roof are an indication that you may be vulnerable to ice damming.
- Ensure vents are not blocked by debris. Dryer vents and interior flexible ducts should be checked for lint build up.

5.3 Spring Maintenance Check

In preparation for the spring snow melt and rain, and to protect you home against basement flooding:

- Seal cracks in foundation walls and basement floors to help reduce basement flooding in your home. In many cases, cracks can be effectively sealed from the inside, for example with hydraulic cement.
- Identify and seal other points of entry for moisture, such as framing around windows and doors, gaps around pipes and wiring and cracks in brickwork.
- Ensure storm grates and drains near your home are clear of debris and blockage. In a flood or heavy rain event, if the storm grate near the house is blocked, it could cause additional and unnecessary flooding to your property.
- Direct stormwater away from your house, ideally towards your garden.
- Have your exterior sewer lines checked. If it is more than 40 years old, you should have it inspected by a licensed plumber to verify that it is in good condition.
- If you have a sump pump, ensure it is properly draining by pouring water into the sump pit and seeing whether the pump starts automatically.
- Make sure battery backup systems are operating properly.
- Make sure your backwater valve is maintained.

To make sure your home is as water efficient as possible, see The City of Calgary's [Homeowner Water Guide - Spring Checklist](#).

Clean and repair your roof, gutters and downspouts by removing needles, leaves and debris to reduce wildfire risk, and ice damming from heavy snow or freezing rain.

Trim back any trees or vegetation overhanging your roof.

If you do not have a garage or covered space for your vehicle, or recreation equipment (boat, camper, ATV, etc.), consider installing a semi-permanent hail protection structure, or a temporary hail protection cover (e.g., hail protection blanket).

If your home is near a dense, continuous forest or unmanaged grasslands, apply [FireSmart](#) principles to your landscaping and property.

5.4 Summer Maintenance Check

If your home is near a dense continuous forest or unmanaged grasslands, apply [FireSmart](#) principles to your landscaping and property.

Purchase a portable air purifier with a HEPA filter: A portable air purifier removes toxins, pollen, dust and wildfire smoke from the air to ensure healthy indoor air quality.

Conserve water and protect your home against drought conditions:

- Water early in the morning before the heat of the day.
- Use a soaker hose, drip irrigation or water by hand, rather than sprinkling.
- Do not mow your lawn too short. Keep it 5 to 7 cm (2 to 3 inches) high to shade the soil.
- Add mulch around trees and shrubs to retain moisture.
- Add a base of at least twenty centimeters (8 inches) of good quality soil for a healthy garden or lawn that retains more water and therefore requires less watering.
- Capture water in a rain barrel or cistern and use it for your garden.
- Sweep your sidewalk and driveway rather than washing with water.

To protect against extreme heat, install interior cellular insulating blinds on your windows; a cost-effective way to reduce heat gain and loss in your home.

Securely anchor outdoor accessories and equipment to protect against high winds and summer storms.

If you do not have a garage or covered space for your vehicle, or recreation equipment (boat, camper, ATV, etc.), consider installing a semi-permanent hail protection structure, or a temporary hail protection cover (e.g., hail protection blanket).

Ensure storm grates and drains near your home are clear of debris and blockage. In a flood or heavy rain event, if the storm grate near the house is blocked, it could cause additional and unnecessary flooding to your property.

5.5 Fall Maintenance Check

In the fall, you should be preparing for the winter:

- If you have a wood burning fireplace, ensure your chimney is clean, and has a spark arrestor to prevent embers from floating out of the chimney and igniting the roof or any other nearby flammable material.
- Install a smart thermostat. A smart thermostat that provides information to your smartphone is an excellent way to check on your home when you are away and also receive information on potential hazards. For example, many smart thermostats provide information on indoor humidity that can alert you to high risk of water leaks or flooding within the home. They may even offer alerts for low or high temperature that can provide warning of pipes freezing or fire hazards when you are not home.
- Incandescent light fixtures in the ceiling below your attic can often generate enough heat to melt snow on a roof. These fixtures should be replaced with more efficient low heat emitting fixtures such as LED.
- Clean and properly disconnect your rain barrel to prevent it from leaking and freezing.
- Turn off your outdoor water supply and controller, and ensure lines and low spots are empty of water.
- To make sure your home is as water efficient as possible, see [The City of Calgary's Homeowner Water Guide - Fall Checklist](#).

5.6 Winter Maintenance Check

To prepare your home and property for winter storms and cold weather:

- If you notice ice damming on your roof, it can be treated with a chemical de-icer; holes are made in the ice to expose the roof and de-icer is placed in each hole.
- If you have persistent issues with ice build-up and damming on your roof, de-icing cables can be installed on your roof and gutters. De-icing cables gives off heat to melt snow and ice on your roof.
- A very large snowfall may put your roof at risk of structural failure or collapse. A simple way to prevent this is by using a snow rake to remove excess snow from the roof by dragging it off the edge to the ground.
- Winter storms can produce extremely heavy snow and slippery conditions. Snow shoveling is a known trigger for heart attacks. Be cautious not to over exert yourself; a high-quality shovel can assist in moving snow in a safer way.
- In the case of a power outage, if water is no longer coming into your home, turn off the main water valve coming into your home. Open all taps to clear the remaining water in the pipes to avoid pipe freezing.
- Explore inside your attic for any penetrations that could leak warm air into the attic. Also check to see that there are no big gaps in the insulation – to reduce winter storm and extreme heat impacts.
- Visit [‘What to do during a severe winter storm or extreme cold’](#) to learn how to prepare for and stay safe during winter storms in general.

6

Additional Resources and Information



- 1 Source: Insurance Bureau of Canada (2020). Media Release: Insurers to pay a record \$1.2 billion to Albertans recovering from Calgary hailstorm. Website: [Insurers to pay a record \\$1.2 billion to Albertans recovering from Calgary hailstorm \(ibc.ca\)](#).
- 2 Source: IBC 2020 Facts of the Property and Casualty Insurance Industry in Canada, Insurance Bureau of Canada.
- 3 Source: Insurance Bureau of Canada (2020). Media Release: Insurers to pay a record \$1.2 billion to Albertans recovering from Calgary hailstorm. Website: [Insurers to pay a record \\$1.2 billion to Albertans recovering from Calgary hailstorm \(ibc.ca\)](#).
- 4 For more information on urban heat island effects see: Health Canada (2020) [Reducing Urban Heat Islands to Protect Health in Canada](#).
- 5 For more information on protecting your home from wildfire see the [Alberta FireSmart Homeowner's Manual](#).
- 6 The floodway refers to the area of river where velocities and depths will equal or exceed 1 m/s and/or 1m depth during a 1:100 flood event. This is the area where the greatest amount of flow is concentrated during a flood and the flow is considered the most erosive and damaging. The flood fringe is the section of river where the flood waters are below 1m depth and 1m/s velocity during a 1:100 flood event. Overland flow zones are areas which become inundated by shallow overland floodwater during a 1:100 flood event. Groundwater becomes an issue for below-grade structures such as basements and parkades, during flood events as low as a 1:5 flood.
- 7 A list of flood-damage-resistant building materials is provided in STANDATA National Building Code – Alberta Edition Bulletin 06-BCB-009R1- [Disaster Recovery Program Flood Mitigation Measures](#).
- 8 Permeable materials or surfaces allow water to readily move through and percolate into the soil. Examples of permeable surfaces include individual unit paving blocks or cobble stones and specialty mixes of both concrete and asphalt with high porosity.
- 9 One study by Brimelow et al (2017) finds that the frequency of small hail events will decrease in our region in summer, but that the frequency of large hail events will increase, resulting in an overall increase in hail damage potential.
- 10 Source: [Institute for Catastrophic Loss Reduction \(2018\). Hail Climatology for Canada: An Update](#)
- 11 Cheng, C.S., et al., 2014, Possible impacts of climate change on wind gusts under downscaled future climate conditions – updated for Canada. Journal of Climate, 27: 1255-1270.
- 12 The measures outlined in this section are based on best available standards and guidelines. For more detailed information see the following resources:
 - CSA Z800-18: Guideline on basement flood protection and risk reduction
 - CSA S478-19, Standard for the Durability of Buildings
 - The Designed for Safer Living program, and [home protection booklets](#) produced by the Institute for Catastrophic Loss Reduction
 - Primers, and information from the [Mobilizing Building Adaptation and Resilience](#) project
 - Publications from the US Federal Emergency Management Agency (FEMA) focused on home and building safety and resilience to [high winds, flooding](#), and [snow storms](#)

- [Increasing High Wind Safety for Canadian Homes: A Foundational Document for Low-Rise Residential and Small Buildings](#)
 - [Durham Region Climate Resilience Standard for New Houses](#) (2018)
- ¹³ “Installed costs” are for professional installation including all materials and are presented as the percentage difference in the total installed costs of each roofing material relative to the total installed costs of standard (Class A) asphalt shingles (on a square foot basis). For example, the total installed cost of an architectural shingle is about 25% more than a standard (Class A) asphalt shingle per square foot; a Class 4 impact resistant shingle about 45% more per square foot. Total installed costs include material costs, labour costs, equipment costs where relevant, and overhead and profit for the installation contractor. For each material, a cost range was generated from RSMeans 2020 for Calgary; the values in the table are based on the mid-points of those ranges.
- ¹⁴ For more information on roof underlayment and options, see: <https://disastersafety.org/11149509-2/>
- ¹⁵ “Installed costs” are for professional installation including all materials and are presented as the percentage difference in the total installed costs of each siding material relative to the total installed costs of standard vinyl siding (on a square foot basis). For example, the total installed cost of aluminum siding is about 35% more than standard vinyl siding per square foot; wood composite siding about 45% more per square foot. Total installed costs include material costs, labour costs, equipment costs where relevant, and overhead and profit for the installation contractor. For each siding material, a cost range was generated from RSMeans 2020 for Calgary; the values in the table are based on the mid-points of those ranges.
- ¹⁶ See FEMA Advisory: Siding Installation in High Wind Regions, and reference to ASTM D 3679, Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Siding.
- ¹⁷ The Wood Council of Canada provides an online tool to calculate the R-value of different wall assemblies for comparison with energy efficiency provisions in national and provincial building codes (<https://cwc.ca/design-tools/effective-r-calculator/>).
- ¹⁸ Descriptions of insulation types are from US Department of Energy web page – [Types of Insulation](#); costs estimates are based on RSMeans Residential Cost Data 2020. This [fact sheet](#) from the Insulation Institute compares the main types of insulation materials.
- ¹⁹ Costs are indicative and for comparing insulation types; determine actual thicknesses, desired R-value and costs with local building supplier and/or contractor.
- ²⁰ RSMeans 2020 Residential Cost Data.
- ²¹ A study in Edmonton found the presence of terminology in the realtor’s home description related to windows (“New windows”, “Updated windows”, “High efficiency windows”, “Triple pane”, “Triple glazed”) increased a home’s expected sale price by just over 5%. This equates to a price premium on the average detached single-family home of \$21,400. [Boyd, R., Ryan, J. and Cuell, C., 2019: Hedonic Property Price Analysis: Energy Home Labelling Program. All One Sky Foundation, Calgary, p. 45].
- ²² RSMeans 2020 Residential Cost Data.
- ²³ RSMeans 2020 Residential Cost Data.
- ²⁴ Source: Home Depot Canada [“How much do blinds cost to install”](#).

- ²⁵ RSMMeans 2020 Residential Cost Data.
- ²⁶ RSMMeans 2020 Residential Cost Data.
- ²⁷ Cost estimates based on: Home Depot (<https://www.homedepot.ca/en/home/ideas-how-to/heating-and-cooling/cost-install-air-conditioner.html>) and RSMMeans 2020 Residential Cost Data.
- ²⁸ If you want to know more about air purifiers see "[Air Purifier – From A to Z: The Complete Beginners Guide](#)".
- ²⁹ Fire resistance is based on two test standards: UL 790 and ASTM E108. There are three levels of fire resistance; Class A is the highest level.
- Class A: Effective against severe test exposure, affords a high degree of fire protection
 - Class B: Effective against moderate test exposure, affords a moderate degree of fire protection
 - Class C: Effective against light test exposure, affords a light degree of fire protection
- ³⁰ Content from: Z800-18 National Standard of Canada: Guideline on Basement Flood Protection and Risk Reduction, and the [Calgary Land Use Bylaw](#).
- ³¹ See: the STANDATA National Building Code – Alberta Edition Bulletin 06-BCB-009R1- [Disaster Recovery Program Flood Mitigation Measures](#), and STANDATA Building Code Bulletin 06-BCB-010- [Disaster Recovery Program Flood Mitigation Measures for Homes Being Rebuilt](#).
- ³² The majority of content for this section was taken from the Institute for Catastrophic Loss Reduction Research Paper – [Increasing High Wind Safety for Canadian Homes: A Foundational Document for Low-Rise Residential and Small Buildings](#), and CSA S478:19 National Standard of Canada: Durability in Buildings. Annex F.
- ³³ For example, the American Society for Testing and Materials (ASTM) has standard test methods for roofing products and materials. For Asphalt shingles, look for shingles rated as [ASTM D7158](#) Class G or better which are rated to withstand winds up to 200 kilometres per hour. The [Insurance Institute of Business & Home Safety](#) also conducts research and provides standards for hail resistance. The Standards Council of Canada is currently working on a [Standard for High Wind Safety \(CSA S520\)](#), to provide guidance on wind resistant building design, materials, and techniques for low-rise residential and small buildings. However, it will be some time before this standard is released.
- ³⁴ For example, [UL 2218](#) is a test method for evaluating impact resistance of roof covering materials. When tested to UL 2218, materials can achieve an impact-resistance rating from Class 1 through 4, with a Class 4 rating being the highest. The [Insurance Institute of Business & Home Safety](#) also conducts research and provides standards for hail resistance.
- ³⁵ For more detailed information on dealing with extensive roof icing and ice dam problems see the [Removing Ice on Roofs](#) publication from the Canadian Mortgage and Housing Corporation.