



## Retaining Wall Stability and Maintenance

Heavy rains have contributed to landslides and other unfortunate occurrences in various jurisdictions. Although the SCR D has been spared any serious mishap, it is timely for the SCR D and its residents to review their experiences and practices to anticipate and avoid future problems. SCR D has developed and continues to develop onto sloped and rugged terrain. Like many north shore municipalities, we are situated at the foot of a major mountain range, various water courses make their way through the RD and our local topography is quite varied. In response to a series of concerns and experiences raised during the heavy rains by residents of the SCR D, the RD has developed this information sheet to address the issues of retaining walls and slope stability.

### Slopes

Owners and developers must consider and pay attention to slope stability and earth retention issues for any sites they wish to develop.

#### Slope Stability Risk Areas:

- Near creeks and ravines
- At the top or bottom of cliffs
- Near bodies of water such as lakes, oceans and rivers
- Near dikes or areas where flooding is known to occur
- Close to gravel operations or large excavations
- Where trees and vegetation have been significantly removed

#### Tips to Improve Slope Safety:

- Do not remove trees and other vegetation from the slope
- Do not place any foreign or heavy materials on the slope (including compost or yard trimmings)
- Ensure that drainage is directed away from the slope
- Ensure that if the slope is used for drainage all piping is installed from top to bottom of slope
- Inspect slopes on your property twice a year and during heavy rainfalls
- If any sloughing or slippage is observed on your property, have the slope inspected by a professional engineer
- Obtain all required permits for work at or near the slope including garden sheds, pools, etc.

#### What to Watch For:

- Cracks and /or ground settlement
- Erosion that is causing soil or other ground cover to slide or slough away
- Soils moving away from house foundations, patios, or pool decks
- Leaning of brick chimneys, house foundations and other heavy structures
- Sidewalks or driveways cracking near the slope
- Leaning, curving, or uprooting of trees or vegetation
- Soils moving to/from your property or to/from a neighbouring property



- Raising, lowering or altering of slopes by a neighbouring property owner
- Removal of vegetation that would otherwise stabilize the soils and prevent erosion

**What to do:**

**If you notice any of the above listed concerns please contact a Structural or Geotechnical Engineer.**

## **Retaining Walls**

Retaining walls are frequently used to stabilise and modify slopes, level sites, and correct grade differences between properties. If you have a retaining wall or are planning to build one, it is important to ensure the structural integrity of the wall. Failure of your wall could lead to landslides or other unfortunate occurrences.

**Walls are installed to deal with grade differences between private properties for reasons such as:**

- Creating a level site for construction
- Levelling a back yard near a slope
- Holding back a natural or man made slope
- Accommodating a swimming pool or fish pond
- Landscaping between properties or on an individual property
- Retaining a driveway access to a carport or to access a detached garage
- Developing a property for subdivision and the creation of several building lots

**There are a number of different approaches to retaining wall construction; however the most common methods are:**

- Concrete steel reinforced
- Brick or interlocking blocks (i.e. Allen blocks)
- Rock walls built of split rock and mortar
- Wood cribbed/uncribbed
- Walls built from used recycled materials
- Gabion style wire baskets filled with rock or gravel
- Stacked sand bags or premixed cement
- Large concrete blocks (i.e. Lock-block walls)
- Stacked logs
- Heavy timber treated wood
- Un-cemented boulders

Some retaining walls may have been built before the RD required permits for such construction. In addition, permitted wood retaining walls may well have been in service for a long time, but could possibly be coming to the end of their lifespan.

Various kinds of wood, including treated wood, do not last forever.

These walls should be reviewed for structural performance, slumping, insect infestation and degradation, rot, and supporting slope stability. If the retaining wall is no longer fully functioning, homeowners should make the necessary repairs or replace it entirely.



## **Homeowners Responsibilities:**

### **Existing Walls**

- Ensure soil behind the wall is draining properly. Saturated soils behind the wall can push against it, causing the wall to bow or push apart
- Ensure your wall does not trespass onto neighbouring properties
- Monitor wall for any weak areas or risk of failure (see below)
- Obtain professional advice and employ competent contractors when repairing a wall

### **New Walls**

- Obtain all required SCRDP permits for construction. For more information on permit requirements, please call 604-885-6800
- Obtain professional advice and competent contractors when building a retaining wall, Structural Engineers and Geotechnical Engineers possess the expertise and training for retaining wall construction and assessments.

### **What to Watch For** (monitor on a regular basis):

- Cracks in the wall face, particularly if concrete or mortared wall has been used
- Splitting of wood in timber retaining walls
- Bowing or bellying of the wall-- horizontally or vertically
- Vegetation or hedges that are leaning or have become uprooted
- Shifting of the wall as a whole, or creeping down the slope
- Insect infestations such as termites and carpenter ants in timber retaining walls
- Alterations to the wall by a neighbour or previous owner
- Leaning of the wall—most walls should lean into the slope not away from it
- Cracking or shifting of landscape or paving (i.e. pools, pool deck, and patio)
- The removal of soils supporting the bottom of the wall (this can result in the whole wall sliding down to a new resting place on the slope)
- Added construction to the top of the wall such as decks, additional walls, or sheds which add more pressure and weight

### **Drainage**

Many of the failures associated with retaining walls can be largely attributed to lack of proper drainage. The weight of saturated soils behind the wall pushes against it, causing it to bow or even pull apart. Dealing with the water causing such events is crucial to securing the retaining wall's structural stability and longevity.

Soil erosion and the deterioration of a retaining wall can be the result of poor or missing drainage, or a concentrated water outflow, (such as when the drainage isn't properly connected to a storm water system). This can cause the wall to fail or impact the stability of the slope just below the retaining wall, destabilizing the support of the wall itself.



Walls should be designed with proper drainage and storm water must be directed to a approved SCRCD Storm Water Management System. For walls requiring building permits, drainage must be designed by a Structural or Geotechnical Engineer.

#### **What to do:**

**If you notice any of the above concerns please contact a Structural or Geotechnical Engineer. To report any unusual activity and risk areas, please contact the SRCD at 604-885-6800.**

## **Roles and Responsibility**

### **The Property Owner**

The owner has the right to enjoy their property in a manner that does not jeopardize their family or family's health and safety, or that of neighbours or public. This obligation runs with the property, and due diligence should be exercised when investigating a potential property purchase. When considering the development or maintenance of property, an owner is obliged to plan work in a responsible manner that will preserve health and safety. Owners often lack the expertise to fulfill this responsibility directly, and generally rely on professionals for advice, and contractors for execution.

The owner must also ensure that any retaining wall built for the benefit of their property does not intrude on neighbouring properties rights-of-way. The responsibility for monitoring and maintaining retaining walls is solely that of the owner of the property on which the wall has been built.

### **The Contractor**

Owners often lack the resources or the time to maintain or develop their properties independently. Slope stabilization and the construction of retaining walls entail the movement of quantities of earth, the placement of heavy and awkward construction materials and the scheduling and coordination of a number of trades. Experienced contractors can undertake these tasks effectively and efficiently. The owner should take great care in selecting a contractor for work. Various things to be considered are; the contractors' history of completed projects, financial stability, experience in similar work, and the opinions and experiences of previous clients.

### **Structural and Geotechnical Engineers**

Owners considering repairs or replacement of retaining walls or the stabilisation of slopes should employ experts such as Structural Engineers and Geotechnical Engineers. These registered professionals' possess the expertise and training necessary to provide technical assessment for decisions to maintain or replace a retaining wall. Engineers can:

- assess the stability of slopes
- assess the condition of existing installations
- make recommendations for measures appropriate to the conditions they observe
- provide designs and specifications that meet appropriate standards



- assess the work undertaken by the owner or his contactor for compliance to the engineers designs and specifications

### **The Regional District**

The RD regulates any replacement or repairs and any new construction in accordance with its Building and Zoning Bylaws. Construction generally requires a Building Permit. While the permitting process can provide an owner a certain level of comfort that the various steps in the process have been adhered to and that appropriate expertise has been involved, this process does not guarantee that work done under any permit is correct or has been competently done. The RD relies on the Registered Professionals, the contractors and ultimately the Owner to ensure that permitted work provide the level of health and safety required by current standards, codes and practises.

When the overall height of a retaining wall or combination of retaining walls exceeds four feet in height, the RD requires a Building Permit for its construction and replacement. Where retaining walls with individual heights of less than four feet are separated by a horizontal distance greater than twice the height of the lower wall height, their combined height is not considered cumulative, and a building permit is *not* required.

Retaining walls built without a building permit must be properly permitted and comply with current regulations and Codes.

### **Summary**

The SCRD is concerned for the wellbeing and safety of its citizens. This information is intended to make people aware of the maintenance concerns of retaining walls and slopes on private property. If you have any concerns with respect to retaining walls or slopes on or near your property, RD Staff will do its best to provide guidance and assist you wherever possible. It should be emphasised, however, that retaining walls and slopes on private property are the sole responsibility of the Property Owner. Like the roof of your home, retaining walls last for many years without concern, but just as roofs need maintenance and replacement, so do retaining walls.

### **End document**

**This information sheet has been prepared as a public service to provide information only. It is not a legal document. If any contradiction exists between this document and the relevant Bylaws, Policies or Codes, the text of the RD Bylaws, Policies or Codes shall be the legal authority.**