Drainage
FACTSHEET

BRITISH COLUMBIA | Ministry of Agriculture

Order No. 532.000-2
Revised February 2016

Special Care in the Installation of Subsurface Drainage on Sloping Land

Although most drainage is applied to level land, increasingly more drainage systems are being used on sloping lands. However, sloping lands pose special problems. Unlike drainage of level lands, flow velocities and pressure can buildup in drainage systems on sloping land.

This can pose substantial hazards to the drainage system and to the land. The purpose of this factsheet is to direct attention to potential hazards and to measures of safeguarding against such hazards.

1. Drainage Plan

It is imperative that all aspects of the drainage system are of the highest quality. A good plan is essential. This permits accurate assessment of slope conditions and allows for the pinpointing of potential failure points. Plans are important, even when doing small scale installations with a backhoe. Refer to the B.C. Agricultural Drainage Manual for elements of a plan.

2. Main Drains

While under-design of drain capacity on level land is of little consequence it can be disastrous on sloping land. Severe rainstorms can temporarily overload the drains and cause the water to back up resulting in a buildup of water pressure. This rise in water pressure may force water to the surface through perforations or other openings in the line creating the potential for serious erosion.

For these reasons, main lines must never be constructed from perforated pipe. It is essential that the main lines be of adequate size, particularly at the lower end of the system, so as to comfortably accommodate heavy discharge. Connections must be fastened securely and be installed with carefully placed bedding or backfill material to hold the drain line in place.

3. Lateral Drains

Many of the comments for main drains also apply to lateral drains except for the use of non-perforated pipe. It is advisable to limit the length of each lateral drain. The chance of overloading a drain increases with increasing drain length. In addition, grades should not exceed 2%. If steeper grades cannot be avoided, non-perforated pipe must be used. Where possible laterals should follow natural contours.

Lateral drains should be used to intercept seepage areas. Seepage can be the major source of water that causes slumping along the edges of gullies and ravines. It is important to control seepage before it gets to the edge of the field.

4. Connecting Drain Line Sections

The use of short sections of drain line must be avoided to minimize the need for connections. Each connection is a possible weak point. All connections should be made securely. Make a collar of drain tubing material, with a length of not less than double the diameter of the tubing, to cover the joint and this must be tied securely.

5. Bedding

Bedding is the term used to describe the material that surrounds the drain and holds it in place. Coarse sand and fine gravel are the best-suited bedding materials. These materials allow water to flow rapidly through them while surrounding the tubing closely, providing even support around the drain tube. If a pipe is being routed through an earthen berm, the material around the pipe should be well packed heavy soil and seepage collars should be installed at pipe joints.

Large lumps of clayey materials or rocks and woody debris should not be used to cover the drain as they do not provide proper support and can allow the drain to shift or deform. Joints in the tubing are particularly susceptible to failure under high flow conditions and require good bedding. Where possible drains should be plowed in rather than trenched.

6. Time of Construction

The time of construction of drains on sloping land is important for two reasons: a) to provide suitable soil conditions for construction and b) to permit working and reseeding of the land before heavy winter rains have a chance to erode the soil. Midsummer is the most suitable period for these reasons.

7. Tie-in of Old Drains

It is not uncommon to find old drains during installation of a new system. When old drains are intercepted during construction it is very important that these drains be connected in a proper fashion to the new drain system. Failure to do so can result in the washout of newly constructed drain as well as other erosion damage.

8. Surface Finish

It is best to establish a crop cover on the soil exposed during construction as soon as possible. Particularly in areas which would normally conduct surface water downhill. These areas should be reseeded and kept in a permanent vegetative cover, such as grass. During abnormally high rain storm conditions, when some overland flow of water is unavoidable, these areas could function as grassed waterways. Cover crops such as annual rye grass or spring cereals can be used as a nurse crop for permanent grass cover.

9. Barn Roofs

Roofs of barns and other buildings cover a substantial area. During a rainstorm all of the rain is intercepted and brought together, often into a single discharge point. If this water is not taken away in a controlled fashion, it may cause flooding around buildings. On sloping land uncontrolled roof discharge is disastrous. Every effort must be made to intercept roof discharge and conduct it away safely. This may be done by connecting roof drains directly into the field drainage system or by installing a separate discharge line for roof drains.

10. Blind Drains

In areas where there is a potential for significant overland flow it may be necessary to install blind inlet drains. These are drain tubing which have been covered with pea gravel and/or drain rock to the surface. These blind inlet drains should be positioned in critical areas in the field such as across swales or above gulley. These areas should be left undisturbed so as not to mix soil into gravel and cause the inlet to fail.

11. System Outlet

The entire drainage system must be designed with a suitable outlet in mind. If water is to be discharged into a municipal ditch or gulley, provisions must be made to reduce the risk of serious erosion caused by the concentrate discharge created by the drainage system.

Water should be discharged onto a bed of riprap at a low slope or elevation position in either the ditch or gulley. Solid flexible pipe should be used as the discharge pipe. This pipe should be securely anchored top to bottom. A collector sump at the top of the discharge point and a breather pipe on the discharge line may be required.

12. Breathers and Relief Wells

When drain lines are installed on a very steep slope, a breather should be installed at the top of the slope and a relief well at the base. Breathers allow air to enter the drain for the purpose of venting the line. They are appropriate when the line is longer than 400 m or where the line changes from a flat to a steep grade (5%). Relief wells relieve the positive pressure that can be created in a pipe. This pressure may create blowouts or drain failure.

FOR FURTHER INFORMATION CONTACT
Phone: 604.556.3001
Toll Free: 1.888.221.7141

MINISTRY OF AGRICULTURE
1767 Angus Campbell Road
Abbotsford, B.C. V3G 2M3