

How to set Slopes (Falls/Grades) with a Rotary Laser Level

The following description in this guide, explains the general principles of setting a Slope (Fall/Grade) when using a rotary laser level. The rotary level must be either a “grade facility” laser with a Manual over-ride button or a “true grade” laser with a LCD enabling the User to input slopes into the X-axis, Y-axis or both together ie. Dual Grading. Note, a Gradient Conversion Chart to convert grade values into % fall is available on request.

Please read this information in conjunction with your laser level’s Instruction Manual.

Equipment:

You need a rotary laser level, a surveying tripod, measuring staff (rod) with mm scale and a laser detector/receiver. Its preferable to have a Remote Control too but essential if the laser keypad does not have grading arrow buttons, like on the Spectra models LL100N & LL300N (Without a remote control, having another person to assist you, is essential to operate the laser).

Site Conditions:

There are many different worksite scenarios. As an example, we are assuming that you are outside on a site with a clear field of view and planning to set drainage falls.

All above ground and below ground drainage pipes should be laid to an adequate gradient. The fall in a pipe is defined as the vertical height by which the pipe drops over a known distance. eg. a 2.5% gradient is a fall of 1m over 40m or 1:40. (1 in 40). Typically, surface water or foul water drainage pipes are set between 1:40 to 1:80.

If a gradient is too steep ie. steeper than 1 in 40, the liquid may run faster than the solids in a foul water pipe thus leaving the solids stranded, which could then block the pipe. Conversely, if a gradient is not steep enough (usually less than 1 in 110), then the pipe may still block, if the solids slow down and become stranded.

PROCEDURE (with a “grade facility” laser):

Place the rotary laser horizontally on the surveying tripod, switch it ON and allow it to auto (self) level. Note the X-axis / Y-axis markings on the top cover of the laser.

Setting a 1:40 gradient: Position the measuring staff at 10m away from the tripod, held vertically and move the laser detector (receiver) along the staff to find the set level position, usually by giving a continuous audible tone. By proportion, a 1m fall at 40m is only 250mm at 10m, so carefully noting the *set level dimension* on the rear of the staff, move the detector down by 250mm and clamp tight.

Using the remote control yourself (from the staff location) or a colleague at the laser, switch the rotary laser to its MANUAL setting in the axis facing the measuring staff. See the laser’s Instruction Manual – if the exact procedure is unknown.

Hold the “down arrow” button on the remote control or laser’s keypad, to slope the laser beam down the measuring staff until it gives a continuous tone again, having found *set level* on the detector. **This has now set a 1:40 fall.**

Return the laser detector to the original *set level dimension* on the staff.

Dig out soil & lower staff until the laser detector picks up the laser beam again.

Important note: All “grade facility” rotary lasers revert back to the auto (self) level condition if switched Off without retaining the gradient set. So its recommended to complete the ground-works before switching the laser Off.

However, a “true grade” laser level with LCD can be used to record this exact value.

If you are not sure whether your rotary is a “grade facility” laser or “true grade” laser, then please ring our Technical Dept. on 08000 869 769 giving your model number, for further advice.

Once this 1:40 fall is set, the User can use this inclined laser beam as a datum to set the depth of either the crown of the drainage pipe or the Invert level, anywhere in range of the laser – along that same axis.

Invert level of a pipe – is the level taken from the bottom of the inside of the pipe.
Crown of a pipe – is the Invert level plus the internal diameter of the pipe plus the pipe wall thickness. It may be necessary to use this in calculations when level measurements are taken from the crown of a pipe.

Manhole / Access Chambers:

A manhole or access chamber is required to gain access to a drainage system for un-blocking, cleaning, rodding or inspection. (Land drainage systems excluded). They can be manufactured in PVC, masonry or pre-cast concrete.

When setting appropriate drainage gradients it is important to allow for the depth down to either the crown of the pipe (or the Invert level) from ground level, when using these manholes.

Dual Grading:

A rotary laser level with dual grading facility can be used for setting out driveways, car-parks or areas with slopes (falls) in BOTH the X & Y axis.

The same procedure is adopted as above for drainage runs, except a second step in the process is undertaken to set the laser to a fall in the other axis, to complete the dual grade setting-out.

True Grade Lasers:

The only difference when using a *true grade* rotary laser level (to the above procedure) is that actual grade, % slope values can be entered into either the keypad or remote control for the laser & then it will automatically move the angle of the rotating prism head to that exact value. Again this can be in a single axis for drainage runs or for more complex dual grading applications.

Cut & Fill Machine control work:

If slopes of more than 10% (1:10) are required, which is outside the range of electronic adjustment of the rotary laser’s head; then simply switch the laser to Manual & fit a “Laser Grade Adapter” between the top face of the tripod & the base of the laser. Then set the required slope. Search via our website - for more details.

Laser levels Online / www.laser-level.co.uk

Freephone 08000 869 769