Building on sloping sites

A guide for building on sloping sites.

CITY OF GOLD COAST
Introduction

Building on a sloping site offers many advantages. These advantages include opportunities for views and the capture of prevailing breezes. However building on a sloping site may require more site planning and design consideration to minimise the environmental, visual and amenity impact on neighbouring properties and surrounding landscape.

The key to minimising construction costs on a sloping site is to reduce the amount of earthworks required to level the site through cut and fill and to minimise the number of engineered retaining walls. This can be achieved by adopting a house design that suits your sloping site.

Some cut and fill on sloping sites may be unavoidable, but the visual, structural and drainage impacts can be mitigated by designing the house to step with the landscape and minimise the need for extensive excavation.

Who I need to talk to

A well designed house on a sloping block should have minimal excavations, attractive retaining walls and no ongoing stormwater or maintenance problems.

Advice should be sought from registered architects, engineers, building designers or builders experienced in a wide range of slope sensitive building designs and structural systems, along with the site works and management of surface and sub-surface drainage.

Useful links:

Find an architect
findanarchitect.com.au

Find a builder
consumer.masterbuilders.asn.au/find-a-master-builder

HIA information for home builders

What I need to know to get started

An analysis of the site should identify important physical characteristics to take into consideration in the building design. This includes the degree of the slope, the type of slope, solar orientation, direction of prevailing breezes and the best vantage and viewpoints.

The first step of designing a house on a sloping site is to obtain a topographic survey to accurately plot the contours and determine the slope of your block, the location of existing vegetation and drainage corridors. This will assist in understanding the unique characteristics of the site. It will also enable appropriate decisions to be made regarding the best location for the construction of the house, the size of the house, vegetation and natural features to retain, orientation to views and the best position for outdoor structures and driveway.

Figure 1: A typical survey for a sloping site
Matching building design to suit the degree of slope

**Flat to slightly sloping sites**
Single slab on ground construction is only suitable for a site slope up to seven per cent. Slopes between seven and 10 per cent, should accommodate some level change within the building footprint.

**Moderate slope**
For slopes between seven and 20 per cent, stepping two or more slabs or using part slab/part post or beam construction would be suitable to handle the slope. Single slab on ground construction is not recommended.

**Steep slope**
For slopes between 20 and 33 per cent, post and beam construction should be used which steps with the site. This may include a lower part level with a concrete slab. Single slab on ground construction should not be used.

**Extreme slope**
For slopes more than 33 per cent, suspended or pole construction techniques are required. This degree of slope is more suited to a downslope configuration. Driveway access is generally too difficult on steep upslope lots which require large batters/retaining walls and sometimes a curving driveway.
Dealing with surface and sub-surface drainage

Good design will minimise future surface and sub-surface drainage and maintenance problems common to building on a sloping site. Understanding the effects of water on your site in both dry and wet seasons can be challenging. Surface water can usually be diverted away from the building by a combination of grading, swales (shallow ditches), detention tanks and stormwater pits which are directed to a legal point of stormwater discharge. Surface water must be disposed of in a way that avoids the likelihood of damage or nuisance to any adjoining property. If it is not well treated, erosion can be a problem on disturbed areas of the site.

The lowest floor of the house should be designed above the seasonal high water table. If a basement is built below the water table, input should be sought from a geotechnical engineer for dewatering techniques.

A hydraulic plan should be prepared by a registered engineer identifying how all stormwater is managed across the site and connected to a legal point of discharge. Drainage needs to be provided behind retaining walls.

Figure 2: Surface and sub-surface water flow
Building ideas for different slope types

Typical house design for a down slope site
- Site falls away from road.
- Suits suspended structural systems.
- Locate garages or carports close to the street.
- Provide level entry off the street into the living areas.
- Avoid extra storey at the rear which significantly increases the building’s height and bulk from the rear.

Typical house design for an up slope site
- Site rises up from road.
- Provide a projecting balcony over the garage to reduce visual dominance of the garage from the street.
- Aim for a level transition from elevated living areas to the backyard.

Slope conversion table

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Guidelines for building on sloping sites

Typical house design for a side slope site

- Site rise/falls away from side boundaries.
- Locate the garage at lower level with living space above.
- Avoid site benching and large retaining walls at property boundaries which can lead to oversahdowing, overlooking and drainage issues.

Checklist

- Get a topographic survey to accurately plot the contours and determine the slope of your block.
- Aim to take up level change in the building design.
- If you have a sloping block, avoid ‘off the shelf’ designs which have been specifically designed for a flat block.
- Single slab on ground construction (most project homes) are only really appropriate up to a slope of seven per cent as the cut/fill required becomes excessive (over one metre).
- On slopes between seven and 20 per cent think about stepping two or more slabs or using part slab/part post and beam construction to handle the slope.
- On slopes between 20 and 33 per cent, look at post and beam construction which steps with the slope.
- On slopes over 33 per cent are difficult sites to build on. Look at suspended or pole construction. This degree of slope can only really be accessed from a downslope configuration. It’s generally too difficult to achieve an upslope driveway access so parking/carport tends to be located at the bottom of the site.
- Be aware that additional costs on sloping sites can include excavation, retaining walls, scaffolding hire, additional engineering services, insulation under elevated timber floors and general increased labour costs.
- Offset these additional construction costs by reducing the amount of floor area you are building or even stage your development to ‘infill the undercroft’ at a later stage.
- Minimise site clearing and protect mature vegetation which will help with slope stability.
- Connect stormwater to a legal point of discharge.
- Locate vehicular crossing (VXO) in a location that minimises the change of ground level.
- It may also be possible to have a narrow footprint building which avoids these issues by keeping to a shallower part of the site.

References:
