

2.4.2 OTHER STRUCTURES

2.4.2.2 RETAINING WALLS – PURPOSE-DESIGNED

GENERAL DESCRIPTION

On projects for which the standard components described in 2.4.2.1 are not suitable, precast retaining walls can be purpose designed to satisfy any structural and aesthetic requirements. They may be cantilevered from an insitu concrete base or span (horizontally or vertically) between supports, typically provided for the below-ground part of a building.

Where exposed to view, the front surface can be off-form grey or painted; if appearance is important, it can also have other decorative finishes as set out in Chapter 10. Internally, the finish is usually steel trowelled. For cantilever retaining walls if decorative finishes are used they should be on all exposed faces, which may include the front, top and part of the back of the wall depending on final soil levels. Retaining walls in buildings will require appropriate fire resistance levels where exposed to view above the level of retained material or if the latter is removed later.

When retaining soil, the gap between the back of the precast wall and the excavated batter should be backfilled with a suitable granular material with appropriate drainage, etc. All the specific requirements of drainage, waterproofing, etc that apply to insitu concrete retaining walls will apply to precast walls and designers will need to review these requirements for each project. The joints between panels may need to be waterproofed and sealed and meet the required fire resistance levels.

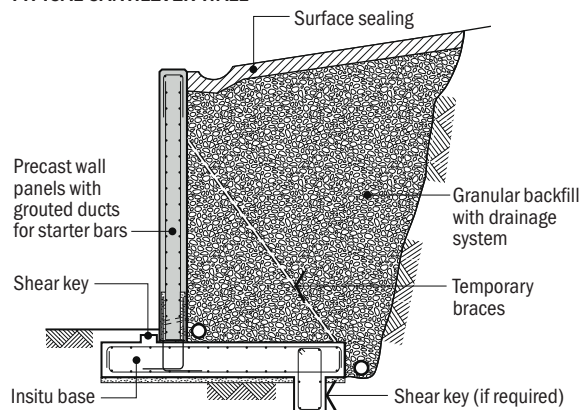
The size of precast retaining walls will depend on the configuration, the size of wall adopted, and transport. The maximum dimension in one direction generally should not exceed 3–3.5 m, which can be transported on drop down trailers. The weight of panels should generally be in the range of 5–15 t to suit site mobile cranes and transport. Designers should consult with local precasters on size and weight restrictions in their area.

CANTILEVER WALLS

For initial design for cantilever walls, a preliminary thickness of 100 mm per m of height, rationalised to the nearest 25 mm, can be used. A minimum thicknesses of 150 mm is required for walls where vertical projecting bars from the footing engage with a dowel duct in the bottom of the precast wall. For walls with two layers of reinforcement, a minimum thickness of about 175 mm is needed. Cantilever walls are often reinforced with bars as the main reinforcement located in the tension face. For walls thicker than 175 mm, frequently a layer of mesh with an N12 trimmer bar around the perimeter is provided in the other face for crack control. For precast cantilever walls, the base footing is normally insitu concrete because of the need for shear keys and the like.

Cantilever walls are erected and braced off the insitu base footing and then levelled and grouted in place. It is recommended the dowel bars from the footing be surveyed or set with a template and be galvanised. Because lifters are placed in the top of the walls, care will be needed when filling these in to ensure a good finish.

TYPICAL CANTILEVER WALL



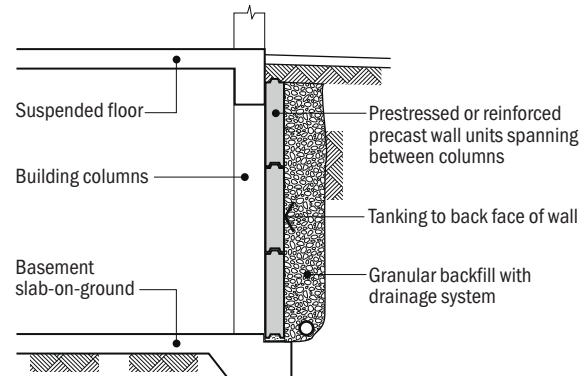
WALLS SPANNING HORIZONTALLY OR VERTICALLY

Retaining walls spanning horizontally, are usually designed as “pinned” each end. Where the retaining walls span vertically, they can be designed as “pinned” or “fixed” at both the top and bottom, giving a number of design options. Where spans are not too great it is common to design them as pinned top and bottom. For preliminary sizing of such walls a thickness of 75 mm per m of height, rationalised to the nearest 25 mm, with a minimum thickness of 150 mm can be used. Since these walls can also be used as loadbearing, there can be a number of different design criteria.

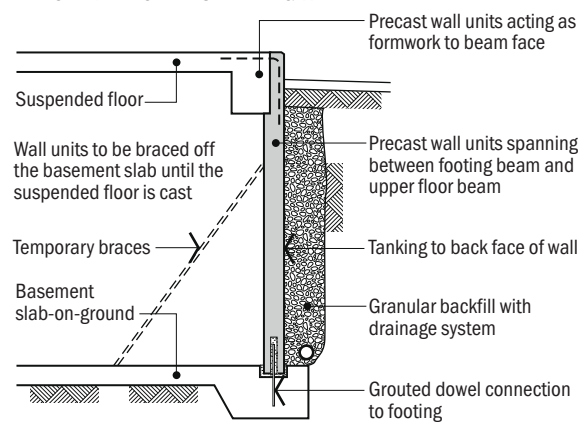
Retaining walls that span vertically between restraints, are typically supported on a strip footing, a slab edge, or a footing beam or similar. Restraint fixing at the top can be steel angles bolted to the structure (may need to be fire rated), cast-in bars to the slab, grouted dowels or similar. Before they are joined to a floor at the top of the panel they will need to be temporarily braced, usually back to the slab at the bottom level of the wall before the floor over is cast.

Designers need to be aware that rigid walls can significantly restrain floors along their length when rigidly connected to the floor at the top and bottom of the panel. This often will result in unsightly diagonal cracking in floors whether reinforced or post-tensioned. There are construction techniques to minimise such problems, eg the provision of slip connections.

TYPICAL HORIZONTALLY-SPANNING WALL



TYPICAL VERTICALLY-SPANNING WALL



Note:
For both cantilever retaining walls and retaining walls spanning vertically, large horizontal forces (reactions) occur at the bottom of the walls, which vertical dowel bars are generally unable to resist. A shear key or rebate should be provided and the panel grouted to give adequate restraint at the base of the retaining wall under lateral actions.