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1. Introduction

The purpose of this practice note is to provide guidance about retaining walls; it provides information about when a building/resource consent is required and how they should be designed.

The Building Act 2004 schedule 1, exempts some retaining walls including retaining walls built in rural zones from a building consent; however, these exemptions may breach other legislation such as the Resource Management Act 1991.

2. Building Act 2004 - Schedule 1 building work for which a consent is not required

Schedule 1: Exemption 20
A building consent is not required for the construction or alteration of any retaining wall that retains not more than 1.5 metres depth of ground and does not support any surcharge or any load additional to the load of that ground (for example, the load of vehicles on a road).

Retaining wall - urban	Is a building consent required?
Retaining wall = or < 1.5 m / no surcharge	No
Retaining wall = or < 1.5 m / with surcharge	Yes
Retaining wall > 1.5 m / with or without surcharge	Yes

Schedule 1: Exemption 41
Building work for which design is carried out or reviewed by chartered professional engineer

(1) Building work in connection with a retaining wall in a rural zone, if:-
   a) the wall retains not more than 3 metres depth of ground; and
   b) the distance between the wall and any legal boundary or existing building is at least the height of the wall

(2) In subsection (1), **rural zone** means any zone or area (other than a rural residential area) that, in the District Plan of the Territorial Authority (the Council) in whose district the building work is to be undertaken, is described as a rural zone, rural resource area, or rural environment, or by words of similar meaning.

Although a building consent may not be required, all building work must comply with the requirements of The New Zealand Building Code. For example, clause B1.3.1 requires that "buildings, building elements and site work shall withstand the combination of loads that they are likely to experience during construction or alteration and throughout their lives.

Important note: all building work must comply with other legislation this may mean that resource consent might be required even though a building consent is not.

3. Other legislation

Under the Building Act 2004, a new section has been enacted, which must be considered before deciding whether building work is exempt, that is:-.

- S.42A(2)(c) that the building work does not breach any other enactment

Example: resource consent is required because the work does not comply with the AUP; after the applicant obtains resource consent for the particular infringement, the building work reverts to being exempt from the need to obtain building consent.

Auckland Unitary Plan (AUP)

According to the AUP rural zoning rules, any retaining wall that exceeds 1.5m in height is regarded as a building. Therefore, all requirements under the AUP relating to a building, apply to a retaining wall that exceeds 1.5m in height.

Please refer to Sections H19, 20 and 21 of the AUP for zone definitions.

4. What is a surcharge?

Any vertical pressure applied to the ground surface in the vicinity of a retaining wall is a surcharge. This surcharge load will result in an additional horizontal pressure on the retaining wall.

It is the responsibility of the designer/structural engineer to determine the appropriate surcharge that can reasonably be ascertained from the site condition for both during the construction stage and long-term condition in which the retaining wall is to be built.

Close proximity definition

Where a retaining wall is constructed in close proximity to a building or structure, the distance from the base of the building to the wall (retained area side of the wall) shall be equal to or less than the height of the retaining wall (measured from the base of the foundation).

5. Design of retaining walls on boundary for surcharge load

If the owner of a property wishes to erect a retaining wall on or close to the boundary of their site, they must design the wall to provide adequate support to the neighbouring site, and should also provide reasonable allowance for surcharge loadings likely to occur during the life of the structure. In particular, it is highly likely that the retaining wall will incur a surcharge if there is potential for subdivision or other further development of the neighbouring site.

The designer of the retaining wall shall specify and design for the maximum surcharge loading likely to be experienced throughout the life of the structure (with reasons) and show that long-term lateral deflection of the wall will be within acceptable limits (in some cases, design for 'at rest' soil pressure will be considered sufficient to address this deflection requirement).

Unless there is clearly a case for designing for a greater surcharge loading, Council will normally accept design for:

- 12.0 kPa minimum surcharge loading if there is future potential for a right of way or access lot on the adjoining site
- 5.0 kPa minimum surcharge loading in all other cases (this allows for up to about 300mm of loose filling placed on top of the ground behind the wall).

In addition, the structural design shall include a construction methodology to ensure that the stability of any land on the adjoining site is fully protected.

Note the wall including the drainage metal and sub-soil drain behind the wall must not cross the boundary at any point.

Commentary

B1.3.3 of the Building Code states that *"…account shall be taken of all physical conditions **likely** to affect the stability of buildings, building elements and site work…"*

This implies that the retaining wall design needs to consider “likely” loads. “Likely” loads have been previously defined by MBIE as “loads known with reasonable certainty” including planned activity such as anticipated loading from a subdivision (driveway).

Council has engaged an engineering consultant (GHD) to ascertain the magnitude of the surcharge load which can be reasonably expected. The GHD report dated Feb 2005 concluded that a 12kPA surcharge is indeed reasonable. It is equivalent to dead and live loads arising from a 2m wide driveway with a 100mm concrete slab at the vicinity of the retaining wall.

This is the basis of which Council has accepted that a 12kPA surcharge in the absence of any other reasonably proposed surcharge load for retaining wall at the boundary is appropriate.

Past Determinations
Whilst there is no direct ruling from past determinations regarding the design to 12kPA surcharge on retaining walls, such load magnitude has been quoted and appear acceptable (albeit indirectly) in site specific cases (see determinations 2015/003 and 2015/006).

NZS 4229:2013 Concrete masonry Buildings not requiring specific engineering design
There has been some confusion in the past regarding masonry retaining wall designed to NZS 4229. Details of the design are explained in Appendix A. Clause A1.2 states that specific engineering design still needs to be provided if any one of the conditions (a)-(g) exists.

In particular, A1.2(b) where the surcharge is above the limit specified in Fig. A2 which is 2.5kPA. In other words, the deem-to-comply design in Fig. A2 can be adopted without specific design if and only if the expected surcharge does not exceed 2.5kPA. It does not mean, however, that all surcharge loads must only be 2.5kPA.

6. Timber wall durability

Council has in the past, required H6 treated timber for pole retaining walls. The reason is to ensure that the retaining wall would have an expected service life of at least 100 years. It was presumed that this condition aligns with Resource Consents requirements, especially for retaining walls at the boundary, and including the idea of “*protecting the land*”.

However, Ellis Gould in their legal opinion, dated August 2014, argued convincingly that the demand for a 100 year service life for pole retaining walls is untenable under both the Building Act as well as the Resource management Act.

Notwithstanding this legal issue, Council has been informed by the engineering community (see KCL/Coffey April 2015) that the risk of compliant with H5 class only, even for a 100 year service requirement is low given that

1. The critical part of timber poles are concrete casted and are not in direct ground contact
2. There is conservatism in the structural design, since the critical cross section is larger than the smaller end used in the design, H5 treated timber poles will be accepted as adequate

7. Do I need a barrier?

As specified in clause F4.3.1 of the Building Code, a barrier is required to be constructed to safeguard people from falling, where the height of the retaining wall exceeds 1.0m and the area is associated with the use of a building.

Examples of areas associated with the use of a building in respect to retaining walls:-

1. on the edge of driveways
2. near pedestrian access routes to and from buildings; and
3. amenity areas used in conjunction with the use of a dwelling

8. Retaining wall design and observation

Where retaining walls are to specific design, and generally, Engineer's observation and PS4 producer statement is required. Agreement in respect to the PS4 producer statement must be reached before the building consent is granted.

A B and C type masonry retaining walls
NZS 4230:2004 Table 3.1 has 3 categories for masonry design (A, B & C). These designs are based on the maximum design compressive strength of masonry.

- A and B type masonry must be inspected by the design Engineer or their nominated representative
- C Grade masonry is generally inspected by Council officers

For timber pole retaining walls, the PS4 producer statement should include the inspection of the bored holes and the final retained height.

9. Drainage

It is essential that suitable drainage be installed behind retaining walls. Stormwater should discharge to an approved point of disposal via a silt trap. However, this does not necessarily apply to subsoil drains that is solely used to relieve water pressure behind the retaining walls as the flow in such conditions are minor. In order to protect the public stormwater system from silt build up, drain coil should be wrapped in a protective wrap or sock which prevents silt entering the drain. Alternatively, clean out points at either end of the drain can be installed to enable the system to be flushed out from time to time.

Note: drainage is not required for porous retaining walls where seepage does not cause a nuisance. For example gabion structures are porous and hence are not designed for hydrostatic pressure as they are physically not able to retain water. Similarly, timber walls can be constructed as fully porous structures as long as the seepage from such retaining wall will not cause nuisance to neighbouring property.

10. Other considerations

Protection of existing private drainage on site shall be incorporated into the design to minimise the risk of failure due to ground pressure from foundations or cast piles. Protection of public drainage and utilities must be ensured by way of specific design.

The location of all public drainage must be clearly marked on site at the time of inspection. Unsuitable soils such as: soft clays, peat or organic soils and fill ground must also be considered and incorporated into the design. Where the soil has been identified as unsuitable i.e. via the hazard register or by the design engineer, the retaining wall must be specifically designed.

If there is any doubt as to the suitability of the soil, building work should not proceed. Seek professional advice.

Regardless of the height of the retaining wall, if the overland flow and/or secondary flow path is impeded or obstructed in any way, construction must not proceed. Seek professional advice.

Secondary flow path means: - the path over which surface water will follow if the drainage system becomes overloaded or inoperative.

Overland flow path means: - the path over which surface water will flow due to the natural lie of the land.

11. References

NZS 4210:2001 Masonry Construction, Materials and Workmanship
NZS 4229:1999 Concrete Masonry Buildings not Requiring Specific Engineering Design
NZS 4230:2004 Design of Reinforced Concrete Masonry Structures
Manukau City Council “City Managers Task Force – Retaining Walls and Excavations – Surcharge Levels For Boundary Retaining Walls (GHD) Feb 2005
Ellis Gould legal opinion Aug 2014
New Zealand Building Code
New Zealand Building Act 2004