

In Ontario if a home foundation is built on clay, does this impact the footing size chosen? Are footings reinforced?

Impact of Clay Soil on Footing Size and Reinforcement in Ontario Home Foundations

Introduction

The design and construction of home foundations in Ontario, particularly when built on clay soils, are governed by both engineering principles and local building codes. The unique characteristics of clay—its tendency to expand when wet and contract when dry—make it a challenging substrate for supporting structures. This directly impacts decisions regarding the size and reinforcement of footings beneath foundations.

Influence of Clay Soil on Footing Size

1. Bearing Capacity Considerations

Clay soils generally have lower bearing capacities compared to granular soils like sand or gravel. The bearing capacity is the maximum load per unit area that the soil can support without undergoing shear failure or excessive settlement[1][2]. Because clays can be highly compressible and susceptible to seasonal volume changes (expansion and contraction), footings must be designed to distribute loads over a larger area to prevent differential settlement or structural instability[3][4].

- **Canadian Building Code Requirements:** According to the *Canadian Foundation Engineering Manual*, minimum footing widths are specified based on soil type. For typical residential loads:
 - On stiff clay: minimum width is often 16–24 inches (400–600 mm).
 - On soft or plastic clays: even wider footings may be required, sometimes exceeding 24 inches (600 mm) depending on geotechnical recommendations[5][6].
- **Ontario Building Code (OBC):** The OBC also mandates that footings must extend below the frost line (typically at least 1.2 m deep in southern Ontario) and be sized according to the allowable bearing pressure of the underlying soil[7].

2. Settlement Control

Clays are prone to long-term consolidation settlement under sustained loads, especially if they are soft or have high water content[8]. To mitigate this:

- Engineers increase footing size to reduce pressure exerted on the soil.
- In some cases, mat foundations or grade beams are used for additional stability[9].

3. Frost Heave Protection

Ontario's climate requires consideration of frost heave—a phenomenon where freezing causes upward movement of moist clay soils. Wider footings help resist uneven lifting forces caused by frost action[10].

Reinforcement of Footings

1. Structural Reinforcement Necessity

Reinforcing steel (rebar) is commonly embedded in concrete footings for several reasons:

- **Crack Control:** Clay soils can shrink and swell, causing movement beneath the foundation that leads to cracking if not properly reinforced[11].
- **Shear Strength:** Rebar increases the shear strength of concrete, which is essential when dealing with weaker subsoils like clay.
- **Flexural Strength:** Reinforcement helps resist bending moments induced by uneven settlement or lateral soil pressures[12].

2. Typical Reinforcement Practices in Ontario

- According to *Building Construction Illustrated* by Francis D.K. Ching, standard practice includes placing two continuous rows of #4 rebar (12 mm diameter) near the bottom third of residential strip footings[13].
- For expansive clays, additional reinforcement may be specified by engineers based on site-specific geotechnical reports.
- The *Canadian Concrete Design Handbook* recommends increased reinforcement ratios for footings resting on low-strength soils such as clay[14].

3. Local Builder Practices

Builders in Ontario routinely reinforce all footings with rebar—even beyond code minimums—when working with clay soils due to their unpredictability and potential for movement[15]. Sulfate-resistant concrete mixes may also be used if chemical attack from certain clays is a concern.

Summary Table: Key Factors Affecting Footing Design on Clay Soils

Factor	Impact on Footing Design	Reference(s)
Low bearing capacity	Increased width/area	[1][5][6]
High compressibility	Larger/wider footings	[3][8]
Frost susceptibility	Deeper/wider placement	[7][10]

Factor	Impact on Footing Design	Reference(s)
Shrink-swell behavior	Mandatory reinforcement	[11] [12] [14]

Conclusion

In summary, when building home foundations in Ontario on clay soils:

- **Footing sizes are typically increased** compared to those used for granular soils, both for bearing capacity and settlement control.
- **Reinforcement with steel rebar is standard practice**, required by code and engineering best practices due to the unpredictable nature of clay's expansion/contraction cycles.
- Both provincial codes and authoritative engineering references emphasize site-specific geotechnical investigation as essential before finalizing footing dimensions and reinforcement details.

References

World's Most Authoritative Sources

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15. Allen E., Iano J., *Fundamentals of Building Construction: Materials and Methods*, Wiley & Sons; PRINT.↵

Additional web-based/contextual references:

- "From the Ground Up: Why a Structurally Sound Foundation Is Important." mphomes.ca↵
- "Home Foundation Sitting On Clay And Silt Soils." directwaterproofing.ca