



## Engineering Certification for Appendix D

The wall reinforcing tables in Appendix D for use in Canada have been reviewed and certified on October 30, 2015 by Tacoma Engineers for use in the Province of Ontario. These tables have also been reviewed for conformance to the following Codes and Regulations:

- 2014 Alberta Building Code
- 2012 British Columbia Building Code
- 2011 Manitoba Building Code
- 2014 Nova Scotia Building Code
- 2010 National Building Code as amended by The Uniform Building and Accessibility Standards Regulations in Saskatchewan

The following additional requirements apply to locations where  $S_a(0.2) \geq 0.67$

- The maximum spacing for vertical wall reinforcement shall be 16"o.c. for 15M bars and 12"o.c. for 10M bars.
- The maximum spacing for horizontal wall reinforcement shall be 18"o.c. for 15M bars and 18"o.c. for 2-10M bars.





## Design Limitations and Tables for Above and Below Grade Walls



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## Design Limitations/ Installation Conditions

### Introduction

The structural wall reinforcing and lintel design tables contained within Appendix D and E of NUDURA's Installation Manual have been prepared consistent with the design principals and practices that have been applied throughout the North American ICF industry for prescriptive design of insulated concrete form walls. The intent of these specific tables is to enable design and building reviewing professionals to competently determine reinforcement requirements for walls specifically constructed using the NUDURA Integrated Building Technology Insulated Concrete Form System™. For this reason, reinforcement specifications may vary slightly from generic reinforcement configurations that may be specified within the NBCC 2010 (National Building Code of Canada) as the design reflects the specific geometry and reinforcement capabilities that are unique to the NUDURA Wall System.

### Design – General

1. These tables apply to residential buildings ONLY that conform to the requirements of the appropriate building codes or design guides that are already recognized within the official Canadian product evaluation reports produced for NUDURA Corporation. It is assumed that construction will comply with the appropriate, local building codes, which includes the following:
  - Part 9 of the National Building Code of Canada – 2010.
  - Part 9 of applicable provincial building codes, issued based on the above requirement.

NOTE: If the proposed construction does not meet the design or applicability parameters noted herein, a local design professional shall be retained to prepare the design in accordance with applicable standards.



2. These tables have been designed to resist gravity, wind, and earthquake forces, as stated in accordance with the National Building Code of Canada 2010 (NBCC) and applicable provincial building codes based on the 2010 NBCC. The tables have also been designed along with the design loads and factors that are indicated in Notes 3 & 4 and within the structural tables contained in this appendix.
3. The following maximum UNFACTORED loads were assumed in the design of the structural tables featured in this appendix:
  - A) Roof Snow Load (Live) = 4.0 kPa (84 psf)
  - B) Main Floor Occupancy Load (Live) = 1.9 kPa (40 psf)
  - C) Second Floor Occupancy Load (Live) = 1.4 kPa (30 psf)
  - D) Roof and Floor Load (Dead) = 0.7 kPa (15 psf)
  - E) Soil Surcharge (Live) = 2.4 kPa (50 psf)
  - F) Concrete Density (Dead) = 23.6 kN/m<sup>3</sup> (150 lb/ft<sup>3</sup>)
  - G) Brick Density (Dead) = 20.0 kN/m<sup>3</sup> (128 lb/ft<sup>3</sup>)
4. The loads given for equivalent fluid density (live load) in the below grade tables of this appendix are also noted to be UNFACTORED and are assumed in the design along with the un-factored loads stated in Note 3.
5. Seismic Data and Factors (Note: Seismic Factors are expressed per Canadian Code Standards):
  - i. Seismic Zone Classification:
    - a) Above Grade Walls
      - A) Low:  $S_a(0.2) \leq 0.32$
      - B) Medium:  $S_a(0.2) \geq 0.32$  &  $\leq 0.67$
      - C) High:  $S_a(0.2) \geq 0.67$  &  $\leq 2.3$
    - b) Below Grade Walls
      - A) Low:  $S_a(0.2) \leq 0.25$
      - B) High:  $S_a(0.2) > 0.25$
  - ii. Only soil types A, B, C and D are permitted, as outlined in Part 4 in the National Building Code of Canada



6. Except as noted otherwise for specific conditions, the design assumes that ALL walls are laterally supported by building foundation, roof and floor systems including diaphragms, designed by others.
7. Design assumes that deflection is limited to  $L/360$ .
8. Foundation wall backfill has been designed for maximum allowable surcharge of 2.4 kPa (50 psf) with a horizontal soil coefficient,  $k_o = 0.5$ .
9. Foundation walls have been designed for an equivalent fluid density backfill pressure, and therefore have been designed with a horizontal soil coefficient,  $k_a = 1.0$ .
10. Design assumes that the reinforcing steel will be deformed rebar, placed in accordance with the manuals of standard practice for Canada and shall be supplied at the following yield strength:
  - CAN: Grade 400 (400 MPa)
11. Design also assumes that the minimum 28 day compressive strength of concrete used in the installation shall be 20 MPa (3000 psi).
12. It is optimal to use a maximum of 9.5 mm (3/8") diameter pea gravel or 9.5 mm (3/8") diameter crushed aggregate.

For 100 mm (4") and 150 mm (6") thick concrete walls it is permitted to use up to 12.7 mm (1/2") diameter crushed aggregate, and for 200 mm (8") and 250 mm (10") thick concrete walls a maximum 19.1 mm (3/4") diameter crushed aggregate.

Extra care is needed when vibrating during concrete placement for the purpose of ensuring a homogeneous aggregate distribution, without segregation. Larger diameter crushed aggregate can cause air pockets and honeycombing and a generally poor concrete mix as a result of inadequate vibration.



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13. All walls shall be proportionally and evenly distributed in both the transverse and longitudinal directions of the building.

**Design Limitations**

14. The following maximum building dimensions are permitted for use:

- A) Largest Plan Dimension = 24.4 m (80 ft)
- B) Building Area = 300m<sup>2</sup> (3200ft<sup>2</sup>)

15. Design is limited to 1 floor below grade and a maximum of 2 storeys above grade. A walkout basement is considered as one floor below grade. For buildings with walkout basements, the review of the global site and building stability, as may be required by Part 9 of the National Building Code, is by others.

16. Maximum height of all above grade second floor walls and all above grade 100 mm (4") walls is 3.05 m (10 ft.).

17. Maximum height of above grade 150 mm (6") and 200 mm (8") main floor walls is 4.88m (16 ft.).

18. Maximum height of foundation walls = 3.66 m (12 ft).

19. Maximum floor clear span = 7.32 m (24 ft.).

20. Maximum roof clear span = 12.2 m (40 ft.).

21. It is the responsibility of the roof or floor designer to ensure adequate bearing for all framing members is provided on the concrete walls.



## Use of Design Tables

### General

22. Height of foundation wall is defined as “the distance from the top of the basement floor slab to the point of bearing for the floor system”.
23. Backfill height is defined as “the distance from the top of the basement floor slab to the finished exterior grade level”.
24. For walls below grade, vertical reinforcement shall be placed at 38 mm (1½”) from interior face of forms (to the tension side of the wall).
25. Interpolation between backfill heights and soil equivalent fluid density is not permitted.
26. For walls above grade, vertical reinforcement shall be placed at the middle (or center axis) of the wall.
27. Horizontal reinforcing to consist of 10M continuous bars at 457 mm (18”) o.c. or 914 mm (36”) o.c., plus one 10M continuous bar 150mm (6”) from the top of wall and at floor levels.
28. With respect to vertical reinforcing specifications, in some cases, spacing of vertical wall reinforcing in the design tables of this appendix may exceed minimum requirements according to Subsection 14.1.8 of CSA A23.3-04 (Canada), where maximum stress does not exceed 67% of the reinforced wall’s capacity. Horizontal temperature and shrinkage steel is also set as 10M at 457 mm (18”) o.c. or 914 mm (36”) o.c., for wall thicknesses up to 250 mm (10”). This is due to ideal curing conditions within the NUDURA ICF system, which reduces the risk of cracking.



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Also, since finishes are not applied directly to the concrete wall, the risk of potential cracks propagating to the surface of the finishes is minimized.

Furthermore, testing conducted by the Portland Cement Association demonstrated that the strength of reinforced concrete walls could be predicted using conventional reinforced concrete equations with reinforcement spacing of up to 1.22 m (4'-0") o.c.

## Rules for Reinforcement at Openings

29. In addition to the vertical wall reinforcement indicated within these design tables, a minimum of 2-10M bars shall be installed at both sides of all openings in concrete. Bars shall extend vertically for the full height of the wall pour, as shown in drawing L1 located within the Design Limitations document for concrete lintels. Vertical bars shall be installed with adequate lap lengths at construction joints. In addition to the horizontal wall reinforcement, 2 -10M bars shall be installed at the base of the opening – extending a minimum of 610 mm (24") beyond both sides of the opening. A minimum concrete cover of 50 mm (2") shall be maintained for all additional bars.
30. For foundation walls, the minimum length of solid wall between two openings shall equal the average width of the openings and be no less than 1.22 m (4'-0").
31. Openings in a foundation wall shall not exceed a width of 1.83 m (6'-0").





32. Foundation shall not have a total width of openings constituting more than 25% of the length of the wall, *except openings may constitute up to 50% of the length of the wall provided:*

- A) all the reinforcing interrupted by openings is placed on each side of the opening as per Note 34, including windows less than 4'-0" wide, and*
- B) the foundation wall does not contain a brick ledge form to support masonry veneer, and*
- C) where the foundation wall supports wood framed walls above, the floor framing is supported on top of the foundation wall and not with a ledger board.*

33. For sections of wall between openings conforming to Note 30 above, the spacing of the vertical reinforcement must be decreased in these walls by a factor as calculated by the following formula:

$$\frac{\text{width of wall between openings}}{(\text{width of wall between openings} + \text{average width of the two openings})}$$

34. Openings in foundation walls that exceed 1.22 m (4'-0") width, the spacing of the vertical reinforcement indicated within the structural tables of this appendix shall be reduced by half for a distance equal to half the opening width on each side of the opening.

35. If the required spacing of the wall vertical reinforcement is found to be less than 100 mm (4") as determined per notes 33 or 34, a local design professional shall be retained to prepare the design in accordance with applicable codes and standards.



## Minimum Shear Wall Lengths

36. A minimum length of solid concrete shear wall without openings is required in each building direction. The following table indicates the minimum solid shear wall lengths without openings as either two solid wall sections within the length of a wall, or one solid wall section within the length of the wall.

Seismic Zone	First Floor of One Storey Concrete Structure or Top Floor of 2 Storey Concrete Structure	Foundation Walls and Lower Floor of 2 Storey Concrete Structure
$S_a(0.2) \leq 0.32$	2 – 2590mm (8'-6") Solid Wall Lengths or a Single 4110mm (13'-6") Wall Length	2 – 3660mm (12'-0") Solid Wall Lengths or a Single 5790mm (19'-0") Wall Length
$S_a(0.2) \geq 0.32 \ \& \ \leq 0.67$	2 – 4570mm (15'-0") Solid Wall Lengths or a Single 6550mm (21'-6") Wall Length	2 – 4880mm (16'-0") Solid Wall Lengths or a Single 7320mm (24'-0") Wall Length
$S_a(0.2) \geq 0.67 \ \& \ \leq 2.3$	2 – 5180mm (17'-0") Solid Wall Lengths or a Single 7920mm (26'-0") Wall Length	2 – 5940mm (19'-6") Solid Wall Lengths or a Single 10060mm (33'-0") Wall Length

37. For residential buildings with an area less than 232m<sup>2</sup> (2500 ft<sup>2</sup>), the minimum shear wall lengths indicated in the table above may be reduced by a factor equal to the residential building area, divided by 232m<sup>2</sup> (2500 ft<sup>2</sup>). However, in no instance shall the minimum horizontal shear wall length be reduced to less than 2 – 2590mm (8'-6") solid wall lengths or a single 4110mm (13'-6") wall length.

## Point Loads

38. All point loads, such as concentrated loads created by girder trusses, columns and beams, shall bear directly on top of the concrete wall, and shall not be hung or in any other manner create an eccentric loading on the concrete wall.

39. The minimum horizontal length of solid wall without openings directly below point loads, such as concentrated loads created by girder trusses, columns and beams, shall be 1.83 m (6'-0"). In addition to the wall reinforcement required within the structural tables of this appendix, two additional 15M vertical bars shall be installed directly below the point load.



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## Reinforcement at Corners

40. Two full height vertical bars, equal to the vertical reinforcement within the wall system, are to be installed at all corners.

## Installation

### General

41. The design and construction of all work on site shall conform to the latest editions of the applicable building codes for the region where installation is taking place, including local applicable code regulations and bylaws as well as all applicable health and safety regulations.

### Footing Reinforcement

42. Strip footings are to be fitted with dowels to provide connection between the footing and the wall cavity. Dowels shall be installed along the center axis of the strip footings and shall be installed as per the details shown in Appendix C.

### General Reinforcement Installation

43. Reinforcement placement must be in accordance with the specified design as per these notes and drawings produced in accordance with the NUDURA Structural Tables contained in Appendices D & E.

44. Minimum bar lap length shall be:

- A) 450 mm (18") for 10M bars
- B) 650 mm (26") for 15M bars
- C) 750 mm (30") for 20M bars



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## Concrete Placement

45. Concrete work shall conform to the latest editions of the following standard for materials and workmanship:

- i. CAN/CSA-A23.1 /A23.2 /A23.3

46. Construction joints shall be made and located so as not to impair the strength of the structure. All specified reinforcing bars shall have minimum lap lengths across all construction joints.

47. The contractor shall employ high frequency vibration to place all concrete.

48. Concrete pours shall be terminated at locations of lateral support, such as provided by roof and floor systems.

## Protection of Structure During Installation

49. Adequate frost protection shall be provided for all foundation walls and footings both during construction and in the final installation.

50. The contractor shall make adequate provision to protect concrete from exposure to freezing temperatures and precipitation at least seven days after concrete placement.

51. NOTE: Hydrostatic pressure due to water build-up has not been included in the design and analysis. Backfill shall be drained in accordance with the following Code Requirements:

- NBCC 2010 Article 9.4.4.6.

52. Except as noted otherwise for specific conditions, walls shall be laterally supported at top and bottom prior to backfilling.



53. Surface grading around the foundation shall be sloped away from building to allow surface runoff to drain away.

54. The contractor shall make adequate provision for construction loads and temporary bracing to keep structure plumb and in true alignment in all phases of construction.

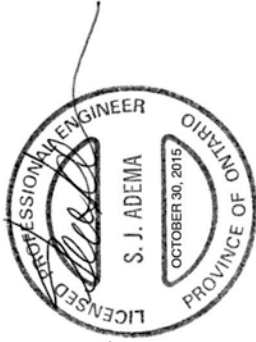
55. All work shall conform to the latest editions of ANY of the following codes and standards that are deemed applicable for your region:

CAN:

- National Building Code of Canada 2010
- Other local Provincial or regional building code, local regulations and bylaws
- Workplace and Hazardous Material Health and Safety (WHMS) & Ontario Ministry of Labour Safety Regulations
- Occupational Safety and Health Association Regulations



# REINFORCING TABLES D-1

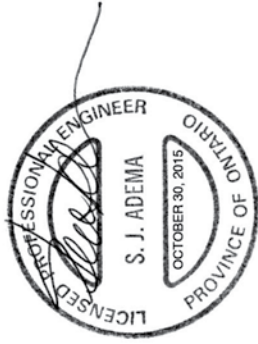


Below-Grade Walls Built with NUDURA Insulated Forms  
Vertical and Horizontal Steel Reinforcement for Seismic Zone Classification:  $S_A(0.2) \leq 0.25$

Wall Height m (ft)	Backfill Height m (ft)	Vertical Reinforcement										Horizontal Steel Reinforcement			
		Sand & Gravel					Free Draining Backfill Soil Type (Maximum Equivalent Fluid Density) 480					Sand, Gravel with Silt or Clay 720 kg/m <sup>3</sup> (45 pcf)		All Soils	
		150 mm (6") Wall	200 mm (8") Wall	250 mm (10") Wall	150 mm (6") Wall	200 mm (8") Wall	250 mm (10") Wall	150 mm (6") Wall	200 mm (8") Wall	250 mm (10") Wall	200 mm (8") Wall	250 mm (10") Wall	All Wall Thicknesses		
2.44 (8.0)	1.22 (4.0)	10M @ 400 (16) <sup>2</sup>	10M @ 600 (24) <sup>2</sup>	10M @ 800 (32) <sup>2</sup>	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	10M @ 914 (36")	
	1.53 (5.0)	10M @ 400 (16) <sup>2</sup>	10M @ 400 (16) <sup>2</sup>	10M @ 600 (24) <sup>2</sup>	10M @ 400 (16)	10M @ 600 (24) <sup>2</sup>	10M @ 400 (16) <sup>2</sup>	10M @ 400 (16)	10M @ 400 (16)	10M @ 600 (24)	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	10M @ 914 (36")	
	1.83 (6.0)	10M @ 400 (16)	15M @ 400 (16)	10M @ 400 (16) <sup>2</sup>	10M @ 400 (16)	15M @ 400 (16)	10M @ 400 (16) <sup>2</sup>	10M @ 400 (16)	15M @ 400 (16)	10M @ 600 (24)	15M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	10M @ 914 (36")	
	2.13 (7.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24) <sup>2</sup>	15M @ 400 (16)	15M @ 600 (24) <sup>2</sup>	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	10M @ 800 (32)	10M @ 914 (36")	
	2.44 (8.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24) <sup>2</sup>	15M @ 400 (16)	15M @ 600 (24) <sup>2</sup>	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	10M @ 800 (32)	10M @ 914 (36")	
2.74 (9.0)	1.53 (5.0)	10M @ 400 (16) <sup>2</sup>	10M @ 400 (16) <sup>2</sup>	10M @ 600 (24) <sup>2</sup>	10M @ 400 (16)	10M @ 600 (24)	10M @ 400 (16)	10M @ 400 (16)	10M @ 400 (16)	10M @ 600 (24)	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	10M @ 914 (36")	
	1.83 (6.0)	10M @ 400 (16)	15M @ 400 (16)	10M @ 400 (16) <sup>2</sup>	10M @ 400 (16)	15M @ 400 (16)	10M @ 400 (16) <sup>2</sup>	10M @ 400 (16)	15M @ 400 (16)	10M @ 600 (24)	15M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	10M @ 914 (36")	
	2.13 (7.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24) <sup>2</sup>	15M @ 400 (16)	15M @ 600 (24) <sup>2</sup>	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	10M @ 800 (32)	10M @ 914 (36")	
	2.44 (8.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24) <sup>2</sup>	15M @ 400 (16)	15M @ 600 (24) <sup>2</sup>	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	10M @ 800 (32)	10M @ 914 (36")	
	2.74 (9.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24) <sup>2</sup>	15M @ 400 (16)	15M @ 600 (24) <sup>2</sup>	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	10M @ 800 (32)	10M @ 914 (36")	
3.05 (10.0)	1.22 (4.0)	10M @ 400 (16) <sup>2</sup>	10M @ 600 (24) <sup>2</sup>	10M @ 800 (32) <sup>2</sup>	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	10M @ 914 (36")	
	1.53 (5.0)	10M @ 400 (16)	10M @ 400 (16)	10M @ 600 (24) <sup>2</sup>	10M @ 400 (16)	10M @ 600 (24)	10M @ 400 (16) <sup>2</sup>	10M @ 400 (16)	10M @ 600 (24)	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	10M @ 914 (36")		
	1.83 (6.0)	10M @ 200 (8)	15M @ 600 (24) <sup>2</sup>	10M @ 400 (16) <sup>2</sup>	15M @ 400 (16)	10M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 914 (36")		
	2.13 (7.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24) <sup>2</sup>	15M @ 400 (16)	15M @ 600 (24) <sup>2</sup>	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	10M @ 914 (36")		
	2.44 (8.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24) <sup>2</sup>	15M @ 400 (16)	15M @ 600 (24) <sup>2</sup>	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	10M @ 914 (36")		
3.35 (11.0)	1.22 (4.0)	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	10M @ 914 (36")	
	1.53 (5.0)	10M @ 400 (16)	10M @ 400 (16)	10M @ 600 (24)	10M @ 400 (16)	10M @ 600 (24)	10M @ 400 (16)	10M @ 400 (16)	10M @ 600 (24)	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	10M @ 914 (36")		
	1.83 (6.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	10M @ 914 (36")		
	2.13 (7.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	10M @ 914 (36")		
	2.44 (8.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	10M @ 914 (36")		
3.66 (12.0)	1.22 (4.0)	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	10M @ 914 (36")	
	1.53 (5.0)	10M @ 400 (16)	10M @ 400 (16)	10M @ 600 (24)	10M @ 400 (16)	10M @ 600 (24)	10M @ 400 (16)	10M @ 400 (16)	10M @ 600 (24)	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	10M @ 914 (36")		
	1.83 (6.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	10M @ 914 (36")		
	2.13 (7.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	10M @ 914 (36")		
	2.44 (8.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	10M @ 914 (36")		

Note:

1. This table is to be used in conjunction with "Design Limitations" prepared by Tacoma Engineers Inc.
2. As per Table 9.15.4.2.A of the National Building Code, for the wall and backfill height noted, an unreinforced wall with  $F_c = 20$  MPa is adequate when supporting wood framing above.
3. Refer to Design Limitations for info on construction methods, material specifications, design loads, additional wall reinforcing around openings, min. wall length, etc.
4. 2-10M bars are permitted to replace each 15M bar at the specified spacing indicated above.

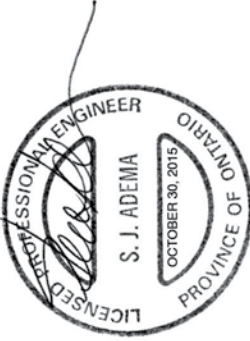


**Vertical and Horizontal Steel Reinforcement for Seismic Zone Classification:  $S_s(0.2) \leq 0.25$**   
Below-Grade Walls Built with NUDURA Insulated Forms

Wall Height m (ft)	Backfill Height m (ft)	Vertical Reinforcement				Horizontal Steel Reinforcement
		Free Draining Backfill Soil Type (Maximum Equivalent Fluid Density)				
		Inorganic Silt or Clay 960 kg/m <sup>3</sup> (60 pcf)		250 mm (10") Wall		
		150 mm (6") Wall	200 mm (8") Wall	250 mm (10") Wall	All Soils All Wall Thicknesses	
2.44 (8.0)	1.22 (4.0)	10M @ 400 (16)	10M @ 400 (16)	10M @ 600 (24)	10M @ 914 (36")	
	1.53 (5.0)	10M @ 400 (16)	15M @ 600 (24)	10M @ 400 (16)	10M @ 914 (36")	
	1.83 (6.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24)	10M @ 914 (36")	
	2.13 (7.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 914 (36")	
2.74 (9.0)	1.22 (4.0)	10M @ 400 (16)	10M @ 400 (16)	10M @ 600 (24)	10M @ 914 (36")	
	1.53 (5.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24)	10M @ 914 (36")	
	1.83 (6.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24)	10M @ 914 (36")	
	2.13 (7.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 914 (36")	
3.05 (10.0)	1.22 (4.0)	10M @ 400 (16)	10M @ 400 (16)	10M @ 600 (24)	10M @ 914 (36")	
	1.53 (5.0)	15M @ 400 (16)	15M @ 600 (24)	10M @ 400 (16)	10M @ 914 (36")	
	1.83 (6.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 914 (36")	
	2.13 (7.0)	15M @ 200 (8)	15M @ 400 (16)	15M @ 400 (16)	10M @ 914 (36")	
3.35 (11.0)	1.22 (4.0)	10M @ 400 (16)	15M @ 200 (8)	15M @ 400 (16)	10M @ 914 (36")	
	1.53 (5.0)	15M @ 400 (16)	15M @ 200 (8)	15M @ 400 (16)	10M @ 914 (36")	
	1.83 (6.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 914 (36")	
	2.13 (7.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 914 (36")	
3.66 (12.0)	1.22 (4.0)	10M @ 400 (16)	15M @ 200 (8)	15M @ 400 (16)	10M @ 914 (36")	
	1.53 (5.0)	15M @ 400 (16)	15M @ 200 (8)	15M @ 400 (16)	10M @ 914 (36")	
	1.83 (6.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 914 (36")	
	2.13 (7.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 914 (36")	

Note:

1. This table is to be used in conjunction with "Design Limitations" prepared by Tacoma Engineers Inc.
2. As per Table 9.15.4.2.A of the National Building Code, for the wall and backfill height noted, an unreinforced wall with  $f_c = 20$  MPa is adequate when supporting wood framing above.
3. Refer to Design Limitations for info on construction methods, material specifications, design loads, additional wall reinforcing around openings, min. wall length, etc.
4. 2-10M bars are permitted to replace each 15M bar at the specified spacing indicated above.

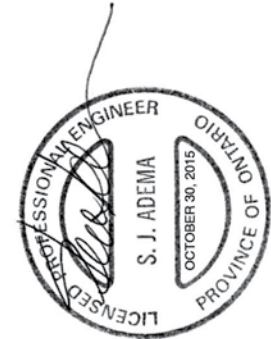


Below-Grade Walls Built with NUDURA Insulated Forms  
Vertical and Horizontal Steel Reinforcement for Seismic Zone Classification:  $S_a(0.2) > 0.25$

Wall Height m (ft)	Backfill Height m (ft)	Vertical Reinforcement										Horizontal Steel Reinforcement
		Sand & Gravel		Free Draining Backfill Soil Type (Maximum Equivalent Fluid Density)		Sand, Gravel with Silt or Clay		250 mm (10") Wall		250 mm (10") Wall		
		150 mm (6") Wall	200 mm (8") Wall	kg/m <sup>3</sup> (30 pcf)	250 mm (10") Wall	150 mm (6") Wall	200 mm (8") Wall	720 kg/m <sup>3</sup> (45 pcf)	250 mm (10") Wall	250 mm (10") Wall	250 mm (10") Wall	
2.44 (8.0)	1.22 (4.0)	10M @ 400 (16) <sup>2</sup>	10M @ 600 (24) <sup>2</sup>	10M @ 800 (32) <sup>2</sup>	10M @ 400 (16)	10M @ 400 (16)	10M @ 400 (16)	10M @ 400 (16)	10M @ 400 (16)	10M @ 400 (16)	10M @ 600 (24)	10M @ 457 (18")
	1.53 (5.0)	10M @ 400 (16) <sup>2</sup>	10M @ 400 (16) <sup>2</sup>	10M @ 600 (24) <sup>2</sup>	15M @ 400 (16)	15M @ 600 (24)	15M @ 600 (24)	15M @ 600 (24)	15M @ 600 (24)	15M @ 600 (24)	15M @ 600 (24)	10M @ 457 (18")
	1.83 (6.0)	10M @ 400 (16)	15M @ 600 (24) <sup>2</sup>	10M @ 400 (16) <sup>2</sup>	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24)	10M @ 457 (18")
	2.13 (7.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24) <sup>2</sup>	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 457 (18")
	2.44 (8.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24) <sup>2</sup>	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 457 (18")
2.74 (9.0)	1.22 (4.0)	10M @ 400 (16) <sup>2</sup>	10M @ 600 (24) <sup>2</sup>	10M @ 800 (32) <sup>2</sup>	10M @ 400 (16)	10M @ 400 (16)	10M @ 400 (16)	10M @ 400 (16)	10M @ 400 (16)	10M @ 400 (16)	10M @ 600 (24)	10M @ 457 (18")
	1.53 (5.0)	10M @ 400 (16) <sup>2</sup>	10M @ 400 (16) <sup>2</sup>	10M @ 600 (24) <sup>2</sup>	15M @ 400 (16)	15M @ 600 (24)	15M @ 600 (24)	15M @ 600 (24)	15M @ 600 (24)	15M @ 600 (24)	15M @ 600 (24)	10M @ 457 (18")
	1.83 (6.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24) <sup>2</sup>	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 457 (18")
	2.13 (7.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24) <sup>2</sup>	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 457 (18")
	2.44 (8.0)	15M @ 200 (8)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 457 (18")
3.05 (10.0)	1.22 (4.0)	10M @ 400 (16) <sup>2</sup>	10M @ 400 (16) <sup>2</sup>	10M @ 800 (32) <sup>2</sup>	10M @ 400 (16)	10M @ 400 (16)	10M @ 400 (16)	10M @ 400 (16)	10M @ 400 (16)	10M @ 400 (16)	10M @ 600 (24)	10M @ 457 (18")
	1.53 (5.0)	10M @ 400 (16) <sup>2</sup>	10M @ 400 (16) <sup>2</sup>	10M @ 600 (24) <sup>2</sup>	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 457 (18")
	1.83 (6.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24) <sup>2</sup>	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 457 (18")
	2.13 (7.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24) <sup>2</sup>	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 457 (18")
	2.44 (8.0)	15M @ 200 (8)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 457 (18")
3.35 (11.0)	1.22 (4.0)	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	10M @ 400 (16)	10M @ 400 (16)	10M @ 400 (16)	10M @ 400 (16)	10M @ 400 (16)	10M @ 400 (16)	10M @ 600 (24)	10M @ 457 (18")
	1.53 (5.0)	10M @ 400 (16)	10M @ 400 (16)	10M @ 600 (24)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 457 (18")
	1.83 (6.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24) <sup>2</sup>	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 457 (18")
	2.13 (7.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24) <sup>2</sup>	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 457 (18")
	2.44 (8.0)	15M @ 200 (8)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 457 (18")
3.66 (12.0)	1.22 (4.0)	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	10M @ 400 (16)	10M @ 400 (16)	10M @ 400 (16)	10M @ 400 (16)	10M @ 400 (16)	10M @ 400 (16)	10M @ 600 (24)	10M @ 457 (18")
	1.53 (5.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24) <sup>2</sup>	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 457 (18")
	1.83 (6.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24) <sup>2</sup>	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 457 (18")
	2.13 (7.0)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24) <sup>2</sup>	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 457 (18")
	2.44 (8.0)	15M @ 200 (8)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 457 (18")

Note:  
 1. This table is to be used in conjunction with "Design Limitations" prepared by Tacoma Engineers Inc.  
 2. As per Table 6.15.4.2.A of the National Building Code, for the wall and backfill height noted, an unreinforced wall with  $f_c = 20$  MPa is adequate when supporting wood framing above.  
 3. Refer to Design Limitations for info on construction methods, material specifications, design loads, additional wall reinforcing around openings, min. wall length, etc.  
 4. 2-10M bars are permitted to replace each 15M bar at the specified spacing indicated above.



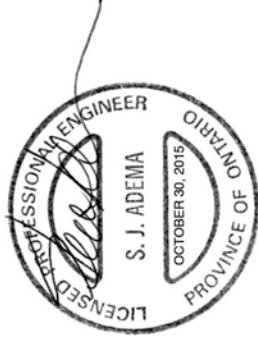


Below-Grade Walls Built with NUDURA Insulated Forms  
Vertical and Horizontal Steel Reinforcement for Seismic Zone Classification:  $S_e(0.2) > 0.25$

Wall Height m (ft)	Backfill Height m (ft)	Vertical Reinforcement		Horizontal Steel Reinforcement
		Free Draining Backfill Soil Type (Maximum Equivalent Fluid Density)		
		Inorganic Silt or Clay	All Soils	
		150 mm (6") Wall	200 mm (8") Wall	250 mm (10") Wall
2.44 (8.0)	1.22 (4.0)	10M @ 400 (16)	10M @ 400 (16)	10M @ 600 (24)
	1.53 (5.0)	15M @ 400 (16)	15M @ 400 (16)	10M @ 200 (8)
	1.83 (6.0)	15M @ 400 (16)	15M @ 400 (16)	10M @ 457 (18")
	2.13 (7.0)	15M @ 200 (8)	15M @ 400 (16)	10M @ 457 (18")
2.74 (9.0)	1.22 (4.0)	10M @ 400 (16)	10M @ 400 (16)	10M @ 457 (18")
	1.53 (5.0)	15M @ 400 (16)	15M @ 400 (16)	10M @ 457 (18")
	1.83 (6.0)	15M @ 200 (8)	15M @ 400 (16)	10M @ 457 (18")
	2.13 (7.0)	15M @ 200 (8)	15M @ 400 (16)	10M @ 457 (18")
3.05 (10.0)	1.22 (4.0)	10M @ 400 (16)	15M @ 200 (8)	10M @ 457 (18")
	1.53 (5.0)	15M @ 400 (16)	15M @ 200 (8)	10M @ 457 (18")
	1.83 (6.0)	15M @ 200 (8)	15M @ 400 (16)	10M @ 457 (18")
	2.13 (7.0)	15M @ 200 (8)	15M @ 400 (16)	10M @ 457 (18")
3.35 (11.0)	1.22 (4.0)	10M @ 400 (16)	15M @ 200 (8)	10M @ 457 (18")
	1.53 (5.0)	15M @ 400 (16)	15M @ 200 (8)	10M @ 457 (18")
	1.83 (6.0)	15M @ 200 (8)	15M @ 400 (16)	10M @ 457 (18")
	2.13 (7.0)	15M @ 200 (8)	15M @ 400 (16)	10M @ 457 (18")
3.66 (12.0)	1.22 (4.0)	10M @ 400 (16)	15M @ 200 (8)	10M @ 457 (18")
	1.53 (5.0)	15M @ 400 (16)	15M @ 200 (8)	10M @ 457 (18")
	1.83 (6.0)	15M @ 200 (8)	15M @ 400 (16)	10M @ 457 (18")
	2.13 (7.0)	15M @ 200 (8)	15M @ 400 (16)	10M @ 457 (18")

Note:

- This table is to be used in conjunction with "Design Limitations" prepared by Tacoma Engineers Inc.
- As per Table 9.15.4.2.A of the National Building Code, for the wall and backfill height noted, an unreinforced wall with  $f_c = 20$  MPa is adequate when supporting wood framing above.
- Refer to Design Limitations for info on construction methods, material specifications, design loads, additional wall reinforcing around openings, min. wall length, etc.
- 2-10M bars are permitted to replace each 15M bar at the specified spacing indicated above.



**Above-Grade Walls: Vertical and Horizontal Steel Reinforcement for Walls Built with NUDURA Insulated Concrete Forms**

Wall Height	Vertical Steel										Horizontal Steel
	Hourly Wind Pressure, $q/50 \leq 0.75$ kPa (15.7 psf)										All Scenarios
Seismic Zone Classification											
$S_a(0.2) \leq 0.32$											
$S_a(0.2) > 0.32$ & $\leq 0.67$											
<b>One Storey Concrete Structure or Top Floor of 2 Storey Concrete Structure Supporting Wood Frame Roof</b>											
m (ft)	100 mm (4") Wall	150 mm (6") Wall	200 mm (8") Wall	250 mm (10") Wall	100 mm (4") Wall	150 mm (6") Wall	200 mm (8") Wall	250 mm (10") Wall	250 mm (10") Wall		
2.44 (8)	10M @ 600 (24)	10M @ 800 (32)	10M @ 800 (32)	10M @ 800 (32)	10M @ 600 (24)	10M @ 800 (32)	10M @ 800 (32)	10M @ 800 (32)	10M @ 800 (32)	10M @ 800 (32)	10M @ 914 (36")
2.75 (9)	10M @ 400 (16)	10M @ 800 (32)	10M @ 800 (32)	10M @ 800 (32)	10M @ 400 (16)	10M @ 800 (32)	10M @ 800 (32)	10M @ 800 (32)	10M @ 800 (32)	10M @ 800 (32)	10M @ 914 (36")
3.05 (10)	10M @ 400 (16)	10M @ 600 (24)	10M @ 600 (24)	10M @ 600 (24)	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	10M @ 800 (32)	10M @ 800 (32)	10M @ 800 (32)	10M @ 914 (36")
3.66 (12)	-	10M @ 400 (16)	10M @ 400 (16)	10M @ 600 (24)	-	10M @ 400 (16)	10M @ 400 (16)	10M @ 400 (16)	10M @ 600 (24)	10M @ 600 (24)	10M @ 914 (36")
4.27 (14)	-	15M @ 400 (16)	15M @ 600 (24)	15M @ 600 (24)	-	10M @ 400 (16)	15M @ 600 (24)	15M @ 600 (24)	15M @ 600 (24)	15M @ 600 (24)	10M @ 914 (36")
4.88 (16)	-	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	-	-	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 914 (36")
<b>Lower Floor of 2 Storey Structure Supporting 2<sup>nd</sup> Storey Wood Frame Walls, Floor and Roof</b>											
2.44 (8)	10M @ 600 (24)	10M @ 800 (32)	10M @ 800 (32)	10M @ 800 (32)	10M @ 600 (24)	10M @ 800 (32)	10M @ 800 (32)	10M @ 800 (32)	10M @ 800 (32)	10M @ 800 (32)	10M @ 914 (36")
2.75 (9)	10M @ 400 (16)	10M @ 800 (32)	10M @ 800 (32)	10M @ 800 (32)	10M @ 400 (16)	10M @ 800 (32)	10M @ 800 (32)	10M @ 800 (32)	10M @ 800 (32)	10M @ 800 (32)	10M @ 914 (36")
3.05 (10)	-	10M @ 600 (24)	10M @ 600 (24)	10M @ 600 (24)	-	10M @ 600 (24)	10M @ 800 (32)	10M @ 800 (32)	10M @ 800 (32)	10M @ 800 (32)	10M @ 914 (36")
3.66 (12)	-	10M @ 400 (16)	10M @ 600 (24)	10M @ 600 (24)	-	10M @ 400 (16)	10M @ 400 (16)	10M @ 400 (16)	10M @ 600 (24)	10M @ 600 (24)	10M @ 914 (36")
4.27 (14)	-	-	15M @ 600 (24)	15M @ 600 (24)	-	-	15M @ 600 (24)	15M @ 600 (24)	15M @ 600 (24)	15M @ 600 (24)	10M @ 914 (36")
4.88 (16)	-	-	15M @ 400 (16)	15M @ 400 (16)	-	-	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 914 (36")
<b>Lower Floor of 2 Storey Concrete Structure Supporting 2<sup>nd</sup> Storey Concrete Walls and Wood Frame Floor &amp; Roof</b>											
2.44 (8)	10M @ 400 (16)	10M @ 800 (32)	10M @ 800 (32)	10M @ 800 (32)	10M @ 400 (16)	10M @ 800 (32)	10M @ 800 (32)	10M @ 800 (32)	10M @ 800 (32)	10M @ 800 (32)	10M @ 914 (36")
2.75 (9)	-	10M @ 600 (24)	10M @ 800 (32)	10M @ 800 (32)	-	10M @ 600 (24)	10M @ 600 (24)	10M @ 600 (24)	10M @ 800 (32)	10M @ 800 (32)	10M @ 914 (36")
3.05 (10)	-	10M @ 400 (16)	10M @ 600 (24)	10M @ 600 (24)	-	10M @ 400 (16)	10M @ 600 (24)	10M @ 600 (24)	10M @ 600 (24)	10M @ 600 (24)	10M @ 914 (36")
3.66 (12)	-	15M @ 600 (24)	15M @ 600 (24)	15M @ 600 (24)	-	10M @ 200 (8)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 914 (36")
4.27 (14)	-	-	15M @ 400 (16)	15M @ 400 (16)	-	-	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 914 (36")
4.88 (16)	-	-	15M @ 200 (8)	15M @ 200 (8)	-	-	15M @ 200 (8)	15M @ 200 (8)	15M @ 200 (8)	15M @ 200 (8)	10M @ 914 (36")

**Note:**

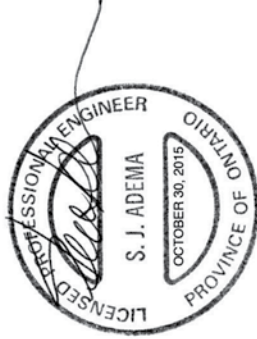
1. Bolded data indicates reinforcing for ground floor concrete walls only. Second floor concrete walls to be limited to height of 3.05m (10'-0").
2. This table is to be used in conjunction with the "Design Limitations" prepared by Tacoma Engineers Inc.
3. Vertical wall steel spacing indicated in mm (in).
4. Refer to Design Limitations for information on construction methods, material specifications, design loads, additional wall reinforcing requirements around openings, minimum wall length, etc.
5. 2-10M bars are permitted to replace each 15M bar at the specified spacing indicated above.

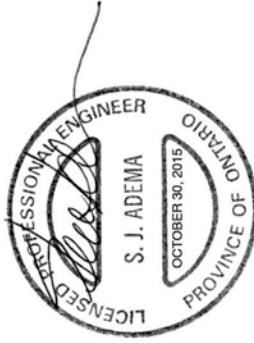
**Above-Grade Walls: Vertical and Horizontal Steel Reinforcement for Walls Built with NUDURA Insulated Concrete Forms**

Wall Height	Vertical Steel				Horizontal Steel
	Hourly Wind Pressure, $q/150 \leq 0.75$ kPa (15.7 psf)				All Scenarios
	Seismic Zone Classification				
$S_a(0.2) > 0.67$ & $\leq 2.3$					
<b>One Storey Concrete Structure or Top Floor of 2 Storey Concrete Structure Supporting Wood Frame Roof</b>					
m (ft)	100 mm (4") Wall	150 mm (6") Wall	200 mm (8") Wall	250 mm (10") Wall	
2.44 (8)	10M @ 600 (24)	10M @ 800 (32)	10M @ 800 (32)	10M @ 800 (32)	10M @ 457 (18")
2.75 (9)	10M @ 400 (16)	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	10M @ 457 (18")
3.05 (10)	10M @ 400 (16)	10M @ 400 (16)	15M @ 600 (24)	10M @ 600 (24)	10M @ 457 (18")
3.66 (12)	-	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 457 (18")
4.27 (14)	-	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 457 (18")
4.88 (16)	-	15M @ 200 (8)	15M @ 200 (8)	15M @ 200 (8)	10M @ 457 (18")
<b>Lower Floor of 2 Storey Structure Supporting 2<sup>nd</sup> Storey Wood Frame Walls, Floor and Roof</b>					
2.44 (8)	10M @ 600 (24)	10M @ 600 (24)	10M @ 800 (32)	10M @ 800 (32)	10M @ 457 (18")
2.75 (9)	10M @ 400 (16)	10M @ 400 (16)	10M @ 800 (32)	10M @ 800 (32)	10M @ 457 (18")
3.05 (10)	-	10M @ 400 (16)	10M @ 600 (24)	10M @ 600 (24)	10M @ 457 (18")
3.66 (12)	-	10M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 457 (18")
4.27 (14)	-	-	15M @ 400 (16)	15M @ 400 (16)	10M @ 457 (18")
4.88 (16)	-	-	15M @ 200 (8)	15M @ 200 (8)	10M @ 457 (18")
<b>Lower Floor of 2 Storey Concrete Structure Supporting 2<sup>nd</sup> Storey Concrete Walls and Wood Frame Floor &amp; Roof</b>					
2.44 (8)	15M @ 600 (24)	15M @ 600 (24)	15M @ 600 (24)	15M @ 600 (24)	10M @ 457 (18")
2.75 (9)	-	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 457 (18")
3.05 (10)	-	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 457 (18")
3.66 (12)	-	-	15M @ 200 (8)	15M @ 200 (8)	10M @ 457 (18")
4.27 (14)	-	-	-	-	10M @ 457 (18")
4.88 (16)	-	-	-	-	10M @ 457 (18")

**Note:**

1. Bolded data indicates reinforcing for ground floor concrete walls only. Second floor concrete walls to be limited to height of 3.05m (10'-0").
2. This table is to be used in conjunction with the "Design Limitations" prepared by Tacoma Engineers Inc.
3. Vertical wall steel spacing indicated in mm (in).
4. Refer to Design Limitations for information on construction methods, material specifications, design loads, additional wall reinforcing requirements around openings, minimum wall length, etc.
5. 2-10M bars are permitted to replace each 15M bar at the specified spacing indicated above.



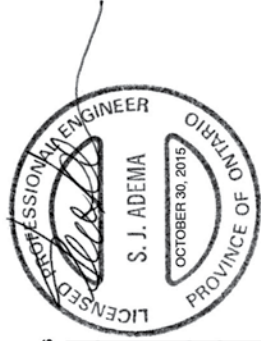


# REINFORCING TABLES D-7

**Above-Grade Walls: Vertical and Horizontal Steel Reinforcement for Walls Built with NUDURA Insulated Concrete Forms**

Wall Height	Vertical Steel										Horizontal Steel	
	Hourly Wind Pressure, $q/150 > 0.75 \text{ kPa (15.7psf)}$ & $\leq 1.23 \text{ kPa (25.7 psf)}$											All Scenarios
	Seismic Zone Classification											
	$S_a(0.2) \leq 0.32$											
	$S_a(0.2) > 0.32 \text{ \& \le 0.67}$											
	<b>One Storey Concrete Structure or Top Floor of 2 Storey Concrete Structure Supporting Wood Frame Roof</b>											
m (ft)	100 mm (4") Wall	150 mm (6") Wall	200 mm (8") Wall	250 mm (10") Wall	100 mm (4") Wall	150 mm (6") Wall	200 mm (8") Wall	250 mm (10") Wall	100 mm (4") Wall	150 mm (6") Wall	200 mm (8") Wall	250 mm (10") Wall
2.44 (8)	15M @ 600 (24)	10M @ 800 (32)	10M @ 800 (32)	10M @ 800 (32)	15M @ 600 (24)	10M @ 800 (32)	10M @ 800 (32)	10M @ 800 (32)	15M @ 600 (24)	10M @ 800 (32)	10M @ 800 (32)	10M @ 914 (36")
2.75 (9)	15M @ 400 (16)	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	15M @ 400 (16)	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	15M @ 400 (16)	10M @ 400 (16)	10M @ 600 (24)	10M @ 914 (36")
3.05 (10)	15M @ 400 (16)	10M @ 400 (16)	10M @ 400 (16)	10M @ 600 (24)	15M @ 400 (16)	10M @ 400 (16)	10M @ 400 (16)	10M @ 600 (24)	15M @ 400 (16)	10M @ 400 (16)	10M @ 600 (24)	10M @ 914 (36")
3.66 (12)	-	15M @ 400 (16)	15M @ 600 (24)	15M @ 600 (24)	-	-	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	15M @ 600 (24)	15M @ 600 (24)	10M @ 914 (36")
4.27 (14)	-	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	-	-	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 600 (24)	10M @ 914 (36")
4.88 (16)	-	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	-	-	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 914 (36")
	<b>Lower Floor of 2 Storey Concrete Structure Supporting 2<sup>nd</sup> Storey Wood Frame Walls, Floor and Roof</b>											
2.44 (8)	15M @ 600 (24)	10M @ 600 (24)	10M @ 800 (32)	10M @ 800 (32)	15M @ 600 (24)	10M @ 600 (24)	10M @ 800 (32)	10M @ 800 (32)	15M @ 600 (24)	10M @ 600 (24)	10M @ 800 (32)	10M @ 914 (36")
2.75 (9)	15M @ 600 (24)	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	15M @ 600 (24)	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	15M @ 600 (24)	10M @ 400 (16)	10M @ 600 (24)	10M @ 914 (36")
3.05 (10)	-	10M @ 400 (16)	10M @ 400 (16)	10M @ 600 (24)	-	-	10M @ 400 (16)	10M @ 600 (24)	10M @ 400 (16)	10M @ 600 (24)	10M @ 600 (24)	10M @ 914 (36")
3.66 (12)	-	15M @ 400 (16)	15M @ 600 (24)	10M @ 400 (16)	-	-	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	15M @ 600 (24)	15M @ 600 (24)	10M @ 914 (36")
4.27 (14)	-	-	15M @ 400 (16)	15M @ 600 (24)	-	-	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	15M @ 600 (24)	15M @ 600 (24)	10M @ 914 (36")
4.88 (16)	-	-	15M @ 400 (16)	15M @ 600 (24)	-	-	15M @ 400 (16)	15M @ 600 (24)	15M @ 400 (16)	15M @ 600 (24)	15M @ 600 (24)	10M @ 914 (36")
	<b>Lower Floor of 2 Storey Concrete Structure Supporting 2<sup>nd</sup> Storey Concrete Walls and Wood Frame Floor &amp; Roof</b>											
2.44 (8)	15M @ 600 (24)	10M @ 600 (24)	10M @ 800 (32)	10M @ 800 (32)	15M @ 600 (24)	10M @ 600 (24)	10M @ 800 (32)	10M @ 800 (32)	15M @ 600 (24)	10M @ 600 (24)	10M @ 800 (32)	10M @ 914 (36")
2.75 (9)	-	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	-	-	10M @ 400 (16)	10M @ 600 (24)	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)	10M @ 914 (36")
3.05 (10)	-	10M @ 400 (16)	10M @ 400 (16)	10M @ 600 (24)	-	-	10M @ 400 (16)	10M @ 600 (24)	10M @ 400 (16)	10M @ 600 (24)	10M @ 600 (24)	10M @ 914 (36")
3.66 (12)	-	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	-	-	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 914 (36")
4.27 (14)	-	-	15M @ 400 (16)	15M @ 400 (16)	-	-	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)	10M @ 914 (36")
4.88 (16)	-	-	15M @ 200 (8)	15M @ 200 (8)	-	-	15M @ 200 (8)	15M @ 200 (8)	15M @ 200 (8)	15M @ 200 (8)	15M @ 200 (8)	10M @ 914 (36")

- Note:**
1. **Bolded data** indicates reinforcing for ground floor concrete walls only. Second floor concrete walls to be limited to height of 3.05m (10'-0").
  2. **This table is to be used in conjunction with the "Design Limitations"** prepared by Tacoma Engineers Inc.
  3. Vertical wall steel spacing indicated in mm (in).
  4. Refer to Design Limitations for information on construction methods, material specifications, design loads, additional wall reinforcing requirements around openings, minimum wall length, etc.
  5. 2-10M bars are permitted to replace each 15M bar at the specified spacing indicated above.



**Above-Grade Walls: Vertical and Horizontal Steel Reinforcement for Walls Built with NUDURA Insulated Concrete Forms**

Wall Height	Vertical Steel					Horizontal Steel All Scenarios
	Hourly Wind Pressure, $q/150 > 0.75 \text{ kPa}$ (15.7psf) & $\leq 1.23 \text{ kPa}$ (25.7 psf)					
	Seismic Zone Classification $S_a(0.2) > 0.67$ & $\leq 2.3$					
<b>One Storey Concrete Structure or Top Floor of 2 Storey Concrete Structure Supporting Wood Frame Roof</b>						
<b>m (ft)</b>	<b>100 mm (4") Wall</b>	<b>150 mm (6") Wall</b>	<b>200 mm (8") Wall</b>	<b>250 mm (10") Wall</b>		
2.44 (8)	15M @ 600 (24)	10M @ 600 (24)	10M @ 800 (32)	10M @ 800 (32)		10M @ 457 (18")
2.75 (9)	15M @ 600 (24)	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)		10M @ 457 (18")
3.05 (10)	15M @ 400 (16)	15M @ 600 (24)	15M @ 600 (24)	10M @ 600 (24)		10M @ 457 (18")
3.66 (12)	-	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)		10M @ 457 (18")
4.27 (14)	-	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)		10M @ 457 (18")
4.88 (16)	-	15M @ 200 (8)	15M @ 200 (8)	15M @ 200 (8)		10M @ 457 (18")
<b>Lower Floor of 2 Storey Concrete Structure Supporting 2<sup>nd</sup> Storey Wood Frame Walls, Floor and Roof</b>						
2.44 (8)	15M @ 600 (24)	10M @ 600 (24)	10M @ 800 (32)	10M @ 800 (32)		10M @ 457 (18")
2.75 (9)	15M @ 600 (24)	10M @ 400 (16)	10M @ 600 (24)	10M @ 800 (32)		10M @ 457 (18")
3.05 (10)	-	15M @ 600 (24)	10M @ 400 (16)	10M @ 600 (24)		10M @ 457 (18")
3.66 (12)	-	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)		10M @ 457 (18")
4.27 (14)	-	-	15M @ 400 (16)	15M @ 400 (16)		10M @ 457 (18")
4.88 (16)	-	-	15M @ 200 (8)	15M @ 200 (8)		10M @ 457 (18")
<b>Lower Floor of 2 Storey Concrete Structure Supporting 2<sup>nd</sup> Storey Concrete Walls and Wood Frame Floor &amp; Roof</b>						
2.44 (8)	15M @ 600 (24)	15M @ 600 (24)	15M @ 600 (24)	15M @ 600 (24)		10M @ 457 (18")
2.75 (9)	-	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)		10M @ 457 (18")
3.05 (10)	-	15M @ 400 (16)	15M @ 400 (16)	15M @ 400 (16)		10M @ 457 (18")
3.66 (12)	-	-	15M @ 200 (8)	15M @ 200 (8)		10M @ 457 (18")
4.27 (14)	-	-	-	-		10M @ 457 (18")
4.88 (16)	-	-	-	-		10M @ 457 (18")

**Note:**

1. **Bolded data** indicates reinforcing for ground floor concrete walls only. Second floor concrete walls to be limited to height of 3.05m (10'-0").
2. This table is to be used in conjunction with the "Design Limitations" prepared by Tacoma Engineers Inc.
3. Vertical wall steel spacing indicated in mm (in).
4. Refer to Design Limitations for information on construction methods, material specifications, design loads, additional wall reinforcing requirements around openings, minimum wall length, etc.
5. 2-10M bars are permitted to replace each 15M bar at the specified spacing indicated above.