

PART 1 GENERAL

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| <u>1.1 SUMMARY</u> | .1 | Section Includes: |
| | .1 | The performance and installation criteria for foundation types for buildings. |
| | .2 | Strip Footings: |
| | .1 | Material: concrete, reinforced. |
| | .3 | Spread Footings: |
| | .1 | Material: concrete, reinforced. |
| | .4 | Foundation Walls: |
| | .1 | Material: cast-in-place concrete. |
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<u>1.2 REFERENCES</u> | .1 | American Concrete Institute (ACI) |
| | .2 | American Society for Testing and Materials (ASTM) |
| | .1 | ASTM A252-98(2002), Specification for Welded and Seamless Steel Pipe Piles. |
| | .3 | CAN/CSA A23.1/A23.2 and CAN/CSA A23.3 concrete construction, testing and design. |
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<u>1.3 DESIGN/PERFORMANCE LOADS</u> | .1 | Seismic Resistance: |
| | .1 | Design seismic resistance and horizontal acceleration of foundation structure to applicable code at the place of the project. |
| | .2 | Design foundation to ensure yielding will occur in the superstructure and not the foundation. |
| | .2 | Foundation Support Loads: |
| | .1 | 200 kPa average, vertical. To be verified by contractor using qualified geotechnical personnel. |
| | .3 | Frost Line: 3.0 m below finish. |
| | .4 | Wind Loads: |
| | .1 | As per NBCC. |
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<u>1.4 SUBMITTALS</u> | .1 | Submittals in accordance with Section 01 33 00 - Submittal Procedures. |

- .2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 10 10 - General Instructions.
- .3 Shop Drawings: required, with seal of Professional Structural Engineer in Province of Newfoundland and Labrador.

1.5 QUALITY ASSURANCE

- .1 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 30 - Health and Safety Requirements.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .2 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
 - .3 Fold up metal and plastic banding, flatten and place in designated area for recycling.

PART 2 PRODUCTS

2.1 CONCRETE WORK

- .1 Concrete Material:
 - .1 Design all concrete work as per CAN/CSA A23.3-04 "Design of Concrete Structures".
 - .2 Construct and test all concrete work as per CAN/CSA A23.1-09 and A23.2-09 "Concrete Materials and Methods of Concrete Construction / Test Methods and Standard Practices for Concrete".

2.2 CONCRETE FOOTINGS

- .1 Reinforcement: deformed steel bars.
- .2 Concrete Materials: 25 MPa 28 day compressive strength using General Use (GC) hydraulic cement.

2.3 FOUNDATION WALLS	.1	Concrete Materials:
	.1	Forms: Plywood.
	.2	Reinforcement: deformed steel bars.
		Concrete: 25 MPa 28 day compressive strength using Type 10 - Normal cement; normal slump mix.

PART 3 EXECUTION

3.1 INSTALLATION - CONCRETE FOOTINGS	.1	Footings to support and resist imposed loads.
	.2	Dimensions:
	.1	Nominal Thickness: 250 mm.
	.2	Nominal Width: 300 mm wider than foundation wall above.
	.3	Form for component configuration and dimensions.
	.4	Place reinforcing steel and concrete.
	.5	Trowel top surface smooth and level.

3.2 INSTALLATION - FOUNDATION WALLS	.1	Foundation wall to support and transfer imposed loads to foundation.
	.2	Concrete:
	.1	Nominal Wall Thickness: 200 mm.
	.2	Form for component configuration and dimensions.
	.3	Place reinforcing steel and concrete.
	.4	Place 'L' shaped anchors with threaded end for anchoring wood plate as required.
	.5	Trowel top surface smooth and level.

3.3 QUALITY CONTROL	.1	Field Tests: required.
	.2	Field Inspection: required.

PART 1 GENERAL

1.1 REFERENCES

.1 ASTM International

- .1 ASTM A48/A48M-03(2008), Standard Specification for Gray Iron Castings.
- .2 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .3 ASTM D1751-04(2008), Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- .4 ASTM E96/E96M-05, Standard Test Methods for Water Vapor Transmission of Materials.

.2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-19.24-M90, Multicomponent, Chemical-Curing Sealing Compound.
- .2 CGSB 51-GP-51M-81, Polyethylene Sheet for Use in Building Construction.
- .3 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.

.3 CSA International

- .1 CAN/CSA A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
- .2 CAN/CSA A23.3-04, Design of Concrete Structures.
- .3 CSA A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .4 CAN/CSA-G30.18-M92(R2007), Billet-Steel Bars for Concrete Reinforcement.
- .5 CSA G40.20/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .6 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .7 CAN/CSA O86.1-01Consolidation (R2007), Engineering Design in Wood (Limit States Design).
- .8 CAN/CSA O86S1-05, Supplement #1 to CSA

		O86-01, Engineering Design in Wood.
	.9	CSA 0121-08, Douglas Fir Plywood.
	.10	CSA W59-03(R2008), Welded Steel Construction (Metal Arc Welding).
	.4	Reinforcing Steel Institute of Ontario (RSIO)
	.1	Manual of Standard Practice 2004.
1.2 ADMINISTRATIVE REQUIREMENTS	.1	Conduct pre-installation meeting 1 week prior to start of installation with general contractor, manufacturer and installer to:
	.1	Examine sub-surface investigation report and recommendations.
	.2	Discuss known underground utility lines and buried objects to be reviewed.
	.3	Ensure building substrate will be firm, straight, dry, free of snow, ice or frost and clean of dust and debris. Submit report to Departmental Representative confirming granular fill beneath concrete slabs is compacted before casting concrete on it.
	.4	Ensure graded base conforms with required drainage pattern before placing bedding material.
	.5	Concrete slab finish.
1.3 ACTION AND INFORMATIONAL SUBMITTALS	.1	Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
	.2	Product Data:
	.1	Provide manufacturer's printed product literature and data sheets, and include product characteristics, performance criteria, physical size, finish and limitations.
	.3	Shop Drawings:
	.1	Submit drawings stamped and signed by professional engineer registered or licensed in Province of Newfoundland and Labrador Canada.
	.2	Submit shop drawing to indicate size, shape, location and necessary details of reinforcing in accordance with RSIO Manual of Standard Practice.
	.3	Drawings submitted showing formwork and

falsework design in accordance with
CAN/CSA A23.1.

.4 Samples:

- .1 Submit insulation.
- .2 Weeping tile complete with cloth filter fabric sock.

.5 Certificates:

- .1 Submit signed certificates verifying that concrete supplier is member of Ready-Mixed Concrete Association of Ontario and has been issued with quality concrete seal attesting that coefficient of variation is less than 12%.
 - .1 Submit in writing times from charging mixer to final deposit.

.6 Test Reports:

- .1 Submit report determining granular fill beneath concrete slabs is compacted. Independent testing laboratory must indicate compliance with specifications and physical properties.
- .2 Affidavit: maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken. Indicate curing compounds compatible with applied concrete finish.
- .3 Cylinders: carry out testing of concrete and concrete materials using independent testing laboratory in accordance to CAN/CSA A23.1.
- .4 Provide documentation verifying compatibility of ingredients in concrete mixture.

.7 Pre-installation Meeting Report: submit report to Departmental Representative Consultant confirming granular fill beneath concrete slabs is compacted before casting concrete on it.

1.4 QUALITY ASSURANCE

.1 Licensed Professionals:

- .1 Submit in accordance with Section 01 45 00 - Testing and Quality Control.
 - .1 Ensure sealed: formwork, falsework, bracing, underpinning, dewatering systems required to complete work bears stamp and

signature of professional engineer
licensed in Province of
Newfoundland and Labrador.

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| 1.5 DELIVERY,
STORAGE AND
HANDLING | .1 | Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions. |
| | .2 | Delivery and Acceptance Requirements: |
| | .1 | Deliver materials to site in original factory packaging, labelled with manufacturer's name, address. |
| | .3 | Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal. |

PART 2 PRODUCTS

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| 2.1 PERFORMANCE
REQUIREMENTS | .1 | Slabs on Grade: |
| | .1 | Design Slabs on Grade to: |
| | .1 | CAN/CSA A23.3. |
| | .2 | Soil, environmental and climatic conditions. |
| | .3 | Varied building uses and occupancies. |
| | .4 | Interior future relocation of non load-bearing masonry partitions. |
| | .1 | Use uniform slab thickness instead of thickening slab under partitions. |
| | .5 | Provide slab depressions and slopes to drains. |
| | .6 | Floor grates and weigh stations. |
| | .7 | Provide housekeeping pads for mechanical and electrical equipment. |
| | .2 | Criteria: |
| | .1 | Live load not less than 12.0 kPa. |
| | .2 | Minimum concentrated live load: 54 kN acting over an area of 250 x 600 mm. |

- .3 Heavy usage, exposure to de-icing agents and freeze-thaw conditions at exterior door locations.
 - .4 Surface tolerances: to CAN/CSA A23.1. Clause 22, straight edge method: conventional flatness.
 - .3 Control Joint:
 - .1 Provide control joint to eliminate uncontrolled shrinkage cracking.
 - .2 Saw cut control joints. Maximum spacing 5.0 m.
 - .3 Fill with joint sealer/filler.
 - .4 Expansion Joint:
 - .1 Install premoulded joint filler in expansion and isolation joints to full depth of slab and flush with finished surface.
 - .2 Dampproof Membrane:
 - .1 Install dampproof membrane under concrete slab-on-grade inside building.
 - .2 Lap dampproof membrane 150 mm minimum at joints and seal.
 - .3 Seal punctures in dampproof membrane before placing concrete. Use patching material 150 mm minimum larger than puncture.
- 2.2 SYSTEM PERFORMANCE
- .1 As required to achieve specified performance criteria; functionally compatible with adjacent materials and components, and at minimum meet requirements and relevant standards listed under REFERENCE STANDARDS.
 - .2 Performance will provide appropriately finished slabs-on-grade for spaces required by program that are appropriate for anticipated usage and traffic in each area per following criteria.
- 2.3 MATERIALS
- .1 Standard Slabs-on-Grade Subgrade: type 1 granular compacted to 98% standard modified proctor density.
 - .1 Finished Grade: type 1 granular, compacted to 95% standard modified protector density. Tolerances: plus or minus 12 mm in 3000 mm.
 - .2 Moisture Barrier: sheet polypropylene, 0.25 mm thick to NBC.

- .3 Concrete: cast-in-place, normal type, 30MPa.
- .4 Reinforcing: deformed steel billet bars, to Grade 400 MPa.
- .2 Other:
 - .1 Joint filler: bituminous impregnated fibre board to ASTM D1751.
 - .2 Polyethylene film: to CGSB 51-GP-51M. Minimum 0.25 mm 6 mils. Maximum practical width.
 - .3 Cement: to CSA A3001, type GU.
 - .1 Supplementary cementing materials: with minimum 20 % Type F CI CH fly ash replacement N GGBFS, by mass of total cementitious materials to CSA A3001.
 - .4 Water: to CAN/CSA A23.1.

2.4 SOURCE QUALITY CONTROL

- .1 Installer/Supplier Qualifications:
 - .1 Submit letter of competence issued by manufacturer indicating minimum 5 years' experience related to installation of product.
 - .2 Submit proof that qualified concrete flooring contractors are members in good standing in the province of Newfoundland and Labrador.
 - .3 Submit proof that concrete is being supplied by member of Ready-Mix Concrete Association of that has been issued seal of special quality concrete.

PART 3 EXECUTION

3.1 APPLICATION .1

Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and data sheets.

3.2 INSTALLATION .1

Install slabs-on-grade, and accessories in accordance with manufacturer's written instructions, product data, references, standard references and authorities having jurisdiction.

3.3 FIELD
QUALITY CONTROL

.1 Manufacturer's Services:

- .1 Ensure manufacturer's representative review work involved in handling, installation/application, protection and cleaning, of products and submit written reports, in acceptable format, to verify compliance of Work with Contract.
- .2 Schedule site visits to review Work, at stages listed:
 - .1 After delivery and storage of products, and when preparatory work, or other work, on which Work of this section depends, is complete but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon total completion of Work, after cleaning is carried out.
- .3 Obtain report, within 3 days of review, and submit, immediately, to Departmental Representative.

.2 Verification:

- .1 Independent Concrete Inspection and Testing Agency Services:
 - .1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by Departmental Representative in accordance with CAN/CSA A23.1 and Section 01 45 00 - Quality Control.
 - .2 Departmental Representative will pay for costs of tests as specified.
 - .3 Departmental Representative will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
 - .4 When concrete is exposed to temperatures below 5 degrees C, during pouring or curing, carry out non-destructive testing to CAN/CSA A23.1/A23.2, Appendix A and related ASTM Standards to determine concrete strength prior to stripping formwork.

- .1 Report results to Departmental Representative.
 - .5 Inspection or testing by Departmental Representative does not augment or replace Contractor quality control nor relieve him of his contractual responsibility.
 - .3 Concrete Tests:
 - .1 Notify testing agency of concreting schedule. Ensure supervisory personnel are on hand when concrete is being cast to observe placing and curing procedures.
 - .2 Use non-destructive methods to CAN/CSA A23.2 for testing concrete.
 - .3 One standard strength is required for each 50 m3 of concrete placed, but not less than one test for each mix design of concrete placed each day.
 - .4 One standard air entrainment test is required for each 20 m3 of air-entrained concrete or portion thereof placed each day.
 - .5 Make slump tests in accordance with CSA standard CAN/CSA A23.2, Test Method CAN/CSA A23.2-5C, with each standard strength test.
 - .4 Reinforcement:
 - .1 Adjust reinforcement immediately before concrete placed to ensure that all bars are secured in their correct positions. Arrange to have a crew of reinforcing setters on hand as concrete is placed.
 - .2 Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.
 - .3 Verify dimensions, tolerances, deflection, expansion and control joints and method of attachment with other work on-site.
 - .4 Finish concrete to manufacturer's instructions.
 - .5 Ensure concrete floors have finish hardness equal or greater than Mohs hardness to CAN/CSA A23.1.

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| 3.4 FINISHING | .1 Use curing compounds compatible with applied |
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finish on concrete surfaces.

.1 Provide written affidavit verifying compounds used are compatible.

.2 Applied Finishes:

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.3 Ramps:

.1 Ramps: grooved joints 13 mm deep x 25 mm wide.

.2 Landings: medium broom texture to CAN/CSA A23.1.

3.5 CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Clean installed products in accordance with manufacturer's recommendation.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.