AMEC Earth &
Environmental Limited
221 - 16th Street S.E.
Calgary, Alberta
Canada, T2E 6J5
Tel: (403) 248-4331
Fax: (403) 569-0737

MOISTURE-DENSITY RELATIONSHIP REPORT

Dillon Consulting Limited

Project No: YX00681
Test Date: February 12, 2003
Client P.O.:
CC:

Attention: Mr. Gary Strong, P.Eng.
Project: Water Treatment Plant, Gjoa Haven, NU

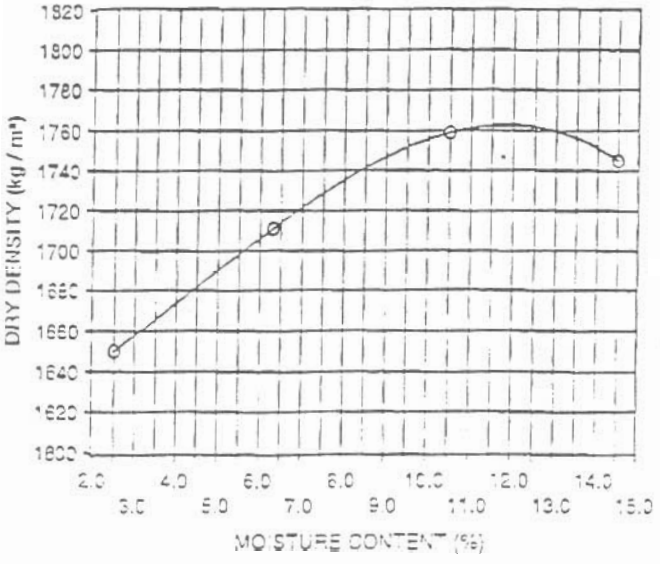
Type Of Construction: Fill Material

Applicable Standard: ASTM D698-91 Method: A

Wet Density (kg / m³):	1691	1819	1944	1998			
Dry Density (kg / m³):	1650	1711	1759	1745			
Moisture Content (%):	2.5	6.3	10.5	14.5			

Maximum Dry Density: 1760 kg / m³
Optimum Moisture: 11.5 %

MOISTURE-DENSITY RELATIONSHIP



Source: Site

Date Sampled:
Sampled By:
Date Received: February 12, 2003
Tested By: AMEC

Proctor No: 1
Rammer Type: Auto
Preparation: Moist

Percent Retained
4.75 mm screen: 0.0 %
9.5 mm screen: 0.0 %
19 mm screen: 0.0 %

Soil Description: Sand

Approved By: Larry Ritco

Reporting of these test results constitutes a testing service only. Engineering interpretation or evaluation of these test results is provided only on written request. The data presented is for the sole use of the client stipulated above. S1 2.22 2002.04/10

Contents

PART 1 GENERAL

1.1 References

.1 Canadian Standards Association (CSA)

- .1 CAN/CSA-A23.1-[94], Concrete Materials and Methods of Concrete Construction.
- .2 CAN/CSA-O86.1-[94], Engineering Design in Wood (Limit States Design).
- .3 CSA O121-[M1978], Douglas Fir Plywood.
- .4 CSA O151-[M1978], Canadian Softwood Plywood.
- .5 CSA O153-[M1980], Poplar Plywood.
- .6 CAN3-O188.0-[M78], Standard Test Methods for Mat-Formed Wood Particleboards and Waferboard.
- .7 CSA O437 Series-[93], Standards for OSB and Waferboard.
- .8 CSA S269.1-[1975], Falsework for Construction Purposes.
- .9 CAN/CSA-S269.3-[M92], Concrete Formwork.

.2 Council of Forest Industries of British Columbia (COFI)

- .1 COFI Exterior Plywood for Concrete Formwork.

1.2 Shop Drawings

.1 Submit shop drawings for formwork and falsework in accordance with Section 01330 - Submittal Procedures.

.2 Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms.

.3 Indicate sequence of erection and removal of formwork/falsework as directed by Engineer.

.4

PART 2 PRODUCTS

2.1 Materials

.1 Formwork materials:

- .1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121
- .2 For concrete with special architectural features, use formwork materials to CAN/CSA-A23.1.

.2 Pan forms: removable steel as indicated.

.3 Form ties:

.1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm dia. in concrete surface.

.2 For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.

.4 Form liner:

.1 Plywood: medium density overlay .

.5 Form release agent: non-toxic, biodegradable

.6 Form stripping agent: colourless mineral oil, non-toxic, biodegradable free of kerosene, with viscosity between [70 and 110s Saybolt Universal, flashpoint minimum 150°C, open cup.

.7 Falsework materials: to CSA-S269.1.

PART 3 EXECUTION

3.1 Fabrication and Erection

.1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.

.2 Obtain Engineer's approval for use of earth forms framing openings not indicated on drawings.

.3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.

.4 Fabricate and erect falsework in accordance with CSA S269.1 and COFI Exterior Plywood for Concrete Formwork.

.5 Refer to architectural drawings for concrete members requiring architectural exposed finishes.

.6 Do not place shores and mud sills on frozen ground.

.7 Provide site drainage to prevent washout of soil supporting mud sills and shores.

.8 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CAN/CSA-A23.1.

.9 Align form joints and make watertight. Keep form joints to minimum.

.10 Locate horizontal form joints for exposed columns 2400 mm above finished floor elevation.

.11 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners , joints, unless specified otherwise.

.12 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

.13 Construct forms for architectural concrete, and place ties as indicated and/or as directed. Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.

.14 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections. Assure that all anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

.15 Clean formwork in accordance with CAN/CSA-A23.1, before placing concrete.

3.2 Removal and Reshoring

.1 Remove formwork when concrete has reached 70 % of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.

.2 Provide all necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.

.3 Re-use formwork and falsework subject to requirements of CAN/CSA-A23.1.

END OF SECTION

PART 1 GENERAL

1.1 References

.1 Canadian Standards Association (CSA)

.1 CAN/CSA-A3000, Cementitious Materials Compendium.

.2 CAN/CSA-G30.18-M92 (R1998), Billet Steel Bars for Concrete Reinforcement.

.3 CAN/CSA-A23.1-00 Concrete Materials and Methods of Concrete Construction.

1.2 Standard

.1 Concrete materials and methods of construction: to CAN/CSA-A23.1- 94 unless otherwise specified.

1.3 Shop Drawings

.1 Submit placing drawings prepared in accordance with plans to clearly show size, shape, location and all necessary details of reinforcing.

.2 Shop drawings are to be submitted a minimum of 7 days prior to placement of reinforcing.

1.4 Quality Assurance

.1 Minimum 4 weeks prior to starting concrete work, submit proposed quality control procedures for Engineer's approval for following items:

.1 Falsework erection.

.2 Cold weather concrete.

.3 Curing.

.4 Finishes.

.5 Formwork removal.

.6 Joints.

PART 2 PRODUCTS

2.1 Materials

.1 Portland cement: to CAN/CSA-A3000, Type 10 .

.2 Reinforcing bars: to CAN/CSA-G30.18-M92 (R1998), Grade 400.

.3 Premoulded joint filler: bituminous impregnated fibreboard to ASTM D 1751-[83(1991).

.4 Joint sealer/filler: grey, to CAN/CGSB-19.24- M90 . Type1, ClassB

.5 Floor hardener: non-metallic, pre-mixed.

.6 Sealer: proprietary poly-siloxane resin blend .

.7 All other concrete materials: to CAN/CSA-A23.1-00.

2.2 Mix Proportions

.1 Cement type: as specified under 2.1.

.2 Minimum 28 day compressive strengths and exposure classifications:

.1 All concrete: 30 MPa; F - 1.

.3 Nominal size of coarse aggregate: 20mm.

.4 Slump: 80 mm +/- 20 mm

.5 Water Cement ratio 0.45

.6 Air content: 5% to 8%.

PART 3 EXECUTION

3.1 Finishes

3.2 Finishes

.1 Formed surfaces exposed to view: sack rubbed finish in accordance with CAN/CSA-A23.1-94 .

.2 Interior floor slabs to receive epoxy covering requiring a smooth surface: initial finishing operations followed by final finishing comprising mechanical floating and steel trowelling as specified in CAN/CSA-A23.1-94 to produce hard, smooth, dense trowelled surface free from blemishes; finishing tolerance classification: Conventional.

.3 Hardened floor finish: as specified in 3.2.2 immediately above in conjunction with application of hardener applied 2.44 kg/m 2 .

.4 Equipment pads: smooth trowelled surface; finishing tolerance classification: Moderately Flat.

3.3 Control Joints

.1 Form control joints in slabs on grade at locations indicated, in accordance with CAN/CSA-A23.1-94. Fill with specified joint sealer/filler.

3.4 Expansion and Isolation Joints

.1 Install premoulded joint filler in expansion and isolation joints full depth of slab flush with finished surface.

3.5 Curing

.1 Cure and protect concrete in accordance with CAN/CSA-A23.1-[94], except that curing compounds shall not be used where bond is required by subsequent topping or coating.

3.6 Grout

.1 Grout voids under baseplates.

.2 Grout into place, bolts and other items of concrete hardware, that are not placed prior to pouring concrete.

.3 Mix and place grout.

3.7 Sealing

.1 Apply poly-siloxane resin blend sealer at 4 m 2/L

3.8 Field Quality Control

.1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory in accordance with CAN/CSA-A23.1 and Section 01450 - Quality Control. Two sets of cylinders will be made for each pour day. QA testing for air and slump will be made once per hour during a pour.

.2 Contractor will pay for costs of tests.

.3 Engineer will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.

.4 Non-destructive Methods for Testing Concrete shall be in accordance with CAN/CSA-A23.2.

.5 Inspection or testing by Consultant will not augment or replace Contractor quality control nor relieve him of his contractual responsibility.

END OF SECTION

Contents

PART 1 GENERAL

1.1 References

.1 Canadian Standards Association (CSA)

- .1 CSA B111-1974 (R1998), Wire Nails, Spikes and Staples.
- .2 CSA O151-M1978 (R1998), Canadian Softwood Plywood.
- .3 CAN/CSA-O325.0-92 (R1998), Construction Sheathing.
- .4 CAN/CSA-O141-91 (R1991), Softwood Lumber.
- .5 CAN/CSA-O437.0-93 (R2001), OSB and Waferboard.

.2 National Lumber Grades Authority (NLGA)

- .1 Standard Grading Rules for Canadian Lumber 1991.

.3 National Research Council

- .1 National Building Code of Canada 1995.

1.2 Quality Assurance

.1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

.2 Plywood identification: by grade mark in accordance with applicable CSA standards.

.3 Plywood, OSB and wood based composite panel construction sheathing identification: by grademark in accordance with applicable CSA standards.

PART 2 PRODUCTS

2.1 Lumber Material

.1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% or less in accordance with following standards:

- .1 CAN/CSA-O141-91(R1999), Softwood Lumber.
- .2 NLGA Standard Grading Rules for Canadian Lumber.
- .3 Dimensional lumber studs to be No.1/No.2 SPF.
- .4 Floor joist to be No.1/No.2 SPF.

.2 Furring, blocking, nailing strips, grounds, rough bucks, curbs, fascia backing and sleepers:

- .1 Dimension sizes: "Standard" light framing or better grade.
- .2 Post and timbers sizes: "Standard" or better grade.

2.2 Panel Materials

.1 Canadian softwood plywood (CSP): to CSA O151-M1978 (R1998), standard construction.

.2 OSB and wood based composite panels: to CAN/CSA-O437.0-93 (R2001).

2.3 Engineered Studs

.1 Exterior studs to be Trusjoist Timberstrand studs.

2.4 Accessories

.1 Nails, spikes and staples: to CSA B111-1974 (R1998).

.2 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.

.3 Connectors for Trusjoist products as per manufacturers specifications.

PART 3 EXECUTION

3.1 Installation

.1 Comply with requirements of National Building Code of Canada 1995.

3.2 Erection

.1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.

.2 Countersink bolts where necessary to provide clearance for other work.

.3 Install Trusjoist products as per manufacturers specifications.

END OF SECTION

PART 1 GENERAL

1.1 References

.1 CAN/CSA-O86.1-M89, Engineering Design in Wood (Limit States Design).

1.2 Design Criteria

.1 Design trusses and bracing in accordance with CAN/CSA-O86.1 for loads indicated and minimum uniform and minimum concentrated loadings stipulated in NBC commentary.

1.3 Qualification of Manufacturers

.1 Fabricator for welded steel connections to be certified in accordance with CSAW47.1.

1.4 Shop Drawings

.1 Submit shop drawings in accordance with Section 01330 - Submittal Procedures.

.2 Each shop drawing submission shall bear signature and stamp of professional engineer registered or licensed in the territory of Nunavut, Canada.

.3 Show pitch, span, camber, configuration and spacing of trusses. Indicate connector types, thicknesses, sizes, locations and design value. Show bearing details. Indicate design load for each member.

.4 Indicate arrangement of webs or other members to accommodate ducts and other specialties.

.5 Show lifting points for storage, handling and erection.

.6 Show location of lateral bracing for compression members.

1.5 Delivery and Storage

.1 Store trusses on job site in accordance with manufacturer's instructions. Provide bearing supports and bracings. Prevent bending, warping and overturning of trusses.

PART 2 PRODUCTS

2.1 Materials

.1 All roof trusses to be Trusjoist open web series trusses as designed by manufacturer.

2.2 Fabrication

.1 Fabricate wood trusses in accordance with approved shop drawings.

PART 3 EXECUTION

3.1 Erection

.1 Erect wood trusses in accordance with approved erection drawings.

.2 Indicated lifting points to be used to hoist trusses into position.

.3 Make adequate provisions for handling and erection stresses.

.4 Exercise care to prevent out-of-plane bending of trusses.

.5 Install temporary horizontal and cross bracing to hold trusses plumb and in safe condition until permanent bracing and decking are installed.

.6 Install permanent bracing in accordance with approved shop drawings, prior to application of loads to trusses.

.7 Do not cut or remove any truss material without approval of Engineer.

END OF SECTION

.....1999-12-16

PART 1 GENERAL

1.1 Related Sections

.1 Section 09900 - Painting: Painting and finishing.

1.2 References

.1 American National Standards Institute (ANSI)

.1 ANSI A208.1-1989, Particleboard, Matformed Wood.

.2 ANSI A208.2-1994, Medium Density Fibreboard (MDF).

.2 Architectural Woodwork Manufacturers Association of Canada (AWMAC)

.1 AWMAC Quality Standards for Architectural Woodwork 1991.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-11.3-M87, Hardboard.

.4 Canadian Standards Association (CSA)

.1 CSA B111-1974, Wire Nails, Spikes and Staples.

.2 CAN/CSA-G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles.

.3 CSA O115-M1982, Hardwood and Decorative Plywood.

.4 CAN/CSA O141-91, Softwood Lumber.

.5 CSA O151-M1978, Canadian Softwood Plywood.

.5 National Hardwood Lumber Association (NHLA)

.1 Rules for the Measurement and Inspection of Hardwood and Cypress January 1986.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01330 - Submittal Procedures.

.2 Indicate details of construction, profiles, jointing, fastening and other related details.

.3 Indicate all materials, thicknesses, finishes and hardware.

1.4 Regulatory Requirements

.1 Wood fire rated frames and panels: listed and labelled by an organization accredited by Standards Council of Canada in conformance with CAN4-S104M and CAN4-S105M for ratings specified or indicated.

1.5 Delivery, Storage, and Handling

.1 Protect materials against dampness during and after delivery.

.2 Store materials in ventilated areas, protected from extreme changes of temperature or humidity.

PART 2 PRODUCTS

2.1 Lumber Material

.1 Softwood lumber: unless specified otherwise, S4S, moisture content 19% or less in accordance with following standards:

.1 CAN/CSA O141.

.2 NLGA Standard Grading Rules for Canadian Lumber.

.3 AWMAC [custom] [premium] grade, moisture content as specified.

.2 Machine stress-rated lumber is acceptable for all purposes.

.3 Manufacturing process must adhere to Lifecycle Assessment (LCA) Standards as per [ISO 14040/14041 LCA Standards (to be published by 1998)], [CSA Z760-94 LCA Standards].

2.2 Panel Material

.1 Canadian softwood plywood (CSP): to CSA O151, standard construction.

.2 Hardwood plywood: to CSA O115.

.3 Particleboard: to ANSI A208.1.

.4 Hardboard: to CAN/CGSB-11.3.

.1 Hardboard must be manufactured such that formaldehyde emissions do not exceed 0.15 ppm when tested in accordance with ASTM E 1333, Standard Test Method for Determining Formaldehyde Levels From Wood Products Under Defined Test Conditions Using a Large Chamber;

.5 Medium density fibreboard (MDF): to ANSI A208.2, density 769 kg/m3.

.6 Medium density fibreboard must:

.1 be manufactured such that formaldehyde emissions do not exceed 0.5 ppm when tested in accordance with ASTM E 1333.

.7 Low density fibreboard: to CAN3-A247M.

.1 Ensure fibreboard is not manufactured with binders, coatings or adhesives which contain resins or other compounds that have potential to release formaldehyde during final product's use:

.8 Manufacturing process must adhere to Lifecycle Assessment Standards as [ISO 14040/14041 LCA Standards (to be published by 1998)], [CSA Z760 LCA Standards].

2.3 Accessories

.1 Nails and staples: to CSA B111; galvanized to CAN/CSA-G164 for exterior work, interior humid areas and for treated lumber; stainless steel finish elsewhere.

.2 Wood screws: to CSA B35.4 stainless steel, type and size to suit application.

.3 Splines: wood.

.4 Adhesive: recommended by manufacturer.

.5 Use least toxic sealants, adhesives, sealers, and finishes necessary to comply with requirements of this section.

PART 3 EXECUTION

3.1 Installation

.1 Do finish carpentry to Quality Standards of the Architectural Woodwork Manufacturers Association of Canada (AWMAC), except where specified otherwise.

.2 Scribe and cut as required, fit to abutting walls, and surfaces, fit properly into recesses and to accommodate piping, columns, fixtures, outlets, or other projecting, intersecting or penetrating objects.

.3 Form joints to conceal shrinkage.

3.2 Construction

.1 Fastening.

.1 Position items of finished carpentry work accurately, level, plumb, true and fasten or anchor securely.

.2 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.

.3 Set finishing nails to receive filler. Where screws are used to secure members, countersink screw in round cleanly cut hole and plug with wood plug to match material being secured.

.4 Replace items of finish carpentry with damage to wood surfaces including hammer and other bruises.

.2 Standing and running trim.

.1 Butt and cope internal joints of baseboards to make snug, tight, joint. Cut right angle joints of casing and base with mitred joints.

.2 Fit backs of baseboards and casing snugly to wall surfaces to eliminate cracks at junction of base and casing with walls.

.3 Make joints in baseboard, where necessary using a 45° scarfe type joint.

.4 Install door and window trim in single lengths without splicing.

.3 Interior and exterior frames.

.1 Set frames with plumb sides and level heads and sills and secure.

.4 Handrails, wallrails and bumper rails.

.1 Make joints hair line, dowelled and glued.

.2 Install brackets at ends and at 1,200 mm o.c. maximum at intermediate spacings.

.3 Install metal backing plates between studs at bracket locations to ensure proper support for brackets and bolts or self-tapping screws.

.4 Secure using counter sunk screws plugged with matching wood plugs.

.5 Shelving.

.1 Install shelving on ledgers.

3.3 Schedules

.1 Shelving.

.1 Hardwood plywood:

.1 Thickness: 19mm.

.2 Number of plies: 5.

.3 Face veneer: fur species,

.4 Bond: Type II.

.5 Sanding: no sanding..

.2 Edge banding: provide 10 mm thick solid matching wood strip on plywood.

END OF SECTION

Contents

1.0 General

1.1 RELATED WORK

.1 Comply with requirements of Division 1.
.2 Rough Carpentry: Section 06100
.3 Board Insulation Section 07212
.4 Roll Roofing System: Section 07520
.5 Metal Flashing and Trim: Section 07620

1.2 Product Delivery, Storage and Handling

.1 Deliver weather barrier materials in factory sealed rolls with labels indicating.
- .1 Manufacturer or trade name
- .2 Compliance with CGBS standard
- .3 Material type, thickness, roll width and area.

.2 Project materials from direct exposure to sunlight and physical damage.

1.3 Quality Assurance

.1 Allow 7 days for inspection of complete work by the Architect before proceeding with covering materials. Do not cover any area until installation has been inspected and accepted by the Architect.

PART 2 PRODUCTS

2.1 Weather Barrier

.1 Weather Barrier: spunbonded olefin manufactured from very fine continuous filaments of high-density polyethylene (HDPE) bonded together by heat and pressure.
- .1 Moisture Vapour Transmission: 3300 to ASTM E-96
- .2 Flamabilitiy: Flame Spread and Smoke Developed Value to Class A to ASTM E-84-89a.
- .3 Standard of Acceptance: "Tyvek" by Dupont Canada, 0.38 mm(15 mil) thick.

.2 Weather Barrier Tape: as recommended by weather barrier manufacturer min. 50 mm wide.

2.2 Wall Vapour Barrier

.1 Torch-n Vapour Barrier: Standard of Acceptance: Sopralene Flam 180 by Soprema Canada

2.3 Accessories

.1 Staples: minimum 12 mm leg. Galvanized, to CSA B111-1974 nails to have large heads.

PART 3 Execution

3.1 Installation

.1 Install weather barrier at exterior walls where indicated on Drawings.

.2 Installed weather barrier shall be continuous and complete, lapped and taped at all joints, so as to form an effective barrier against weather, dust and snow.

.3 Install torch on vapour barrier in 300 mm wide strips centered over all sheathing joints and at all changes in planes.

.4 Install vapour barrier around all penetrations in the exterior envelope such as mechanical penetrations, windows and doors etc.

END OF SECTION