Intertek Testing Services
ETL SEMKO

Date	January 6, 2003	
Revision Date	January 29, 2003	
Project No.	3033871	Page 1 of 6
Report No.	1 Revised	
Client No.	28021	
Description	**Interim Pour-in Place Forming Capacity Testing**	
Client	NUDURA Corporation 80 Ellis Road, Unit #1, Barrie, Ontario. L4M 6E7	Attention: Mr. Keven Rector

INTRODUCTION

This test report covers Interim Pour-in-Place forming capacity testing of an insulated concrete form wall. Testing was conducted between the dates of December 17, and 20, 2002 using the interim method pending the completion of the modifications to the present forming capacity test method of CCMC Technical Guide, MasterFormat 03131, dated 2000-09-16. The insulated concrete forms were randomly sampled at NUDURA Corporation's plant by Mr. Sheldon Warman, P.Eng. of Intertek Testing Services NA Ltd., and received November 18, 2002.

DESCRIPTION

The wall was assembled with 458 mm high by 1219 mm wide by 285 mm deep insulated concrete form half modules. The ends to the wall were capped with slip in foam end caps. The height of the wall specimen was 3.20 metres high by 3.66 metres wide. The wall was formed 7 modules high and 3 modules wide (either 3 half size modules or 2 half size and 2 quarter size modules per course). The wall was braced with four 3.5 metre high braces spaced 1220 mm apart and fastened to the plastic reinforcing with screws spaced at 200 mm intervals. The bottom of the wall was captured between 3.66 metre long wood 2 by 4's anchored to the concrete floor. Attached photographs show the wall at various stages.

Prior to start of assembly, the standard 2438 mm long NUDURA form modules were required to be cut in half to form 1219 mm long half modules. This was done to obtain a reasonably sized test wall 3 modules wide as per CCMC's requirement and also have a typical number of joints (based on a 1219 mm module) in the test wall. This would be the worst case scenario for the subject ICF modules. It should be noted that this additional requirement for cutting may have adversely and artificially affected the amount of deflection observed in the results noted.

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DESCRIPTION (continued)

The concrete was ordered with the following properties

1.	Slump	150 mm
2.	Aggregate size	13 mm
3.	W/C ratio	0.6
4.	Compressive strength	20 MPa
5.	Concrete density	2400 kg/m^3
6.	Superplasticizers	None

A copy of the ready mix data sheet is appended to this report

The insulated concrete form modules were

Foam Description:	"NUDURA™ Integrated Building Technology Insulating Concrete Forms (ICF)" manufactured by Plastiques Cellulaire Polyform at Granby, Quebec.
Material:	Expanded polystyrene foam manufactured from one (1) bead type identified as Starex SF-301H Cheil Industries.
Foam Panel Dimensions:	458 mm high by 1219 mm wide by 67 mm thick each side
Colour:	Green
Web Description:	Polypropylene reinforcing webs are cast into EPS foam to create a positive connection between interior and exterior EPS walls and to serve as an anchor point for surface finishing materials.
Web Material:	Injection Molded Polypropylene
Web Spacing:	Every 203 mm horizontally
Web Color:	Black

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TESTING PROCEDURE

The client assembled the wall complete with bracing and platform on one face. The opposite face was not braced.(1) Reference marks were made on the wall surface at 1/4, 1/2, and 3/4 the height and width of the wall. A measured 500 mm long by 6 mm diameter steel rod was inserted through the wall at these locations to measure any change of thickness of the wall with our Mitutoyo Digital vernier caliper (280 01 0108). Vertical and horizontal bow was measured on the non braced surface with a 3 metre straight edge and steel ruler. Deviation from plumb was measured with plumb line and steel ruler on the non braced surface of the wall. Measurements were taken before the concrete was pumped into the wall cavity. Measurements were again taken after the first lift of 1.6 metre high of concrete was poured into the form, after the second lift filling form with concrete to 3.2 metres high, and after 3 days of curing. The consolidation of the concrete during the pouring of the concrete was with mechanical vibration using a 1-inch head, duration of 40% of placing time, and depth of vibration of 1.25 m. This was followed by an undisturbed period of 15 to 30 minutes.

Prior to placement of the concrete, the slump was verified as 150 mm by a slump test. In addition, a set (3) of standard concrete cylinders were cast, cured with the wall, and compression tested after 28 days.

Note (1) : Within respect to observations regarding plumbness of the wall, it is important to note that the client's contractor prepared the alignment/bracing system in full accordance with the required installation instructions for the NUDURA wall system, that is, installed in preparation for pouring with the brace poles being turned 1/4 turn inward to prepare for the wall to be pushed out to proper alignment post pour. Intertek Testing Services staff was not aware of this alignment procedure and took their pre pour readings. Inadvertently, the wall was not realigned by the contractor prior to the pour. Therefore, the results reflect the wall being positioned off alignment throughout the full test.

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OBSERVATIONS

Overall Increased Wall Thickness

Location	Wall thickness (mm)			
	Initial (mm)	1st lift before vibrating	2nd lift after vibrating	3 days of curing
1	282.61	284.60	287.56	286.23
2	282.14	288.91	291.54	290.60
3	282.79	284.91	287.20	286.48
4	284.40	285.24	288.32	287.50
5	283.01	285.22	290.34	289.40
6	283.86	285.99	288.83	287.40
7	282.92	282.58	284.96	284.73
8	285.28	282.94	285.73	285.45
9	282.38	282.77	285.48	285.73

Individual Surface Increased Wall Thickness

Location	Rod length exposure from wall (mm)					
	Open surface			Braced surface		
	Initial	2nd lift	3days	Initial	2nd	3day
1	105.25	102.49	102.45	120.00	117.81	119.18
2	104.53	95.85	96.35	122.59	121.87	122.31
3	107.38	85.04	85.31	118.37	136.30	136.75
4	103.68	89.28	89.35	121.34	131.82	132.57
5	104.46	99.06	99.35	121.11	119.18	119.83
6	101.47	98.16	98.61	123.79	122.13	123.11
7	108.14	129.36	129.48	117.62	94.36	94.47
8	110.14	151.16	167.00	114.42	72.95	57.39
9	106.24	141.32	140.77	121.10	82.92	83.22

Note:Negative number indicates increased length of rod exposed from wall.
Due to pouring of the concrete some of the rods were moved by the concrete

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OBSERVATIONS (continued)

Bow from Straight Edge (non supported surface)

Location	Net increase of outward bow of non supported surface (mm)		
	1st lift before vibrating	2nd lift after vibrating	3 days of curing
Horizontal			
8 (3/4 height)	2.5	2.0	-0.5
5 (mid height)	0.5	2.0	0.0
2 (1/4 height)	-1.0	3.5	-4.5
Vertical			
4 (1/4 width)	-0.5	1.0	-1.5
5 (mid width)	1.0	0.5	-1.0
6 (3/4 width)	1.5	0.0	0.0

Note: Straight edge could not be used on the braced surface due the presence of the braces and scaffold platform at the measuring locations.

Deviation from Plumb line (non supported surface)

Location	Deviation from plumb line of non supported surface (mm)			
	Initial (mm)	1st lift before vibrating	2nd lift after vibrating	3 days of curing
9 (3/4 height)	5.0	8.5	12.5	11.0
4 (mid height)	4.5	4.0	6.0	5.5
3 (1/4 height)	0.0	0.0	0.0	0.0
8 (3/4 height)	9.5	11.5	14.5	14.0
5 (mid height)	4.0	6.0	8.0	8.0
2 (1/4 height)	0.0	0.0	0.0	0.0
7 (3/4 height)	7.5	9.0	14.0	11.5
6 (mid height)	5.0	6.0	7.0	6.5
1 (1/4 height)	0.0	0.0	0.0	0.0

Note: Negative number indicated towards the core.
Measurements relative to 1/4 height.

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OBSERVATIONS (continued)

Concrete Strength After 28 Days

Cylinder	Concrete Strength (MPa)
1	31.8
2	31.2
3	31.4
Average	31.5

Tested and reported by: David Wren, Vern Jones, and Robert Obuchi
Concrete tested by: Construction Testing Laboratories Limited, Mississauga, Ontario

Respectfully submitted,

Intertek Testing Services NA Ltd.

Reviewed by:

Robert M. Obuchi, P. Eng.
Physical Testing Services

Vern W. Jones, C.E.T.
Manager
Physical Testing Services

RMO/VWJ/mro
2 cc:client
encls

APPENDIX

Toronto Area Dispatch: 416 798 1112
Newmarket Area Dispatch: 905 895 7072

Time left plant DEC 17 12:10

Time arrive job 12 40 pm

Time leave job

Time return to plant

innocon

Unusual incident of note on this delivery

Returned Concrete
M³

Slump (mm)	Air (%)
Before S.P.	Before S.P.
After S.P.	After S.P.

Test cylinder taken? ○ Yes ○ No

☐ No water added
☐ Water added within slump
☐ Water added over slump
Quantity
Time
Authorized by

In the event of delivery beyond curb line, this company will not assume liability for damage to sidewalk, driveway, utility lines, meters, septic systems or any other property. Materials hereby sold become property of purchaser at point of origin. No cancellation accepted after concrete has been loaded at our plant.
Customer is responsible for water requested to exceed ordered slump

Caution!
Cement powder or freshly mixed concrete, grout, or mortar may cause skin injury. Avoid contact with skin and wash exposed areas promptly with water. If any cement powder or mixture gets into the eyes, rinse immediately and repeatedly with water and get prompt medical attention. Keep out of reach of children.

Note:
Our health and safety policy prohibits the return of concrete to our ready mix truck drum.

Date	Customer no.	Order no.	Customer P.O.	Job no.	Plant no.	Delivery ticket no.
17-Dec-02	1642	1		1642299	8	302760

Customer name
JOHN MAGUIRE CONSTRUCTION INC

Job address
I.T.S. 3210 AMERICAN DR
[illegible] WAIL

Special instructions
409 TO AIRPORT RD, N ON AIRPORT RD TO R ON AMERICAN DR FOR TEST MUST BE 150 SLUMP NO MORE NO LE

Cubic meters	Total shipped	Description	Product code	Unit price	Amount
3.00	3.00	20-13MM 150MM SLUMP .6WC	20NCHX58		
3.00		10MM LIMESTONE	10LIME		
3.00		WINTER HANDLING	HEAT		
3.00		ENVIRONMENTAL CH	ENVIRO		

Customer ordered 54.00 Meters m3 | Design (Slump) (Mm) 150MIX | Truck no. 37 | Driver WILLIAM QUESENBERRY

Order taken by NEWKIRK DISPATCH | Tax Exempt | Load 1 | G.S.T. # 89712 1596RT

Sixty minutes per load is allowed for unloading. Excess time will be charged at $60.00 **per minute**

I have read and agree to the terms and conditions of this sale and acknowledge that the acceptance of materials not in accordance with project specifications is the sole responsibility of the purchaser. I acknowledge that the addition of any products not approved by the supplier to this concrete voids any warranty that may apply.

Total amount 452889

X
Customer signature:

X
Print name:

Delivery ticket/Customer copy 1

Construction Testing Laboratories Limited

2355 Derry Road East, Unit 47, Mississauga, Ontario L5S 1V6

Telephone: (905) 671-9993 Fax: (905) 671-9994 E-Mail: ctlab@sprint.ca

CONCRETE CYLINDER COMPRESSIVE STRENGTH TEST REPORT

CLIENT: Intertek Testing Services
ADDRESS: 3210 American Drive
Mississauga, Ontario
L4V 1B3

PROJECT: NUDURA
CONTRACTOR:
DATE : 16-Jan-03

STRUCTURE: TEST WALL

LOCATION:

REF. NO: TEST NO:

LAB NO.	CYL. NO.	CURE	DIA. (mm)	MASS (kg./m3)	DATE CAST	DATE RECEIVED	DATE TESTED	AGE	STRENGTH (MPa)	NOTE
1994	1		152	2369.4	17-Dec	14-Jan	14-Jan	28	31.8	
	2		152	2405.3	17-Dec	14-Jan	14-Jan	28	31.2	
	3		152	2396.4	17-Dec	14-Jan	14-Jan	28	31.4	

Travel Time
Site Time:
Mileage:

L: Laboratory cured
F: Field Cured
R: Reduced Period of Lab. cure

SPECIFIED 28 DAY STRENGTH: 20 Mpa

	SLUMP	AIR	TEMPERATURE	TIME	CYLINDERS
SPECIFIED	mm.	%	CONCRETE: ° C	BATCHED:	CAST BY:
MEASURED	mm.	%	AIR: ° C	CAST AT:	OF:

CONCRETE SUPPLIER:

PLANT: TRUCK NO. LOAD NO.: M^3:

DELIVERY TICKET: MIX DESIGN:

WATER ADDED ON THE JOB:

BY WHOSE AUTHORITY:

NOMINAL SIZE OF AGGREGATE: mm

TYPE OF MOLD: X Plastic - 6"x 8"
Steel - 4"x 8"

TYPE OF ADMIXTURE:

TYPE OF AIR ENT. AGEN

INITIAL 24 HR. CURING TEMPERATURE:

MAX. ° C

MIN. ° C

REMARKS:

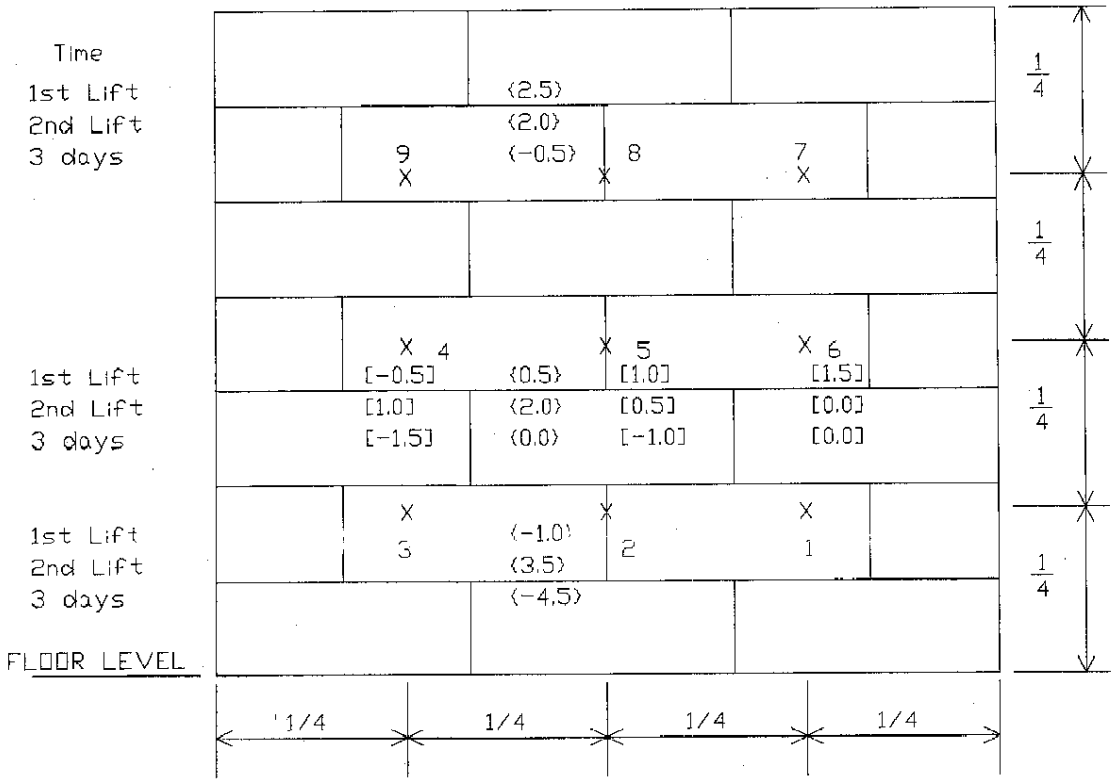
DISTRIBUTION:

1 cc: Client
1 cc: File

SIGNED:

Bill Wong, P. Eng.

We certify that the portion of the testing performed by our company was in accordance with current CAN3-A23.2 Standards.



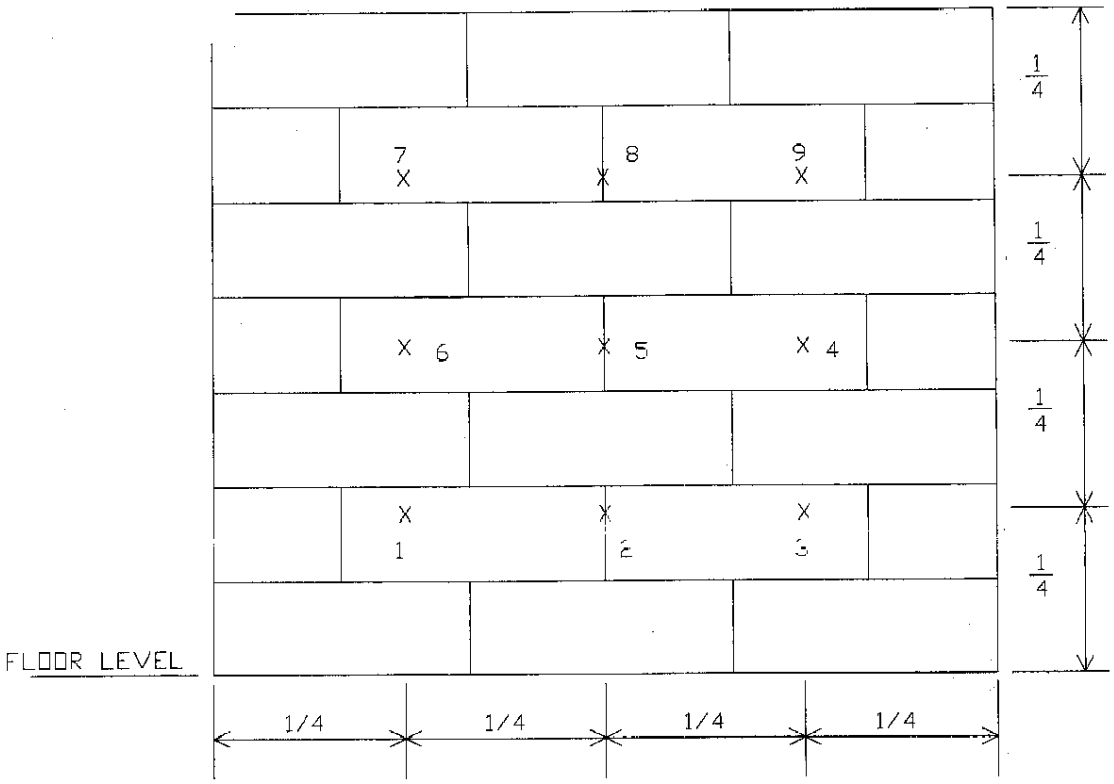
[ ] Net Increase In Vertical Bow (mm)
( ) Net Increase In Horizontal Bow (mm)

NON BRACED SURFACE

Intertek Testing Services NA Ltd.

NET INCREASE IN OUTWARD BOW AND MEASUREMENT LOCATIONS
INSULATED FORM WALL
NUDURA CORPORATION

DATE: JANUARY 6, 2003	SCALE: N.T.S.	DRAWN: M.R.D.	DWG. No. 3033871-1-1



BRACED SURFACE

Intertek Testing Services NA Ltd.

DEFLECTION MEASUREMENT LOCATIONS
INSULATED FORM WALL
NUDURA CORPORATION

DATE: JANUARY 6, 2003	SCALE: N.T.S.	DRAWN: M.R.D.	DWG. No. 3033871-1-2

Photograph No. 1: Assembling of insulated concrete form wall modules

Photograph No. 2: Wall assembly before bracing and end caps installed.

Photograph No. 3: Wall assembly with bracing attached.

Photograph No. 4: Wall assembly before concrete pour.

Photograph No. 5: 500 mm measuring rods on braced surface.

Photograph No. 6: 500 mm measuring rods on non braced surface.