

STANDARD CORNER ROOM FIRE TEST  
TO UBC 26-3

FOR

NUDURA™ INTEGRATED BUILDING TECHNOLOGY  
INSULATED CONCRETE FORMS



NOTE:

ON NOV 1<sup>st</sup>, 2002, THE COMPANY FORMERLY KNOWN AS "AIM BUILDING PRODUCTS INC."  
BECAME INCORPORATED UNDER THE COMPANY NAME OF "NUDURA CORPORATION"



**Intertek Testing Services**  
ETL SEMKO

**REPORT OF**

**STANDARD ROOM FIRE TEST**

**FOR**

**NUDURA INTEGRATED BUILDING TECHNOLOGY SYSTEM**

**CLIENT:**

**AIM BUILDING PRODUCTS INC.  
80 ELLIS DRIVE  
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**REPORT BY:**

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**REPORT NUMBER: 3017215(a)**

**DATE: FEBRUARY 26, 2002  
REVISED DATE: MARCH 27, 2002**

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## **PREFACE**

This report describes tests, standards, and details of the test specimens as installed for this program.

This product has met the performance requirements to be eligible for an ITS/Warnock Hersey Certification Program. The report does not imply product certification. Products must bear  labels in order to demonstrate ITS/Warnock Hersey Certification.

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## INTRODUCTION

On February 7, 2002, Intertek Testing Services NA Ltd./Warnock Hersey conducted a room fire test in accordance with the Uniform Building Code Standard 26-3, 1997, *Room Fire Test Standard for Interior of Foam Plastic Systems*.

The objective of the test was to evaluate the fastening method of protection of the insulated concrete formwork manufactured by AIM Building Products Inc. The protection consisted of conventional 1/2 in. gypsum wallboard fastened to the plastic strips in the forms, as described in the Test Sample Installation.

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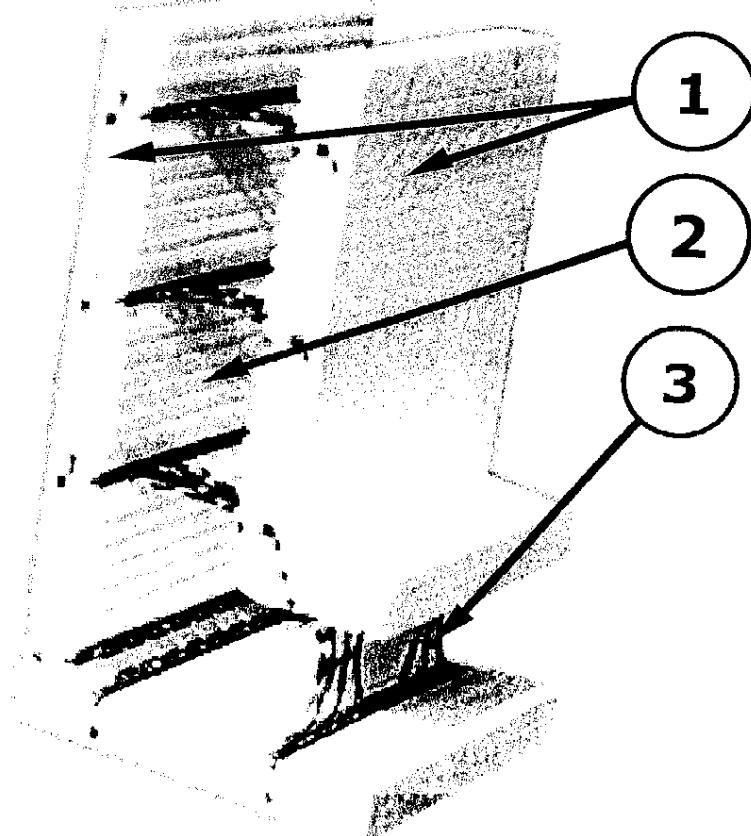
Revised: March 27, 2002

## MATERIAL SPECIFICATIONS

|                               |                                                                                                                                                                                                                                       |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Description:                  | Interlocking, stackable, expanded polystyrene (EPS) foam form units for concrete forming. Each form consisted of two 18 in. high by 96 in. wide by 2-5/8 in. thick foam panels, held together by 12 hinged plastic ties.              |
| Height:                       | 18 in. nominal, 19 in. overall                                                                                                                                                                                                        |
| Length:                       | 96 in.                                                                                                                                                                                                                                |
| Thickness (overall):          | 11-1/4 in.                                                                                                                                                                                                                            |
| Resultant Concrete Thickness: | 6 in. minimum to 6-1/2 in. maximum                                                                                                                                                                                                    |
| Wall Thickness:               | 2-5/8 in.                                                                                                                                                                                                                             |
| Colour:                       | Light green                                                                                                                                                                                                                           |
| Material:                     | Type II Expanded polystyrene foam (EPS)                                                                                                                                                                                               |
| Web Description:              | Polypropylene reinforcing pieces, 10-1/8 in. wide, are cast into the EPS foam walls. The webs create a positive connection between the interior and exterior EPS walls, and serve as an anchor point for surface finishing materials. |
| Web Spacing:                  | 8 in.                                                                                                                                                                                                                                 |
| Web Colour:                   | Black                                                                                                                                                                                                                                 |

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**FIGURE I**  
**NUDURA INTEGRATED BUILDING TECHNOLOGY SYSTEM**



- ① Double Insulation Protection
- ② Concrete Core
- ③ Nudura's Patented Hinged, Folding Web

### **TEST SAMPLE INSTALLATION**

The AIM Building Products Inc. insulated concrete formwork units were assembled with vertical joints staggered on successive rows to construct a wall with a 90 degree corner. The finished form was 8 ft. long in one direction, 8 ft. long in the other, and 8 ft. high. The final concrete thickness was nominally 6-1/4 in.

Concrete of 25 mpa, 5 to 6 in. slump without air entrainment and 3/8 in. clean, washed, pea sized aggregate was ordered. The concrete was pumped into the form using a concrete pumper truck. The concrete was poured on January 31, 2002 and allowed to cure for 1 week prior to testing.

## TEST ROOM CONSTRUCTION

Standard 1/2 in. gypsum wallboard was installed oriented vertically on to the right side wall foam surface and fastened through the foam into the ties using 2-1/4 in. standard drywall screws. Standard 1/2 in. gypsum wallboard was installed with both horizontal and vertical joints onto the left side wall foam surface. Each sheet of gypsum wallboard was fastened to the walls with screws every 12 in. on centres into every other plastic web. The screws fastening the wallboard to the plastic ties along the upper edge row were installed with a screw spacing of 8 in. on centres, 2 in. below the upper edge of the wallboard. The gypsum wallboard joints were taped with mesh type drywall tape, and filled with joint compound. The screw heads were also filled with joint compound.

The burn room was constructed around the sample wall such that the sample wall was located at the end of the room opposite the door opening and on the right side adjacent wall.

The remaining walls and ceiling of the room were constructed inside our laboratory building using 3-5/8 in. steel stud walls faced on the room interior side with 1/2 in. conventional gypsum wallboard. The room interior dimensions after the installation of the foam plastic and its protection were 8 ft. in height and width and 12 ft. in length ( $\pm$  1/2 in. maximum). A door opening measuring 2 ft. 6 in. in width by 7 ft. in height was centred in the end 8 ft. wall. The ceiling was constructed from 3-5/8 in. steel studs faced on the underside with 1/2 in. conventional gypsum wallboard. The gypsum wallboard joints were tight.

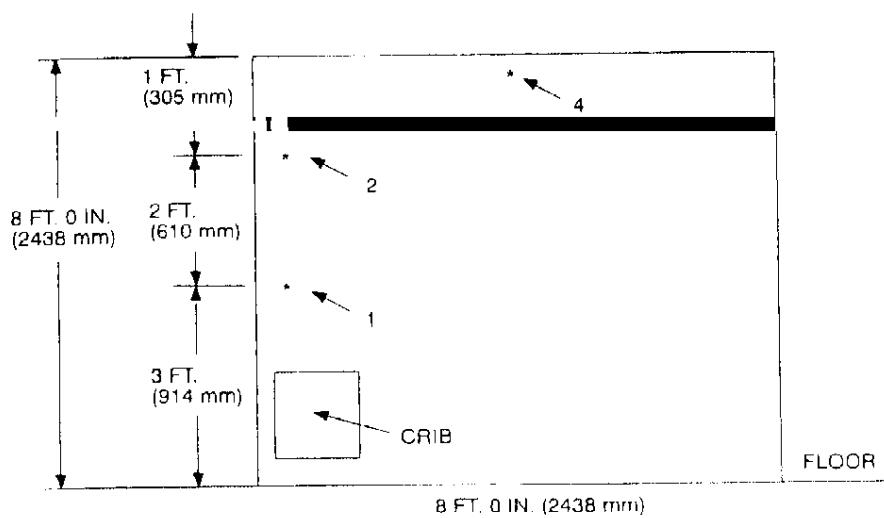
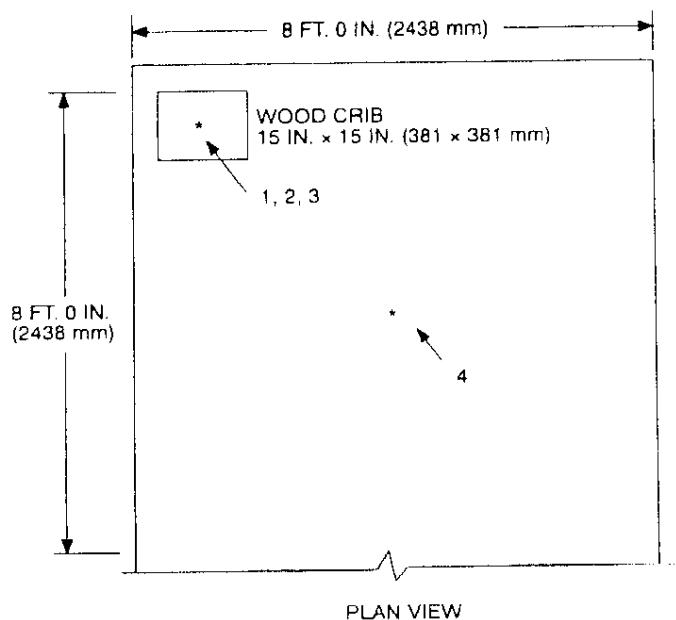
### **THERMOCOUPLE LOCATIONS**

A total of four 24 gauge Type K welded thermocouples were installed in the corner above the wood crib at the following locations:

| <b>Thermocouple No.</b> | <b>Location</b>                                         |
|-------------------------|---------------------------------------------------------|
| 1                       | 60 in. below ceiling, 3 in. from adjacent wall surfaces |
| 2                       | 36 in. below ceiling, 3 in. from adjacent wall surfaces |
| 3                       | 12 in. below ceiling, 3 in. from adjacent wall surfaces |
| 4                       | 1 in. below ceiling, 4 ft. from each test sample wall   |

Thermocouples 1, 2 and 3 were fastened to a metal support frame built for this test. The support frame has horizontal rods extending from it to allow for thermocouple mounting at the required elevations.

**FIGURE II**  
**THERMOCOUPLE LOCATIONS**



\* THERMOCOUPLE LOCATIONS

ELEVATION

## THE FIRE TEST

A wood crib was constructed from nominal 1-1/2 in. by 1-1/2 in. clear Douglas Fir kiln dried, finish lumber, measuring 15 in. by 15 in. The crib used for the test was purchased preconditioned from Carr Lumber and Manufacturing based in Bedford Park, Illinois. The crib was constructed with five sticks in each of ten tiers and was fastened together with one 8d nail at each end of each stick. The crib was placed into our conditioning room at  $23 \pm 3^{\circ}\text{C}$  and  $50 \pm 5\%$  humidity until immediately before the fire test. At the time of test it averaged less than 6% moisture content, and weighed 28 lb. 1 oz. The crib was supported on its corners on cut bricks such that it was located 3-1/2 in. above the floor. A 36 in. by 36 in. section of 5/8 in. Type "X" gypsum wallboard was placed on the floor beneath the crib to prevent the concrete floor from spalling due to the heat of the fire during the test.

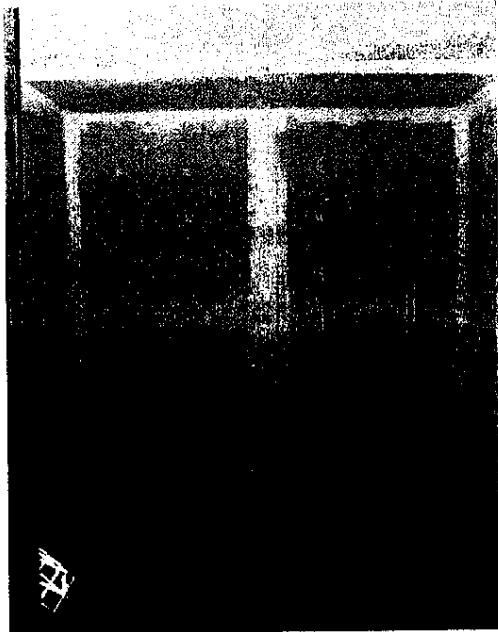
One pound of shredded and fluffed wood excelsior was distributed around the bricks covering an area approximately 21 in. by 21 in. Just prior to the start of the test, the excelsior was soaked with 4 ounces of reagent ethyl alcohol, except for an area approximately 6 in. diametrically opposite the intersection of the walls.

The crib was placed on the bricks and positioned 1 in. from the test wall surfaces, the excelsior was ignited and the test was started. Observations were recorded throughout the 15 minute test duration. The temperatures of the thermocouples were automatically recorded every 10 seconds using a calibrated Hydra "data bucket" automatic data recorder, with the ITS identification "Hydra #1". A video camera was used to record the test, a digital camera was used to photograph the test once a minute, and lights were used to show smoke levels and enhance the video picture.

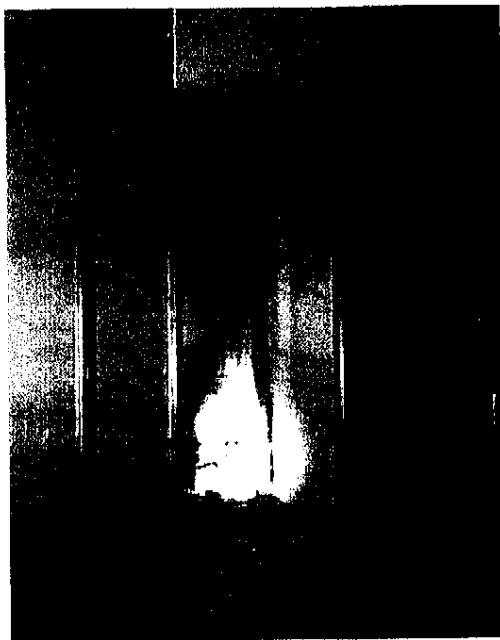
### FIRE TEST OBSERVATIONS

| TIME  | EXPOSED SIDE                                         |
|-------|------------------------------------------------------|
| 0:30  | Crib ignition                                        |
| 1:00  | Flames to 5 feet                                     |
| 1:30  | Flames to 7 feet                                     |
| 2:00  | No visible smoke                                     |
| 2:30  |                                                      |
| 3:00  | Some smoke, approximately 10% opacity                |
| 3:30  |                                                      |
| 4:00  | Smoke is slightly darker                             |
| 4:30  |                                                      |
| 5:00  |                                                      |
| 5:30  |                                                      |
| 6:00  |                                                      |
| 6:30  | Smoke opacity is 20-30% (visual estimate)            |
| 7:00  | Appears the fire has surpassed its maximum intensity |
| 7:30  | Smoke is still very clear                            |
| 8:00  |                                                      |
| 8:30  |                                                      |
| 9:00  |                                                      |
| 9:30  | Smoke is slightly darker                             |
| 10:00 | More fire intensity again                            |
| 11:00 |                                                      |
| 11:30 |                                                      |
| 12:00 |                                                      |
| 12:30 | Fire intensity is decreasing                         |
| 13:00 | Very little smoke now                                |
| 13:30 | Crib is sagging                                      |
| 14:00 |                                                      |
| 15:00 | Crib extinguished                                    |

### PHOTOGRAPHS



Test Sample Prior to Fire Test



Test Sample During Fire Test

**PHOTOGRAPHS - *Continued***

Test Sample After Fire Test

Test Sample After Removal of All Gypsum Wallboard, Crib Area

**PHOTOGRAPHS - *Continued***

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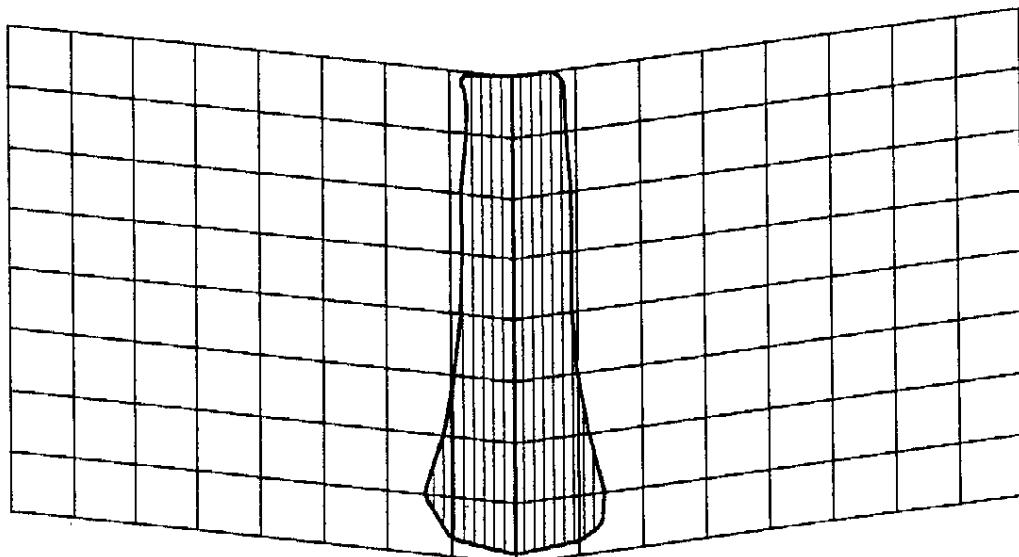
Test Sample After Removal of All Gypsum Wallboard, Right Wall

Test Sample After Removal of All Gypsum Wallboard, Left Wall

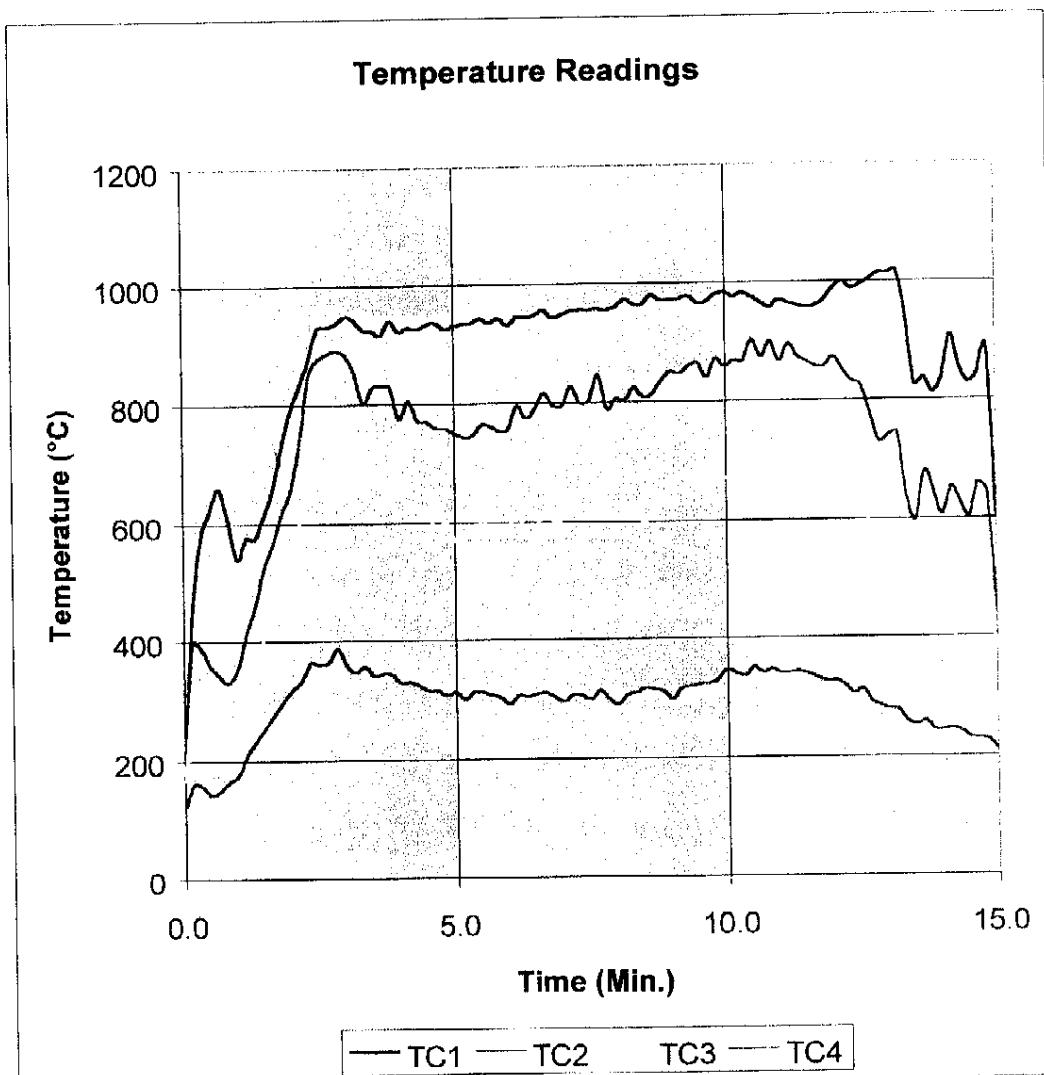
**FIGURE III**  
**EXTENT OF FIRE DAMAGE ON EPS FORMS**

| Elevation Above Floor | Extent of Damage LHS | Extent of Damage RHS |
|-----------------------|----------------------|----------------------|
| 8 ft.                 | 11 in.               | 10.5 in.             |
| 7 ft.                 | 10.5 in.             | 10 in.               |
| 6 ft.                 | 11 in.               | 10.5 in.             |
| 5 ft.                 | 11 in.               | 11 in.               |
| 4 ft.                 | 12 in.               | 12 in.               |
| 3 ft.                 | 13 in.               | 12 in.               |
| 2 ft.                 | 15 in.               | 14 in.               |
| 1 ft.                 | 14 in.               | 13 in.               |
| 6 in.                 | 11 in.               | 12 in.               |
| 2 in.                 | 6 in.                | 6 in.                |

Grid lines show 1 ft. square sections to visually represent the extent of charring.



**THERMOCOUPLE TEMPERATURES (°C)**



## **CONDITIONS OF ACCEPTANCE**

Section 26.304 states:

"A foam plastic wall or ceiling assembly shall be considered as meeting the requirements for acceptable performance within the following conditions:

1. Charring of the foam plastic shall not extend to the outer extremities of the test area within a 15 minute period after ignition of the excelsior. Discolouration extending not more than 1/4 in. (6 mm) into the foam plastic shall not be considered as charring.
2. Smoke levels generated during the test period shall not be excessive.
3. Structural panels shall sustain the applied load during the test period.

## **TEST RESULTS**

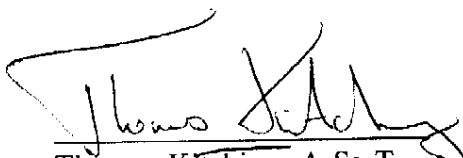
1. There was melting of the EPS foam in the vicinity of the wood crib and the flame column to the ceiling. There was no damage to the foam at the outer extremities of the test area.
2. The video record shows the degree of smoke produced during the test. The view of the fire was not obscured by smoke at any time and, consequently, we do not consider the smoke levels generated to be excessive.
3. Since the concrete core was undamaged during the fire test, the structural properties of the wall were not reduced. If a load had been applied, the wall would certainly have been able to sustain the load.

## CONCLUSIONS

The AIM Building Products Inc. modular unit insulated concrete formwork, protected by 1/2 in. conventional gypsum wallboard and installed as described in this report, met the conditions of acceptance of Uniform Building Code Standard UBC 26-3, 1997. The AIM Building Products Inc. insulated concrete formwork is consequently eligible for listing and labelling under our follow-up factory inspection and certification service.

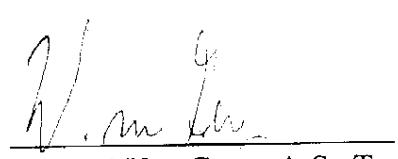
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