

APPENDIX "E"

MOISTURE PIN DEMONSTRATION  
STATUS REPORT

PART IX REPORT  
RAPPORT PARTIE IX

Canada Mortgage and Housing Corporation  
Société canadienne d'hypothèques et de logement

Canadian Housing Information Centre  
Centre canadien de documentation sur  
l'habitation

PHASE I REPORT  
FOR THE  
MOISTURE PIN PROJECT

for  
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## MOISTURE PIN PROJECT REPORT

### BACKGROUND AND ISSUES

Over a period of time the Northwest Territories Housing Corporation (NWTHC) has come to the conclusion that the unique climate in Northern Canada is causing the premature rotting of framing members and wood siding. To confirm this problem the NWTHC has requested a monitoring program to study the moisture content of wooden building materials.

Due to the remoteness of the area building materials are often left exposed to the environment for several weeks or months. This can change the moisture content of the wood which often leads to cracking of building envelopes, because of shrinkage, after it has been used. This in turn leads to interstitial condensation within the building fabric which again effects the framing members moisture content. Another factor that is of interest to the NWTHC is the effect of the long winter nights on the moisture content of the wood.

To study this a number of houses in a variety of northern communities will be chosen and fitted with moisture pins (see appendix A). What a moisture pin is is a sensor with two nails pointing out of it, this sensor is driven into the wooden member by use of the nails, which are in actual fact the moisture sensor. When it is installed two readings are gotten from it, both are resistances but from one a temperature can be determined and the other a moisture reading. The pins are to be placed on the framing members of the building envelope and will be monitored over the 1988/89 heating season.

The types of houses to be included in this study are new (1988 construction), existing and retrofit housing. The result of the study will be used to determine the condition of the wood framing members and provide data for computer modelling efforts that are ongoing in the Northwest Territories.

### PHASE I STATUS REPORT

The main goals behind Phase I of this report are:

1. Selection of communities and houses
2. Purchasing moisture pins
3. Determining locations for placement of pins in the framework

### Selections of Communities and Houses

The final selection of the moisture pin tests was done by Dick Bushal of the NWTHC. He decided on four communities each with four houses. The names of these communities and the descriptions of the houses are all tabulated below, along with the names of the local Project Officers.

Aklavik - Barton Bourassa, Project Officer

1. Weber unit 126, 1976 - 5 bedroom
2. Retrofit II, unit 124, 1976 - 4 bedroom
3. 1985 - 3 bedroom detached (no unit number)
4. 1988 - 2 bedroom duplex (new construction)

Cambridge Bay - Gary Smith, Project Officer

1. 1985 duplex, unit 218 or 219 (one only)
2. Weber unit 141, 1977 - 3 bedroom
3. Retrofit II, unit 152, 1978 - 4 bedroom
4. 1986 Fourplex, unit 226; A, B, C and D (one only)

Rankin Inlet - Marc Aquin, Project Officer

1. Weber unit 405, 1975 - 4 bedroom
2. Retrofit II, unit 406, 1975 - 4 bedroom
3. 4 bedroom detached, unit 545 (existing)
4. 1985 - 2 bedroom duplex, unit 541-B

Fort Rae - Gary Porter, Project Coordinator

1. 1985 - 2 bedroom duplex, unit SS1-A or B (one only)
2. 1986 - 4 bedroom detached, unit 602
3. 1988 Fourplex (new construction)
4. 1986 - 2 bedroom duplex, unit S43-A or B (one only)

The fourth house in each community is considered optional, only 15 houses will be fitted with pins. The house that will not be fitted is left up to our judgement once on site, depending on time and difficulty.

#### Purchase of Moisture Pins

The moisture pins have been purchased from Buchan, Lawton, Parent and all 150 have been delivered along with the six moisture meters and six multimeters.

#### Selection of Pin Locations

Through discussions between Dick Bushal, Dana Ferguson and Shawn Rowell the pin locations were decided upon and are shown in Fig. 1 Moisture Pin Positions. Each house is to have ten (10) moisture pins installed into its framing members. There are two different types of houses that these are to be installed into, one has a standard type of ceiling and the other a cathedral ceiling.

The basic placement is the same for each type, one set in the floor and two sets on the roof beams, one on each side of the peak. The difference is that with the standard ceiling one set is in the ceiling members and the other in the envelope wall, while the cathedral type has both sets in the upper and lower portions of the envelope wall. The positioning of each set, though, is the same, one is one inch from the outside of the member and the other one inch from the inside.

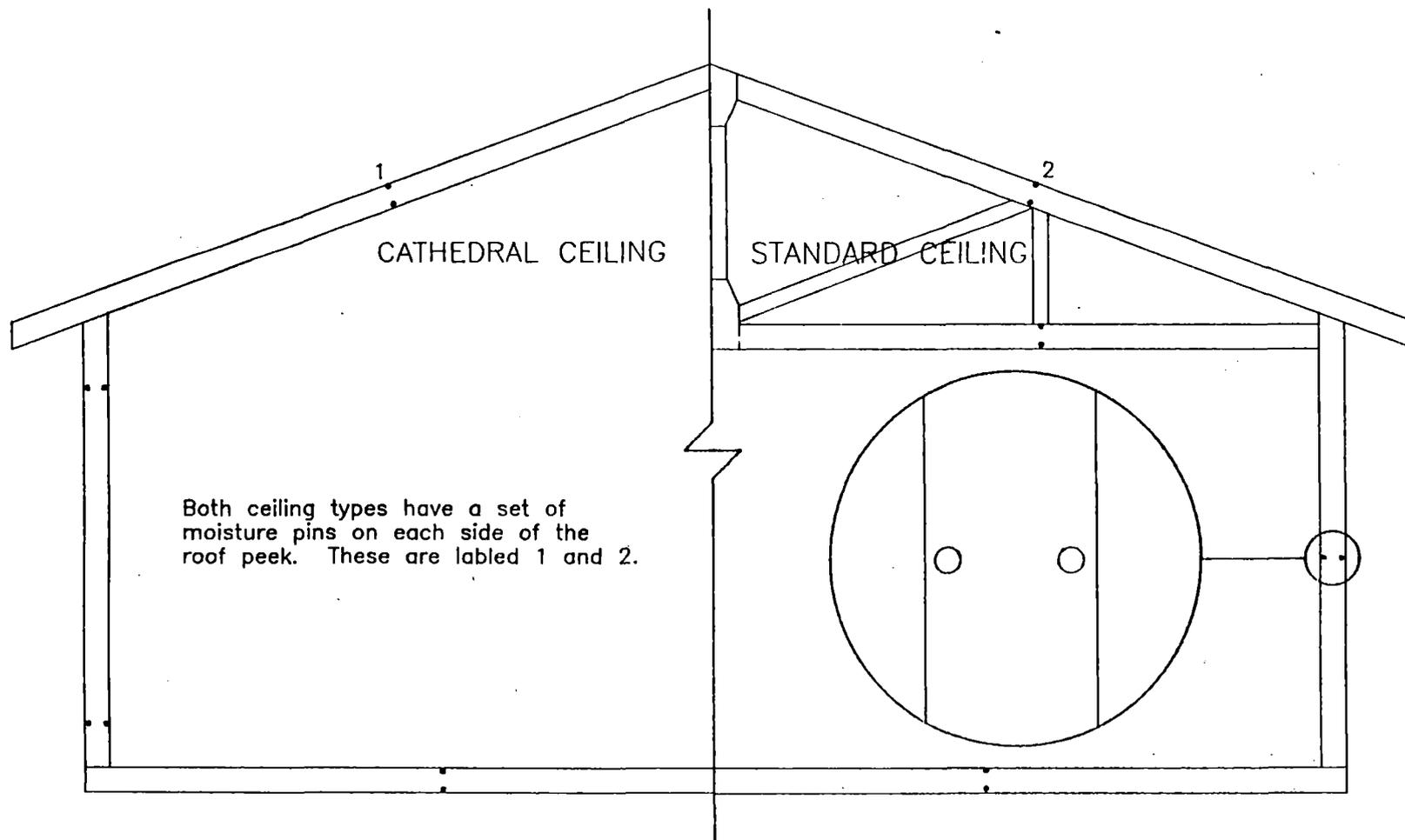


FIG. 1 MOISTURE PIN POSITIONS

The reasoning behind the positioning of the moisture pins is so that at least one set of pins is installed in all walls that make up the envelope frame. It is possible that one side of the roof is operating as a hot sink and the other side as a cold sink. This would cause the hot side to dry and all the moisture would migrate to the cold side, saturating the wooden members. The pins are mounted in sets as described above in order to get a temperature profile across the wall and also to observe the movement of moisture across a single member.

All of the wiring for each pin will be brought back to a common point and a Test Board installed. The Test Boards consists of ten (10) pairs of phono jacks, one pair for each of the moisture pins. These phono jacks will be set up in two columns for easy reading, one column will be for the moisture reading and the other for the temperature reading. This board will be positioned inside the unit so the cold temperatures don't affect the instrument's readings.

#### DETAILED PLAN OF PHASE II "Installation"

The steps that are involved in the installation of the moisture pins in each community are all the same. These steps are listed below as a daily schedule for the community of Aklavik.

##### Day 1

- fly Ryan Monti and Shawn Rowell to Aklavik
- meet with the Project Officer, maintenance personal and members of the community to discuss plans
- start installation of moisture pins

##### Day 2 through 6

- install all pins into houses

##### Day 7

- finish installation
- fly back to Yellowknife or on to next community

The only difference to this schedule is in Fort Rae where Ryan and Shawn will be traveling to Rae each day by truck.

At each of the four communities the maintenance staff will be helping in any way they can in areas Shawn and Ryan do not have experience like carpentry and drywalling. This will be done for a basic hourly wage.

The method that will mostly be used to install the moisture pins is one where the installation is done through the outer wall. To do this the some of the siding needs to be removed and a hole cut in th wall beside the chosen stud. This hole will be cut using a round saw on a drill so the wood can be replaced and caulked with sealant. The wires will brought out through a small

hole in the wood plug and this is also caulked. Once the siding is replaced the wires will be strung down the side of the wall and stapled into place. These wires will then be taken under the house and brought up through the floor at a predetermined location, the hole in the floor will also be caulked properly. As said before these wires will then be terminated at a test board.

### PLAN FOR PHASE III "Data Colection"

The first part of the data collection process for this project is the instruction of the Project Officers on how to use the meters supplied (moisture and multimeters) and how to best record the data before it is mailed back to us. After this we need only sit and wait for the Project Officers to mail the data once a month.

### PROJECT COST BREAKDOWN

<u>PHASE I</u>	Dana	Ryan	Shawn	Sec.
Project Coordination	.5	-	2	-
- Purchase of moisture pins				
- Selection of houses				
- Design of Test Boards				
- Coordination of installation times				
Phase I Report	.5	-	1	.5
Phase I Total	1	-	3	.5

### Expenditures

- Moisture Pins ..... \$10,000
- Test Boards ..... \$200
- Telephone Calls ..... \$200
- Miscellaneous ..... \$500

### PHASE II

Fort Rae Installation	(The labor used to install the pins is calculated as an installation expenses and is listed under the subcontracting costs)			
Aklavik Installation				
Cambridge Bay Installation				
Rankin Inlet Installation				
Phase II Report	.5	-	1	.5
Phase II Total	.5	-	1	.5

## Expenditures

The wages for Ryan Monti and Shawn Rowell are calculated in as expenditures of installation because a subcontractor would have been use if one could be found to do it less expensively. For this reason all costs encountered by Ferguson, Simek, Clark for the installation of the Moisture Pins are to be considered as chargeable to the Subcontracting portion of the contract.

The actual calculation of the wages was done on an hourly basis. For both Ryan Monti and Shawn Rowell the basic hourly wage charged was \$35 per hour. The calculation was then made by multiplying the hourly rate by the length of the working day and again by the number of days.

Telephone Calls.....\$400

## Fort Rae Installation (9 days)

- Ryan Monti's Wages (7.5 hr days).....\$2,400  
 - Shawn Rowell's Wages (7.5 hr days)....\$2,400  
 - Travel Costs (truck \$50/trip).....\$450  
 - Maintenance Personal Charges.....\$500

Total \$5,750

## Aklavik Installation (7 days)

- Ryan Monti's Wages (10 hr days).....\$2,500  
 - Shawn Rowell's Wages (10 hr days).....\$2,500  
 - Travel Costs (2 return tickets).....\$1,500  
 - Food and Lodging.....\$1,500  
 - Maintenance Personal Charges.....\$500

Total \$8,500

## Cambridge Bay Installation (7 days)

- Ryan Monti's Wages (10 hr days).....\$2,500  
 - Shawn Rowell's Wages (10 hr days).....\$2,500  
 - Travel Costs (2 return tickets).....\$1,300  
 - Food and Lodging.....\$1,500  
 - Maintenance Personal Charges.....\$500

Total \$8,300

## Rankin Inlet Installation (7 days)

- Ryan Monti's Wages (10 hr days).....\$2,500  
 - Shawn Rowell's Wages (10 hr days).....\$2,500  
 - Travel Costs (2 return tickets).....\$2,200  
 - Food and Lodging.....\$1,500  
 - Maintenance Personal Charges.....\$500

Total \$9,200

PHASE III

	Dana	Ryan	Shawn	Sec.
Data Collection	-	-	1	-
- instruct Project Officers on data collection				
- collect mailed data	-	-	1	-
Phase III Report	.5	-	1	.5
Phase III Total	.5	-	3	.5

PHASE IV

Data Analysis	1	-	1	-
- Analysis of moisture contents				
Phase IV Report	.5	-	1	.5
Phase IV Total	1.5	-	2	.5

PHASE V

Wrap up, Final Report, Decommission and presentation	1	-	2	1
Phase V Total	1	-	2	1
PROJECT TOTAL MAN DAYS	4.5	-	11	3

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**BASIS OF PAYMENT**

1. Fees

Professional	Firm Per Diem	Est. # of Days	Total Fees
D. Ferguson	\$560	4.5	\$2,520
S. Rowell	\$315	11	\$3,465
R. Monti	\$490	-	000
Secretarial	\$210	3	\$630
		Fees Total	\$6,615

2. Expenses

a) Travel and Living Expenses -----

## b) Materials and Supplies

## Phase I

- Telephone Calls.....\$200

## Phase II

- Telephone Calls.....\$400

	\$600.....\$600
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## c) Other Expenses

## Phase I

- Test Boards.....\$200

- Miscellaneous.....\$500

	\$700.....\$700
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	Expenses Total \$1,300
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## 3. Subcontracts

Buchan, Lawton, Parent (fabricate moisture pins)...\$10,000

Fort Rae Installation.....\$5,750

Aklavik Installation.....\$8,500

Cambridge Bay Installation.....\$8,300

Rankin Inlet Installation.....\$9,200

	Subcontracts Total \$41,750
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	TOTAL PROJECT COST \$49,665
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SUMMARY OF EXPENSES

This is a summary of the costs encured in all three projects as written in the report.

1. FEES

Heating and Ventilation Project.....	\$34,230
NWTHC Ventilation System Project.....	\$15,505
Moisture Pin Project.....	\$6,615
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<b>Fees Total</b>	<b>\$56,350</b>

2. EXPENSES

a) Travel and Living Expenses

Heating and Ventilation Project....	\$10,000
NWTHC Ventilation System Project....	\$4,200
Moisture Pin Project.....	\$000
	-----
\$14,200.....	\$14,200

b) Materials and Telephone Calls

Heating and Ventilation Project....	\$3,700
NWTHC Ventilation System Project....	\$600
Moisture Pin Project.....	\$600
	-----
\$4,900.....	\$4,900

c) Other Expenses

Heating and Ventilation Project....	\$27,750
NWTHC Ventilation System Project....	\$5,500
Moisture Pin Project.....	\$700
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\$33,950.....	\$33,950

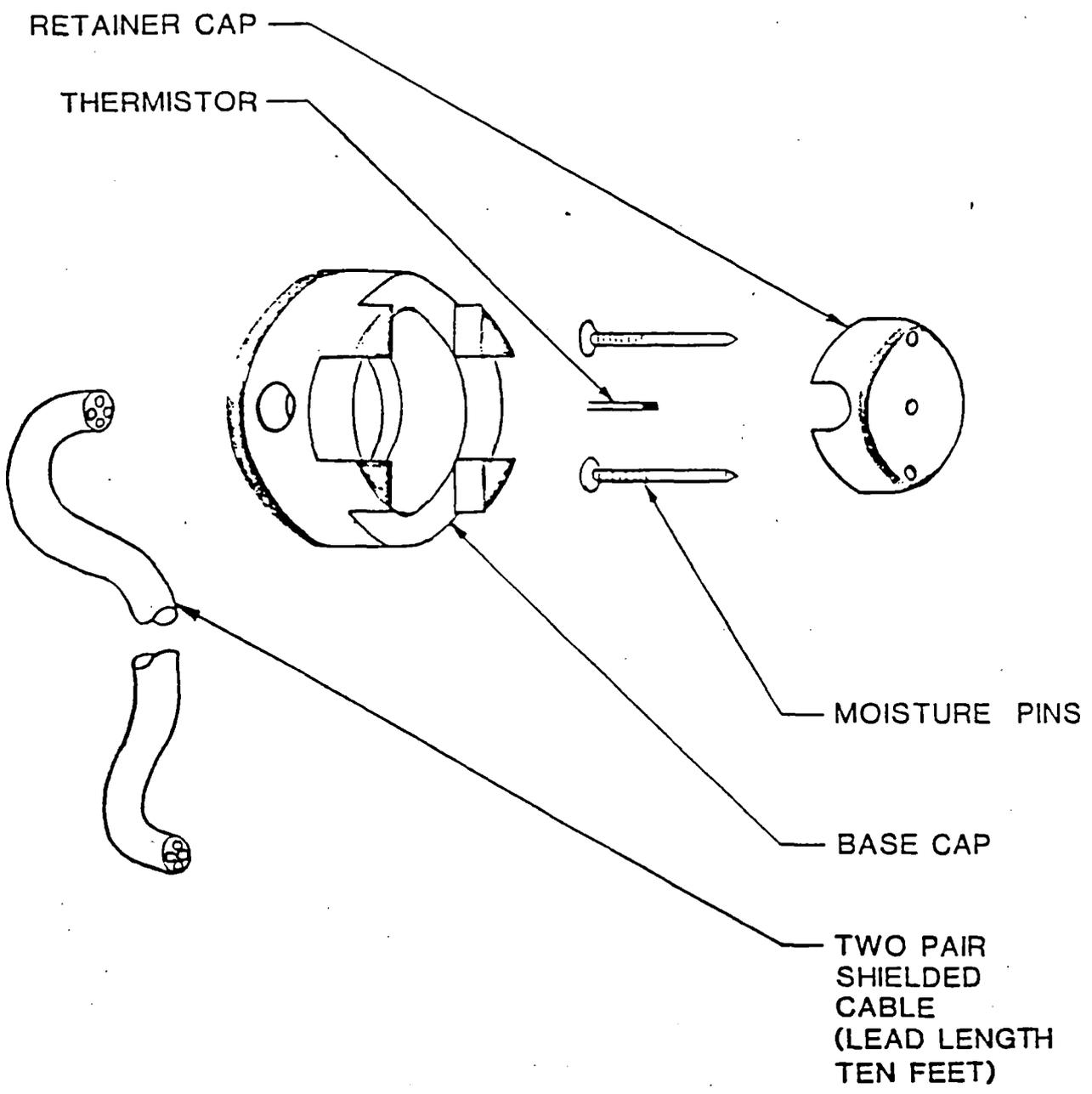
**Expenses Total \$53,050**

3. SUBCONTRACTS

Heating and Ventilation Project.....	\$34,400
NWTHC Ventilation System Project.....	\$000
Moisture Pin Project.....	\$41,750
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<b>Subcontracts Total</b>	<b>\$76,150</b>

**TOTAL COST OF CONTRACT \$185,550**  
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- APPENDIX A  
Moisture Pin Information



BLP MOISTURE SENSOR

# INSTALLATION OF THE WALL MOUNT MOISTURE SENSOR

