COPPER RIVER BASIN REGIONAL HOUSING AUTHORITY TRIP REPORT
Assessment of Mold and Moisture Conditions

Final Report

Date:
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Prepared for:
U.S. Department of Housing & Urban Development
Office of Native American Programs

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BACKGROUND INFORMATION

The CRBRHA is located near the town of Glennallen in the Copper River Valley in Alaska. The valley is at an elevation of approximately 1500 feet above sea level and is surrounded by mountains. The climate of the region can be described as very cold and dry. Mean temperatures in the winter are below 0°F with mean minimum temperatures well below zero. Summer is the warmest season, with mean temperatures in the 50’s. Average rainfall in Glennallen is only 10 inches annually, with most of this precipitation falling in the summer months.

Day 1 Sunday, February 16, 2003

The first day was a travel day to Anchorage, Alaska.

Days 2-3, February 17-18, 2003

The first two days of the Alaska trip were spent on the Kenai Peninsula of Alaska.

Day 4, Wednesday, February 19, 2003

On Wednesday morning, the assessment team met with David Nash and Robert Thorson, staff members of the HUD Alaska ONAP office. The group traveled to the Copper River Valley. Upon arrival at Glennallen in the early afternoon, the assessment team met with staff members of the housing authority. The team reviewed the possible sites selected for inspection and the proposed schedule for the site visit. In the afternoon, the team visited four properties. Each site was examined for past and current moisture and mold issues. Digital photographs were taken at each site to record conditions. The inspection process involved visual assessment of both interior and exterior conditions, moisture content readings of wood floor framing members, subfloor nail stubs or crawl spaces, measurements of floor or basement crawl spaces when applicable, and discussion with available residents. Part II, Technical Housing Assessment Report provides a detailed analysis of findings and recommendations for the properties inspected.
PART I

INTRODUCTION

Jeff Gordon from the Building Research Council (BRC) at the University of Illinois Urbana-Champaign, and Paul Knight of Magna Systems, conducted a site visit to the Copper River Basin Regional Housing Authority (CRBRHA) on February 19th and 20th, 2003. The purpose of the site visit was to provide technical assistance to the housing authority in assessing mold and moisture conditions in housing units. This is a summary report of activities of the site visit. A detailed analysis of the findings and recommendations are found in the attached report, entitled: Part II: Technical Housing Assessment Report: Examining Mold and Moisture Conditions in Copper River Basin Regional Housing Authority.

BACKGROUND INFORMATION

The CRBRHA is located near the town of Glenallen in the Copper River Valley of Alaska. The valley is at an elevation of approximately 1500 feet above sea level, and is surrounded by mountains. The climate of the region can be described as very cold and dry. Mean temperatures in the winter are below 0°F, with mean minimum temperatures well below zero. Summers are temperate, with mean temperatures in the 50’s. Average rainfall at Glenallen is only 11.2 inches annually, with most of this precipitation falling in the summer months.

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Day 4: Thursday, February 20, 2003

On Thursday morning, one unit of a newer duplex was inspected, following the same procedure as the previous day. Inspections scheduled in Gulkana were cancelled as tribal members were attending a meeting. In the afternoon, the inspection team traveled back to Anchorage, Alaska.

FINDINGS

Visible mold was found in three homes, although in two cases the mold appeared to be dormant. A wet crawl space and cold spots on the exterior wall appeared to be the cause of mold in one home, a previous plumbing leak the cause in the second home, and residual construction moisture the source in the third home.

All five properties were built over crawl spaces. Two sites had crawl spaces. Two other crawl spaces, although dry at the time of the site visit, showed signs of previous water problems.

Other principal findings from the site inspections include:

1. Site drainage was flat. Snow piles from plowing and snow sliding off roofs were found next to homes. Two crawl space spaces were wet. Signs of moisture were found in two other crawl spaces even though the crawl spaces were dry at the time of site visits.

2. Except for the new duplex, ventilation was poor with exhaust fans either not present, non-operational or barely operating. The ventilation system in the multi-family unit was not examined.

3. The heat recovery ventilation (HRV) system found in one home appeared to be well designed and functioning properly.

4. None of the houses had gutter systems; however, this is not considered a major item given that the climate is fairly dry.

5. No significant plumbing or bathroom problems were found.

6. No exterior wall/ceiling joint or attic problems were found.

These findings are discussed in more detail in the *Housing Assessment Report: Examining Mold and Moisture Conditions in Copper River Basin Regional Housing Authority.*
PART II

TECHNICAL HOUSING ASSESSMENT REPORT

EXAMINING MOLD AND MOISTURE CONDITIONS IN THE COPPER RIVER BASIN REGIONAL HOUSING AUTHORITY

Executive Summary

Introduction

Section 1: Methodology

Section 2: Copper River Basin Regional Housing Authority Housing Types

Section 3: Findings

Section 4: Technical Recommendations

Appendix A: Summary Site Visit Report

Appendix B: Housing Assessment Results
Executive Summary

Jeff Gordon, Building Research Council (BRC) staff member, and Paul Knight of Magna Systems, Inc. inspected four single-family properties and one multi-family building for mold and moisture problems for the Copper River Basin Regional Housing Authority (CRBRHA) on February 19th and 20th, 2003. They were accompanied by David Vought, Native American Program Specialist, and Randy Thorne, Grants Management Specialist; both with the HUD Office of Native American Programs in Alaska.

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Principal findings from the site inspections include:

1. Site drainage was flat. Snow piles from plowing and snow sliding off roofs were found next to homes. Two crawl spaces were wet. Signs of moisture were found in two other crawl spaces, even though the crawl spaces were dry at the time of site visits.

2. Except for the new duplex, ventilation was poor with exhaust fans either not installed, non-operational or barely operating. The ventilation in the multi-family unit was not examined.

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5. No significant plumbing or bathroom problems were found.

6. No exterior wall/ceiling joint or attic problems were found.

This report provides technical recommendations and discussions focusing on these items. Appendix A provides a summary of findings at each inspected home. Appendix B includes a detailed assessment of each home.
INTRODUCTION

Jeff Gordon and Paul Knight conducted the site visit on February 19th and 20th, 2003. HUD employees, David Vought and Randy Thorne accompanied them. The team assessed site, thermal and structural conditions contributing to mold and moisture problems of the CRBRHA. The housing authority pre-selected the houses.

The team inspected four homes and one multi-family building. Visible mold was found in three homes, although the mold was dormant in two of the homes. A wet crawl space and cold spots on the exterior wall appeared to be the cause of mold in one home, a previous plumbing leak the cause in the second home and residual construction moisture the source in the third home. Two of the five inspected crawl spaces showed signs of previous water problems.

SECTION 1 – METHODOLOGY

Visual inspection was used to assess mold and moisture conditions in the homes. The results of the mold and moisture assessments were compiled on a spreadsheet, with broad categories of common moisture problems noted. This data is presented in Appendix A of this report. Findings for individually inspected houses are presented in Appendix B.

Visual Inspection

Housing inspections consisted of visual assessment of mold and moisture conditions. Assessment forms developed for the Chicago Mold and Moisture Project (a HUD Healthy Homes Program) were used to record information. The assessment forms are organized for a room-by-room inspection. All rooms were examined for water damage and evidence of mold. Additionally the plumbing, localized ventilation, water entry and other moisture source issues were assessed in the kitchens, bathrooms, crawl spaces, utility rooms and attics.

The exterior of the houses were inspected for rainwater and snow melt management, including site grading, roof condition and gutter system.

Whenever possible, residents were interviewed to gather history on moisture problems, plumbing leaks, winter condensation, health issues, number of occupants and other useful information.

Digital photographs were taken at each house to visually record notable conditions.

Measurements

Moisture content measurements were taken where moisture was thought to be a problem (Figure 1).
Because of the storage capacity of wood, moisture content measurements provide information on foundation and basement/crawl space wetness in the recent past, perhaps three weeks to a month. Moisture content readings can range from 5%, a very dry reading to 30%, a very wet reading.

Actual ventilation rates of bathroom fans were measured with an exhaust fan flow meter. The flow meter consists of a gasketed pan that is placed tightly over an operating exhaust fan. The pan has a variable orifice and a connection for a digital manometer. The manometer measures the pressure difference between the pan and the house during fan operation. Based on the setting of the variable orifice and the measured pressure difference at the fan, the cubic feet of air per minute (CFM) exhausted by the fan is calculated.

Depressurization of the living space with respect to the crawl space was measured in one home. Depressurization is measured with a digital manometer. Windows are closed and the furnace air handler and all exhaust fans are operated. Depressurization indicates that insufficient air may be available to support combustion and venting and that crawl space air is being pulled into the home.

Temperature and relative humidity measurements were also made in each home.

SECTION 2 – HOUSE DESCRIPTIONS

Four homes of varying construction methods and ages and one multi-family building were inspected.

All inspected buildings were built over crawl spaces, with three wood foundations and the remaining two having poured concrete foundations. The foundation walls were insulated in four of the buildings. The floor above the crawl space was insulated in the fifth home. Mechanicals were located in all five crawl spaces.

Sidewalls were 2” x 6” construction in four homes. The walls and roof in the fifth home were constructed using 6” SIP’s (structural insulated panels). Windows were double-glazed. Tripe glazing was used in the SIP’s home.

Two of the single-family homes had cathedral ceilings. The other two single-family homes had attics, only one of which was accessible. The attic in the multi-family building was not examined.

A variety of heating systems were also found. One home had a propane forced air furnace with wood stove backup. Another home had an oil space heater with wood stove-backup. Oil fired boilers were used in the other two homes.
Ventilation was poor to non-existent in the single-family homes. One bathroom exhaust fan was barely operable. Only two kitchen fans were vented to the outside. A heat recovery ventilator (HRV) was used in the SIP’s home. Ventilation in the multi-family building was not examined.

SECTION 3 – FINDINGS

3.1 Site Drainage

Site drainage was flat. Snow piles from plowing and snow sliding off roofs were found next to homes (Figures 2 & 3). Resulting snowmelt and rainwater could drain into the crawl spaces.

Standing water was found in one crawl space. The inside surface of the crawl space sheathing in two of the three homes with wood foundations was wet (Figure 4). One of the wood foundations was not insulated. Condensation was found in the second home when the R19 fiberglass batt insulation was pulled-back from the sheathing.

Both homes with poured concrete had dry crawl spaces at the time of the visit, but both showed signs of having previously been wet. Gypsum board covering foam insulation in one house exhibited signs of dormant mold (Figure 5). Both the gypsum board and crawl space were dry at the time of the visit. It is presumed that residual construction moisture from the concrete footings was drawn-up onto the paper facing of the gypsum board. Plant life was found in the crawl space of the multi-family building (Figure 6) though the crawl space was dry during the site visit.
3.2 Ventilation

Except for one house, ventilation was poor to non-existent. A summary of the ventilation found in three homes is shown in Table 1. The ventilation system in the multi-family building was not examined. Ventilation for house 2-1 is excluded from the table and is discussed in Section 3.3.

<table>
<thead>
<tr>
<th>House Number</th>
<th>Bathroom</th>
<th>Kitchen</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1</td>
<td>No fan</td>
<td>No fan</td>
</tr>
<tr>
<td>1-2</td>
<td>No fan</td>
<td>Fan vented through roof vent</td>
</tr>
<tr>
<td>1-3</td>
<td>14 CFM</td>
<td>Non-operational</td>
</tr>
</tbody>
</table>

Two homes had dryers with plastic ribbed venting through the crawl space to the outside. Sags and numerous bends were observed in these vents (Figure 7). The effectiveness of the dryers was compromised, given the condition and length of the dryer vents observed.

3.3 Heat Recovery Ventilation System

One house included the installation of an HRV system (Figure 8). Supply air was provided to the bedrooms and living room. Exhaust air was drawn from the bathroom and kitchen. An override switch in the bathroom is used for increased exhaust ventilation during...
showering (Figure 9). A separate kitchen exhaust fan was also provided. Ductwork for the system is contained in the conditioned attic space.

Even though the home was unoccupied during the site visit, the air quality in the home felt good and had a fresh smell to it. The system appears to be well designed and operating properly.

3.4 Gutter System

None of the inspected homes had gutter systems. Consequently, snowmelt and rainwater from the roof collect around the perimeter of the homes and was compounded by the poor site drainage around the homes.

CRBRHA is located in a fairly dry climate with an annual equivalent rainfall to just over 11". By contrast, Anchorage is 16", Juneau is 58" and Chicago is 38".

A gutter system is not recommended. It is felt that improved site drainage would be more beneficial than gutter systems.

3.5 Plumbing and Bathroom Problems

No significant plumbing or bathroom problems were found. There was water damage adjacent to the one bathtub that may have been caused by splash from the shower (Figure 10).

3.6 Exterior Wall Ceiling Joint/Attic Problems

It is not uncommon to find mold growth at the joint between the exterior wall and ceiling in a cold climate. Insufficient insulation over the top plate or wind blowing through soffit vents can cause cold spots at this location and foster mold growth. This condition was not found at CRBRHA.

Only one attic was inspected at CRBRHA. There were numerous gaps between the insulation batts. The gaps could cause cold spots on the ceiling surface resulting in mold growth or sooting (Figure 11).
SECTION 4 – TECHNICAL RECOMMENDATIONS

The following recommendations are based on the site visit findings.

4.1 Site Drainage

Site drainage could be improved at most of the inspected homes.

- Fill in holes and dips adjacent to foundations to divert water away from the foundation. This is especially critical for those homes with wood foundations.

- Where possible, modify site grading to direct rainwater/snow melt away from the home. Avoid plowing snow into piles adjacent to homes. It is unavoidable to have snowfall from the steeply pitched roofs collect in piles adjacent to homes. However, positive site drainage away from the home should direct snowmelt away from the foundations.

4.2 Bathroom and Kitchen Exhaust Fans/Dryer Vents

Bathrooms and kitchens generate large amounts of water. Properly operating exhaust fans remove moisture from these spaces. Recommendations for bathrooms include:

- Install bathroom exhaust fans where none are present and replace original exhaust fans. New bathroom fans should have sone ratings no higher than 1.5. Low-sone fans include Broan Solitaire and Panasonic WhisperCeiling and WhisperLite series. Low-sone fans generally cost between $75 and $100 (Figure 12).

- In some cases, a through the wall exhaust fan may be appropriate. One such fan is the Panasonic WhisperWall unit (70 CFM, 1.1 sones).

- Install/replace existing bathroom light/fan switch with a fan delay timer. The fan delay timer is a two-function switch that is typically wired to a fan and a light. When the switch is turned on, both the light and exhaust fan are turned on. When the switch is turned off, the light is turned off but the fan continues to operate for an extended period of time. The extended period of time can be adjusted from 1 to 60 minutes. Fan delay timers are about $35.00. A timer switch should be used when separate switches operate the fan and light.

1 – Sone is a rating for sound. The lower the sone rating, the quieter the fan and the more likely it will be used by the occupants. Standard bathroom exhaust fans have sone ratings between 3.5 and 5.0.
• Inspect all bathroom and kitchen exhaust fan ducts. Ensure that exhaust ducts are properly attached and sealed to the exhaust fan housing. All ducts should terminate outside the house and not below roof vents.

Recommendations for kitchens include:

• Replace inoperable kitchen exhaust fans or install where non-existent. Kitchen exhaust fans should be rated at 150 CFM and should be vented to the exterior. Under no circumstance should the replacement fans be recirculating. Kitchen fans generally do not have sone ratings. However the Broan Allure series has sone ratings ranging from 0.4 to 1.5.

Dryer vents should be inspected on a regular basis to assure proper connections. Dips, sags and excessive duct lengths should be corrected. When the existing ribbed vents requirement replacement, the following criteria should be considered:

• Use aluminum or galvanized sheet metal rather than plastic ribbed vents.

• Aluminum flex duct (UL labeled “Clothes Dryer Transition Duct”) can be used for up to 8’ to make a transition.

• Use high quality foil tape or approved clamps.

• Do not use duct tape or screws or rivets.

• Utilize a vent cap with a back draft damper.

• Do not use a metal cage on the vent cap as this can become clogged with lint.

• Avoid sharp bends in the duct, especially behind the dryer.

4.3 Heat Recovery Ventilation (HRV)

The design and installation of the HRV at one home appeared to be well installed and functioning properly, thus should be used as a model where future HRV’s are planned.

4.4 Plumbing and Bathroom Problems

No significant plumbing or bathroom problems were found. Water damage to a wall was found in one house behind the toilet and adjacent to the tub. Occupants should be encouraged to immediately report plumbing problems to avoid damage and potential mold growth.
4.5 Exterior Wall/Ceiling Joints and Attic Problems

No exterior wall/ceiling joint or attic problems were found. However, a cold spot on one exterior wall was supporting mold growth. An infrared sensor was used to measure the surface temperature. The temperature was 11°F cooler than surrounding surfaces caused by lack of wall insulation or airflow within the wall cavity. Likewise, soot stains on the ceiling in one house may also be caused by gaps between the fiberglass batt attic insulation.

It is recommended that the CRBRHA investigate the purchase of an infrared sensor to determine if cold surface temperatures may be contributing to mold and soot stains found in their homes.
## Appendix A: SITE:Copper River

### Summary Site Visit Report

**DATE:** February 19, 2003

<table>
<thead>
<tr>
<th>Inspection Number</th>
<th>Address</th>
<th>HUD Program</th>
<th>Building Age</th>
<th>Foundation Type</th>
<th>Model and Framing Type</th>
<th>Heat Type</th>
<th>Site Drainage Problems</th>
<th>Gutter System Problems</th>
<th>Leaks from Exterior</th>
<th>Wet Basement or Crawl Space Problems</th>
<th>Plumbing Problems</th>
<th>Bathroom Problems</th>
<th>Exhaust Ventilation</th>
<th>Exterior wall/ceiling problems</th>
<th>Attic Problems</th>
<th>Visible Mold</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1</td>
<td>Unknown</td>
<td>BIA</td>
<td>4</td>
<td>Crawl Space</td>
<td>Ranch; 2&quot;x6&quot; wood frame</td>
<td>Propane Forced Air/Wood Stove</td>
<td>Yes</td>
<td>No Gutters</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Not accessible</td>
<td>16</td>
</tr>
<tr>
<td>1-2</td>
<td>Unknown</td>
<td>BIA</td>
<td>18</td>
<td>Unoccupied</td>
<td>Crawl Space Ranch; 2&quot;x6&quot; wood frame</td>
<td>Oil Space Heater/Wood Stove</td>
<td>Yes</td>
<td>No Gutters</td>
<td>No</td>
<td>No</td>
<td>Yes, but inactive</td>
<td>No</td>
<td>Yes</td>
<td>Kitchen - Y</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>1-3</td>
<td>#24</td>
<td>MH</td>
<td>20</td>
<td>Unknown</td>
<td>Crawl Space One and one half story; 2&quot;x6&quot; wood frame</td>
<td>Oil Boiler</td>
<td>Yes</td>
<td>No Gutters</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Kitchen - Not functional Bathroom - Y</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>1-4</td>
<td>Unknown</td>
<td>None</td>
<td>About 25 years old</td>
<td>Unknown</td>
<td>Crawl Space Poured Concrete</td>
<td>Ranch</td>
<td>Unknown</td>
<td>Yes</td>
<td>No Gutters</td>
<td>Not examined</td>
<td>Yes, previously but currently dry</td>
<td>Not Examined</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>2-1</td>
<td>#21</td>
<td>LR</td>
<td>3</td>
<td>Unoccupied</td>
<td>Crawl Space Poured Concrete</td>
<td>One story duplex; 6&quot; SIPs</td>
<td>Oil Boiler</td>
<td>Yes</td>
<td>No Gutters</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>HRV</td>
<td>No</td>
</tr>
</tbody>
</table>

* Structural Insulated Panels
Inspection Number: 1-1
Address: Unknown
Age: 4 years
House Type: One story
Bedrooms: 1
Foundation: Crawl space/wood foundation
Heat Type: Propane FA w/wood stove back-up
Construction: 2" x 6" wood frame

Mold and Moisture Conditions: Mold was found on windows and on the walls in the bedroom and furnace room (Figures 2 - 4). Standing water was found in the crawl space. Ice crystals were found on the interior side of the crawl space sheathing.

At the time of inspection, the mold location in the bedroom was not overly wet. The moisture content of the wood baseboard measured 14% and the mold was dry.

There was a noticeable surface temperature depression at the mold site (measured with an infrared sensor). Surface temperature on top of the wall measured 70°F whereas surface temperature at the mold site was 59°F, indicating an insulation or airflow problem. Other exterior cavities were checked and did not show similar temperature stratification.

Rainwater/Snow Melt Management: Site grading around the home was flat. Snowdrifts were present around the home. There was no gutter system.
Crawl Space: The crawl space was enclosed with uninsulated wood sheathing. Ice crystals were found on the sheathing (Figure 5). There was no ground cover and standing water was visible on the ground. Insulated heating ducts were located in the crawl space. The ducts were resting on the ground rather than attached to the floor system above (Figure 6). The floor above the crawl space was insulated and covered with oriented strand board sheathing. The crawl space could contribute to the moisture load within the home. A pressure measurement was made in the house with respect to the crawl space. Without the furnace air handler operating, there was no pressure difference between the house and crawl space. However, the house measured -3.8 pascals with respect to the crawl space with the furnace air handler operating. In other words, the house was under a negative pressure with respect to the crawl space when the furnace was operation. Moisture laden air from the crawl space could move into the home. Ducts lying on the ground and possibly leaking could compound this problem.

Bathroom/Kitchen: There were no exhaust fans in the home.

Attic: The attic was not accessible.

Occupant Notes: The occupant was not home, but we spoke to the occupant’s daughter who lived next door. She indicated that mold was present in the bedroom when they moved in, due possibly to construction moisture or rain damage during construction. However, the depressed surface temperature at the mold site may have allowed the mold to actively grow during periods of high interior relative humidity. The occupant apparently frequently boiled game and fish, releasing a lot of moisture into the house. The bed covered the heat register in the room with the mold problem.
Inspection Number: 1-2
Address: Unknown
Age: 18 years
House Type: Ranch
Bedrooms: 2
Foundation: Crawl space/wood foundation
Heat Type: Oil space heater/wood stove backup
Construction: 2” x 6” wood frame

Mold and Moisture Conditions: Inactive mold was found within a plumbing wall that was open (Figure 2). Soot stains were visible on the ceiling (Figure 3). The house had a distinctive smell of oil. The house was dry at 29% RH at 62°F.

Rainwater/Snow Melt Management: Site grading around the home was flat. There was no gutter system.

Crawl Space: The crawl space had wood sheathing and was insulated with R11 fiberglass and 1” of extruded polystyrene insulation. A ground cover was present. The crawl space was dry.

Bathroom/Kitchen: There was no exhaust fan in the bathroom. Although the kitchen fan vented out, the duct terminated just below a roof vent (Figure 4). A washer was present,
but there was no dryer indicating that clothes may have been dried indoors, releasing a lot of moisture into the home.

**Attic:** The attic was insulated to R38 with fiberglass batts. The insulation was uneven with gaps between the batts. The condition of the attic insulation may create cold spots on the ceiling resulting in the soot stains. A large bypass (opening) was found around the water heater vent into the attic. Bypasses allow warm moist air to move-up into a cold attic. Energy is lost and moisture condensation may occur on the roof sheathing. The attic is well vented with roof vents connected to the outside (Figure 5).

**Occupant Notes:** The home was unoccupied at the time of the site visit.

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**Figure 5 – Attic insulation with roof vents in background.**
Inspection Number: 1-3  
Address: #24  
Age: 20 years  
House Type: 1-1/2 stories  
Bedrooms: 2  
Foundation: Crawl space/wood foundation  
Heat Type: Oil boiler w/ hot water storage tank  
Construction: 2” x 6” wood frame

Mold and Moisture Conditions: No mold was found in the home. The crawl space sheathing was wet. A plumbing problem adjacent to the bathtub had caused some wall deterioration (Figure 2). It could not be determined if water damage was present in the wall cavity.

Rainwater/Snow Melt Management: Site grading around the home was flat. Snowdrifts were present around the home. There was no gutter system.

Crawl Space: The crawl space walls were wood and insulated with R19 fiberglass batts. The sheathing was wet when the batts were pulled-back (Figure 3). There was no ground cover and no standing water was visible on the floor of the crawl space.

Bathroom/Kitchen: Although rated at 60 CFM, the bathroom exhaust fan only measured 14 CFM. The kitchen fan vented to the outside, but was non-operational. The dryer is vented to the outside. However the dryer vent is probably not effective given the length and circuitous route of the duct through the crawl space (Figure 4). The house measured 30% RH at 72° F.
The floor between the bathroom and utility room was structurally unsafe. Compromised structural floor members appeared to be a result of mechanical installations rather than water damage.

**Attic:** The main body of the second floor of the house had cathedral ceilings. Access to the area behind the knee walls could not be found.

**Occupant Notes:** The occupants were not home during the site visit.
Mold and Moisture Conditions: There were no reported mold or moisture problems in this building. However, the CRBRHA requested that the BRC inspection team look at the crawl space for the building.

Rainwater/Snow Melt Management: Site drainage around the building was flat. There was no gutter system. Snow from plowing was found adjacent to the building (Figure 2).

Crawl Space: The crawl space foundation walls were insulated and a ground cover was present. Although the crawl space was dry, there was evidence that water does get into the crawl space as evidenced by some plant life growing adjacent to the foundation wall (Figure 3). The lobby of the crawl space measured 32% RH and 70°F.
Appendix B, Copper River Basin RHA’s Technical Housing Assessment Report

Inspection Number: 2-1
Address: #21
Age: 3 years
House Type: One story Duplex
Bedrooms: 2 units
Foundation: Crawl space/poured concrete
Heat Type: Oil boiler w/ hot water storage tank
Construction: 6” Structural Insulated Panels (SIPS)

Mold and Moisture Conditions: The home was part of a duplex. The walls and roof were 6” SIP panels. Windows were triple glazed. A heat recovery ventilation system was used in the home. The home was unoccupied at the time of the visit. Signs of mold growth were found in the crawl space. The floor plan was well designed with all closets located on the interior walls.

Rainwater/Snow Melt Management: Site grading around the home was flat. Snowdrifts were present around the home. There was no gutter system.

Crawl Space: The concrete foundation walls were insulated with 1½” extruded polystyrene insulation. The insulation was covered with ½” gypsum board, presumably as fire protection. The ground cover was still in a box in the crawl space. The floor of the crawl space was dry (Figure 2).

There was mold growth at the base of the gypsum board where it was in contact with the footing (Figure 3). The mold growth was more prevalent under the artic entry. The mold seemed to be dormant – the gypsum board was solid. It was speculated that the mold was caused by residual construction moisture from the concrete footings that eventually dried.

1 – Structural Insulated Panels
Bathroom/Kitchen: The kitchen fan vented to the outside. A heat recovery ventilation system was present in the home (Figure 4). The air supplied to the bedrooms and living room exhausted from the bathroom and kitchen. An override switch in the bathroom increased the exhaust capacity during showering.

Attic: The roof was constructed with SIP’s panels. Most of the house had a cathedral ceiling. A small attic was located above the hallway. This attic space was conditioned as a result of the SIP’s roof panels and housed the ductwork for the heat recovery ventilation system.

Occupant Notes: The home was not occupied during the inspection. The house measured 32% RH and 70°F.