Risk Assessment of Housing Related Hazards: Linking Deficiencies to Hazards to Outcomes

Hector E. Moreno

June 15-16, 2017 | Springfield, MA
### Overview Risk Management Process

<table>
<thead>
<tr>
<th>Step</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspecting the dwelling</td>
</tr>
<tr>
<td>Linking deficiencies to hazards</td>
</tr>
<tr>
<td>Scoring the hazards</td>
</tr>
<tr>
<td>Determining the appropriate Action</td>
</tr>
</tbody>
</table>
What is Risk?

1. Product of the probability of a hazard resulting in an adverse event times severity of the event.
2. Experience and knowledge helps you in better estimating risks (intuition, gut instinct, etc.)

What is Risk Management?

1. The identification, assessment and prioritization of risks
2. Followed by coordinated and economical application of resources to minimize, monitor and control the probability and/or impact of unfortunate events
What is Risk Management?

- In Risk Assessment, you identify the potential risks, then you assess them so that you know which of the identified risks are more critical and which are less.
- Based on that assessment you give more priority to some risks and less to others.
- You cannot address all risks since you have limited resources.
- With the prioritization you put your funding on the high priority risks.
- The goal is to minimize the impact of risks, monitor them and keep them under control.

Identification of Risks

Risk Assessment

Prioritization of Risks

Minimize

Monitor

Control

Probability and/or impact of unfortunate events.

Resources
Benefits of the Risk Management Process

• Better decision making through a good understanding of risks and their impact.
• Fewer un-welcome surprises
• Effective use of resources
• Saves costs and time
• Reassures stakeholders

Steps of the Risk Management Process

• Plan Risk Management
• Identify Risks
• Analyze Risks
• Plan Risk Responses
• Monitor and Control Risks
Steps of the Risk Management Process

1. **Plan Risk Management** – Management intent, systems and procedures required for managing risks.
2. **Identify Risks** – Identify potential risks, root cause, and risk consequences. Prepare list of all of them.
3. **Analyze Risks** – Determine high, medium and low priority risks. Qualitative Risk Analysis is quick, easy to perform, and subjective. (Probability x Impact = Risk score)
4. **Plan Risk Responses** – Attempt to reduce the impact (harms) and probability of something bad happening. (M. E. A. A. T.)
5. **Monitor and Control Risks** – Unexpected risks, QC Audits
Risk Response Plan - M. E. A. A. T.

1. **Mitigate** – Reduce the risk. Tweak the situation in order to reduce the hazard making the situation safer. (Encapsulation lead surfaces, asbestos)

2. **Eliminate** – Eliminate the risk. Hazard remediation.

3. **Accept** – Accept the risk means that the probability or severity of the risk associated to a hazard is low enough that we will do nothing about it, unless it occurs.

4. **Avoidance** – Avoid the risk. Completely eliminate the possibility of risk. (Deferred, walk away, closeout, subcontract, awareness, etc.)

5. **Transfer** – Transfer or share the risk. Someone else takes the risk. (Insurance, landlord, form a team, etc.)
The goal of asbestos disease prevention is to limit exposure.

What to do with asbestos?
What to do with Asbestos
What to do with Asbestos
Simple Tools for Risk Management

1. Hazard recognition
   • Know what to look for!
   • What’s going to go wrong with this house?
   • “Just happy thoughts and all is going to be OK”...No! It won’t!!!
   • “The power of Positive thinking,” ...It doesn’t work! Better still: The power of **Negative** thinking!!

2. Anticipate change / Expect change
   • Things, situations are always changing when in a home.
   • Have a plan for when things start going sideways.

3. Know your limitations
   • “Do I actually know what I’m doing? If the answer is no, bring an expert in.
Overview Risk Management Process

Inspecting the dwelling

Linking deficiencies to hazards

Scoring the hazards

Determining the appropriate Action
Review of occupants

- Don’t consider just the current occupants; consider the vulnerable populations.
- Make the dwelling as safe and healthy as possible for all potential occupants.
- Consider current occupants when determining actions to take.
How is the Assessment Done? Identifying Hazards

1. Perform site visit/walk-through
2. Assess each deficiency, dwelling as a whole, surrounding spaces - **Comprehensive Assessment**
3. Performs building diagnostics & safety tests
5. **Scope of Work** - Records & reports findings & concerns and specifies corrective actions -
Damp and Mold growth
Caused by dust mites, mold or fungal growth caused by dampness and/or high humidity. It includes threats to mental health and social wellbeing caused by living with damp, damp staining and/or mold growth.
**Most vulnerable:**
14 years or less

2. Excess cold
Caused by excessively cold indoor temperatures.

6. Carbon monoxide and smoke
For CO - 65 years plus; for NO2, SO2 & smoke - no specific group

5. Biocides
Threats to health from those chemicals used to treat timber and mold growth in dwelling. While biocides include insecticides and rodenticides to control pest infestations (e.g. cockroaches or rats and mice), these are not considered for the purposes of the HHRT.
**Most vulnerable:**
6 years or younger

7. Lead
Ingestion from lead-paint dust, debris or leaded water pipes.
**Most vulnerable:**
No Specific Group

8. Radiation
This category covers the threats to health from radon gas and its daughters, primarily airborne, but also radon dissolved in water.
**Most vulnerable:**
No Specific Group

10. Volatile Organic Compounds
Volatile organic compounds (VOCs) are a diverse group of organic chemicals which includes formaldehyde, that are gaseous at room temperature, and are found in a wide variety of materials in the home.
**Most vulnerable:**
No Specific Group

11. Crowding and Space
This category covers hazards associated with lack of space within the dwelling for living, sleeping and normal daily activities.
**Most vulnerable:**
No Specific Group

14. Noise
Covers threats to physical and mental health resulting from exposure to noise inside the dwelling or within its curtilage.
**Most vulnerable:**
No Specific Group
3. Excess heat
Caused by excessively high indoor air temperatures.
Most vulnerable: 65 years or older

4. Asbestos, Silica and other MMF
Caused by excessive levels of silica, asbestos and man-made mineral fibers (MMF).

The Effect of the Defect

Housing Hazards as Identified in the Healthy Home Rating Tool

Entry by Intruders
Difficulties in keeping a dwelling secure against unauthorized entry and the maintenance of defensible space.
Most vulnerable: No Specific Group

Lighting
This category covers the threats to physical and mental health
Most vulnerable: No Specific Group
## What are the 29 Hazards?

<table>
<thead>
<tr>
<th>Physiological</th>
<th>Psychological</th>
<th>Infection</th>
<th>Safety</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Biocides</td>
<td></td>
<td></td>
<td>23. Electrical hazards</td>
</tr>
<tr>
<td>7. Lead-based paint</td>
<td></td>
<td></td>
<td>25. Hot surfaces etc.</td>
</tr>
<tr>
<td>9. Uncombusted fuel</td>
<td></td>
<td></td>
<td>27. Ergonomics</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>29. Structural collapse</td>
</tr>
</tbody>
</table>
Overview Risk Management Process

Inspecting the dwelling

Linking deficiencies to hazards

Scoring the hazards

Determining the appropriate Action
Definitions

**Element** - Part of a dwelling (wall, window, staircase, etc.)
Definitions

**Ideal** - The standard for the element that is intended to prevent, avoid or minimize a hazard.

**Deficiency** - A failure of an element to meet the ideal

For the GHHI the most important factor is whether the deficiency could result in a hazard over the next 12 months.
Definitions

Ideal - The standard for the element that is intended to prevent, avoid or minimize a hazard.

Deficiency - A failure of an element to meet the ideal
Hot Water Systems
Definitions

**Ideal** - The standard for the element that is intended to prevent, avoid or minimize a hazard.

**Deficiency** - A failure of an element to meet the ideal
Avoiding Slip and Fall Injuries
Definitions

1. **Deficiency** - A failure of an element to meet the ideal

2. **Hazard** - The risk of harm that arises from a deficiency in the element.

3. **Risk** - product of the probability of a hazard resulting in an adverse event times severity of the event.

For the GHHI the most important factor is whether the deficiency could result in a hazard over the next 12 months.
How is the Assessment Done?

Identifying Hazards

So, how do we know whether or not a deficiency is connected to one or more hazards?

1. Understanding of the functions and workings
   Requiring understanding the function of each **element** of the unit. (**The ideal**)
   - Appliances (boilers, furnaces, water heaters, AC, stoves, refrigerators, etc.) and
   - House components (roof, foundation, chimneys, etc.)

2. Ability to assess or test whether the **deficiency** will cause a hazard.

3. Requiring knowledge on how to measure parameters such as combustion gases, moisture, radon, lead paint, etc.
1. When an assessor finds a hazard, two key tests are applied:

2. What is the **likelihood** of a dangerous occurrence as a result of this hazard and

3. If there is such an occurrence, what would be the likely **outcome**
Classes of Harms (Outcomes)

- **Class I, Extreme**: death, lung cancer, coma, major burn injuries
- **Class II, Severe**: asthma, lead poisoning, loss of a hand or foot, serious fractures
- **Class III, Serious**: eye disorders, sleep disturbance, mild heart attack, concussion
- **Class IV, Moderate**: severe discomfort, occasional mild pneumonia, broken finger, severe bruising to body, regular serious coughs or colds
Element - Stairs

Is there a hazard?
What is the likelihood of a dangerous occurrence?
What is the likely outcome?

Ideal

Deficiency
Element - Window

Is there a hazard?

What is the likelihood of a dangerous occurrence?

What is the likely outcome?
Element – Floor tiles

Is there a hazard?
What is the likelihood of a dangerous occurrence?
What is the likely outcome?
Single Deficiency and many hazards

1. A single deficiency may contribute to:
2. Hazards of differing degrees and,
3. More than one hazard
4. Example: A single deficiency such as a broken water pipe could lead to other hazards.
Single Deficiency and many hazards

Is there a hazard?
What is the likelihood of a dangerous occurrence?
What is the likely outcome?
Many deficiencies and single hazard

1. Several deficiencies may contribute to the same hazard.
2. Example: Disrepair of gutters and downspouts, porous foundation walls, water leaks into basement all contribute to the hazard of mold.
Similar deficiency throughout

May be similar deficiencies in various locations in dwelling – all contribute to the same hazard.
Similar deficiency throughout
Overview Risk Management Process
Inspecting the dwelling
Linking deficiencies to hazards
Scoring the hazards
Determining the appropriate Action
HUD’s Healthy Homes Rating System (HHRS)

1. Risk Assessment Process to analyze and prioritize health hazards in the home
2. Hazards are rated according to how serious they are to health - their potential to harm residents
3. The HHRS enables those risks to be removed or minimized
4. Focuses on the risk to health and safety, rather than cosmetic or physical conditions
5. Do not focus on the current occupants; consider the most vulnerable population
The HHRS formula

Three figures used to generate the hazard score:
1. **Likelihood** of the hazards will harm someone
2. **Possible harm** from the hazard
3. **Weighting** for each class of harm

\[
(Likelihood) \times (Spread\ of\ Harms) \times (Weight\ of\ Harm) = Score
\]

The inspector considers **likelihood** and **possible harm**
Two judgments by assessor

HHRS requires the assessor to make 2 judgements for each hazard:

1. The likelihood, over the 12 months, that the hazard could harm a member of the vulnerable group
2. The potential harm outcomes if there is harm
First judgment: Likelihood

1. Assessor judges the likelihood, over **next 12 months**, that a hazard could harm a member of the **vulnerable group**

2. Judgment limited to likelihood of hazard causing **harm requiring medical attention**

3. Inspector is not expected to give an exact likelihood ratio, but to select one of the standard HHRS likelihood ranges.

<table>
<thead>
<tr>
<th>How likely is the hazard to result in harm? Ones in......</th>
</tr>
</thead>
<tbody>
<tr>
<td>5600</td>
</tr>
</tbody>
</table>

**Assessor makes a judgment about likelihood of the occurrence over the next 12 months**
Likelihood numbers

1. **Hazard profiles** give national UK average likelihoods for vulnerable age groups

2. Only assess hazards that presently cause, or are likely to cause harm, over next 12 months.

3. The UK likelihoods are **only a reference**

---

<table>
<thead>
<tr>
<th>Dwelling type &amp; age</th>
<th>Average likelihood 1 in</th>
<th>Average HHSRS scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Houses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre 1920</td>
<td>218</td>
<td>170 (F)</td>
</tr>
<tr>
<td>1920-45</td>
<td>226</td>
<td>156 (F)</td>
</tr>
<tr>
<td>1946-79</td>
<td>256</td>
<td>116 (F)</td>
</tr>
<tr>
<td>Post 1979</td>
<td>256</td>
<td>112 (F)</td>
</tr>
<tr>
<td>Apts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre 1920</td>
<td>214</td>
<td>249 (E)</td>
</tr>
<tr>
<td>1920-45</td>
<td>263</td>
<td>97 (G)</td>
</tr>
<tr>
<td>1946-79</td>
<td>410</td>
<td>96 (G)</td>
</tr>
<tr>
<td>Post 1979</td>
<td>409</td>
<td>92 (G)</td>
</tr>
<tr>
<td>All</td>
<td>245</td>
<td>134 (F)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Class 1</th>
<th>Class II</th>
<th>Class III</th>
<th>Class IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
</tbody>
</table>

*Spread of health outcomes for falling on stairs: Average likelihood and health outcomes for all persons aged 60 years and over, 1997-1999.*
Is there a hazard?  
What is the likelihood of a dangerous occurrence?  
What is the likely outcome?  

**Deficiency ➔ Hazard ➔ Risk**
Second Judgment: Spread of Harms

Deficiency $\rightarrow$ Hazard $\rightarrow$ Risk

(Likelihood) x (Spread of Harms) x (Weight of Harm) = Score

After the likelihood of an occurrence, the inspector makes a second judgment: that of the possible harm outcomes for the vulnerable age group that could result from such an occurrence

This is done by assessing the range of outcomes, under the four (4) classes of harms:

<table>
<thead>
<tr>
<th>Class of Harm</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>I  Extreme</td>
<td>10,000</td>
</tr>
<tr>
<td>II Severe</td>
<td>1,000</td>
</tr>
<tr>
<td>III Serious</td>
<td>300</td>
</tr>
<tr>
<td>IV Moderate</td>
<td>10</td>
</tr>
</tbody>
</table>
Classes of Harms

(Likelihood) x (Spread of Harms) x (Weight of Harm) = Score

- **Class I, Extreme**: death, lung cancer, coma, major burn injuries
- **Class II, Severe**: asthma, lead poisoning, loss of a hand or foot, serious fractures
- **Class III, Serious**: eye disorders, sleep disturbance, mild heart attack, concussion
- **Class IV, Moderate**: severe discomfort, occasional mild pneumonia, broken finger, severe bruising to body, regular serious coughs or colds
HHRS Bands: Hazard Score Range

(Likelihood) x (Spread of Harms) x (Weight of Harm) = Score

The Hazard Score – It is a numerical representation of the degree of risk represented by a hazard.

<table>
<thead>
<tr>
<th>Band</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>5,000 or more</td>
</tr>
<tr>
<td>B</td>
<td>2,000 to 4,999</td>
</tr>
<tr>
<td>C</td>
<td>1,000 to 1,999</td>
</tr>
<tr>
<td>D</td>
<td>500 to 999</td>
</tr>
<tr>
<td>E</td>
<td>200 to 499</td>
</tr>
<tr>
<td>F</td>
<td>100 to 199</td>
</tr>
<tr>
<td>G</td>
<td>50 to 99</td>
</tr>
<tr>
<td>H</td>
<td>20 to 49</td>
</tr>
<tr>
<td>I</td>
<td>10 to 19</td>
</tr>
<tr>
<td>J</td>
<td>9 or less</td>
</tr>
</tbody>
</table>
2) HAZARD & No:  Damp, Mold

<table>
<thead>
<tr>
<th>LIKELIHOOD</th>
<th>3000</th>
<th>2400</th>
<th>1800</th>
<th>1200</th>
<th>900</th>
<th>600</th>
<th>300</th>
<th>180</th>
<th>10</th>
<th>6</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;4200</td>
<td>2400</td>
<td>1800</td>
<td>1300</td>
<td>1000</td>
<td>750</td>
<td>500</td>
<td>320</td>
<td>180</td>
<td>10</td>
<td>6</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Justification
Presence of mold and water leaks and no venting of bathrooms make conditions ideal for an increase on asthma attacks.

<table>
<thead>
<tr>
<th>OUTCOMES</th>
<th>Class I</th>
<th>Class II</th>
<th>Class III</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.1</td>
<td>0.2</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Justification
High moisture levels + presence of small levels of mold may increase incidence of asthma attacks on vulnerable population.

<table>
<thead>
<tr>
<th>RATING</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;5000</td>
<td>2000</td>
<td>1000</td>
<td>500</td>
<td>200</td>
<td>100</td>
<td>50</td>
<td>20</td>
<td>10</td>
<td>0</td>
</tr>
</tbody>
</table>

Score (if calculated) 535.5
• What’s the defect?
• What is (are) the hazard (s)?
• Likelihood of harm?
• Spread of Harm?

- **Class I, Extreme**: death, lung cancer, coma, major burn injuries
- **Class II, Severe**: asthma, lead poisoning, loss of a hand or foot, serious fractures
- **Class III, Serious**: eye disorders, sleep disturbance, mild heart attack, concussion
- **Class IV, Moderate**: severe discomfort, occasional mild pneumonia, broken finger, severe bruising to body, regular serious coughs or colds
• What’s the defect?
• What is (are) the hazard (s)?
• Likelihood of harm?
• Spread of Harm?

• **Class I, Extreme:** death, lung cancer, coma, major burn injuries
• **Class II, Severe:** asthma, lead poisoning, loss of a hand or foot, serious fractures
• **Class III, Serious:** eye disorders, sleep disturbance, mild heart attack, concussion
• **Class IV, Moderate:** severe discomfort, occasional mild pneumonia, broken finger, severe bruising to body, regular serious coughs or colds
• What’s the defect?
• What is (are) the hazard (s)?
• Likelihood of harm?
• Spread of Harm?

• **Class I, Extreme**: death, lung cancer, coma, major burn injuries
• **Class II, Severe**: asthma, lead poisoning, loss of a hand or foot, serious fractures
• **Class III, Serious**: eye disorders, sleep disturbance, mild heart attack, concussion
• **Class IV, Moderate**: severe discomfort, occasional mild pneumonia, broken finger, severe bruising to body, regular serious coughs or colds
• What’s the defect?
• What is (are) the hazard (s)?
• Likelihood of harm?
• Spread of Harm?

• **Class I, Extreme**: death, lung cancer, coma, major burn injuries
• **Class II, Severe**: asthma, lead poisoning, loss of a hand or foot, serious fractures
• **Class III, Serious**: eye disorders, sleep disturbance, mild heart attack, concussion
• **Class IV, Moderate**: severe discomfort, occasional mild pneumonia, broken finger, severe bruising to body, regular serious coughs or colds
The HHRS Process

- HHRS Overview
- Inspecting the dwelling
- Linking deficiencies to hazards
- Scoring the hazards
- Determining the appropriate Action
Examples – Scope of Work
## HHRS Report & Scope of Work for 504 Rosehill Terrace_03.07.16 @ 9:00 AM

<table>
<thead>
<tr>
<th>Hazards</th>
<th>Defects / Location</th>
<th>Likelihood</th>
<th>Spread of harm / (Average vs. Estimated)</th>
<th>Weight</th>
<th>Hazard Score</th>
<th>Scope of work</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Falling Between Levels (#22)</td>
<td>1) No balusters on railings in back porch.</td>
<td>I</td>
<td>0.2%</td>
<td>10,000</td>
<td>555.6</td>
<td>1) Install missing balusters on 2nd floor railings</td>
</tr>
<tr>
<td></td>
<td>2) No railings above exterior entrance to basement door (3-4 ft. deep).</td>
<td>II</td>
<td>1.8%</td>
<td>1,000</td>
<td>111.1</td>
<td>2) Install missing balusters in back porch railings.</td>
</tr>
<tr>
<td></td>
<td>3) No balusters on railings on 2nd floor.</td>
<td>III</td>
<td>9.9%</td>
<td>300</td>
<td>33.3</td>
<td>3) Install railings above exterior entrance to basement.</td>
</tr>
<tr>
<td></td>
<td>Estimated: Low 1/180</td>
<td>IV</td>
<td>88.1%</td>
<td>10</td>
<td>2.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Moisture and mold growth (#1)</td>
<td>1) Front porch floor is not sealed from basement allowing moisture to get in.</td>
<td>I</td>
<td>0%</td>
<td>10,000</td>
<td>200</td>
<td>1) Cover front porch floor with treated plywood and weather proof material in</td>
</tr>
<tr>
<td></td>
<td>2) Gutter and downspout on side C are damaged allowing water to fall along the</td>
<td>II</td>
<td>1%</td>
<td>1,000</td>
<td>100</td>
<td>2) Replace gutter (25’) and downspout (18’) on side C. Also install 5 ft.</td>
</tr>
<tr>
<td></td>
<td>exterior wall causing water damage on exterior fixtures.</td>
<td>III</td>
<td>10%</td>
<td>300</td>
<td>84</td>
<td>extensions at the end of downspout.</td>
</tr>
<tr>
<td></td>
<td>3) Water damage and moisture stains in 2nd floor front bedroom ceiling,</td>
<td>IV</td>
<td>89%</td>
<td>10</td>
<td>6</td>
<td>3) Remove and replace water damaged ceiling (16 ft²) in 2nd floor, front</td>
</tr>
<tr>
<td></td>
<td>approximately 16 ft². Roof may have leaks.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>bedroom. Check roof for water leaks.</td>
</tr>
<tr>
<td></td>
<td>4) Kitchen sink drain is leaking causing water damage to kitchen cabinet floor.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4) Repair leaky kitchen sink drain pipe. Replace bottom of kitchen sink</td>
</tr>
<tr>
<td></td>
<td>5) Bathroom on 2nd floor is not vented to the outside.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>cabinet.</td>
</tr>
<tr>
<td></td>
<td>6) Piece of exhaust pipe on basement window (side C) is open to the outside</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5) Install bath exhaust fans in bathroom, 50cfm with a sone rating of 1.0 or</td>
</tr>
<tr>
<td></td>
<td>allowing moisture to get in.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>less. Install vent ducting terminating completely outside of dwelling. Use</td>
</tr>
<tr>
<td></td>
<td>7) No exhaust fan in kitchen with gas stove.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>smooth sheet metal ducts, minimizing number of elbows. Seal gaskets and</td>
</tr>
<tr>
<td></td>
<td>8) Chimney without cap which allows water to get into the heating system.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>fan housing on ceiling. Install termination fitting with damper.</td>
</tr>
<tr>
<td></td>
<td>9) Sump pump inside basement utility sink used to pump out water from washing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6) Remove or cap piece of exhaust pipe on basement window (side C).</td>
</tr>
<tr>
<td></td>
<td>machine. Utility sink drain pipe is broken.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7) Install a 100 cm exhaust fan on kitchen wall C.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8) Install chimney cap.</td>
</tr>
<tr>
<td>3. Falling on Leveled Surfaces (#20)</td>
<td>1) Concrete on sidewalk to home is shattered presenting a fall hazards for occupants.</td>
<td>Average: 1/135</td>
<td>I 0.2%</td>
<td>0.2%</td>
<td>10,000</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Estimated: Low 1/80</td>
<td>II 13.8%</td>
<td>13.8%</td>
<td>1,000</td>
<td>172.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>III 27.3%</td>
<td>30%</td>
<td>300</td>
<td>112.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>IV 58.7%</td>
<td>56%</td>
<td>10</td>
<td>7.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 4. Lead poisoning (#7) | 1) Chipping paint on exterior surfaces / Windows trims, door frames, fascia, baseboards, etc. | Average: 1/58400 | I 0% | 0% | 10,000 | 0 | 1) Follow Lead hazards control scope of work. |
| | | Estimated: Medium, high 1/180 | II 1% | 20% | 1,000 | 111.1 | |
| | | | III 9% | 30% | 300 | 50.0 | |
| | | | IV 90% | 50% | 10 | 2.8 | |
| | | | Total | | | | **163.9 (F)** |

| 5. CO poisoning (#5) | 1) No CO alarms in the home. 2) Kitchen with gas stove not vented. Current exhaust fan does not work. | Average: 1/135 | I 0% | 5% | 10,000 | 89.3 | 1) Install CO alarms on every level of the home, 6 to 8 ft. away from bathrooms or combustion sources. 2) Install kitchen exhaust fan, vented to exterior. Vent to exterior through wall C. Use a 100 cfm exhaust fan. |
| | | Estimated: Low 1/560 | II 0% | 15% | 1,000 | 17.9 | |
| | | | III 2% | 30% | 300 | 8 | |
| | | | IV 98% | 70% | 10 | 1.25 | |
| | | | Total | | | | **116.45 (F)** |

| 6. Domestic Hygiene (#15) | 2) Kitchen floor without cover, just bare wood exposed to moisture and food debris, difficult to dry or clean. 3) Kitchen walls are not painted, without protective coating, exposed to moisture and difficult to clean. | Average: 1/16869 | I 0.6% | 0.6% | 10,000 | 3.3 | 2) Install vinyl tiles on kitchen floor approximately (200 ft²). 3) Apply protective coating to kitchen walls for protection against moisture and dirt. |
| | | Estimated: Low 1/1800 | II 8.2% | 8.2% | 1,000 | 4.6 | |
| | | | III 49.2% | 49.2% | 300 | 8.2 | |
| | | | IV 42% | 42% | 10 | **0.23** | | **16.3 (L)** |
Questions?