

Water damage in Icelandic buildings and the effect on mold growth

Innovation Center Iceland
Kristmann Magnússon Engineer



Byggmögel Väst
Kerstin Gillen Mycologist



This presentation will be focusing on two topics

1. Concrete houses in Iceland, examples of water damages due to plumbing failure
2. Mold growth research project on popular building materials used in construction in Iceland



Icelandic houses



Picture: Magnús Ólafsson (1862–1937)

Today, most houses in Iceland are made of concrete (>90%)

After the big burn in Reykjavík 1915 regulation regarding wooden houses were restricted and therefore concrete houses started rising dominantly in the downtown area.

Icelandic houses

From the beginning of concrete construction, houses were insulated on the inside and it is not until recently that exterior insulation has been adapted to some degree.

Insulation methods have varied over the years and many of those methods have lead to mold and bacteria growth in the wall cavities, both on the surface and in to the concrete itself



Photos from exhibition in Árbæjarsafn, Iceland



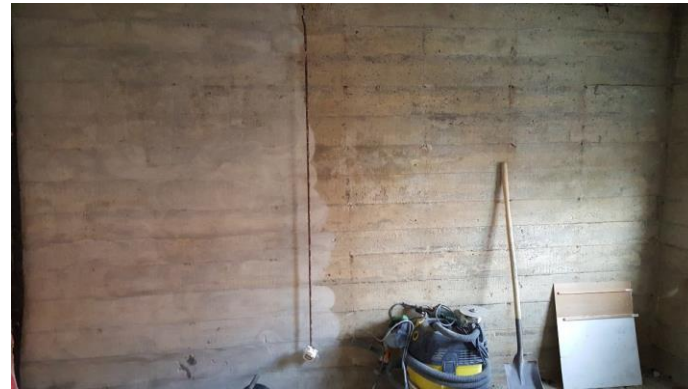
Icelandic people and plumbings

Almost all houses in Iceland have hidden plumbings. All pipes go the shortest distance from any sink, toilet, drain etc. straight in to the next wall, ceiling or floor.

This type of construction makes detecting minor leaks near impossible until something actually bursts.

When something is finally detected then the damage is often quite extensive

Minor leak from a plumbing line hidden in floor



Minor leak from ice machine, went undetected



Photos: Ágúst Bjarnason

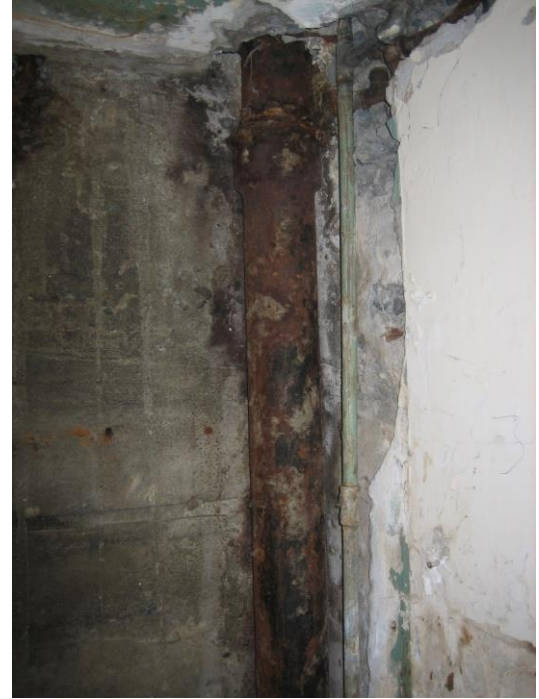
Minor leak from both shower and bath drain, 1m apart went undetected. Unvented spaces



Plumbing lines repaired inside an external wall



Main sewer pipe cracked inside an external wall in an apartment building



Hot water connected
to a built in toilet.



One way valve on a sewer
pipe malfunctioned



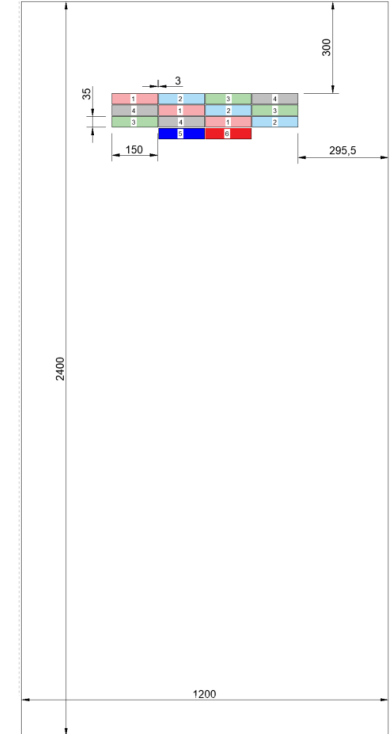
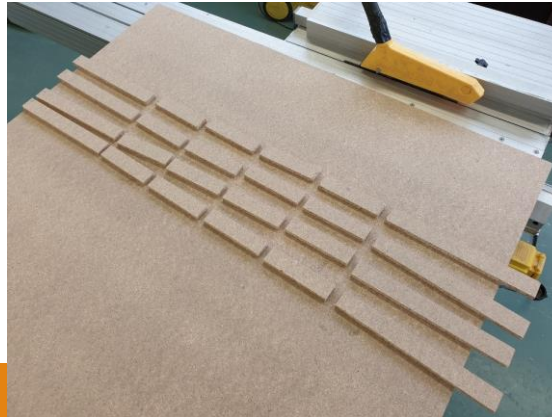
2. Research project NMI (Innovation Center Iceland): susceptibility of different building materials to mold growth

Aim of the project:

Test different building materials from different retailers to see what types of mold grew on which materials and observe the diversity if any.

Samples were all handled the same way from the seller to the test site and all were taken from within a new stack to minimize contamination during transit

Samples were not treated in any way before testing in humidity chambers



2. Research project NMI (Innovation Center Iceland): susceptibility of different building materials to mold growth

Start: April 2019

Building materials:

- regular gypsum board
- greenboard ("water-resistant" gypsum board)
- particle board
- plywood pine, spruce and birch

Moisture chambers with different humidity levels:

- 100% RH
- 84% RH
- 75% RH
- 69% RH



2. Research project NMI (Innovation Center Iceland): susceptibility of different building materials to mold growth

Visual inspection weekly (surface % mold growth).

Large assessment 4 times during the experiment.

- After 1 month (june 2019)
- After 2 months (july 2019)
- After 4 months (september 2019)
- After >6 months (winter 2019)

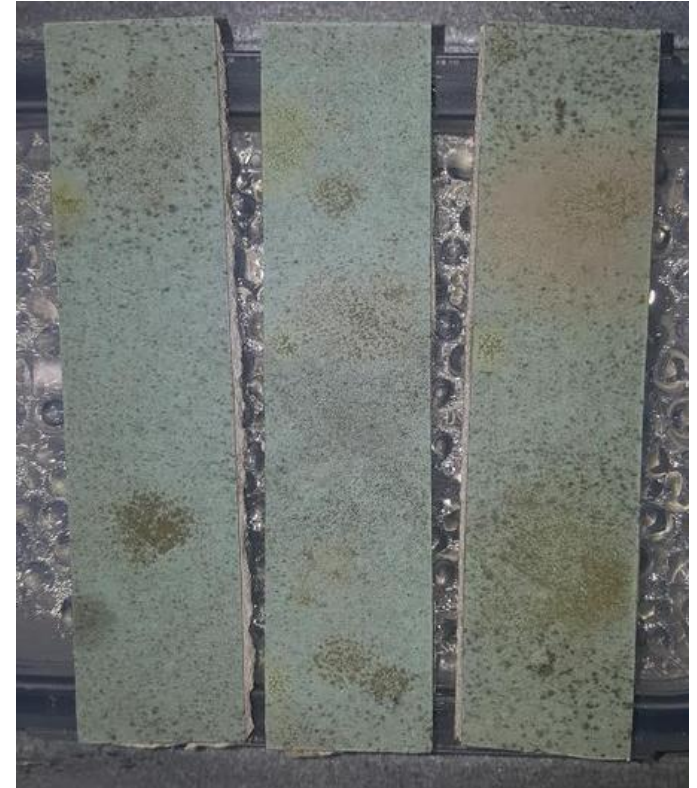
Mold assessment:

- Quantity (surface %, front and back)
- identification on genus/species level (direct microscopy)



First observations:

- 2 samples showed mold growth from the beginning
- >15 mold species detected (after 2 months)
- at least two new species
- 100% RH:
 - after 1 month: 88% of samples showed mold growth
 - after 2 months: 100% (several with surface overgrown by 100% by mold)
- 84% RH:
 - after 1 month: 0%
 - after 2 months: 24% samples showed mold growth
- 64-75% RH: no mold observed yet.
- “water-resistant” greenboard is sensitive to mold growth
- Particle board: also prominent smell (before mold growth is visible)



Mold inside concrete

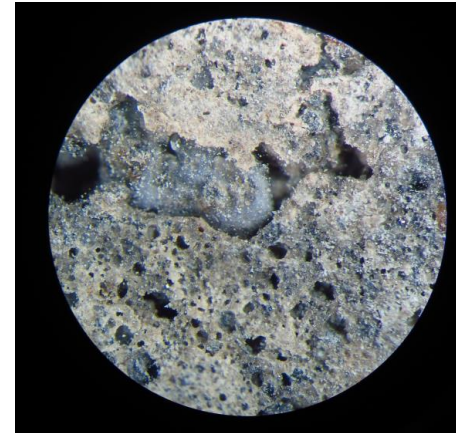
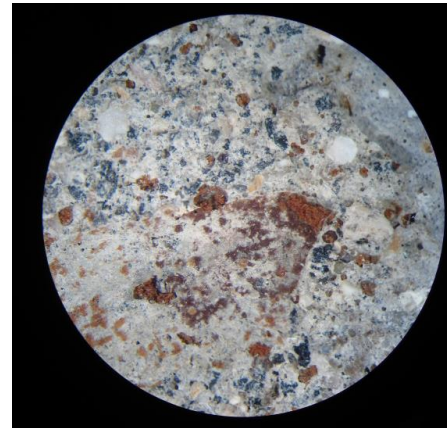
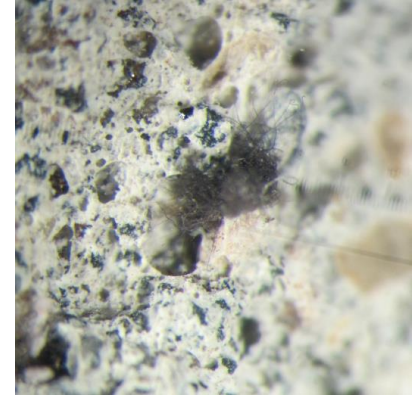
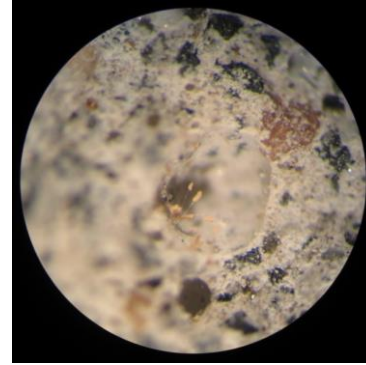
Non-visible on the surface. Break open. Not visible to the naked eye, microscope necessary.

Often several mm to cm deep inside the concrete.

Actinomycetes – smell contamination (geosmin and others)

Common indoor molds on water-damaged concrete in Icelandic buildings

Aspergillus spp., *Chaetomium globosum*, *Eurotium herbariorum*, *Penicillium* spp., *Scopulariopsis* spp., actinomycetes ...



Differences between Iceland and Sweden?

Based on own observations.

- different building styles.
Sweden: many wooden houses.
Iceland: mostly concrete buildings.

Iceland:

- “National focus”: indoor molds.

Sweden:

- “National focus”: wood-decaying fungi, especially *Serpula lacrymans* (Äkta Hussvamp).
- Mold inside concrete??? I never got a sample from Swedish concrete.

Raki og mygla í Fossvogsskóla



Raki og mygla hafa breiðt komið upp í hjólaði á Íslandi á undanfnum árum. mbl.is/2011



mbl.is



Mynd: Anders Nilsson