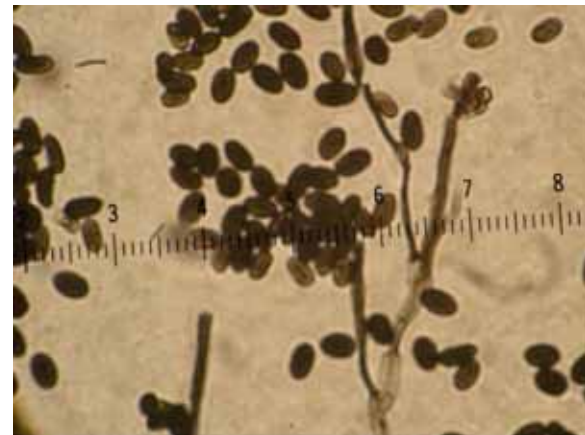


Indoor Air Quality Investigations of Previously Flooded Buildings in SE Minnesota



Dan Tranter

Minnesota Department of Health—Indoor Air Unit

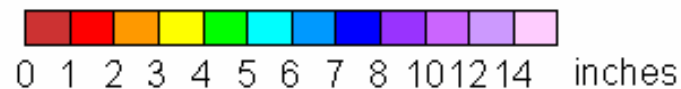
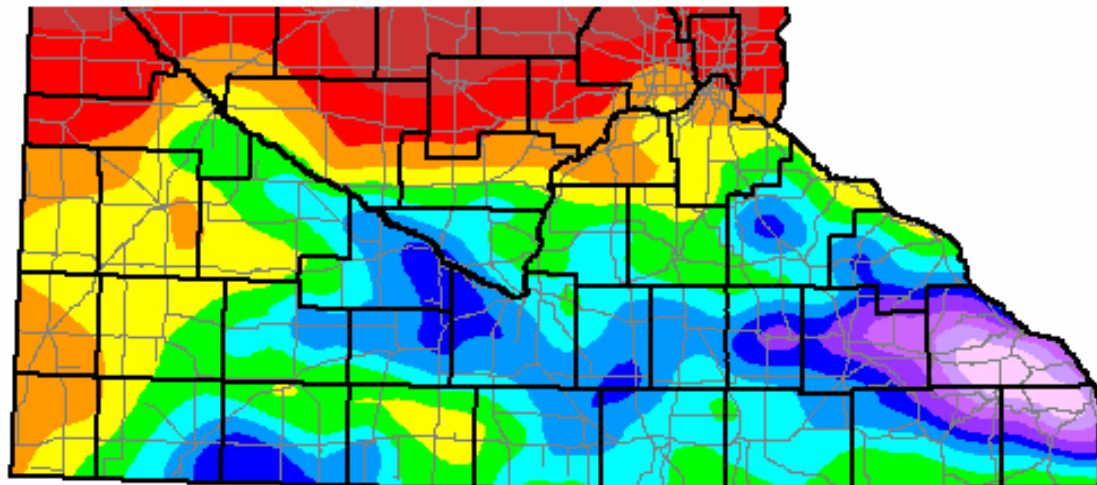
651-201-4618

daniel.tranter@health.state.mn.us

<http://www.health.state.mn.us/divs/eh/air/index.htm>

Flooding in SE Minnesota

Rainfall Totals for Southern Minnesota
August 18 through August 20 (8:00 AM CDT), 2007



State Climatology Office - DNR Waters

Historic Flooding: Rushford



Flood Relief Bill

- Instructed MDH to “conduct indoor air quality investigation and sampling of public facilities and non-profit organizations”

(10.28-10.33, RC 071-0001-1)

MDH Perspective on Mold

- All molds may cause health problems.
- No governmental health standards
 - ◆ Air sampling usually not necessary, last option
- Mold growth should NOT be tolerated in occupied indoor areas.
- Remediation is based on visible growth amount and material it's on.

Development of Investigation Service

- Definition of eligible buildings
- Investigation objectives
- Scope of investigation services

Recruitment of Buildings

- Wrote to all city and county administrators
- Fourteen buildings referred to us
- Nine buildings elected to participate

Indoor air quality investigation and sampling methods

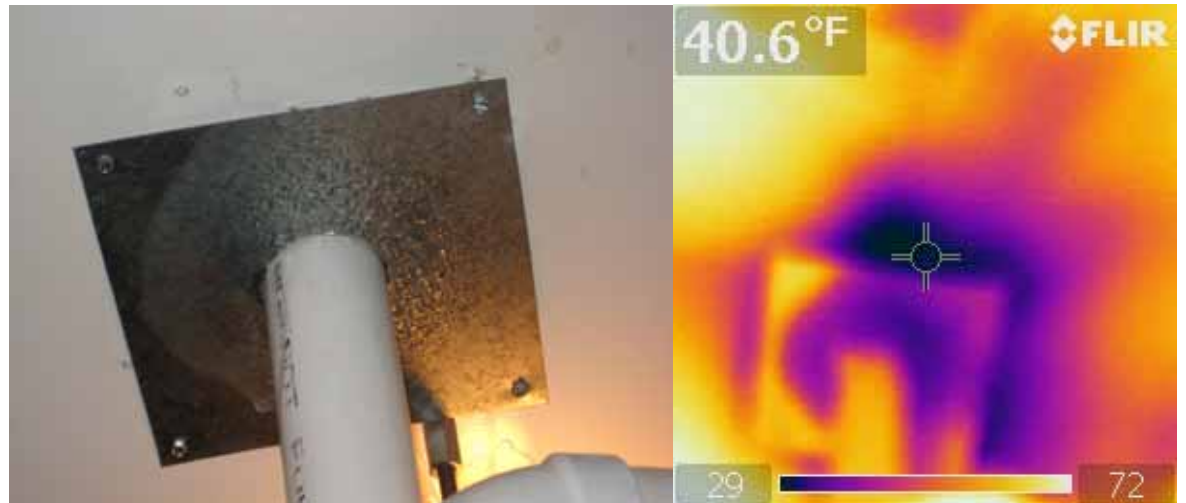
- Visual Inspection
- Moisture Testing
- Tape Lift Sampling
- Bulk Sampling
- Opening Areas with Indications of Water Damage
- Opening Easily Accessible Areas
- Cutting holes in walls to check, sample

Methods Moisture Testing



Moisture
Meters

Infrared Camera



Methods

Tape Lift Sampling



Carpet



Dry wall

Methods Bulk Sampling



Piece of Sheet
Rock Paper



Piece of
Sheetrock,
Plaster, and
Insulation

Methods

Opening Areas with Indications of Water Damage



Rusty nails



Mud

Methods Opening Easily Accessible Areas



Remove ventilation
diffuser



Peel back carpet



Pull away insulation



Peel back base board

Methods

Cutting holes in walls to check, sample



Dry wall



Cover with electrical plate when done



Sink Cabinet

General History of Buildings (9 buildings)

- 8 buildings flooded by over-flowing creeks (muddy water)
- 1 building flooded by rain
- 1-24 inches flood water depth
- Building materials wet for a few days to several weeks
- Buildings materials (dry wall, flooring) generally left in place

General Observations

- Six buildings had visible water damage
- Three buildings still had damp insulation
- Four buildings had mold on visible surfaces and also behind materials
- Two buildings had no mold on visible surfaces, but had hidden mold

Example 1. Muddy wall



Interior



Exterior

Wet, muddy wall cavity

Only a little mold confirmed, but future mold is a risk

Example 2: Wind-driven rain

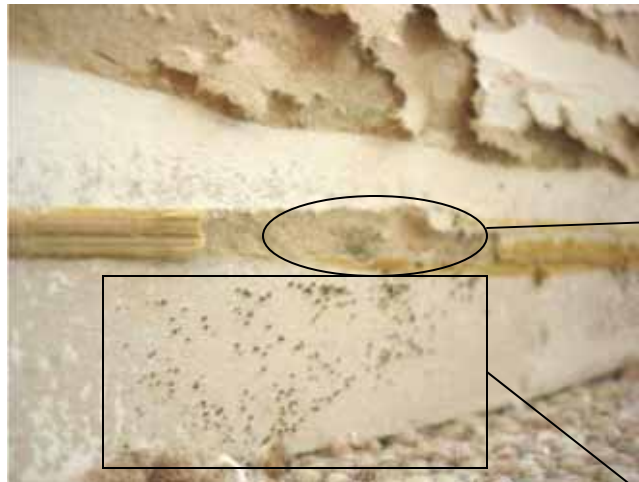


Moldy Sheetrock

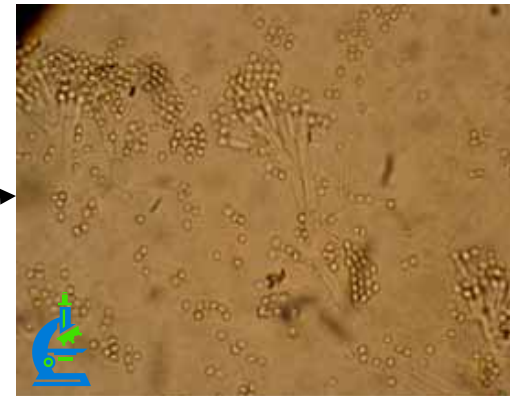
Moldy insulation,
rotting studs



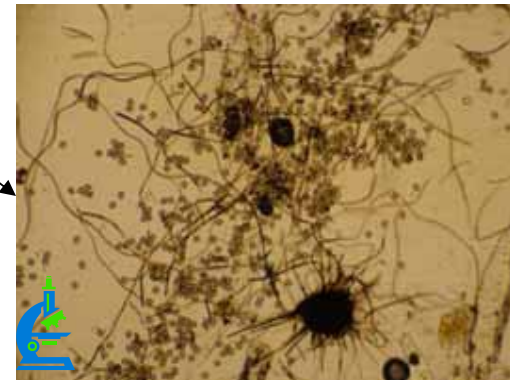
Example 2: Closer inspection



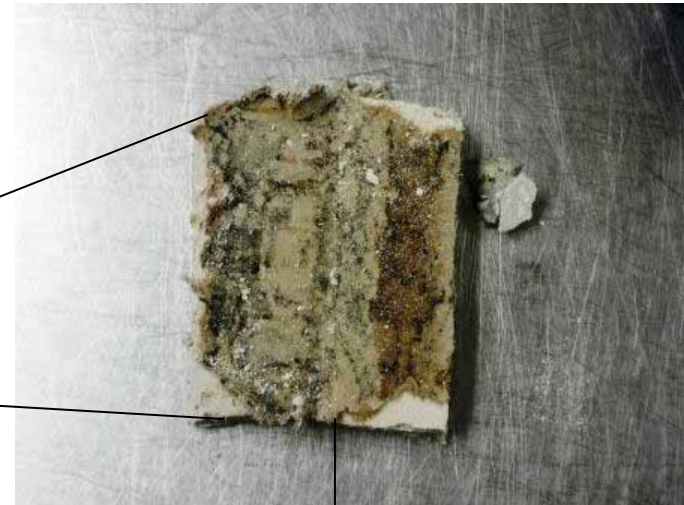
Sheetrock



Insulation



Example 3: Flooded sheetrock wall



Cleaned by hosing down

Sheetrock very moldy on back side



Mold in other locations



Block wall, pressed wood



Metal Wall



Transite Ducts



Wood Beams

Building Materials Suspected and Confirmed Moldy

Building Material	Number Samples Collected (suspected growth)	Number Samples with Mold Growth
Sheetrock	29	19
Carpet	10	3
Insulation	8	0
Concrete Block Wall/Masonry	6	2
Baseboard/Beam	4	2
Plywood Cabinet Base	4	2
Wall Paneling	4	4
Ceiling Tile	3	0
Furnace Filter	2	2
Furnishing Particle Board	2	1
Plaster	2	0
Under Floor Tile	2	0
Duct Interior	1	0
Metal Heat Register	1	0
Wood Framing	1	1
Total	79	36

Other IAQ issues



- Furnace emitting small amount of nitrogen dioxide

Friable asbestos flooring (?)

Conclusions

- Problems can still persist several months after flood
- People don't always follow best practices
 - ◆ remove dry wall, insulation and other absorbent materials
 - ◆ clean smooth surfaces
 - ◆ dry areas, especially wall cavities
- Investigation services should be provided after future floods.