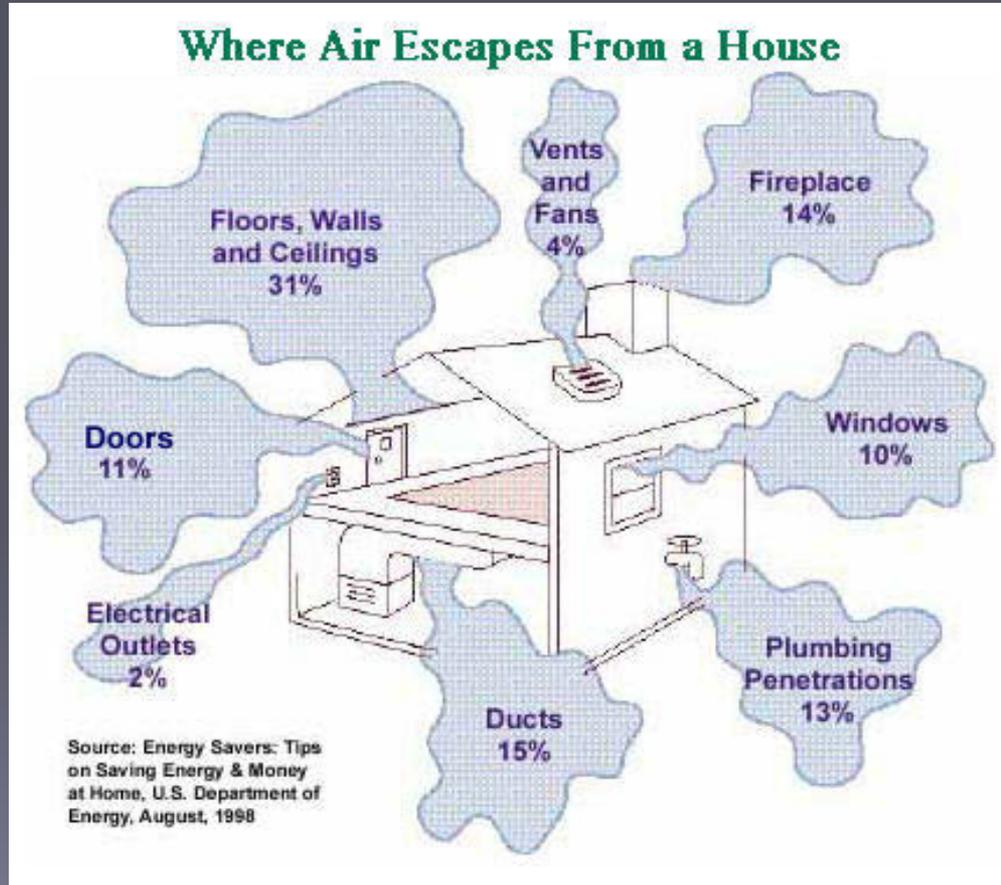
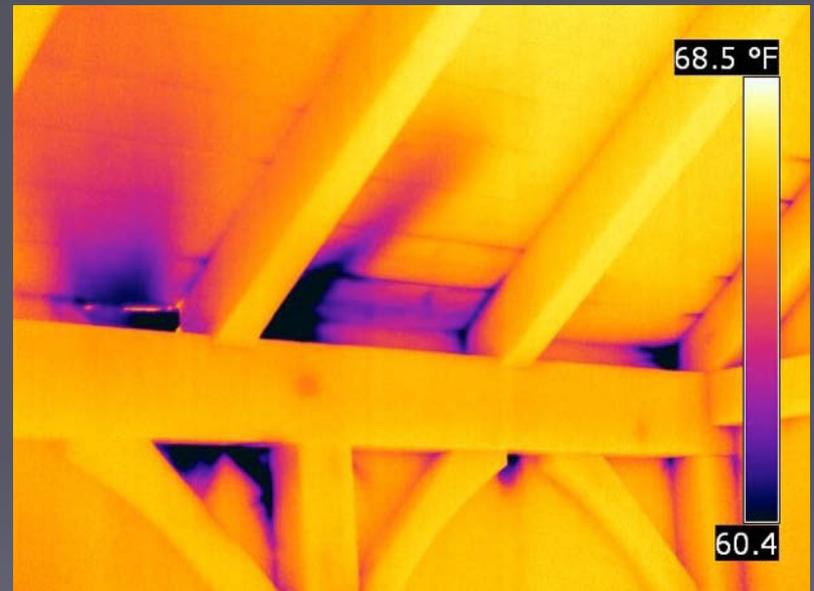
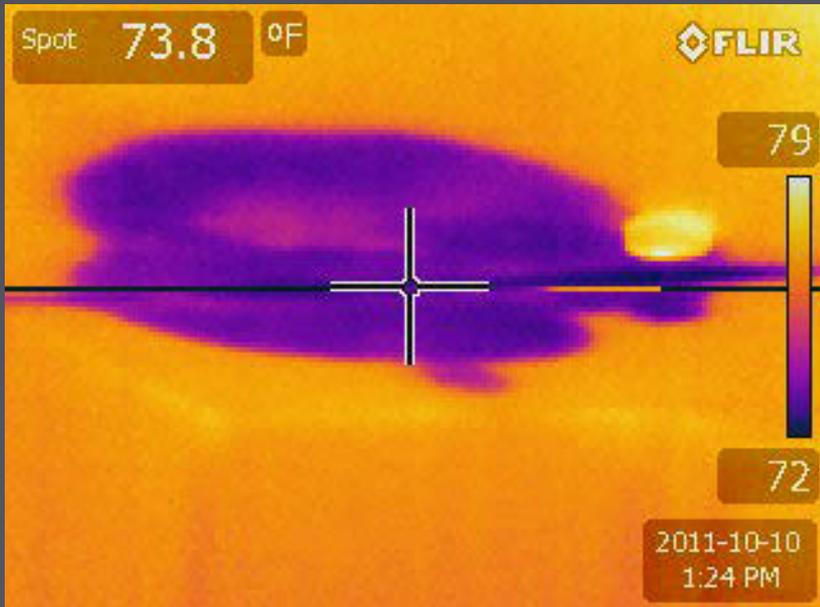


Blower Door & Infrared Imagery





Attic Inspections



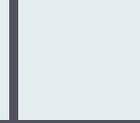
Attic Inspections





Keep in Mind...

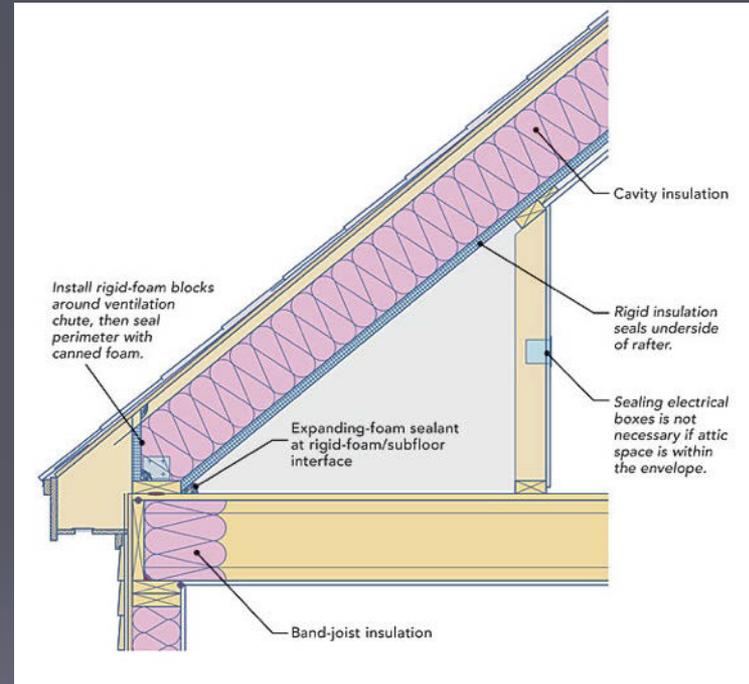
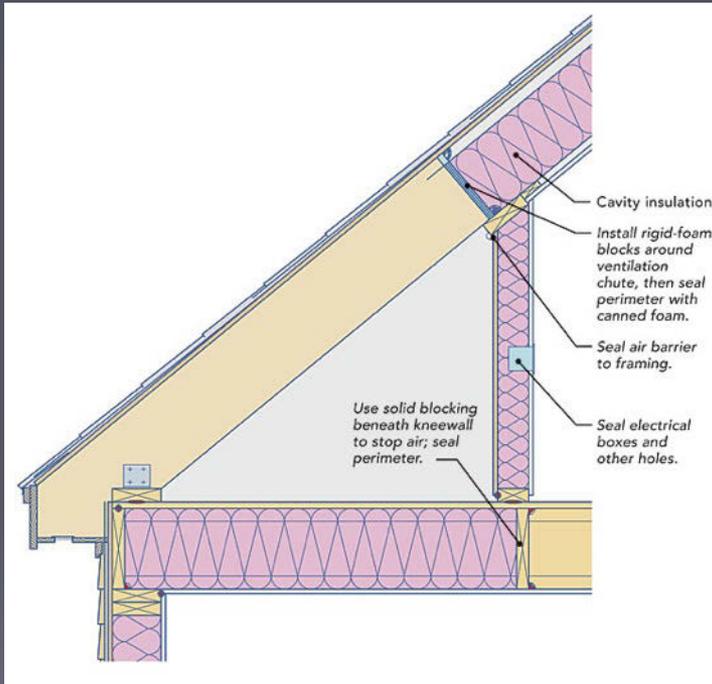
- Is creating a consistent thermal and pressure boundary possible?
 - Pitch of roof
 - Accessibility
- Is obtaining adequate attic ventilation possible?



What If...

- If an attic is not accessible?
- Attic ventilation is not possible?
- Ductwork and other HVAC equipment is located in the attic?

Weigh Your Options



Diagnostic Testing

Step 2: Equipment Assessment

- Combustion Safety
- Ventilation Assessment
- HVAC Performance
- Radon

Diagnostic Testing

Step 2: Equipment Assessment

- Combustion Safety
 - Worst-Case Depressurization
 - Flue Gas Analysis



Equipment Assessment Continued

- Ventilation Assessment
 - Point Source
 - Whole House



Equipment Assessment Continued

- HVAC Testing
 - Duct Blaster
 - Pressure Pan
 - Flow Blaster



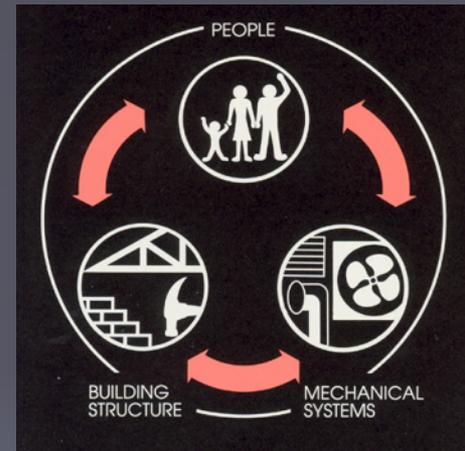


KEY POINTS

3. Creating sound resolutions

Developing Scope of Work: Writing a “Prescription”

1. Homeowner goals
2. Resolve performance issues
3. Avoid unintended consequences
4. Client Education





Writing a “Prescription”

Step 1

THE HUMAN ASPECT

- What are client’s goals?
 - Reasons for testing / understanding their “pain”
 - Client Constraints
 - Budget
 - ROI
 - Other



Writing a “Prescription”

Step 2

THE SCIENTIFIC ASPECT

- What does the house need?
 - Are “sick” symptoms a result of envelope issues, equipment issues or both?
 - Extent of work to be recommended: “the cliff”



Writing a “Prescription”

Step 3

- Combine steps 1 & 2

What does the house need?

Prioritizing Issues:

1. Building Envelope

- Control the container and control the indoor environment



What does the house need?

Prioritizing Issues:

2. Equipment

- Systems within the building envelope affect
 - Comfort
 - Building Durability
 - IAQ
 - Energy Efficiency

Writing a “Prescription”

Step 4

- Build client relationship and trust
 - Listen
 - Understand homeowner goals
 - Understand homeowner constraints
 - Educate
 - Explain cause of pain and proper fix
 - Introduce “the cliff” concept and set client expectations

Critical for Selling a Prescription!



KEY POINTS

4. Case studies: Interpreting diagnostic testing data

Case Study 1

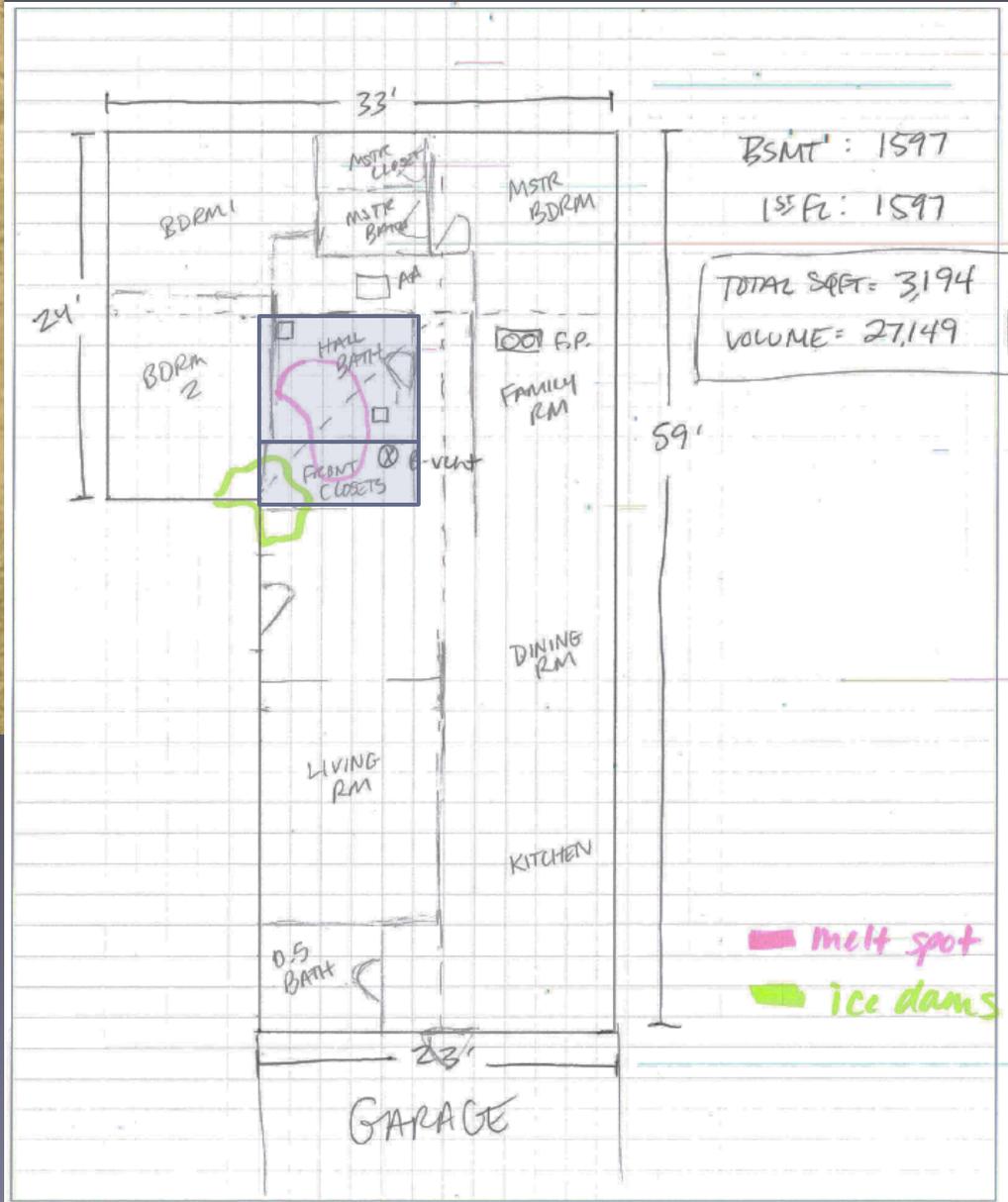


- Inver Grove Heights, MN
- 1980's rambler with walk out basement

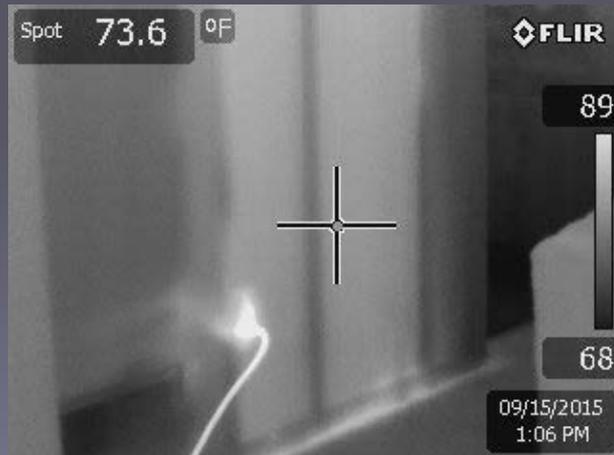
Pain

- Melt spot and ice dams





Diagnostic Pre Test



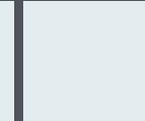
Diagnostic Pre Test



Diagnostic Pre Test

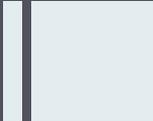






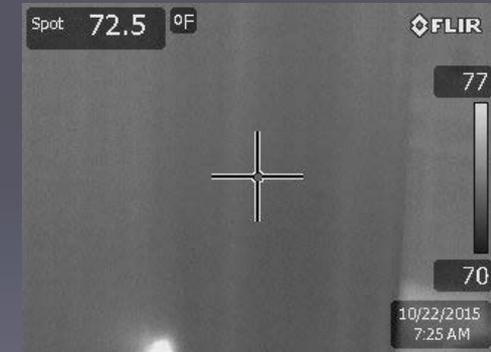
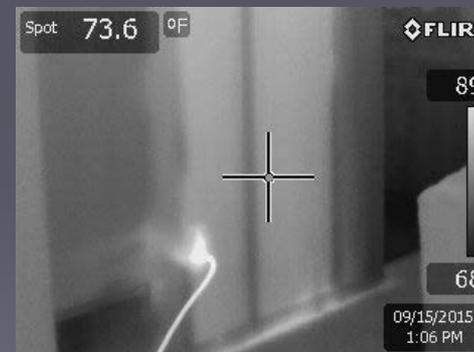
Prescription







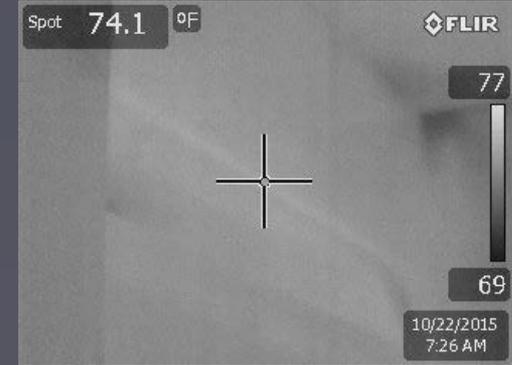
Post Test



Pre Test: $T_i = 75^\circ\text{F}$, $T_o = 82^\circ\text{F}$

Post Test: $T_i = 74^\circ\text{F}$, $T_o = 42^\circ\text{F}$

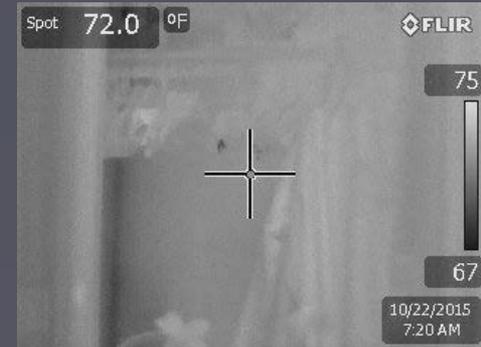
Post Test



Pre Test: $T_i = 75^\circ\text{F}$, $T_o = 82^\circ\text{F}$

Post Test: $T_i = 74^\circ\text{F}$, $T_o = 42^\circ\text{F}$

Post Test



Pre Test: $T_i = 75^\circ\text{F}$, $T_o = 82^\circ\text{F}$

Post Test: $T_i = 74^\circ\text{F}$, $T_o = 42^\circ\text{F}$

Blower Door Results

Test Results

	Test #1	Test #2	Change	Percent
1. Airflow at 50 Pascals:	2162 CFM	1586 CFM	-575 CFM	-26.6 %
	4.78 ACH	3.51 ACH	-1.27 ACH	-26.6 %
2. Leakage Areas:				
LBL ELA @ 4 Pa:	118.9 in2	87.3 in2	-31.6 in2	-26.6 %



Other Considerations

- Water Heater
 - Passed WCD
- IAQ
 - 49 cfm recommended whole house ventilation (ASHRAE 62.2 2013)

A Happy Customer...



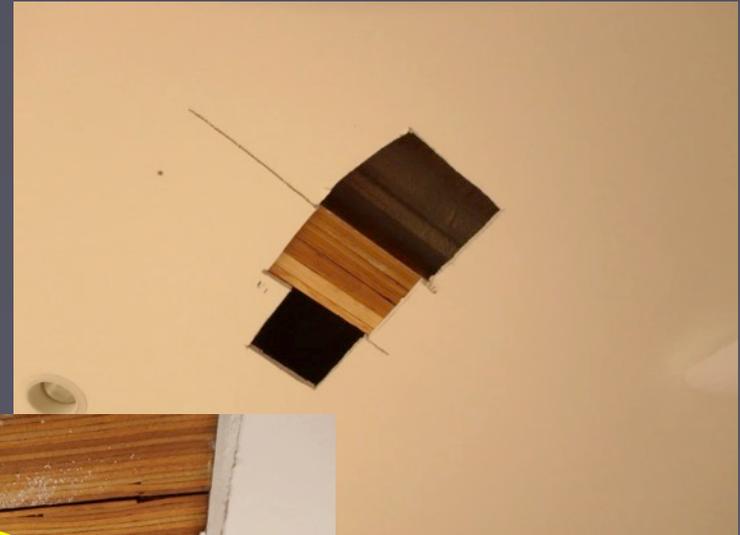
Case Study 2

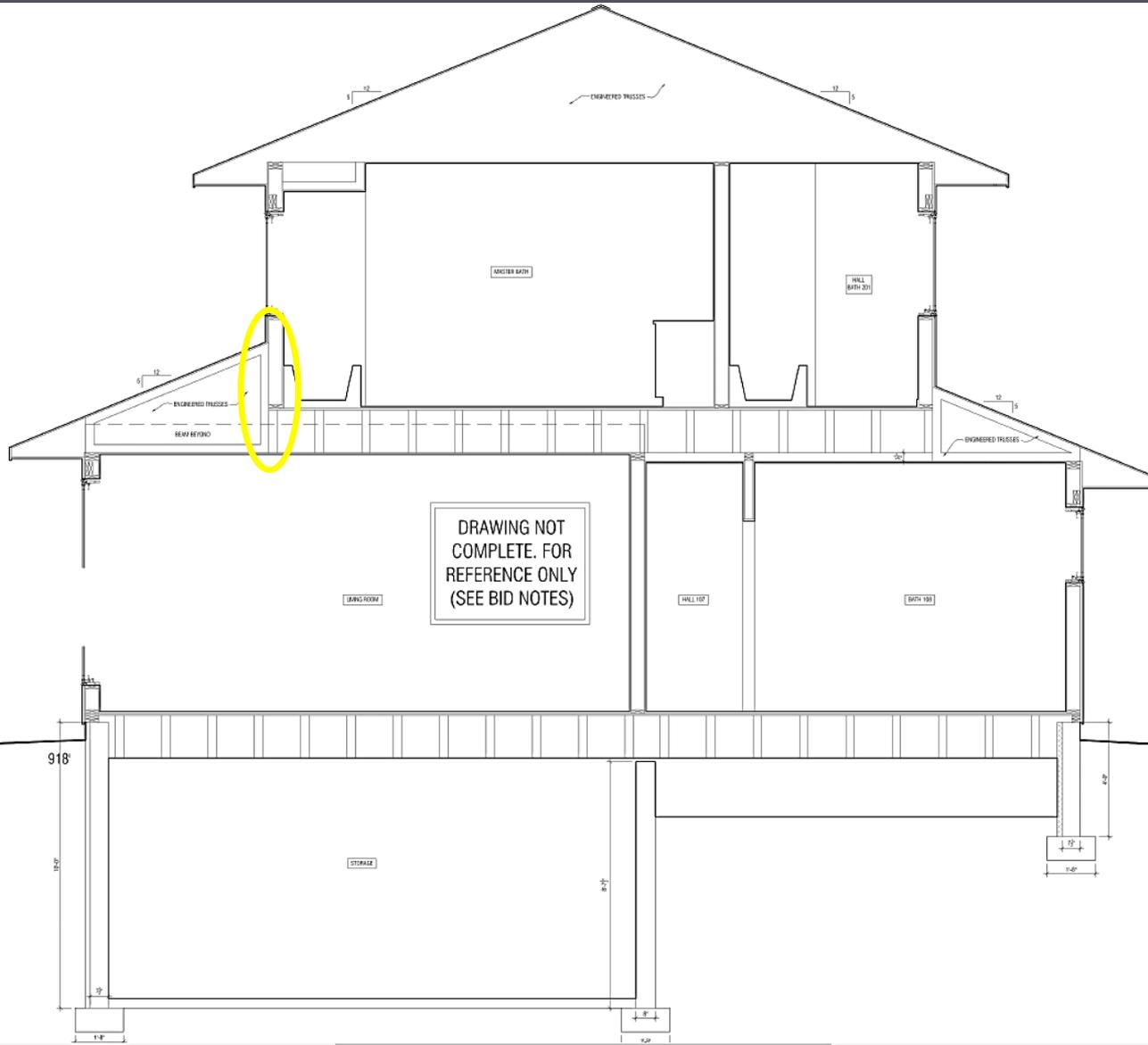


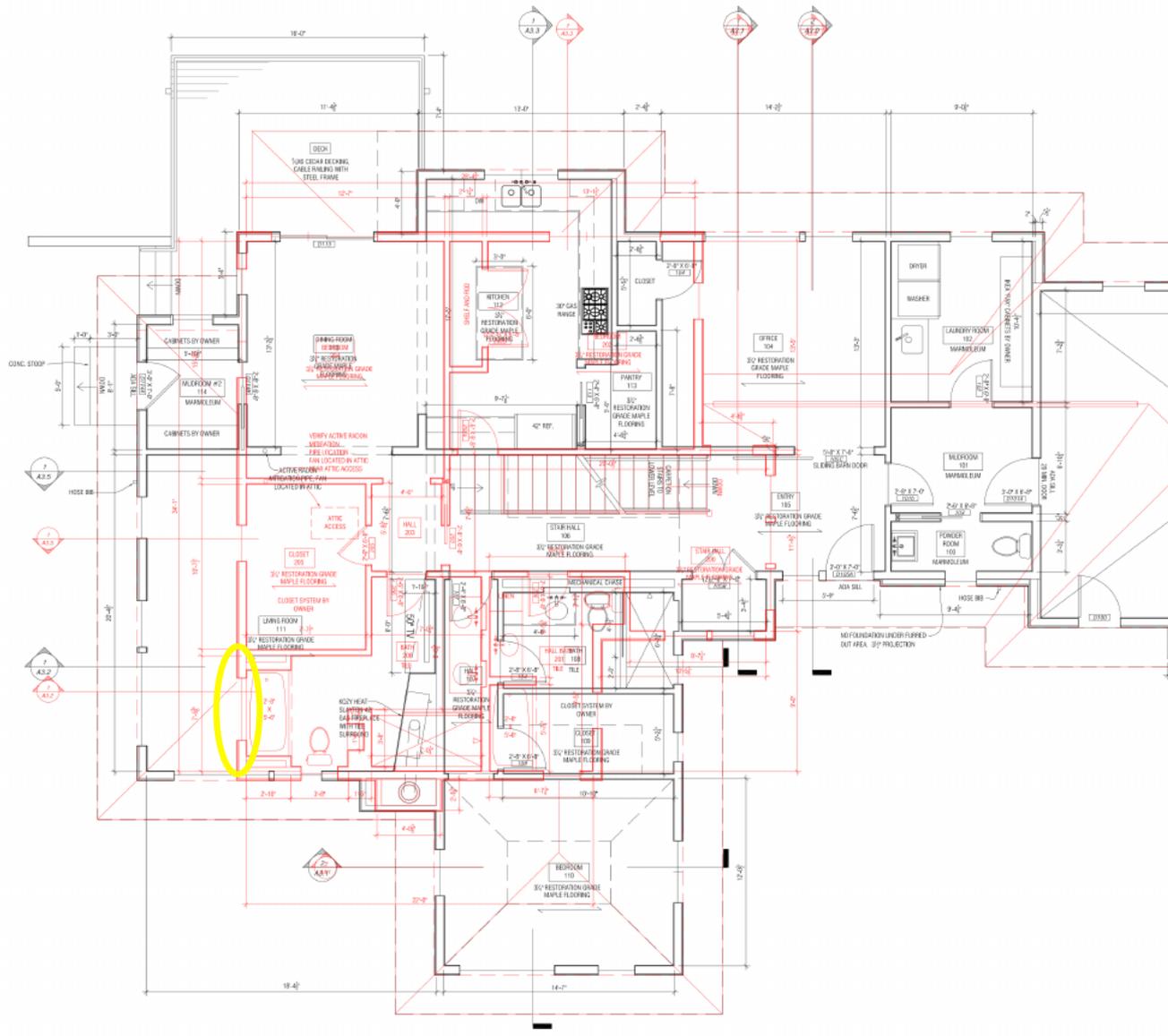
- Minnetonka, MN
- Built in 2014

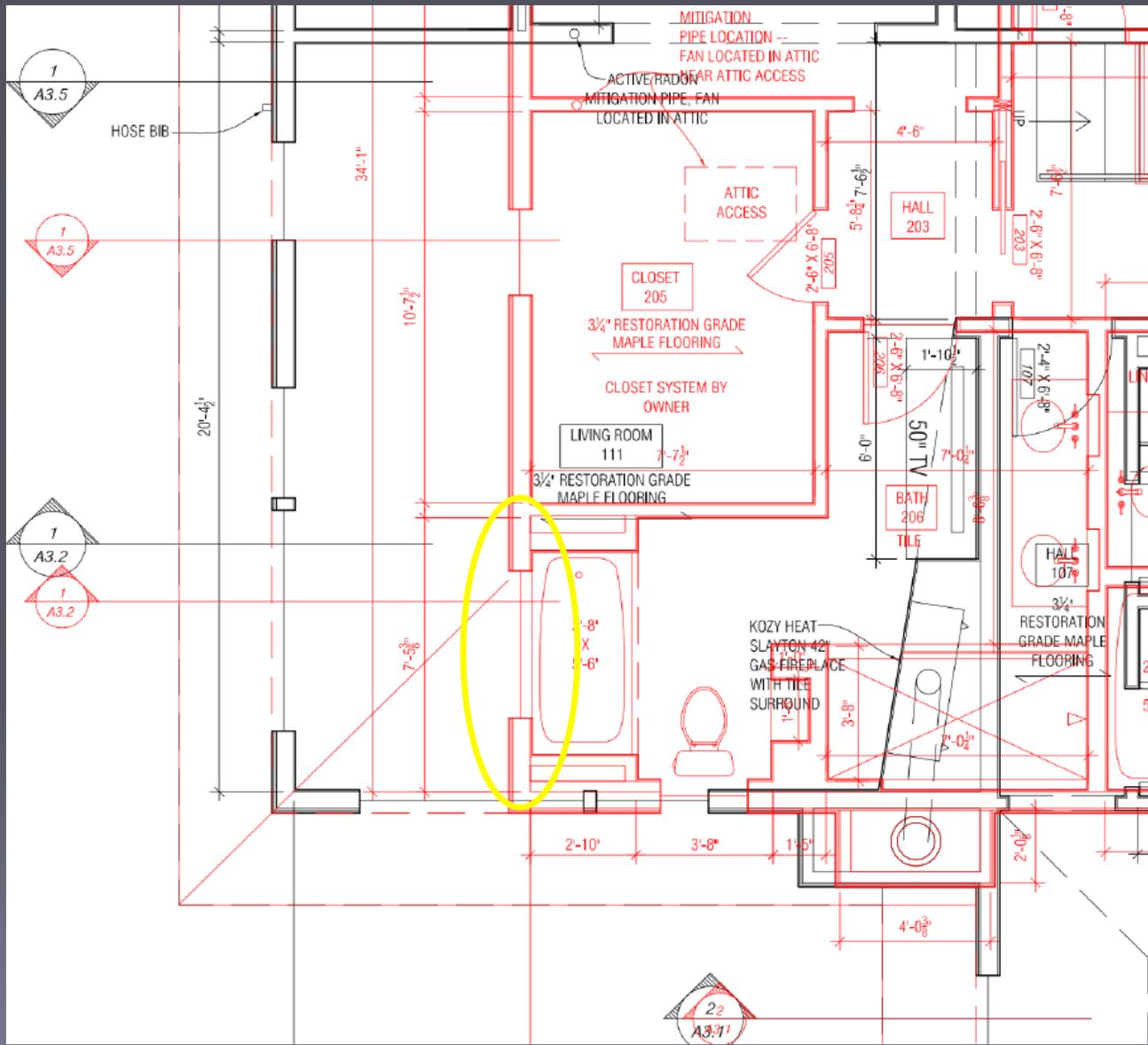
Pain

- Water dripping in main level living room ceiling









Visual Inspection





