

# BUILDING EVALUATIONS, FORENSICS, DIAGNOSTICS & REMEDIATION SERVICES

## WHAT IS BUILDING EVALUATION?

Building Evaluation is a means of evaluating the condition of your building or a building you are considering purchasing to determine what work may be required to keep it functioning properly or to correct recognized deficiencies. After an initial assessment and a diagnosis is made, corrective action may be required. If so, a remediation plan is created and implemented.

We breakdown each evaluation into three parts which we call “Assessment,” “Forensics and Diagnostics” and “Remediation.”

### 1. ASSESSMENT

Identify the problems. This phase usually involves one or more site visits to view reported problems or to review the building or buildings for existing or potential problems. A building assessment is highly recommended to anyone considering the purchase of a commercial building.

#### BUILDING ENVELOPE AND SYSTEMS

The building envelope is the part of the building which keeps the weather out and the heat (or cooling) in. This includes the roof, the walls and the foundation as well as skylights, windows and exterior doors. Our inspection of the envelope is usually the single most significant part of the assessment and the one which solicits the greatest number of calls from building owners and managers. Paint failures, leaks and smells of mold are often the early indicators that there are construction or design problems with the envelope.

#### MECHANICAL AND ELECTRICAL SYSTEMS

An assessment of the mechanical systems will determine if they are functioning properly and have been appropriately maintained. If necessary, a mechanical engineer can assist in this assessment to determine whether the mechanical system is appropriately designed to serve the building and if it is the best system for present and future use.



#### STRUCTURAL SYSTEMS

Structural failure in a building is often readily seen. Diagnosing whether failure is caused by foundation settling; under-structuring; over-loading of the building frame or by structural degradation due to rot, insects or alteration is more difficult. Often structural issues have not yet revealed themselves in building failures and can be addressed before they do – such as in missing truss bracing and improper joining of trusses or splits in the timber truss of older buildings.



#### ENERGY INEFFICIENCIES

Heating, cooling and lighting a building all require an input of energy. All buildings, old ones in particular, require a great deal of energy to operate. There are almost always things which can be done to improve a building's energy efficiency. These include air sealing, adding or correcting insulation, improving mechanical systems and improving operation of existing systems. Determining which improvements are most energy and cost efficient is a part of a building assessment.

#### CODE COMPLIANCE

Sometimes the problems that we look at are not physical problems with a building, but rather are code compliance issues. Often these relate to citations that the Owner has been given regarding specific aspects of non-compliance. Sometimes these are related to proposed changes in use that a new owner of a building discovers only after they have purchased it.

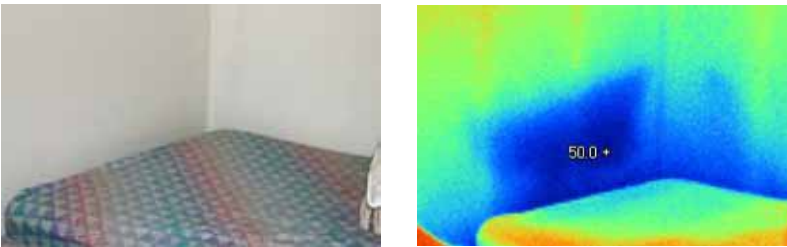
LEFT: A moisture meter measures the moisture content of materials. High moisture levels in siding can lead to paint failure. ABOVE: Infrared image indicating excessive heat loss and air exfiltration through fascia and soffit.

## ACCESSIBILITY LAWS & CODES

Multiple codes regulate the accessibility requirements of a building and its site. Review of these requirements are part of the building assessment. The codes are subject to change on both state and federal levels.

## BUILDING CODES

Many codes regulate the construction and use of a building. If changes in use or additions are considered, a review for code compliance should be performed. Current building codes are complex and are often misunderstood. Commercial buildings are required to meet current building code requirements.



ABOVE: Infrared image revealed uninsulated cavity behind wall allowed moist interior air to condense on foundation wall wetting back of sheet rock and wood studs allowing mold growth.

## 2. FORENSICS & DIAGNOSTICS

Find the Cause. Forensics/Diagnostics is research and investigation to identify the causes of the problems discovered during the assessment and additional investigation to uncover the extent of the problems.

### IDENTIFY AIR LEAKAGE

Air getting into a building through cracks and unsealed construction joints can lead to heating difficulties, occupant comfort complaints and pipe freeze-ups. Excessive or uncontrolled exfiltration can lead to heating difficulties as well as ice damming.

## MAINTENANCE

No building is maintenance free. Proper maintenance of HVAC systems is required for efficient operation. Proper maintenance of the building envelope – painting, replacing worn or damaged components, addressing infiltration (air, water, insect) in a timely manner are all required if a building is to be cost effective to operate and is to last many years. The assessment of maintenance problems is the first step toward developing maintenance regimens or getting existing ones back on track. Anyone who has an investment in a building or is considering investing in a building should know the condition of the investment. A building assessment can identify potential problems and identify ways to improving or preserving that investment by thoroughly inspecting their property.

### IDENTIFY IMPROPER INSULATION

Proper installation of insulation is essential if it is to perform as desired. Gaps, compacted or missing insulation in a wall allows excessive convective and conductive heat transfer.

### IDENTIFY INEFFICIENT HEATING AND COOLING

The mechanical systems in a building consume significant energy. If the system is not efficient in its manufacture, design, installation or condition, much energy is lost. This energy loss is wasteful and very expensive. During the forensic/diagnostic phase, the Mechanical systems are examined and analyzed for condition, appropriateness of design and efficiency.

### IDENTIFY INEFFICIENT LIGHTING AND EQUIPMENT

Lighting and control technology has changed in recent years. It is possible to significantly reduce power costs by increasing fixture and lamping efficiencies and improving control regimens. Improving daylighting, though often beyond the scope of a building evaluation, may also reduce the lighting power requirements.

### IDENTIFY MOISTURE INFILTRATION

The most significant and most damaging type of building performance problem is related to moisture infiltration. The moisture can come from snow, rain, or condensation and is most often made worse by wind and air pressure differences. In many cases, the problems can be traced to poor workmanship during construction. Deferred maintenance and design errors also contribute. Moisture in the structure can lead to mold, rot, material deterioration and delamination as well as persistent failure of finishes.

Rain and snow water as well as ground water must be managed at all components of the building envelope. These include the roof and walls but also the individual components of the envelope and the site surrounding the building.

### IDENTIFY FLASHING DEFECTS

Missing, mis-installed and mis-specified flashings are often the culprit in leaks at openings and trim. The damage caused by flashing errors can often be undetected until significant damage has been done.

### ENVIRONMENTAL

Asbestos, mold, radon and abandoned underground tanks are environmental contaminants

which must be addressed for safe building occupancy, permitting and when title is conveyed.

#### AIR QUALITY, SOILS, HAZARDOUS MATERIALS

Some environmental hazards may make themselves known visually or through odors. Others may only be discovered through research or property history. Many times these issues become significant when renovations, additions or property transfers are considered.

#### MOLD

Mold spores require water and food to grow. It's impossible to eliminate the spores. Eliminating food is also often impossible. Most often the approach is to eliminate the source of water. Mold can be cleaned off surfaces, but if the source of water or the source of food is not eliminated, it will return.

#### IDENTIFY SITE PROBLEMS

Sites that do not drain away from structures can cause wet basements and rotted sills. Muddy and hard to maintain sites can often be cured through correcting drainage. Proper grading away from the building and proper integration of water-proofing membranes must channel all moisture away from the building.



ABOVE: The blower door can be used in conjunction with the infrared camera and smoke pen, to locate points of moisture and air infiltration.

## TOOLS

Diagnosing the problems often requires specialized tools. There are a number of tools in addition to visual observation that can help pin-point the problems.

#### INFRARED PHOTOGRAPHY

BMA has a high resolution Electrophysics Hotshot HD infrared camera. IR measures the temperature of materials. The camera enables us to see air infiltration and thermal bridging as well as moisture leaks in certain materials. We can detect heat loss air loss through poorly insulated walls and at windows, vents, fascias and soffits.

#### BLOWER DOOR TESTING

Sometimes pressurizing or depressurizing a building aids in discovering where air leaks are occurring. This can help with air sealing and can also help with finding water leaks caused by interior and exterior pressure differences. Blower doors can also help in diagnosing HVAC leaks.

#### AIR QUALITY TESTING

Testing for radon, VOC's (volatile organic compounds), asbestos, mold and other air contaminants may be indicated or required by a prospective building occupant or buyer. A consultant can be subcontracted to perform air quality testing as part of the Forensic work.

#### MOISTURE METER, SMOKE PENS

Using a moisture meter, materials can be checked for unusually high moisture content; often a clue in the search for leaks. A smoke pen, especially when used along with a blower door, can be used to locate air leaks.

#### SELECTIVE DEMOLITION

By selectively removing building materials, we can see how construction was done – whether it matches construction documents – and we can often see where and how problems have occurred. We always try to minimize selective demolition and to locate it where it will have minimum impact. Documents are prepared that will locate and specify the demolition and the reconstruction.

#### ENERGY AUDITING

In certain cases, further energy analysis and auditing can be done. This is called for when energy conservation is of major concern.



ABOVE: After insulation and air blocking, heat loss and air leaking is significantly reduced as seen in this infrared image.

#### HARDSCAPE

Assessment of the paving and other “hardscape” surrounding a building is part of the forensic phase. Broken curbs, heaving pavement, cracked finishes may all be signs of movement due to freeze-thaw cycles, improper drainage or understructured or mis-installed materials.

#### LANDSCAPE

Often landscape design – grading, planting etc. can contribute to more significant building problems. Plantings too close to buildings, for example, may lead to surface mildew on siding. Lawn mowing too close to walls may result in damage to finishes or waterproofing membranes.

#### SITE LIGHTING

Evaluations can include the review of the quality, energy efficiency and code compliance of the site lighting and control. Older or poorly functioning fixtures may produce poor quality light, may not be code compliant, and may waste energy.

#### ENERGY STANDARDS

States have adopted energy standard for building envelopes, mechanical systems and lighting which regulate energy consumption of buildings. Lowering energy use reduces operating cost. The assessment will determine if a building meets energy guidelines.

### 3. REMEDIATION

Fix the problem. Once the problems are identified, a plan for remediation is created.

#### RESEARCH BEST OPTION FOR SOLUTIONS

The information gathered during the Forensics/ Diagnostics phase is analyzed and research is done to determine the best course of action for remediation.

#### DESIGN AND DOCUMENTATION / BIDDING AND NEGOTIATION

As architects, we are able to create a remediation plan that will correct the problems. The plan would include construction drawings and specifications to be used by contractors implementing the work. Biddings and Negotiations can be handled by BMA or by the Owner with assistance from BMA.

#### CONSTRUCTION ADMINISTRATION

During construction, BMA will monitor the Contractor’s progress; review submittals and shop drawings, process requests for payment, and inspect the work to insure that the remediation plan is executed properly.

### WHY USE THESE SERVICES?

To see that a building has problems may take a trained eye. To diagnose the problem and plan to make the corrections takes a trained person with experience providing BE services.

- Problems don’t always reveal themselves until damage is severe.
- You have to know the cause to properly fix it
- It will save the Owner money

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