

INTRODUCTION **PRK**

MOLD & MOISTURE: Double Trouble for Schools
HEALTHY SCHOOL ENVIRONMENTS ACROSS TEXAS // GARLAND, TEXAS // APRIL 24, 2012

SCHOOL BOND AID
Texas School District Construction and Maintenance Planning

BUILDING PROGRAM MILESTONE SCHEDULE

YEAR	2011	2012	2013	2014
WORK ITEM	OCT/NOV/DEC	JAN/FEB/MAR/APR/MAY/JUN/JUL/AUG/SEP/OCT/NOV/DEC	JAN/FEB/MAR/APR/MAY/JUN/JUL/AUG/SEP/OCT/NOV/DEC	JAN/FEB

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Bond Planning
• Facility Condition
• Steering Committee
• Recommendation to Board
• Call for Action

Legal Process
• Call for Action
• Notice of Election
• Notice of Election
• Notice of Election

By Voting
• Election Day

Action Planning Guide

As you listen to this presentation, use the chart in your Action Planning Guide to write down any key strategies to install the Six Technical Solutions in your district.



Indoor Air Quality (IAQ)

AGENDA **PRK**

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IMPORTANCE OF THE BUILDING ENVELOPE

FORCES AT WORK ON THE BUILDING ENVELOPE

COMMON DEFECTS AND FAILURE MODES

MANAGING YOUR BUILDING ENVELOPE

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Importance of the Building Envelope



Importance of the Building Envelope



By definition "envelope" is an encapsulating covering such as an outer shell or membrane

In simple building terms, the **Building Envelope** consists of:

- The roof
- The above-grade wall systems
- The below-grade wall systems



Importance of the Building Envelope



While many building components & systems may have a single required function, the **Building Envelope** fulfills many roles –

- Primary line of defense against water/air intrusion (rain, snow, hail, ice and vapor)
- Plays a major role in capturing and diverting water to storm drainage systems
- Establishes the buildings thermal envelope (resistance to the movement of heat and cold)
- May serve as an important work platform for the building (supporting and protecting critical equipment)

Importance of the Building Envelope

A buildings performance is attributed to two basic factors:

- The efficiency of the systems within the building (lighting, HVAC, plumbing, etc.)
- The efficiency of the building envelope

Much focus is given to the internal building systems, but often little attention is given to the **Building Envelope**

Usually its only expected to keep the rain out, whether or not it keeps hot/cold in is unfortunately secondary in many cases

Importance of the Building Envelope

Given the fact that buildings:

- Annually consume over 40% of the energy in the United States
- Are responsible for more than one-third of the green-house gas emissions
- Often contribute to health problems such as asthma & allergies due to poor indoor environmental quality

Ensuring a more energy-efficient, high performance, sustainable **Building Envelope** is critical

Importance of the Building Envelope

When we talk about **Sustainability** specific to our facilities, we commonly see a focus on:

- Energy Efficiency; Natural Lighting; Indoor Air Quality; Recycled Materials; Solar/Wind Power, etc

When we consider that approximately one-fourth of our facilities are new construction, and the remaining three-quarters are existing facilities, **Sustainability** tends to take on a whole new meaning...

“The Capacity to Endure”

Importance of the Building Envelope

For our facilities to “Endure”, we must **Maintain** them

- Maintenance (Repair, Renovation and Restoration) will extend the useful lives of our facilities while improving their performance

THEREFORE....

The single most significant thing we can do to cut energy cost and minimize capital expenditures is to **MAINTAIN** our facilities

Importance of the Building Envelope

Proactive **Maintenance** is often overlooked by our industry

There is a lack of importance or motivation for **Maintaining** our existing facilities

Maintenance is often inadequately budgeted or not properly funded

Maintenance is often postponed until it is too late, then becomes reactive with limited options and increased cost

Importance of the Building Envelope

As building owners we need to:

- Understand the importance of maintenance
- Understand the conditions of your facilities

As design professionals we need to:

- Not be so quick to just tear down and replace
- Provide better resources, guide specifications, details and contract methods for maintenance

As contractors we need to:

- Understand that there is profitability in maintenance programs
- Learn how to better estimate and bid maintenance programs



Forces at Work on the Building Envelope



Forces at Work on the Building Envelope

WATER penetration through the building envelope continues to be the number one source of complaints and lawsuits from building owners

Approximately 80% to 90% of all building problems are associated with **WATER**

WATER can penetrate the building envelope as vapor, liquid or solid state



Forces at Work on the Building Envelope

All exterior wall components are subject to **WATER** infiltration/migration

Walls leak when three conditions exist simultaneously:

- **Presence of water** – (rain, soil moisture, air vapor)
- **Forces are present to drive or draw water inward** – (pressure differentials, capillary, gravity, wind)
- **Openings in a wall** – (gaps, cracks, windows, doors)

“ELIMINATE ANY ONE OF THESE THREE CONDITIONS AND WATER WILL NOT PENETRATE THE ENCLOSURE”



Forces at Work on the Building Envelope

Water can enter thru numerous openings commonly found in every exterior wall assembly: (as small as 0.005")

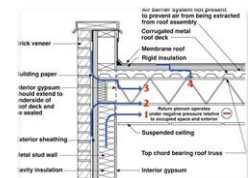
- **Cracked/porous brick & plaster** – (Absorption)
- **Improperly installed / cracked mortar joints**
20,000 sf wall surface = 135,000 modular brick; 22.7 miles of mortar joints; 45.5 miles brick/mortar interface
- **Poorly bonded “dissimilar materials” and “movement type” joints**
- **At top of walls, coping caps, through-wall flashing**
- **Various other types of wall penetrations:**
Doors, Windows, Pipes/Conduits, Ductwork, Signage

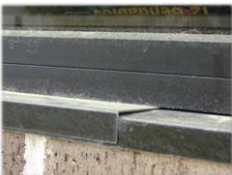


Common Defects & Failure Modes



Common Defects & Failure Modes



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Common Defects & Failure Modes

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Managing Your Building Envelope

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Managing Your Building Envelope

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Thermal and Air penetration performance of building envelopes have a direct and measureable effect on the buildings energy usage

To build a more energy-efficient building the most common emphasis is to incorporate more insulation and use energy-efficient HVAC systems, appliances and lighting.

An often over looked and highly effective way to save energy is to reduce the building envelopes air leakage – (up to 40%)

Managing Your Building Envelope

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Approximately 99% of all envelope leakage is attributable to causes other than material or system failure

Rarely is leakage through the envelope as a result of failure of the materials themselves, but rather by

- Installation errors
- Wrong system or materials being specified
- Incompatible materials being used together
- Individual components not properly detailed to allow the system to function as a cohesive unit

Managing Your Building Envelope

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Since it is impossible to eliminate rain, snow and ground water

Since it is impossible to stop mother nature and the forces of gravity, air currents, capillary suction, surface tension, kinetic energy, air pressure and hydrostatic pressure

Our mission and goal should be to eliminate as many of the intentional and inadvertent openings and penetrations that occur in the building envelope as possible

Managing Your Building Envelope



Mitigate water penetration of the **BUILDING ENVELOPE** by applying three basic strategies:

- Limit water penetration into a building with:
 - Barriers such as membranes and sealants
 - Diversions such as sloping surfaces and gutters
 - Screens such as projections, overhangs & baffles
- Prevent water accumulation by providing:
 - Drainage
 - Drying / evaporation
 - Ventilation
- Neutralize the physical forces that transport water by:
 - Capillary breaks; drip lips
 - Protected openings; rain screens

Managing Your Building Envelope



Successful **BUILDING ENVELOPES** will include the following:

- An air barrier to control the movement of air across the building enclosure
- A vapor barrier to prevent the diffusion of moisture through the building enclosure
- A thermal barrier to provide insulating properties
- A drainage plane to effectively manage water infiltration

Managing Your Building Envelope



Managing Your Building Envelope



Managing Your Building Envelope



Successful **BUILDING ENVELOPE** design guidelines to consider are:

- Minimize the number of protrusions and penetrations
- Minimize number of different cladding and waterproofing systems and materials being used, to limit termination and transition detailing
- Minimize reliance on sealant systems for termination and transition detailing
- Design joints to shed water
- Minimize reliance on single-barrier system, incorporate back-up or secondary systems

Managing Your Building Envelope



Additional successful **BUILDING ENVELOPE** design guidelines to consider are:

- Secondary systems installed where applicable:
 - Through-wall flashing
 - Dampproofing
 - Weeps
- Proper allowance for thermal expansion, contraction, and weathering cycles
- Absence of level or horizontal envelope areas that would allow ponding water
- Drainage of water away from an envelope as quickly as possible
- Recessing windows, curtain walls and doors

Managing Your Building Envelope



Successful procedures to protect the **BUILDING ENVELOPE** are:

- Hire a professional Roofing and Building Envelope Consultant
- Establish routine STANDARD inspections to identify active and potential leak areas
 - Tools for School walk through inspections
 - Annual roof inspections
 - After every significant storm event
- Develop a Roofing and Building Envelope Maintenance Program
 - In-house personnel
 - Annual contract with contractor



Thank you!