LESSONS LEARNED IN A LARGE MOLDY BUILDING

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PURPOSES

• Describe why and how the problems occurred
• Describe what was done to remedy the problems
EVIDENCE OF THE PROBLEMS

• Mold
• Clammy conditions
• High humidity
• Sagging ceiling tiles
• Employee complaints
• High CO2 readings
ARCHITECTURAL DESIGN

EXTERIOR

- Overhangs and shading
- Thermal bridges
- Wall dampproofing vs. vapor retarder
- Water leaks
  - Roof
  - Windows
  - Flashings
ARCHITECTURAL DESIGN
INTERIOR

- Uninsulated walls above ceilings
- Unconditioned interior spaces
- Vinyl wall covering
- Wall cavity drainage
- Openings in block walls
  - At slab above
  - At columns
  - Blocks missing
MECHANICAL SYSTEMS

- Gas boiler and electric chillers
- 65 AHU’s, 53 VAV, 10 SZ, 2 MZ
- Outdoor air
- Exhaust balance
- Minimum airflow settings
- No humidity control
- HVAC oversized by a factor of 2
- Building too efficient
APPROACH TO DETERMINING CAUSES OF PROBLEMS

• Review of design
• Review of construction
• Review of operation and maintenance
NO COST AND LOW COST ATTEMPTS AT TEMPORARY SOLUTIONS

- Record and monitor T & H
- Change CHW and CCD temperatures
- Leave lights on around the clock
- Install heating coils and dehumidifiers
- Operate HVAC around the clock

Results – Improved conditions, but not resolved
EVALUATION OF PERMANENT SOLUTIONS

- What should have been done in the first place
  - Why wasn’t it done
- What is required to do it right
- Are there less expensive solutions
  - Degree of certainty they will work
- Opportunity to correct unrelated defects
REPORT CONCLUSIONS

• Principal causes
  – Inability to control humidity
  – Inability to preclude moisture accumulation

• Contributing factors
  – Inadequate vapor retarder
  – Air leakage
  – Water leakage
  – Inadequate outdoor air

• Related problems
  – Employee health
SOLUTIONS

• Eliminate wall, window, and roof leaks
• Install vapor retarder
  – Required removing exterior walls
• Provide specific humidity control
  – Replace all AHU’s
  – New controls
• New outdoor air systems
DEFENSIBILITY OF SOLUTIONS

- Taxpayers
- Building occupants
- Defendants
- Insurance carriers
- Staff
- Industry standards
- Why these problems don’t always occur
WHAT CAN BE DONE TO PRECLUDE THESE PROBLEMS IN OTHER BUILDINGS

• In new construction
  – Follow accepted practices
  – Make certain construction is proper

• In existing buildings
  – Pay careful attention to O & M
  – Verify that capability exists to deal with these types of problems
CONCLUSIONS

- Odyssey for all involved
- Architects and Engineers
  - Professional embarrassment
  - Insurance carriers paid limit of policies
- Contractors and subcontractors
  - Paid settlements of many times what saved
- Taxpayers
  - Will never recover total cost
- Elected officials
  - Political embarrassment
CONCLUSIONS

- Employees
  - Suffered health problems and dislocation

- Facilities staff
  - Endless grief

- Consultants
  - Additional problems discovered at every turn

- Remediation contractors
  - Will think twice before doing a similar project

- Rest of the world
  - I hope you never have to experience something like this