Conquering Moisture in the Gulf South

By Paul LaGrange

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Who is Paul LaGrange?

• Forensic investigator for moisture, hvac, and energy in historic, existing, and new homes located in the hot humid Gulf South.
• Building Science Educator at the LaHouse Resource Center at LSU, Louisiana.
• Expert Witness for Legal Cases related to building science and construction
• Former Contractor with 20 years of building experience
What We GET PAID to Do

• 95% of the consulting we do is moisture-related
Regional Challenges

• Hot Humid Climate
  – Excessive amounts of rainfall
    - Annual average rainfall – 40” to 60”
  – Average Summertime dew point temperatures of 72 – 74 degrees
August Climate & Weather Averages in New Orleans

- High Temp: 92 °F
- Low Temp: 79 °F
- Mean Temp: 85 °F
- Precipitation: 2.48"'
- Humidity: 72%
- Dew Point: 74 °F
- Wind: 8 mph
- Pressure: 29.99 "Hg
- Visibility: 9 mi
The percentage of time spent at various humidity comfort levels, categorized by dew point: dry < 55°F < comfortable < 60°F < humid < 65°F < muggy < 70°F < oppressive < 75°F < miserable.
Industry Failure

Design and Execution Flaw
Industry Failure

Design Flaw
Industry Failure
Laziness
I have no words for this one!
Effects of Differential Pressure
Water Vapor Barrier on Wrong Side of Exterior Wall Assembly in Hot Humid Region
Industry Solution to Reducing Attic Heat and Preventing Moisture on Supply Ductwork
User Error!

Thermostat Setting 69 degrees
Indoor temperature 74 degrees
Fan controller is set to ON
Homeowner’s Solution to a Leaky Attic Stairwell
Industry Lies I often hear…

- LIE #1: Insulating without a drainage plane or air barrier is ok.
- LIE #2: Variable capacity AC systems perform like dehumidifiers
- LIE #3: Variable capacity air handlers can overcome poor duct design, poor installation methods and incorrect sizing of machines.
LIE #1: Insulating without a drainage plane or air barrier is ok.

The Facts:
– Historic homes in hot humid climates originally had no insulation or air barrier and no planned drainage plane.
– A lot of the homes had window ac units previous to central HVAC and many rooms of the home were passively cooled.
– Updating these homes often included insulation and/or adding central heating and air conditioning.
Believing the Lie...
Believing the Lie…
Stick built – balloon framed wall assembly

- Cypress wood clapboards
- Double hung wood single glazed windows
- Plaster interior – no wall insulation
- Home recorded with Historic District
- Exterior Improvements were not an option

Flooded during Hurricane Katrina
Gutted
Wet clapboards and studs
Home owner wanted to protect the structure and make the home energy efficient
Wall Assembly
Section Cut

1. Existing Clapboards
2. Rain screen (Home Slicker)
3. Foam Board
4. Renewable spray foam insulation (Agribalance by Demilec)
5. Half inch Paperless sheetrock
Creating a Drainage Plane
(from the inside out)

A water drainage space behind the siding was provided by installing a plastic mesh – cut to fit between each stud cavity.
Integrating an Air Barrier with the Drainage Plane
(from the inside out)

Rigid Foam board is installed over the drainage mesh and sealed as it abuts the stud framing to provide both air and water protection.
Drainage Path at bottom of the wall
(from the inside out)

Create a path for the water to weep to the bottom of the wall while addressing an air seal as a bottom plate of the stud cavity.
Installing Insulation
Flooded homes with brick veneer and damaged wall sheathing
Flooded homes with brick veneer and damaged wall sheathing
Addressing the exterior walls another way....

...from the outside in...
Addressing the exterior walls another way…. 

…from the outside in…

- Pine wood clapboards
- Double hung wood single glazed windows
- Plaster interior – no wall insulation
- Improvements from the inside was not an option
- Exterior siding was removed
- Added insulation inside the stud cavities, exterior wall sheathing to stud framing to improve structural integrity
- Home owner wanted to improve the structure for wind and make the home energy efficient
Creating Effective Air & Water Barriers – Exterior of Wall Assembly

Install Primer Around Window Edges. Install flashing so that half the tape is attached to the wall sheathing and the other half is attached to the underside of the window frame.
Trim the bottom horizontal straight flash at both bottom corners
Flash the corners according to the following pictures.
Apply adhesive/primer on corners and sides.

Install Flex Flashing to protect the corners from water infiltration.
Install Straight flashing at the vertical sides coordinating the flashing at the wall sheathing horizontal joint.
Overlap the horizontal joint flashing on the wall sheathing with the upper portion of the vertical flashing for the side of the window.
Protect the lower corner by overlapping the horizontal flashed corner with the vertical straight flashing tape
Address the Upper Corners Similar to the Lower Corners
Install Primer/Adhesive and then Flexible Flashing to protect the corner
Install horizontal straight flashing at the top of the window
Trim the flashing to work around the corner of the window
Install fluid-applied product at all flashing around the window
This marries the flashing to the wall sheathing
Set all nails – fastener heads beneath the face of the wall sheathing
Install fluid-applied product at nail – fastener heads
Coat entire surface of wall sheathing according to Manufacturer’s recommended mils
Improvements to old Wood Double Hung Windows
LIE #2: Variable capacity AC systems perform like dehumidifiers.
The Facts:

- Air conditioners can only dehumidify when they are operating.
- Air conditioners operate for short cycles of time during the “shoulder months” or during the winter, so the air conditioner is not operating long enough to effectively dehumidifying.
- Older homes have larger amounts of moisture than newer homes in the Gulf South because they are notoriously leaky.
Why is this a Challenge?
Suggested HVAC approach for older homes in the Gulf South

- Install properly sized single speed AC equipment with supplemental dehumidification.
- Bring all mechanical systems and ductwork into conditioned or semi-conditioned areas.
Correcting the Lie
LIE #3: Variable capacity air handlers can overcome poor HVAC design

FACT:
- No amount of air can overcome kinked, twisted, or bent ductwork because the air simply cannot pass through.
Suggested Air Distribution Design in the Gulf South

- Install properly designed and sized ductwork using ACCA Manual D guidelines
- Utilize air tight ducts
- Insulate as needed based on duct location
- Properly support ductwork to prevent cool surfaces from condensing
Who is Paul LaGrange?

How my kids describe what I do professionally:

I grow a beard and I know things.