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


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Science
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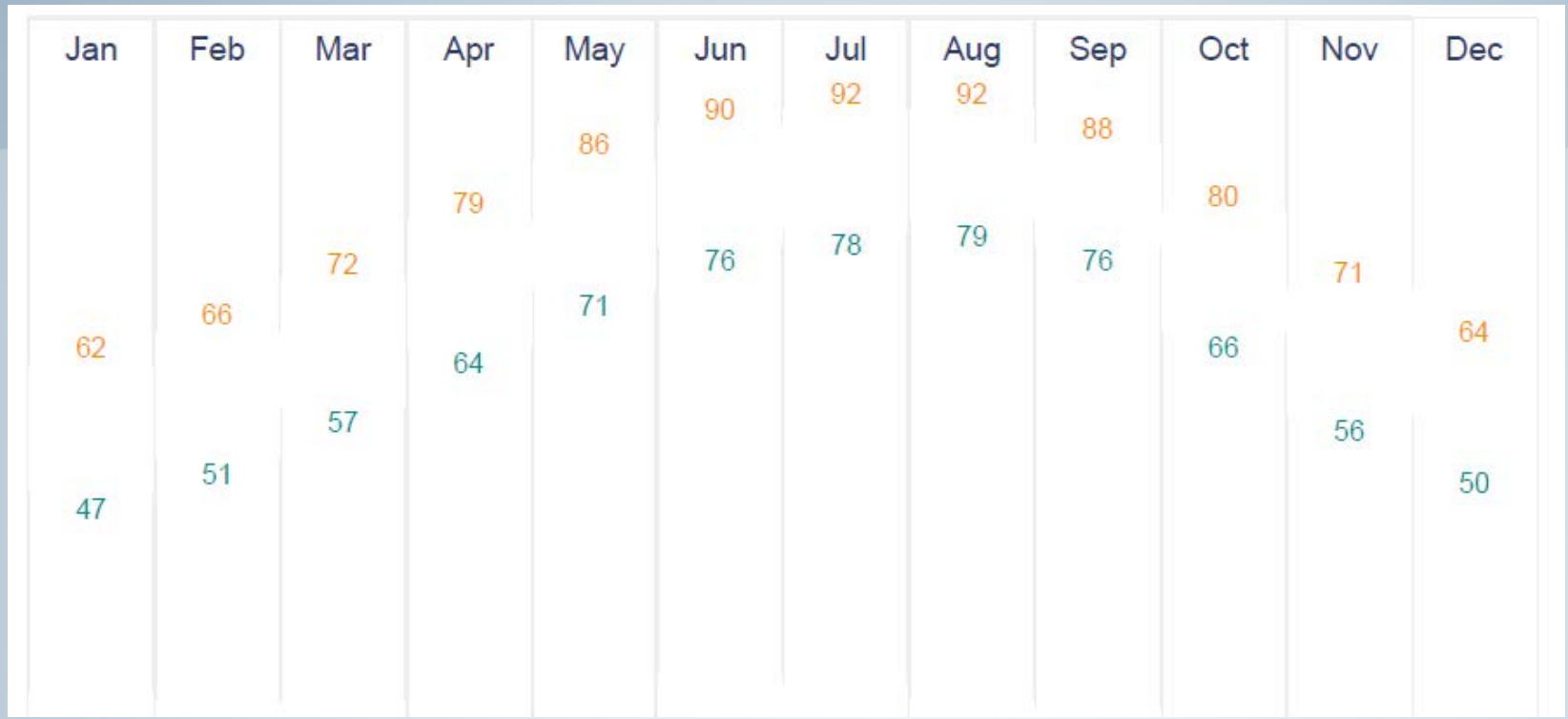
A program of the Insurance Institute for Business & Home Safety
Extreme
MAKEOVER
HOME EDITION
INFRASPECTION INSTITUTE
CERTIFIED
INFRARED THERMOGRAPHER
LACAP
community Action
PARTNERSHIP
COMMUNITY ACTION
PEOPLE HELPING PEOPLE
ACCA
MANUAL J.
ALLIANCE for AFFORDABLE ENERGY

What We GET PAID to Do

- 95% of the consulting we do is moisture-related

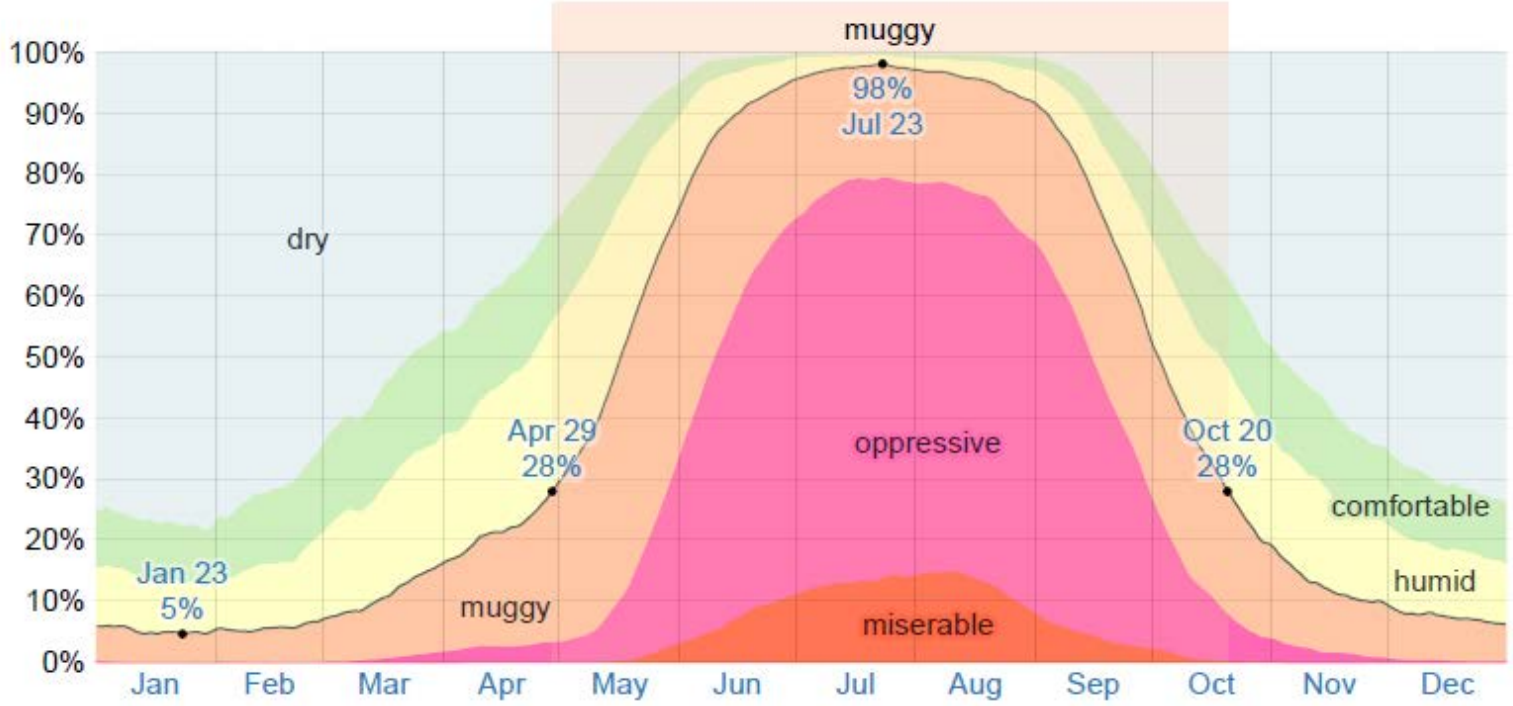
Regional Challenges

- 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

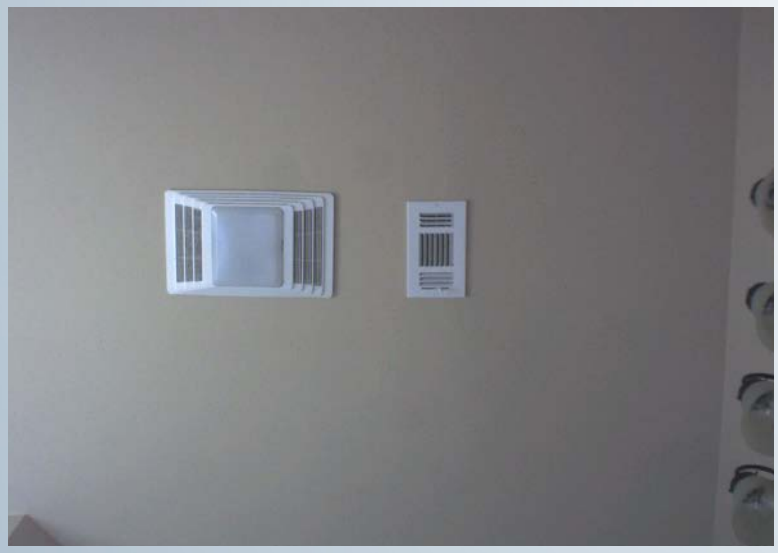
High Temp: 92 °F	Precipitation: 2.48"	Wind: 8 mph
Low Temp: 79 °F	Humidity: 72%	Pressure: 29.99 "Hg
Mean Temp: 85 °F	Dew Point: 74 °F	Visibility: 9 mi

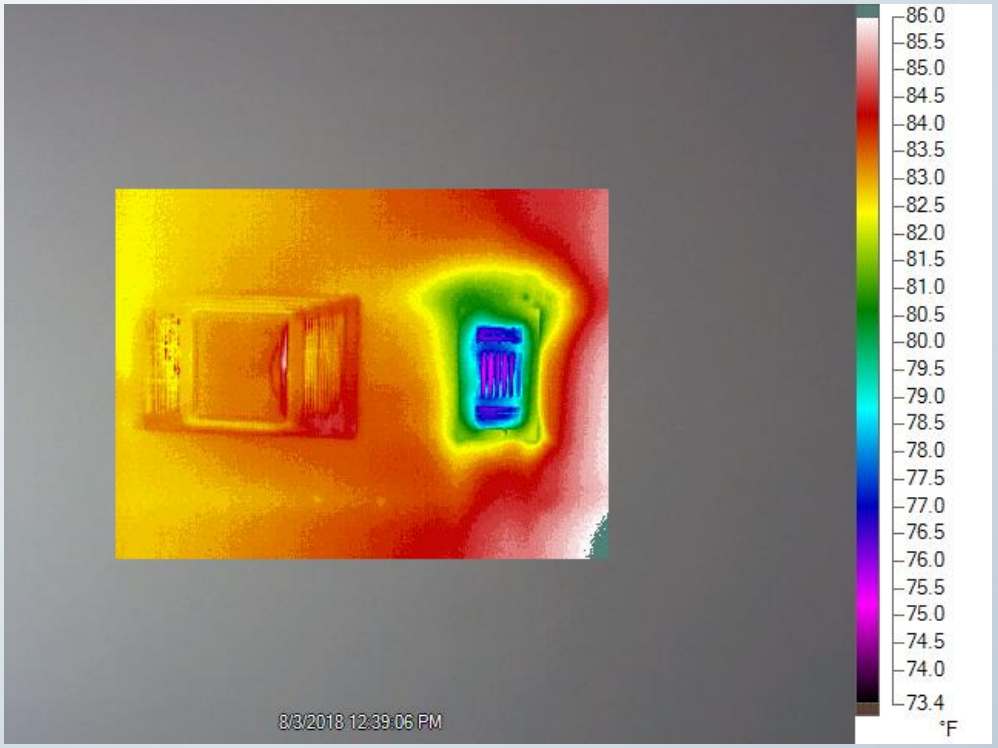


The percentage of time spent at various humidity comfort levels, categorized by dew point: dry < 55°F < comfortable < 60°F < humid < 65°F < muggy < 70°F < oppressive < 75°F < miserable.

Industry Failure

Design and Execution Flaw

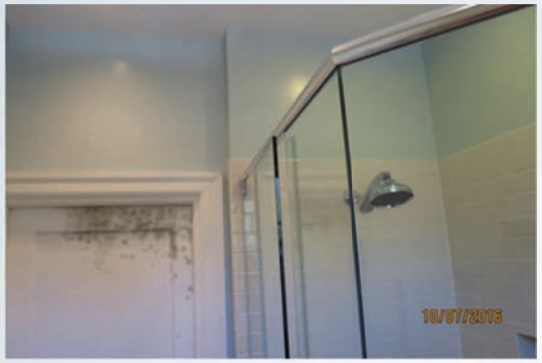




Industry Failure

Design Flaw

Industry Failure



Laziness

I have no words for this one!


09/07/2016


DG-700 Pressure & Flow Gauge
THE ENERGY CONSERVATORY


09/14/2016

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

Flooded during Hurricane Katrina

Gutted

Wet clapboards and studs

Home owner wanted to protect the structure and make the home energy efficient

Cypress wood clapboards

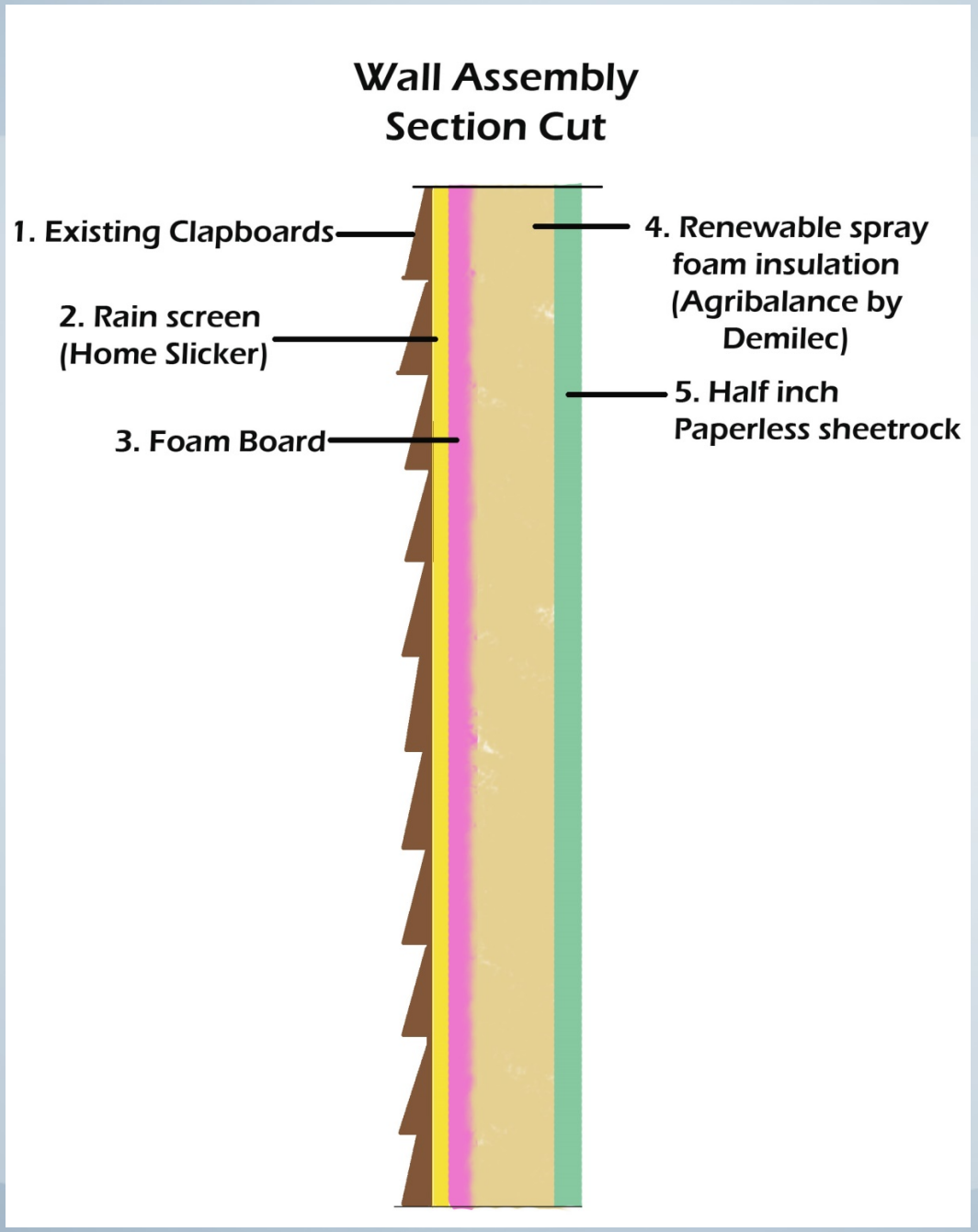
Double hung wood single glazed windows

Plaster interior – no wall insulation

Home recorded with Historic District

Exterior Improvements were not an option

Wall Assembly Section Cut



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)

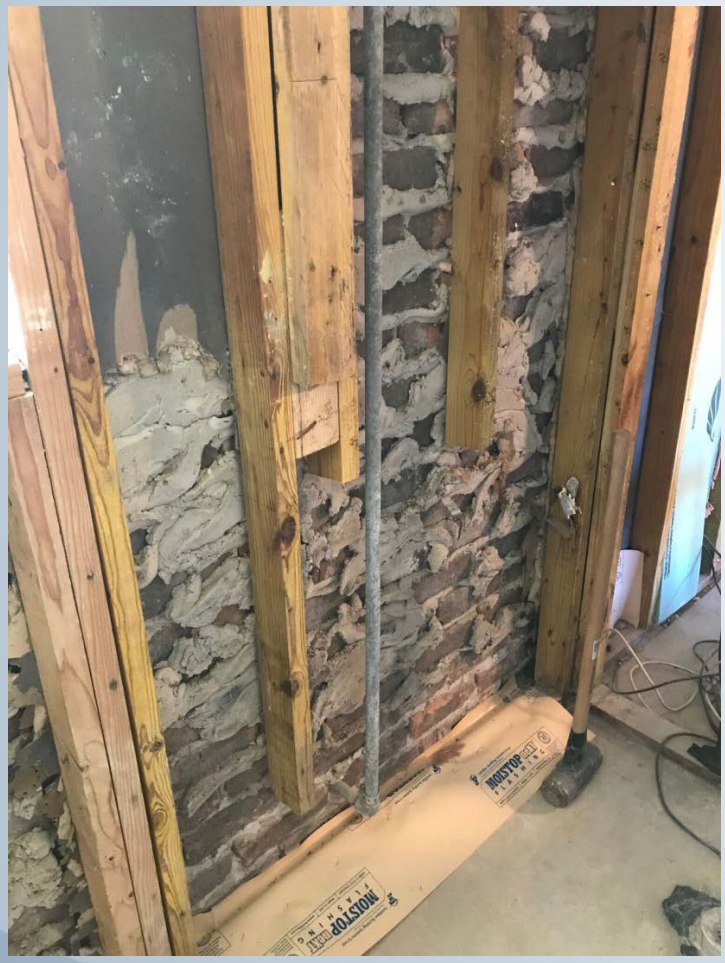
Rigid Foam board is installed over the drainage mesh and sealed as it abuts the stud framing to provide both air and water protection.

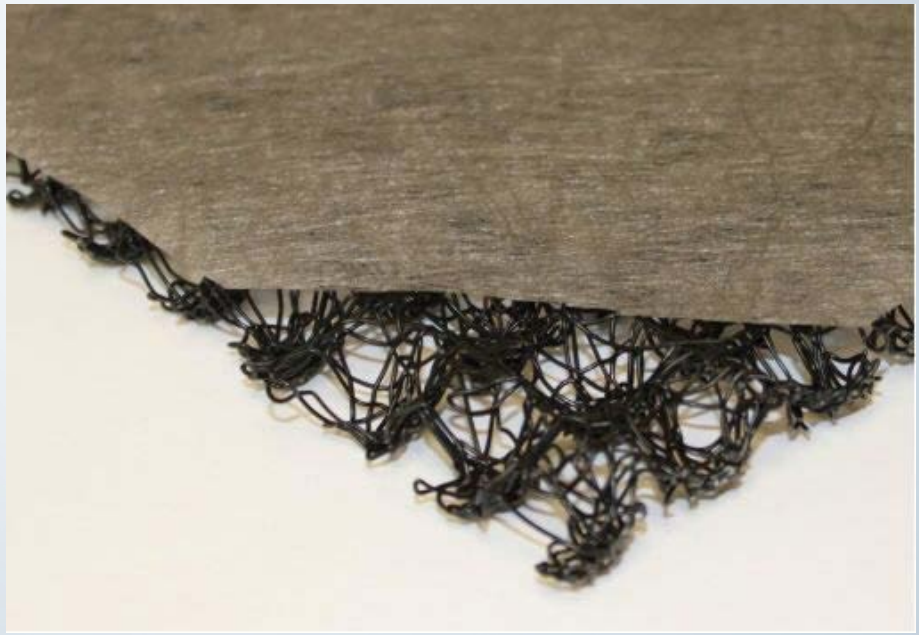
Drainage Path at bottom of the wall
(from the inside out)

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

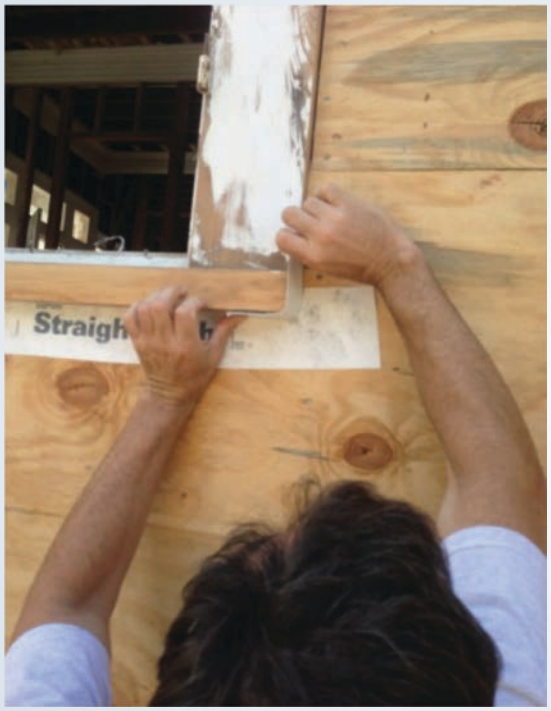
Install Primer Around Window Edges.

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.



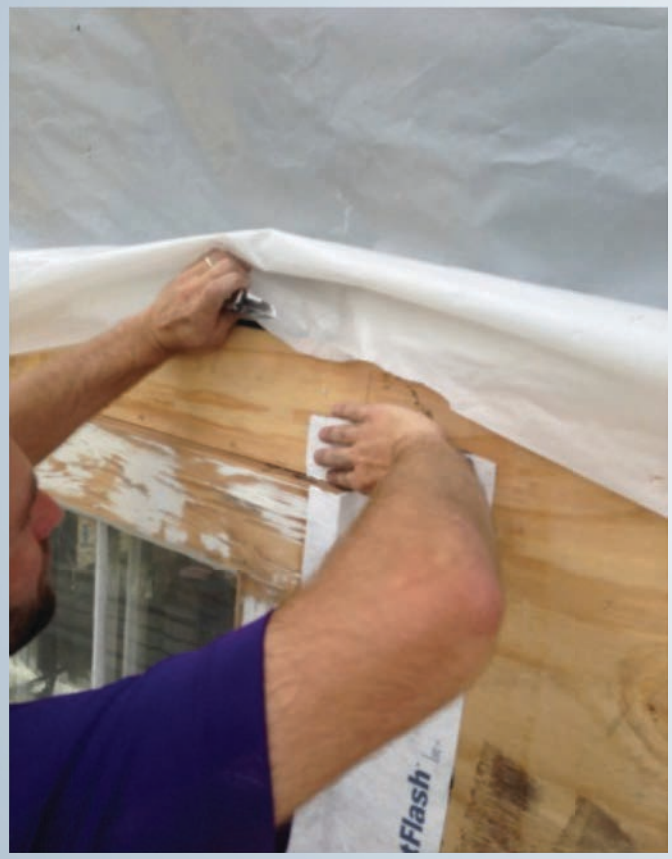
Install Flex Flashing to protect the corners from water infiltration

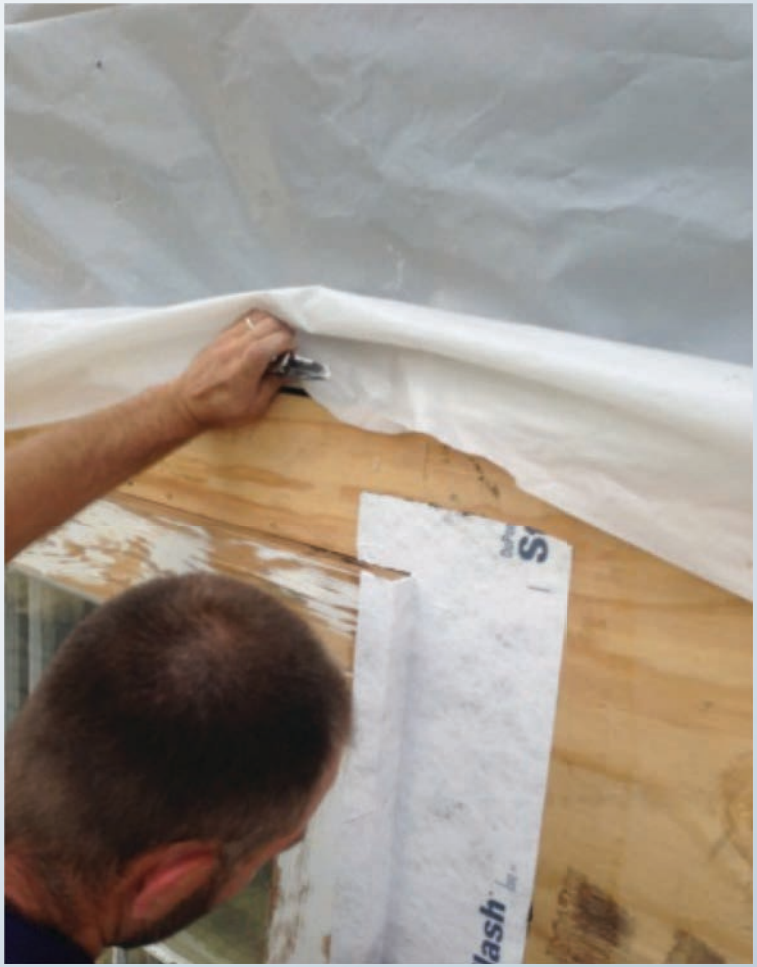
Install Straight flashing at the vertical sides coordinating the flashing at the wall sheathing horizontal joint.

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

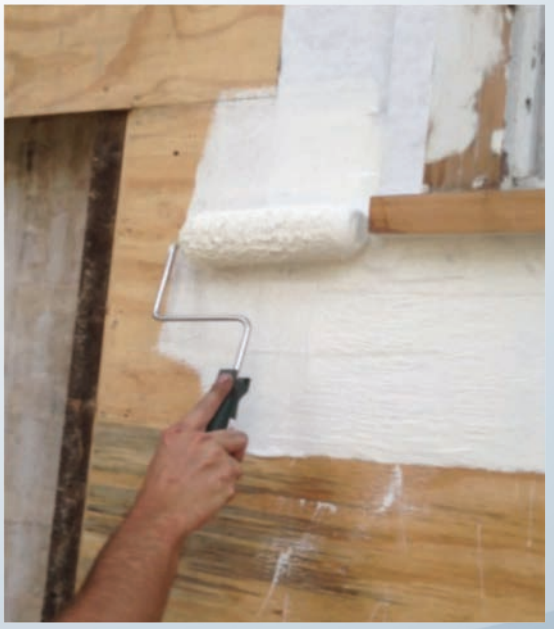
Trim the flashing to work around the corner of the window

IMG_2557

IMG_2559

Install fluid-applied product at all flashing around the window

This marries the flashing to the wall sheathing



IMG_2580

IMG_2581

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.

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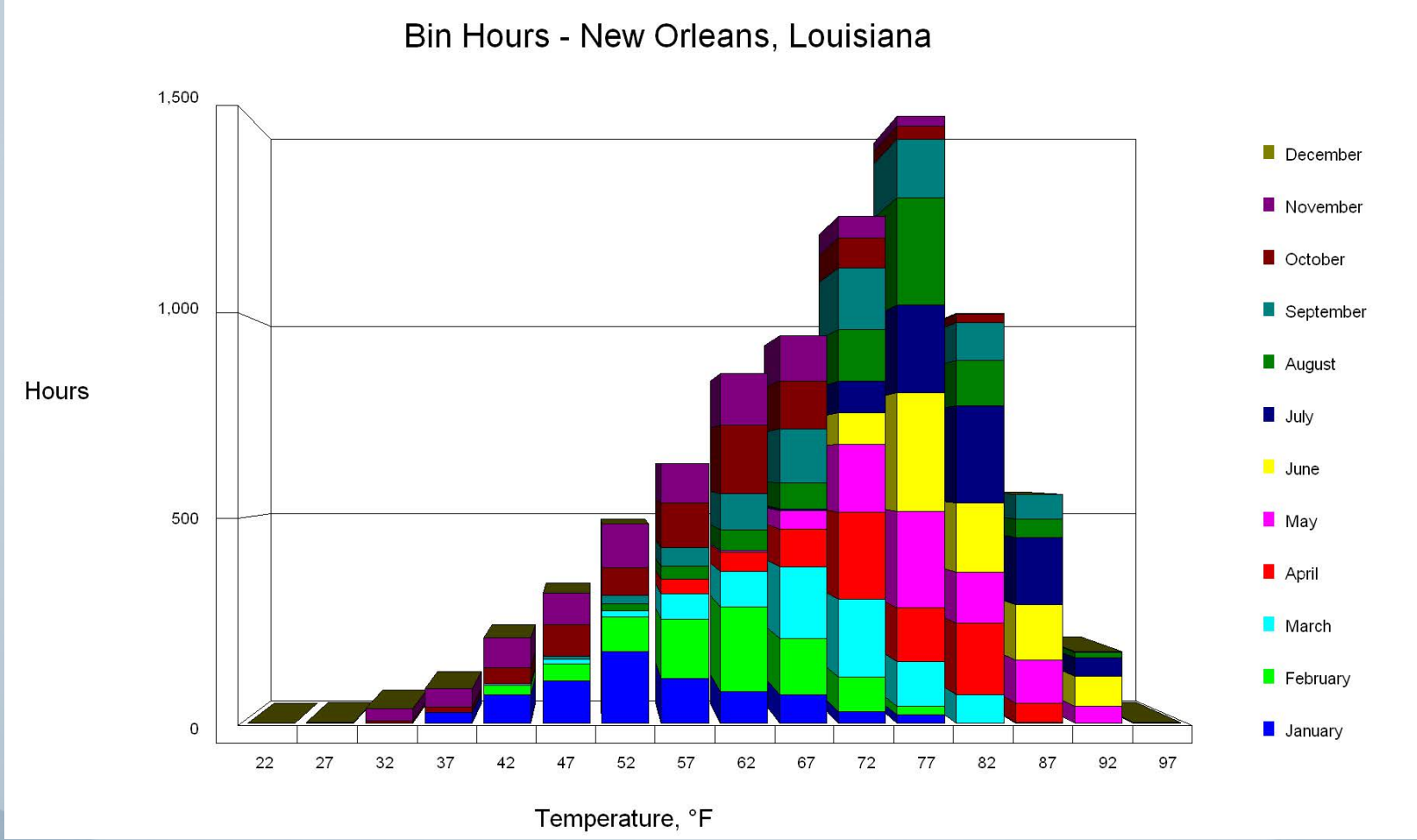
The Facts:

- 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.

IMG_2070


RUBATEX INSUL
INSUL- -UBE 180 25/50 1-1/8" ID X 1/2" WALL
01281 2
RUBATEX INSUL
25/50 1-1/8" ID X 1/2" WALL
01281 2

IMG_8607

IMG_3386


3 7/8" ID X 3/8" WALL

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: