



HRAC Update: Asphalt Shingle Research

Principal Investigator: Forrest J. Masters, Ph.D., P.E. (FL)

Co-PI: David O. Prevatt, Ph.D., P.E. (MA)

Co-PI: Kurtis R. Gurley, Ph.D.

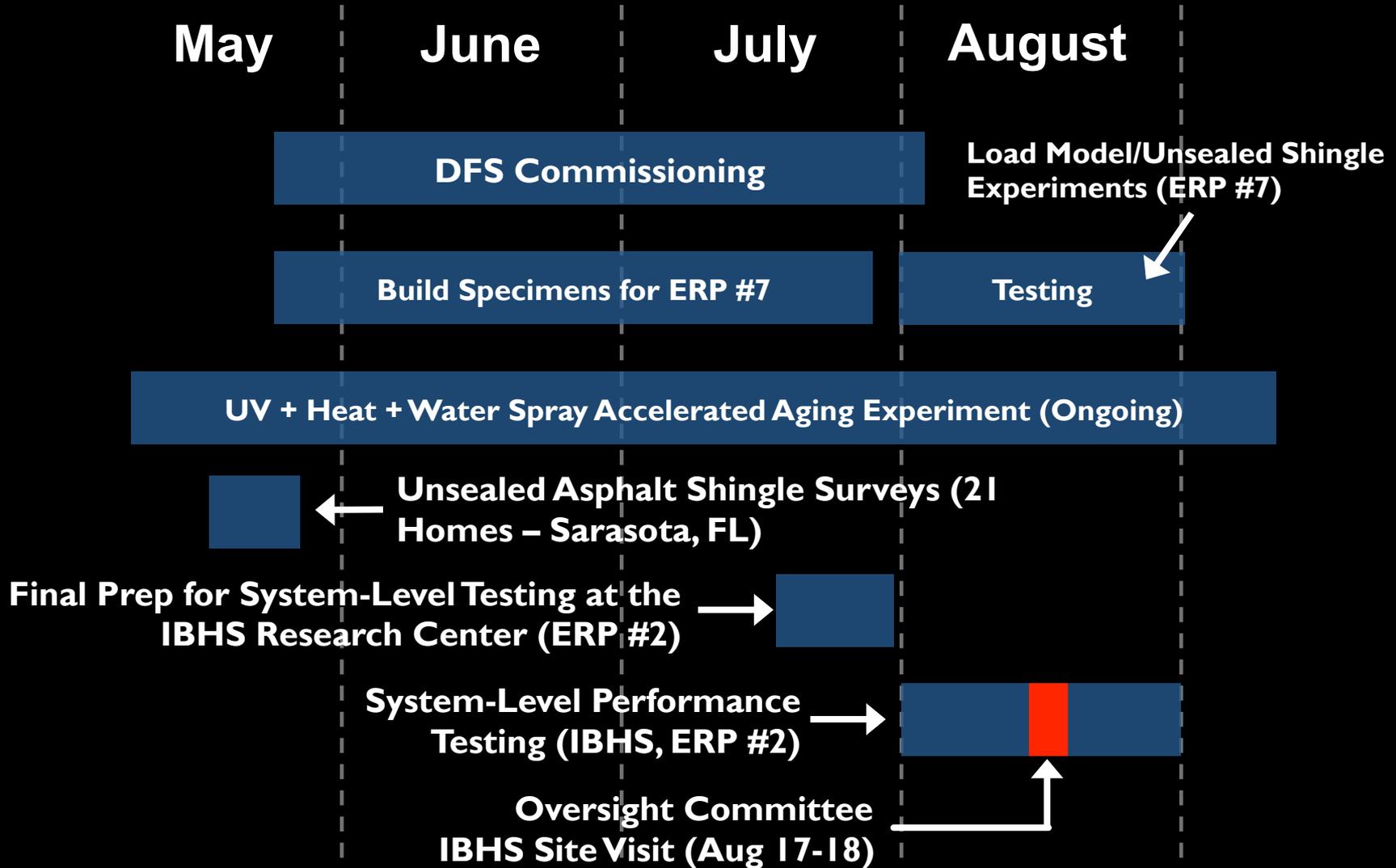


College of Engineering
UNIVERSITY of FLORIDA

Objectives and Exp. Outcomes

- Objective\Purpose
 - To investigate the performance of new and aged asphalt roof shingles exposed to windstorm conditions and to calibrate current wind uplift requirements to realistic wind load scenarios
- Expected Outcomes
 - Provide a comprehensive quantification of the performance of new and aged shingle roof systems
 - Refine the specific causes of the inadequate performance observed in field studies
 - Create a roadmap to reduce loss associated with shingle damage in extreme winds

Progress



Asphalt Shingle Load Model Evaluation

Goal: To evaluate the current asphalt shingle load model and extend our knowledge on wind load effects on asphalt shingles.

Variables:

- Mean velocity
- Angle of attack
- Length and pattern of seal (unsealing effects)

ERP #7 - Asphalt Shingle Load Model Evaluation

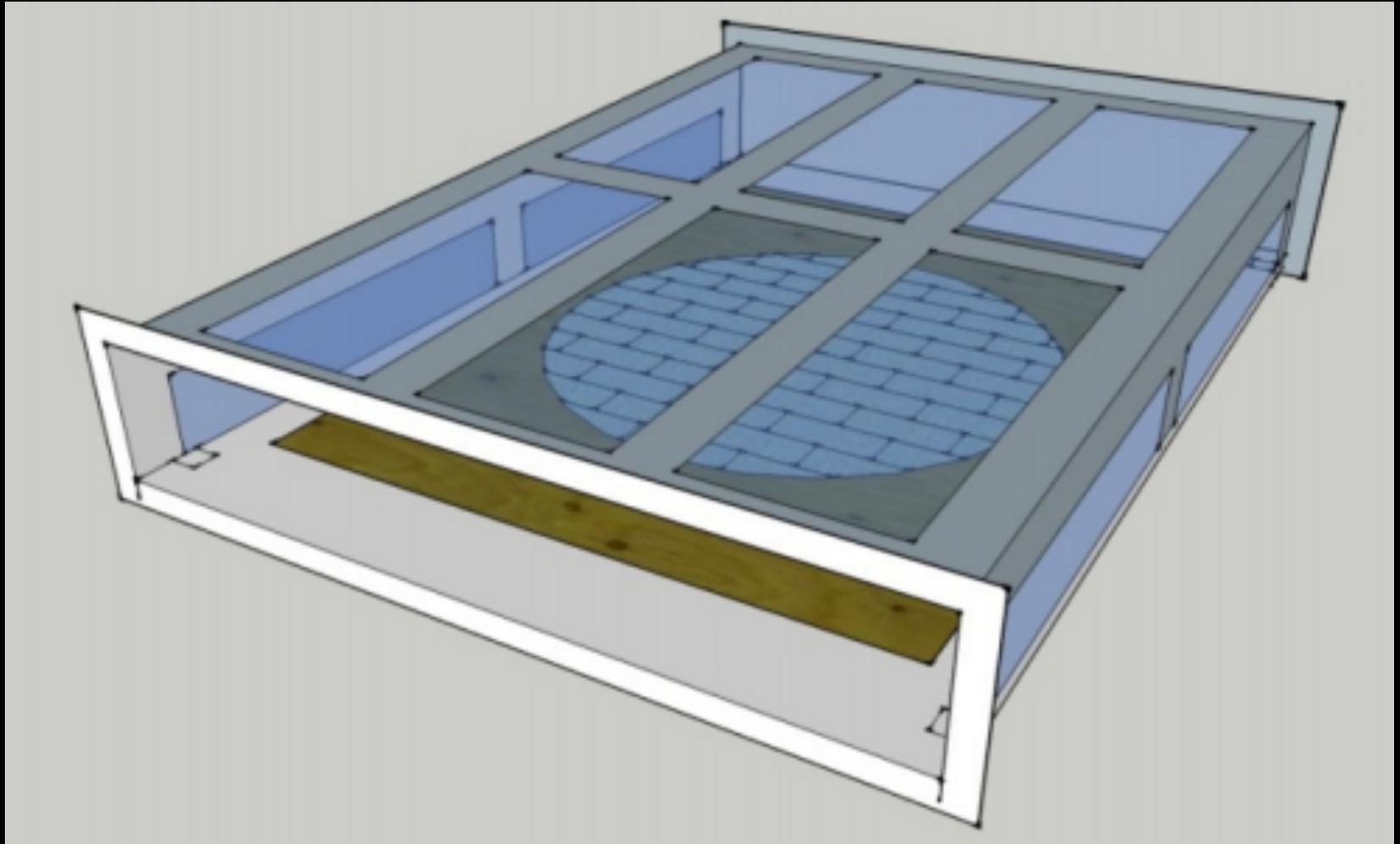
Methods:

- Directly measure wind load path
 - six-axis load cells at sealant strip and fasteners
- Measure three-axis wind velocity using TFI Cobra Probes at 1 in above shingle deck
- Use turntable and vary angle of attack
- Vary mean wind velocity
- Full seal → partial seal → fully unsealed load effects
- Test specimens → 1 laminated, 1 three tab

ERP #7 - Asphalt Shingle Load Model Evaluation



ERP #7 - Asphalt Shingle Load Model Evaluation



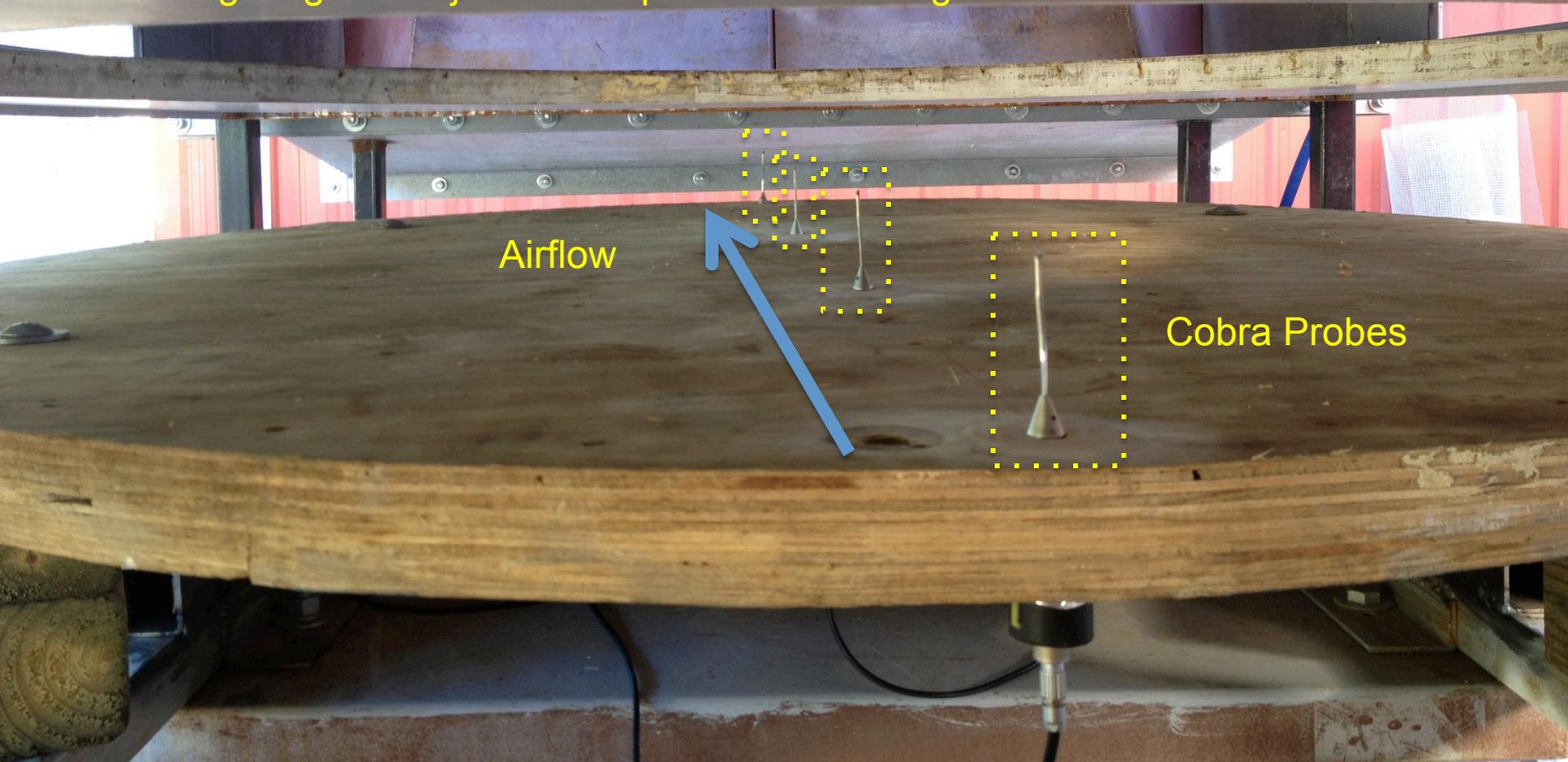
ERP #7 - Asphalt Shingle Load Model Evaluation



ERP #7 - Asphalt Shingle Load Model Evaluation

MEASURED: 220 mph unobstructed flow | 170 mph with ASTM D7158 Turbulence Grid

Ceiling height is adjustable to produce static regain to overcome frictional losses



Next step..

- Final commissioning
- Testing..
- Please let us know if you wish to attend

Asphalt Shingle Load Model Evaluation

Goal: To investigate the system-level performance of ASTM D7158 Class H (150 mph) asphalt shingles subjected to a realistic BL wind storm at the IBHS Research Center in Chester County, SC

Variables:

- Mean velocity → 53, 64, 76 mph (peaks → 84, 108, 120 mph)
- Roof type → hip vs. gable
- Product type → three-tab vs. laminate



Institute for Business & Home Safety

- 30 MW Wind Tunnel
- Test Two Story Home in Cat 3 Hurricane
- Chester County, SC

SLIDE
12



College of Engineering
UNIVERSITY of FLORIDA



©Insurance Institute for Business & Home Safety

Base Structure Prep



Base Structure Prep



Base Structure Prep



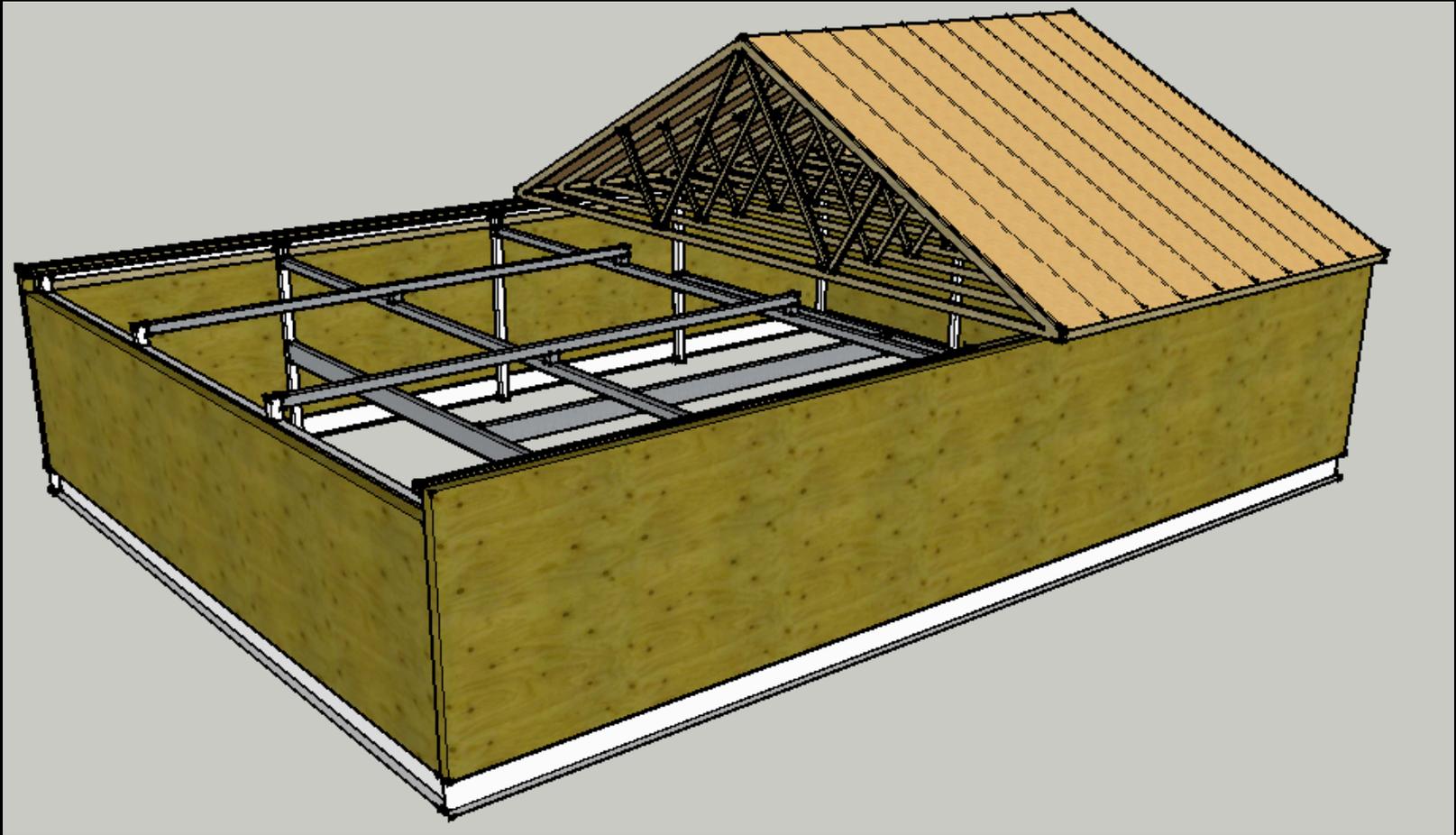
SLIDE
16



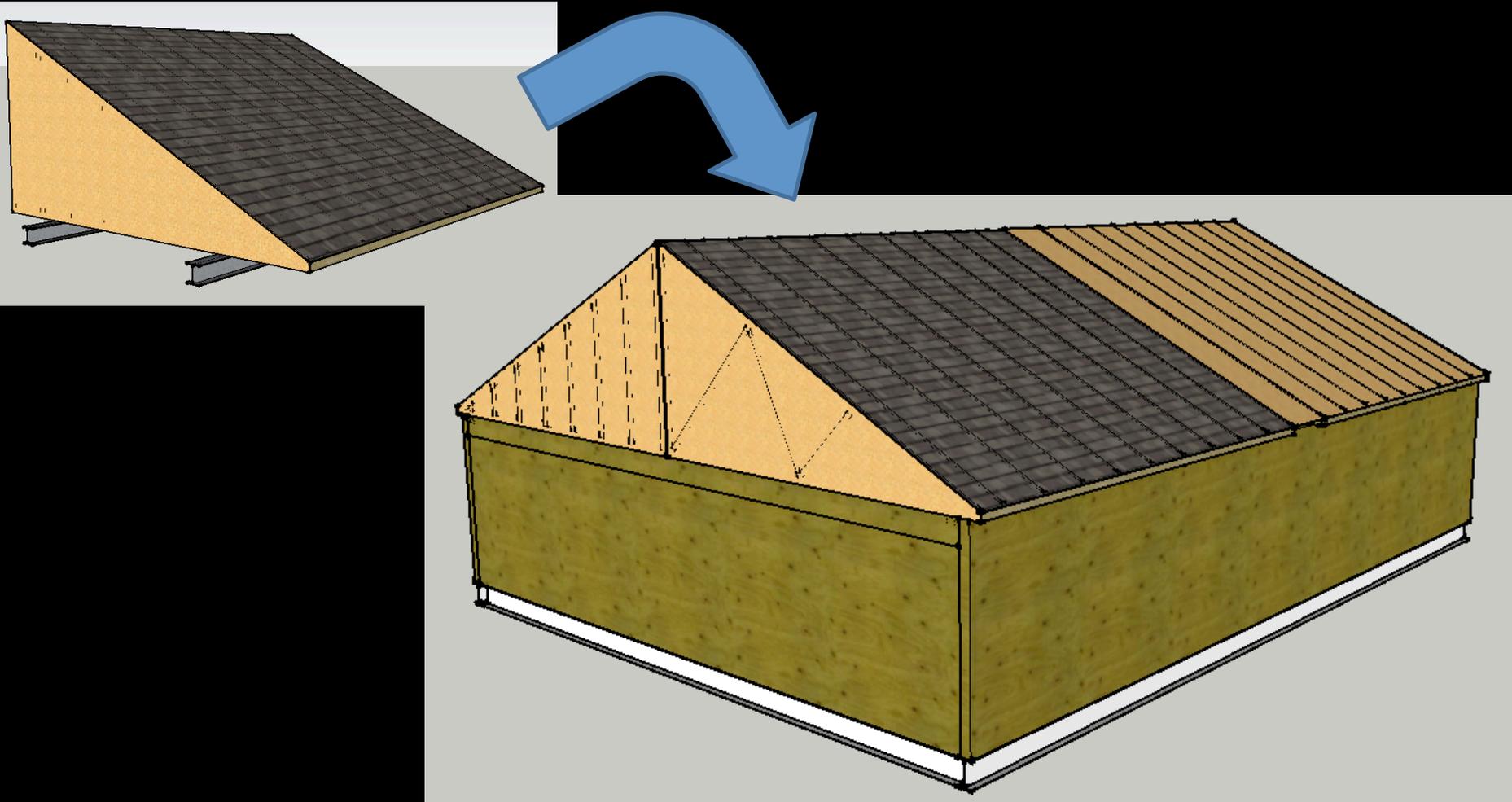
UF

College of Engineering
UNIVERSITY of FLORIDA

Base Structure Prep



Complete Structure



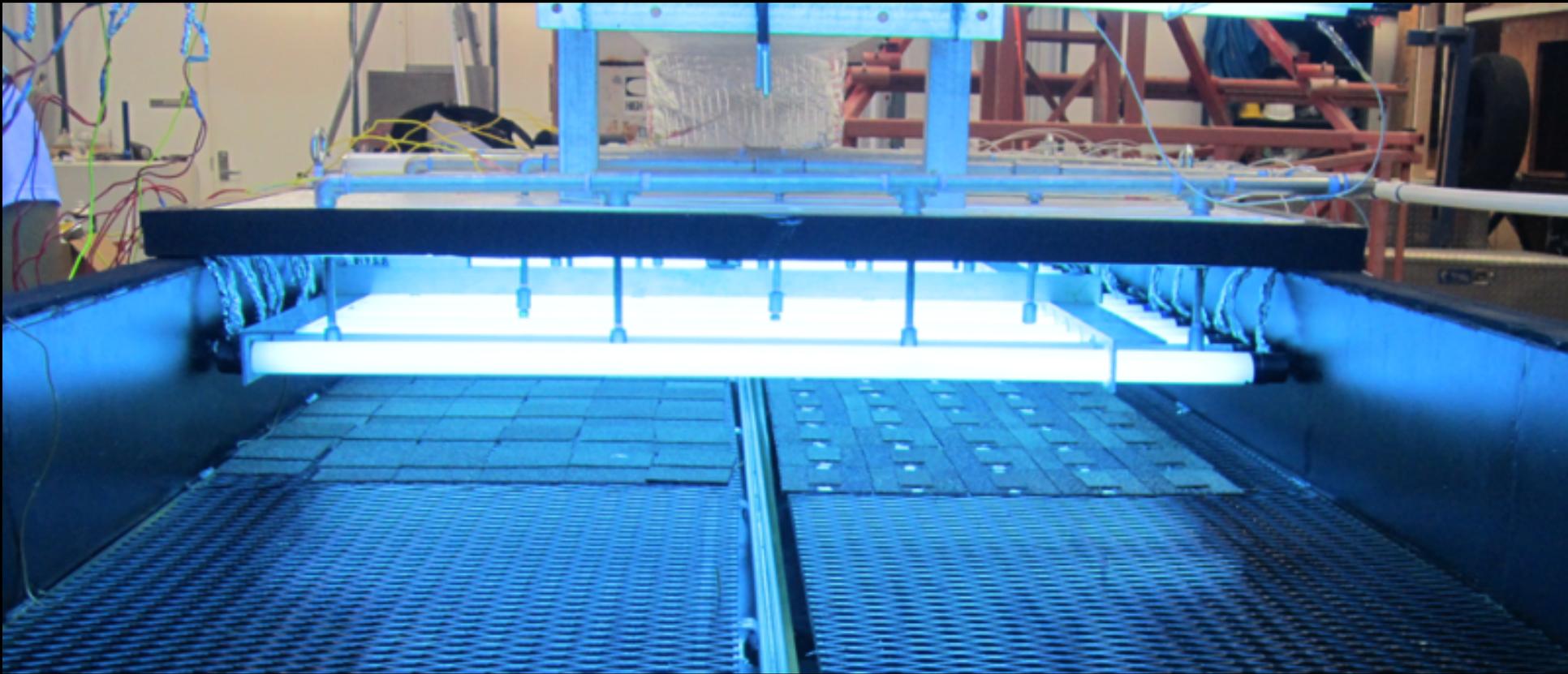
Test Schedule

- Base structure construction complete
- Testing → July 30th – Aug 31st
- Test roofs subjected to open country BL wind test
 - Three 30 min wind tests at one direction
 - Peak speeds = 84, 108, 120 mph
 - Continuous HD video capture
 - Forensic investigation b/t each wind test

Uplift Resistance of Shingles Subjected to UV + Heat + Water Spray Aging

- Repeat of thermal aging experiment – add-in UV + water
 - Aging up to 3000 hr
 - Continuous cycles → 5 hr 158 °F + UVA 340 , 15 min. water spray
 - Two manufacturers (A & B from thermal aging)
 - Five testing intervals (1, 5, 12, 16, and 20 weeks)
- Chamber details
 - 48 UVA340 Lamps @ 4” on center
 - Irradiance measured along centerline of chamber via radiometer
 - Irradiance @ 158 °F = 0.70 W/m² @ 340 nm → equivalent to sun at noon
 - Heater control via internal thermocouples
 - 240 specimen capacity (ASTM D6381)





Test Schedule

- Experiment commenced May 7th, 2012
- Week one specimens extracted
→ Mechanical uplift testing in progress
- Experiment will conclude Sept 24th, 2012 (20 week aging)

- Thank you for your time and attention
- Questions/Comments?
- Contact Information
 - Dr. Forrest Masters, P.E., Assistant Professor, masters@ce.ufl.edu
 - Dr. David Prevatt, P.E., Assistant Professor, dprev@ce.ufl.edu
 - Dr. Kurtis Gurley, Associate Professor, kgurl@ce.ufl.edu
 - Department of Civil and Coastal Engineering
 - University of Florida
- Follow the project on asphaltshingles.windengineer.org and on the UF Hurricane Research Facebook site