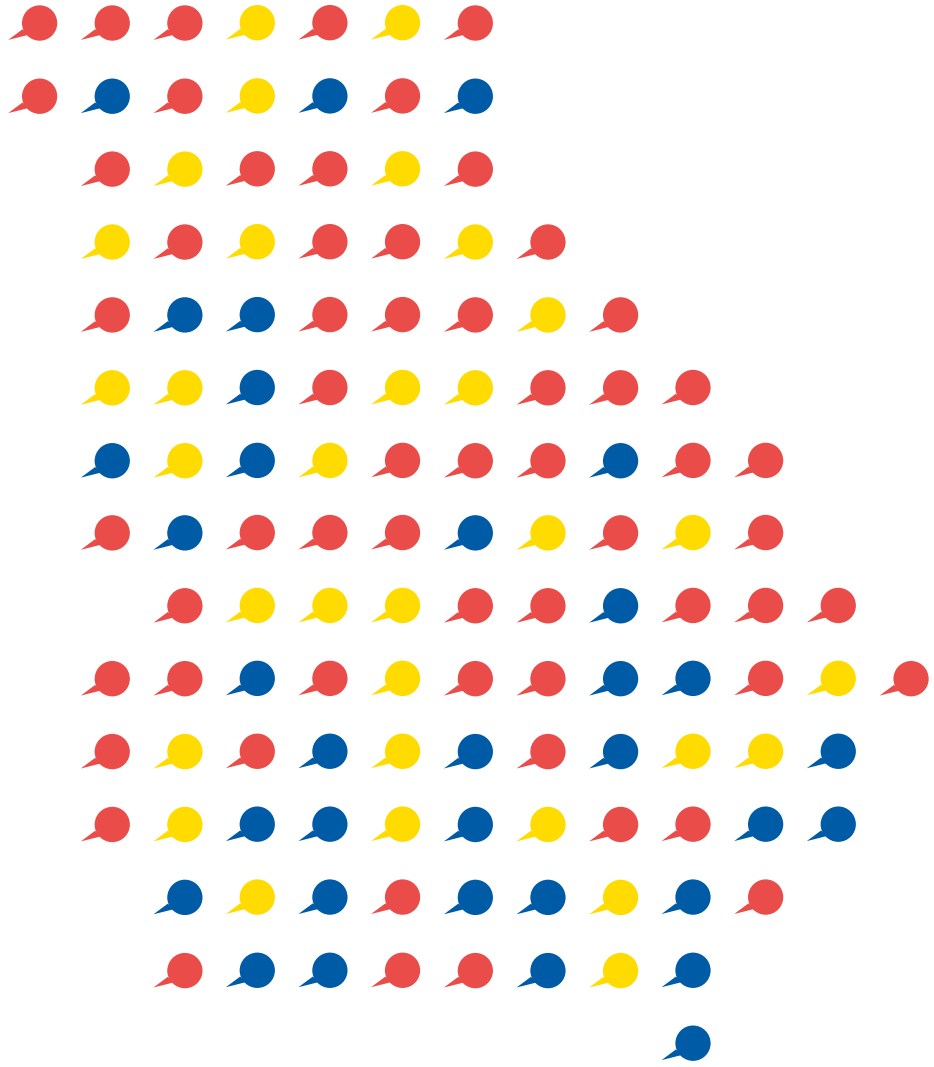
Partnership for Inclusive Innovation



Georgia Smart Communities Challenge

Thomasville Heights: Building Strategies for Energy Efficient Retrofits

2022-2023 Cohort Final Presentation

Social: @pingeorgia / #GeorgiaSmart

pin partnership for inclusive innovation

pingeorgia.org

Introduction

Energy Burden

Introduction

- ***Thomasville Heights & Norwood Manor ranks top 7% for energy burden statewide***

Energy Burden

- ***According to NREL, energy-efficiency /weatherization programs could save low-to-moderate-income (LMI) households up to 35% in energy consumption***

Weatherization

Protecting a building and its interior from the elements to reduce energy use and increase comfort

Objectives

To invest in household energy efficiency through non-invasive diagnostic techniques that could help achieve significant cost savings at a community scale

- *Reduce Energy Consumption & Cost*
- *Improve Resident Health & Comfort*
- *Alleviate Energy Burden*

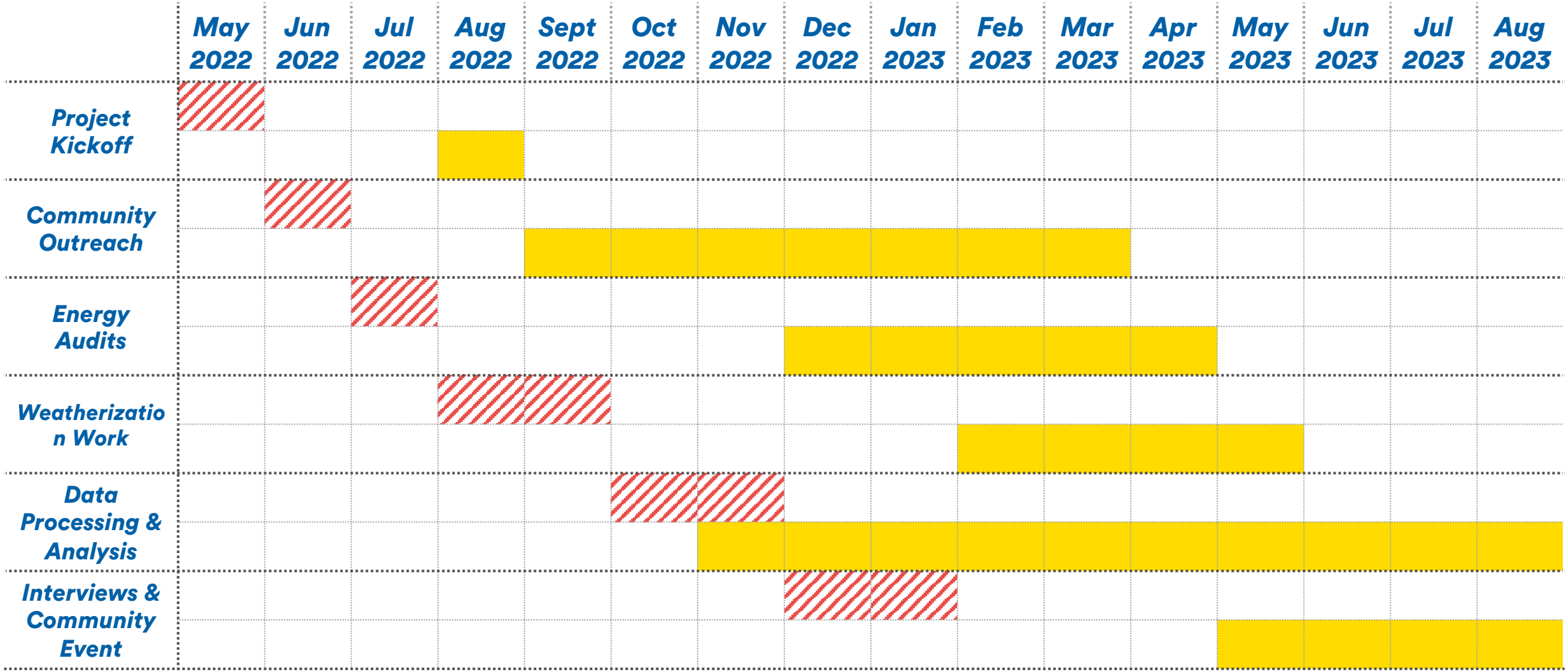
Project Team

Project Lead	Chanel Zeisel (Principal Investigator)	Beth Graham (City Rep)	Chandra Farley (City Rep)	Susana Duran (City Rep)	Anne Phillips (Chair of NPU-Z)	
Research Lead	Julie Kim (Research Lead)	Tarek Rakha (Research Co-Lead)	Danielle Willkens (Research Advisor)	Anuradha Kadam (Project Manager & GRA)	Max Doersam (GRA)	Samantha Morton (GRA)
Community Partner	Pamela Stringfield (Community Lead)	Mikayla Santos (Financial Lead)				
Research Partner	Latrice Rollins (Researcher)	Kamilah Mustafa (GRA)				
Contractor	Bob Bird (Founder & Admin)	Brian Martin (Lead Contractor)				

Project Progress

Original Timeline

Updated Timeline



Challenges

Lessons Learned

Lack of Trust

Accessibility of Utility Bills

Technology Limitations

mportance of in-person and phone call contact.

Assistance with utility bill access during energy audit.

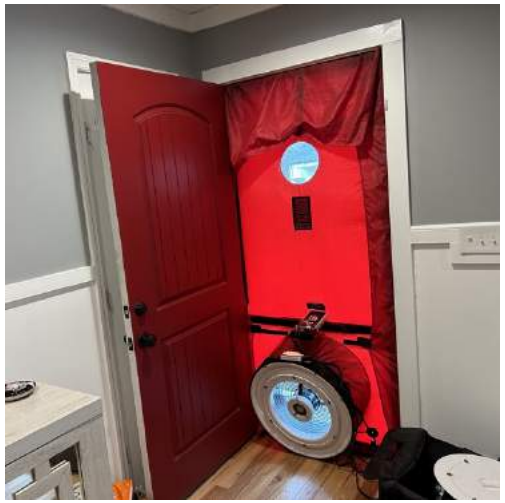
Provide paper applications.

Project Summary & Program Timeline

20
Stakeholder Engagement Events

16
Houses Enrolled in the Program

1
Report



Pre – Retrofit Data Collection

1. ***Application – Building Info (Survey)***
2. ***Historical Utility Bills (12 months)***
3. ***Aerial Thermography***
4. ***Energy Audit & Blower Door***

RETROFITS / WEATHERIZATION

Post – Retrofit Data Collection

1. ***Retrofit & Blower Door Results***
2. ***Occupant Comfort & Feedback (Interviews)***
3. ***Aerial Thermography***
4. ***Utility Bills (3+ months)***

Energy Efficiency Retrofits

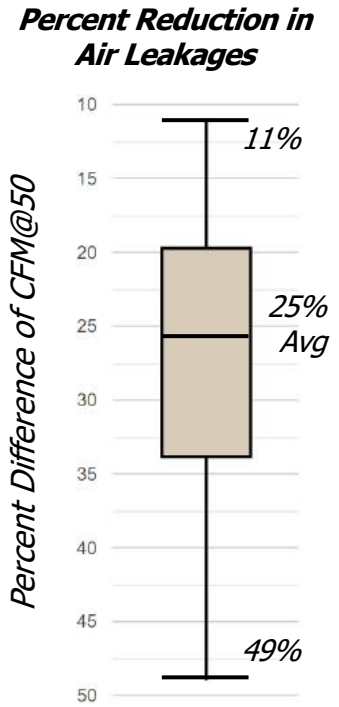
1. Carbon Monoxide / Smoke Alarm
2. LED Lighting
3. Seal / Repair Ducts

WEATHERIZATION

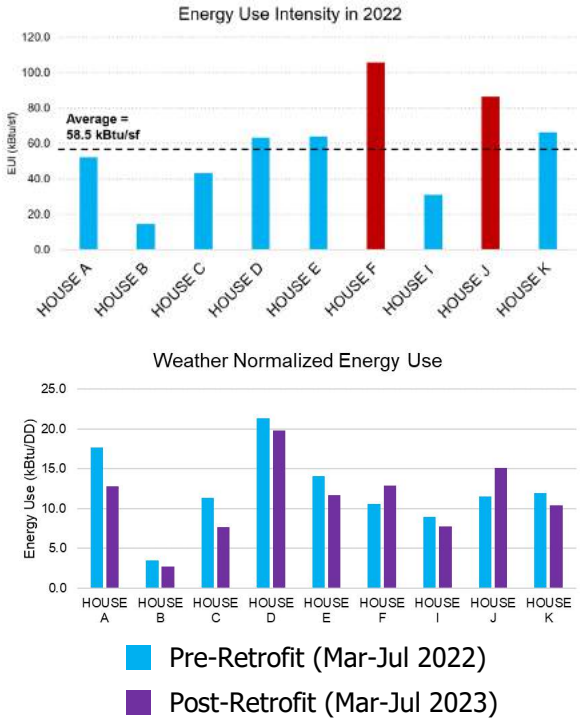
4. Attic Insulation
5. Weatherstripping Windows & Doors
6. Seal Cracks In Walls
7. Seal Holes Around Pipes

Pre- and Post-Retrofit Data Collection

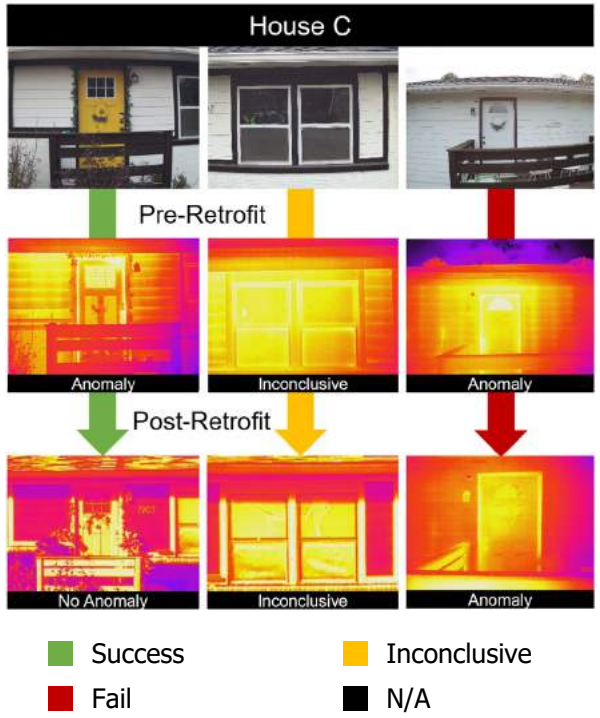
Blower Door Test



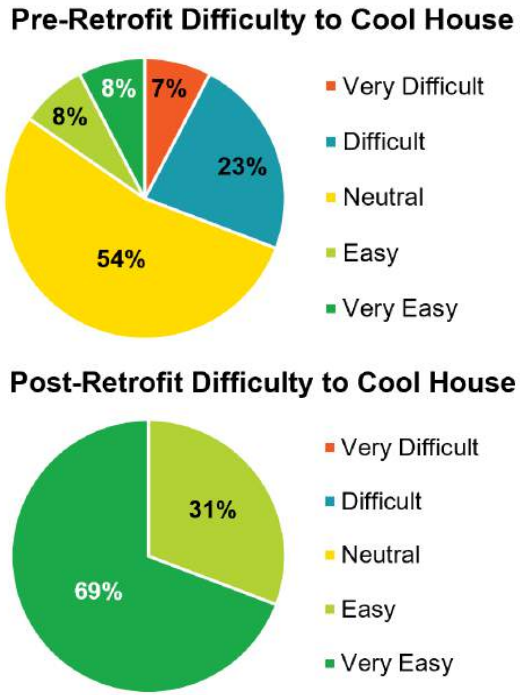
Utility Bills



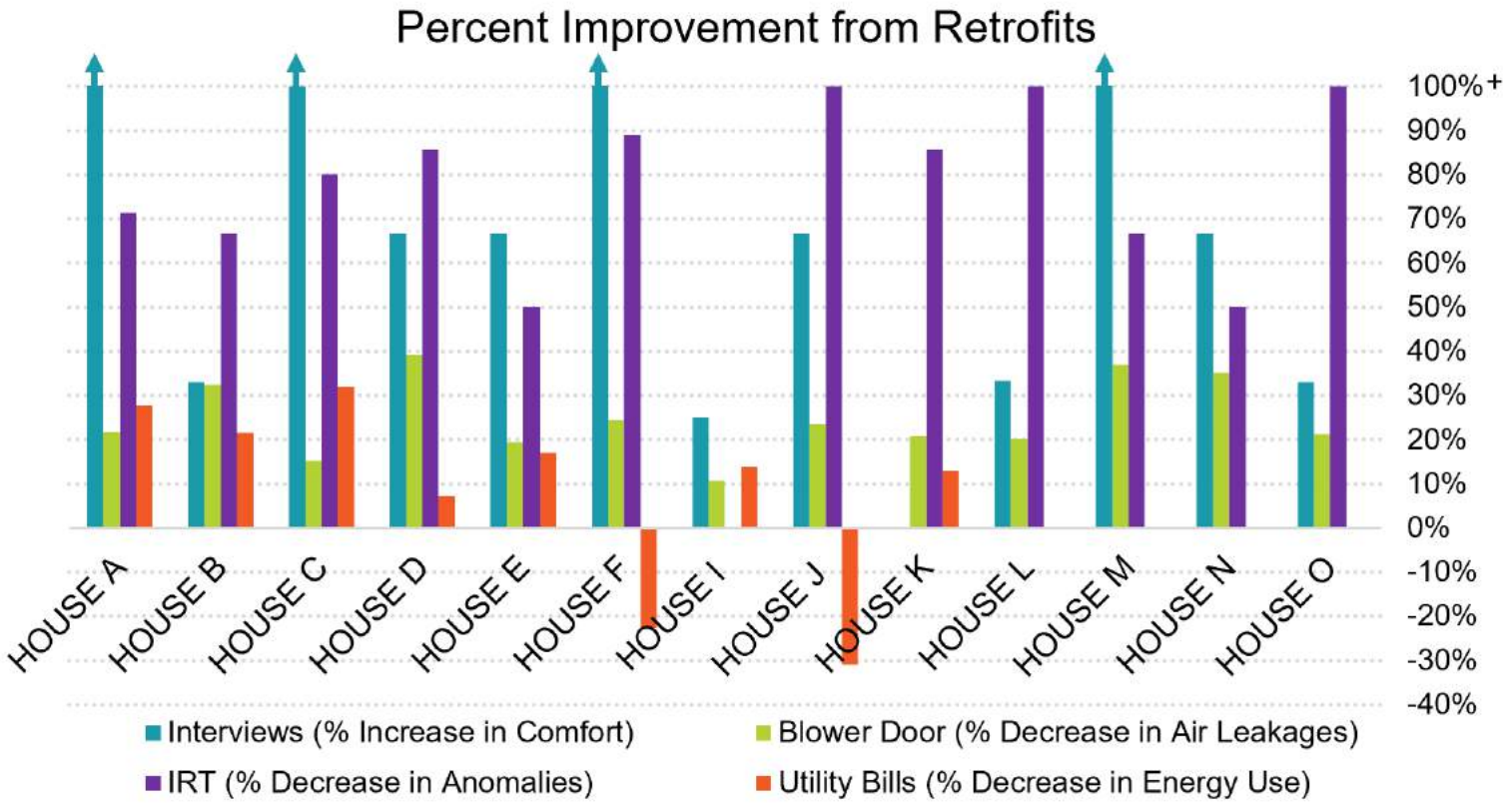
Aerial Thermography



Survey & Interview



Data Analysis



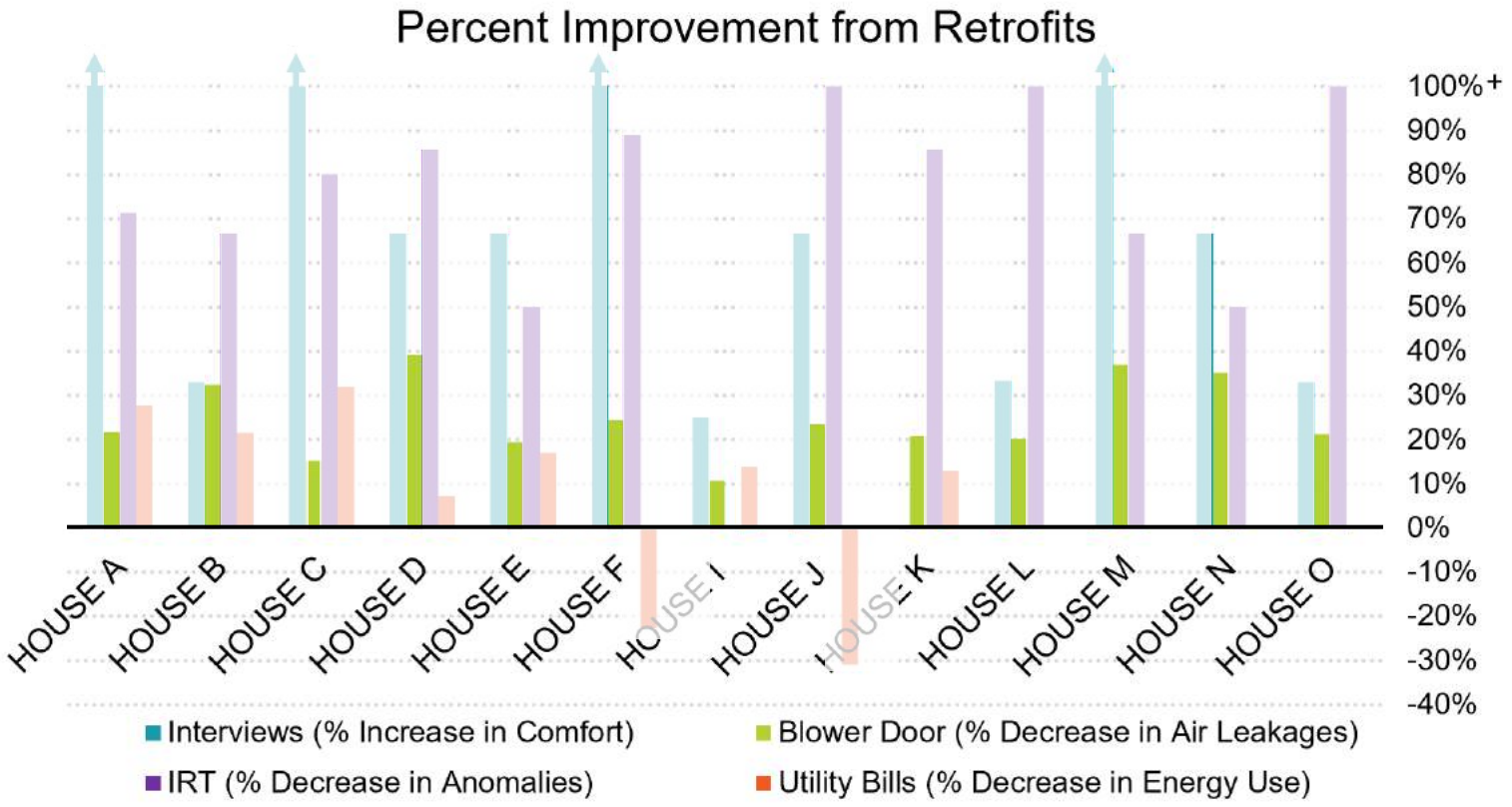
25%
Decrease in Air Leakages

9%
Decrease in Energy Use

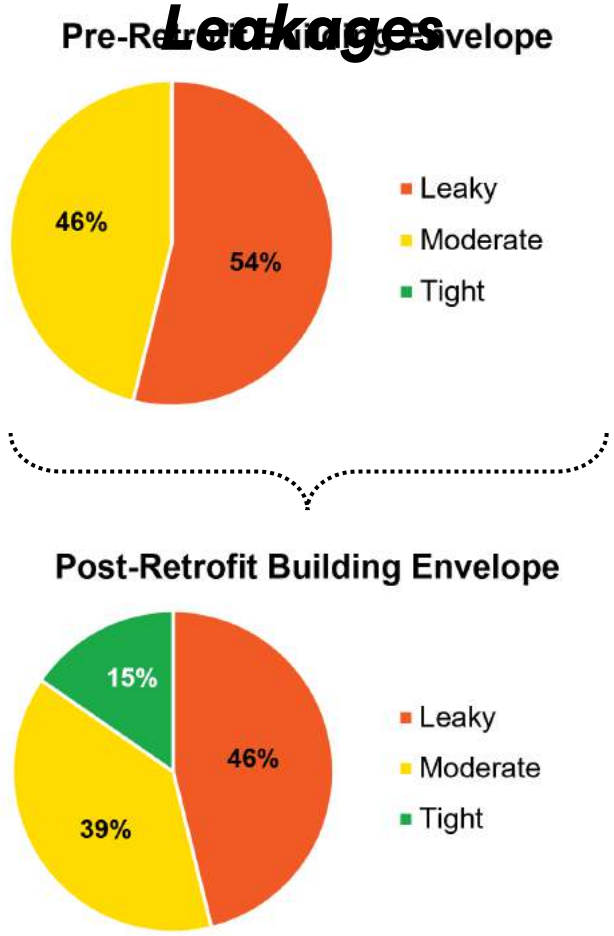
79%
Decrease in Anomalies

92%
Increase in Comfort

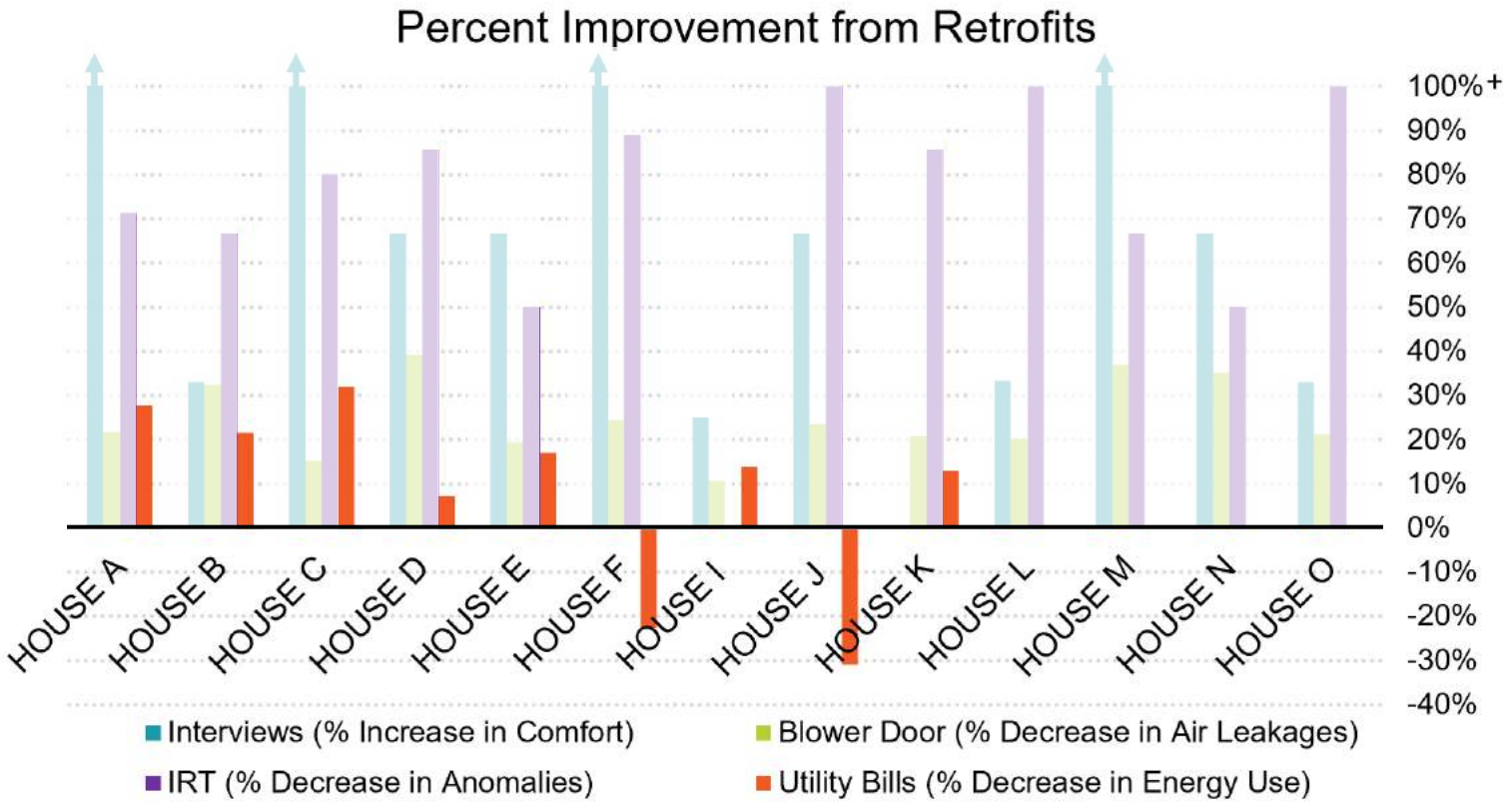
Data Analysis



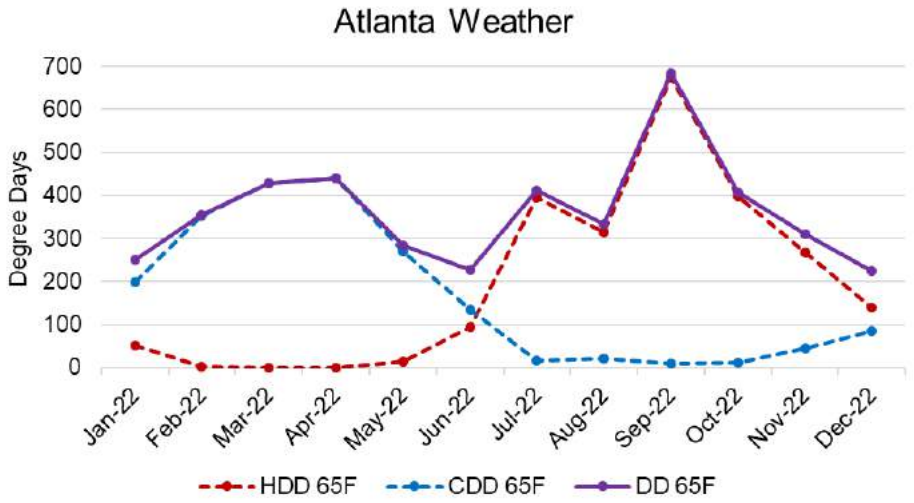
25% Decrease in Air Leakages

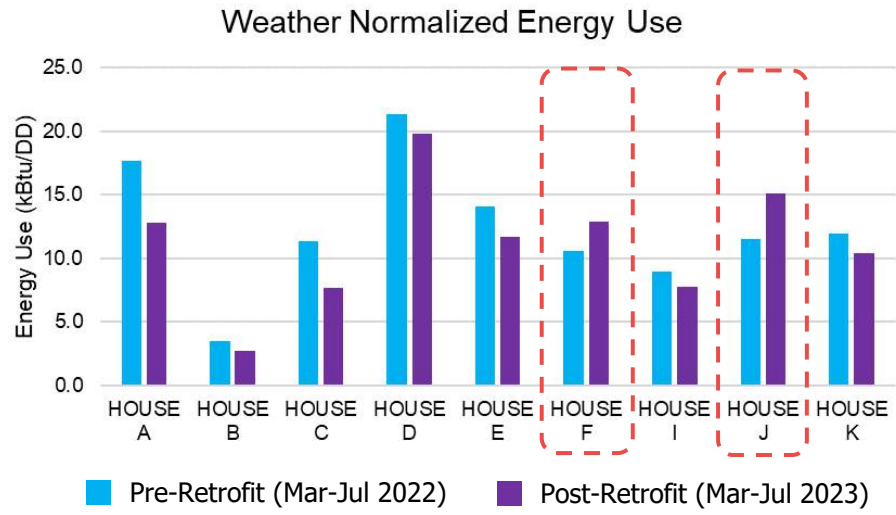


Data Analysis



9% Decrease in Energy Use

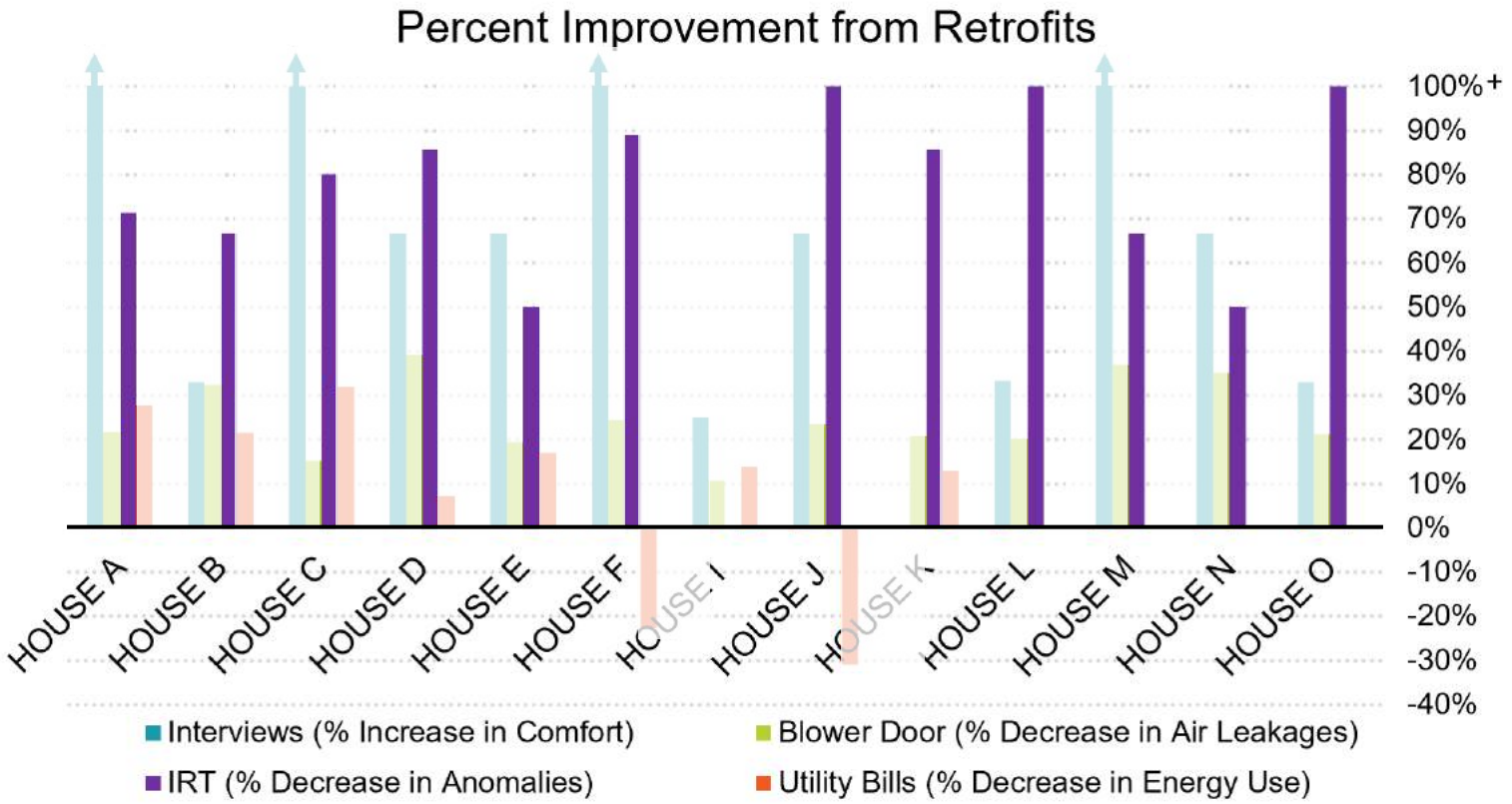


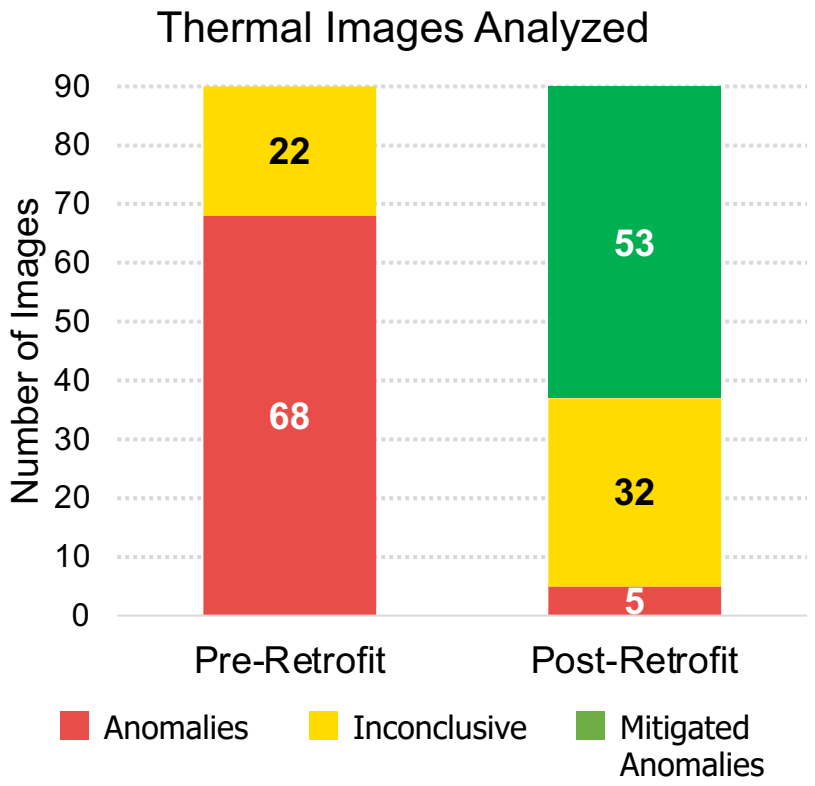


Aerial Thermography

Data Analysis

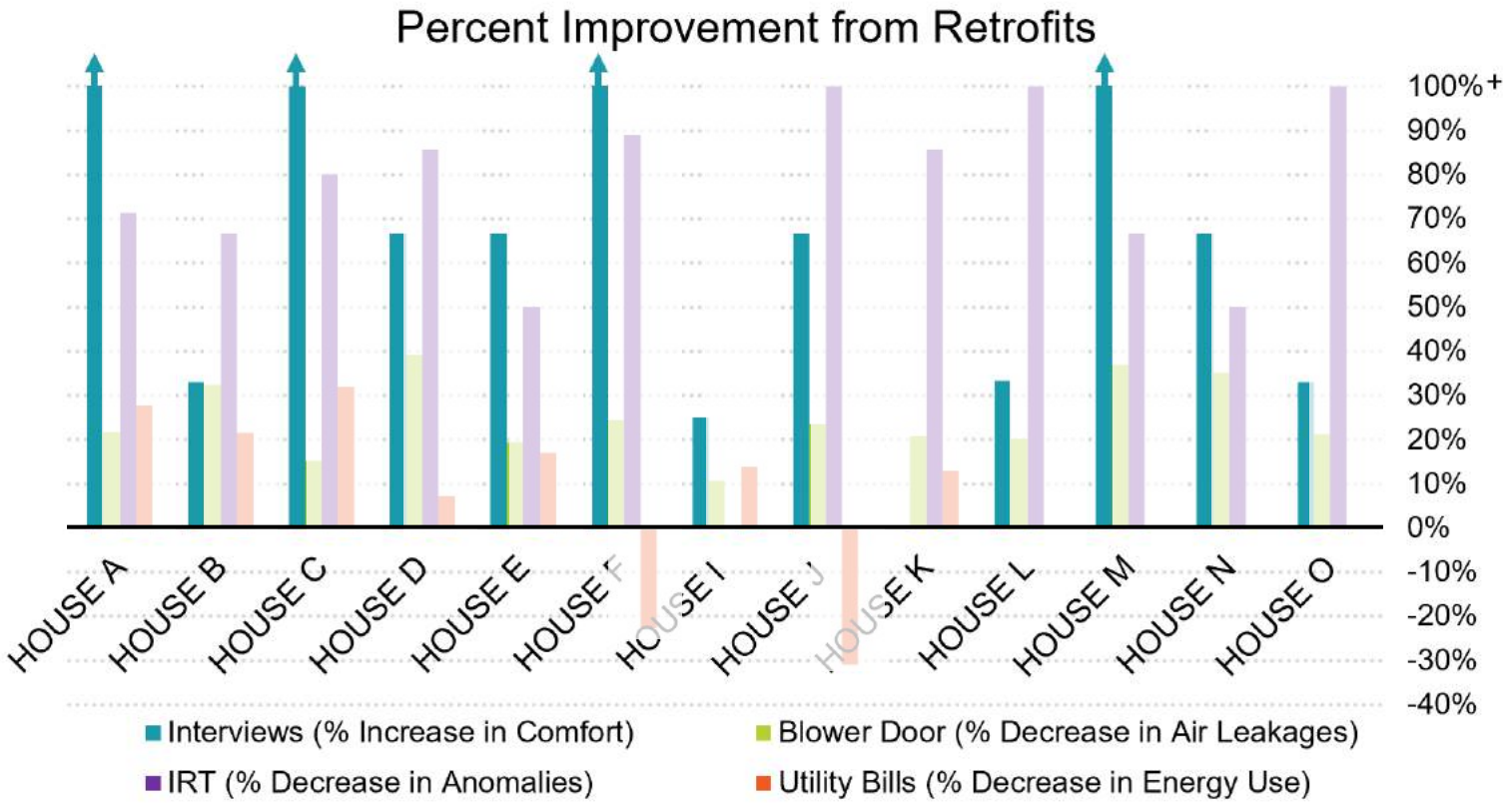
79% Decrease in Anomalies

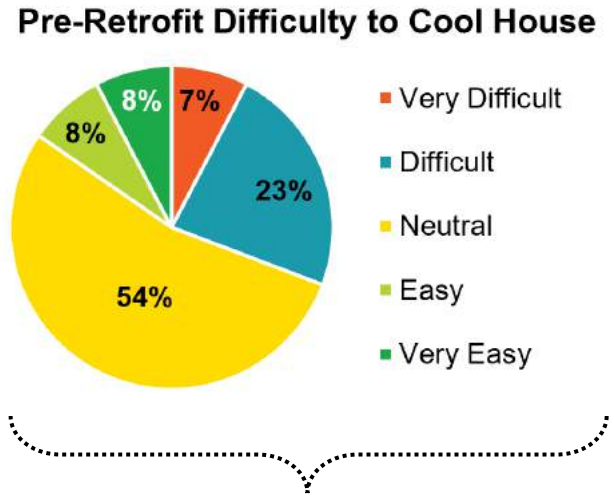


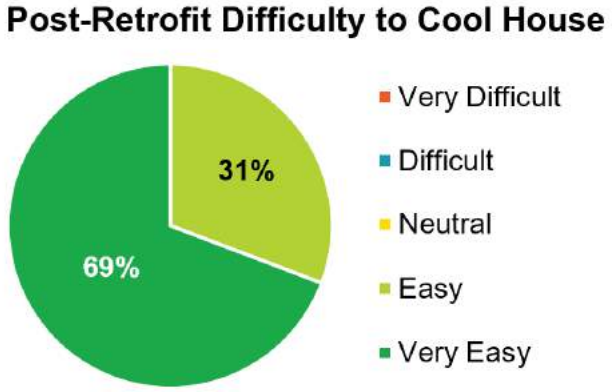


Data Analysis

92% *Increase in Comfort*







Survey & Interview Findings

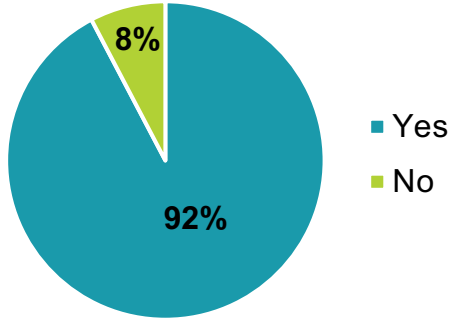
" I think it's super helpful for this community, because one, it's mostly an older community. I don't think a lot of people know of all the resources out there. I just think it was amazing that you all were trying to reach out and actually help."

"From the program, the biggest benefit is being able to make my utility bills affordable. It changed the heat in the house and it made the house warmer in wintertime and cooler in the summertime... I'm a senior citizen, and we only get income once a month and we got to take that income and spread it like peanut butter, so it made a big difference."

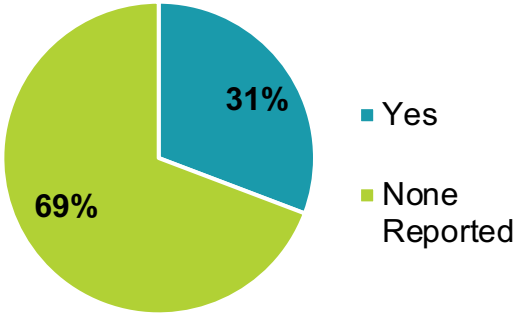
"My first thoughts was I wouldn't qualify based on income and all these kind of things, but the truth of the matter is living in an older home... doesn't mean I necessarily have money. I have what I have, and some things that I can afford to do or couldn't be able to, wouldn't be able to do without taking out more debt to be able to do it."

Post-Retrofit

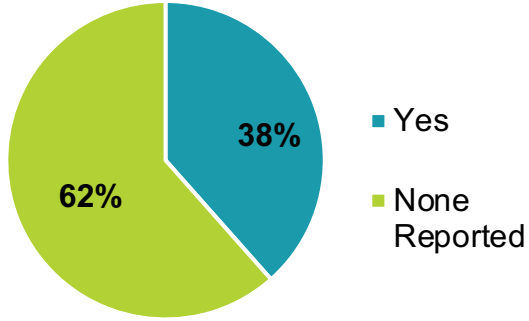
Perceived Difference in House



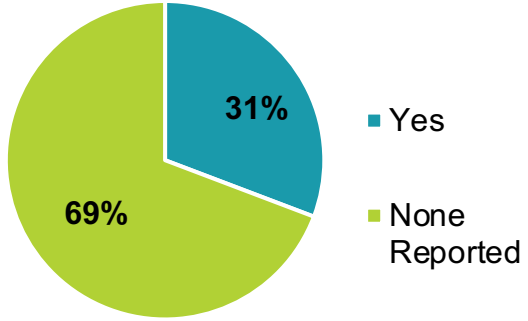
Balanced House Temperature



Less Need for AC



Lower Utility Bills



Conclusion

Key Takeaways

- ***Low-budget retrofits and weatherization DOES make a tangible positive impact on vulnerable communities, and is the first step towards preserving legacy homeownership***
- ***A single, sustainable, and reliable weatherization program is necessary for community members to trust, recommend to their neighbors, and continues beyond just one year***
- ***Weatherization has the potential to contribute to long-term benefits such as health, comfort, and building envelope integrity***

Future Opportunities

- ***Long-term post-retrofit data collection (more than 3 months) would provide more insight on long-term benefits of weatherization in underserved communities and reduction in energy burden***
- ***Long-term occupancy and behavior data collection would provide more insight on home and energy education needed***
- ***Better advertising and recruitment would lead to more applicants benefitting from weatherization programs***
- ***Long term partnerships can be formed with community, residents, and utility providers such as Georgia Power to develop a more efficient process***

Thank you

Georgia Tech

FOCUSED COMMUNITY STRATEGIES

MOREHOUSE SCHOOL OF MEDICINE

Project Team Contact Information

Project Lead	***Chanel Zeisel*** *(Principal Investigator)* *917-886-4147* *cpzeisel@atlantaga.gov*	***Beth Graham*** *(City Rep)* *begraham@atlantaga.gov*	***Chandra Farley*** *(City Rep)* *cfarley@atlantaga.gov*	***Anne Phillips*** *(Chair of NPU-Z)* *404-791-1434* *aphillipscitybusiness@gmail.com*
Research Lead Georgia Tech	***Julie Kim*** *(Research Lead)* *301-633-5920* *julie.kim@design.gatech.edu*	***Tarek Rakha*** *(Research Co-Lead)* *617-913-8328* *rakha@design.gatech.edu*	***Anuradha Kadam*** *(Project Manager & GRA)* *732-668-1523* *akadam35@gatech.edu*	***Max Doersam*** *(GRA)* *470-494-8121* *mdoersam3@gatech.edu*
Community Partner FOCUSED COMMUNITY STRATEGIES	***Pamela Stringfield*** *(Community Lead)* *404-627-4304* *pamela@fcsministries.org*	***Mikayla Santos*** *(Financial Lead)* *919-924-5728* *Mikayla@fcsministries.org*		
Research Partner MOREHOUSE SCHOOL OF MEDICINE	***Latrice Rollins*** *(Researcher)* *lrollins@msm.edu*			

Appendix

- Pilot Program & Processes
  - Application
  - Energy Audit
  - Energy Efficiency Retrofits
  - Aerial Thermography
  - Utility Bills
- Financial Reporting
  - Program Spending
  - Salaries
- Project Images
  - B-Roll Images

- Data Collected
  - Survey + Interview Data
  - Utility Bill Data
  - Blower Door Data
  - Thermographic Inspections

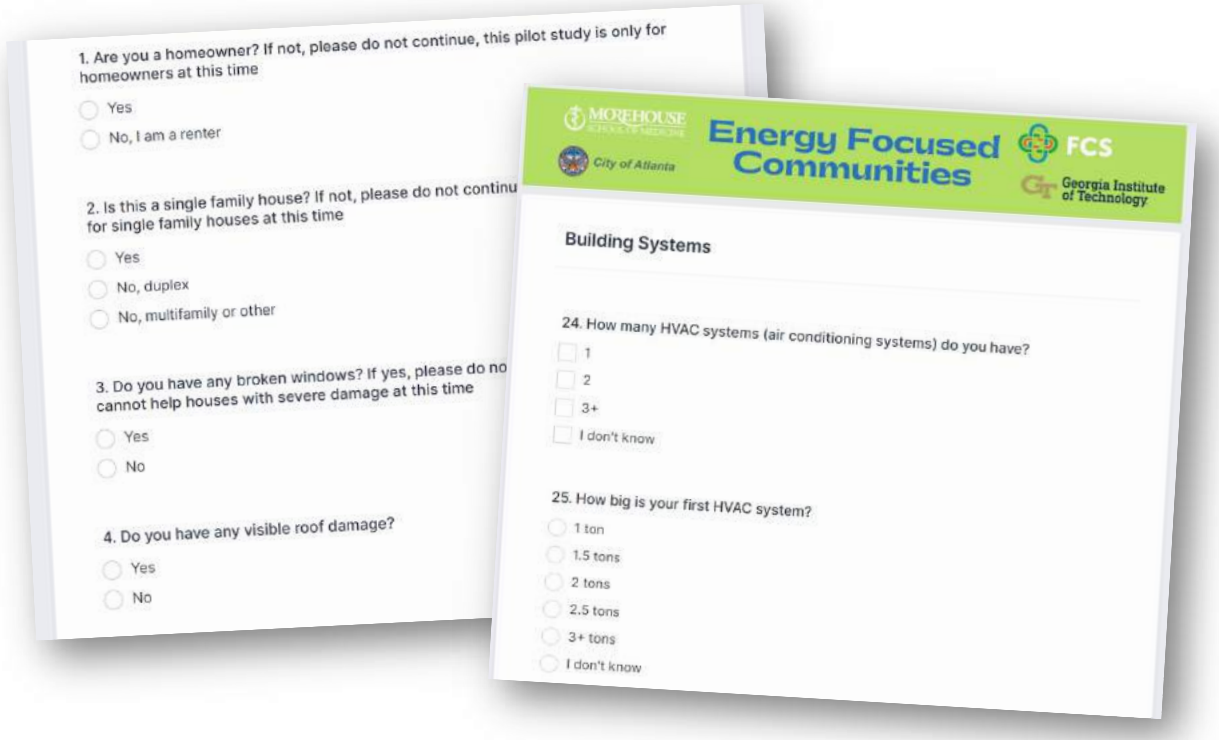
The Application

Used to determine program eligibility

- ***Single-family***
- ***Homeowner***
- ***12 months of utility bills***
- ***Complete building envelope (minimal roof or window damage)***

Collect Data

- ***Age – house, appliances, systems***
- ***Building info – rooms, foundation, etc.***
- ***Comfort & health***
- ***Insulation, lighting***



Building Envelope

Separates the exterior and interior of a building and includes walls, roof, windows, and foundation.

Energy Audit

A home inspection to determine causes for the energy used and wasted in a home

Lighting

Ductwork

Combustion Testing

Windows

Attic

Blower Door Test

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Energy Efficiency Retrofits

1. Carbon Monoxide / Smoke Alarm
2. LED Lighting
3. Seal ducts
4. Attic Insulation
5. Weatherstripping Windows & Doors
6. Seal cracks
7. Seal holes around pipes

Aerial Thermography

Preparation

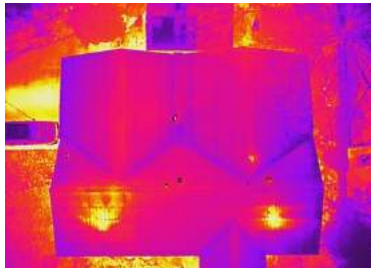
- *Ideal weather conditions: mornings, cloudy day*
- *Time to prepare: 10-15 min*

Drone Flight

- *Fly with caution, be aware of your surroundings*
- *Facades that cannot be reached via drone must be documented with a handheld thermal camera*
- *Time to collect data: 15-20 min*

Results

Thermal bridging



Exfiltration / Infiltration

- *Examine building envelope conditions*
- *Get better insights and understanding*
- *Compare pre- and post- retrofit*

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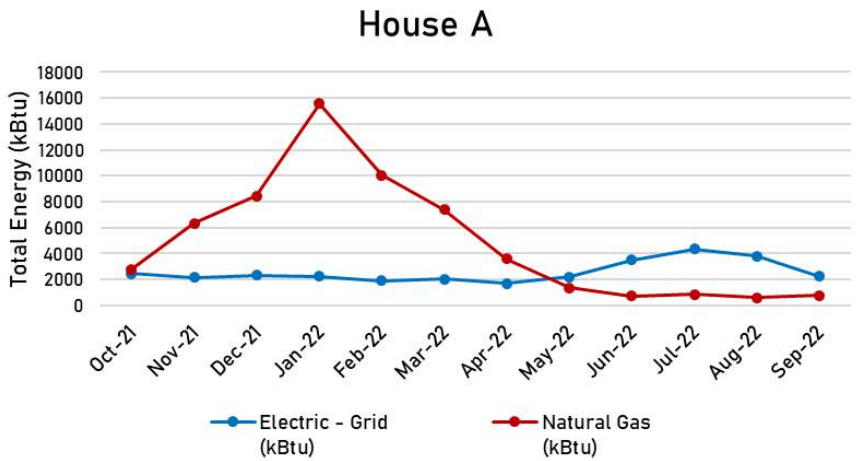
Utility Bills – Energy STAR Portfolio Manager

Date	Transaction	Billing Period	Due Date	Balance Forward	Transaction Amount	Amount Due	Current Actual Bill	Budget Bill Diff	RDG/Type	Days Used	Usage KWH	Bill Demand
5/13/2021	Balance Forward			$50.00								
5/13/2021	Electric Service	4/14/2021 5/13/2021			$68.41				0027449		478	
5/13/2021	Regular Bill		05/27			$68.41				29		
5/18/2021	Payment				$(68.41)							
6/14/2021	Balance Forward			$50.00								
6/14/2021	Electric Service	5/13/2021 6/14/2021			$121.06				0028294		845	
6/14/2021	Regular Bill		06/28			$121.06				32		
6/17/2021	Payment				$(121.06)							
7/14/2021	Balance Forward			$50.00								
7/14/2021	Electric Service	6/14/2021 7/14/2021			$182.72				0029517		1223	
7/14/2021	Regular Bill		07/28			$182.72				30		
7/20/2021	Payment				$(182.72)							
8/13/2021	Balance Forward			$50.00								
8/13/2021	Electric Service	7/14/2021 8/13/2021			$237.15				0031064		1547	
8/13/2021	Regular Bill		08/27			$237.15				30		
8/18/2021	Payment				$(237.15)							
9/14/2021	Balance Forward			$50.00								
9/14/2021	Electric Service	8/13/2021 9/14/2021			$216.25				0032480		1416	
9/14/2021	Regular Bill		09/28			$216.25				32		
9/17/2021	Payment				$(216.25)							
10/13/2021	Balance Forward			$50.00								
10/13/2021	Electric Service	9/14/2021 10/13/2021			$99.11				0033253		773	
10/13/2021	Regular Bill		10/27			$99.11				29		
10/18/2021	Payment				$(99.11)							
11/11/2021	Balance Forward			$50.00								
11/11/2021	Electric Service	10/13/2021 11/11/2021			$82.78				0033863		610	
11/11/2021	Regular Bill		11/29			$82.78				29		
11/16/2021	Payment				$(82.78)							

Bill Date	Days of Service	Heating Degree Days	Gas Used (Therms)	Balance Forward	Guaranteed Bill Amt	Other Charges		Promotional Discount	Taxes		Total Amount
2023/05/17	29	81	28.7	0	101.42					9.03	110.45
2023/04/18	32	279	49.344	0	101.42					9.03	110.45
2023/03/20	29	161.5	42.271	0	101.42					9.03	110.45
2023/02/17	30	468.5	87.72	0	84.62					7.54	92.16
2023/01/19	32	536	116.277	0	84.62					7.54	92.16
2022/12/19	30	372.5	90.816	0	84.62					7.54	92.16
2022/11/16	29	102	35.156	0	84.62					7.54	92.16
2022/10/18	32	8.5	8.28	0	84.62					7.19	91.81
2022/09/16	30	0	7.245	0	84.62					7.19	91.81
2022/08/17	32	0	9.297	0	84.62					7.19	91.81
2022/07/18	30	0	8.272	0	84.62					7.19	91.81
2022/06/16	30	2.5	13.364	0	84.62					7.19	91.81
2022/05/17	32	83	47.288	0	84.62					7.19	91.81
2022/04/18	29	229.5	72.1	0	84.62					7.54	92.16
2022/03/18	29	293.5	79.387	0	84.62					7.54	92.16
2022/02/17	31	682.5	104.333	0	70.08					6.24	76.32
2022/01/19	31	365	79.387	0	70.08		-3			5.97	73.05
2021/12/17	30	345.5	85.49	0	70.08		-3			5.97	73.05
2021/11/16	31	158.5	49.44	0	70.08		-3			5.97	73.05
2021/10/18	30	2.5	10.34	0	70.08		-3			5.97	73.05
2021/09/16	30	0	10.35	0	70.08		-3			5.97	73.05
2021/08/17	32	0	12.42	0	70.08		-3			5.97	73.05
2021/07/16	30	0	11.352	0	70.08		-3			5.97	73.05
2021/06/16	32	28	19.551	0	70.08		-3			5.97	73.05

Georgia Power

SCANA ENERGY



Site EUI = 49.7 kBtu/sf

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Financial Reporting - Program

Original Line Item	*Budget*	*Spent on 18 houses*	*Amount Remaining*	*Balance*
Home Energy Audit	*$8,100.00*	*$8,100.00*	*$0.00*	*$0*
Energy Efficiency Retrofits	*$64,087.00*	*$64,087.00*	*$0.00*	*$0*
Community Engagement	*$3,900.00*	*$3,900.00*	*$0.00*	*$0*
Data Analysis	*$20,000.00*	*$20,000.00*	*$0.00*	*$0*

Financial Reporting - Salaries

Grant Recipient	Organization	Title	Amount Received	Amount Spent	Balance
Focused Community Strategies (FCS)	FCS	Project Manager	$10,000.00	$10,000.00	$0.00
n/a, in kind	FCS	Community Point of Contact	$15,000.00	$15,000.00	$0.00
n/a, in kind	City of Atlanta	Project Manager	$7,000.00	$7,000.00	$0.00
n/a, in kind	Georgia Tech	Director, High Performance Building Lab	$15,170.00	$15,170.00	$0.00
n/a, in kind	Georgia Tech	Associate Chair, School of Architecture	$15,170.00	$15,170.00	$0.00
n/a, in kind	Georgia Tech	Assistant Professor, School of Architecture	$15,170.00	$15,170.00	$0.00
n/a, in kind	Georgia Tech	Masters Graduate Research Assistant	$13,200.00	$13,200.00	$0.00
n/a, in kind	Georgia Tech	Masters Graduate Research Assistant	$28,026.00	$28,026.00	$0.00
Georgia Tech	Georgia Tech	Masters Graduate Research Assistant	$13,913.00	$13,913.00	$0.00
Morehouse School of Medicine	Morehouse School of Medicine	Community Health Engagement and Data Analysis	$12,942.00	$12,942.00	$0.00

Project Images

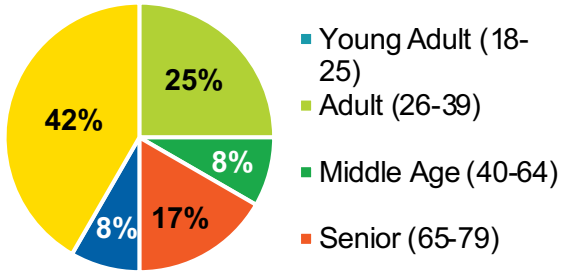
Project Images

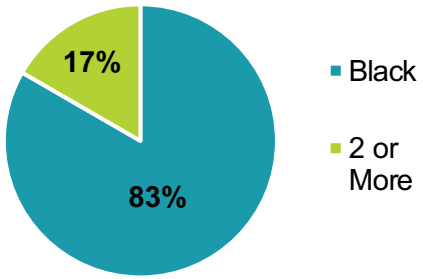
Project Images

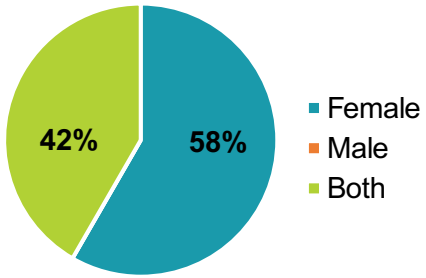
Project Images

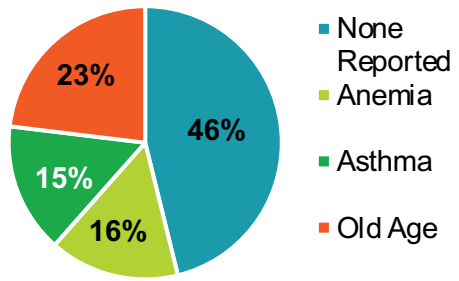
Data Collected – Survey & Interview Data

Participant Demographics

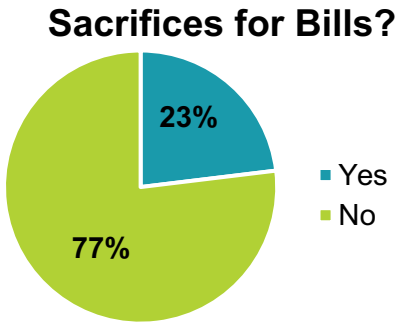


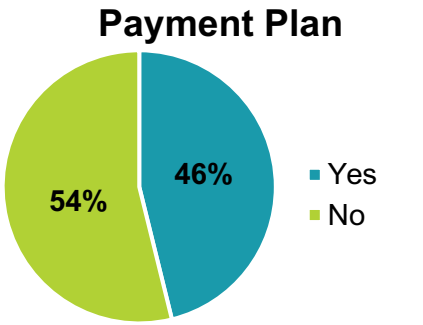


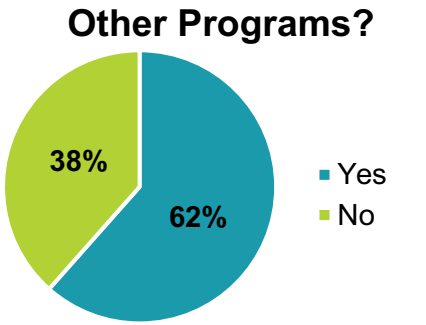




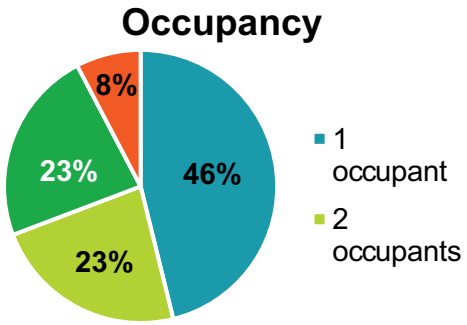
Energy Burden

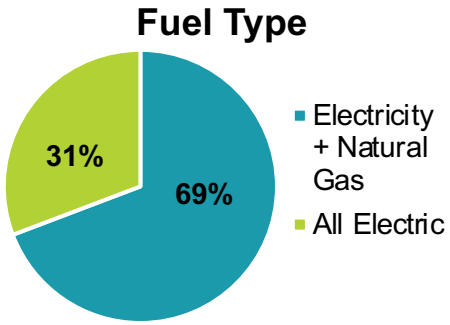






House Info





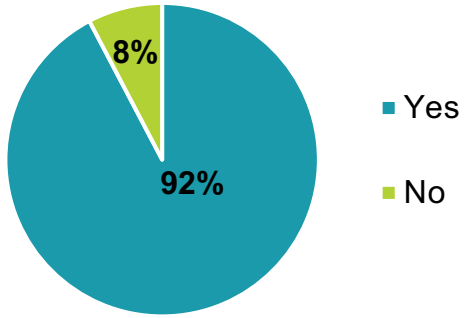
Participant, Building, and Energy Burden Pre-Retrofit) Survey Results

Participant demographics collected from 12 houses, all other data collected from 13 houses total

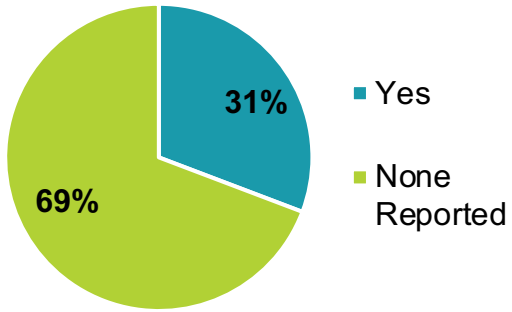
Data Collected – Survey & Interview Data

Post-Retrofit Interview Findings - Comfort

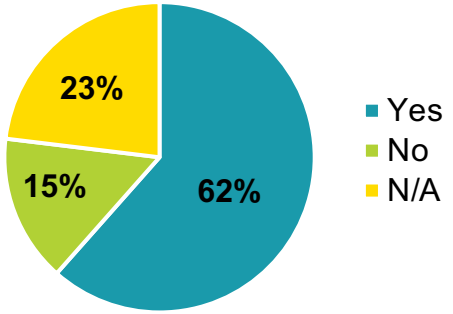
Perceived Difference in House



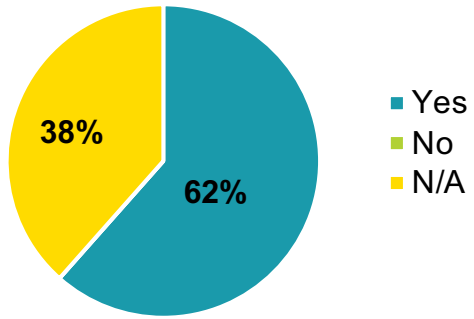
Balanced House Temperature



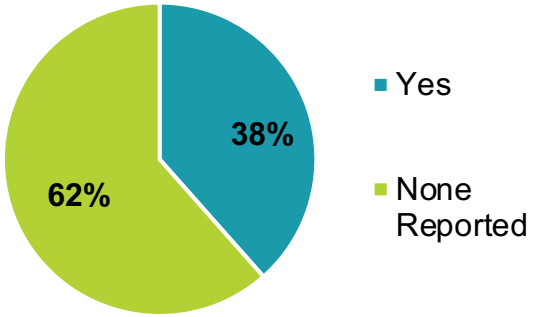
Mitigated Cold Spots



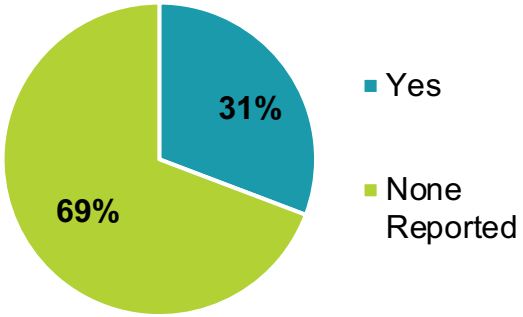
Mitigated Drafty Spots



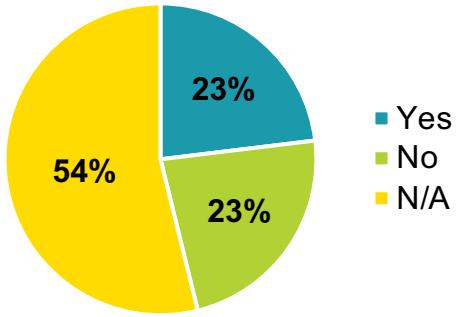
Less Need for AC



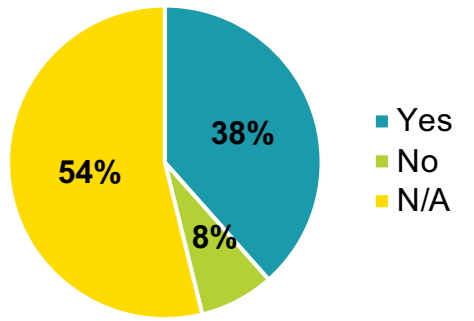
Lower Utility Bills



Mitigated Warm Spots

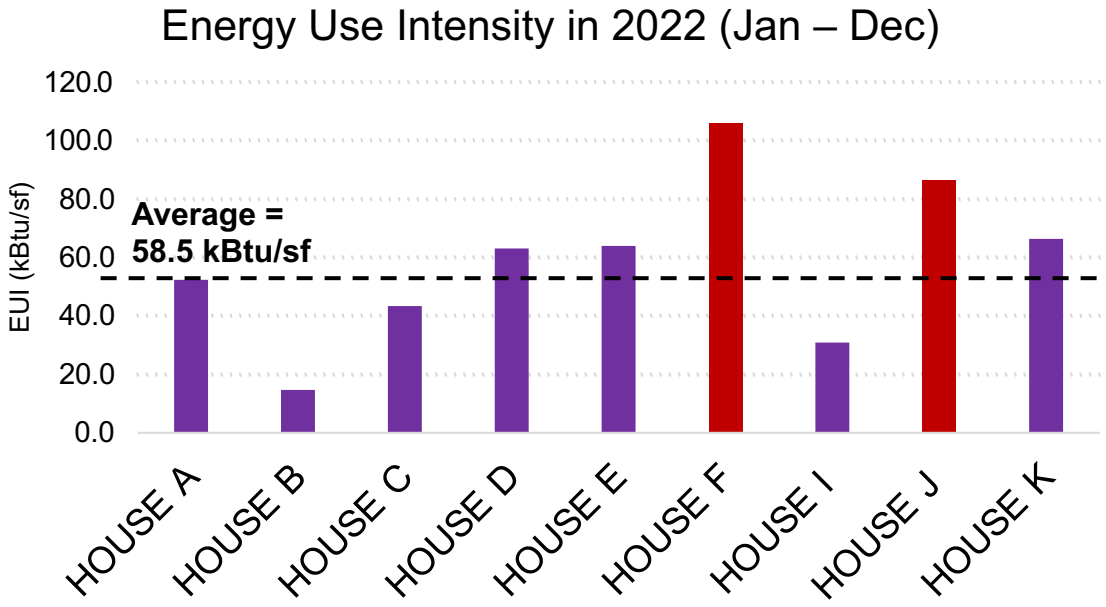


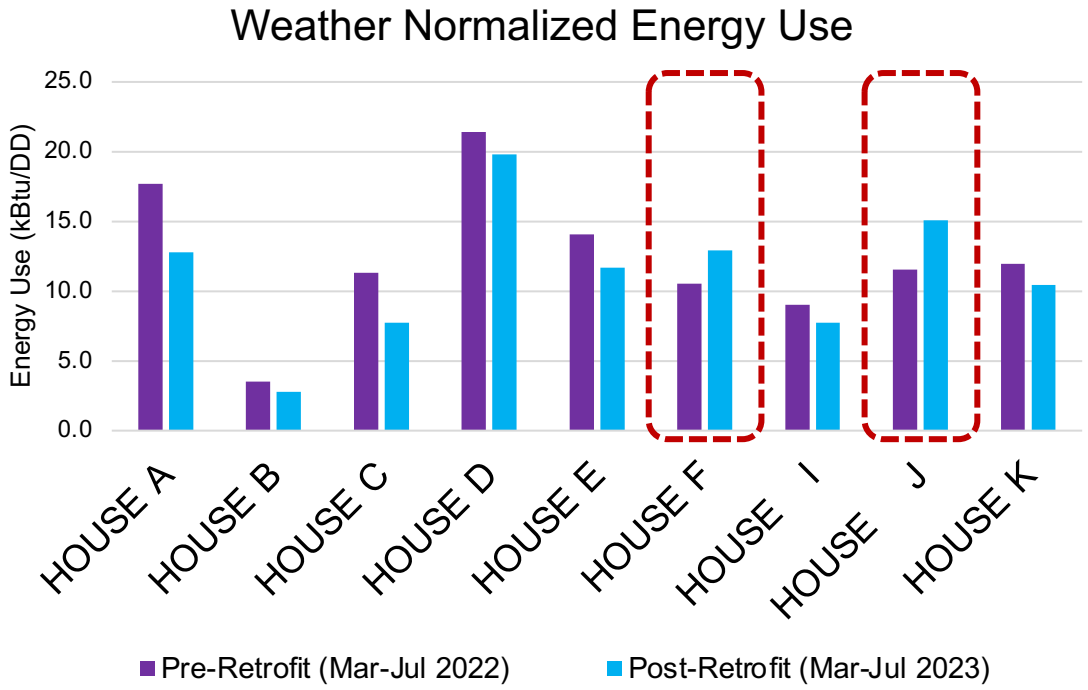
Mitigated Mold/Condensation



Participant demographics collected from 12 houses, all other data collected from 13 houses total

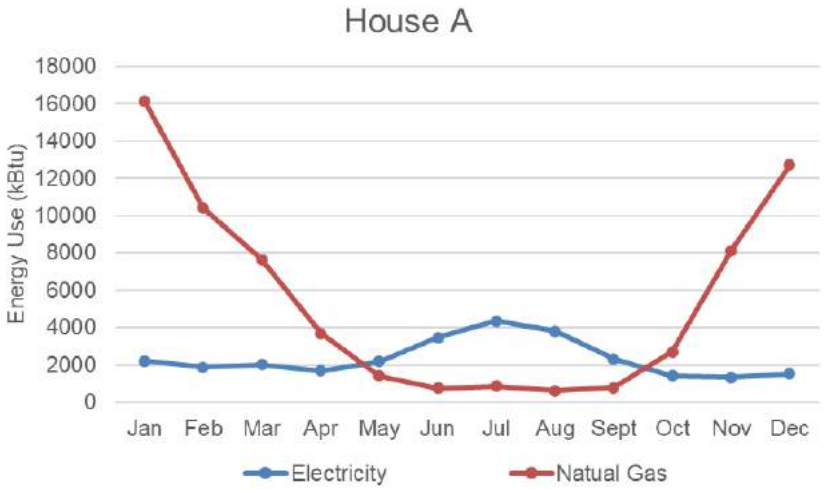
Data Collected – Utility Bill Data

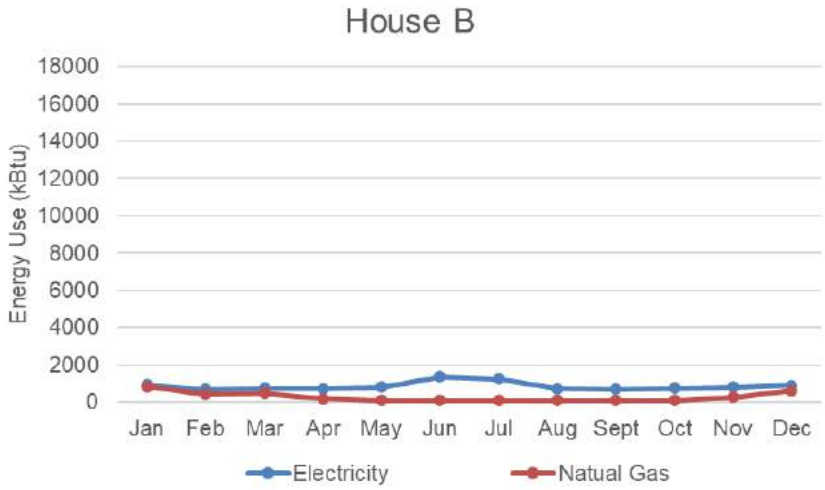


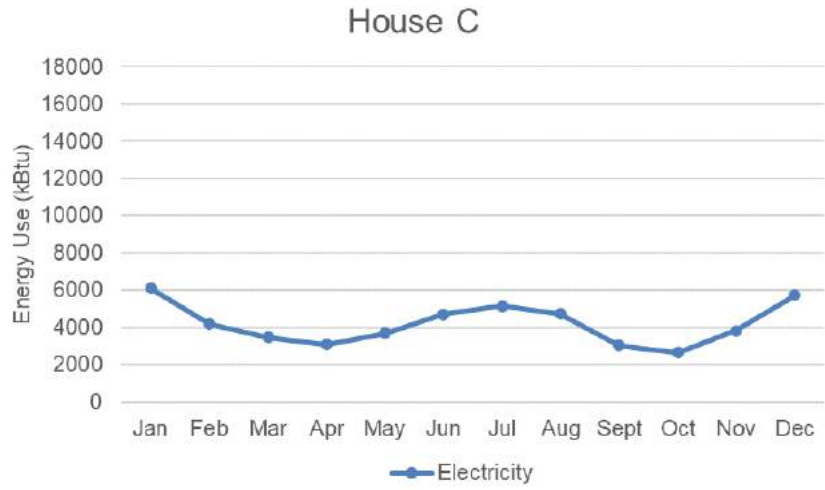


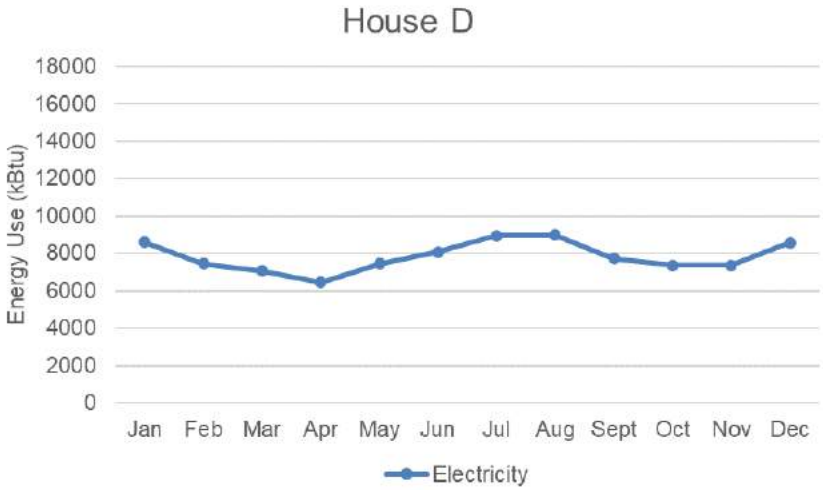
The two houses that increased in Energy Use post-retrofit also originally had the largest EUI among all the houses. This may indicate that the larger energy use is due to occupant behavior.

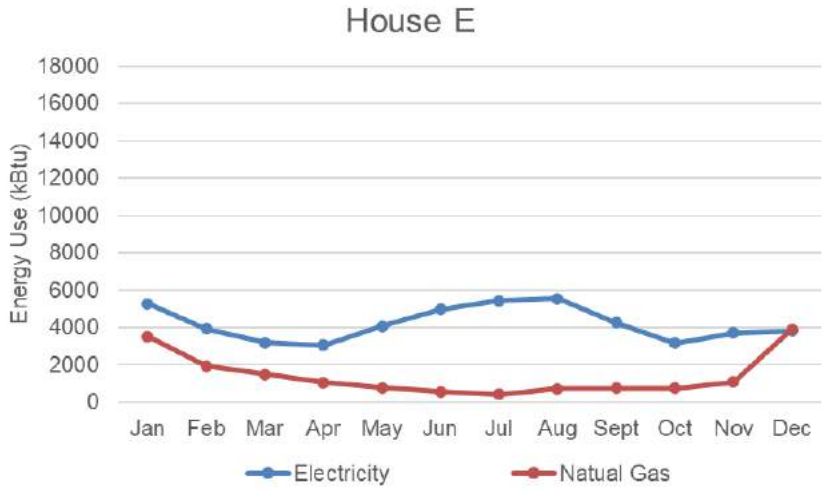
Data Collected – Utility Bill Data

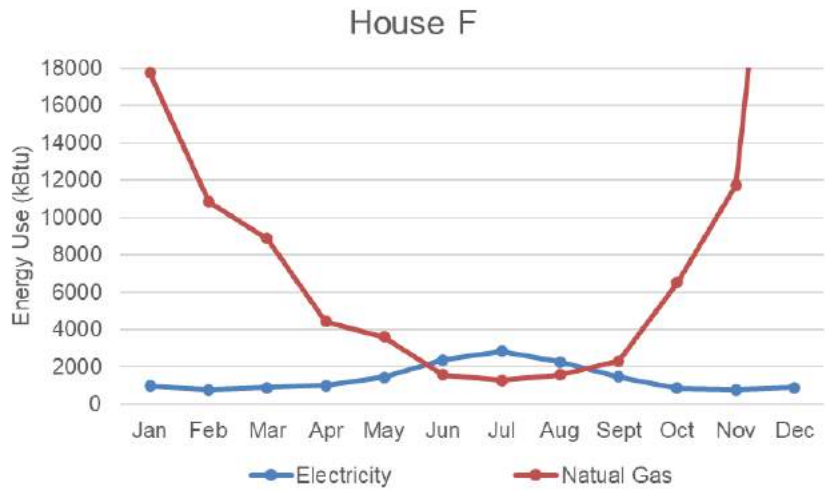




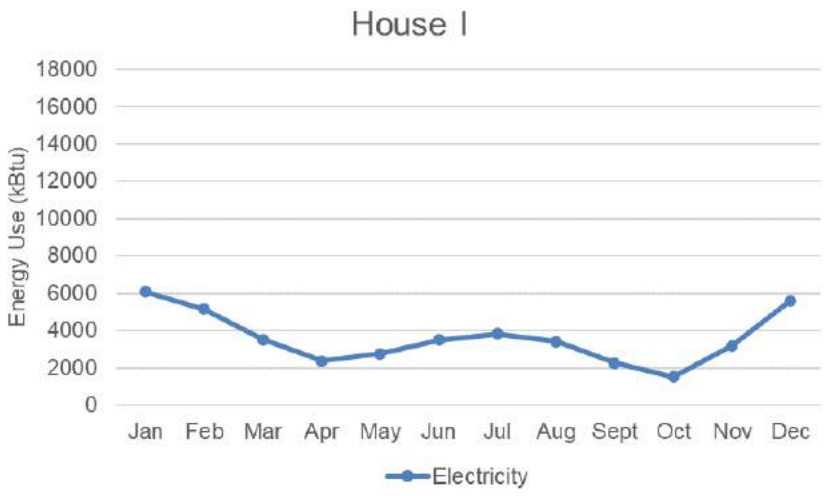


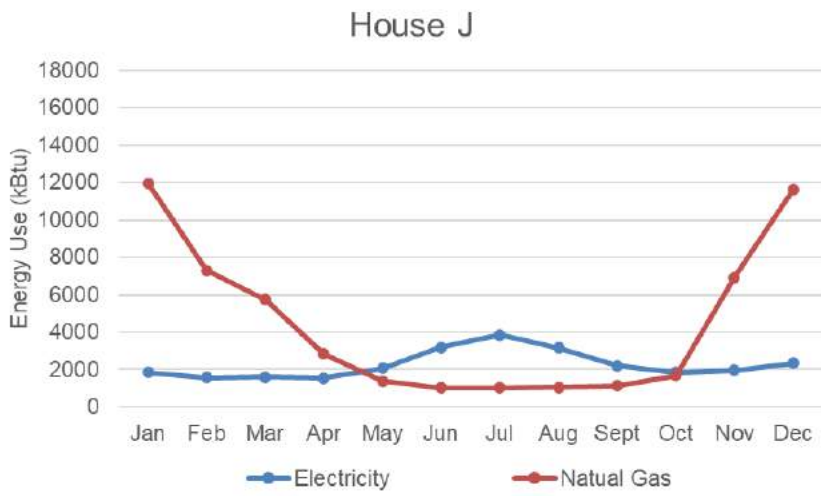


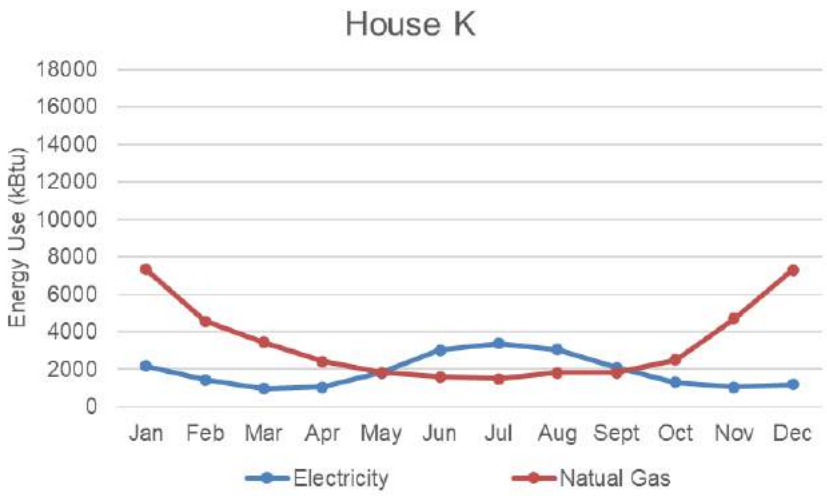




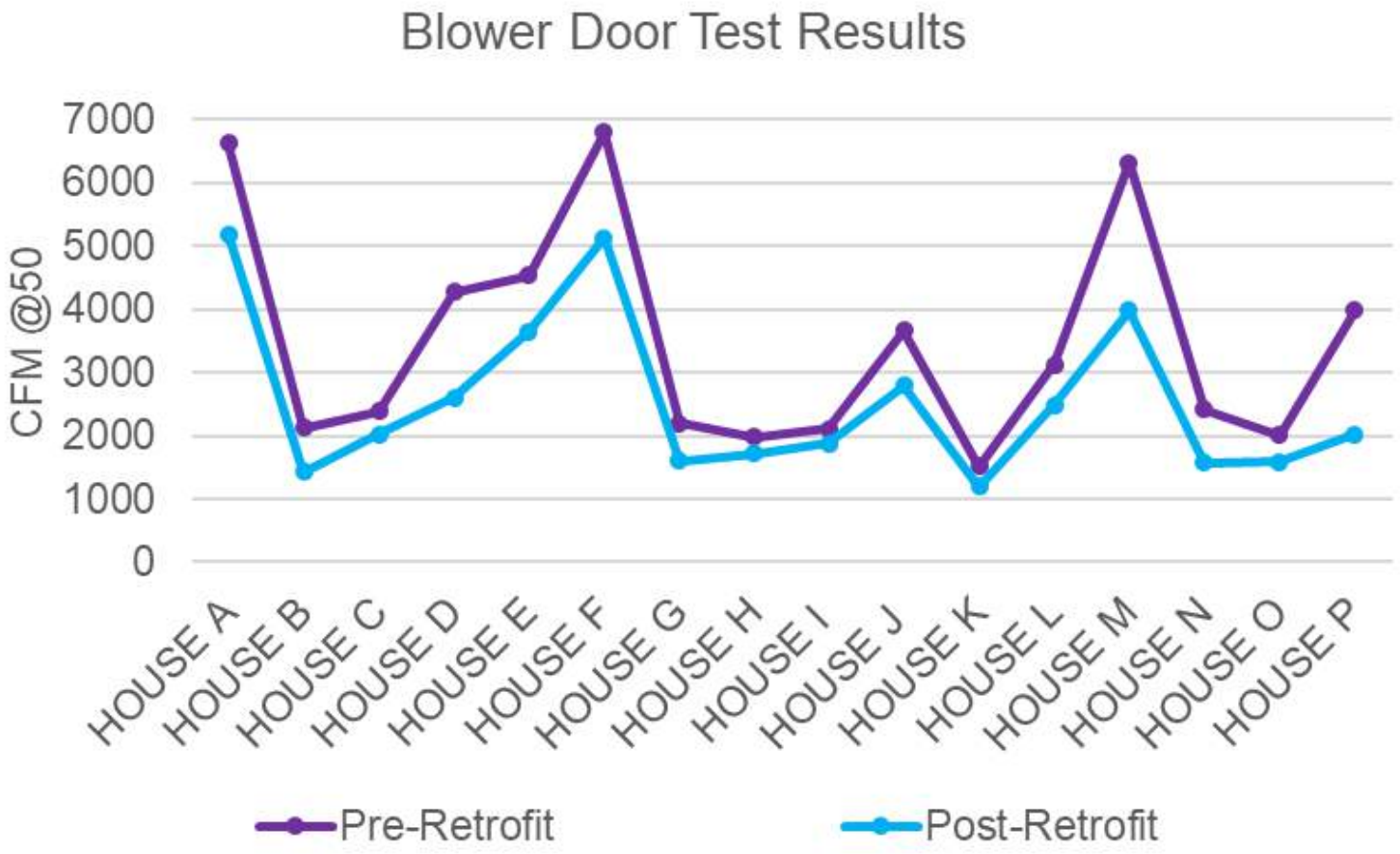
Data Collected – Utility Bill Data

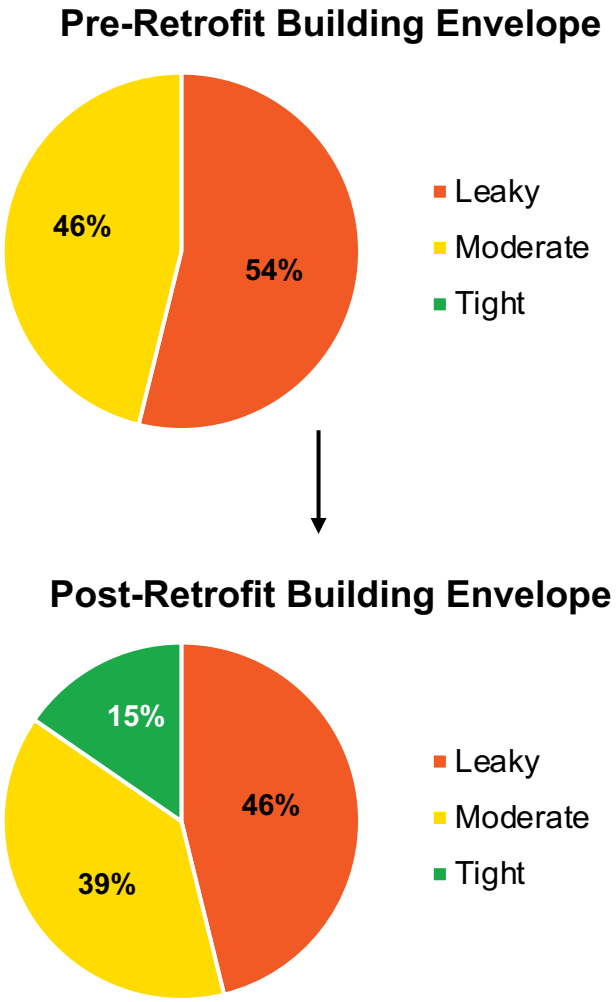




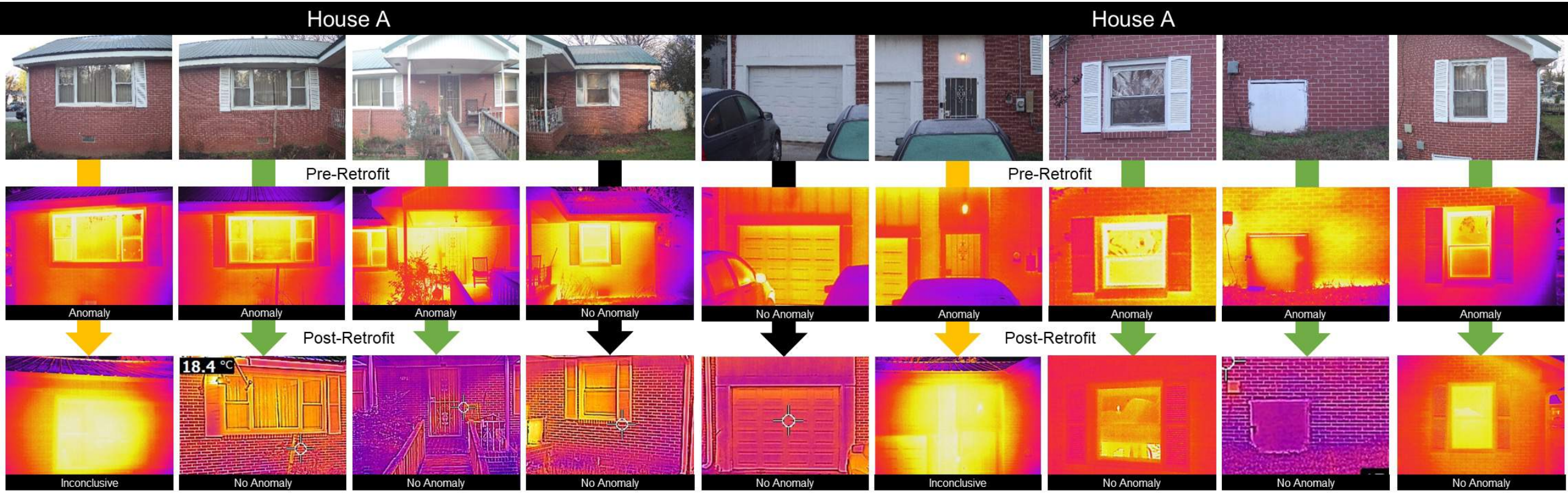


Data Collected – Blower Door Test





Data Collected – Thermographic Inspections



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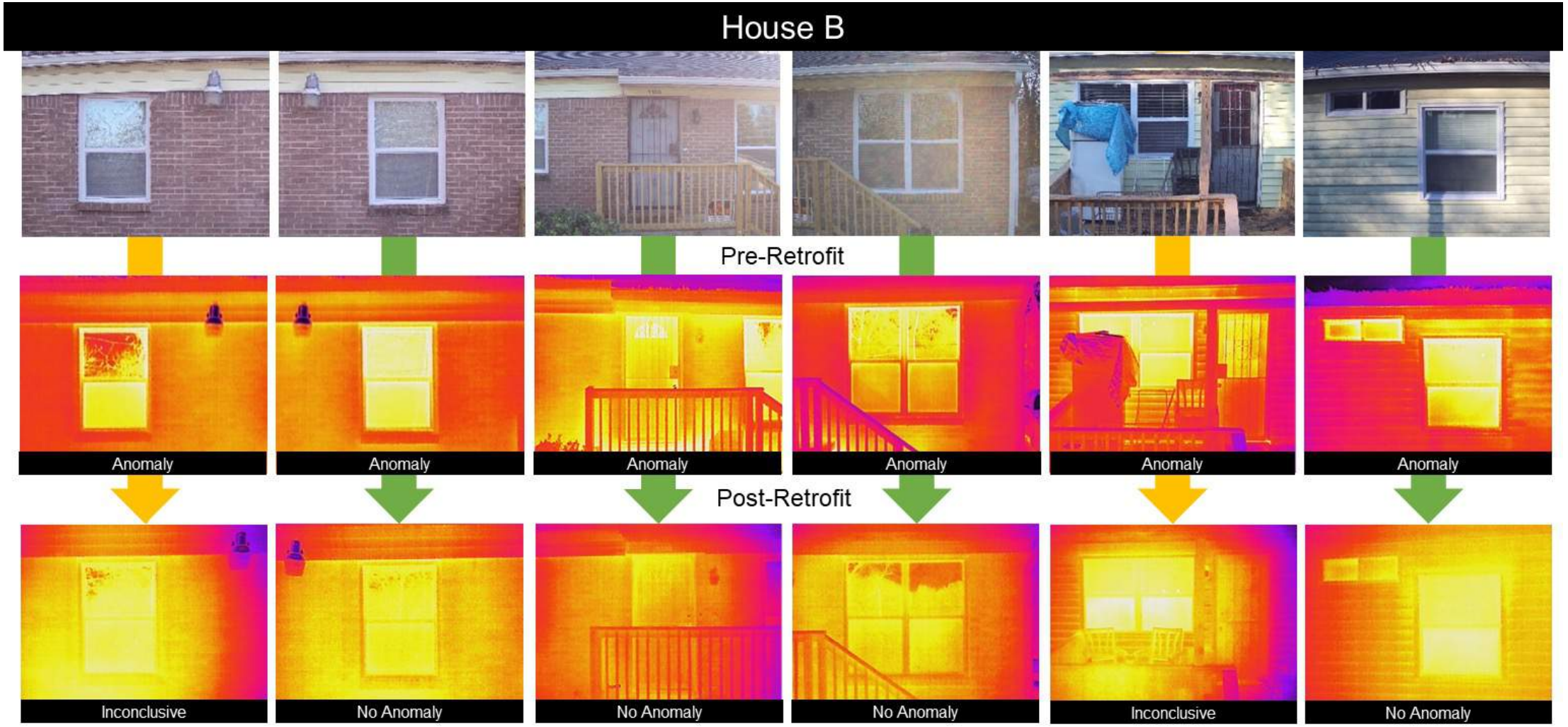

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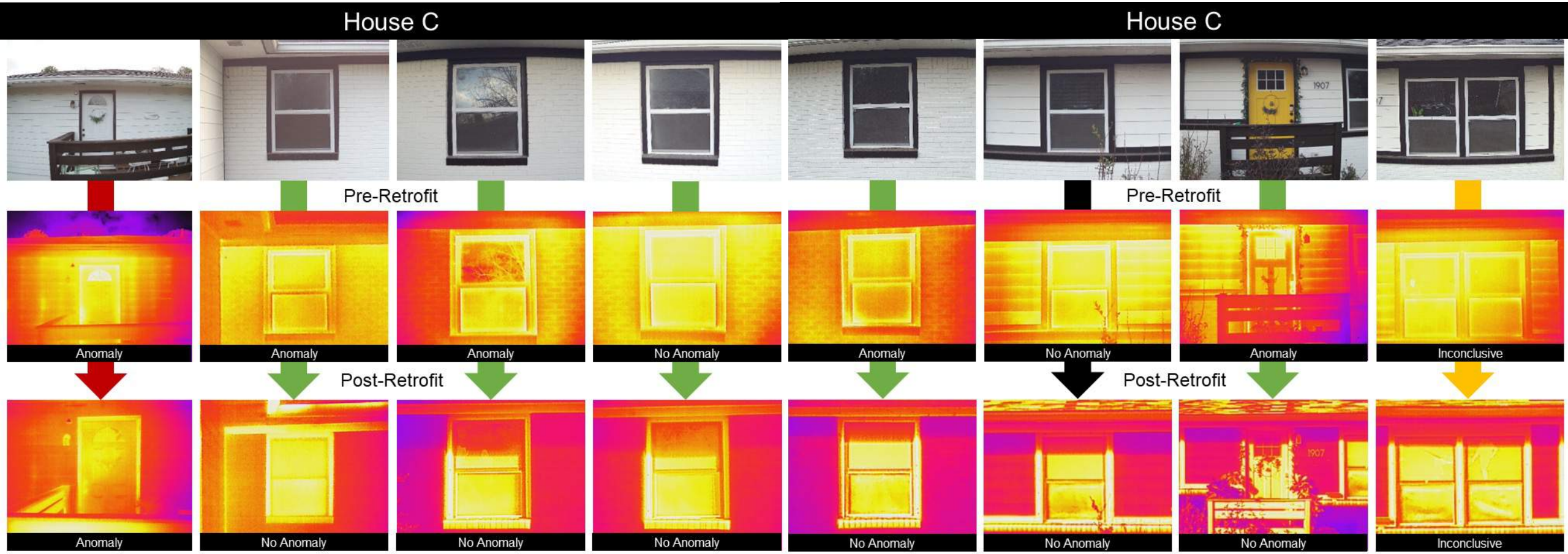

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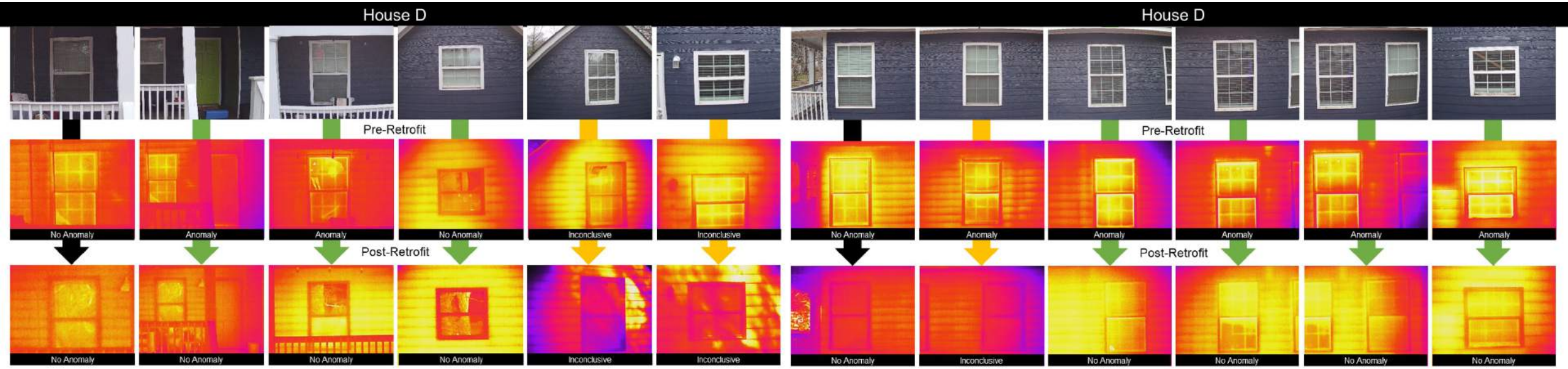

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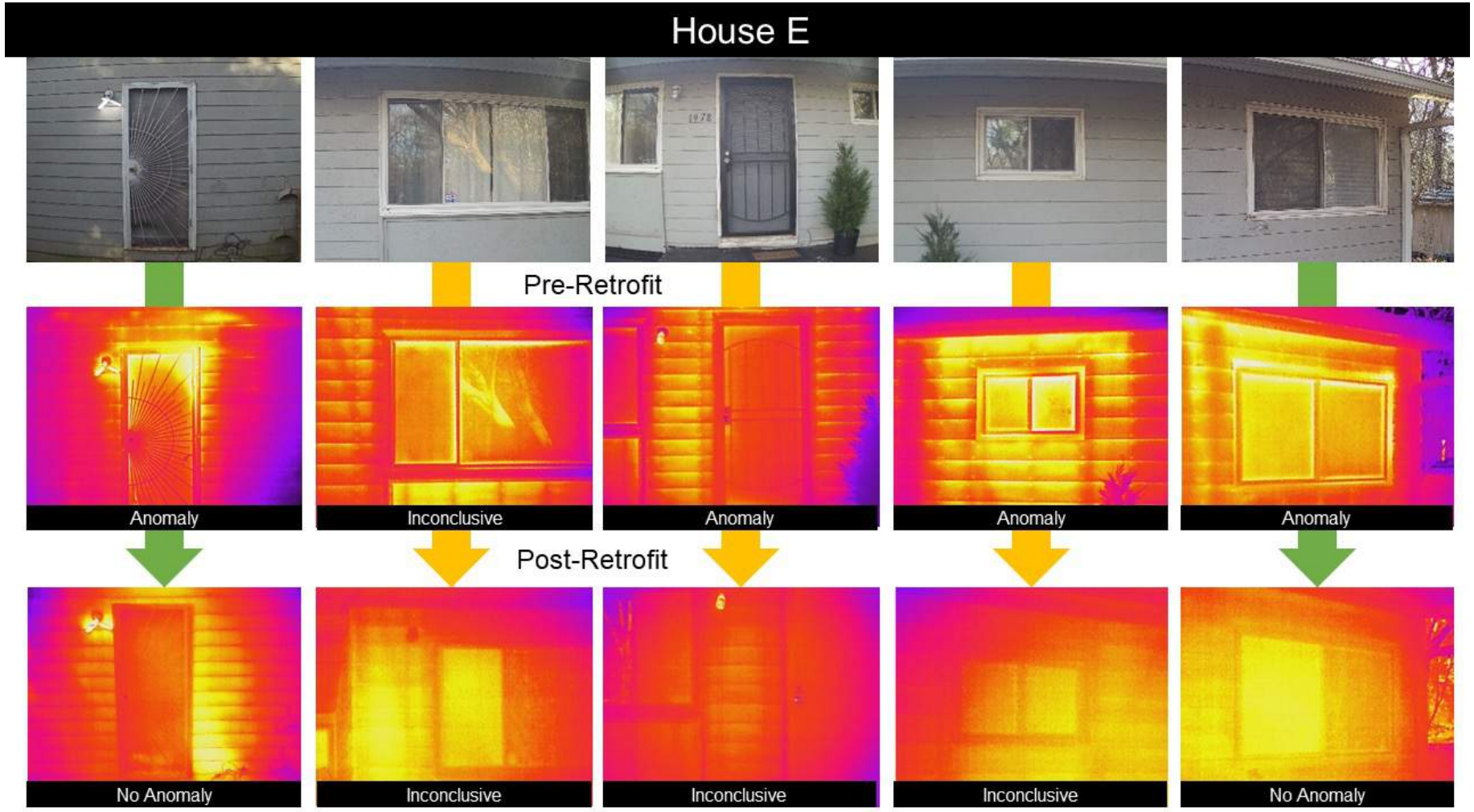

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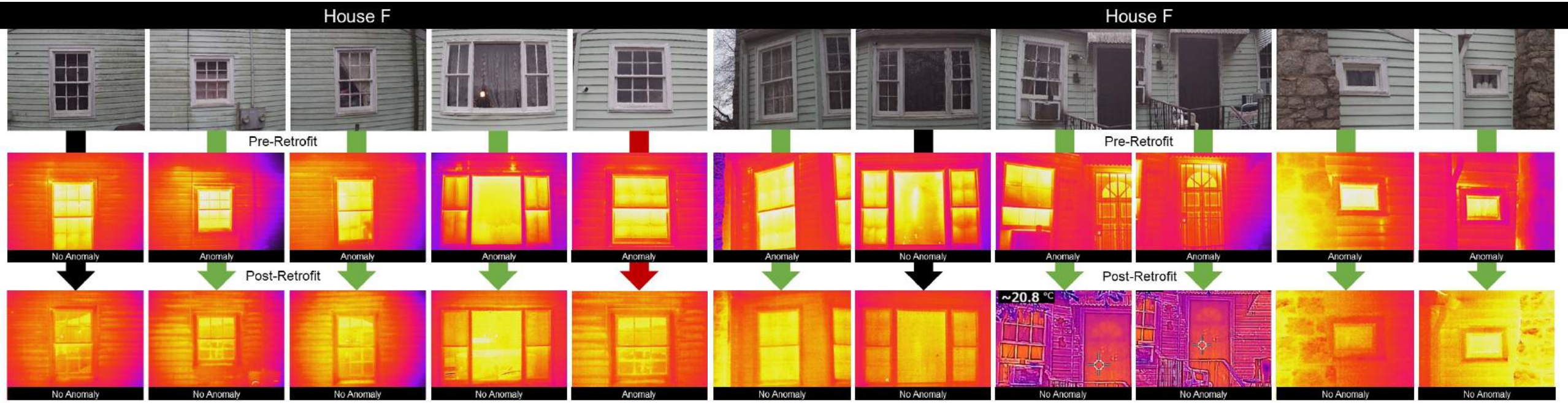

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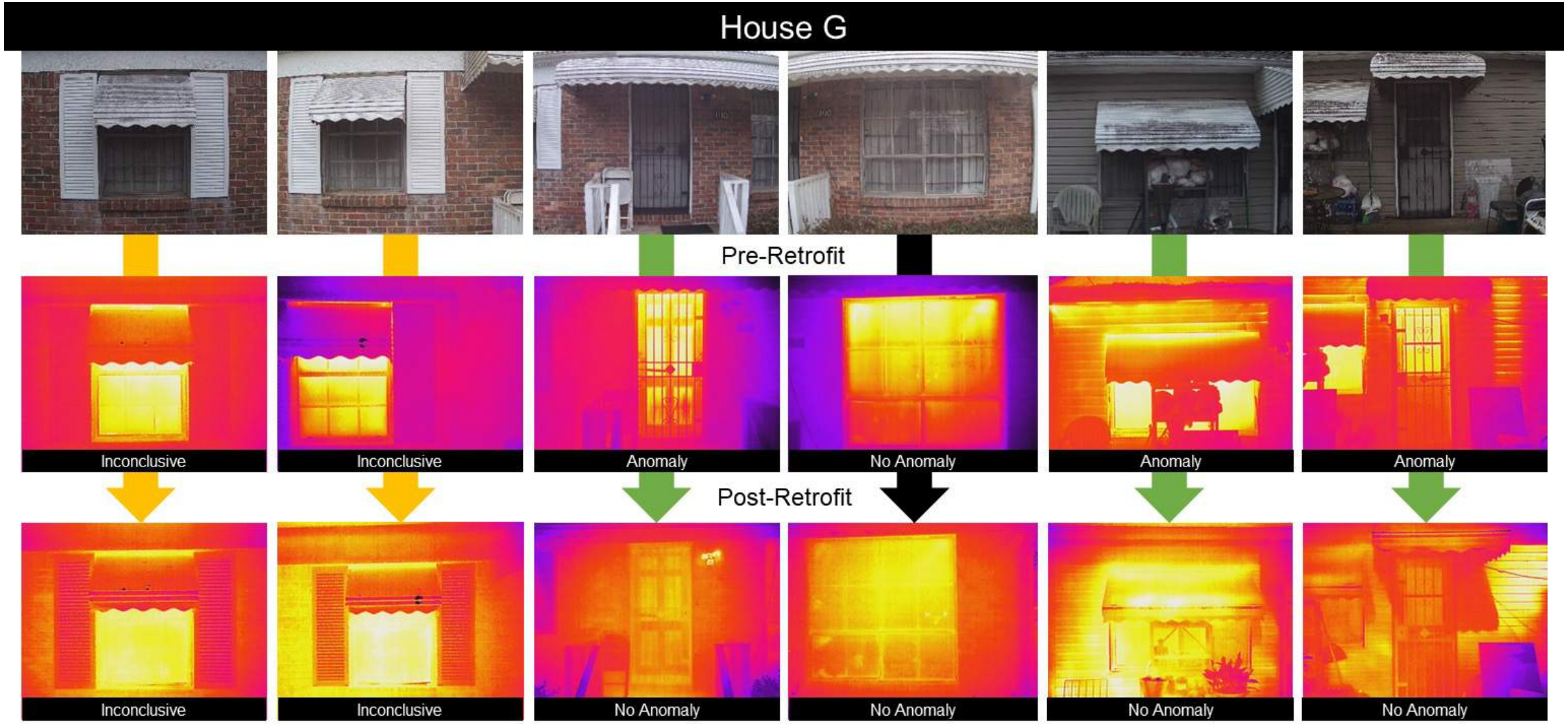

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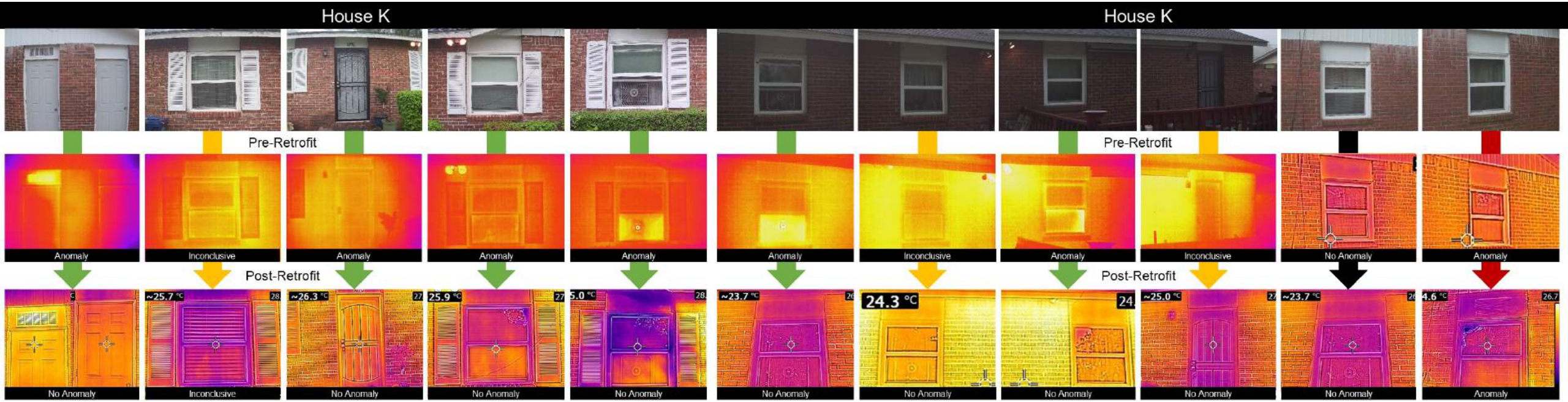

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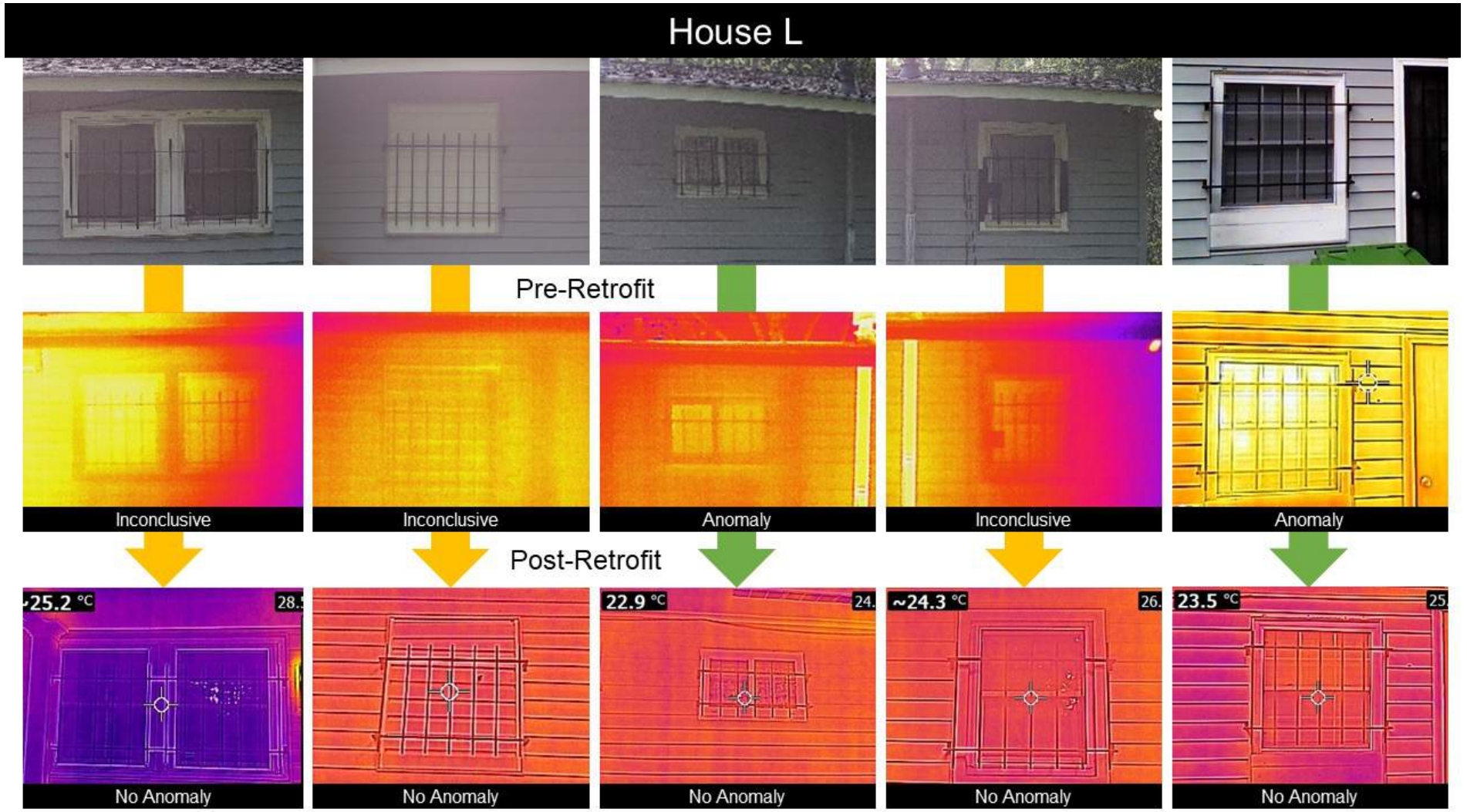

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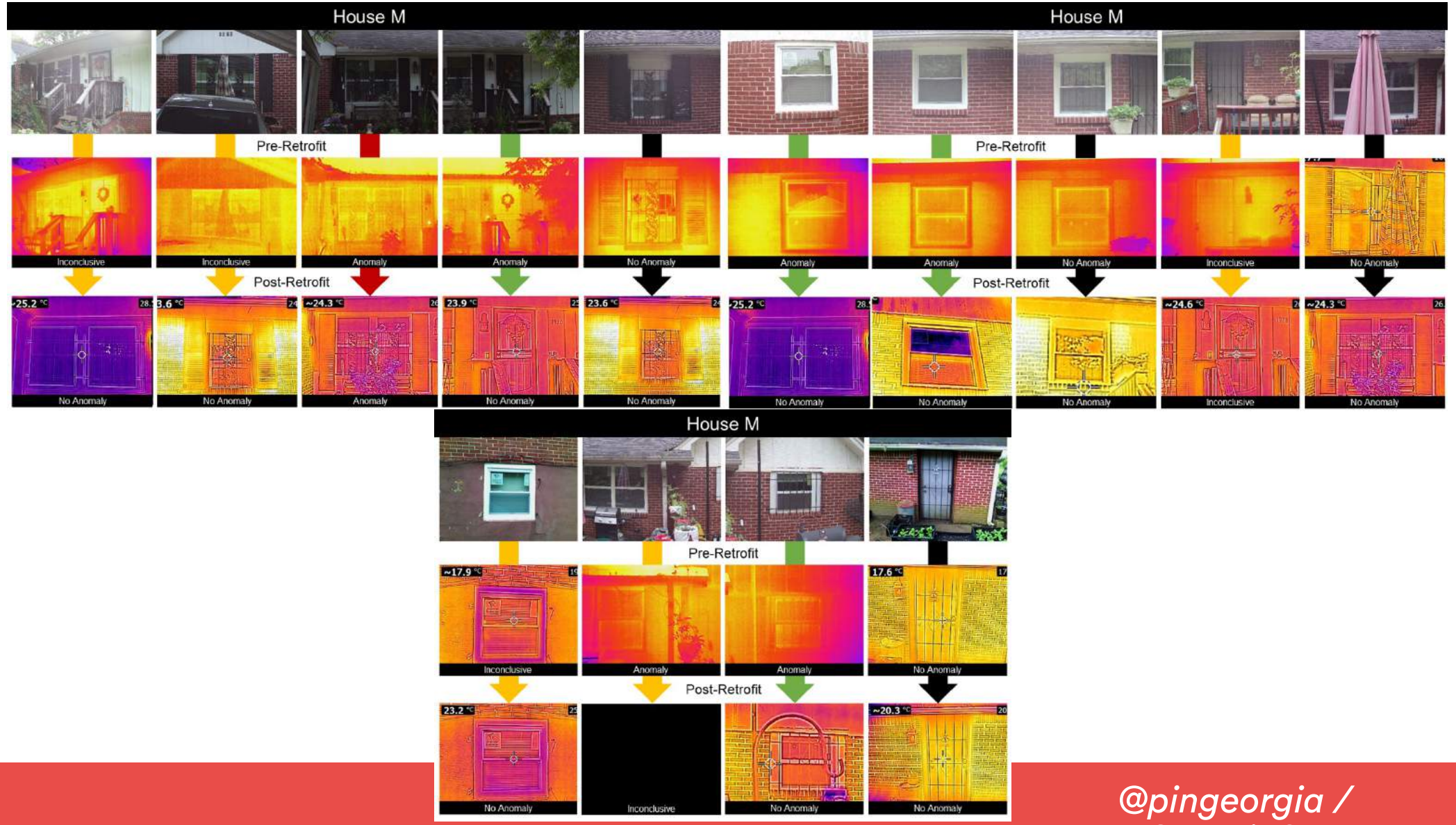

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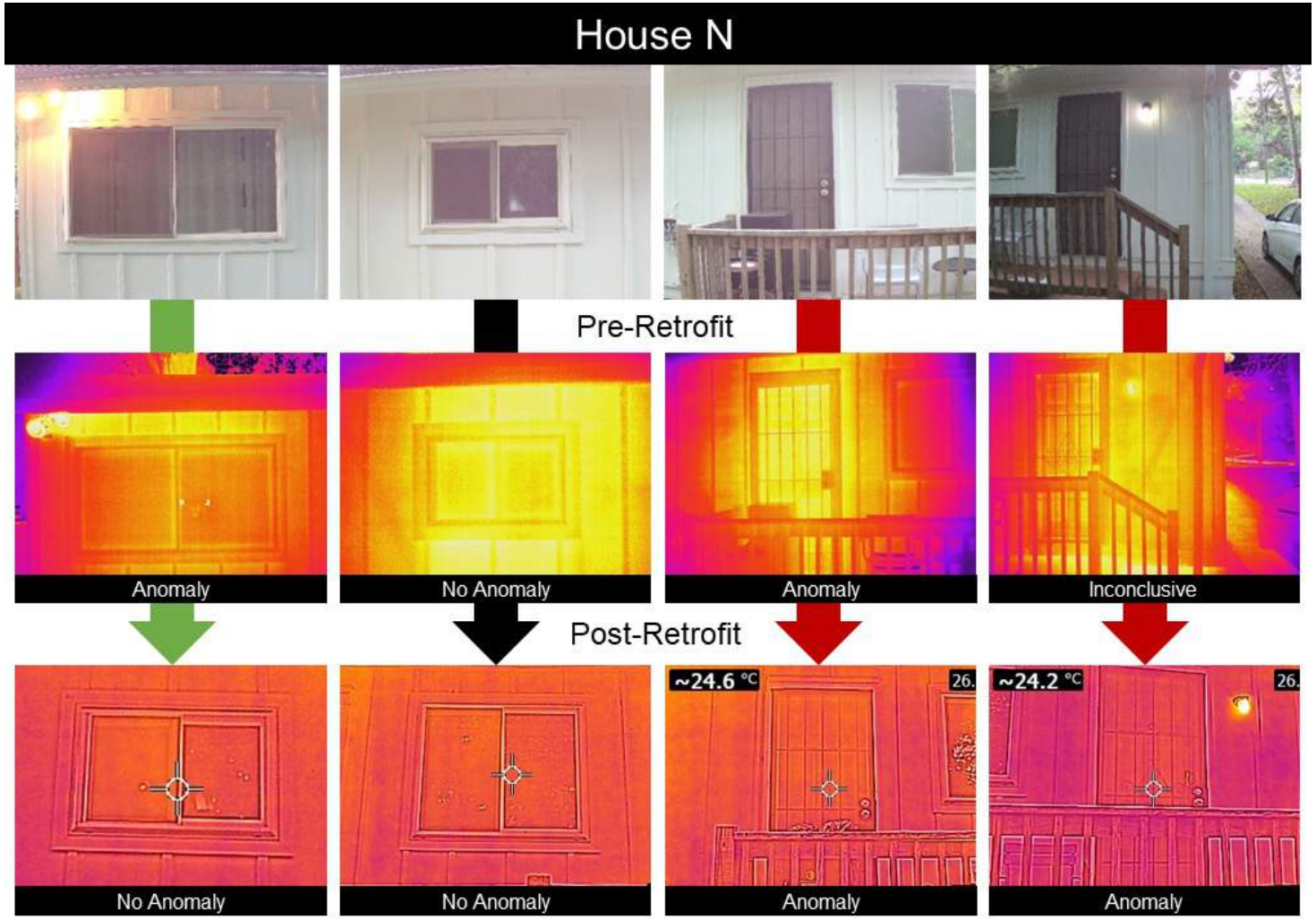
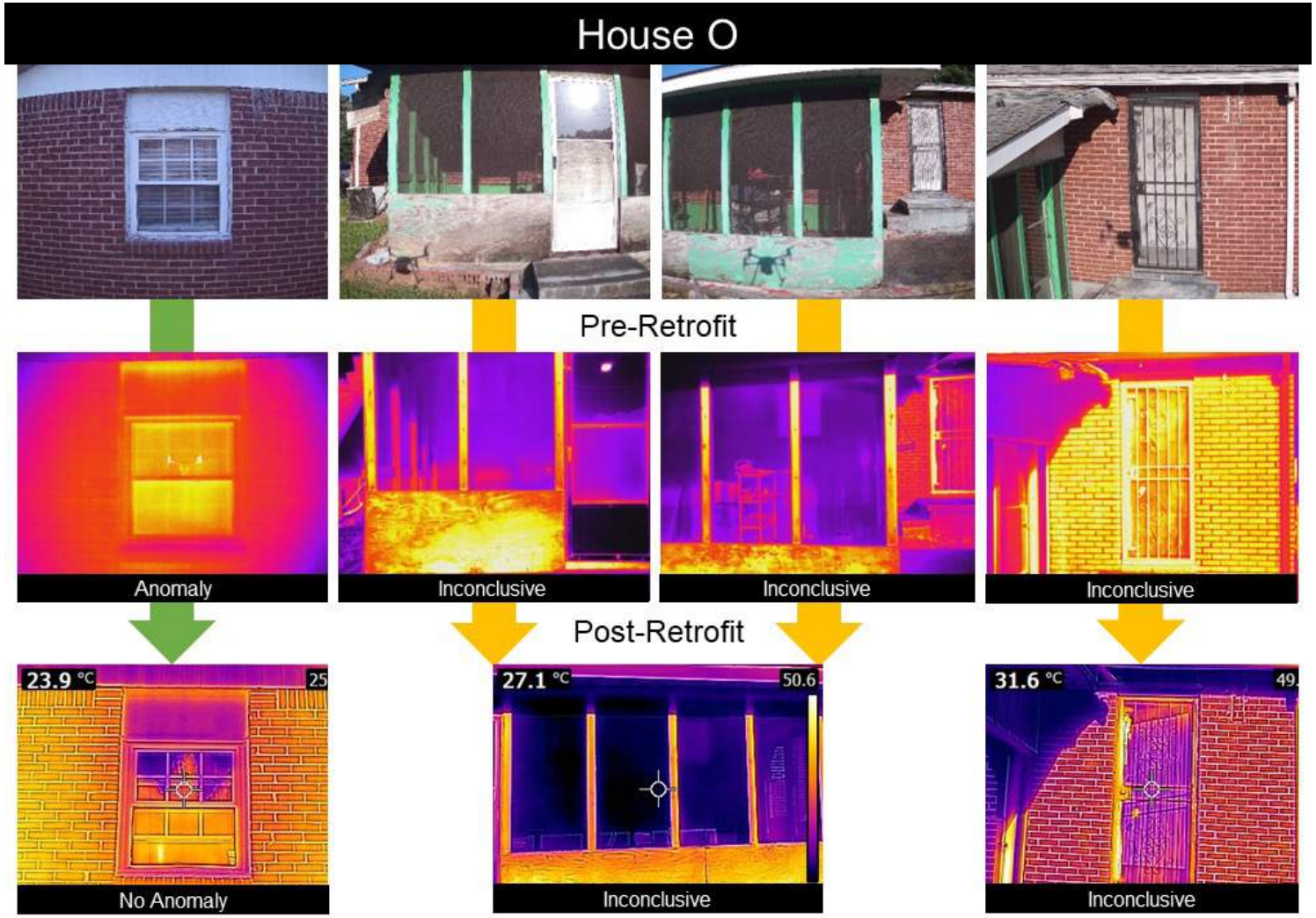
Data Collected – Thermographic Inspections