Introduction to the DOE Weatherization Assistance Program

Presented at the Arizona Tribal Energy Association Annual Meeting

January 25, 2018

Welcome

- ITCA – Bruce Robinson, Water and Energy Technical Assistance Program Manager
- Arizona Renewable Energy Measures – Bonnie Dekavallas

Weatherization Assistance Program (WAP) Purpose

10 CFR 440.1 - *"implement a weatherization assistance program to increase the energy efficiency of dwellings owned or occupied by low-income persons especially low-income persons who are particularly vulnerable such as the elderly, persons with disabilities, families with children, high residential energy users, and households with high energy burden."*

History of ITCA Weatherization Assistance

1970s

- Department of Energy (DOE) Proposed Program in 1976 and it was finalized in 1979.
- Reaction to the 1973 oil crisis and heating fuel costs.
- Consisted of low-cost conservation measures, covering windows with plastic sheeting, caulking, and weather-stripping, to reduce home heating bills.

1980s

- Added Insulation and focused on improved heating systems

History of ITCA Weatherization Assistance

1990s Funding Reduced, but….

- Focus - Improving cost effectiveness of the Program.
- Advanced energy audits and diagnostic equipment.
- Use of computerized energy audits.
- Blower door-directed air sealing.
- 1994 - the Program integrated cooling efficiency measures.
- 1996 - Oak Ridge National Lab conducts Program Evaluation.
- It improved training, auditing tools, and manage practices.
- Lead to 70% higher energy savings per dwelling.

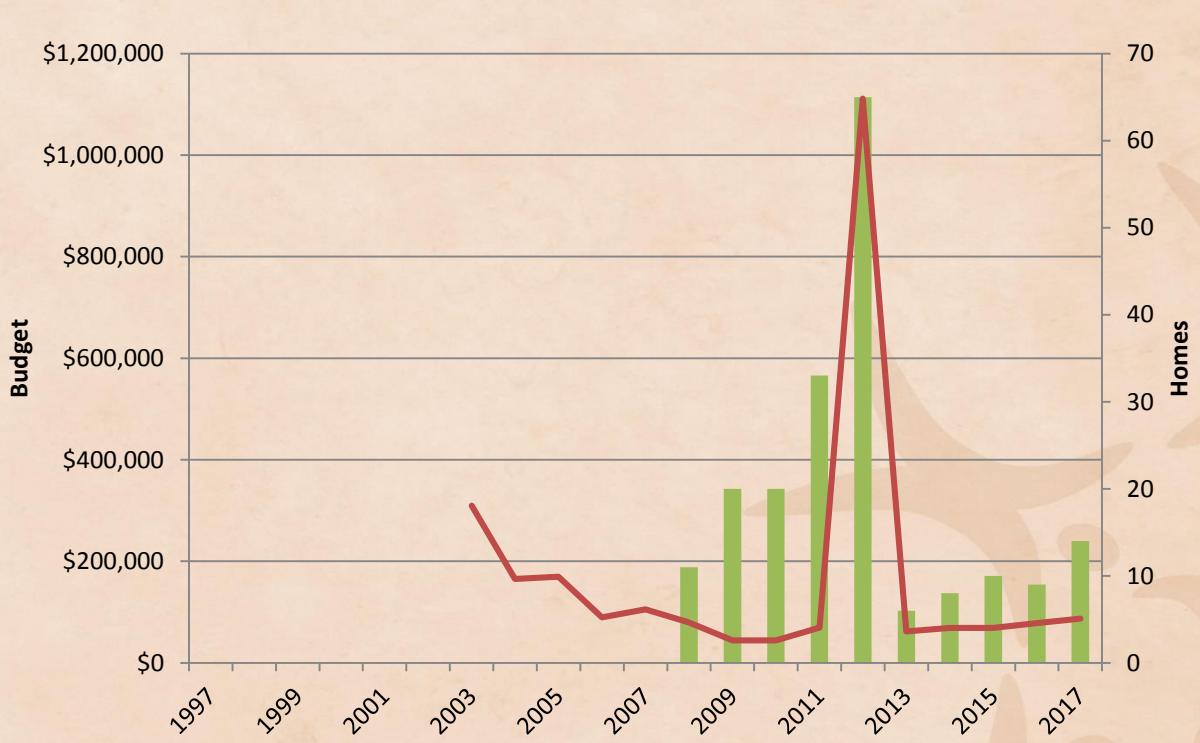
History of ITCA Weatherization Assistance

2000s

- Millennium Committee Strategy Report (April 1999)
- DOE changes strategy, *"The goal is to not only grow the program but expand the reach."* Dan Reicher, Assistant Secretary, Energy Efficiency and Renewable Energy.
- Electric base loading procedures approved.
- Focus on increased flexibility, better technology and expanded resources = better results
- 2009 - American Recovery and Reinvestment Act - $5 billion

History of ITCA Weatherization Assistance

2000s



ITCA Since 1997

Since 2008:

220 Homes

11 Tribes

ARRA Project

Havasupai Falls
2011

ITCA WAP Program

Moving Parts

- Rotation of Tribal WAP Services
- Memorandum of Agreement
- ITCA Conducts Workshop for Tribal Departments.
- Priority Lists (Every 5 Years)
- State Plan (Annual)
- Field Guide (Best Practices – Every 3 Years)
- WAP Application Packet of Materials

ITCA WAP Program

Memorandum of Agreement

- Discusses Sovereign Immunity
- Outlines WAP components and procedures
- Defines Community Coordinator
- Protects PII
- Defines ITCA Responsibilities
- Important due to liability of working in private homes and ensuring safety

ITCA WAP Program

ITCA Workshop with Tribe

- Defines Level of Participation From Tribe
- Identifies Tribal Coordinator Role
- Tribal Coordinator locates potential applicants
- Reviews Application Requirements
- Overview of WAP Services

ITCA WAP Program

What is Priority List
WAP-WPN-01-4

- State Energy Efficiency Programs Improvement Act of 1990
- Provided States with waiver so not required to spend 40% WAP monies on materials.
- WAPTC Program Notice 01-4 – Allowed Waiver, but required energy audit (model)
- Systematic approach to Weatherizing Homes

ITCA WAP Program

DOE Priority List

- DOE Approach - Priority List 01-4
  1) Model each home,
  2) Model all Climate Zones and Const. Type
- Approved models
  1) National Energy Audit (NEAT) or,
  2) Mobile Home Energy Audit (MHEA)
- Regardless of Approach - must document analytic methods, field procedures and administrative requirements!

ITCA WAP Program

ITCA Priority List Approach

- 2011 ITCA Adopted Arizona Priority List.
- DOE permitted based on similar housing type and climate zones.
- 2016 DOE required ITCA to develop new Priority List. Cost $4,000 to $6,000.
- ITCA elected to sunset WAP in 2017

ITCA WAP Program

State Plan (Annual Plan)

- Formal work plan submitted each February
  1. Client Eligibility
  2. Approach to building eligibility
  3. Areas to be served
  4. Priority for service delivery
  5. Climate Conditions
  6. Weatherization analysis and effectiveness
  7. Health and Safety
  8. Program Management

ITCA WAP Program

Field Guide

- This part of the Quality Work Plan addresses aligning the work done in (State Plan) with the Standard Work Specifications (SWS).
- Quality Control Inspection (QCI) confirms compliance with SWS.

ITCA WAP Program

WAP Application Packet

- Client Check Off-List
- WAP Application with Income Verification
- Priority Point System
- Utility History Release Form
- Rental or Owner Agreement
- Final Inspection Form
- WAP Privacy Act Notice
- WAP Deferral Notice
- Lead Awareness Pamphlet and Form
- Radon Awareness Pamphlet and Form

Weatherization Process

Who is Eligible for Assistance?

- Finding the priority population
- Confirming the DOE program WAP Application

❖ Senior Citizens

❖ Income Qualified

❖ Families with Children

❖ Disabled

Types of Dwellings Weatherized

- Establish appointment for preliminary test-in audit to confirm home construction fits criteria of priority list.
- Evaluate home to ensure it is not a walk-away or "deferral".
- Take pre-weatherization photos.

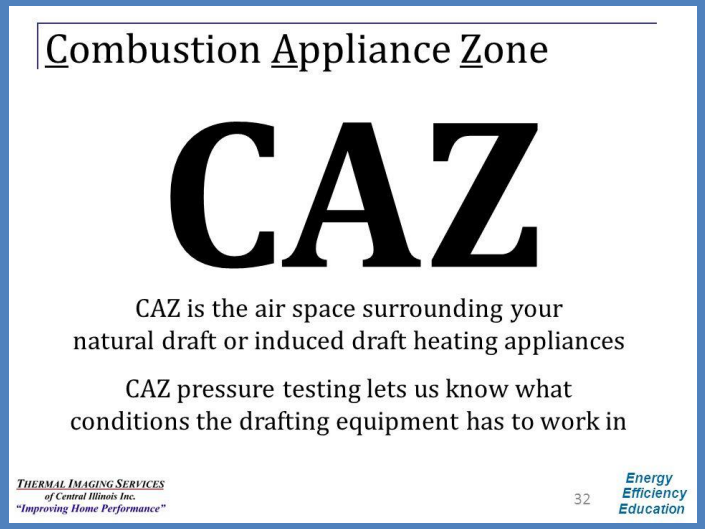
Diagnostic Tools Used

- Blower Door Test
- Depressurize House to locate Duct and Air Leakage

Blower Door Test

Diagnostic Tools Used

- Combustion Science (CO Detection)

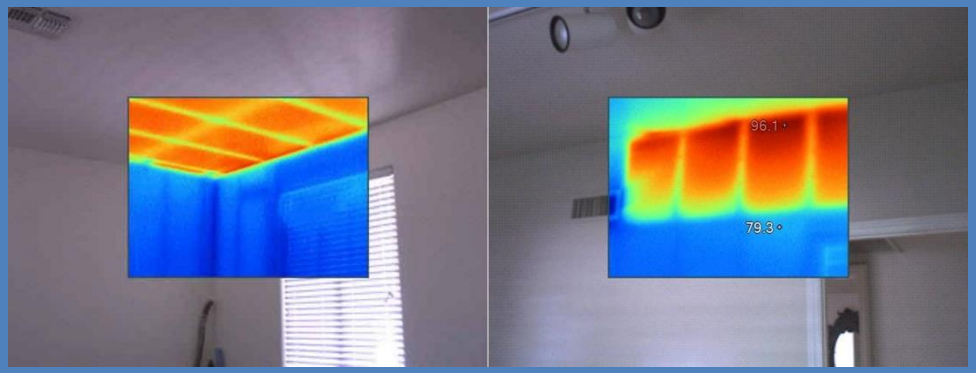


Caz and Safety Testing

Diagnostic Tools Used

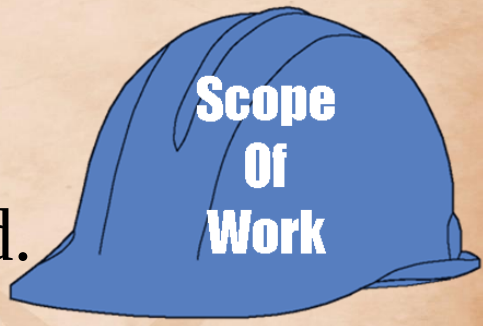
- Infrared Camera
- Heat and Insulation Deficiencies

What you see – Camera Image



Infrared Camera

Weatherization Scope of Work



- Audit results are evaluated and compiled.
- Construction material and cost are calculated.
- Pre-audit pictures are organized and documented.
- Priority list is used to create Scope of Work.
- Create itemized list of each home with explanation and cost.
- Submit Scope of Work for ITCA review and approval.

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Audit Summary Page 1

Scope of Work for the Emment Luna Residence
8-27-16

Audit Date	8/23/16
Program	ITCA/DOE
Address	45084 Vincent Ave, Maricopa, AZ 85139 Climate Zone 2
Auditors	Erich Heidewald

Audit Summary: The Luna house was built in the early1990's. Lead test N/A. It is 1537 square feet, including a converted carport, and is in fair condition, although there is room for weatherization improvement. The tiled roof is sloped with gabled ends and a flat-ceiling attic. The floor is concrete slab-on-grade. The exterior walls are insulated block with stucco. Dual-pane aluminum frame windows. There is a natural gas water heater in the laundry room, the door of which opens to the attached carport conversion. Water temperature was 129.

Heating and cooling is provided by a (illegible) Btu gas pack with (illegible) ton A/C on the roof. (c. 1999) One 8,000 Btu window A/C in the carport conversion. Zero electric space heaters, evaporative coolers or woodstoves. Metal ductwork is in the dropped soffit area of the hall and there are flex duct runs as well. Present insulation is R-38.1 blown cellulose and chopped fiberglass, with a few bare spots. Carport conversion attic was also insulated. Insulation dam IS required in this case.

The house tested-in at 1400 CFM50 (depressurized) and the target CFM50 is 870 CFM50 for 3 bedrooms, 2 occupants. The kitchen rangehood tested at 81 CFM (Keep.), guest bath fan at 10 CFM (Replace with mech. vent fan.) and master bath fan at 41 CFM. (Keep.) Pressure pans (8) averaged 3.5 pascals, with the return at 5.9 pascals. The zonal pressure of the attic was -45.2 pa. WRT the house and the carport area was -37.4 pa. Room pressures were 5.5, 1.4 (reg. closed) and 11.0 pa. in bedrooms 1, 2 and 3, respectively.

The main body (none) worst-case depressurization was -14.3 pa. and the laundry (WH) was -15.4 pa. due to the dryer and blocked makeup air. The water heater ONLY passed spillage under natural case with a draft pressure of -3.6 pa. and 16 ppm carbon monoxide. Furnace heat exchanger okay. CO tested at 49 ppm. (84.5% eff.) No carbon monoxide detector. Smoke detectors okay. Oven tested okay at 32 ppm.

Safety and notes for Housing: Beware, dog with puppies. No gas leaks. Exposed wires at location of old evaporative cooler on roof may or may not be live.

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Scope of Work Page 2

Scope of Work

1. Audits. This includes pre and post testing and reporting. This price includes customer consultation at end of job on how to operate their home in a more efficient manner.
*Cost $650.00

2. CO detector. (1 total) Install a CO detector in hallway outside bedrooms. (Health and Safety) *Note: Install at outlet height.* Cost $73.50

3. Clean Cooktop. Crews will attempt to clean gas cooktop to improve burning characteristics and lower carbon monoxide production. (Health and Safety) Cost $39.90

4. Ventilation Unit (ASHRAE 62.2 - 2013). Crews will REPLACE GUEST BATH fan with a Panasonic Whisper Green Select equipped with timed (0-60min) boost (to 50, 80, 110 CFM) on motion sensor and adjustable continuous low flow of 30-100 CFM. 0.3 sone rating. (Model FV-05-11VKS1 plus motion sensor FV-MSVK-1) Includes 4" insulated flex to exterior flanged vent termination and rewire for always-on operation. *Note: Crew to set fan boost to 80CFM and set fan continuous dial based on final test-out CFM50: (Luna; <1510 = 50CFM; <1080 = 60CFM; <650 = 70CFM) Ancillary Items: Luna - (0) ~~Roof vent termination.~~ (2) 4" collar at underroof. (Master fan duct repair as well)* (Health and Safety) Cost $512.40

5. Safety: WH Combustion Air. Crews will clear away blown insulation in the vicinity of the water heater flue and existing upper air grille. Crews will cut back shingles and other flammable materials contacting B-vent. (The laundry room is not conditioned space.) (Health & Safety) Cost $15.75

6. Safety: WH Makeup Air. Crews will add 4" diameter lower combustion/dryer makeup air from 12" over the attic floor to within 12" of the laundry room floor. Clear away blown insulation in the vicinity of the water heater flue and air grille. (The laundry room is not conditioned space.) *Note: attachment of single wall vent pipe will be to concrete block.* (Health & Safety) Cost $58.80

7. Duct Seal and REPAIR. Crews will remove all supply and return registers and seal all joints between boot/ box and sheetrock with caulk and mastic. Crews will also seal S and drives, collars and other ductwork connections. Seal all connections with mastic and use fiberglass mesh tape at gaps. Includes sealing flex ducts to and from roof unit. REPAIR: Remove abandoned flex duct from distribution box and seal hole with sheet metal, screws and mastic. Estimated potential reduction of 530 CFM50. *Note: There is deep blown insulation to move and replace over dropped soffit trunk line. Bring extra sheet metal as rust was noted on the trunk line and distribution box.*(Cost effective) Cost $1,032.86

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Scope of Work Page 3

8. Pressure Relief- (3)Doors. Crews will add transfer grills to bedroom doors under 6 panel molding for pressure relief. (Cost effective) Cost $278.25

9. HVAC 16 point checkup. A HVAC specialist will visually inspect, clean and test the HVAC unit. The recommendations from the HVAC specialist will be evaluated to determine if additional HVAC parts/labor are needed. SEE BELOW Cost $131.25

10. HVAC – Parts. HVAC specialist will replace parts to get HVAC unit running safely and efficiently. Includes replacement of gas flex line where run through furnace cabinet, sensors, switches, controls, blowers, etc. as needed. Prior approval by ITCA required for major components. *Replaced bad main line contactor switch, repaired condensate line to drip off of roof and repaired sun damaged thermostat wire.* Cost $365.40

11. Attic insulation. Crews will cap existing insulation with blown cellulose where thin or at bare spots along eaves or other repair locations. (+-512 sq. ft./ 9 bags) Target is R-30 (IECC climate zone 2) over all conditioned space. Flag junction boxes. Add depth gauges. Post insulation tag with depth and cellulose bag count. *Ancillary Items: Luna - ~~(0)Dams at flues and/or lights.~~ Note: insulation over unconditioned laundry is to be cleared away from water heater flue and combustion air.* (Cost effective) Cost $365.57

12. Attic Hatch. Crews will add vinyl weatherstripping tape to perimeter of attic access within interior conditioned space. Crews will add plywood insulation dam with 2x blocking as needed around attic access. Add glued rigid insulation to attic-equivalent R-value. (Cost effective) Cost $110.25

13. Shade Screens. Crews will install (4) shade screens with Textilene 80% fabric on east, west and south windows as applicable to reduce direct solar heat gain. (63.5 sq. ft.) (Cost effective) Cost $266.70

14. LCNC: Turn Down WH. Crews will reduce domestic hot water temperature to 120 degrees. (General waste heat) Cost $10.50

15. LCNC: (WH) Low Flow. Crews will replace existing showerhead and faucet aerators with low flow <1.5GPM units. *(Luna: 1 shower, 3 sinks)* (General waste heat) Cost $105.00

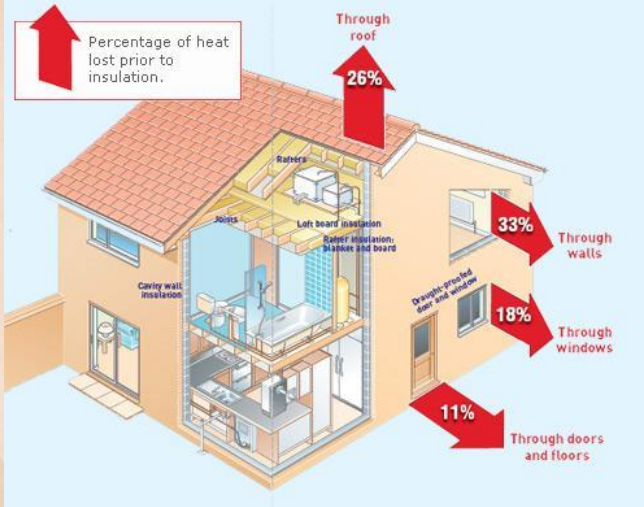
Total Price includes sales tax (audit not taxed)* **Total Cost $4,016.13**
* QCI, travel, lodging and per diem not included.

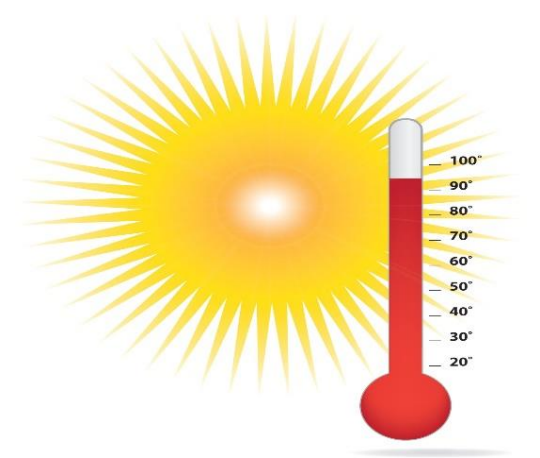
As needed, per test-out:

Weatherizing the Home

Three Major Components

- Air Leakage/Air Sealing
- Heat/Insulation
- Health & Safety





Weatherizing the Home

What is Included?

- 16-Point HVAC/Furnace or Evap Cooler Inspection.

- Check condenser coil
- Check evaporator coil
- Check blower motor
- Check refrigerant charge
- Inspect filters
- Check belts and pulleys
- Lubricate motors
- Check thermostat
- Check controls and safety devices
- Check motors
- Check capacitors
- Check condensate drain
- Check relays and contactors
- Check service disconnect
- Check and tighten wiring connections
- Check temperatures and pressures
- Check ductwork

Weatherizing the Home

What we find...

- Inspect and Repair all Duct work

Before

After

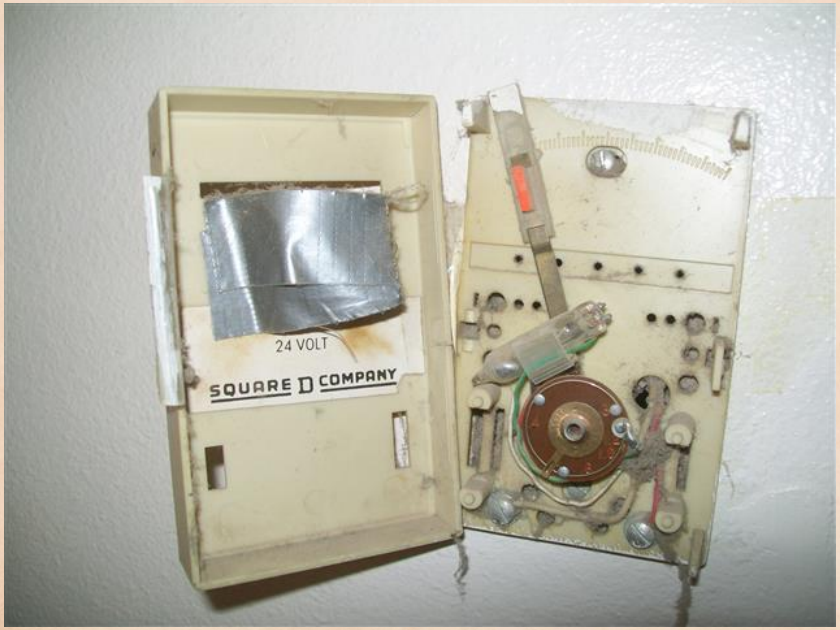
Weatherizing the Home

What we find…

Weatherizing the Home

What we find…

- **Damaged Thermostat that we replace with Improved Programmable Unit.**

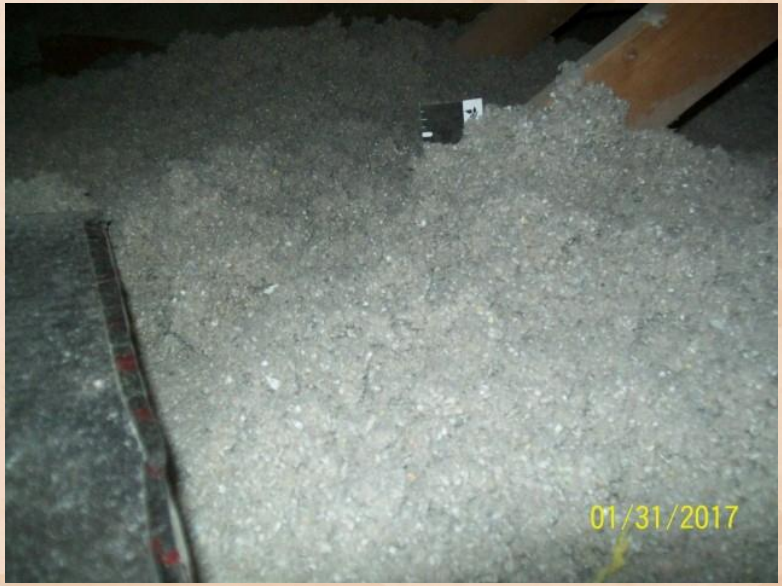


Weatherizing the Home

What is Included?

- Inspect and up-grade Insulation

Before



After

Weatherizing the Home

What we find…

Before

After

Weatherizing the Home

What is Included?

- Inspecting the roof

Before

After

Weatherizing the Home

What is Included?

<u>Safety Testing</u>

- Check all Smoke Detectors to ensure they are work correctly.
- Verify there are CO detectors in all homes with Gas Appliances.

Weatherizing the Home

What is Included?

- Hot Water Heater venting test to find deficiencies.
- Hot Water Heater Vent checks to ensure proper venting.

Before

After

Weatherizing the Home

What we Find…

Before

After

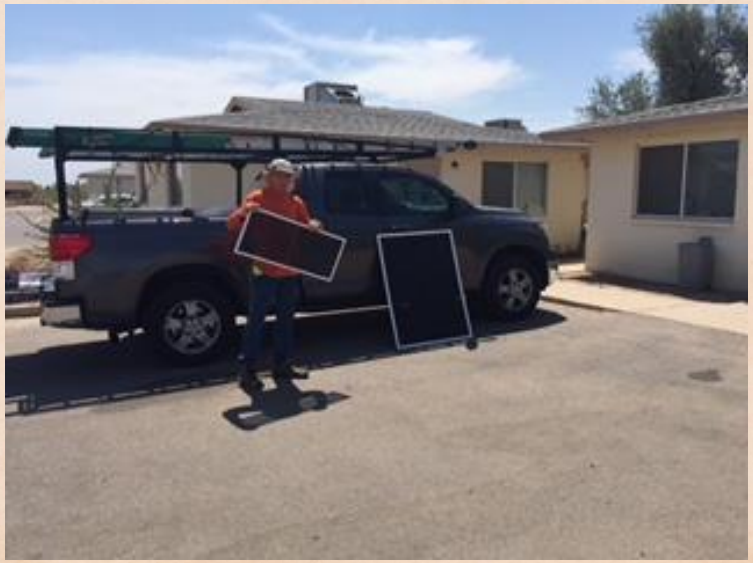
Before

After

Weatherizing the Home

What is Included?

- Solar Shade Screens.
- Custom Built and fitted to each window.
- Keeps out 80-90% of Heat from the direct sun.



Weatherizing the Home

What is Included?

- Inspect and repair/replace cooking hoods.
- Ensure all hoods are venting properly.

Weatherizing the Home

Additional Items included

- Piping repairs.
- Transfer Grill on Door for continuous air flow

Before

After

Weatherizing the Home

Final Household Energy Report

- After each home is audited, weatherized and inspected a Final Household Report is generated.

Household Energy Report

HOUSEHOLD REPORTING FORM

Application Denied (Y/N) No alk Away (Y/N) N Date 3/31/2017

Job # _____ Housing Type SFR X MH _____ Multi _____

Ownership Rent x Own _____

Age of Home 1980 Cond SqFt 782

Applicant Information

Last Name Johns

First Name Bruce

Address 226 W. Azule St. # 4-A

City Sacaton Zip 85147

Income _____

Electricity Provider _____

Electric Account # _____

Gas Provider _____

Gas Account # _____

Other Fuel Provider _____

Other Fuel Account# _____

Final Inspection By Erich Heidewald

	Occupancy							
	Demographics			Ages				
Occupant	Handicapped	Homebound	Native American	<= 2	3 to 5	6 to 17	18 to 59	> 60
1			x				x	
2								
3								
4								
5								
6								
7								
8								
9								
10								

Total Other Leveraging Funds _____

Existing problems - Work Performed	DOE	LIHEAP	UES	URRD	APS	Total
Health and Safety						**$664.65**
Ventilation, ASHRAE, Panasonic Mo	$512.40					$512.40
Add rooftop vent for bath fan	$78.75					$78.75
Spot Ventilation Kitchen Rangehood	$0.00					$0.00
CO Detector (1)	$73.50					$73.50
Smoke detector (1)	$0.00					$0.00
						$0.00
CAZ Flue Extension	$0.00					$0.00
CAZ Combustion Air Repairs	$0.00					$0.00
CAZ Isolation: WX double doors	$0.00					$0.00
Inoperable Furnace Replacement	$0.00					$0.00
						$0.00
Duct Work						**$1,042.27**
Duct seal, CFM50 reduction	**$837.52**					$837.52
						$0.00
Pressure Relief: transfer grills (2)	**$204.75**					$204.75
						$0.00
						$0.00
						$0.00
						$0.00
HVAC						**$131.25**
16 point HVAC checkup	$131.25					$131.25
LCNC: Digital Thermostat	$0.00					$0.00
LCNC: Furnace filters (3)	$0.00					$0.00
HVAC parts	$0.00					$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00

	DOE	LIHEAP	UES	URRD	APS	Total
Attic						**$811.40**
R-13 Blown cellulose for R-30 tota	**$344.15**					$344.15
(482 sq. ft.)						$0.00
Fill dropped soffits w/ cellulose	**$183.75**					$183.75
(100 sq. ft.)						$0.00
Attic: Repair existing batts	**$173.25**					$173.25
(300 sq. ft.)						$0.00
Attic: Seal open wall drops	$0.00					$0.00
(0 sq. ft.)						$0.00
Ancillary Item: Attic hatch seal & da	$110.25					$110.25
Incidental Repairs: Minor roof	$0.00					$0.00
						$0.00
Walls						**$0.00**
Air barrier: seal drywall holes	$0.00					$0.00
(0 sq. ft.)						$0.00
						$0.00
Dense Pack Wall Insulation N/A	$0.00					$0.00
						$0.00
						$0.00
						$0.00
Windows						**$236.25**
Shade screens (3)	**$236.25**					$236.25
(45 sq. ft.)						$0.00
						$0.00
Low-E Storm Windows E,W N N/	$0.00					$0.00
(0 sq. ft.)						$0.00
						$0.00
						$0.00
Doors						**$0.00**
LCNC: Doors A + B, sweep	$0.00					$0.00
plus adjust Door A						$0.00
plus jamb-up kit, door A						$0.00
						$0.00
						$0.00
Water Heater						**$88.20**
LCNC: Insulate water heater lines	$46.20					$46.20
LCNC: shower (0), faucet aerators (	$42.00					$42.00
						$0.00
Install Heat Pump Water Heater N	$0.00					$0.00
						$0.00
						$0.00
General Repairs						**$50.40**
CFL's (8)	**$50.40**					$50.40
						$0.00
Replace Refrigerator N/A	$0.00					$0.00
						$0.00
						$0.00
						$0.00
Audit						**$650.00**
						$0.00
Audit charge -No tax.	$650.00					$650.00
Total Investment	**$3,674.42**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	$3,674.42

Note: Prices are with tax added, except labor-only test-in audit.
Block house, Climate zone 2.
Refrigerator notes: Old -Brand, Model#, Serial #: New (Owned by Housing Dept.)

Household Energy Report

Combustion Safety Report

Job # _____ Name: Johns, Bruce Final Test Date: 3/31/2017

Auditor: Test-In: Erich Heidewald Test-out: Erich Heidewald utside Air Temperatur ? F

Check for gas leaks

Found: No gas on property.

Measure carbon monoxide levels in indoor air during appliance operation

	Initial reading	After servicing or new replacement reading
Furnace or space heater	ppm	ppm
Water heater room:	ppm	ppm
In kitchen after 5 min. oven	ppm	ppm
Near supply air registers:	ppm	ppm
Other:	ppm	ppm

Measure carbon monoxide levels in undiluted flue

	Initial reading	After servicing or new replacement reading
Furnace or space heater flue	ppm	ppm
Multi-port Furnace highest	ppm	ppm
Water heater flue:	ppm	ppm
Oven vent:	ppm	ppm
Other:	ppm	ppm

Furnace/space heater:

Kbtu/hr: _____

Location: roof

Source and amount of combustion air:

Source: _____

Amount: _____ sq. in.

Water heater:

Input Kbtu/hr _____

Location: kitchen cabinet

Source and amount of combustion air:

Source: _____

Amount: _____ sq. in.

Standard Draft Test

(Do not drill sealed combustion of power exhaust appliance vents)

Appliance	Pressure	Reason for not performing Standard Draft Test
Furnace	Pa	Electric on roof
Water Heater	Pa	Electric
Other:	Pa	

Spillage Test

(Time from when appliance burner fires up)

Pressure Diagnostic Report

Job # _____ Client Name: Johns, Bruce nal Test Date: 3/31/2017

Combustion Appliances

Furnace No Dryer No

Water Heater No Fireplace No Other No

Room Pressures

Test	Room Tested	Initial Room Pressure	Post Air Sealing Pressure	Post Pressure Balancing	Appliances in CAZ
Dominant duct leakage	Main Body	1		0	
Room Pressure	Bedroom 1	5.6		2.6	
Room Pressure	Bedroom 2	6.7		1.2	
Room Pressure	Bedroom 3				
Room Pressure	Bedroom 4				
Room Pressure	Utility Room				
CAZ test	Main Body	-2.6		-7.7	None
CAZ test	Utility Room				
CAZ test	Laundry				

Zonal Pressures

	Before Repairs	After Repairs	Duct Location
Attic WRT house	-43.7	-38.2	yes
Floor WRT house			
awlspace WRT house			
Utility WRT house			

Whole House CFM50 Test

Pressure Diagnostic Stage Test	Flow Ring Used	House Pressure (Pa)	Fan Pressure (Pa)	Flow (CFM50)	CFM50 Reduction
Initial whole house CFM50	B	-50		1125	
Post duct repair CFM50	C8	-50		618	
Duct leakage reduction					507
Post bldg shell air sealing CFM50	C8	-50		618	
Building shell leakage reduction					0

Pressure Pan Duct Test

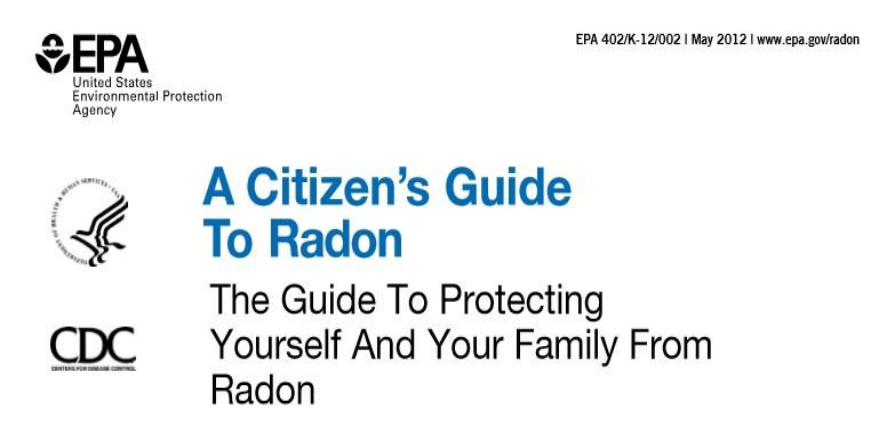
Room	Register #	Initial pressure	Post-repair pressure	Room	Register #	Initial pressure	Post-repair pressure
DIN	1	0.4	0.3		7		
LIV	2	0.6	0.4		8		
BA	3	0.3	0.3		9		
BD1	4	0.2	0.2		10		
BD2	5	0.2	0.2		11		
RETURN	6	3.9	1		12		

Comments

Negative CFM50 blower door test. Retrotec monometer gives no fan pressure.
Final numbers:
Water heater temp: 114
ASHRAE Panasonic, set to 30 CFM continuous, pressure compensation to 50 CFM, ? Pascals, Door used

Educational Information

- After weatherizing the home, each home receives a personal information session about home safety.
- All homes receive information sheets that we print and leave with them.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EPA United States Environmental Protection Agency

A Citizen's Guide To Radon

The Guide To Protecting Yourself And Your Family From Radon

CDC

ITCA Weatherization Assistance Program