



# NAVAJO NATION EPA IMPLEMENTING A TRIBAL INDOOR AIR QUALITY PROGRAM



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# NNEPA AIR QUALITY CONTROL PROGRAM OVERVIEW

## ■ Section 105 Clean Air Act Grant

- Ambient air monitoring
- Open Burn of Household Waste
- **Indoor Air Quality (IAQ)**

## ■ Operating Permit Program

- 13 Title V Facilities



To protect and enhance the health and livelihood of Navajo people



To protect and preserve the natural beauty and environment on the Navajo Nation



To ensure the air emissions from the industries operating on the Navajo Nation are regulated

# INDOOR AIR QUALITY ON THE NAVAJO NATION

- Addressing IAQ on the Navajo Nation – AQCP
  - Added Indoor Air Quality Component to CAA Section 105 Grant Work Plan
  - Outreach Material development
  - Conducted Indoor Air Quality Measurements
  - Developed Partnerships with Universities to Support IAQ Studies on Navajo Nation
    - Northern Arizona University ITEP/TAMS Center Equipment Loan Program
    - University of Montana - Residential Wood Smoke Intervention Study (on-going)
    - University of Tulsa – Home to School Study to Reduce Asthma Triggers (on-going)
    - University of Colorado & Dine College – Impact of Heating Stove Replacement on Indoor and Outdoor Air Pollution in Shiprock, NM, Navajo Nation (proposed start date Jan. 2018)
- Mitigation project – Wood/Coal Stove Changeout

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### Burn the Right Fuel

Using the right fuel helps you burn at that low cost with better efficiency and keeps your heating season safe. Here are some tips to help you select and maximize efficiency burn.



Burn only dry, split firewood. If you choose to burn coal, burn only clean, higher quality coal. Higher quality coal burns more efficiently and doesn't leave as much residue in your stove or fireplace. Combined with a moisture of approximately 8% burn better and better with less.


Split and stack firewood outdoors for at least 6 months before burning. Properly seasoned wood is lighter and burns faster and cleaner than unseasoned wood. Split the wood into 16 inch lengths, 4 inch wide and 8 inch high. The moisture content of your wood affects how fast it burns. For every 10 percent increase in moisture, you need 10 percent more wood to heat the same space. To test the moisture content of your wood, either use a moisture meter or simply weigh a piece of wood, let it dry in the sun for 24 hours, and weigh it again. The difference in weight is the moisture content.

Store wood with a clear space on one side, keeping it off the ground with a few boards.

to better containing burning:

- Foam, Ladders and Tied Combustibles
- Coated, Painted or Treated
- Motor Fuel and Other Combustibles








# Wood and Coal Stove Household Use

Residential EPA Air Quality Control Program & Operating Permit Program

Post Office Box 115, EPA Region 9 Office, 4000 N. 19th Ave., Suite 100  
 Phoenix, AZ 85016-1155 | Tel: 602/732-1313 | Fax: 602/732-1314  
[www.epa.gov/region9](http://www.epa.gov/region9)




### Stove Maintenance




• Certified stove owner and maintain a pro professional  
 • Clean chimney, remove build up  
 • Check and clean flue, pipes or replace if needed  
 • Check chimney cap, cracks and replace

### Dry Firewood




• Split wood  
 • Store in a well-kept site down off the ground & away from building  
 • Cover and keep dry for use for air circulation  
 • Store for 6 to 12 months depending on type of wood

### Burned Right




• Start fires with newspaper or dry kindling  
 • Only burn 1/3 of seasoned wood  
 • Moisture adds and place the metal container inside  
 • Do not burn household waste

### EPA Certified Wood Stoves




• Uses 1/3 less wood but generates same amount of heat  
 • Little to no smoke  
 • Decreases fuel cost in chimney  
 • Repair experts & local packagers are reducing product EPA's Tier 1


### Wood and Coal Use on the Navajo Nation



Stoves are not made to process that coal or wood which leads to poor indoor air quality




• BHP Billiton and Peabody Western Coal mines both provide people distribution of coal during winter months.



The gathering of this wood occurs usually in summer to early fall and in winter months. Public sales of burned by wood distributors and trading sites also help with wood getting to winter months.


### Potential Health Effects




Burning Coal  
 Respiratory irritation  
 Coughing  
 Irritation of the throat  
 Acute/Chronic bronchitis

Burning wood  
 Irritation to the throat  
 Headaches  
 Irritation of the throat  
 Acute/Chronic bronchitis


### Residential Wood use on the Navajo Nation



Stoves are not made to process that coal or wood which leads to poor indoor air quality



### Residential Coal use on the Navajo Nation



### Outreach Efforts

Collaborating with U.S. EPA Region 9 to develop outreach & material addressing wood use on the Navajo Nation  
 Developing a case to sample data regarding the use of woodstoves on the Navajo Nation.

## What is Indoor Air Quality?

Indoor air quality (IAQ) is the degree to which the air inside a home or structure, and how it affects the health of its occupants, meets acceptable levels (U.S. EPA). Poor IAQ can lead to five to nine more cases of illness per year, on average. And even people who don't show signs of illness may be affected. Children, elderly, and people with cardiovascular or respiratory diseases are at higher risk of illness from indoor air quality.

## Sources of Indoor Air Pollution

There are a wide variety of factors that can cause poor indoor air quality of a home.

Common indoor pollutants (PAPs) are carbon monoxide, radon, gas from fuel-burning appliances, dust, mold, pollen, and volatile organic compounds (VOCs), such as formaldehyde, paint, and water vapor.

Radon is a naturally occurring, odorless, colorless, and tasteless gas that enters homes from the ground and can lead to lung cancer.

Carbon monoxide is a colorless, odorless, and tasteless gas that enters homes from the ground and can lead to heart disease, if it's in high concentrations and stays for long periods of time.

Formaldehyde is a colorless, odorless, and tasteless gas that enters homes from the ground and can lead to heart disease, if it's in high concentrations and stays for long periods of time.

Water vapor is a colorless, odorless, and tasteless gas that enters homes from the ground and can lead to heart disease, if it's in high concentrations and stays for long periods of time.

Indoor air is a mixed environment often used as the basis for air quality, indoor environmental quality, and environmental quality.

## Furn Facts

1. **IAQ matters.** The amount of air that circulates in a home is the most important factor in determining indoor air quality.

2. **Indoor air pollution is responsible for the top five leading causes of death in the United States.**

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## Air Quality Hazards – Room by Room

## Health Effects

The effects of indoor air pollution range from short-term effects, such as irritation of the eyes, nose, and throat, to long-term effects, such as chronic respiratory disease, heart disease, and cancer.

Indoor air pollution can also cause acute health effects, such as asthma, allergies, and other respiratory conditions.

Indoor air pollution can also cause chronic health effects, such as heart disease, lung disease, and cancer.

Indoor air pollution can also cause reproductive health effects, such as miscarriage, stillbirth, and low birth weight.

Indoor air pollution can also cause neurological health effects, such as headaches, dizziness, and fatigue.

Indoor air pollution can also cause psychological health effects, such as stress, anxiety, and depression.

Indoor air pollution can also cause physical health effects, such as coughing, sneezing, and watery eyes.

Indoor air pollution can also cause skin health effects, such as dry skin, eczema, and psoriasis.

## Reducing Exposure to Air Pollutants

Use an EPA certified air filter in your HVAC system. Use an EPA certified air filter in your HVAC system.

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## 8 EASY STEPS TO IMPROVE YOUR INDOOR AIR QUALITY

<p><b>1. Seal Leaks</b></p> <p>Seal leaks in your home to prevent outdoor air from entering.</p>	<p><b>2. Ventilate</b></p> <p>Use exhaust fans to vent moisture and odors from your home.</p>
<p><b>3. Reduce Moisture</b></p> <p>Reduce moisture in your home to prevent mold and mildew.</p>	<p><b>4. Test for Radon</b></p> <p>Test for radon in your home to prevent lung cancer.</p>
<p><b>5. Upgrade Furnace</b></p> <p>Upgrade your furnace to a high-efficiency model.</p>	<p><b>6. Test for Lead</b></p> <p>Test for lead in your home to prevent lead poisoning.</p>
<p><b>7. Insulate Windows</b></p> <p>Insulate your windows to prevent heat loss.</p>	<p><b>8. Upgrade HVAC</b></p> <p>Upgrade your HVAC system to a high-efficiency model.</p>

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## Tips for Cleaner Stoves and Healthier Homes

Fire is sacred and should be treated with respect inside Navajo homes. Follow these guidelines to minimize smoke and protect your health when using the family stove.

  - 1** Clean and repair your stove and chimney.

Repair cracks or gaps and clean your stove and chimney regularly to ensure a safe fire and to keep your family warm.


  - 2** Burn the right fuel.

Burn only dry, seasoned wood in a wood-burning stove and clean, high-quality coal in a coal stove. Never burn trash, tires, or combustible liquids like gasoline or lighter fluid.


  - 3** Ensure proper ventilation.

Ensure that your stove pipe and chimney vent properly so smoke is directed outdoors. Keep the stove roof capped tightly when a fire is burning to avoid releasing harmful smoke into your home.


  - 4** Use smoke detectors and carbon monoxide alarms. These devices help make your home safer for you and your family. Test regularly to ensure proper functioning.






For more information on how to heat your home safely, go to [NavajoNationEPA.org/AirQuality](http://NavajoNationEPA.org/AirQuality)

# INDOOR AIR QUALITY ON THE NAVAJO NATION: INTERN VIDEO PROJECT

<https://www.youtube.com/watch?v=jfq873KVxyo&feature=youtu.be>

- Summer Interns developed two 5 minute videos focusing on wood and coal stove intervention and Navajo hybrid stove operation
- Videos are completely in Navajo with subtitles
- Interns were funded through NAU ITEP
- The videos were showcased during our end of the year intern presentation
- Final edits completed and videos are uploaded to the NNEPA AQCP website





# INDOOR AIR QUALITY ASSESSMENTS

- Measure Indoor Air Quality for Particulate Matter, Particle Counts, Relative Humidity, Temperature, Carbon Monoxide and Carbon Dioxide
- Obtained Indoor Air Quality monitors from U.S. EPA and Tribal Air Monitoring Support Center



## MITIGATION PROJECT FOUR CORNERS POWER PLANT: STOVE CHANGE OUT PROJECT

- A 2010 EPA Settlement Agreement with Four Corners Power Plant for CAA violations is providing \$ 4.7 million to replace older wood and coal stoves with cleaner burning heating appliances and to weatherize homes on the Navajo Nation.
- 750 change-outs will occur in a five year period in the Shiprock Agency.
- The agreement requires both the use of Navajo workers where possible and the use of workers who are certified (or equivalent) for a safe installation of stoves (Wood Stove Training for Contractors).
- EPA and other participants worked with a stove manufacture to design dual fuel stoves that is **EPA Certified** and is able to burn wood and coal.
  - The manufacture visited the Navajo Nation to learn more about burning habits
  - Participated on calls with occupants who burn coal
  - The stove meets NSPS for new Residential Wood Testers, New residential Hydronic Heaters and Forced Air Furnaces 40 CFR Part 60 Subpart AAA (2015 PSNS)

# NAVAJO HYBRID WOOD/COAL STOVE EPA CERTIFICATION

- On December 11, 2017, the Navajo Hybrid Wood/Coal Stove was EPA certified pursuant to the 2015 New Source Performance Standards for New Residential Wood Heaters (40CFR Part 60, Subpart AAA). The Navajo stove has been designed and developed for burning sub-bituminous coal, like Fruitland Coal and Black Mesa Coal and wood with moisture content ranging from 15-25%.
- Average wood emissions: 1.13 g/hr                      Heat output wood: 15,332 – 27,294 BTU/hr
- Average coal emissions: 4.93 g/hr                      Heat output coal: 7,095 – 10,189 BTU/hr
- In early January 2018 Wood Stock Soapstone Company, Inc. and Zhonnie Construction begin installation of the Navajo Wood/Coal stove.
- Video clips of the installation are available at the following link:

<https://www.facebook.com/Woodstock-Soapstone-Co-123135437743584/>



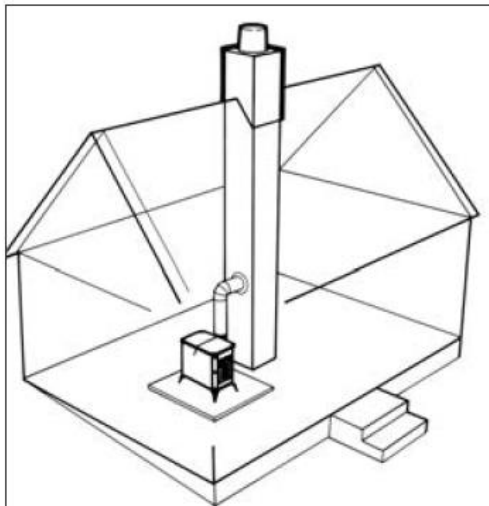


# FOUR CORNERS POWER PLANT STOVE CHANGEOUT AND WEATHERIZATION PROJECT

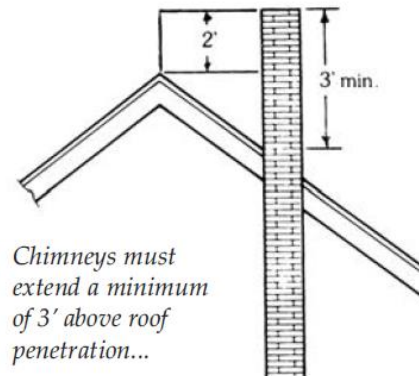
What to expect . . .



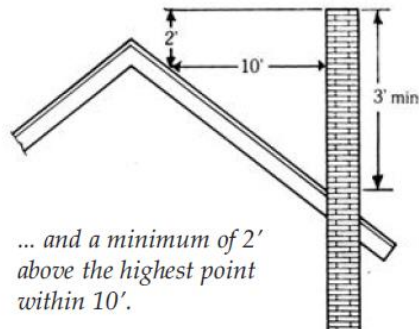
# NAVAJO HYBRID WOOD/COAL STOVE INSTALLATION



*The best location for a chimney and woodstove is in the center of the house. The chimney will be warmer, draft will be better, and radiant heat will be distributed more evenly.*

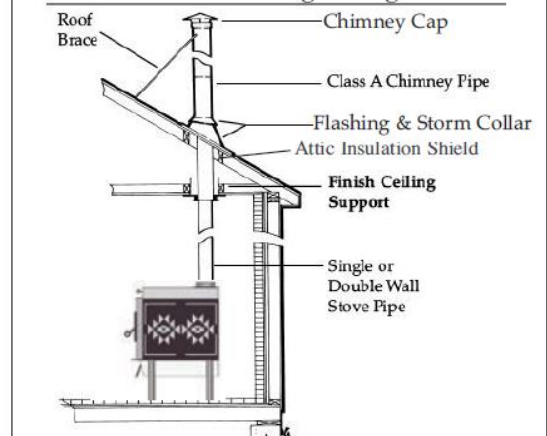


*Chimneys must extend a minimum of 3' above roof penetration...*

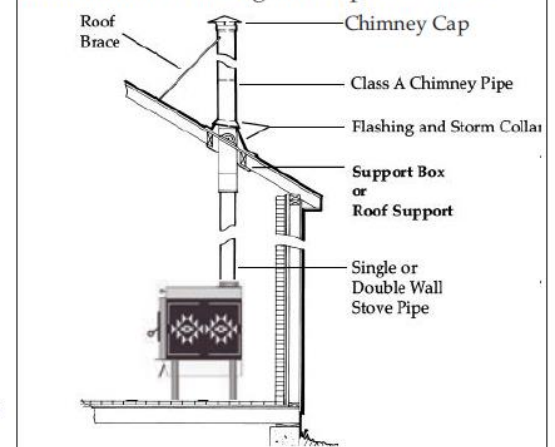


*... and a minimum of 2' above the highest point within 10'.*

**Installation 1- Flat ceiling through the roof**

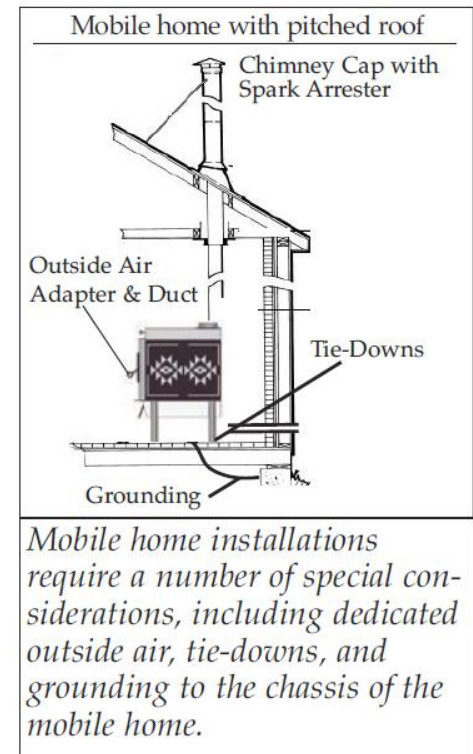
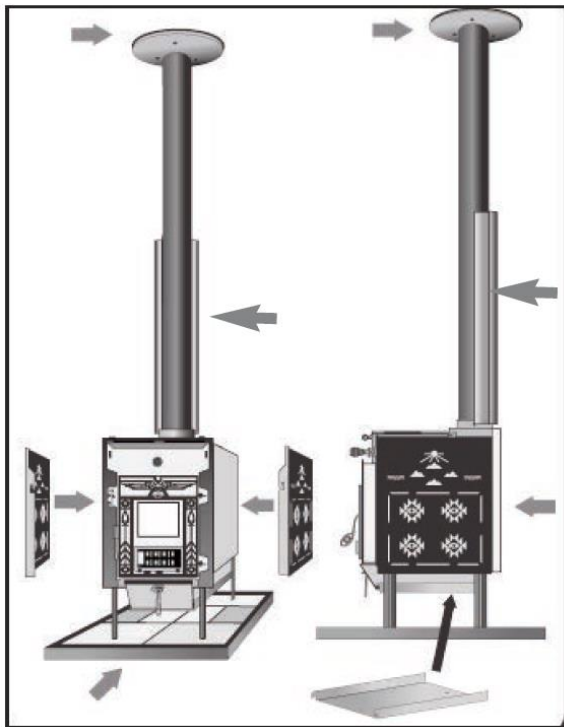


**Installation 2 -Through flat or pitched roof.**



- The chimney pipe should be 12 ft in height, with height above roof of 3 ft or greater. If too short, the hot exhaust can cool and slow down. This can lead to poor stove performance, smoke spillage, or back puffing.

# NAVAJO HYBRID WOOD/COAL STOVE INSTALLATION



- The stove is shipped assembled except for the heat shields. Heat shields are decorative but prevent heat from being radiated to nearby walls.
- Stove installations were also completed in mobile homes and hogans as well.

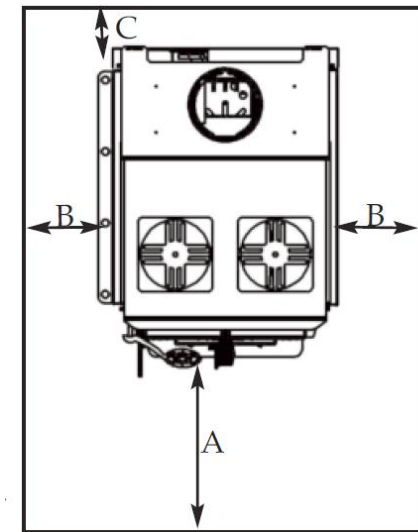
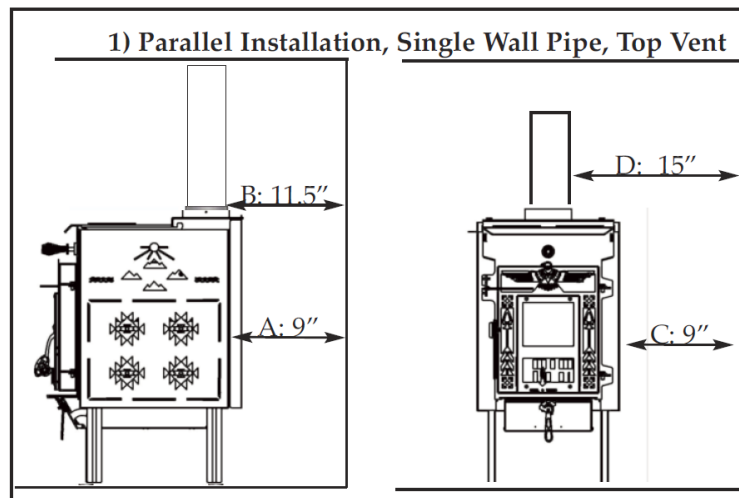
# NAVAJO HYBRID WOOD/COAL STOVE INSTALLATION

## CLEARANCE INSTALLATION DIAGRAMS

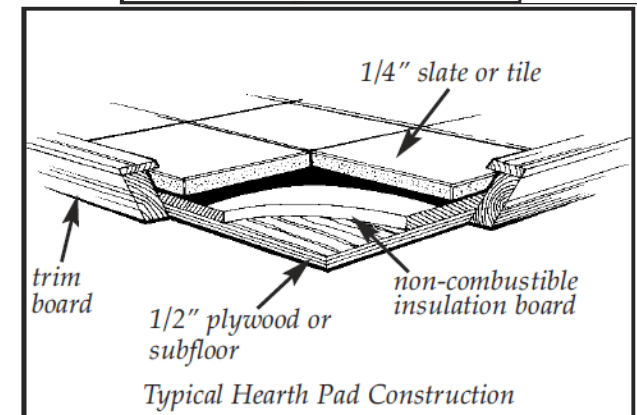
The Navajo Hybrid Combination stove is a top vent stove designed to be installed along a side or back wall, or at a 45 degree angle to a corner wall. Straight up venting will provide the best draft and easiest operation.

### PARALLEL INSTALLATION WITH STOVE SHIELDS, PIPE/CEILING SHIELDS

- A. Back of stove to wall = 9"
- B. Back of pipe shield to wall = 9"
- C. Side of stove to wall = 9"
- D. Side of pipe to wall = 15"



- No building codes on the Navajo Nation. Therefore, clearances and installation procedures are in compliance with recommendations of the National Fire Protection Association (NFPA), Underwriters Laboratories (UL) and the U.S. EPA.





# NAVAJO HYBRID WOOD/COAL STOVE OPERATION

Fuel Choice Lever



Wood Position



Coal Position

*When burning wood and coal at the same time, leave Fuel Selection Rod in "COAL" position.*

Bypass Damper



Bypass Closed



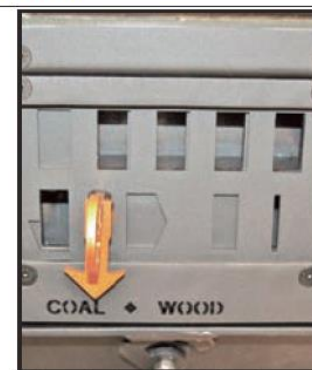
Bypass Opening

*The Bypass Handle must be opened to kindle a fire or reload the stove. Close this handle when the stove is in operation. The stove will produce more heat and less smoke with the handle closed.*

Air Control



Push RIGHT To Burn  
WOOD



Push LEFT To Burn  
COAL

- Fuel Choice Lever: - This control engages a catalytic combustor when burning wood, and disengages it when burning coal.
- Bypass Damper – Prevents smoke from coming out the loading door when kindling a fire or loading fuel. When bypass is open, smoke goes directly up the chimney. When the bypass is closed, the stove produces more heat and less smoke.
- Air Control – Controls the rate the fuel is burned and the amount of heat the stove produces. Move air damper to right of the diamond mark to burn wood. Move it all the way to the right to kindle a fire or maximum heat.



# NAVAJO HYBRID WOOD/COAL STOVE OPERATION

## Catalytic Combustor Operation:

- Engage catalytic combustor once the pipe thermometer reaches 250°F (500°F internally). The end of the thermometer probe is 1 inch away from the catalyst and will tell you the exhaust gas temperature as it exits the catalyst.
- The catalytic combustor is a round stainless steel honeycomb with thousands of cells. The catalyst produces high temperatures, which loosen the bonds of chemical compounds and “burns” wood smoke to produce more heat, while reducing creosote and air pollution at the same time
- Without a catalytic combustor, between 5% - 40% of the chemical energy contained in wood simply escapes up the chimney when wood is burned.



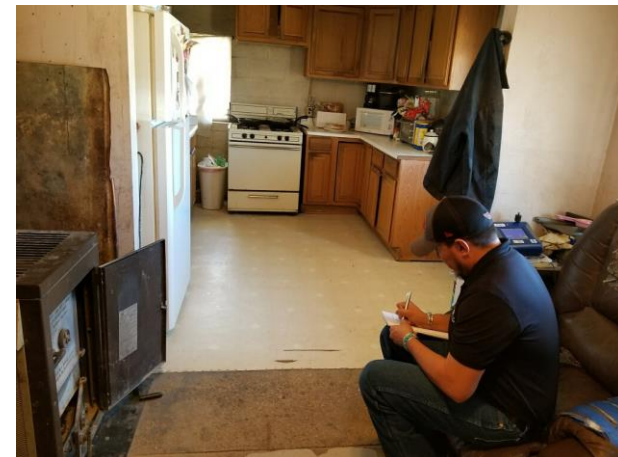
*Bypass lever should be up when starting or reloading the Navajo Steel, allowing the smoke to heat up to 500° internally.*



*The bypass lever interlocks with the door when the combustor is engaged (bypass closed). This safety feature makes it impossible to open the loading door without opening the bypass.*

# PILOT STUDY PRELIMINARY DATA TO SUPPORT RESEARCH GRANT

- Developed Study Protocol
- Received IRB Approval (Dine College, CU-Boulder, Navajo Nation)
- Received IAQ monitors from TAMS Center (DustTrak, Qtrak)
- Health Assessment Survey (Asthma Control Test, COPD Test)
- General Household Survey (Log Burning Practices, Fuels, Stove Conditions, # Occupants, Structure)
- IAQ Measurements ( $PM_{2.5}$ , CO,  $CO_2$ )



# PILOT STUDY PRELIMINARY DATA RESULTS

- 7 Homes monitored
- Observed PM and CO decrease in several of the homes after change-out
- Observed increases in PM and CO
  - PM decreases but CO increases
  - PM increases but CO decreases
- Reviewing occupant activity logs to see if there were other combustion sources or activities impacting indoor air quality



# STOVE CHANGE OUT AND FUTURE MONITORING

- From 2018 to 2022 the full stove change out will commence within 7 Chapters in Shiprock Agency
  - Shiprock, Nenahnezad, Sanostee, San Juan, Upper Fruitland, Hog Back, and Burnham
- Over the course of the next 4 years of the proposed monitoring study, the goal is to monitor within 200 homes that receive the “Navajo” stove
- The research study will document and quantify any improvements in indoor air quality, and health outcomes resulting from the stove changeout
- Seeking additional funding to continue the monitoring initiative
- Currently evaluating monitoring data and surveys from Pilot Study
- This summer we hope to develop an outreach video in the Navajo language on how to operate the “Navajo” stove

# LESSONS LEARNED

- You don't need a lot of money to carry out a project, just think outside the box
- Collaborating with other entities and educating your partners on the importance on improving indoor air quality.
- Use what you have on hand
- Utilize interns (Funded through NAU ITEP EEOP)
- Understanding culturally acceptable burning practices when implementing a heating appliance changeout project
- Overcoming a language barrier in understanding how to properly operate heating appliances and implement best burning practices
- <https://www.facebook.com/123135437743584/videos/1805771002813344/>



# NNEPA OPERATING PERMIT PROGRAM UPDATE

- Currently have 13 Title V Sources on the Navajo Nation
  - El Paso Natural Gas (Kinder Morgan) Compressor Stations
    - White Rock, Gallup Window Rock, Navajo, Dilkon, and Leupp
  - Transwestern Pipeline Leupp Compressor Station
  - Western Refining LLC – Wingate Plant (Candle Stick Flare)
  - Peabody Western Coal Mine (Submitted a Non- Title V application to USEPA and applied for a Synthetic Minor Source permit)
  - Elk Operating Services, LLC – Aneth Unit
  - Four Corners Power Plant
  - Navajo Generating Station
  - Preferred Sands of Arizona – Sanders Facility
- Elk Operating Services LLC submitted a new Title V application for the McElmo Creek Unit which will put the total number of Title V sources at 14 once the permit is issued

# REGULATORY UPDATE

- Currently working on obtaining a Second Supplemental Delegation to administer a Part 71 Permit Program within the Former Bennet Freeze Area
- Currently working on releasing the Navajo Nation Minor Source Regulations for Public Notice
  - Unitary operating and preconstruction review permitting program for minor sources, certain modifications at existing sources, minor modifications at major sources and synthetic minor sources located on the Navajo Nation

# NAVAJO NATION EPA IMPLEMENTING A TRIBAL INDOOR AIR QUALITY PROGRAM

Thank You



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