



Residential Wood Combustion: Documentation for EPA's Nonpoint Emissions Estimation Tool

Residential Wood Combustion Tool Version 3.0



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A. Introduction

Residential wood combustion (RWC) appliances, such as fireplaces, fireplace inserts, woodstoves, and hydronic heaters, are significant sources of air pollution in the United States—especially during winter months. RWC emits large amounts of fine particulate matter, volatile organic compounds (VOCs), and hazardous air pollutants that are known to contribute to poor human health, air quality, and visibility.

EPA worked with a group of State, local, and regional planning organization representatives to create the new methodology. This paper describes the new methodology and introduces a revised Microsoft Access Tool that was developed to allow S/L/T agencies to calculate annual emissions from RWC sources in the future.

To help estimate emissions from residential wood combustion, the EPA and Abt Associates have developed and improved the Residential Wood Combustion (RWC) tool. The Tool is designed to allow users to update county-level input parameters (based on local survey data) and then easily recalculate county-level emissions at the click of a button. The RWC tool is a Microsoft Access-based tool that computes the amount of wood burned and emissions of criteria pollutants and HAPs from 12 different wood burning appliance types, including fireplaces, seven types of woodstoves, wood-fired furnaces and boilers, outdoor burning devices, and wax firelogs (Table 1). The woodstoves are divided into conventional and EPA-certified units. In general, the conventional units were constructed prior to 1988. Units constructed after 1988 had to meet EPA emission standards and they are either catalytic or non-catalytic, depending on whether they contain a catalyst to improve the burn efficiency.

In recent years, sales and use of residential woodstoves have been increasing due to rising costs of home heating fuel. In addition and over the past 5-years, sales of outdoor hydronic heaters (OHH) are also strong in the Northern U.S. where they are used as the primary heating source for some homes. These OHHs have, until recently, been essentially unregulated by Federal air pollution regulations and emit, on an average per hour basis, about four times as much fine particulate matter (PM) as conventional woodstoves and about 12 times as much as EPA-certified stoves (OAGEB, 2008).

Table 1 lists the appliance categories and SCCs for RWC sources. The first column of Table 1 indicates which source categories are included in the RWC Tool.

Table 1. Appliance Types and Source Category Codes for RWC Sources

Included	SCC	Fuel	Appliance Type	Comment
<input checked="" type="checkbox"/>	2104008100	Wood	Fireplace: general	
	2104008110	Wood	Fireplace: open	Conventional fireplace with open hearth
	2104008120	Wood	Fireplace: enclosed (or otherwise modified)	Enclosed with glass doors or other modifications to a conventional fireplace such as devices to boost efficiency (heat exchangers)
	2104008130	Wood	Fireplace: qualified for EPA voluntary program	

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Included	SCC	Fuel	Appliance Type	Comment
	2104008200	Wood	Woodstove: fireplace inserts; general	Fireplace inserts are similar to freestanding woodstove but they sit inside a fireplace. Other types of inserts should use SCC = 2104008120
<input checked="" type="checkbox"/>	2104008210	Wood	Woodstove: fireplace inserts; non EPA-certified	
<input checked="" type="checkbox"/>	2104008220	Wood	Woodstove: fireplace inserts; EPA-certified; non-catalytic	
<input checked="" type="checkbox"/>	2104008230	Wood	Woodstove: fireplace inserts; EPA-certified; catalytic	
	2104008300	Wood	Woodstove: freestanding, general	
<input checked="" type="checkbox"/>	2104008310	Wood	Woodstove: freestanding, non-EPA certified	
<input checked="" type="checkbox"/>	2104008320	Wood	Woodstove: freestanding, EPA certified, non-catalytic	
<input checked="" type="checkbox"/>	2104008330	Wood	Woodstove: freestanding, EPA certified, catalytic	
	2104008340	Wood	Woodstove: freestanding, masonry heater	
<input checked="" type="checkbox"/>	2104008400	Wood	Woodstove: pellet-fired, general	Freestanding or fireplace insert
	2104008410	Wood	Woodstove: pellet-fired, non-EPA certified	Freestanding or fireplace insert
	2104008420	Wood	Woodstove: pellet-fired, EPA certified	Freestanding or fireplace insert
	2104008500	Wood	Furnace: Indoor, general	
<input checked="" type="checkbox"/>	2104008510	Wood	Furnace: Indoor, cordwood-fired, non-EPA certified	
	2104008520	Wood	Furnace: Indoor, cordwood-fired, EPA certified	
	2104008530	Wood	Furnace: Indoor, pellet-fired, general	
	2104008540	Wood	Furnace: Indoor, pellet-fired, non-EPA certified	
	2104008550	Wood	Furnace: Indoor, pellet-fired, EPA certified	
	2104008600	Wood	Hydronic heater: general, all types	
<input checked="" type="checkbox"/>	2104008610	Wood	Hydronic heater: outdoor	
	2104008620	Wood	Hydronic heater: indoor	
	2104008630	Wood	Hydronic heater: pellet-fired	
	2104008640	Wood	Hydronic heater: meets NESCAUM phase II standards	
<input checked="" type="checkbox"/>	2104008700	Wood	Outdoor wood burning device, NEC	Fire-pits and chimenaes
<input checked="" type="checkbox"/>	2104009000	Firelog	Total: All Combustor Types	
	2104010000	Biomass; All Except Wood	Total: All Combustor Types	

B. Calculation Methodology

The emissions from RWC are calculated using the equation below.

$$E_y = Homes \times ApplianceFrac \times BurnRate \times WoodDensity \times EF_y$$

where:

- E_y = annual emissions (ton/year) for a specific appliance (or SCC),
- Homes = the number of occupied homes in each county,
- ApplianceFrac = fraction of homes in each county that use the appliance,
- BurnRate = the average amount of wood burned per appliance (cords/appliance),
- WoodDensity = the density of firewood (tons/cord),
- EF_y = emission factor (tons of pollutant emitted/ton of fuel used), and
- y is a specific pollutant

For each of the terms in the equation, the term and its source are explained further below.

1. Activity Data

The activity data for RWC is the total amount of wood burned. It is estimated by multiplying the number of occupied homes in each county by the appliance fraction to estimate the number of appliances operated annually in the county. This number is multiplied by the burn rate to estimate the total amount of wood burned in each appliance in each county.

a. Occupied Housing Units

Since appliance fractions are estimated in terms of the fraction of occupied units by appliance type, it is important that county population also be based on number of occupied units. The data on occupied housing units in each county comes from the 2014 American Community Survey (U.S. Census Bureau 2016a), which reports on the number of homes by the type of house:

- Single-family detached homes,
- Single-family attached homes,
- Multi-family homes with 2-4 units,
- Multi-family homes with more than 5 units, and
- Mobile homes.

Each of these home types is divided into urban and rural homes (e.g. number of urban single-family detached homes, number of rural single-family detached homes, etc.) using the proportion of total urban and rural homes in each county from the 2010 census.

The number of occupied units by county by house type appears in the RWC tool in the table named “Homes_by_House_Type” and the total number of homes in each county appears in the table named “Master County Table.”

b. Appliance Fractions

Appliance fractions are the fraction of occupied homes in each county that uses each type of wood burning appliance. The appliance fractions are calculated using two main data sources: the Energy Information Administration Residential Energy Combustion Survey (RECS, EIA 2016) and the American Housing Survey (AHS, U.S. Census Bureau 2016b).

Each of these sources includes survey data that asks respondents whether they use a given wood burning appliance. The methodology for determining the appliance fractions from these data sources differs by the type of appliance.

Fireplaces, Woodstoves, and Furnaces

The methodology for estimating the appliance fraction from fireplaces, fireplace inserts, freestanding woodstoves, pellet stoves, and indoor furnaces uses the EIA’s RECS microdata, which consists of 27,187 individual survey responses between 1997 and 2009. RECS asks a wide variety of questions related to home energy use, including several that are important for RWC emissions estimation:

- The appliance used for the main heat source in the home,
- The fuel used for the main heat source in the home,
- Whether the home uses a woodstove for a secondary heat source,
- Whether the home uses a fireplace for a secondary heat source.
- The amount of wood burned (cords) annually by the home.

The RECS data also includes demographic data about the respondent, including their census division location, the number of heating degree days in their area, the type of house they live in, and whether their home is in an urban or rural setting.

The appliance fractions were estimated using a regression technique called logistic regression that estimates the likelihood of a binary (i.e. yes or no) outcome. In this case the outcome is whether or not the home uses the wood burning appliance. The result of the regression analysis is an equation that uses the demographic variables to predict the proportion of homes in each county that uses each appliance.

To estimate the appliance fraction for each county, the regression equation is used with the number of heating degree days in each county from NOAA (2016) and each unique combination of:

- Home type (5 types),
- Urban or rural setting,
- Appliance type (fireplaces, woodstoves, and furnaces), and
- Burn types (main heat or other heating; only main heating was used for furnaces)

The result is 50 unique appliance fractions for each county. These appliance fractions are multiplied by the number of homes in each county in each category. For example, the appliance fraction for main

heating by woodstoves in urban mobile homes is multiplied by the number of urban mobile homes in each county to determine the total number of woodstoves that were used for main heating in urban mobile homes. This process is repeated for all home types, appliance types, and burn types.

Outdoor Hydronic Heaters (OHHs)

For OHHs a different approach is used to determine the number of appliances in use. There are not enough survey responses to RECS by respondents that use OHHs to allow for the type of regression analysis used for the other appliance types. Therefore the appliance fractions for OHHs are calculated using data from the American Housing Survey. In 2011 (the only year in which this question was included in the AHS), the AHS asked whether the respondent used an OHH. Like the RECS data, the AHS includes demographic data about the respondent, including their census region and division location, and climate zone, which is defined by number of heating degree days.

The total number of estimated OHHs are divided into each unique combination of census region and climate zone. This total OHHs population is then distributed to each county within the unique census region and climate zone based on proportion of rural population. For example, there are estimated to be approximately 15,000 OHHs in the coldest climate zone of the Northeast census region, which includes 100 counties. These 15,000 OHHs are distributed to the counties with the highest proportion of rural population.

There are two exceptions to this methodology. The first is that for the West census region, the OHH population is apportioned based on unique combinations of census division (rather than census region) and climate zone. The second is that there are some states, particularly Michigan, Ohio, and Wisconsin, that prefer to distribute the OHHs based on inverse population density rather than rural population. In this way, most of the OHHs are distributed to the least dense (people/mi²) counties. The RWC tool offers the capability in the “Edit Assumptions” window to redistribute the emissions from OHHs and furnaces based on inverse population density rather than rural population. The user may wish to run the tool with and without this option selected to see if the emissions distribution in the selected state(s) are more appropriate. However, it is recommended that for most states the inverse population density method should NOT be chosen.

The appliance fractions for OHHs are estimated by dividing the number of OHHs distributed to each county by the number of occupied houses in each county in 2011. This number is then multiplied by the number of occupied houses in 2014 to estimate the county-level OHH population in 2014.

Wax Firelogs and Outdoor Wood Burning Devices

Data are unavailable to update the activity data for wax firelogs and outdoor wood burning devices (e.g. firepits or chimeneas). The activity data for these source categories is pulled forward from the 2011 NEI methodology, which is based mostly on expert judgment.

c. Burn Rates

Burn rates are the amount of wood burned annually per appliance. The burn rates for fireplaces, woodstoves, and indoor furnaces in the RWC tool are estimated using EIA RECS data.

Similar to the methodology for estimating the appliance fractions, the burn rates are estimated using regression analysis based on each unique combination of home type, urban or rural setting, appliance type, and burn type. The results of the regression analysis show that the number of heating degree days is not a significant predictor variable for most of the United States, and therefore it is not included in the analysis for all census divisions except the South Atlantic division.

The burn rates match the level of specificity of the appliance fractions. For example, there are unique burn rates and appliance fractions for each county for rural mobile homes that use fireplaces as a secondary heat source, as well as all other combinations of home type, appliance type, and burn type.

The AHS data used to estimate the appliance fractions for OHHs does not include data on the amount of wood burned. Therefore, the burn rates for OHHs are pulled forward from the 2011 methodology, which is based largely on expert judgment.

Similarly, the burn rates for wax firelogs and outdoor wood burning devices are pulled forward from the 2011 NEI methodology, which is based mostly on expert judgment.

d. Wood Density

To compute average density of wood by county, the density of oven dried wood is used because emission factors developed by EPA are based on oven dried wood mass units. Dried wood density data are obtained from the U.S. Forest Service (USDA, 2007) for various wood species. The Forest Service developed a database (called the Timber Products Output) that contains survey results of sawmill operators that includes the volume of wood by species for several different categories of use - one of the uses being fuel wood.

Using the oven dried density by species multiplied by the per-species volumes gives a per species weight which is summed to calculate the total weight for the county. This is then divided by the total volume of wood in the county to get the average density by county. If a county specific density is not available, regional averages are used instead.

The calculated density by county from the Forest Service data is then converted to tons/cords. Officially a cord is defined as a stack of wood 4 feet wide, 8 feet long, and 4 feet tall or 128 ft³. However, to account for air spaces in the stack, a value of 80 ft³ per cord is assumed instead.

For wax firelogs, density is assumed to not vary from county to county, and a density of 4.005 tons per cord is used. This is based on the volume of a typical 5 pound firelog. For wax firelogs, a cord is assumed to be 128 ft³ because air spaces assumptions are not applicable.

The wood density data can be found in the RWC tool in the table called “Master County Table,” in the “WoodDensity” column.

e. Certification Profiles

Because the data from EIA’s RECS does not specify whether the respondent uses a woodstove or fireplace insert that is certified, the general data on the number of woodstoves and fireplaces must be split into specific SCCs based on assumptions. In the RWC tool, these assumptions are found in the

“Certification Profiles” table. The certification profiles are grouped by Appliance Type (woodstove or fireplace) and Census Region.

The certification profile assumptions can be adjusted in the tool, but the profile ratios when grouped by appliance type and region should sum to 1. For example, the sum of the profile ratios for woodstoves in the Midwest Census Region should equal 1. It is recommended that caution should be taken before adjusting these assumptions.

Table 2 shows the certification profiles for woodstoves, which are used to split the general data on woodstove populations into four SCCs: freestanding non-EPA certified stoves, freestanding EPA certified non-catalytic stoves, freestanding EPA certified catalytic stoves, and pellet stoves.

RECS is used to estimate these certification profiles. Although RECS does not specifically ask whether the woodstove is EPA certified, the 2009 edition does ask the age of the appliance. It is assumed that any appliance older than 20 years old is uncertified, since the appliance would have been built prior to the first NSPS for woodstoves finalized in 1988. All appliances less than 20 years old are assumed to be EPA certified. The split between EPA certified non-catalytic and catalytic stoves is based on data provided by Minnesota from their 2014/2015 residential wood survey. The certification profile for pellet stoves is based on the proportion of respondents to RECS that use a woodstove but their main fuel source is wood pellets, rather than cordwood.

Table 2. Certification Profiles for Woodstoves

SCC	Description	Appliance Type	NE	MW	S	W
2104008310	Woodstove: freestanding, non-EPA certified	Woodstove	0.286	0.286	0.286	0.286
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Woodstove	0.355	0.355	0.355	0.355
2104008330	Woodstove: freestanding, EPA certified, catalytic	Woodstove	0.237	0.237	0.237	0.237
2104008400	Woodstove: pellet-fired, general	Woodstove	0.122	0.122	0.122	0.122
		Total	1	1	1	1

Table 3 shows the certification profiles for fireplaces, which are used to split the general data on fireplace populations into four SCCs: general fireplaces, non-EPA certified fireplace inserts, EPA certified non-catalytic inserts, and EPA certified catalytic inserts. The AHS asks respondents whether their fireplace has an insert, and reports these data at the census region level. The split between certified and non-certified, and catalytic and non-catalytic inserts are based on data provided by Minnesota from their 2014/2015 residential wood survey.

Table 3. Certification Profiles for Fireplaces

SCC	Description	ApplianceType	NE	MW	S	W
2104008100	Fireplace: general	Fireplace	0.487	0.438	0.575	0.523
2104008210	Woodstove: fireplace inserts; non-EPA certified	Fireplace	0.278	0.305	0.23	0.258
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Fireplace	0.182	0.199	0.151	0.169
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Fireplace	0.053	0.058	0.044	0.050
		Total	1	1	1	1

f. Appliance and Burn Ban Adjustments

The RWC tool also allows users to make adjustments to specific SCCs in specific counties to account for appliance or burn bans. Users can update the table “Appliance or Burn Bans” with additional SCCs and counties where the emissions should be adjusted. The calculated throughput and emissions for that SCC and county will be multiplied by the value in the “Adjustment Factor” column. If, for example, a particular county has banned OHHs, then add the county FIPS code and the correct SCC (2104008610 for OHHs), and set the adjustment factor to 0. This will zero out the throughput and emissions for OHHs in that county.

If a county has instituted a burn ban that is expected to reduce burning by 50%, the adjustment factor could be set to 0.5. This would reduce the calculated throughput and emissions for the listed SCC by 50%.

2. Emission Factors

The emission factors used are expressed as tons of pollutant produced for every ton of wood burned. The emission factors were last reviewed for the 2011 NEI by the ERTAC committee. The emission factors are shown in the Appendix.

The references for the emission factors are listed in the references section. Many of the emission factors used to determine national emission estimates for RWC are from EPA’s AP-42 document (Tables 1.9-1, 1.10-3, and 1.10-4). Some of the stove and insert factors were adjusted based on new data developed in the reference *Review of Wood Heater and Fireplace Emission Factors* (Houck et al. 2001). The emission factors generated by Houck, et. al. for 7-PAH and 16-PAH are lower than the associated AP-42 emission factors. Therefore, the AP-42 PAH emission factors were adjusted downward by 62% for conventional woodstoves, 51% for catalytic woodstoves, and 40% for non-catalytic woodstoves.

The only update to the emission factors made for version 3.0 of the tool has been an update of the volatile organic compounds (VOC) emission factor for pellet stoves. Based on a review of the literature, the previous VOC emission factor used in the RWC tool, 0.041 lb./ton of wood, was deemed to be too low, given that it is much lower than emission factors for individual hazardous air pollutant (HAP) VOC compounds as reported in the literature. The pellet stove VOC emission factor was updated based on the ratio of the sum of the HAP-VOC emission factors to the VOC emission factor for EPA certified non-catalytic woodstoves. This ratio is multiplied by the sum of the HAP-VOC emission factors for pellet stoves to estimate the VOC emission factor for pellet stoves, of 2.2 lb./ton of wood.

C. Description and Use of the RWC Tool

The RWC Tool was developed in Microsoft Access to allow S/L/T agencies to adjust assumptions and calculate annual emissions from RWC sources. The Tool is designed to allow users to update county-level input parameters (based on local survey data) and then calculate county-level emissions by clicking on the button in the Control Module form called “Create Emissions Inventory.”

The results of the calculated emissions inventory are also exported to a separate database called “RWC Tool Output – EIS Format.” **This output database must be saved in the same folder as the RWC tool for the tool to run correctly.** The output database is in staging table format which can be used with the EPA Bridge Tool to generate XML files to be uploaded to the Central Data Exchange.

Figure 1 provides the flow of the RWC Tool calculations. The green boxes in Figure 1 show calculated values whereas the gray boxes show data inputs or assumptions.

As shown in Table 4, the RWC Tool consists of several tables of parameters used to calculate emissions associated with burning. Each is described below.

Figure 1. RWC Tool Data Flow Diagram

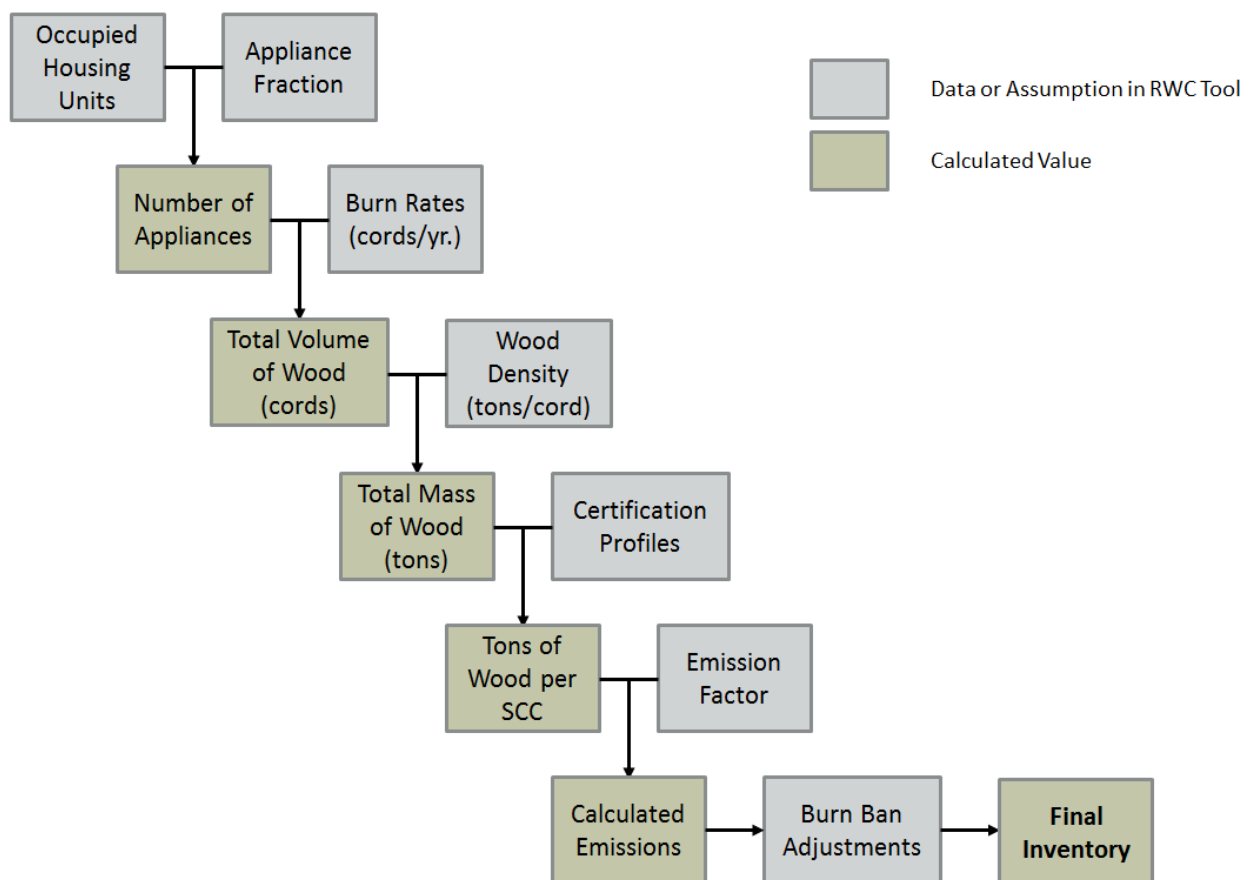


Table 4. Listing and Descriptions of the Tables Included in the RWC Tool

Data Element	Location in RWC Tool	Data Element Description
Occupied Housing Units	Homes_by_House_Type; Master County Table	Number of occupied housing units in 2014. “Homes_by_House_Type” provides data for each house type. “Master County Table” provides the total number of homes.
Appliance Fraction	ApplFracBurnRate (for woodstoves, fireplaces, and furnaces) ApplFracBurnRate_other (for OHHs, wax firelogs, and outdoor devices)	Fraction of homes in each county that use each type of wood burning appliance. The appliance fractions in the “ApplFracBurnRate” table (used for woodstoves, fireplaces, and furnaces) are split into separate fractions by house type. The appliance fractions in the “ApplFracBurnRate_other” table (used for OHHs, wax firelogs, and outdoor devices) apply to all houses in the county.
Burn Rates	ApplFracBurnRate (for woodstoves, fireplaces, and furnaces) ApplFracBurnRate_other (for OHHs, wax firelogs, and outdoor devices)	Burn rates, which are the number of cords burned per year per appliance. The burn rates in the “ApplFracBurnRate” table (used for woodstoves, fireplaces, and furnaces) are split into separate rates by house type. The burn rates in the “ApplFracBurnRate_other” table (used for OHHs, wax firelogs, and outdoor devices) apply to all houses in the county.
Wood Density	Master County Table	Density (tons/cord) of firewood in each county.
Certification Profiles	Certification Profiles	Assumptions used to split general data on the total number of fireplaces or woodstoves into specific SCCs.
Emission Factor	Emission Factor by SCC	Emission factor with units by pollutant and SCC.
Burn Ban Adjustments	Appliance or Burn Bans	Assumptions that can be used to adjust throughput and calculated emissions for specific SCCs in specific counties. Can be used to account for banned appliances, such as OHHs or furnaces.

D. References

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7. U.S. EPA. 1997. Mercury Study Report to Congress. Volume II: An Inventory of Anthropogenic Mercury Emissions in the United States. Available at: <https://www3.epa.gov/ttn/atw/112nmerc/volume2.pdf>
8. U.S. EPA. 2003. Documentation of Emissions Estimation methods for Year 2000 and 2001 Mobile Source and NonPoint Source Dioxin Inventories. Prepared by E.H. Pechan & Associates.

E. Appendix: Emission Factors

Table 5. Emission factors for Residential Wood Combustion appliances.

SCC	Description	Pollutant	Emission Factor (lb/ton)	Ref.
2104008100	Fireplace: general	1,2,3,4,6,7,8-Heptachlorodibenzofuran	3E-10	8
2104008100	Fireplace: general	1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin	3.159E-10	8
2104008100	Fireplace: general	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.34E-10	8
2104008100	Fireplace: general	1,2,3,4,7,8-Hexachlorodibenzofuran	3.559E-10	8
2104008100	Fireplace: general	1,2,3,4,7,8-Hexachlorodibenzo-p-Dioxin	2.5E-10	8
2104008100	Fireplace: general	1,2,3,6,7,8-Hexachlorodibenzofuran	2.2E-10	8
2104008100	Fireplace: general	1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin	2.5E-10	8
2104008100	Fireplace: general	1,2,3,7,8,9-Hexachlorodibenzofuran	1.984E-10	8
2104008100	Fireplace: general	1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin	2.5E-10	8
2104008100	Fireplace: general	1,2,3,7,8-Pentachlorodibenzofuran	4.559E-10	8
2104008100	Fireplace: general	1,2,3,7,8-Pentachlorodibenzo-p-Dioxin	2.58E-10	8
2104008100	Fireplace: general	1,3-Butadiene	0.157	4
2104008100	Fireplace: general	2,3,4,6,7,8-Hexachlorodibenzofuran	1.65E-10	8
2104008100	Fireplace: general	2,3,4,7,8-Pentachlorodibenzofuran	6.439E-10	8
2104008100	Fireplace: general	2,3,7,8-Tetrachlorodibenzofuran	1.25E-09	8
2104008100	Fireplace: general	2,3,7,8-Tetrachlorodibenzo-p-Dioxin	2.28E-10	8
2104008100	Fireplace: general	Acetaldehyde	1.07	4
2104008100	Fireplace: general	Acrolein	0.123	4
2104008100	Fireplace: general	Ammonia	1.8	4
2104008100	Fireplace: general	Benzene	0.686	4
2104008100	Fireplace: general	Benzo[a]Pyrene	0.001	4
2104008100	Fireplace: general	Carbon Monoxide	149	4
2104008100	Fireplace: general	Cresols (Includes o, m, & p)/Cresylic Acids	0.357	4
2104008100	Fireplace: general	Dioxins/Furans as 2,3,7,8-TCDD TEQs - WHO2005	7.87E-10	4
2104008100	Fireplace: general	Formaldehyde	1.79	4
2104008100	Fireplace: general	Mercury	0.0000052	7
2104008100	Fireplace: general	Methane	14.4	4
2104008100	Fireplace: general	Naphthalene	0.265	4

RESIDENTIAL WOOD COMBUSTION TOOL

SCC	Description	Pollutant	Emission Factor (lb/ton)	Ref.
2104008100	Fireplace: general	Nitrogen Oxides	2.6	6
2104008100	Fireplace: general	Octachlorodibenzofuran	1.666E-10	8
2104008100	Fireplace: general	Octachlorodibenzo-p-Dioxin	6.659E-10	8
2104008100	Fireplace: general	Phenol	0.472	4
2104008100	Fireplace: general	Primary PM10	23.6	3
2104008100	Fireplace: general	Primary PM2.5	23.6	3
2104008100	Fireplace: general	Sulfur Dioxide	0.4	6
2104008100	Fireplace: general	Volatile Organic Compounds	18.9	4
2104008210	Woodstove: fireplace inserts; non-EPA certified	1,2,3,4,6,7,8-Heptachlorodibenzofuran	3E-10	8
2104008210	Woodstove: fireplace inserts; non-EPA certified	1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin	3.159E-10	8
2104008210	Woodstove: fireplace inserts; non-EPA certified	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.34E-10	8
2104008210	Woodstove: fireplace inserts; non-EPA certified	1,2,3,4,7,8-Hexachlorodibenzofuran	3.559E-10	8
2104008210	Woodstove: fireplace inserts; non-EPA certified	1,2,3,4,7,8-Hexachlorodibenzo-p-Dioxin	2.5E-10	8
2104008210	Woodstove: fireplace inserts; non-EPA certified	1,2,3,6,7,8-Hexachlorodibenzofuran	2.2E-10	8
2104008210	Woodstove: fireplace inserts; non-EPA certified	1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin	2.5E-10	8
2104008210	Woodstove: fireplace inserts; non-EPA certified	1,2,3,7,8,9-Hexachlorodibenzofuran	1.984E-10	8
2104008210	Woodstove: fireplace inserts; non-EPA certified	1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin	2.5E-10	8
2104008210	Woodstove: fireplace inserts; non-EPA certified	1,2,3,7,8-Pentachlorodibenzofuran	4.559E-10	8
2104008210	Woodstove: fireplace inserts; non-EPA certified	1,2,3,7,8-Pentachlorodibenzo-p-Dioxin	2.58E-10	8
2104008210	Woodstove: fireplace inserts; non-EPA certified	1,3-Butadiene	0.39	4
2104008210	Woodstove: fireplace inserts; non-EPA certified	2,3,4,6,7,8-Hexachlorodibenzofuran	1.65E-10	8
2104008210	Woodstove: fireplace inserts; non-EPA certified	2,3,4,7,8-Pentachlorodibenzofuran	6.439E-10	8
2104008210	Woodstove: fireplace inserts; non-EPA certified	2,3,7,8-Tetrachlorodibenzofuran	1.25E-09	8
2104008210	Woodstove: fireplace inserts; non-EPA certified	2,3,7,8-Tetrachlorodibenzo-p-Dioxin	2.28E-10	8
2104008210	Woodstove: fireplace inserts; non-EPA certified	Acenaphthene	0.00621	6
2104008210	Woodstove: fireplace inserts; non-EPA certified	Acenaphthylene	0.132	6
2104008210	Woodstove: fireplace inserts; non-EPA certified	Acetaldehyde	0.616	4
2104008210	Woodstove: fireplace inserts; non-EPA certified	Acrolein	0.091	4
2104008210	Woodstove: fireplace inserts; non-EPA certified	Ammonia	1.7	4
2104008210	Woodstove: fireplace inserts; non-EPA certified	Anthracene	0.00869	6
2104008210	Woodstove: fireplace inserts; non-EPA certified	Benzene	1.938	6
2104008210	Woodstove: fireplace inserts; non-EPA certified	Benzo[a]anthracene	0.000577	2
2104008210	Woodstove: fireplace inserts; non-EPA certified	Benzo[a]fluoranthene	0.000321	2

RESIDENTIAL WOOD COMBUSTION TOOL

SCC	Description	Pollutant	Emission Factor (lb/ton)	Ref.
2104008210	Woodstove: fireplace inserts; non-EPA certified	Benzo[a]Pyrene	0.0009794	2
2104008210	Woodstove: fireplace inserts; non-EPA certified	Benzo[b]fluoranthene	0.0005916	2
2104008210	Woodstove: fireplace inserts; non-EPA certified	Benzo[e]Pyrene	0.0005893	2
2104008210	Woodstove: fireplace inserts; non-EPA certified	Benzo[g,h,i,l]Perylene	0.0002012	2
2104008210	Woodstove: fireplace inserts; non-EPA certified	Benzo[k]Fluoranthene	0.0005093	2
2104008210	Woodstove: fireplace inserts; non-EPA certified	Cadmium	0.000022	6
2104008210	Woodstove: fireplace inserts; non-EPA certified	Carbon Monoxide	230.8	6
2104008210	Woodstove: fireplace inserts; non-EPA certified	Chrysene	0.0004716	2
2104008210	Woodstove: fireplace inserts; non-EPA certified	Cresols (Includes o, m, & p)/Cresylic Acids	0.16	4
2104008210	Woodstove: fireplace inserts; non-EPA certified	Dibenzo[ah]anthracene	3.916E-05	2
2104008210	Woodstove: fireplace inserts; non-EPA certified	Dioxins/Furans as 2,3,7,8-TCDD TEQs - WHO2005	4.6E-09	4
2104008210	Woodstove: fireplace inserts; non-EPA certified	Fluoranthene	0.0002486	2
2104008210	Woodstove: fireplace inserts; non-EPA certified	Fluorene	0.0149	6
2104008210	Woodstove: fireplace inserts; non-EPA certified	Formaldehyde	1.45	4
2104008210	Woodstove: fireplace inserts; non-EPA certified	Indeno[1,2,3-cd]pyrene	0.0004084	2
2104008210	Woodstove: fireplace inserts; non-EPA certified	Manganese	0.00017	6
2104008210	Woodstove: fireplace inserts; non-EPA certified	Mercury	0.0000052	7
2104008210	Woodstove: fireplace inserts; non-EPA certified	Methane	64	4
2104008210	Woodstove: fireplace inserts; non-EPA certified	Methylchrysene	0.0000584	2
2104008210	Woodstove: fireplace inserts; non-EPA certified	Naphthalene	0.179	6
2104008210	Woodstove: fireplace inserts; non-EPA certified	Nickel	0.000014	6
2104008210	Woodstove: fireplace inserts; non-EPA certified	Nitrogen Oxides	2.8	6
2104008210	Woodstove: fireplace inserts; non-EPA certified	Octachlorodibenzofuran	1.666E-10	8
2104008210	Woodstove: fireplace inserts; non-EPA certified	Octachlorodibenzo-p-Dioxin	6.659E-10	8
2104008210	Woodstove: fireplace inserts; non-EPA certified	o-Xylene	0.202	6
2104008210	Woodstove: fireplace inserts; non-EPA certified	Perylene	0.0001552	2
2104008210	Woodstove: fireplace inserts; non-EPA certified	Phenanthrene	0.0484	6
2104008210	Woodstove: fireplace inserts; non-EPA certified	Phenol	0.295	4
2104008210	Woodstove: fireplace inserts; non-EPA certified	Primary PM10	30.6	6
2104008210	Woodstove: fireplace inserts; non-EPA certified	Primary PM2.5	30.6	6
2104008210	Woodstove: fireplace inserts; non-EPA certified	Pyrene	0.0002175	2
2104008210	Woodstove: fireplace inserts; non-EPA certified	Sulfur Dioxide	0.4	6
2104008210	Woodstove: fireplace inserts; non-EPA certified	Toluene	0.73	6
2104008210	Woodstove: fireplace inserts; non-EPA certified	Volatile Organic Compounds	53	6
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	1,2,3,4,6,7,8-Heptachlorodibenzofuran	3E-10	8
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin	3.159E-10	8
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.34E-10	8

RESIDENTIAL WOOD COMBUSTION TOOL

SCC	Description	Pollutant	Emission Factor (lb/ton)	Ref.
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	1,2,3,4,7,8-Hexachlorodibenzofuran	3.559E-10	8
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	1,2,3,4,7,8-Hexachlorodibenzo-p-Dioxin	2.5E-10	8
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	1,2,3,6,7,8-Hexachlorodibenzofuran	2.2E-10	8
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin	2.5E-10	8
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	1,2,3,7,8,9-Hexachlorodibenzofuran	1.984E-10	8
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin	2.5E-10	8
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	1,2,3,7,8-Pentachlorodibenzofuran	4.559E-10	8
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	1,2,3,7,8-Pentachlorodibenzo-p-Dioxin	2.58E-10	8
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	1,3-Butadiene	0.175	4
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	2,3,4,6,7,8-Hexachlorodibenzofuran	1.65E-10	8
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	2,3,4,7,8-Pentachlorodibenzofuran	6.439E-10	8
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	2,3,7,8-Tetrachlorodibenzofuran	1.25E-09	8
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	2,3,7,8-Tetrachlorodibenzo-p-Dioxin	2.28E-10	8
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Acenaphthene	0.00404	6
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Acenaphthylene	0.0129	6
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Acetaldehyde	0.632	4
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Acrolein	0.0404	4
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Ammonia	0.9	4
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Anthracene	0.00364	6
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Benzene	0.959	4
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Benzo[a]anthracene	0.000577	2
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Benzo[a]fluoranthene	0.000321	2
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Benzo[a]Pyrene	0.0009794	2
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Benzo[b]Fluoranthene	0.0005916	2
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Benzo[e]Pyrene	0.0005893	2
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Benzo[g,h,i]Perylene	0.0002012	2
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Benzo[k]Fluoranthene	0.0005093	2
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Cadmium	0.00002	6
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Carbon Monoxide	140.8	6
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Chrysene	0.0004716	2
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Cresols (Includes o, m, & p)/Cresylic Acids	0.462	4
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Dibenzo[ah]anthracene	3.916E-05	2
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Dioxins/Furans as 2,3,7,8-TCDD TEQs - WHO2005	7.94E-10	4

RESIDENTIAL WOOD COMBUSTION TOOL

SCC	Description	Pollutant	Emission Factor (lb/ton)	Ref.
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Fluoranthene	0.0002486	2
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Fluorene	0.00566	6
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Formaldehyde	2.22	4
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Indeno[1; 2; 3 . cd]pyrene	0.0004084	2
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Manganese	0.00014	6
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Mercury	0.0000052	7
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Methane	28.4	4
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Methylchrysene	0.0000584	2
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Naphthalene	0.0582	6
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Nickel	0.00002	6
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Nitrogen Oxides	2.28	4
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Octachlorodibenzofuran	1.666E-10	8
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Octachlorodibenzo-p-Dioxin	6.659E-10	8
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Perylene	0.0001552	2
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Phenanthrene	0.0477	6
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Phenol	0.487	4
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Primary PM10	19.6	6
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Primary PM2.5	19.6	6
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Pyrene	0.0002175	2
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Sulfur Dioxide	0.4	6
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Volatile Organic Compounds	12	6
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	1,2,3,4,6,7,8-Heptachlorodibenzofuran	3E-10	8
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin	3.159E-10	8
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.34E-10	8
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	1,2,3,4,7,8-Hexachlorodibenzofuran	3.559E-10	8
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	1,2,3,4,7,8-Hexachlorodibenzo-p-Dioxin	2.5E-10	8
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	1,2,3,6,7,8-Hexachlorodibenzofuran	2.2E-10	8
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin	2.5E-10	8
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	1,2,3,7,8,9-Hexachlorodibenzofuran	1.984E-10	8
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin	2.5E-10	8
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	1,2,3,7,8-Pentachlorodibenzofuran	4.559E-10	8
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	1,2,3,7,8-Pentachlorodibenzo-p-Dioxin	2.58E-10	8
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	1,3-Butadiene	0.195	4
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	2,3,4,6,7,8-Hexachlorodibenzofuran	1.65E-10	8

RESIDENTIAL WOOD COMBUSTION TOOL

SCC	Description	Pollutant	Emission Factor (lb/ton)	Ref.
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	2,3,4,7,8-Pentachlorodibenzofuran	6.439E-10	8
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	2,3,7,8-Tetrachlorodibenzofuran	1.25E-09	8
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	2,3,7,8-Tetrachlorodibenzo-p-Dioxin	2.28E-10	8
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Acenaphthene	0.00308	6
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Acenaphthylene	0.0349	6
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Acetaldehyde	0.531	4
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Acrolein	0.0314	4
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Ammonia	0.9	4
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Anthracene	0.0041	6
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Benzene	1.464	6
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Benzo[a]anthracene	0.000577	2
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Benzo[a]fluoranthene	0.000321	2
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Benzo[a]Pyrene	0.0009794	2
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Benzo[b]Fluoranthene	0.0005916	2
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Benzo[e]Pyrene	0.0005893	2
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Benzo[g,h,i]Perylene	0.0002012	2
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Benzo[k]Fluoranthene	0.0005093	2
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Carbon Monoxide	104.4	6
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Chrysene	0.0004716	2
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Cresols (Includes o, m, & p)/Cresylic Acids	0.531	4
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Dibenzo[ah]anthracene	3.916E-05	2
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Dioxins/Furans as 2,3,7,8-TCDD TEQs - WHO2005	2.28E-09	4
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Fluoranthene	0.0002486	2
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Fluorene	0.00718	6
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Formaldehyde	0.982	4
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Indeno[1; 2; 3 - cd]pyrene	0.0004084	2
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Mercury	0.0000052	7
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Methane	26	4
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Methylchrysene	0.0000584	2
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Naphthalene	0.0954	6
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Nitrogen Oxides	2	6
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Octachlorodibenzofuran	1.666E-10	8
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Octachlorodibenzo-p-Dioxin	6.659E-10	8
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	o-Xylene	0.186	6
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Perylene	0.0001552	2
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Phenanthrene	0.0246	6
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Phenol	0.408	4

RESIDENTIAL WOOD COMBUSTION TOOL

SCC	Description	Pollutant	Emission Factor (lb/ton)	Ref.
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Primary PM10	20.4	6
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Primary PM2.5	20.4	6
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Pyrene	0.0002175	2
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Sulfur Dioxide	0.4	6
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Toluene	0.52	6
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Volatile Organic Compounds	15	6
2104008310	Woodstove: freestanding, non-EPA certified	1,2,3,4,6,7,8-Heptachlorodibenzofuran	3E-10	8
2104008310	Woodstove: freestanding, non-EPA certified	1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin	3.159E-10	8
2104008310	Woodstove: freestanding, non-EPA certified	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.34E-10	8
2104008310	Woodstove: freestanding, non-EPA certified	1,2,3,4,7,8-Hexachlorodibenzofuran	3.559E-10	8
2104008310	Woodstove: freestanding, non-EPA certified	1,2,3,4,7,8-Hexachlorodibenzo-p-Dioxin	2.5E-10	8
2104008310	Woodstove: freestanding, non-EPA certified	1,2,3,6,7,8-Hexachlorodibenzofuran	2.2E-10	8
2104008310	Woodstove: freestanding, non-EPA certified	1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin	2.5E-10	8
2104008310	Woodstove: freestanding, non-EPA certified	1,2,3,7,8,9-Hexachlorodibenzofuran	1.984E-10	8
2104008310	Woodstove: freestanding, non-EPA certified	1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin	2.5E-10	8
2104008310	Woodstove: freestanding, non-EPA certified	1,2,3,7,8-Pentachlorodibenzofuran	4.559E-10	8
2104008310	Woodstove: freestanding, non-EPA certified	1,2,3,7,8-Pentachlorodibenzo-p-Dioxin	2.58E-10	8
2104008310	Woodstove: freestanding, non-EPA certified	1,3-Butadiene	0.39	4
2104008310	Woodstove: freestanding, non-EPA certified	2,3,4,6,7,8-Hexachlorodibenzofuran	1.65E-10	8
2104008310	Woodstove: freestanding, non-EPA certified	2,3,4,7,8-Pentachlorodibenzofuran	6.439E-10	8
2104008310	Woodstove: freestanding, non-EPA certified	2,3,7,8-Tetrachlorodibenzofuran	1.25E-09	8
2104008310	Woodstove: freestanding, non-EPA certified	2,3,7,8-Tetrachlorodibenzo-p-Dioxin	2.28E-10	8
2104008310	Woodstove: freestanding, non-EPA certified	Acenaphthene	0.00621	6
2104008310	Woodstove: freestanding, non-EPA certified	Acenaphthylene	0.132	6
2104008310	Woodstove: freestanding, non-EPA certified	Acetaldehyde	0.616	4
2104008310	Woodstove: freestanding, non-EPA certified	Acrolein	0.091	4
2104008310	Woodstove: freestanding, non-EPA certified	Ammonia	1.7	4
2104008310	Woodstove: freestanding, non-EPA certified	Anthracene	0.00869	6
2104008310	Woodstove: freestanding, non-EPA certified	Benzene	1.938	6
2104008310	Woodstove: freestanding, non-EPA certified	Benzo[a]anthracene	0.000577	2
2104008310	Woodstove: freestanding, non-EPA certified	Benzo[a]fluoranthene	0.000321	2
2104008310	Woodstove: freestanding, non-EPA certified	Benzo[a]Pyrene	0.0009794	2
2104008310	Woodstove: freestanding, non-EPA certified	Benzo[b]fluoranthene	0.0005916	2

RESIDENTIAL WOOD COMBUSTION TOOL

SCC	Description	Pollutant	Emission Factor (lb/ton)	Ref.
2104008310	Woodstove: freestanding, non-EPA certified	Benzo[e]Pyrene	0.0005893	2
2104008310	Woodstove: freestanding, non-EPA certified	Benzo[g,h,i,l]Perylene	0.0002012	2
2104008310	Woodstove: freestanding, non-EPA certified	Benzo[k]Fluoranthene	0.0005093	2
2104008310	Woodstove: freestanding, non-EPA certified	Cadmium	0.000022	6
2104008310	Woodstove: freestanding, non-EPA certified	Carbon Monoxide	230.8	6
2104008310	Woodstove: freestanding, non-EPA certified	Chrysene	0.0004716	2
2104008310	Woodstove: freestanding, non-EPA certified	Cresols (Includes o, m, & p)/Cresylic Acids	0.16	4
2104008310	Woodstove: freestanding, non-EPA certified	Dibenzo[ah]anthracene	3.916E-05	2
2104008310	Woodstove: freestanding, non-EPA certified	Dioxins/Furans as 2,3,7,8-TCDD TEQs - WHO2005	4.6E-09	4
2104008310	Woodstove: freestanding, non-EPA certified	Fluoranthene	0.0002486	2
2104008310	Woodstove: freestanding, non-EPA certified	Fluorene	0.0149	6
2104008310	Woodstove: freestanding, non-EPA certified	Formaldehyde	1.45	4
2104008310	Woodstove: freestanding, non-EPA certified	Indeno[1,2,3-cd]pyrene	0.0004084	2
2104008310	Woodstove: freestanding, non-EPA certified	Manganese	0.00017	6
2104008310	Woodstove: freestanding, non-EPA certified	Mercury	0.0000052	7
2104008310	Woodstove: freestanding, non-EPA certified	Methane	64	4
2104008310	Woodstove: freestanding, non-EPA certified	Methylchrysene	0.0000584	2
2104008310	Woodstove: freestanding, non-EPA certified	Naphthalene	0.179	6
2104008310	Woodstove: freestanding, non-EPA certified	Nickel	0.000014	6
2104008310	Woodstove: freestanding, non-EPA certified	Nitrogen Oxides	2.8	6
2104008310	Woodstove: freestanding, non-EPA certified	Octachlorodibenzofuran	1.666E-10	8
2104008310	Woodstove: freestanding, non-EPA certified	Octachlorodibenzo-p-Dioxin	6.659E-10	8
2104008310	Woodstove: freestanding, non-EPA certified	o-Xylene	0.202	6
2104008310	Woodstove: freestanding, non-EPA certified	Perylene	0.0001552	2
2104008310	Woodstove: freestanding, non-EPA certified	Phenanthrene	0.0484	6
2104008310	Woodstove: freestanding, non-EPA certified	Phenol	0.295	4
2104008310	Woodstove: freestanding, non-EPA certified	Primary PM10	30.6	6
2104008310	Woodstove: freestanding, non-EPA certified	Primary PM2.5	30.6	6
2104008310	Woodstove: freestanding, non-EPA certified	Pyrene	0.0002175	2
2104008310	Woodstove: freestanding, non-EPA certified	Sulfur Dioxide	0.4	6
2104008310	Woodstove: freestanding, non-EPA certified	Toluene	0.73	6
2104008310	Woodstove: freestanding, non-EPA certified	Volatile Organic Compounds	53	6
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	1,2,3,4,6,7,8-Heptachlorodibenzofuran	3E-10	8
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin	3.159E-10	8
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.34E-10	8
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	1,2,3,4,7,8-Hexachlorodibenzofuran	3.559E-10	8

RESIDENTIAL WOOD COMBUSTION TOOL

SCC	Description	Pollutant	Emission Factor (lb/ton)	Ref.
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	1,2,3,4,7,8-Hexachlorodibenzo-p-Dioxin	2.5E-10	8
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	1,2,3,6,7,8-Hexachlorodibenzofuran	2.2E-10	8
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin	2.5E-10	8
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	1,2,3,7,8,9-Hexachlorodibenzofuran	1.984E-10	8
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin	2.5E-10	8
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	1,2,3,7,8-Pentachlorodibenzofuran	4.559E-10	8
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	1,2,3,7,8-Pentachlorodibenzo-p-Dioxin	2.58E-10	8
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	1,3-Butadiene	0.175	4
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	2,3,4,6,7,8-Hexachlorodibenzofuran	1.65E-10	8
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	2,3,4,7,8-Pentachlorodibenzofuran	6.439E-10	8
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	2,3,7,8-Tetrachlorodibenzofuran	1.25E-09	8
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	2,3,7,8-Tetrachlorodibenzo-p-Dioxin	2.28E-10	8
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Acenaphthene	0.00404	6
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Acenaphthylene	0.0129	6
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Acetaldehyde	0.632	4
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Acrolein	0.0404	4
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Ammonia	0.9	4
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Anthracene	0.00364	6
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Benzene	0.959	4
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Benzo[a]anthracene	0.000577	2
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Benzo[a]fluoranthene	0.000321	2
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Benzo[a]Pyrene	0.0009794	2
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Benzo[b]Fluoranthene	0.0005916	2
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Benzo[e]Pyrene	0.0005893	2
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Benzo[g,h,i,j]Perylene	0.0002012	2
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Benzo[k]Fluoranthene	0.0005093	2
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Cadmium	0.00002	6
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Carbon Monoxide	140.8	6
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Chrysene	0.0004716	2
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Cresols (Includes o, m, & p)/Cresylic Acids	0.462	4
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Dibenzo[ah]anthracene	3.916E-05	2
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Dioxins/Furans as 2,3,7,8-TCDD TEQs - WHO2005	7.94E-10	4
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Fluoranthene	0.0002486	2
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Fluorene	0.00566	6

RESIDENTIAL WOOD COMBUSTION TOOL

SCC	Description	Pollutant	Emission Factor (lb/ton)	Ref.
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Formaldehyde	2.22	4
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Indeno[1; 2; 3 . cd]pyrene	0.0004084	2
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Manganese	0.00014	6
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Mercury	0.0000052	7
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Methane	28.4	4
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Methylchrysene	0.0000584	2
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Naphthalene	0.0582	6
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Nickel	0.00002	6
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Nitrogen Oxides	2.28	4
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Octachlorodibenzofuran	1.666E-10	8
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Octachlorodibenzo-p-Dioxin	6.659E-10	8
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Perylene	0.0001552	2
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Phenanthrene	0.0477	6
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Phenol	0.487	4
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Primary PM10	19.6	6
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Primary PM2.5	19.6	6
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Pyrene	0.0002175	2
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Sulfur Dioxide	0.4	6
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Volatile Organic Compounds	12	6
2104008330	Woodstove: freestanding, EPA certified, catalytic	1,2,3,4,6,7,8-Heptachlorodibenzofuran	3E-10	8
2104008330	Woodstove: freestanding, EPA certified, catalytic	1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin	3.159E-10	8
2104008330	Woodstove: freestanding, EPA certified, catalytic	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.34E-10	8
2104008330	Woodstove: freestanding, EPA certified, catalytic	1,2,3,4,7,8-Hexachlorodibenzofuran	3.559E-10	8
2104008330	Woodstove: freestanding, EPA certified, catalytic	1,2,3,4,7,8-Hexachlorodibenzo-p-Dioxin	2.5E-10	8
2104008330	Woodstove: freestanding, EPA certified, catalytic	1,2,3,6,7,8-Hexachlorodibenzofuran	2.2E-10	8
2104008330	Woodstove: freestanding, EPA certified, catalytic	1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin	2.5E-10	8
2104008330	Woodstove: freestanding, EPA certified, catalytic	1,2,3,7,8,9-Hexachlorodibenzofuran	1.984E-10	8
2104008330	Woodstove: freestanding, EPA certified, catalytic	1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin	2.5E-10	8
2104008330	Woodstove: freestanding, EPA certified, catalytic	1,2,3,7,8-Pentachlorodibenzofuran	4.559E-10	8
2104008330	Woodstove: freestanding, EPA certified, catalytic	1,2,3,7,8-Pentachlorodibenzo-p-Dioxin	2.58E-10	8
2104008330	Woodstove: freestanding, EPA certified, catalytic	1,3-Butadiene	0.195	4
2104008330	Woodstove: freestanding, EPA certified, catalytic	2,3,4,6,7,8-Hexachlorodibenzofuran	1.65E-10	8
2104008330	Woodstove: freestanding, EPA certified, catalytic	2,3,4,7,8-Pentachlorodibenzofuran	6.439E-10	8

RESIDENTIAL WOOD COMBUSTION TOOL

SCC	Description	Pollutant	Emission Factor (lb/ton)	Ref.
2104008330	Woodstove: freestanding, EPA certified, catalytic	2,3,7,8-Tetrachlorodibenzofuran	1.25E-09	8
2104008330	Woodstove: freestanding, EPA certified, catalytic	2,3,7,8-Tetrachlorodibenzo-p-Dioxin	2.28E-10	8
2104008330	Woodstove: freestanding, EPA certified, catalytic	Acenaphthene	0.00308	6
2104008330	Woodstove: freestanding, EPA certified, catalytic	Acenaphthylene	0.0349	6
2104008330	Woodstove: freestanding, EPA certified, catalytic	Acetaldehyde	0.531	4
2104008330	Woodstove: freestanding, EPA certified, catalytic	Acrolein	0.0314	4
2104008330	Woodstove: freestanding, EPA certified, catalytic	Ammonia	0.9	4
2104008330	Woodstove: freestanding, EPA certified, catalytic	Anthracene	0.0041	6
2104008330	Woodstove: freestanding, EPA certified, catalytic	Benzene	1.464	6
2104008330	Woodstove: freestanding, EPA certified, catalytic	Benzo[a]anthracene	0.000577	2
2104008330	Woodstove: freestanding, EPA certified, catalytic	Benzo[a]fluoranthene	0.000321	2
2104008330	Woodstove: freestanding, EPA certified, catalytic	Benzo[a]Pyrene	0.0009794	2
2104008330	Woodstove: freestanding, EPA certified, catalytic	Benzo[b]Fluoranthene	0.0005916	2
2104008330	Woodstove: freestanding, EPA certified, catalytic	Benzo[e]Pyrene	0.0005893	2
2104008330	Woodstove: freestanding, EPA certified, catalytic	Benzo[g,h,i]Perylene	0.0002012	2
2104008330	Woodstove: freestanding, EPA certified, catalytic	Benzo[k]Fluoranthene	0.0005093	2
2104008330	Woodstove: freestanding, EPA certified, catalytic	Carbon Monoxide	104.4	6
2104008330	Woodstove: freestanding, EPA certified, catalytic	Chrysene	0.0004716	2
2104008330	Woodstove: freestanding, EPA certified, catalytic	Cresols (Includes o, m, & p)/Cresylic Acids	0.531	4
2104008330	Woodstove: freestanding, EPA certified, catalytic	Dibenzo[ah]anthracene	3.916E-05	2
2104008330	Woodstove: freestanding, EPA certified, catalytic	Dioxins/Furans as 2,3,7,8-TCDD TEQs - WHO2005	2.28E-09	4
2104008330	Woodstove: freestanding, EPA certified, catalytic	Fluoranthene	0.0002486	2
2104008330	Woodstove: freestanding, EPA certified, catalytic	Fluorene	0.00718	6
2104008330	Woodstove: freestanding, EPA certified, catalytic	Formaldehyde	0.982	4
2104008330	Woodstove: freestanding, EPA certified, catalytic	Indeno[1; 2; 3 . cd]pyrene	0.0004084	2
2104008330	Woodstove: freestanding, EPA certified, catalytic	Mercury	0.0000052	7
2104008330	Woodstove: freestanding, EPA certified, catalytic	Methane	26	4
2104008330	Woodstove: freestanding, EPA certified, catalytic	Methylchrysene	0.0000584	2
2104008330	Woodstove: freestanding, EPA certified, catalytic	Naphthalene	0.0954	6
2104008330	Woodstove: freestanding, EPA certified, catalytic	Nitrogen Oxides	2	6
2104008330	Woodstove: freestanding, EPA certified, catalytic	Octachlorodibenzofuran	1.666E-10	8
2104008330	Woodstove: freestanding, EPA certified, catalytic	Octachlorodibenzo-p-Dioxin	6.659E-10	8
2104008330	Woodstove: freestanding, EPA certified, catalytic	o-Xylene	0.186	6
2104008330	Woodstove: freestanding, EPA certified, catalytic	Perylene	0.0001552	2
2104008330	Woodstove: freestanding, EPA certified, catalytic	Phenanthrene	0.0246	6
2104008330	Woodstove: freestanding, EPA certified, catalytic	Phenol	0.408	4
2104008330	Woodstove: freestanding, EPA certified, catalytic	Primary PM10	20.4	6
2104008330	Woodstove: freestanding, EPA certified, catalytic	Primary PM2.5	20.4	6

RESIDENTIAL WOOD COMBUSTION TOOL

SCC	Description	Pollutant	Emission Factor (lb/ton)	Ref.
2104008330	Woodstove: freestanding, EPA certified, catalytic	Pyrene	0.0002175	2
2104008330	Woodstove: freestanding, EPA certified, catalytic	Sulfur Dioxide	0.4	6
2104008330	Woodstove: freestanding, EPA certified, catalytic	Toluene	0.52	6
2104008330	Woodstove: freestanding, EPA certified, catalytic	Volatile Organic Compounds	15	6
2104008400	Woodstove: pellet-fired, general	1,3-Butadiene	0.00095	4
2104008400	Woodstove: pellet-fired, general	Acetaldehyde	0.094	4
2104008400	Woodstove: pellet-fired, general	Acrolein	0.0101	4
2104008400	Woodstove: pellet-fired, general	Ammonia	0.3	4
2104008400	Woodstove: pellet-fired, general	Benzene	0.0289	4
2104008400	Woodstove: pellet-fired, general	Benzo[a]Pyrene	0.0067	4
2104008400	Woodstove: pellet-fired, general	Carbon Monoxide	15.9	4
2104008400	Woodstove: pellet-fired, general	Chrysene	0.0000752	9
2104008400	Woodstove: pellet-fired, general	Cresols (Includes o, m, & p)/Cresylic Acids	0.0155	4
2104008400	Woodstove: pellet-fired, general	Dioxins/Furans as 2,3,7,8-TCDD TEQs - WHO2005	3.8E-09	4
2104008400	Woodstove: pellet-fired, general	Fluoranthene	0.0000548	9
2104008400	Woodstove: pellet-fired, general	Formaldehyde	0.316	4
2104008400	Woodstove: pellet-fired, general	Mercury	0.0000052	7
2104008400	Woodstove: pellet-fired, general	Methane	0.248	4
2104008400	Woodstove: pellet-fired, general	Naphthalene	0.423	4
2104008400	Woodstove: pellet-fired, general	Nitrogen Oxides	3.8	4
2104008400	Woodstove: pellet-fired, general	Phenanthrene	0.0000332	9
2104008400	Woodstove: pellet-fired, general	Phenol	0.025	4
2104008400	Woodstove: pellet-fired, general	Primary PM10	3.06	4
2104008400	Woodstove: pellet-fired, general	Primary PM2.5	3.06	4
2104008400	Woodstove: pellet-fired, general	Pyrene	0.0000484	9
2104008400	Woodstove: pellet-fired, general	Sulfur Dioxide	0.32	4
2104008400	Woodstove: pellet-fired, general	Volatile Organic Compounds	2.198	6a
2104008510	Furnace: Indoor, cordwood-fired, non-EPA certified	1,3-Butadiene	0.029032	4
2104008510	Furnace: Indoor, cordwood-fired, non-EPA certified	Acetaldehyde	0.682	4
2104008510	Furnace: Indoor, cordwood-fired, non-EPA certified	Acrolein	0.0437921	4
2104008510	Furnace: Indoor, cordwood-fired, non-EPA certified	Ammonia	1.8	4
2104008510	Furnace: Indoor, cordwood-fired, non-EPA certified	Benzene	2.78	4
2104008510	Furnace: Indoor, cordwood-fired, non-EPA certified	Benzo[a]Pyrene	0.0027333	4
2104008510	Furnace: Indoor, cordwood-fired, non-EPA certified	Carbon Monoxide	184	4
2104008510	Furnace: Indoor, cordwood-fired, non-EPA certified	Cresols (Includes o, m, & p)/Cresylic Acids	0.1311389	4
2104008510	Furnace: Indoor, cordwood-fired, non-EPA certified	Dioxins/Furans as 2,3,7,8-TCDD TEQs - WHO2005	8.325E-10	4
2104008510	Furnace: Indoor, cordwood-fired, non-EPA certified	Formaldehyde	0.7	4

RESIDENTIAL WOOD COMBUSTION TOOL

SCC	Description	Pollutant	Emission Factor (lb/ton)	Ref.
2104008510	Furnace: Indoor, cordwood-fired, non-EPA certified	Mercury	0.0000052	7
2104008510	Furnace: Indoor, cordwood-fired, non-EPA certified	Methane	26.1	4
2104008510	Furnace: Indoor, cordwood-fired, non-EPA certified	Naphthalene	0.1486349	4
2104008510	Furnace: Indoor, cordwood-fired, non-EPA certified	Nitrogen Oxides	1.8	4
2104008510	Furnace: Indoor, cordwood-fired, non-EPA certified	Phenol	0.241	4
2104008510	Furnace: Indoor, cordwood-fired, non-EPA certified	Primary PM10	27.6	4
2104008510	Furnace: Indoor, cordwood-fired, non-EPA certified	Primary PM2.5	27.6	4
2104008510	Furnace: Indoor, cordwood-fired, non-EPA certified	Sulfur Dioxide	2.03	4
2104008510	Furnace: Indoor, cordwood-fired, non-EPA certified	Volatile Organic Compounds	11.7	4
2104008610	Hydronic heater: outdoor	1,3-Butadiene	0.029032	4
2104008610	Hydronic heater: outdoor	Acetaldehyde	0.682	4
2104008610	Hydronic heater: outdoor	Acrolein	0.0437921	4
2104008610	Hydronic heater: outdoor	Ammonia	1.7	4
2104008610	Hydronic heater: outdoor	Benzene	2.78	4
2104008610	Hydronic heater: outdoor	Benzo[a]Pyrene	0.0027333	4
2104008610	Hydronic heater: outdoor	Carbon Dioxide	2907	1
2104008610	Hydronic heater: outdoor	Carbon Monoxide	360	1
2104008610	Hydronic heater: outdoor	Cresols (Includes o, m, & p)/Cresylic Acids	0.1311389	4
2104008610	Hydronic heater: outdoor	Dioxins/Furans as 2,3,7,8-TCDD TEQs - WHO2005	8.325E-10	4
2104008610	Hydronic heater: outdoor	Formaldehyde	0.7	4
2104008610	Hydronic heater: outdoor	Mercury	0.0000052	7
2104008610	Hydronic heater: outdoor	Methane	26	4
2104008610	Hydronic heater: outdoor	Naphthalene	0.1486349	4
2104008610	Hydronic heater: outdoor	Nitrogen Oxides	2	6
2104008610	Hydronic heater: outdoor	Nitrous Oxide	0.0188	1
2104008610	Hydronic heater: outdoor	Phenol	0.241	4
2104008610	Hydronic heater: outdoor	Primary PM10	64	1
2104008610	Hydronic heater: outdoor	Primary PM2.5	64	1
2104008610	Hydronic heater: outdoor	Sulfur Dioxide	2.03	4
2104008610	Hydronic heater: outdoor	Volatile Organic Compounds	67.4	1
2104008700	Outdoor wood burning device, NEC	1,2,3,4,6,7,8-Heptachlorodibenzofuran	3E-10	8
2104008700	Outdoor wood burning device, NEC	1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin	3.159E-10	8
2104008700	Outdoor wood burning device, NEC	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.34E-10	8
2104008700	Outdoor wood burning device, NEC	1,2,3,4,7,8-Hexachlorodibenzofuran	3.559E-10	8
2104008700	Outdoor wood burning device, NEC	1,2,3,4,7,8-Hexachlorodibenzo-p-Dioxin	2.5E-10	8
2104008700	Outdoor wood burning device, NEC	1,2,3,6,7,8-Hexachlorodibenzofuran	2.2E-10	8

RESIDENTIAL WOOD COMBUSTION TOOL

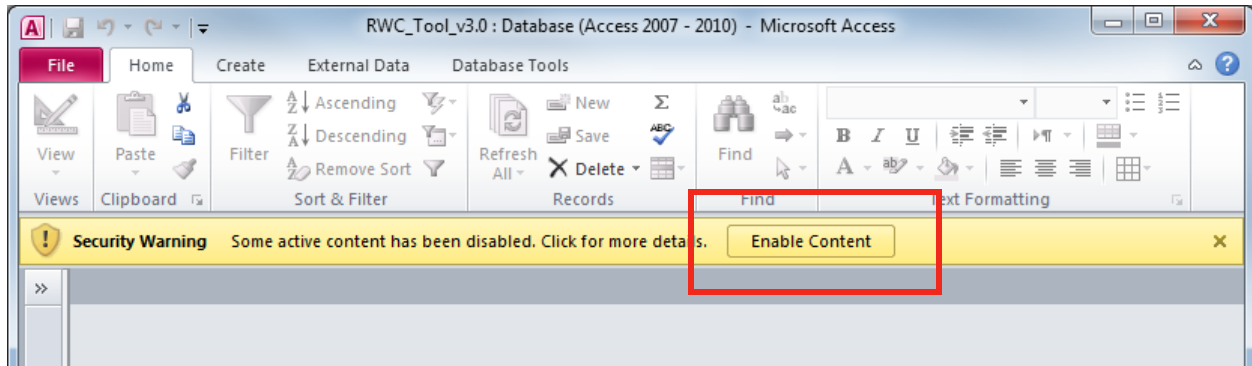
SCC	Description	Pollutant	Emission Factor (lb/ton)	Ref.
2104008700	Outdoor wood burning device, NEC	1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin	2.5E-10	8
2104008700	Outdoor wood burning device, NEC	1,2,3,7,8,9-Hexachlorodibenzofuran	1.984E-10	8
2104008700	Outdoor wood burning device, NEC	1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin	2.5E-10	8
2104008700	Outdoor wood burning device, NEC	1,2,3,7,8-Pentachlorodibenzofuran	4.559E-10	8
2104008700	Outdoor wood burning device, NEC	1,2,3,7,8-Pentachlorodibenzo-p-Dioxin	2.58E-10	8
2104008700	Outdoor wood burning device, NEC	1,3-Butadiene	0.157	4
2104008700	Outdoor wood burning device, NEC	2,3,4,6,7,8-Hexachlorodibenzofuran	1.65E-10	8
2104008700	Outdoor wood burning device, NEC	2,3,4,7,8-Pentachlorodibenzofuran	6.439E-10	8
2104008700	Outdoor wood burning device, NEC	2,3,7,8-Tetrachlorodibenzofuran	1.25E-09	8
2104008700	Outdoor wood burning device, NEC	2,3,7,8-Tetrachlorodibenzo-p-Dioxin	2.28E-10	8
2104008700	Outdoor wood burning device, NEC	Acetaldehyde	1.07	4
2104008700	Outdoor wood burning device, NEC	Acrolein	0.123	4
2104008700	Outdoor wood burning device, NEC	Ammonia	1.8	4
2104008700	Outdoor wood burning device, NEC	Benzene	0.686	4
2104008700	Outdoor wood burning device, NEC	Benzo[a]Pyrene	0.001	4
2104008700	Outdoor wood burning device, NEC	Carbon Monoxide	149	4
2104008700	Outdoor wood burning device, NEC	Cresols (Includes o, m, & p)/Cresylic Acids	0.357	4
2104008700	Outdoor wood burning device, NEC	Dioxins/Furans as 2,3,7,8-TCDD TEQs - WHO2005	7.87E-10	4
2104008700	Outdoor wood burning device, NEC	Formaldehyde	1.79	4
2104008700	Outdoor wood burning device, NEC	Mercury	0.0000052	7
2104008700	Outdoor wood burning device, NEC	Methane	14.4	4
2104008700	Outdoor wood burning device, NEC	Naphthalene	0.265	4
2104008700	Outdoor wood burning device, NEC	Nitrogen Oxides	2.6	6
2104008700	Outdoor wood burning device, NEC	Octachlorodibenzofuran	1.666E-10	8
2104008700	Outdoor wood burning device, NEC	Octachlorodibenzo-p-Dioxin	6.659E-10	8
2104008700	Outdoor wood burning device, NEC	Phenol	0.472	4
2104008700	Outdoor wood burning device, NEC	Primary PM10	23.6	6
2104008700	Outdoor wood burning device, NEC	Primary PM2.5	23.6	3
2104008700	Outdoor wood burning device, NEC	Sulfur Dioxide	0.4	6
2104008700	Outdoor wood burning device, NEC	Volatile Organic Compounds	18.9	4
2104009000	Residential Firelog Total: All Combustor Types	Acenaphthene	0.00168	5
2104009000	Residential Firelog Total: All Combustor Types	Acenaphthylene	0.00748	5
2104009000	Residential Firelog Total: All Combustor Types	Anthracene	0.00232	5
2104009000	Residential Firelog Total: All Combustor Types	Benzene	1.068	5
2104009000	Residential Firelog Total: All Combustor Types	Benzo[a]anthracene	0.0012	5

RESIDENTIAL WOOD COMBUSTION TOOL

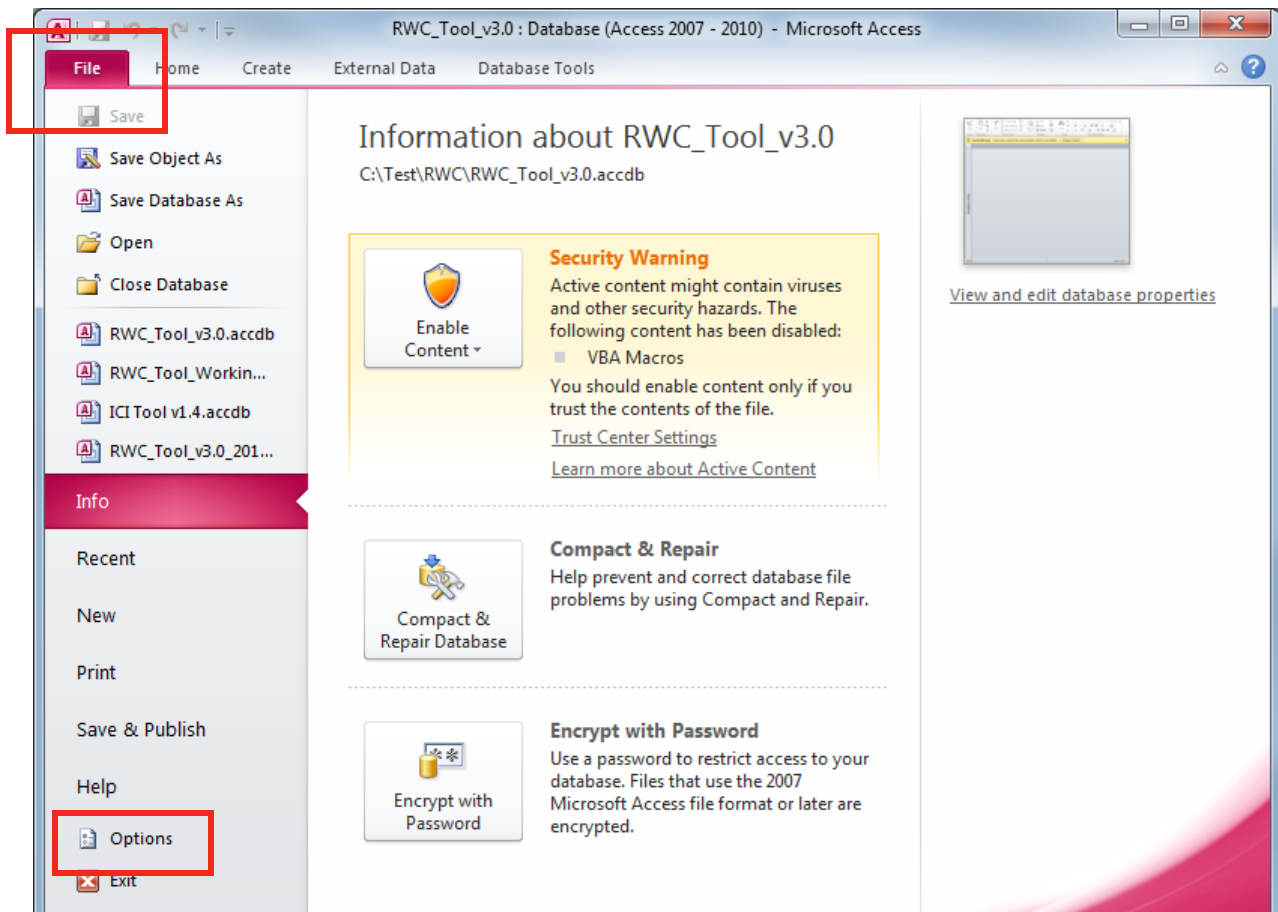
SCC	Description	Pollutant	Emission Factor (lb/ton)	Ref.
2104009000	Residential Firelog Total: All Combustor Types	Benzo[a]Pyrene	0.0012	5
2104009000	Residential Firelog Total: All Combustor Types	Benzo[b]Fluoranthene	0.00112	5
2104009000	Residential Firelog Total: All Combustor Types	Benzo[g,h,i]Perylene	0.00068	5
2104009000	Residential Firelog Total: All Combustor Types	Benzo[k]Fluoranthene	0.0006	5
2104009000	Residential Firelog Total: All Combustor Types	Carbon Monoxide	125.08	5
2104009000	Residential Firelog Total: All Combustor Types	Chrysene	0.00188	5
2104009000	Residential Firelog Total: All Combustor Types	Dibenzo[a,h]Anthracene	0.0006	5
2104009000	Residential Firelog Total: All Combustor Types	Fluoranthene	0.00428	5
2104009000	Residential Firelog Total: All Combustor Types	Fluorene	0.00548	5
2104009000	Residential Firelog Total: All Combustor Types	Indeno[1,2,3-c,d]Pyrene	0.00068	5
2104009000	Residential Firelog Total: All Combustor Types	Naphthalene	0.09756	5
2104009000	Residential Firelog Total: All Combustor Types	Nitrogen Oxides	7.684	5
2104009000	Residential Firelog Total: All Combustor Types	Phenanthrene	0.01724	5
2104009000	Residential Firelog Total: All Combustor Types	Primary PM10	29.32	5
2104009000	Residential Firelog Total: All Combustor Types	Primary PM2.5	28.4	5
2104009000	Residential Firelog Total: All Combustor Types	Pyrene	0.00424	5
2104009000	Residential Firelog Total: All Combustor Types	Volatile Organic Compounds	39.56	5

F. Getting Started with the RWC Tool

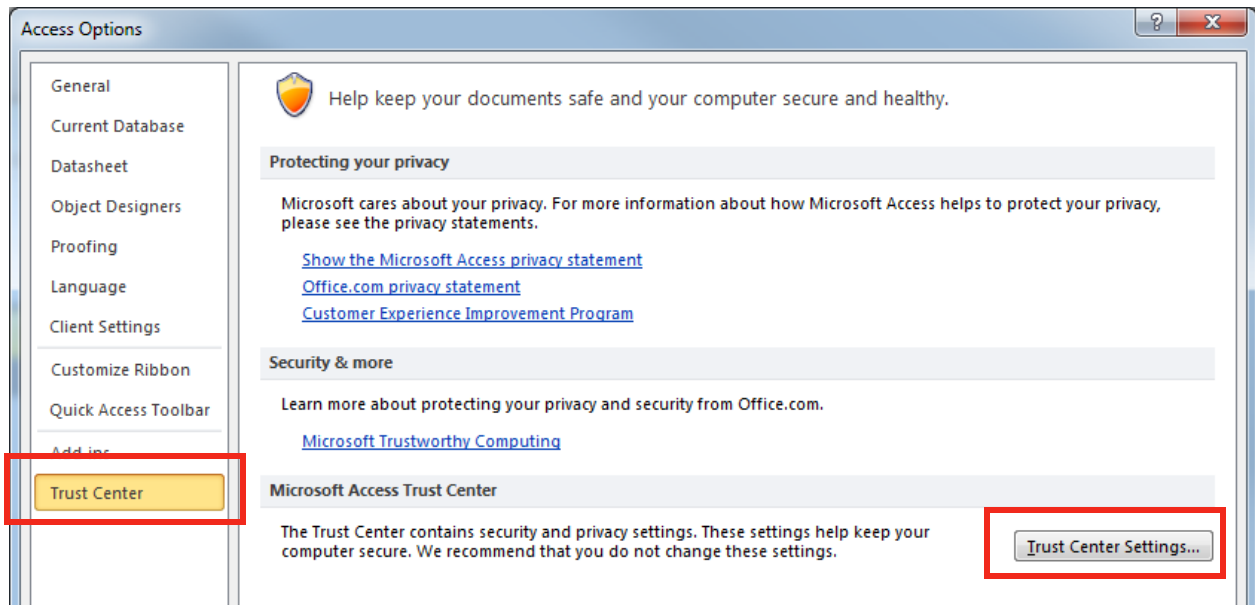
The first time you open the RWC tool, you may see a yellow ribbon stating that “Some active content has been disabled.” Click **Enable Content**. This will allow the tool to run.



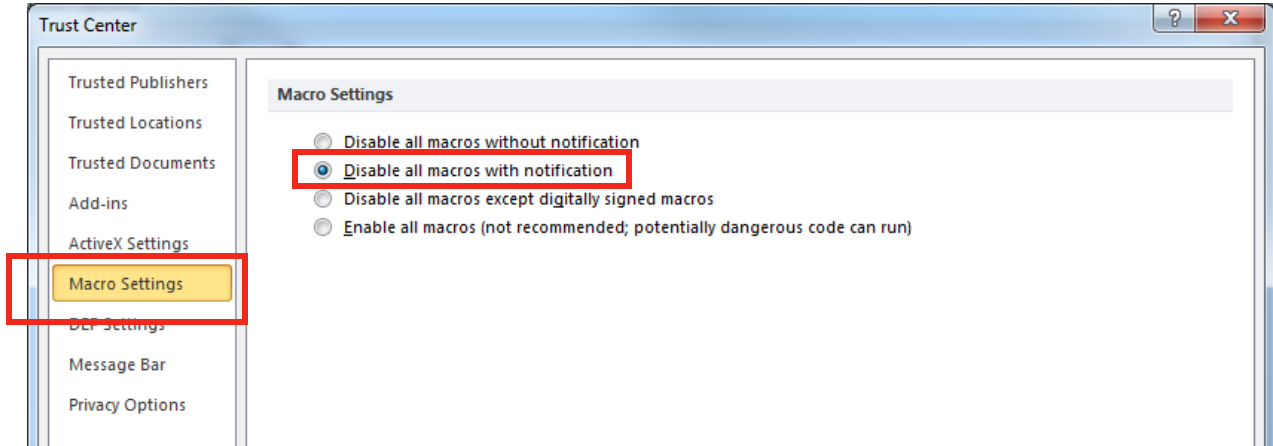
You might also need to enable macros to run. Click **File** then **Options**.



In the window that opens, click **Trust Center**, and then **Trust Center Settings**.



In the next window that opens, click **Macro Settings**, and then select **Disable all macros with notification**.



Click **OK**. You are now ready to run the RWC tool.