FORFS 17-14

University of Kentucky
College of Agriculture, Food and Environment
Cooperative Extension Service

Forestry Emerald Ash Borer
EAB Treatment Procedures for Ash Lumber, Firewood, Logs, and Sawmill Residuals

B. Ammerman, J.W. Stringer, C. Fackler, and C. Niman, UK Forestry Extension and J. Collins, UK Entomology

The Emerald Ash Borer (also called EAB) is a small, ½- to ¾-inch, emerald-colored, winged insect that lays eggs in the bark of branches of all species of ash trees. The EAB larvae feed just under the bark creating s-shaped galleries which eventually kill the tree. D shaped exit holes are visible on the outside of the tree when the adult EAB emerge. Signs of injury often go undetected by landowners until trees sustain irreversible damage or die.

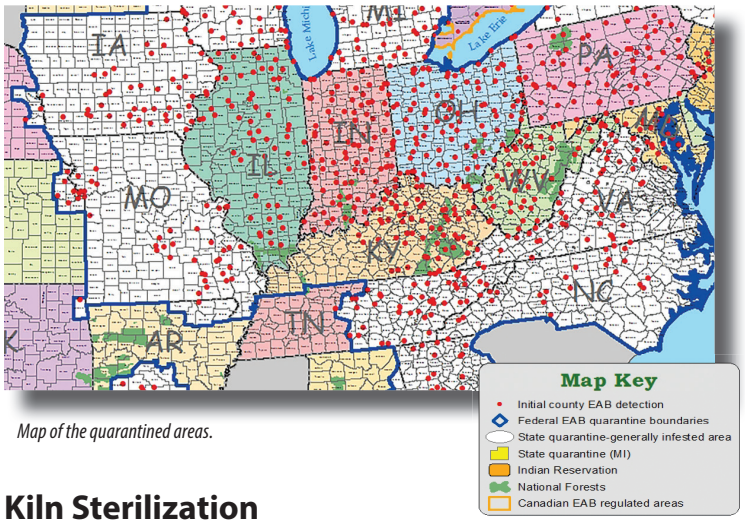
The information contained in this fact sheet describes the requirements and procedures for kiln sterilization, fumigation, composting, and heat treatment methods used to treat green lumber, logs, chips, sawmill residuals, and firewood that meet the requirements for shipping out of the statewide Emerald Ash Borer (EAB) quarantine area. These treatment requirements were created to help slow the spread rate of EAB. If ash wood products are not treated using one of these above methods, the products must be processed into:

- Chips and other sawmill residuals less than 1" in two dimensions (typical pulpwood chips)
- Debarked (removing all bark plus an additional ½" of material)
- Wane-free lumber (no edges or corners with bark.

Since these processing methods are fairly straight forward, this fact sheet covers the treatments that are more technically involved including kiln sterilization, fumigation, composting, and heat treatments that have specific procedures and schedules that must be followed in order to meet USDA requirements. APHIS, the Animal and Plant Health Inspection Service, is the Agency within the USDA responsible for maintaining and inspecting treatment methods discussed in this fact sheet. Treatment methods become important when applying for Compliance Agreement or Firewood Certificates, or receiving ash materials from an EAB quarantined area. These treatment schedules, if required, will be written into your Compliance Agreement. An EAB Compliance Agreement is a legally binding document that requires you to follow the stipulations in the agreement. A certificate is issued once you have been inspected and found that you are meeting the requirements in the Compliance Agreement. For more information on acquiring a compliance agreement read "Forestry Emerald Ash Borer – Cutting and Hauling Ash Logs." Authors: *J.W. Stringer, B. Ammerman, C. Fackler, C. Niman, UK Forestry Extension, J. Collins, UK Entomology*

Compliance Agreements are NOT required when:

- Ash-wood products (logs, lumber, chips, and hardwood firewood) are produced and moved in Kentucky, as long as the statewide federal quarantine is in place, with the exclusion of Kentucky State Parks. Wood brought into Kentucky State Parks must be properly treated and have proper certificate.
- Ash products are cut and transported through federally quarantined areas and are never transported through areas outside of the quarantine.
- Ash materials are moved from outside the federal quarantined area, to inside the quarantine area.



Map of the quarantined areas.

Kiln Sterilization

(Used primarily for treatment of green lumber.)

When using kiln sterilization for interstate or foreign movement (i.e. moving ash-wood products from the Kentucky statewide quarantine area to another state) the process will need to be certified by APHIS PPQ personnel or an APHIS approved inspector. This should be done before the first treatment; otherwise the process will have to be repeated after certification. This is currently nationally accepted protocol, and is recognized by many foreign nations for export. However, it is critical to ensure that this kiln sterilization schedule and the certification acquired meets local, state, or foreign government requirements prior to shipping to save time and money.

Table 1. Kiln Sterilization. T404-b-4 Treatment for Green Lumber					
Dry bulb temperatures	Wet bulb depression	Relative humidity	Moisture content	Thickness of lumber	Exposure time
140°F	7°F	82%	13.8%	1 inch	3 hours
				2 inches	5 hours
				3 inches	7 hours
130°F	16°F	60%	9.4%	1 inch	10 hours
				2 inches	12 hours
				3 inches	14 hours

After kiln drying, the wood will be checked with a moisture meter to verify the wood is at or below the appropriate moisture content (Table 1). Two readings will be taken per stack of wood: one near the top of the stack and one near the bottom of the stack. These readings will be recorded in a computer database along with the date and time. This database information will be supplied to USDA, APHIS, and PPQ on a monthly basis. If the wood does not meet moisture content guidelines, it will NOT be in compliance unless it undergoes additional kiln drying and can then demonstrate that the moisture requirement has been met. To prevent this from happening, it is advised that producers use a moisture meter to check loads prior to compliance checks. Pin meters are the most accurate, but if using a pin-less meter, ensure that it is set to the proper density for the wood you are checking.

Stack of stickered lumber waiting to be dried in a dry kiln.

Photo courtesy: Renee' Williams

Fumigation Treatment

(Used typically for treatment of veneer or export logs)

Fumigation is typically used for treating veneer and export logs. Table 2 provides the schedule required. The fumigation must be performed by a licensed fumigator. The licensed fumigator must have a fumigator compliance agreement with United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine https://www.aphis.usda.gov/aphis/ourfocus/planthealth. This is different from a Compliance agreement which may be required to move ash wood.

Table 2. Fumigation Treatment Schedule. T404-b-1-1 MB at NAP tarpaulin or chamber.					
Temperature	Dosage rate (lb/1,000 ft3)	Minimum concentration readings (ounces) at:			
		½ hr	2 hrs	4 hrs	16 hrs
70°F or above	3 lbs	36	30	27	25
40 - 69°F	5 lbs	60	51	46	42

Heat Treatment

(Used primarily for treating firewood for EAB and other insects)

Treatment: T314-a Heat treatment

For Hardwood Firewood from Emerald Ash Borer Quarantine Areas

Heat treatment is primarily used for treating firewood. When using this treatment method for packaged or interstate movement of firewood (i.e. moving ash-wood products from the Kentucky quarantine area to or through another state outside of the federal quarantine), the process will need to be certified by APHIS PPQ personnel. This should be done before the first treatment; otherwise the process will have to be repeated after being certified.

1. Heat treatment procedures may employ steam, hot water, kilns, or any other method that raises the temperature of the center of the wood to at least 140°F (60°C) and maintains the center temperature for at least 60 minutes. For firewood entering only the states of Florida and New York the center temperature must reach 160°F (71°C) for 75 minutes. For firewood entering Florida or New York contact the proper authority for the respective state at http://nationalplantboard.org/membership/.
2. Facilities, temperature monitors, and temperature sensors will be approved by CPHST, the Center for Plant Health and Science Technology. CPHST is an agency under USDA APHIS PPQ. Approval of equipment should occur prior to a compliance agreement being initiated.
3. Compliance agreements must contain a diagram of the treatment facility to include at a minimum: dimensions, capacity, circulation fans, heat input location, and door locations.
4. The temperature monitoring equipment (thermocouples, temperature data loggers etc.) must be accurate to within +/-0.5°C (0.9°F) at the treatment temperature, capable of collecting temperature data at least once every five (5) minutes, and recording or storing data for 30 days. The temperature monitoring equipment also must be calibrated (by a source that can provide accreditation such as the National Institute of Standards and Technology, NIST) prior

to facility certification tests and a minimum of once annually thereafter. In addition, if a permanent temperature recording system is used, the system must be recalibrated when any part or portion of the system is repaired or replaced.

5. Temperature monitoring equipment must be able to provide a record of the treatment that identifies each sensor and indicates time and temperature.
6. Internal wood temperatures shall be obtained and verified by sensors located in the larger pieces of firewood at representative locations within the stack. The number of temperature sensing elements required per load will vary with the size of the load. The minimum requirement is four (4) sensors – one (1) for measuring air temperature and three (3) for measuring internal wood temperature. For loads greater than 5,000 ft^3 (142 m^3) of wood, a minimum of one additional sensor for measuring internal wood temperature must be provided for each additional 2,000 ft^3. For example, a load of 9,000 ft^3 would require a total of six (6) sensors (one ambient air temperature sensor and five [3 + 2] additional sensors). At least one sensor shall be placed in a large firewood piece in a portion of the load furthest away from initial heat circulation. Sensors will be placed in the wood in pre-drilled holes to measure core wood temperature. Probes are to be sealed into each hole with putty (electricians putty is recommended) to prevent reading ambient air temperature. Other recording arrangements may be considered if approved by CPHST.
7. Begin treatment when all the temperature sensors reach the threshold temperature of 140°F (60°C). Treatment will be complete when all temperature probe readings are at or above the threshold temperature for the entire 60 minutes.
8. Temperature equipment will be certified by USDA APHIS PPQ personnel at regular intervals (suggested monthly) except in those cases where a facility is inactive in excess of two months. Certification will occur before production activities resume.

Composting Requirements

Composting is used to treat hardwood and bark chips, nuggets, and mulch material that are larger than 1 inch (2.54 cm) in any dimension. The composting treatment below has been adapted from the Gypsy Moth Manual. https://www.aphis.usda.gov/import_export/plants/manuals/domestic/downloads/gypsy_moth.pdf.

1. Compost using the following procedure: Compost piles must be a minimum of 200 cubic yards.
2. Internal temperature at a depth of 18 inches must reach 140OF (60oC) for four consecutive days.
3. Using a front-end loader or a bulldozer, remove the outer layer of the compost pile to a depth of three feet.
4. Start a second compost pile using the recently removed cover material as a core.
5. Move the core material from the first compost pile and place on the second compost pile as a cover, at least three feet deep.
6. Allow the second compost pile to remain undisturbed until the temperature reaches 140^0F (60°C) for at least four continuous days.
7. Remove the second compost pile and use as fully composted material.

This procedure will allow continuous operation. After the first compost pile is "turned" to become the second compost pile, a new "first" compost pile can be started.

For additional information:

- **Federal quarantine map:** http://www.emeraldashborer.info/files/MultiState_EABpos.pdf
- **Compliance Agreement – Kentucky:** http://www.uky.edu/Ag/NurseryInspection/phyto/complianceagreementapp.html
- **Kentucky's Office of the State Entomologist at the University of Kentucky - official quarantine areas, movement of firewood:** (859) 257-5838 or http://www.KyStateEnt.org
- **Quarantine in Kentucky as it relates to forest industry:**
- **Forestry EAB Industry Fact Sheets at the University of Kentucky Forestry Extension website:** Update with links once online
- **All aspects of EAB and the quarantine in Kentucky:** http://pest.ca.uky.edu/EXT/EAB/welcomeeab.html
- **Overall information on the emerald ash borer insect:** www.emeraldashborer.info/
- **USDA Treatment Manual:** http://www.aphis.usda.gov/import_export/plants/manuals/ports/downloads/treatment.pdf
- **Contact information for state agencies when moving firewood outside of Kentucky:** http://nationalplantboard.org/membership/

Issued 7-2017