What Type of Burnbox Does Our Village Need?

This information is intended to assist Villages in selecting a burnbox. In making a selection, calling other Villages and asking advice from agency sanitation experts is highly recommended.

Burnboxes versus incinerators: "Burnboxes" are different from "incinerators", which are made to burn garbage and clean the emissions before the smoke leaves the unit. Incinerators are much more expensive than burnboxes. For small Villages, an incinerator that complies fully with federal Clean Air Act (CAA) regulations is likely not affordable to Operate and Maintain (O & M). There *are* incinerators that can be sited outdoors with *affordable O & M* that, unlike burnboxes, offer pollution treatment. While emissions are much less harmful, these units still don't meet the CAA, and cost about $300,000 to $325,000 with shipping and setup (depending on location). Research *is* being carried out now to develop less costly incinerators that produce cleaner emissions than burnboxes. So in the future your Village options should increase.

Emissions: Good **burnboxes make less harmful smoke** than what is produced from on-the-ground dump burning. This is true for **units made locally from in-town metal scrap or old tanks as well as for pre-fabricated units from Alaska burnbox vendors**. As long as they are operated carefully, they should be less likely also to result in an out-of-control dump fire. But **there is no evidence that any of these burnboxes produces better emissions than a well-designed burnbarrel** with good draft. The smoke, particulates, and other contaminants emitting from a burnbox are toxic and can be very harmful to human health. A 2001 health study found that just visiting the dump while garbage was being burned can be associated with an increased risk for short-term health symptoms. For the type of chemical emissions that can be expected from normal household trash, see an EPA summary study at http://www.ccthita-swan.org/pdf/burn1.pdf.

The **advantage of a burnbox over a burnbarrel** is that it can be located at the dump, far away from homes, can fit all of the community's waste, and a single operator can be designated. Households burning their trash in barrels in town is thought to be much worse for the community, because more people are exposed to garbage smoke for longer periods of time, and are closer to the source.

Location: Because the emissions are toxic, it is very important to **site the burnbox downwind** of the Village, and if possible **at least 1 mile away**. A 2001 study showed that people were bothered by smoke odor still at 8,000 ft away. Households that were less than ½ mile away were more likely to experience headache, faintness, and eye irritation. See http://www.ccthita-swan.org/main/site_closure_pdf/appB.pdf . The more unpredictable your winds are, or the more common winter inversion days are, the further the location should be. You can get wind data for your community from the Internet or ADOT, or the Alaska Energy Authority.

Some Villages are **running out of space** quickly, but **don't have a good location for a burnbox**. In this case, focus as much effort as possible on obtaining funding for a new disposal site or a cleaner-burning incinerator. **Explain your situation clearly** in your grant proposals and when you speak with fundors. Community education to encourage people to pay higher fees or taxes might help in paying the higher O & M costs. If the O & M is affordable, the equipment doesn't get stuck, and wastes can

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be kept from falling into the river, compacting wastes to minimize the dump "footprint" is likely the best interim option in terms of public health. If you don't have the equipment, you can seek funds for a track loader and shed. Developing backhauling, recycling, and waste reduction programs, as well as prohibiting project construction wastes, will help as well.

Solving wind problems: If the wind normally blows the wrong direction for just a few days in a row, you can **make your burnbox large enough** to hold the wastes until the wind is favorable. If you have predominant winds in one direction in the winter, and another direction in the summer, think about getting **two burnboxes for two locations**. Or you can **make or purchase a burnbox that can be easily moved.**

Operator masks and public safety: At the burnbox, the emissions are toxic to breathe and are even bad for you if it contacts your skin. It is very important for the operator to wear a proper mask when working with a burnbox. It is also important for the community to not load their own trash into a burning or smoldering box. Ideally, residents should not be allowed in the dump during the entire burn, which will take from 2 – 10 hours typically. As the smoke gets diluted with the air, the amount of contaminants and particulates that people breathe lessens. But with dumps that are close to town, the toxicity may still be high enough to cause health problems. If residents are regularly bothered by the dump smoke in town, or regularly experience congestion, coughing, etc. from the smoke, the burnbox is too close. If possible, try burning at night, when more people (especially Elders and children) are indoors.

Hazardous wastes: Although the emissions will still be toxic, you can make it much healthier for the environment and residents if you do not burn hazardous wastes, or wastes that contain heavy metals like lead, mercury, cadmium, and chromium. Where are these metals found? In electronic goods like computers, batteries, TV's, radios, and cell phones. Also try to keep as much plastic, Styrofoam, and rubber out. It is not easy to sift through household bags, but separating out wastes that stick out will help. For a list of wastes that are prohibited from burning under State regulations, see http://www.ccthita-swan.org/pdf/burning_wastes.pdf

Education: Community awareness of how trash can turn into chemicals that harm the environment is important. Backhauling electronic items, not using used oil or accelerants to start the burnbox fire, reducing plastics, and starting a household hazardous waste exchange shed will all result in much cleaner emissions from burnboxes. Many common household items contain chemicals (see http://www.ccthita-swan.org/pdf/open_burning.pdf), so starting a community sharing/"thrift" store to avoid burning these items will reduce emission hazards, as will eating more subsistence foods, buying less packaging, reusing items, and stopping junk mail. Finally, remember the community is only at risk if they **contact the smoke/fumes** - breathing it, eating it (e.g. by ash settling on drying racks, berries or not washing hands after being in smoke), or touching it (absorbing through the skin).

More on burning and burnboxes: For more on operating and tips, and some contacts for Villages that have various burnboxes, visit http://www.ccthita-swan.org/Tutorials/burnbox.cfm#7

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Considerations In Selecting Between General Burn Box Types

Issue	Pre-fabricated burnbox, with cage-top, drive-through model	Pre-fabricated burnbox, enclosed with stack	Locally-made burnbox (typically old tanks, scrap metal, Connexes, etc. but can also ship in needed design materials)
Ease in emptying unit of ash	Much better – can just push out with heavy equipment. This is a primary advantage if you have heavy equipment to use each day.	Must tilt box (comes with long leveraged handle) and ash spills out. Can use Bobcat to tilt bigger units. Likely a more dirty job.	Can be made to push out, tilt, or shovel out. Free designs similar to sold units are available from ANTHC.
Ease in transferring ash to monofill, sacks, or other	Same	Same	Same
Heavy Equipment needed	Yes	No	Depends on design.
Gravel or "road mat" pad to support equipment, and area for equipment turnaround and storage.	Pad would be needed before could use the box. Pad should be large enough for equipment operation and unit. Also, storage shed for heavy equipment is mandatory in colder areas to assure long-term use.	No – use of the box could begin as soon as it is set up. Comes with dolly to relocate it.	Depends on design.
Start-up fuel for burn	No, according to vendor.	Typically recommended for quickest, hottest burn.	Depends on design.
Heavy Equipment O & M	Yes (if heavy equipment is not used, then the primary advantage of this burnbox is lost)	No	Depends on design.
Operational changes if heavy equipment gets stuck in tundra, or breaks down	Manual shoveling out of ash – with no tipping floor, etc.	No change, would still dump out ash.	Depends on design.
Transferring wastes up to the unit	Same – whichever method is safest and sustainable by Village	Same - whichever method safest and sustainable by Village	Same
Loading wastes in unit	Much easier – self-haul is easier to manually load, pushing wastes in with heavy equipment is easy. Disadvantage is that wastes are not likely to be checked without operator motivation or without using additional time. Self-haul into burnbox should not be allowed as a Village practice without extensive education on harm of burning certain wastes.	Must be hand-loaded. Advantage is that loads will be automatically checked more (e.g. lead-acid batteries, computers, etc. can be spotted and pulled).	Depends on design.
Allowed frequency of burn	Generally need is less frequent due to larger size, but depends on population versus size ordered. Thus, potential for lower staff hours, but higher risk of odors, animal attraction, if not burned regularly.	Depends on population versus size ordered. Largest is for about 450 people, so that two or more units would be needed for more residents. Multiple units offer flexibility in burn operations.	Depends on design.
Worker safety	Unclear. Heavy equipment operation carries risks, but so does manual loading. The likelihood and outcome for exploding wastes (e.g. aerosol cans) is unclear, but see waste monitoring.	Unclear. See to left.	See to left.

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Considerations in Selecting Between General Burn Box Types *(Continued)*

Issue	Pre-fabricated burnbox, with cage-top, drive-through model	Pre-fabricated burnbox, enclosed with stack	Locally-made burnbox (typically old tanks, scrap metal, Connexes, etc. but can also ship in needed design materials)
Operator waste monitoring for hazardous wastes, etc.	Monitoring is logistically less likely to happen and adds a step to the process that is one of the primary advantages of the system.	Some level of waste monitoring is automatic as the worker manually loads the unit. It is easier, and therefore more likely to happen, and would not add substantial time to the loading process.	Depends on design.
Emissions	Insufficient data. Depends most heavily on proper use and what wastes are burned. All else equal (temperature, primarily), *potential* for less clean emissions, higher particulate matter.	Insufficient data. Depends most heavily on proper use and what wastes are burned. All else equal, chambered units have *potential* for cleaner emissions, as fly ash is more likely to settle.	Insufficient data. As long as box has good draft for a hot fire, no evidence that emissions are different than pre-made models.
Use in rural Alaska	Past few years, with clear success in larger rural Village with designed gravel landfill, and at least one mixed review. High growth in use in past two years.	Two decades with continued improved models based on experience. Earlier models with mixed success, later models with tipping ability have good reviews. Not big enough for Villages over about 450, they would need two units used in tandem	Rural Villages invented the burnbox.
O & M labor	Unclear overall, burns are recommended to be monitored for all burn units. Insufficient data on burn times, temperatures. Dumping ash out versus pushing it out should require similar time.	Same as left.	Depends on design. Will likely not last as long – unless high-quality metal used, and proper equipment. But if it falls apart in 3 or 4 years, can be built again with local labor and materials.
Fire danger	Unclear, cage designs are thought to potentially present a higher chance of ember/ash escaping (larger open surface area), particularly if wastes are "stuffed in" and not operated as intended.	Unclear. No data. If operated as intended, risk likely similar to fires starting from chimney stacks.	Unclear, if poorly made and not replaced in time, might present higher risk.
Mobility for relocation if needed due to weather (wind) changes, erosion, new site, other factors	Possible, but not designed for it.	Yes. Comes with dolly to move it.	Can be made to move, takes more time and parts to make.
Cost	Generally $75,000 to $100,000 for non-hub road-less Villages, including shipping and training.	About $35,000 (largest unit) for non-hub, road-less Villages, including shipping and training.	As little as $5,000 to pay local labor, using local materials. As much as $50,000 plus if you want to buy and ship high-quality metal, train a local welder, and purchase welding supplies.

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