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Standard Operating Procedure (SOP) for Open-Air Solid Waste Burning in Contingency Locations

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Standard Operating Procedures for Open-Air Solid Waste Burning in Contingency Locations

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Abstract

Service engineer doctrine and field manuals, such as Army Techniques Publication 3-34.40, Technical Manual 5-634, and Army Regulation 420-1, offer guidance on solid waste management but do not provide the level of detail and practical guidance for open-air burning of solid waste to reduce risk to the Warfighter.

Studies have shown that there could be ill health effects to service members from exposure to toxins from open-air burning. Further practical guidance is necessary to ensure that if there are no other means available for solid waste disposal, the risks associated with open-air burning are minimized as much as possible during contingency operations.

Commands have limited resources and reduced personnel available to study which open-air burning procedures are optimal based on readiness and mission requirements. Planning for efficiency and risk avoidance in open-air burning operations includes several facets (e.g., site planning, processing, and recordkeeping considerations). This special report provides operational guidance to minimize risk of open-air burning for the Warfighter and other joint service personnel, particularly when there is no other alternative to open-air burning, during initial phase operating a burn pit or for waste management planning to establish standard operating procedures.

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Preface

This study was conducted for the US Army Deputy Chief of Staff, G-9, Operations Directorate, Facilities, under MIPR HQ0642816436. The technical monitor was Mr. Kurt Kinnevan, Technical Director for Installations, Office of Technical Directors.

The work was performed by the Environmental Processes of the Installations Division, US Army Engineer Research and Development Center (ERDC), Construction Engineering Research Laboratory (CERL). At the time of publication of this report, Mr. Jeffrey Burkhalter was chief, Environmental Processes Branch; Dr. George Calfas was chief, Installations Division; and Mr. Jim Allen was the technical director for Operational Science and Engineering, Office of Technical Directors. The deputy director of ERDC CERL was Ms. Michelle Hanson, and the director was Dr. Andrew Nelson.

COL Christian Patterson was the commander of ERDC, and the director was Dr. David W. Pittman.

1 Introduction

1.1 Background

While there is guidance on solid waste (SW) management for contingency locations, there is not enough in-depth information on open burn-pit operations to properly protect those engaging with the technique. An open burn pit (National Defense Authorization Act for Fiscal Year 2019) or an open-air burn pit (Office of the Under Secretary of Defense for Acquisition and Sustainment 2018a) is an area of land that has been selected for outdoor burning as designated by the Secretary of Defense and does not contain a commercially manufactured incinerator or other equipment specifically designed and manufactured for the burning of SW (National Defense Authorization Act for Fiscal Year 2019, Section 355). Using a burn pit can successfully reduce waste volume while diminishing risk involved with accumulation; however, burn-pit operations are a last resort in Department of Defense (DoD) operations. They are a short-term solution for when there are no other ways to manage the waste due to the potential risks they pose to nearby personnel.

1.2 Objective

The purpose of this document is to establish Standard Operating Procedures (SOP) for open-air burning by combining field guidance and best practices, particularly when there is no other alternative during the initial phase of the operation and to minimize risk to the operating force.

1.3 Approach

This document details the various roles and responsibilities held by those involved and assesses the possible risks with using open burn pits in the following sections. Risk management techniques are further provided in Section 4, which considers how the landscape would affect the process. Afterwards, the typical procedure used for burning wastes in an open burn pit is described in Section 5, followed by guidance on on-site materials processing, which considers the full lifecycle of items to be discarded. After using an open burn pit, it is essential to have a disposal plan for the remains, which is explained in Section 7, and to properly monitor air emissions and the ashes produced. This is followed by information regarding properly logging and managing the SW. The final section of this

document provides guidance on troubleshooting and preventing failures when operating an open-air burn pit.

1.4 Scope

This SOP offers practical guidance for open-air burning but is not a replacement for current laws and regulation, service engineer doctrine, and field manuals already in existence. The purpose of this SOP is to document best practices for planning, operation, and closure of open burn pits.

This SOP was prepared on behalf of the Office of the Secretary of Defense (OSD) and The Joint Staff by the US Army Corps of Engineers, Engineer Research and Development Center, Construction Engineering Research Laboratory (ERDC-CERL). This work was funded by the OSD. This SOP supplements guidance contained in Department of Defense Instruction (DoDI) 4715.19 (Office of the Under Secretary of Defense for Acquisition and Sustainment 2018a) and applies to all contingency sites and operations as defined in that guidance.

1.5 Solid waste management planning

Solid waste management planning should happen throughout initial planning, operational, and closure phases of base camp management planning. It should consider regulatory and environmental compliance as well as force protection issues. Pest control and necessary health precautions should also be heavily weighted factors.

Under the operational commander, also known as the combatant command (CCMD), a solid-waste management plan (SWMP) should be developed that specifies how to reduce volume of wastes and make transition to alternative methods as smooth as possible. The contents of this plan must include, but are not limited to, covered waste disposal and SW lifecycle analysis to include closure. This plan should be reviewed at least annually, when mission or population size has significantly changed, or by Command directive.

Burn-pit operations can be beneficial in reducing the volume of wastes produced and minimizing risk involved with accumulation or management of waste. However, burn-pit operations are a last resort in DoD operations, when mission timing and theater assets are not yet available, and it should

be transitioned to incineration when practical. Older guidance suggests this occurs when the base accumulates more than 100 attached/assigned personnel for a time period of longer than 90 consecutive days, but given the unique requirements of the current operational force, this 90-day requirement may no longer be feasible. These terms would typically not apply to smaller camps with shorter timeframes. If transition is deemed not to be feasible for covered wastes, Congress must be notified to continue open burn operations (United States Code 2018; and DoDI 4715.19). Base camp size, mission, and length of stay should be taken into consideration when determining feasibility of alternative SW disposal methods.

When establishing open-air burning operations, the location should be as far away from the life support areas (LSAs) of the camp as possible while remaining in a location controlled by friendly forces. Most important, the operation site should be downwind of the prevailing winds to carry smoke away from occupant areas. Accurately determining prevailing wind direction is key to a successful burning operation.

While many wastes can be disposed of via burning operations, certain wastes are restricted due to their unburnable and toxic nature, referred to as *covered wastes* (as defined in Section 6.1.2). If covered waste burning is deemed necessary, disposal must be reported to Congress. Diversion of waste from burning or landfill should be the priority when it comes to disposal methods for covered wastes. Additionally, no hazardous waste (HW), hazardous material (HAZMAT), or medical waste is to be burned in the camp vicinity. Each type of waste (SW, HW, etc.) should have separate sorting operations and should never be mixed. Personnel should visually inspect composition of burn pile to ensure no more than 25% is composed of wet waste such as food. Wet waste should be kept at a minimum below this percentage as it will increase difficulty of the burn and limit combustion (Section 6.3).

Open burning may be necessary to keep away disease vectors if certain SW cannot be properly treated (e.g., human sewage waste). It is important to minimize the amount of dirt added to the burn pile to minimize smoldering. The guidelines given are that burning starts 3 hr* after sunrise and conclude

* For a full list of the spelled-out forms of the units of measure used in this document, please refer to *US Government Publishing Office Style Manual*, 31st ed. (Washington, DC: US Government Publishing Office 2016), 248-52, <https://www.govinfo.gov/content/pkg/GPO-STYLEMANUAL-2016/pdf/GPO-STYLEMANUAL-2016.pdf>.

3 hr prior to sunset. This allows for the smoke to disperse rather than creating a smog at all times. No materials should be added to the burn pile within 1 hr of the intended end of burning operations (Section 4).

For classified documents, it is required to gain approval through authorized security personnel (S-2). Typically, burn barrels are used unless another method becomes practical and is authorized through the proper channel. If personnel operate open burning, they should be properly trained and/or qualified (Section 2).

During burn-pit operation, monitoring and sampling of air emissions and ash should take place. This requirement should be outlined within the SWMP for the base camp. (More information can be found in Section 9.6 of this document.) To minimize open burning, reuse and recycling should be implemented. Recycling is a significant way to reduce the amount of materials being landfilled or burned and should be done using proper storage and segregation of materials. An emphasis should be placed on proper segregation of materials as this will increase the success of recycling operations. When storage areas are not available for smaller contingency operations, plastic recycling may be transitioned to a larger camp. If transition is not an option, materials should be disposed of according to the SWMP in place. The SWMP should take into consideration proper plastic disposal. Options include host nation recycling markets, hauling service as specified in contract (if in existence), compaction with heavy equipment, and storage, with the last option being burial in an engineered landfill.

Composting is an effective way to reduce organic waste going to the burn pit. A compost site can be adjacent to a landfill or a burn-pit area. To effectively compost organic waste, add dry materials like paper, organics, and native soil. Composting food and other organic wet waste will assist effective burn-pit operations by reducing the percentage of wet waste to be burned. The finished compost can be used for daily cover, given to the host nation or local population for their crops, and it may also be used to close a burn-pit site.

Weekly compliance inspection and daily monitoring should be conducted in order to keep operations effective. Closure should be in accordance with DoDI 4715.22. If instruction is not clear, further guidance should be sought through the combatant commander (CCDR). When burn-pit operations

undergo closure, a written closure report must be conducted and given to the lead environmental component (LEC). This report should include GPS locations and applies to ash disposal areas as well. An LEC is nominated by the Assistant Secretary of Defense in coordination with the combatant command (CCMD), and in many cases, the LEC is the combatant commander. The LEC coordinates (or delegates responsibility to do so) with the host nation for any environmental standards, as is applicable.

2 Roles and Responsibilities

2.1 Assistant Secretary of Defense for Sustainment

The Assistant Secretary of Defense for Sustainment reviews the following for completeness and submits to the Committees on Armed Services of the Senate and House of Representatives:

1. The determination from the CCDR that no alternative disposal method for covered waste is feasible other than through use of an open-air burn pit.
2. The justification for subsequent 180-day periods during which covered waste is disposed of in the open-air burn pit covered by the original notice.

The health-risk assessment (HRA) report, for those locations with more than 100 attached or assigned personnel in place for more than 90 consecutive days, no later than 180 days after the initial determination is provided.

2.2 Assistant Secretary of Defense for Health Affairs (ASD(HA))

The Assistant Secretary of Defense for Health Affairs (ASD(HA)) oversees and provides guidance for comprehensive HRAs, including the preliminary hazard assessment and the occupational and environmental health site assessment (OEHSA). The ASD(HA) recommends policy and requirements for force health protection and health surveillance, including hazards associated with open-air burn pits.

2.3 Director, Defense Health Agency (DHA)

The director, Defense Health Agency (DHA), develops and publishes force health protection guidance in locations where open-air burn pits may be considered. The director also provides consultative support to ASD(HA) regarding the HRA report portion of open-air burn pit determination packages.

2.4 Combatant commanders (CCDRs)

The CCDRs develop and maintain area of responsibility (AOR) specific guidance and policy identifying responsibilities and procedures for

compliance with DODI 4715.19. They also determine that no alternative disposal method for covered waste is feasible by performing the following actions:

1. Prepare HRA reports for each open-air burn-pit location, at those locations with more than 100 attached or assigned personnel in place for more than 90 consecutive days, used for the disposal of covered waste.
2. Provide written justifications for each subsequent 180-day period during which covered waste is disposed of in an open-air burn pit in their AOR.
3. Monitor and analyze existing open-air burn pits in their AOR to measure the impacts on mission, health, and funding.
4. Continuously monitor their area of responsibility (AOR) to validate the need for open-air burn pits. If the operational environment changes to where other means of covered waste disposal are feasible, discontinue the use of open-air burn pits.
5. Ensure subordinate operational commanders develop and approve a SWMP for each contingency location.
6. Issue specific engineering and medical guidance that maximizes protection of human health and safety for locations where
 - a. Covered waste is burned because no alternative is feasible
 - b. Disposal methods potentially impact human health and safety.

2.5 Joint task force (JTF)

Environmental components are nominated by the Assistant Secretary of Defense for Energy, Installations, and Environment in coordination with CCDRs and designated by the Office of the Undersecretary of Defense for Acquisitions, Technology, and Logistics. A joint task force (JTF) does not have the authority to designate the lead environmental component (LEC) but can assign base operating support-integration (BOS-I) responsibilities to a specific service component at a specified posture location. BOS-I includes environmental management at that site (DoDI 4715.05).

2.6 Lead environmental component (LEC)

The LEC will have the following procedures in place for the management of SW (CCR-200-2).

1. **Solid Waste Strategy:** Base camps are required to implement a SW management strategy that reduces the volume of SW disposal. The most common method to accomplish this reduction is to transition from burn pits to incinerators. This will be done as soon as practical after the base is established.
2. **Recycling:** Recycling is encouraged to reduce the amount of SW generated and to decrease the environmental footprint of the base. All SW materials that have been separated for the purpose of recycling or incineration will be stored in a safe manner so that the waste does not constitute a fire, health/safety hazard, or provide food/harborage for vectors.
3. **Burn Pit/Open Burning:** Implement a program to detect and prevent the disposal of HW, regulated medical waste (RMW) and wastes determined unsuitable for on-site disposal.
4. Investigate options for composting of SW as an alternative to land filling or treatment prior to land filling.
5. Operate the solid waste landfill (SWLF) in a manner to protect the health and safety of personnel associated with the operation and control access.
6. Maintain conditions that are unfavorable for the harboring, feeding, and breeding of vectors.
7. Prohibit the disposal of liquids in the SWLF.
8. Maintain landfill records for the duration of the base camp operation. During closure and post-closure operations, base camps will prepare a written closure report for burn pits, ash disposal areas, and landfills that include the GPS locations. The plan will be kept as part of the base's permanent records and forwarded to the LEC.

2.7 Environmental officer

At small camps, the environmental officer (EO) might be a lieutenant platoon leader or the company operations non-commissioned officer (NCO). On larger camps, it might be an engineer officer from the Army or Air Force serving as the Department of Public Works element.

It is the responsibility of the EO to follow guidance put forth by the LEC and disseminate best practices and proper procedure to the burn-pit operator. See Section 8 for a more detailed overview of the recordkeeping involved.

2.8 Open-air burn-pit operator (including contractor/heavy equipment operator)

It is the responsibility of the operator to utilize the safest means possible to affectively dispose of applicable SW through an open-air burn pit and to utilize reporting methods and safe means described further in this SOP.

The operator should pay attention to environmental conditions of the surrounding area. There may be times that preclude burning, such as the enemy situation, current operations, flight operations, very important personnel visits, downwind local national activities, or downwind friendly operations. Each operator should refer to their LEC for training and risk assessment guidance.

3 Risk Assessment

3.1 Health and safety

Burn pits are intended to be a short-term solution when there are no other options. Even a properly operated burn pit can emit fumes that can affect the health of personnel. Seek advice from preventive medicine staff who can assist units in monitoring burn operations air emissions and ash sampling.

Burn pits must be located in the predominantly downwind direction and a safe distance (minimum 2,000 ft*) from personnel and water sources.

This includes living, dining, and work areas. Active burning should be done only in daylight hours. This will help disperse smoke. Also, burning in the daylight hours allows easy observation of the smoke direction.

Any unburned waste accumulations can attract nuisance vectors like insects or rodents; therefore, include the waste management area in any pest management practice. For example, tires should be turned into the defense logistics agency (DLA) to be retrograded. Tires should be stored under cover to prevent rain accumulation, which breeds mosquitos. If this is not possible, tires should be shredded (but not placed in the burn pit). Figure 1 provides an example of improper storage of used tires.

Personnel (including any contractors) operating the burn pit should be trained in offloading and staging waste, segregating, igniting, and observing from a safe distance, in addition to fire suppression, and emergency response protocols.

Operators near the burn-pit site should wear appropriate personal protective equipment (PPE) as determined by preventive medicine staff or unit safety personnel. Level C⁺ PPE is recommended. These can include, but are not limited to, the following:

* For a full list of the unit conversions used in this document, please refer to *US Government Publishing Office Style Manual*, 31st ed. (Washington, DC: US Government Publishing Office 2016), 345-7, <https://www.govinfo.gov/content/pkg/GPO-STYLEMANUAL-2016/pdf/GPO-STYLEMANUAL-2016.pdf>.

† United States Department of Labor. By Standard Number/1910.120 App B - General description and discussion of the levels of protection and protective gear.

- Gloves (puncture and chemical resistant)
- Hard hats
- Eye protection
- Particulate masks
- Safety vests
- Air-purifying respirators
- Boots with steel toe and shank.

It is best to refrain from utilizing highly flammable fuels like mobility gasoline (MOGAS) to ignite waste. Jet propellant-8 has a lower flash point and thus may be used. From a safety standpoint, it is important to keep dangerous items out of the burn pit. Some of these include fuel cans, aerosol cans, gas cylinders, lithium batteries, PVC pipe, and ammunition. (see the covered waste list in Section 7).

If the base is large enough to have a fire department, it must be notified of the burning schedule. Sites without a fire department are to keep an adequate supply of water nearby and a pump capable of extinguishing the fire in an emergency.

Figure 1. Improper storage of used tires.



3.2 Force protection

To the extent possible, the burn pit should be located inside the camp perimeter at a minimum of 2,000 ft from any LSA. This provides security for workers on-site and others who deliver waste. This also eliminates the possibility of scavenging. Even inside the wire, the burn-pit area should have access controlled by a locked gate.

If utilizing local contractors for waste management activities, make sure to include force protection measures in the contract and the waste plan. This includes check point access, PPE, and inspections, and specific actions and locations for the contractors to operate.

Burning should not be done in situations where the smoke plume would reveal location to hostile forces as shown in Figure 2.

Figure 2. Burn-pit smoke plume seen from a distance.



4 Risk Management

There are various risk management factors to consider when establishing open-air burning operations to minimize risk. Wind, weather, and temperature are some important factors to consider for burning in theatre.

4.1 Wind, weather, and temperature

Ideal conditions for burning include dry pit surfaces, large contained areas, and placement downwind. Conditions that preclude burning are wetness, cold temperatures, high winds, variable wind direction, air inversion, unsuitable terrain, drainage issues, soil type, and prohibited wastes (see Section 6.1.2 for prohibited waste types).

Wind is perhaps the most important factor when it comes to burn-pit operations. Operations should be established downwind of any prevailing winds. This minimizes the amount of smoke carried towards the base camp and its inhabitants and thus reduces risk from inhalation. Location of transportation vehicles, both ground and airborne, must also be taken into consideration as smoke could cause visualization issues during travel. Distance and location to local populace should also be considered.

General weather, such as rain and snow, should be taken into consideration to keep wet waste at a maximum of 25%. Extreme cold temperatures may not be ideal for keeping the burn-pit operation going. In colder environments, the burn rate will be reduced (For example if part of the pile is frozen, it will take time to thaw out and creates more wet waste). Alternatives may need to be evaluated in these situations, such as adding more fuel to the pile.

Some desert environments go through extreme drops in temperature at night, which can cause a thermal inversion, trapping smoke closer to the ground. Thus, burning should be done only after sunrise and end before sunset.

4.2 Smoke

Consideration should be taken to not consume or obscure guard towers with smoke. Units can position burn pits downwind within the camp, but there will be a guard tower within 45° to 90° (or less) of down wind direction from the burn pit. Alternate guard towers for burn times may be a consideration, not only to keep occupants out of the smoke but also to ensure smoke is not obscuring avenues of advancement on the perimeter.

5 Procedure Summary

There are five main components to creating an open-air burn-pit operation that need to be considered in greater depth: site planning, material processing, sustainment and disposal, solid waste recordkeeping, and pit closure. Appendix A shows three different size base camp layouts.

5.1 Site planning

Basecamp master planning adjacency matrices exist that can assist with site selection and preferred locations or areas that should be avoided. An example matrix is provided in Appendix B. The matrix is developed with a green (Go), amber, and red (No-Go) scenario to find the ideal location for burn-pit operations.

5.2 Waste projection

There have not been any studies on waste generation in contingency locations in more than 5 yr. The two primary references currently utilized are Technical Manual (TM) 3-34.56 Waste Management for Deployed Forces (Department of the Army 2019) and ERDC-CERL TR-13-17, *Contingency Base Camp Solid Waste Generation* (Cosper et al. 2013). A crucial component of consideration that stands out in SW generation at contingency locations rather than fixed installations is the change in battlefield rhythm. Size, population, and mission are important factors, but the time in space for the battlefield is also a critical factor. The most austere environment in comparison to a semi-permanent contingency location will generate different types of waste streams that must be considered. This will include types of structures, shipping supplies and materials, as well as force protection measures.

5.3 Location

The site selection of the burn pit is one of the most critical aspects of the design due to the ramifications to the mission, enemy, terrain, troops available, time, and civilian considerations (METT-TC). As a result, the location of the burn pit from the beginning to the end of an operation may change to adjust to local factors. The site must be as far away from any inhabitants or living areas as possible to minimize exposure to air emissions. A minimum recommended distance is 2,000 ft; however, the greater the distance is between the burn pit and inhabitants, the lower the

potential for unnecessary exposure. The prevailing wind direction from the burn pit cannot be in the direction of inhabitants.* Some locations have seasonal prevailing wind directions. While it is not recommended to have multiple burn pits within the camp, it is a possibility that should be considered during the design stage of the camp. If it is a temporary wind shift, it is suggested to refrain from burn operations.

The local terrain should be considered in this analysis because mountains, vegetation coverage, and rivers will impact the local prevailing winds both at and downwind from the burn-pit site. It is also possible that in a particular location there is minimal wind. Helicopter landing zones and airfield landing strips must be as far away from the burn pit as possible because of their impact to local winds and burn-pit control. Aircraft temporarily change local wind patterns around them, which can cause the smoke plume of a burn pit to change course towards inhabited locations (Anderson and Wolf 2004). If above ground, the burn pile will have to be surrounded with berms. Burn pits take time to change their intensities; therefore, expecting a repeated start and stop of burn pits to accommodate landings is not usually practical (Headquarters United States Pacific Command 2014).†

5.4 Design

Burn pits are large below or above ground sites where controlled burns of waste occur. A burn pit should be designed to be large enough to accommodate an active burning area and a separate disposal area. This prevents waste from being thrown directly into a burning pile. The ideal preference is a below-ground burn pit because it forces greater separation distance from individuals putting waste into the fire. In below-ground sites, ensure the burn pit is as deep as the local soil strength will allow (up to 10 ft) and designed so that they will not collapse due to the burning activities (this includes sloping walls and access points). It should not be so deep that if a burn-pit wall collapses, an operator cannot be retrieved. A burn pit is never to be operated by a single individual alone or without the necessary recovery equipment to retrieve an individual should they fall in.

* USA, United States Forces - Afghanistan, USFOR-A JENG. *Environmental Standard Operating Procedures Afghanistan* (109–210).

† DoD Instruction Number 4715.19, 15 February 2011, and US CENTCOM, *SUBJECT: Use of Open-air Burn Pits in Contingency Operations*, 14 April 2010.

Proper standoff distances must always be maintained.* If possible, the preferred method of adding waste to the burn pit keeps personnel as far away from the edge as possible. Examples include the use of heavy equipment, long poles, mechanical devices, etc. Never manually throw waste in the fire. The burn-pit walls must be banked at an angle to reduce the risk of a cave in.†

The entry point to the pit should be guarded by a soldier who inspects loads prior to entry. Only the appropriate waste should be segregated, prepared for disposal, and deposited in the burn pit. Recycling collection, hazardous materials (HAZMAT), medical waste, and ammunition waste should have been deposited in designated collection points prior to approaching the burn pit (Figures 4 and 8). A regular log will be collected and maintained of all units that have disposed of waste prior to entrance.

There is not any general training on how to operate or design a burn pit; however, each CCMD will provide training or have a separate SOP for the operator. Engineer warrant officers receive extensive training on environmental compliance and building standards in their professional military education. Engineer officers and engineer non-commissioned officers (NCOs) of all services receive basic environmental management training as well as more advanced training for selected specialties. Thus, it is advised that formal training on the execution of burn pits be given to all officers and NCOs prior to entering theater operations. This will allow for more adequate preparation for burn-pit operations prior by giving decision-makers time to review burn-pit SOPs. Refer to CCMD for training and unit specific SOP.

Figure 3 shows an image of a trench style burn pit. Notice that there is nothing to prohibit the flames from spreading to the entire pile. Separation of the piles would allow for more control of the amount burned.

* US CENTCOM, Regulation 200-2, Environmental Quality, CENTCOM Contingency Environmental Standards, 26 March 2012.

† DoD Instruction Number 4715.19, 15 February 2011, and US CENTCOM, SUBJECT: Use of Open-air Burn Pits in Contingency Operations, 14 April 2010.

Figure 3. Burning in a trench. Not a best practice. The preferred method is to use separate piles to keep control of the amount and area to be burned.



5.5 Construction

Dig and plan for the largest expected capacity of the site for a minimum anticipated occupation for one year. Expanding a burn pit following initial construction comes with additional complications to both the health of personnel due to increased proximity to a burn pit and equipment requirements. It is recommended to plan and design the burn pit to allow for multiple trenches or piles. While they may not all be utilized, planning for additional space will alleviate the need to properly close the first burn pit before creating another, or by having to expand after the fact. Figure 4 contains a sample diagram of a burn pit that allows for adequate entrance ramps, amnesty boxes, inspection sheds, maintenance ramps, and traffic flow requirements. Do not attempt to build a burn pit without also laying out disposal methods for burn material, HAZMAT, medical waste, etc. The combined waste efforts should be one continuous process rather than individual processes working next to each other (Anderson and Wolf 2004).

Separate collection areas should be set up for expected high volume materials such as food waste or packaging material. A potential solution is included in the following images, Figures 5–7.

Figure 4. Sample diagram of a burn pit.

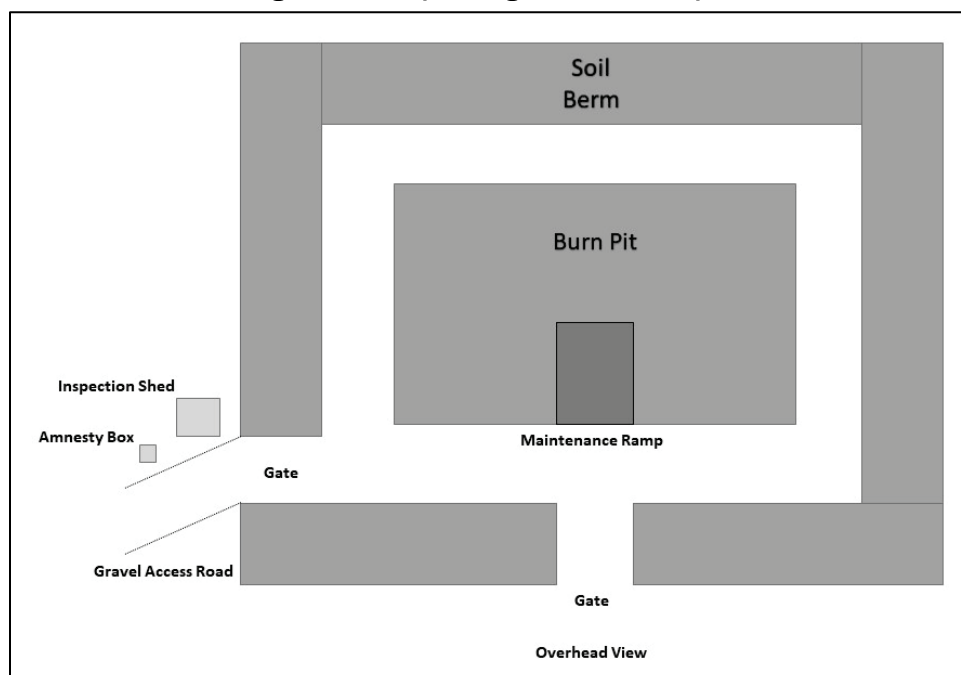


Figure 5. Plastics segregation area (materials excluded from burn pit).



Figure 6. Collection area for bed frames (materials excluded from burn pit).



Figure 7. Collection area for electronics (materials excluded from burn pit).



5.6 Transportation

Transporting waste via construction equipment, such as a dedicated dump truck (which will reduce the number of times it has to be cleaned for other uses), is the preferred solution; however, this method may not always be available in smaller camps. Avoid manually carrying waste from a collection point to a burn pit. Burn-pit site selection should include multiple avenues of escape with a single dedicated avenue of approach for vehicles to bring in refuse. The overall goal of personnel management in burn-pit operations is to minimize the amount of time required to be on-site and the proximity to the smoke. Figure 8 identifies a possible routing method that allows for the proper circulation of traffic during burn-pit operations. The one-way route through the burn pit streamlines the movement of waste and prevents any missed stops or misrouting, which could result in possible missed checkpoints and the improper disposal of materials. This approach minimizes confusion and decreases the amount of time spent on-site, reducing health impacts (Anderson and Wolf 2004). Figure 9 shows a waste management check point. This is a method for controlling traffic into the site.

Figure 8. Sample diagram of one-way entrance point to burn pit from staging (recycling area).

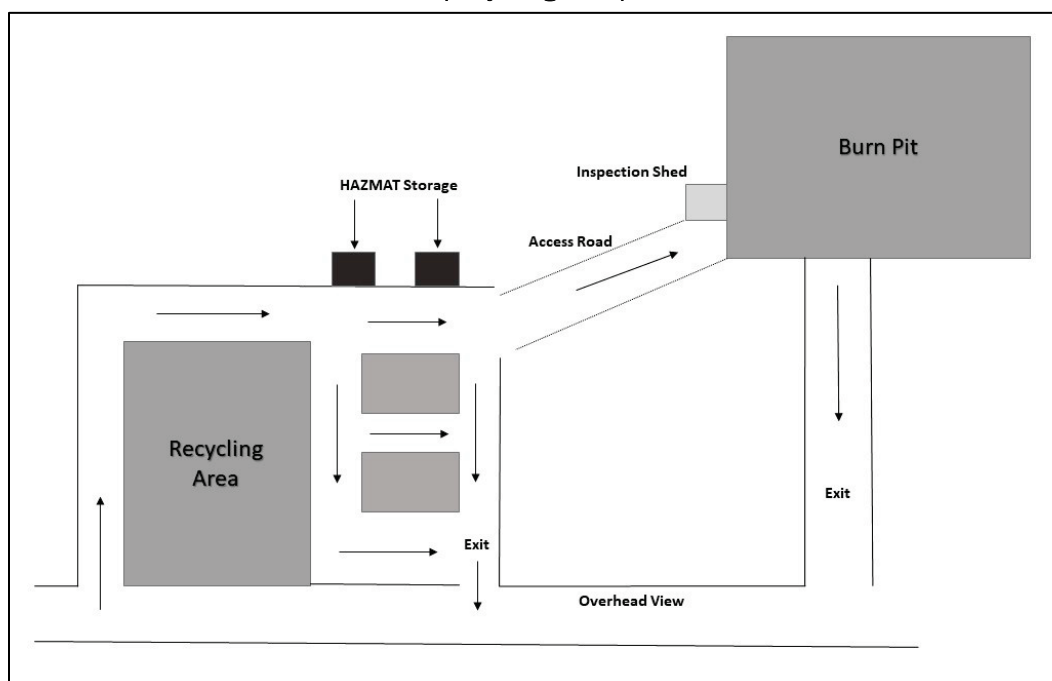


Figure 9. Waste management area check point.



6 Material Processing

Material sorting and segregation is a full lifecycle process that should be considered as early as possible. The most efficient method should emphasize point source or *at-the-source* disposal. At-the-source disposal means that items should be sorted at the point of generation as much as possible and then undergo a quality control sorting procedure at the disposal site. Processing can be considered in five stages:

1. Materials are ordered and acquired for use. Over-ordering to the point of excess should be discouraged so as not to create unnecessary amounts of refuse due to expired or unused items.
2. Items are used to the point of desired necessity. Some items may be set aside for re-use while other items are ready for the next step, segregated disposal.
3. User is ready for disposal of item and initially discards into separate containers based on material type (i.e., separate containers should be created for food discards, paper, plastic, aluminum, etc.).
4. Staff must examine and provide quality control (QC) to further segregate items at disposal site.
5. Staff are required to monitor and test ash for traces for hazardous waste prior to pit closure.

Typically, material processing is thought of only in Stage 4, sort items at the disposal site. If consideration and care is preemptive and is conducted in Stages 1–3, there will be less risk to health and safety, with more efficient use of time and labor.

Two examples of materials that must be considered early in the material processing cycle is plastic packaging wastes and single-use items, such as plastic water bottles. These are two large waste streams that are prohibited from open-air burning and often tend to pile up rapidly. Packaging waste, depending on the material type, may be recycled or re-utilized for other purposes (e.g., untreated wood). Polystyrene (foam) packaging material and Styrofoam food trays are not able to be re-used, but the burning of this type of plastic releases gases that can be toxic. Plastic water bottles are prohibited from burning and must be accumulated and disposed of separately.

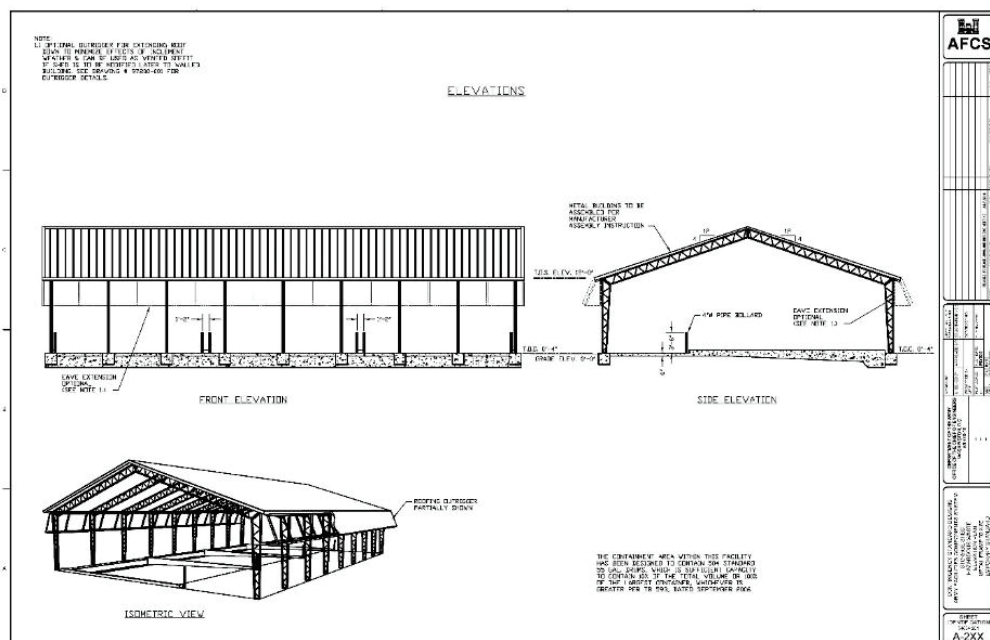
Another area of consideration in SW management planning is the location of waste receptacles and initial segregation. The segregation and disposal process can be expedited if the operational force is properly trained and knows the location of alternative disposal areas to discard of prohibited items separately.

6.1 Segregation and preparation

SW should be segregated at the source of disposal to remove food, recyclables, hazardous and medical wastes, and potentially dangerous items, such as ammunition, aerosol cans, and explosives. US citizens and military personnel are accustomed to this type of segregation state side, and the adoption of proper segregation is even more critical in the contingency area and thus should be strongly emphasized and enforced.

There should be a separate staging area for segregation and preparation of materials ready for the burn pit. This area should act as QC for the initial disposal of the items through separate containers. While contamination of materials will be greatly minimized by having separate disposal containers, there will possibly be some mixing of materials that need QC to avoid prohibited items from entering the burn pit. Figure 10 is a schematic of a covered staging area that meets building design standards for contingency operations.

Figure 10. Covered staging area for secondary degree of materials processing.



6.1.1 Handling

Items that are accepted in burn pits include combustible non-hazardous solid waste from dining facilities, LSAs, and other generation sources from the base excluding any medical wastes or demilitarized items.

Minimization strategies should first be applied by a segregation process. In an ideal situation, it is best to examine all items prior to burning. This can be achieved by opening all refuse bags and spreading out the contents in a thin layer for close inspection. While this may be viewed as a tedious process, it is necessary for the health and safety of the operational force.

As stated in the beginning of this section, it is crucial that emphasis be placed on segregation at the user point of discard. When units are in hostile areas or there is a smaller range of units without the hiring authority for local national contract support, there will not be a consolidated segregation point of operations. Therefore, it is important to separate materials at the initial source of disposal when the user of the item is ready for discard and has separate containers to utilize.

Wastes and materials that are segregated should be stored in a manner that does not attract pests or cause a health or safety hazard. Identify items that can be re-utilized or re-purposed and place in separate piles for future use rather than burning.

Recyclable and Re-Usable Items

- Scrap Metal
- Wood
- Tires
- Appliances
- Furniture
- Aluminum cans
- Plastics such as water bottles
- Cardboard
- Printer cartridges

6.1.2 Sorting and blending

Figure 11 shows rusty metals and non-combustibles remaining after burning. These items should be kept out of the burn pit from the start so that they do not unnecessarily add to the final disposal volume.

Figure 11. Metals remaining after burning.



Note that there are several types of wastes that are strictly prohibited from open-air burning without determination from the CCDR and approval from Congress if longer than 180 days. According to DoDI 4715.19, in no case should munitions, explosives, or radioactive material be placed in open-air burn pits with other wastes.* Batteries and any parts from an aircraft, vehicle, or vessel are also not to be disposed of in any open-air burn-pit operation. Even if an open-air burn pit is permitted under DoDI 4715.19, these types of materials are not to be burned.† These prohibited items are referred to as “covered wastes” and cannot be burned except in cases where there are no alternative means for disposal. If there is not a feasible alternative, commander approval must first be obtained.‡ Covered wastes can be any item containing any of the materials listed in the following.

* Further DoD guidance on the destruction of munitions and explosives is contained in Volume 6 of DoD Manual 6055.09. Disposal guidance for low-level radioactive waste is provided in DoDI 4715.27.

† DoDI 4715.19 Use of Open-air Burn Pits in Contingency Operations.

‡ DoDI 4715.19 Use of Open-air Burn Pits in Contingency Operations.

Prohibited Items

- Hazardous waste (may be in a solid, semi-solid, liquid, or gas state)
- Medical waste
- Tires
- Treated wood
- Batteries of any type
- Plastics (including polystyrene)
- Munitions and explosives
- Compressed gas cylinders
- Fuel containers
- Aerosol cans
- Polychlorinated biphenyls
- Petroleum, oils, and lubricant (POL) products
- Asbestos
- Mercury
- Foam tent material
- Rubber
- Tar paper
- Asphalt shingles
- Paint, paint thinners, and strippers
- Pesticides and pesticide containers
- Appliances
- Electrical equipment and electrical wires

Figures 12, 13, and 14 provide examples of prohibited items segregated from the burn pit.

Burnable Items

- Dry food waste
- Wet food waste
- Paper

If there are centralized mess operations, food waste can be segregated at the point of discard into two categories, dry food waste and wet food waste. This is important as the wet food waste will contribute to excessive moisture in the burn pit.

Note: Pre-segregated refuse ready to be burned will likely be in plastic bags. Plastic bags will keep the refuse dry and retained. Another option is to utilize cardboard boxes for storage or to dump loose refuse directly into the burn pit, but this will also expose it to pests and the elements, which, in the latter case, could cause smoldering even with accelerants and will make it very difficult to burn. While plastic in the burn pit should be avoided since it is a prohibited item, there may be some degree of plastic due to the bags used to contain the refuse. Keep this in mind depending on the resources available.

Figure 12. Ammunition and electronics segregated from the burn pit.



Figure 13. Fuel cans segregated from the burn pit.



Figure 14. Gas cylinders, hazardous waste, and stockpiled metals.



6.2 Placement

6.2.1 Pre-treatment and accumulation

The pile of current discards should be separate and a distance away from the active pile burning. The basic protocol to follow when operating a burn pit is to deposit the refuse in a non-burning location a distance away from the active burn pile, to be burned in the future. This keeps personnel away from smoke and flames. This also enables controlled burning and limits excessive daily burning outside of the hours of operation.

6.2.2 Loading

Injuries result if proper safety protocols are not followed. For example, personnel should not place incoming refuse into an area of the pit where there is active burning. For that reason, batch loading is necessary as opposed to a continuous load.

Even though sorting should take place beforehand in a controlled manner, there is still the potential for aerosol cans, sealed containers of food, occasional ammunition, etc., that will be in the burning piles. It is important that refuse never be thrown into the flames or have personnel standing too close to the flames since there is potential for shrapnel from explosive waste material.

6.2.3 Pile arrangement

The sides of the burn pit should be built up for the arrangement to stay contained. The longer the burn pit is in use, the more the piles may be built up to look like windrows. It is not necessary to increase effectiveness of the burn to have a complete windrow. Most important is to maintain the safe distance between the active burn and the current dumping site.

Even with ideal pre-sorting efforts, explosive items (such as aerosol cans, unopened tin or aluminum cans containing soda, and occasionally ammunition) may accidentally be dumped into the pit.

6.3 Burning

6.3.1 Fuel additive

Diesel fuel is a safer alternative to MOGAS for starting fires or accelerating them, but the type of fuel will best be determined based on what is available. Since fuels burn at different rates, it is best to add fuel in a controlled manner, slowly and not to the point of saturation. Fuel should not simply be dumped into burning sections. As much separation as possible should be maintained to ensure safety.

6.3.2 Ignition and sustainment of the burn

There are several factors to consider when igniting a burn pit, including the amount of refuse, the type, and whether it is wet or dry. If the tool is available, a long stick with POL-soaked fabric at the end can assist in ignition.

As mentioned in Section 5, the pit needs to be large enough so that parts of the pit continually burn while other areas of the pit are available for off-loading of refuse without being impacted by smoke from the active burn. The burn pit should have an active burning area and a separate disposal area. Refuse should never be thrown directly into an actively burning pile.

6.3.3 Aeration

The burn pit must have proper air flow, referred to as aeration, to have a continuous and complete burn. To achieve proper air flow, the windrows are positioned perpendicular to the predominant wind direction. Waste within the pile should be loose and not compacted. Sifting the waste prior to ignition aids the aeration process and complete burning.

Aeration occurs by the movement of air through the pile, also called the chimney or stack effect. As air heats, it expands and begins to rise.* As a result, proper airflow circulation to the flame is vital to sustaining a continuous burn.

* USA, United States Forces – Afghanistan, USFOR-A JENG. Environmental Standard Operating Procedures Afghanistan. 109-210.

Aeration also prevents smoldering, which can produce excess smoke hazardous to operator's health and surrounding personnel. If air is not allowed to circulate, the fire could go out or not burn as well. If possible, turning the material in the burn pit is necessary to get a more complete burn of the waste. Ensure that at no point the flames exceed 2 to 3 ft above the material.

Smaller burn piles can be aerated using field expedient methods, such as a chimney made of metal drums. For larger burn pits, turning the material may be completed with heavy equipment or manually with long poles. With considerations to METT-TC, the best solution minimizes exposure and time near the burning material. After ashes have cooled, the debris should be pushed to the end of the burn pit and backfilled. If heavy equipment is available, ensure that it is regularly maintained and has backup alarms (Anderson and Wolf 2004).

7 Sustainment and Disposal

Sustainment of burning operations and disposal of the remains of these operations are important factors to consider before deploying to and establishing contingency locations. It is important to be able to keep the operation running smoothly and to have a plan for how and where these materials will ultimately be disposed. Monitoring and ash disposal are key elements of these factors.

Note that this section is included for situational awareness and informational purposes for larger operations, but it is not always feasible or practical to anticipate that subject matter experts (SMEs) will be able to visit every camp, especially during swift contingency operations. Units in short-term operational stopping points (days to weeks) should not be letting refuse become a hazard to their operations. These units should be applying some basic principles: do not burn prohibited items, do not breathe in smoke, and determine designated areas for disposing of waste.

7.1 Air emission monitoring

Monitoring and sampling requirements for air emissions should be contained in the approved authorization from the CCDR. The air monitoring plan should be developed by preventive health personnel and should include sampling constituents, frequency, sampling methods, and assigned responsibilities for sample collection. Due to the complexity of air sampling, it should only be performed by qualified preventive health personnel.

7.2 Ash sampling and disposal

When the tactical situation permits and when feasible, camps using burn pits must have an ash disposal plan that is a part of the SWMP. When disposing of ash, move it to the side of the burn pit and cover with soil daily. Residual ash sampling requirements should be contained in the approved authorization from the CCDR. The sampling plan should be developed by preventative health personnel and should include sampling constituents, frequency, sampling methods, and assigned responsibilities for sample collection. Due to the complexity of ash sampling, it should be performed only by qualified preventative health personnel. Ash samples that are classified as HW will be properly segregated and stored until they can be disposed of through DLA.

8 Solid Waste Recordkeeping

In a similar vein to Section 7, it may not always be feasible or practical to adhere to the specific procedures noted in this section. However, it is crucial that best practices and procedures be considered and utilized to the greatest extent possible.

8.1 Inspections

The Environmental Officer (EO) shall conduct weekly and monthly inspections of burn-pit operations to ensure operations are consistent with this SOP. The EO shall write and maintain monthly inspection reports and report violations to the responsible command. The monthly report should include and check for the following items:

- Operator name
- Average daily volume
- Base population
- Locked gate and controlled entrance
- Exclusion of recyclables, covered waste, and other prohibited items from the burning area
- Proper ash management and disposal
- Segregation of recyclable or reusable materials
- Traffic logs (user's unit, name of driver, vehicle ID, volume of material)
- Inspection of incoming loads before dumping
- Emergency notification procedures posted
- Adequate fire suppression equipment
- Burning being conducted only when the burn pit is downwind of the life support area
- Unapproved dumping (i.e., outside of designated areas)
- Observation of vectors or vector/pest remains.

8.2 Exposure records

Preventative medical physicians, or other qualified personnel, should establish an air emissions sampling program to record possible exposures. This must be approved by the CCMD. Consider recording the following:

- Dioxins
- Polycyclic aromatic hydrocarbons (PAH)

- Volatile organic compounds (VOC)
- Carbon monoxide (CO)
- Hexachlorobenzene
- Particulate matter–PM_{2.5} and PM₁₀.

8.3 Congressional notification

A CCDR determines that no alternative disposal method for covered waste is feasible other than through use of an open-air burn pit. Congress must be notified prior to 30 days after the CCDR makes the determination.

8.4 Fuel consumption

The burn-pit operator should record the volume of fuel used to ignite the waste. This will vary with the amount and composition of waste. Dry material may not require any fuel addition, but wet refuse, such as food waste, will require fuel. With experience, tracking fuel will help guide future burning by allowing the operator to predict fuel requirements. The safety officer should ensure that fuel storage requirements are met.

8.5 Estimated waste disposal

Keep track of the daily volume or weight of waste going into the burn pit, (daily traffic log). The traffic log should also list all the users of the burn pit, recording name and unit of the driver, truck number, and a brief description of the waste. Also, track base population, thereby giving you quantity of waste per person per day. This will facilitate planning should the population change. For example, doubling the population would likely double the amount of waste. Therefore, burn pit throughput must be sized to handle the extra load.

8.6 Burn pit closure

Upon closure, report to higher headquarters the dates the burn pit was open and closed and give an accurate map with grid coordinates. Also, include location of any ash disposal site, if at a separate location. *Before* photographs should have been included in the environmental baseline survey; closure photographs are required as part of the environmental site closure report.

The following items must be included when closing a burn pit.*

1. Collect pre- and post-clearance photographs of the burn pit to aid in any future investigations that may occur as a result of the site.
2. Identify the grid coordinates for each corner of the burn pit.
3. Prepare an environmental condition report consolidating all information collected and methods used during the use of the burn pit.
4. Ensure that the following are not present before backfilling a burn pit: propane cylinders, fuel cans, aerosol cans, paints, fuels, oils, chemicals, ammunition, explosives, combustibles, medical waste, metals, batteries, tires, and any other hazardous materials (This process should have been completed prior to waste disposal in the burn pit.).
5. Segregate and remove all recyclables (This process should have been completed prior to waste disposal in the burn pit.).
6. Identify and address any site-specific issues that may lead to groundwater contamination. Redirect or divert any local streams to avoid any surface runoff or percolation.
7. Use fill dirt to cover the burn pit must be cleaned and divested of logs, rocks greater than three inches in diameter, and extraneous matter.
8. Use a minimum of 6 in. of fill dirt as capping material.
9. Mark the site with permanent signs labeled "BURNPIT" using 4 in. letters. In addition, the unit closing the burn pit must be included in the sign name in 2 in. letters. The sign must also include the Military Grid Reference System grid coordinates and approximate area impacted by the burn pit. They shall be printed in both English and the local language (Anderson and Wolf 2004).
10. Wear proper PPE at all times. The requirements for each site will differ in each location but will encompass a minimum of a facial mask eyewear, boots, and gloves.
11. Use fill material that does not include excessive moisture to the point where it compromises slope stability. Some materials will require additional moisture to achieve satisfactory compaction.
12. Place backfill in 6 in. layers and compact to the greatest extent possible.
13. Spread POL-contaminated fill (if present) less than 3 in. thick for 60 to 90 days to reach a non-hazardous level. This will allow enough time for sunlight and natural bacteria to decompose the POLs.

* USA, United States Forces – Afghanistan, USFOR-A JENG. Environmental Standard Operating Procedures Afghanistan. 109-210.

9 Troubleshooting and Failure Prevention

Table 1. Troubleshoot and failure prevention (Anderson and Wolf 2004).

Issue	Remedy
Ground surrounding burn pit is smoking	None. This is likely moisture escaping the ground. The burn pit creates heat that will cause the surrounding environment to evaporate moisture. However, if the area that is smoking is a covered burn pit, it may be necessary to further investigate the cause.
Materials in burn pit are accumulating rather than burning	Check to ensure the materials in the burn pit are combustible. This may indicate that improper segregation processes are being performed. Check to ensure the burn pit has sufficient air-flow intake to sustain the fire. See Chimney or Stack effect.
Fire magnitude is too high	Wait longer between intervals of adding material into the burn pit.
Fire magnitude is too low	Check waste that has been added. Insufficient airflow circulation. Too much waste being put in at one time. Adding a combustible additive or waiting may be the best solution. Ensure proper airflow for burn pit.
Fire is burning multiple colors	This could be an indicator that batteries or hazardous materials have been thrown into the burn pit. Ensure proper segregation techniques are being performed. Stand off and wait for the colored flames to subside. Do not attempt to retrieve the improper materials.
Vehicles getting lost or confused in burn pit path	Ensure path of vehicles through burn pit is established prior to use and clearly marked to avoid confusion and reduce the risk of a missed stop and duration spent on site.

This reference is intended to serve as a guide as there will always be additional measures not accounted for in this table that will impact the resulting corrective action.*

* USA, United States Forces – Afghanistan, USFOR-A JENG. Environmental Standard Operating Procedures Afghanistan. 109-210.

10 Conclusion

This SOP for open burn pits was created to provide more guidance into solid waste management when there is a lack of options. Considering that improper usage of this technique could result in personnel health effects, there must be available resources and strict standards to protect the safety of those nearby. It should be clear that this waste management strategy is an effective way to reduce the buildup of wastes in a contingency location but does not come without risks. Proper risk management, materials processing, remains disposal, and recordkeeping will aid in the safety of those participating in open-pit burning and those working in proximity.

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Abbreviations

AOR	Area of responsibility
ASD(HA)	Assistant Secretary of Defense for Health Affairs
BOS-I	Base operating support-integration
CCDR	Combatant commander
CCMD	Combatant Command
CERL	Construction Engineering Research Laboratory
CO	Carbon monoxide
DHA	Defense Health Agency
DLA	Defense Logistics Agency
DoD	Department of Defense
DoDI	Department of Defense Instruction
EO	Environmental officer
ERDC	Engineer Research and Development Center
HAZMAT	Hazardous material
HRA	Health risk assessment
HW	Hazardous waste
JTF	Joint task force
LEC	Lead environmental component
LSA	Life support areas
METT-TC	Mission, enemy, terrain, troops available, time, and civilian considerations

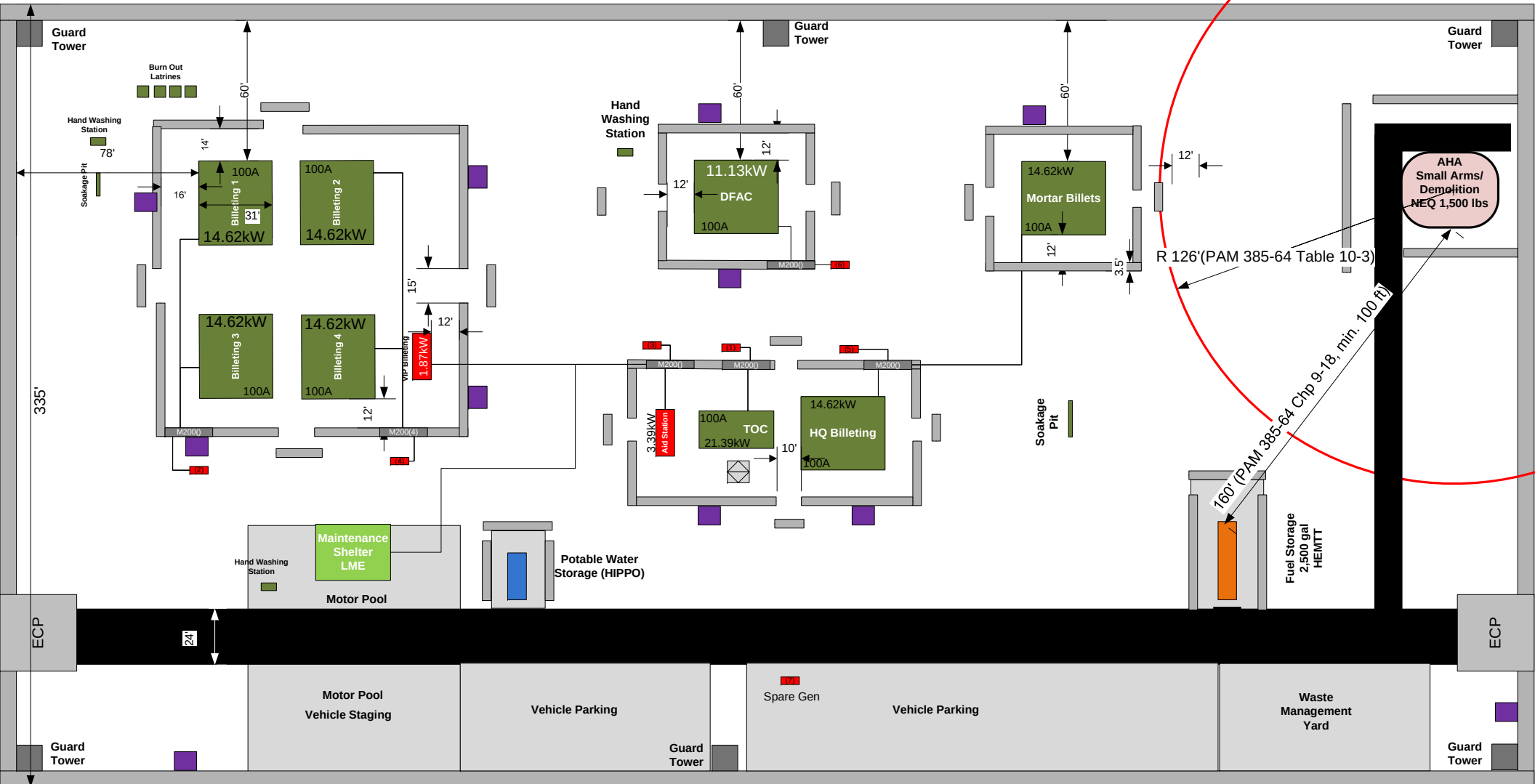
MOGAS	Mobility gasoline
NCO	Non-commissioned officer
NDAA	National Defense Authorization Act
OEHSA	Occupational and environmental health site assessment
OSD	Office of the Secretary of Defense
PAH	Polycyclic aromatic hydrocarbons
PM	Particulate matter
POL	Petroleum, oils, and lubricant
PPE	Personal protective equipment
QC	Quality control
RMW	Regulated medical waste
SME	Subject matter expert
SOP	Standard Operating Procedure
SW	Solid waste
SWLF	Solid waste landfill
SWMP	Solid waste management plan
USACHPPM	United States Army Center for Health Promotion and Preventative Medicine
VOC	Volatile organic compounds

Appendix A: Descriptions of Contingency Camp Layouts

This appendix presents three different-sized base camp layouts depicting suggested placement for a burn pit in relation to the camp (i.e., 50–75, 300, and 1,000 personnel). Source: SLB-STO-D.



656'

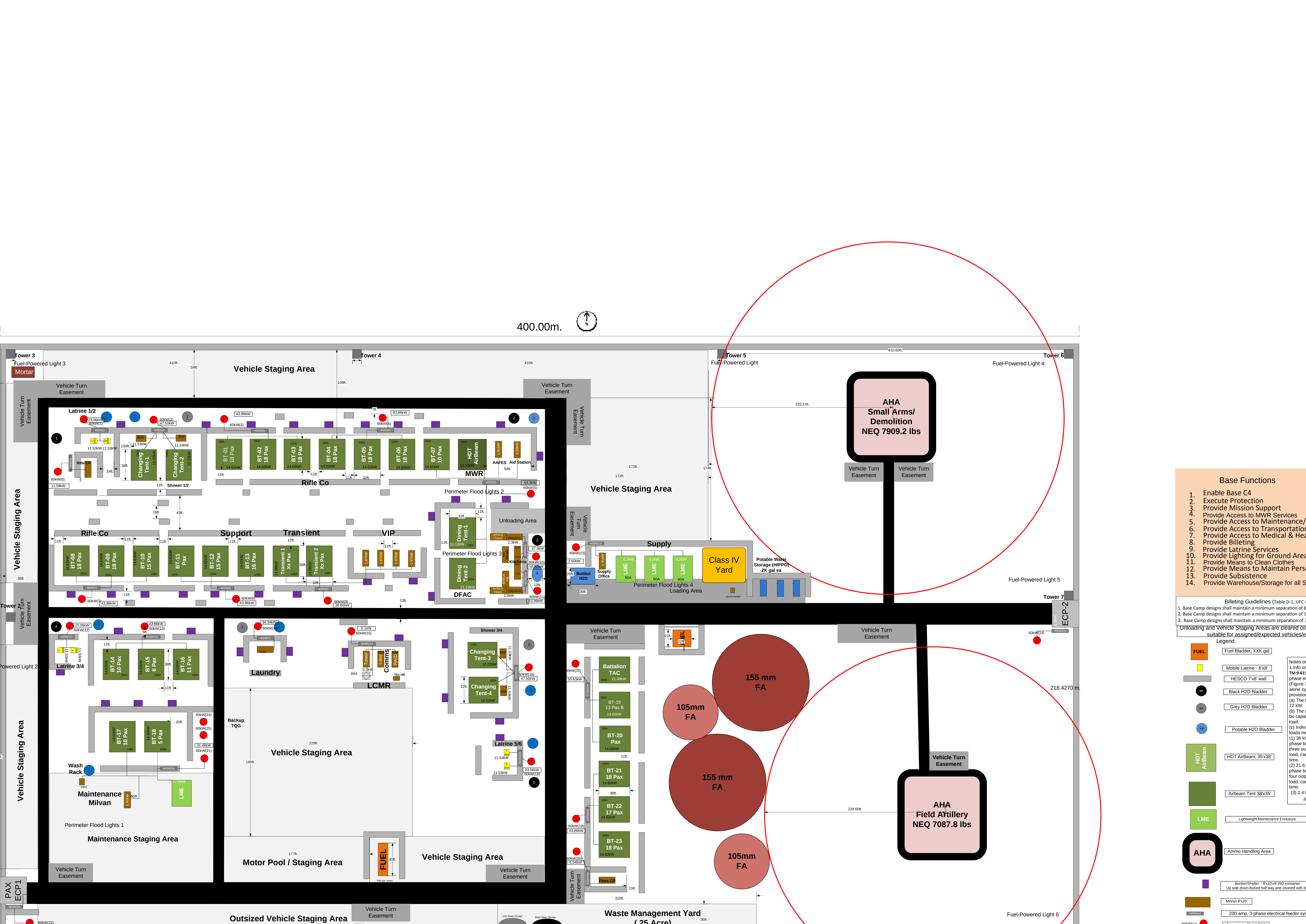


Legend

- Emergency Shelter (8x10')
- 30 kW Generator
- HECSO Wall Segments (3.5'x9'x10.5') MIL19 10842
- MilVan 8'x20'

Version	Change	Date	Author
V1.00	Approved	21 Jan 2014	N. Putnam
V1.01	Updated w/ Demo 1 Technology	21 Aug 2014	D. Fleury
V1.02	Updated Generator Mapping	6 Oct 2014	J. Ouellet
V1.03	Minor formatting	7 Oct 2014	Carpenter

BURN PIT



Base Functions

1. Enable Base C4
2. Execute Protection
3. Provide Mission Support
4. Provide Access to MWR Services
5. Provide Access to Maintenance/
6. Provide Access to Transportation
7. Provide Access to Medical & Hea
8. Provide Billeting
9. Provide Latrine Services
10. Provide Lighting for Ground Area
11. Provide Means to Clean Clothes
12. Provide Means to Maintain Pers
13. Provide Subsistence
14. Provide Warehouse/Storage for all S

Billeting Guidelines (Table D-1, UFC)

1. Base Camp designs shall maintain a minimum separation of 6
2. Base Camp designs shall maintain a minimum separation of 3
3. Base Camp designs shall maintain a minimum separation of 3

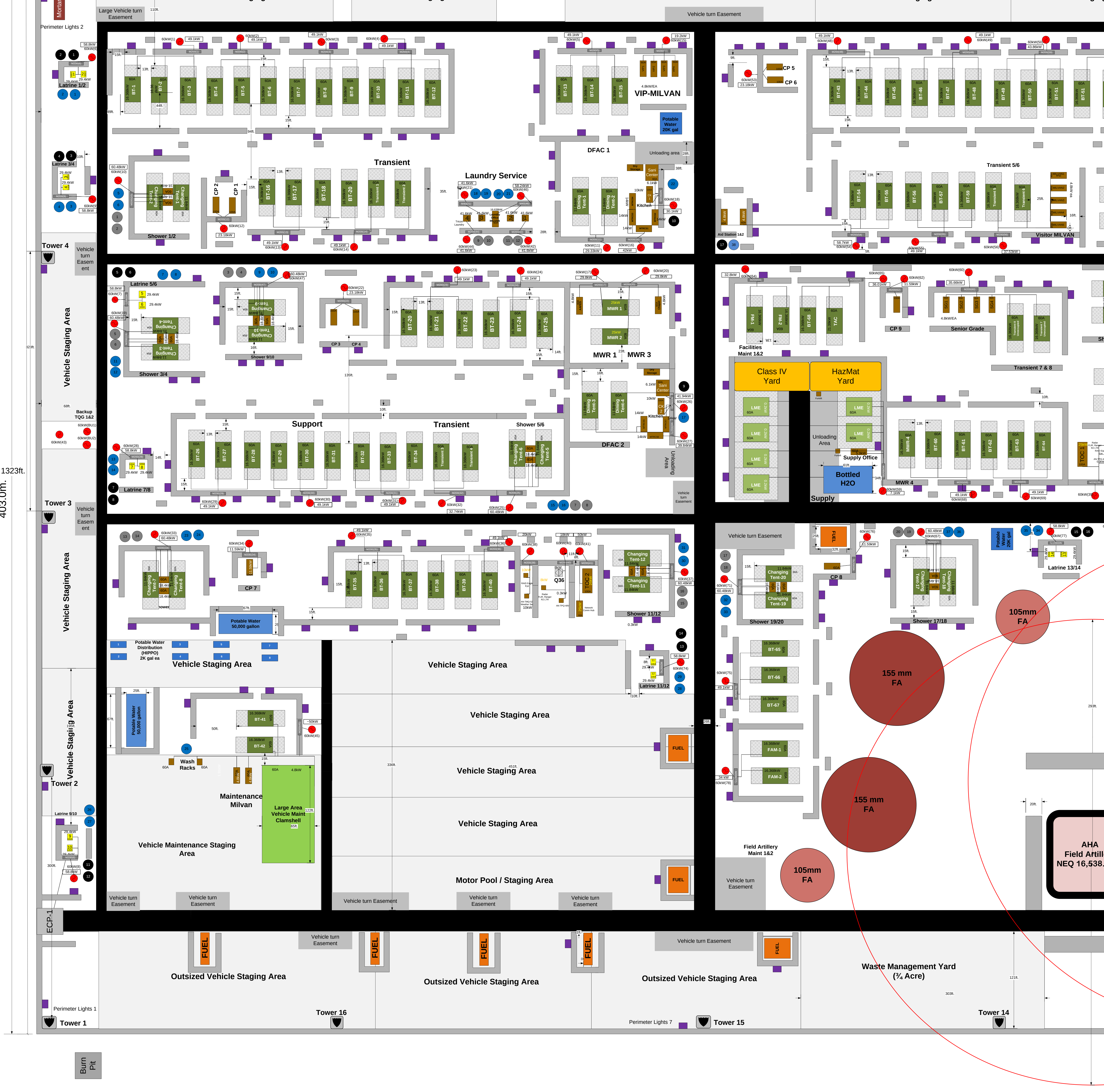
Unloading and Vehicle Staging Areas are cleared co

suitable for assigned/expected vehicles/e

Legend

- FUEL Fuel Bladder, XXK gal
- Mobile Latrine - 6'x8'
- HESCO 7'x8' wall
- Black H2O Bladder
- Grey H2O Bladder
- Potable H2O Bladder
- HDT AirBeam
- HDT AirBeam, 35'x38'
- Airbeam Tent 38'x35'
- LME Lightweight Maintenance Enclosure
- AHA Ammo Handling Area
- Bunker/Shelter - 6'x10'x8' ISO container
- Up side down-Burned half way and covered with d
- MilVan 6'x20'
- 200-amp, 3-phase electrical feeder sy

Notes on
1. Info on
TM 9-61
phase 6
(Figure
alone sy
provision
(a) The
72 kW,
(b) The
be capa
load,
(c) Indiv
loads m
(1) 36 k
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load, ca
time,
(2) 21.6
phase b
four ou
load, ca
time,
(3) 2.4
P



Appendix B: Base Camp Agency Matrix

This appendix presents a green, amber, red decision matrix for agency determination.

[illegible]

Appendix C: Regulatory Requirements and Guidance

National Defense Authorization Act of 2019 Section 355

Report. Not later than 180 days after the date of the enactment of this Act, the Secretary of Defense shall submit to Congress a report that includes:

- a. Details of any ongoing use of open burn pits.
- b. The feasibility of phasing out the use of open burn pits by using technology incinerators.

Open Burn Pit Defined. In this section, the term “open burn pit” means an area of land:

- a. That is designated by the Secretary of Defense to be used for disposing solid waste by burning in the outdoor air.
- b. Does not contain a commercially manufactured incinerator or other equipment specifically designed and manufactured for the burning of solid waste.

Department of Defense Instructions 4715.19 - Use of Open-Air Burn Pits in Contingency Operations

In accordance with the authority in DoD Directives (DoDDs) 5134.01 and 4715.1E, and the July 13, 2018 Deputy Secretary of Defense Memorandum, this issuance establishes policy, assigns responsibilities, and provides procedures regarding the use of open-air burn pits and the prohibition of the disposal of covered waste in open-air burn pits during contingency operations, except in circumstances in which no alternative disposal method is feasible. It is the official policy that the DoD:

- a. Uses an open-air burn pit as a short-term solution (≤ 180 days) during contingency operations where no alternative is feasible. For the longer term (> 180 days), incinerators, engineered landfills, or other accepted solid waste management practices must be used whenever feasible. Congress must be notified no later than 30 days after the Combatant Commander makes the determination that covered waste must be included in the

- open burn. A justification for anything over 180-day periods. Congress must be notified not later than 30 days after the CCDR makes the determination.
- b. A justification for subsequent 180-day periods during which covered waste is disposed of in the open-air burn pit covered by the original notice.
 - c. Only operates open-air burn pits in a manner that prevents or minimizes risks to the human health and safety of DoD personnel.
 - d. Prohibits the disposal of covered waste in open-air burn pits during contingency operations, except in circumstances in which no alternative disposal method is feasible, as determined in accordance with the procedures in this issuance.
 - e. Minimizes the disposal of non-covered waste in open-air burn pits during contingency operations through actions that include reusing materials, reducing waste, recycling, and incineration.

Procedures:

As security and logistical concerns permit, sited at least 2,000 feet from any living, dining, or work areas to prevent or minimize exposures to personnel, and be downwind of the prevailing wind direction<citation>. The siting of each open-air burn pit must be coordinated with the requisite security, safety, and appropriate medical authorities, and when practicable, local or host nation medical or civilian authorities, for the site.

Located where the burning or presence of garbage will not pose an un-safe attraction to birds or other wildlife; in or across the path of aircraft in the air or on the ground; or in any way that affects the ability of air traffic controllers to maintain visual contact with aircraft in the local traffic pattern.

Operated by qualified personnel to ensure the safety of all personnel. Personnel will have adequate training to perform their assigned duties and comply with the requirements of this issuance. The training program must address safe, open-air, burn pit operations, waste identification, safety and emergency procedures, recordkeeping, and security. Personnel,

including contractors, will complete training operating an open-air burn pit, and training will be:

- a. Administered by the CCMD personnel who have open-air burn pit experience.
- b. Documented for all personnel assigned duties associated with open-air burn pits.
- c. Provided to DoD contractors, before operating an open-air burn pit, in accordance with CCMD policies, terms, procedures, and the conditions of the contract.
- d. Operated in a manner that minimizes the attraction of insects or animals that could pose a direct or indirect (disease vector) risk to human health.
- e. Controlled to prevent unauthorized person from approaching the site.
- f. Inspected at least weekly for compliance with this issuance and monitored daily for effective operations and compliance stream restrictions by personnel qualified and trained in the requirements consistent with the issuance and applicable SWMP.
- g. Monitored for unacceptable exposures and health risks by occupational and environmental health (OEH) personnel in accordance with DoD Instructions (DoDIs) 6055.05 and 6490.03 and Joint Memorandum MCM 0017-12. For those locations with attached or assigned personnel in place for more than 90 days, a site-specific sampling plan, based on initial and periodic OEHSAs will be used to identify detailed monitoring requirements, priority, frequency, and number of samples routinely. Adequately assess open-air burn pit emissions and monitor hazardous constituents.
- h. Properly closed with locations documented and photographed in accordance with DoDI 4715.22.
- i. HRA Report Template included in section 3A.2 of DoDI 4715.19.

Waste Management for Deployed Forces (TM 3-34.56)

Locate the burn pit as far away as possible from living and sleeping areas, the flight line, hazmat area, and fuel storage areas. The prevailing wind must push the smoke away from these areas and the rest of the waste management facility. Locate the hazmat area away from living and sleeping areas, the flight line, fuel storage areas, and water sources. Locate the sorting area near the compacting facility and incineration area with ample allowance for traffic flow.

There are several controls that can reduce the potential health and environmental impacts associated with burning:

- a. Establish burn pits and incinerator sites far away (at least 450 feet for burn pits) from and downwind of inhabited areas, such as work and billeting areas. If possible, attempt to site all combustion operations away from potential future expansion locations for the base camp.
- b. Ensure that anyone operating and maintaining open-burning operations and incinerators comply with existing environmental guidance and manufacturer's instructions. This may require obtaining manufacturer-sponsored training as part of an incinerator procurement package.
- c. Purchase orders or contracts should stipulate that liability will be retained by the manufacturer (or contractor) for getting the incinerator into compliance with allowable emission standards (if applicable).
- d. Divert dining facility waste to a compost facility or to the landfill. Wet waste in the burn pit or incinerator will reduce the efficiency of combustion. Since incinerators will not handle wet garbage well, it is necessary to separate the solid from the liquid portions of the garbage. This is done by straining the garbage with a coarse strainer, such as an old bucket, salvaged can, or oil drum with holes punched in the bottom. The solids remaining in the strainer are incinerated, and the liquids are poured through a grease trap (see chapter 4) into a soakage pit.
- e. Ensure that no hazmat, hazardous waste (HW), special waste, lithium batteries, or heavy metals are incinerated, which could

- result in explosions or toxic gases.
- f. Increase combustion temperatures to destroy biohazards, decompose dioxins and other toxic compounds, and loft the plume higher for better dilution.
 - g. Prevent low heat or smoldering fires, which tend to emit toxic compounds and fail to loft the plume high enough for atmospheric dilution, by providing ample ventilation and carefully adding an appropriate amount of fuel.
 - h. Ensure that personnel supporting the burn operation wear the appropriate PPE for respiratory protection, biohazard shielding, heat protection, and fire hazard if handling supplemental fuel. Analyze the meteorological conditions and only conduct burning when the conditions ensure the protection of downwind populations and promote plume lofting and mixing.
 - i. Seek advice from experts, such as those within USAPHC who can assist units in monitoring burning operations and assessing health and environmental impacts.
 - j. Establish emergency response procedures and an emergency response team.
 - k. Emplace security fencing or berms to assist in limiting access to burn operations.
 - l. Provide trained operators to ensure that prohibited waste is not burned and to prevent unrestricted burning.
 - m. Establish burn times to optimize effective burning and to take weather conditions into consideration.
 - n. Ensure that burning operations are appropriately maintained to control the burn.

Disseminate base camp SOPs to senior commanders of tenant organizations before burning operations begin. The enforcement of the SOP by leaders within the chain of command will increase individual awareness and confidence in the process, eliminate the unnecessary use of small-unit burn barrels, discourage unauthorized midnight garbage dumping, and increase the habitability and safety of the camp.

Maintain quality control to ensure personnel safety and accurate record-keeping. Resources required to perform open burning may transition from

unit manpower and equipment to commercial or contracted over the course of the base camp life cycle.

Open burning is usually conducted in a dug-out area, such as a pit, but may occur above ground. Open burning can be harmful to human health and the environment and should only be used until more suitable disposal applications are established, such as the procurement and installation of a SW incinerator. There are several different ways that open burning operations can be conducted, but strict adherence to DOD guidance and theater environment SOPs must occur.

Once established, an open-burning site maintains fixed operating hours, usually during daylight hours only, and may operate seven days per week.

A designated person or crew opens the site for the acceptance of materials for incineration. The contents of each tipping vehicle, or garbage bag for burn barrels, are inspected to ensure that prohibited items are not inter-mixed. This also supports the collection of data for recordkeeping purposes. Consumable and sustainable supplies (fuel, fire extinguishers, communications gear, hand tools, PPE) are maintained at the site to support operations. Before daily burning begins, the base campfire service is alerted to the activities. As it becomes necessary, routine site maintenance (removal of ash and burn residue) and environmental quality monitoring is performed. Depending on the scope of maintenance or environmental monitoring, engineer equipment and industrial or occupational health technical support may be required.

Hasty burning operations may be conducted by tactical maneuver units during an operational pause in close combat. The decision to employ the hasty burn method is driven by two factors:

The units need to safely dispose of accumulated SW to maintain operational security, combat effectiveness, or tactical agility. Hasty burial is not a viable option.

The officer or noncommissioned officer in charge selects a site for the hasty burning. It may be a natural depression in the terrain or a rapidly excavated depression to use as a burn pit. After SW is deposited, a fuel source is applied and safely ignited. Once the contents have been eliminated, the site is capped with soil and the location is reported through

the chain of command. Hasty burning operations are similar to hasty burial operations in that they must adhere to published theater SW disposal guidelines.

Open-air pit burning is the most convenient method of burning, but it is also the least preferred method because of the inherent health, safety, and environmental hazards. A burn pit is a controlled open area where SW is collected and reduced in volume and putrescence by thermal decomposition. Burn pits can be shallow excavations or surface features with berms. Controls must be implemented to mitigate the health and environmental hazards associated with burn pits, and waste management planners must develop a plan to transition to an incinerator as soon as practical as the base camp matures and/or the population increases. Burn pit usage will follow DOD guidance. Alternative waste management practices (such as source reduction, recycling, incinerators, and landfills) are alternatives for managing DOD wartime waste streams, decreasing volume and potential for toxicity, and reducing the potential health impacts of burn pits.

Materials that create unreasonable amounts of smoke, fumes, or hazardous air pollutants should never be burned in a burn pit, burn box, or incinerator. These include HW; petroleum, oils, and lubricants (POL) products (other than the waste fuel that is used to start a fire); rubber; tar paper; asphalt shingles; tires; treated wood; batteries of any type; unexploded ordnance; aerosol cans; compressed gas cylinders; plastic (except insignificant amounts); paint; paint thinner and strippers; pesticides; pesticide containers; asbestos; appliances and electrical equipment; and electrical wires.

Noncombustible materials (such as metal) should be separated and stockpiled for recycling or appropriately landfilled as a last resort.

When burn pits are not actively burning, they should be covered with 4 to 6 inches of soil to prevent exposure to vectors. Upon closure, the date the burn pit was opened and closed and an accurate map with grid coordinates is reported to higher headquarters. This information will be useful in supporting environmental remediation efforts, as needed. Before-photos should have been included as part of an EBS or environmental conditions report (ECR), and closure photographs are required as part of the environmental site closure report.

CENTCOM Contingency Environmental Guidance (CCR- 200)

Below is a portion of the CENTCOM Contingency Environmental Guidance (CCR-200) that addressed the use of Burn Pits for units to consider using when developing their own Standard Operating Procedures based on their operating environment.

Open burning is the most convenient method of waste disposal initially as base camps are established. However, burn pits inherently create health issues and should be terminated as soon as practical, in order to protect the life, health and safety of USCENTCOM and coalition personnel. The disposal method must shift to incineration as camps mature.

Location Guidance:

Locate burn pits, burn boxes and incinerators so that prevailing winds carry smoke away from occupied areas. Burn pits, burn boxes and incinerators must be located as far away from occupied areas (billeting, etc.) as camp conditions and contingency operations will allow.

Prohibition Guidance:

The following prohibition guidance applies to burn pits, burn boxes and incinerators.

- a. No Petroleum, Oils, and Lubricants (POL) products (other than waste fuel to start a fire), rubber, tar paper, asphalt shingles, tires, treated wood, batteries of any type, unexploded ordnance (UXO), aerosol cans, compressed gas cylinders, plastic (except de minimis amounts), paint, paint thinner and strippers, pesticides, pesticide containers, asbestos, appliances and electrical equipment, electrical wires, or other materials that create unreasonable amounts of smoke, fumes, or hazardous air pollutants will be burned in a burn pit, burn box, or incinerator.
- b. Do not burn Hazardous Waste (HW) and/or Hazardous Materials (HAZMAT) in a burn pit or burn box. Do not burn Regulated Medical Waste (RMW) in a burn pit or burn box. Burning HW/HAZMAT/RMW produces hazardous air pollutants.

Burn pit/Open Burning Operations:

To prevent the development and spread of disease carried by flies, rats, and other vermin, burning may be necessary if solid waste cannot be treated, recycled, or buried. The following guidelines apply to burn pit operations:

- a. Minimize the amount of dirt in the material to reduce smoldering.
- b. Burn pits/burn boxes should operate from three hours after sunrise to three hours before sunset to ensure good smoke dispersion. Discontinue (do not add additional material) burning three hours before sunset.

Air Curtain (Burn Box) Operations (Note: Item is not covered in this SOP):

Operate burn box in accordance with the manufacturer's instructions (operator's manual and/or O&M manual). The burn box must provide the proper air velocity over the fire to operate properly.

Wet Waste:

Manage the amount of wet waste burned. In order to achieve maximum volume reduction and reduce smoldering, the goal is to keep the temperature elevated. Wet waste should never exceed 25% of the waste input.

Emissions Sampling/Monitoring:

Establish a sampling and/or monitoring system to sample/monitor pollutants emitted from burn pits, burn boxes and/or incinerators and document potential exposures. Monitoring should be done by trained/qualified personnel (such as the United States Army Center for Health Promotion and Preventative Medicine (USACHPPM)).

- a. Consider the following pollutants for periodic (at least yearly) sampling/monitoring.
 - Dioxins
 - Polycyclic Aromatic Hydrocarbons (PAH)

- Volatile Organic Compounds (VOC)
 - Carbon Monoxide (CO)
 - Hexachlorobenzene
 - Particulate Matter (PM) – both PM₁₀ and PM_{2.5}
- b. Sampling/monitoring results that show high levels of a particular pollutant must be worked on a case-by-case basis to determine cause(s) and resolution(s). Problem solving must include SMEs from various disciplines, including Environmental, FHP and USACHPPM.

Training and Qualifications:

All personnel operating burn pits, burn boxes, and/or incinerators shall be trained/qualified in the systems they operate.

United States Africa Command Instruction

Currently in DRAFT and not available for dissemination.

Appendix D: Sample Burn Pit Standard Operating Procedure (SOP)

This appendix presents burn pit standard operating procedures.

BURN PIT STANDARD OPERATING PROCEDURES

Unit Designation

Mailing Address / Location

Date

1. References

- DODI 4715.19 *Use of Open-Air Burn Pits in Contingency Locations*
- AR 200-1 *Environmental Protection and Enhancement*
- AR 700-147 *Contingency Basing*
- ATP 3-34.5 *Environmental Considerations*
- TM 3-34-56 *Waste Management for Deployed Forces*
- Guidance specific to AOR

2. Purpose

- a. This annex standardizes procedures for determining the need and operating principles required to safely dispose of solid waste using open-air burn pits in contingency locations.

3. Responsibilities

- a. Commander -
 - i. Establishes unit environmental policy
 - ii. Ensures that personnel comply with applicable SOPs, regulations, and instructions
 - iii. Approves the unit solid waste management plan (SWMP)
- b. Logistics Officer –
 - i. Provides required tools, equipment and PPE
 - ii. Participates in backhauling hazardous wastes and determining whether alternative options for disposal of covered and non-covered wastes are available
- c. Preventative Medicine –
 - i. Performs Occupational and Environmental Health Assessments, including the determination of appropriate site sampling methodologies
 - ii. Performs site sampling and analysis IAW the approved OEHS
 - iii. Responsible for reporting disposal of covered wastes in open-air burn pits IAW DODI 4715.19 Appendix 3A for all contingency locations with greater than 100 attached personnel for greater than 90 days.
- d. Environmental Officer -
 - i. Provides advice on environmental matters to the commander
 - ii. Ensures operation of the open-air burn pit IAW CCMD policies and this guidance.
 - iii. Ensures proper training for all burn pit personnel.
 - iv. Regularly inspects the open-air burn pit and related documentation.

4. Safety

- a. All personnel performing waste management functions should be issued proper personal protective equipment (PPE), to include:
 - i. Respiratory protection – half-face respirator with particulate filters (preferred) or HEPA quality dust masks
 - ii. Impermeable gloves
 - iii. Eye protection – goggles (preferred) or impact resistant lenses
 - iv. Safety toe shoes preferred
 - v. Optional: Nomex® or other fire retardant clothing
- b. Burning operations carry inherent risk. Do not attempt to load the burn pit with additional garbage during active burning operations.
- c. Munitions items, explosives, gasoline, kerosene, or other hazardous materials/hazardous wastes that present a serious risk of explosion should never be placed in the burn pit.

SECTION 1 – DETERMINATION OF NEED

1. Applicability

- a. Disposal of any solid wastes in an open-air burn pit is to be avoided unless no alternative is available. Incinerators, engineered landfills, or other accepted solid waste management procedures including waste minimization and recycling are to be preferred.
- b. Open-air burn pits are not to be used in contingency locations unless authorized in the commander's solid waste management plan (SWMP).
- c. For locations with more than 100 attached or assigned personnel in place for more than 90 days, the use of an open-air burn pit will be accompanied by implementation of a site-specific sampling plan based on the initial and periodic OEHS.
- d. No covered wastes as defined in Section 3 will be disposed of in an open-air burn pit unless no feasible alternative exists. If covered wastes must be burned, locations with more than 100 attached or assigned personnel in place for more than 90 days will provide initial and ongoing reports to the Office of the Under Secretary of Defense (Acquisition and Sustainment) IAW with the provisions of DODI 4715.19, Appendix 3A.

SECTION 2 – SITING AND CONSTRUCTION

1. Minimum standoff

- a. Open-air burn pits will be located a minimum of 610-m (2,000-ft) from any living, dining, or work areas, consistent with security and logistical requirements

2. Location

- a. The final designated location will be coordinated with safety, security and medical authorities. When appropriate, local civilian authorities may be consulted.
- b. Open-air burn pits will be sited opposite the prevailing wind direction for the location.
- c. If local data are available for determining the prevailing wind direction, then those source(s) should be preferred.
- d. If the location of prevailing winds is unknown, an estimate may be made using Air Force weather data.
 - i. Navigate to the CAC-enabled NIPR website for the 14th Weather Squadron, <https://climate.af.mil>
 - ii. Select "Country" from the drop-down menus, Select "Submit", and further refine based on the nearest AF weather observation station. The *Engineering Weather Data* products provide complete prevailing wind information by quarter when available.
 - iii. Further information is available in UFC 3-400-02 *Design: Engineering Weather Data*
- e. In the absence of any local data, the rough prevailing wind pattern may be estimated from global circulation:

Latitude	Prevailing winds from:
Greater than 60° N	North
60° N to 30° N	West or Southwest
30° N to 0°	Northeast
0° to 30° S	Southeast
30° S to 60° S	West or Northwest
Greater than 60° S	South

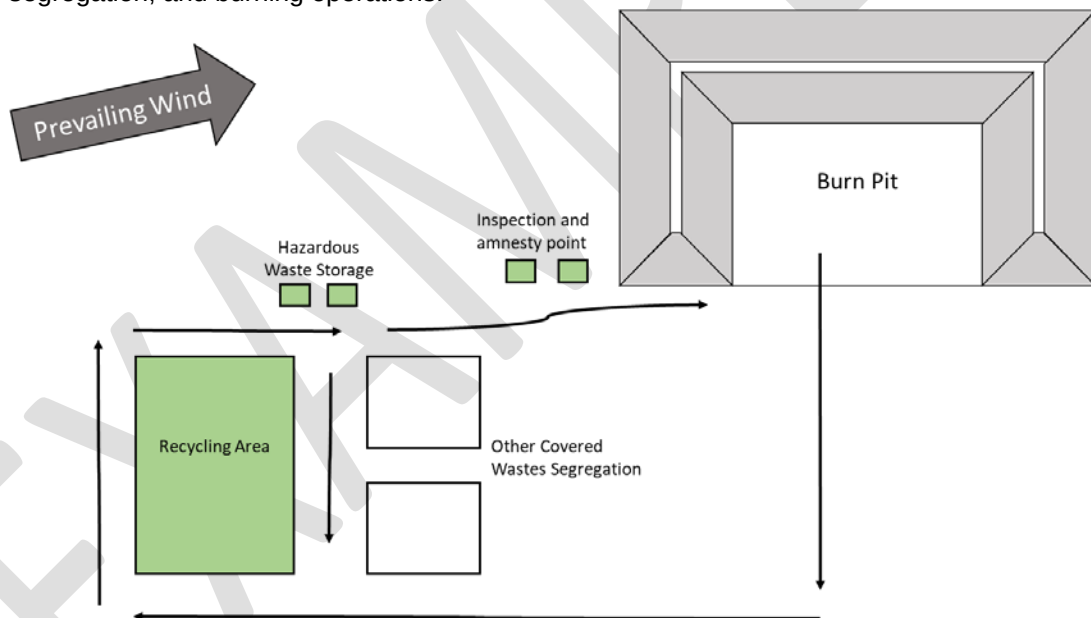
- f. NOTE: Pay careful attention to local terrain and buildings. These may affect the prevailing wind patterns at your site.
- g. Open-air burn pits will not be placed where smoke may be expected to occlude visibility for aircraft operations, or where the presence of garbage would create an unsafe attraction of wildlife affecting aircraft operations.

3. Construction

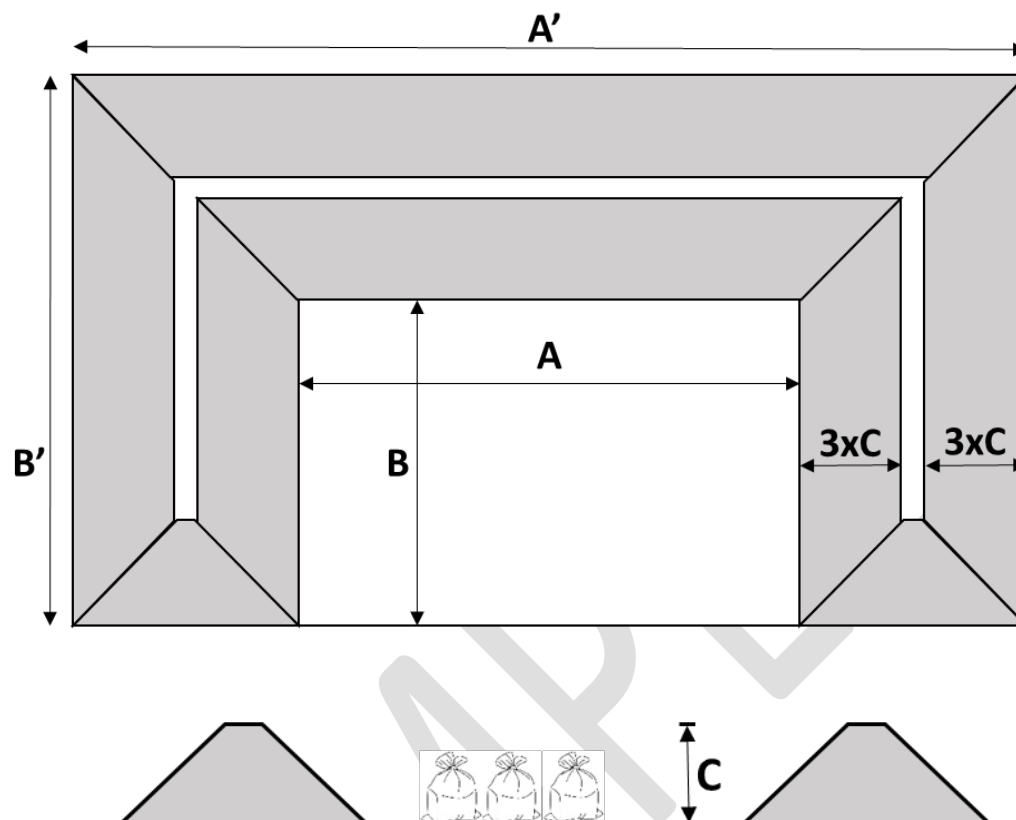
- a. Burn pits may be constructed above grade with a surrounding berm for protection or dug below grade.
- b. Capacity requirement
 - i. Collected observations for waste generation rates vary from less than 5 to greater than 20 lbs per person per day. In general, per person waste generation rates increase with total camp size. The average generation rate across several studies was 13.5 lb/person/d (Army Research Lab 2016)
 - ii. Army Capability Production Documents define 600 PAX and 150 PAX requirements as shown below. These documents specify a lower rate of generation (6-8 lb/person/d) than has been observed in recent contingency operations. Additional planning factors are available in TM 3-34.56.

600 PAX	3,000-4,000 lbs of mixed solid waste per day	10-27 cubic yards of mixed solid waste per day
150 PAX	750-1,200 lbs of mixed solid waste per day	3-8 cubic yards of mixed solid waste per day

- c. Layout
 - i. The waste handling area shall be an integrated system with space for waste handling, segregation, and burning operations.



- d. Pit construction
 - i. A pit suitable for up to 600 PAX may be constructed by modifying an artillery survivability position (ATP 3-37.34, pg 4-16) with appropriate depth and side slopes. An example with varying pit depths and associated capacities for solid waste is shown below. Side slopes for the final pit as constructed may be adjusted to reflect local conditions. The example shown assumes a side slope of 3:1 to ensure slope stability (TM 3-34, pg 8-52). Make use of local topography as needed. Ideal conditions will include one open side as reflected below to facilitate equipment movement and drainage.



Depth, C (ft)	A (ft)	A' (ft)	B (ft)	B' (ft)	Nominal Capacity (lb)
9	20	77	13	70	20,800
6	20	59	13	52	13,900
3	20	41	13	34	7,700

- e. A pit depth of 9 feet will accommodate up to 5 days of waste for a 600 PAX camp. For larger camps, constructing several pits side-by-side should be considered to gain flexibility in the burning schedule. If a larger pit is constructed, extend dimension A to the required width. Place waste in windrows parallel to dimension B to provide flexibility in burning operations.

SECTION 3 – OPERATIONS

1. Training

- a. All operations will be carried out by trained personnel. Personnel, including contractors, will complete training on local policies that will be:
 - i. Administered by CCMD personnel with open air burn pit experience, relevant training, and certification
 - ii. Documented for all personnel assigned duties associated with the open air burn pit
 - iii. Completed before beginning operations, including for contracted personnel IAW CCMD policies and the terms of the contract

2. Waste segregation

- a. **Munitions, explosives, and radioactive materials will be removed from all waste streams. These items will not be burned**, even if open air burning of other covered wastes has been permitted. Separate instructions are available for the proper disposal of these items (DoDM 6055.09 Vol. 6 for ammunition and explosives, DoDI 4715.27 for radioactive materials).
- b. **Batteries and parts from any aircraft will be removed from all waste streams, and will not be burned** in any open-air burn pit.
- c. Covered wastes as defined below will not be burned unless no other viable option is available. When covered wastes are burned at a location with more than 100 attached personnel for greater than 90 days, ongoing reports of burning activities consistent with the requirements of DODI 4715.19 Appendix 3A will be made to the Under Secretary of Defense (Acquisition and Sustainment).
- d. The below listed materials are covered waste categories, and will not be burned unless no other feasible option is available:

Hazardous wastes as defined in 42 USC §101(a)(13)	Fuel containers unless completely evacuated of contents
Medical wastes as defined in 42 USC §6992a(a)(1-10)	Aerosol cans
Tires	Polychlorinated biphenyls (PCBs)
Treated wood	Petroleum, oils, and lubricants (POLs) other than waste fuels for initial combustion
Batteries of any type	Asbestos
Plastics*	Mercury
Compressed gas cylinders with intact valves	Foam tent material
Any item containing any of the above materials	

*Excluding insignificant amounts remaining after good-faith efforts at waste segregation

- e. Waste segregation and storage will be accommodated near the burn pit area.
- f. Loads entering the burn pit will be inspected before drop-off to check for the presence of covered wastes.
- g. Access to the burn pit area will be restricted.
- h. Loads entering the burn pit area will be recorded in a daily operating log to include, at a minimum:
 - i. The estimated weight or volume of both wastes to be burned and segregated wastes. Use consistent estimating procedures and reporting.
 - ii. The user's unit, name of driver, vehicle identification, and arrival time
- i. To the extent feasible, food wastes and other wet, decaying materials should not be disposed of in open-air burn pits. Composting in a shielded container is preferred for these wastes (see TM 3-34.56).

3. Loading

- a. Loading of the burn pit will not occur during active burning.
- b. Mixed waste will be piled to a height not exceeding the surrounding berm height in a compact area of the burn pit.
- c. When space permits, waste should be arranged in windrows to permit flexibility in the size of burn events.
- d. When garbage must be stockpiled for several days before burning, take actions to minimize attracting vectors.
 - i. Avoid placing food waste in uncovered piles – segregation and composting of food wastes (TM 3-34.56) is preferred to open burning.

- ii. Cover decaying waste with daily soil cover or polyethylene liner.

4. Burning

- a. Careful attention should be paid to local weather conditions when preparing to burn wastes. Do not burn if there may be adverse winds or a temperature inversion that will trap rising smoke close to the ground.
 - i. Burning will not occur sooner than three hours following sunrise or later than three hours before sunset.
 - ii. Burning will not occur if local fog or a low cloud ceiling are observed at the burn site.
 - iii. Burning will not occur if local winds are blowing from the burn site towards working or living areas
- b. An accelerant may be used to increase burning rate and temperatures at the outset of the burn. Gasoline or MOGAS should not be used. Diesel or JP-8 fuel is appropriate. Waste fuel is preferred to limit unnecessary strain on base supplies.
- c. Burn events will be recorded in the daily operating log. At a minimum, the start time and end time of the burn event will be recorded.
- d. At the conclusion of a burn event, remaining ashes may be pushed to one side of the burn pit.
- e. Periodically remove ashes to a secure location, covered, on an impermeable base. Ash will be tested by the local medical authority designated by the geographic CCDR as required by the site OESHA. Ash determined to be non-hazardous may be disposed of in a landfill. Hazardous ash must be stored and removed as hazardous waste.

5. Monitoring

- a. Daily monitoring will be carried out by operating personnel to ensure compliance with these guidelines IAW DODI 4715.19 and AR 700-147.
- b. At a minimum, weekly inspections of operations and operating logs will be made to ensure compliance with these guidelines IAW DODI 4715.19 and AR 700-147.
- c. Regular monitoring and sampling will be performed by the local medical authority designated by the geographic CCDR. This may include air monitoring, soil samples, and ash samples as required by the site OEHS.

SECTION 4 – CLOSEOUT

- 1. When burning operations are no longer required, or at the conclusion of operations for the contingency location, the open-air burn pit site will be properly closed out.
- 2. Take digital photographs of the site, prepare a complete closure plan, and record grid coordinates for each corner of the burn pit.
 - a. Confirm that permissible waste is completely burned
 - b. Remove metal objects larger than 1 cu. ft. or greater than 2 ft. long and dispose of as scrap metal.
 - c. If hazardous wastes are suspected in the burn pit area, contact JENG.
- 3. Deconstruct structures in the waste management area IAW CCMD policies.
- 4. Re-grade the burn pit to match local site conditions.
 - a. Backfill the burn pit area with local soils and/or non-contaminated construction debris. Backfill at least 6-12" above existing grade.
 - b. If non-hazardous ash is landfilled, cover with at least 3-4 ft. of soil.
- 5. Clearly mark the perimeter of the area. Use signage stating, "Restricted – Former Burn Pit Area" in both English and the local host nation language.
- 6. Record the grid coordinates of the former open-air burn pit on the environmental site conditions report (ESCR), along with pictures of the site post closure.
- 7. Provide a report of the closure date, along with the ESCR, operating logs, photographs, diagrams, and maps to CCDR.
- 8. Notify the HN of the burial location.

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14. ABSTRACT Service engineer doctrine and field manuals, such as Army Techniques Publication 3-34.40, Technical Manual 5-634, and Army Regulation 420-1, offer guidance on solid waste management but do not provide the level of detail and practical guidance for open-air burning of solid waste to reduce risk to the Warfighter. Studies have shown that there could be ill health effects to service members from exposure to toxins from open-air burning. Further practical guidance is necessary to ensure that if there are no other means available for solid waste disposal, the risks associated with open-air burning are minimized as much as possible during contingency operations. Commands have limited resources and reduced personnel available to study which open-air burning procedures are optimal based on readiness and mission requirements. Planning for efficiency and risk avoidance in open-air burning operations includes several facets (e.g., site planning, processing, and recordkeeping considerations). This special report provides operational guidance to minimize risk of open-air burning for the Warfighter and other joint service personnel, particularly when there is no other alternative to open-air burning, during initial phase operating a burn pit or for waste management planning to establish standard operating procedures.						
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