Disaster Caches

Thanks to the help of our wonderful community partners, we have Disaster Supply Caches located at or near all of our schools in Lincoln County School District:

- At Kirtsis Park near Oceanlake Elementary School.
- At Taft 7-12 High School,
- Across the street from Newport Middle School by the Animal Shelter,
- At Toledo Elementary School,
- At Toledo Jr/Sr High School, and
- At Waldport High School.

The Caches are equipped to serve students and staff from all of our schools within walking distance of each cache. This also includes neighboring community colleges and private schools. The caches are a little bit different in each area and they do not have everything we need just yet, but we are adding more supplies to them every year. Over time they are becoming robust disaster caches that will meet our basic needs if an earthquake occurs while school is in session.

The agreement that we have with our community partners is that if a disaster occurs while school is in session, the schools can take immediate possession of the disaster caches and use the supplies to meet the needs of its students and staff. If school is not in session at the time of a disaster, the local jurisdiction (city, fire, law enforcement, etc.) can take possession of the disaster cache and distribute as needed to meet the needs of the community.

Listed on the following pages are inventories of each cache, followed by some basic instructions and considerations on how to deploy cache resources, depending on the conditions at the time of a disaster.
INVENTORY – NORTH AREA

Taft Disaster Cache – 1,300 Students/Staff
Located in Taft High School Parking Lot (SE Corner) in two steel containers

Shelter & Warmth
1300 Rain Ponchos
53 Tents (10 x 20, steel frame canopies)
56 Tarps (10 x 20, for floor of tents)
600 Sandbags (to help secure tents)
4 Step Stools (to help set up tents)
12 boxes Rope (500’ per spool) = 6000’ total (3/8 “ poly)
18 boxes Stakes (13 per box) = 234 total (12” spike nail)

Medical Supplies
1000 Medical Gloves
1000 Masks
2400 4 x 4 gauze (12 packs of 200)
175 Rolls of Tape (medical tape 1” & 2” mixed)
1 100-Person Trauma Medical Kit
1032 Hand Wipes

Other
4-person Search & Rescue Kit
30 Wind-up Flashlights
3 boxes Visqueen (20’x100’ each, clear, 6 mil)
2 Shovels (flat) for scooping up broken glass & debris
7 boxes Construction Bags (2’x4’, 20 per box)

Teen CERT Supplies stored in Taft High
75 Teen CERT Backpacks w/protective gear
4 Triage Tarps & Vests
Misc Cribbing wood, splints, portable stretchers, medical supplies, fire extinguishers, etc.

Water & Food
32 Filled, 55-gallon Water Barrels
1300 Water Filter Straws (20 gallons each)
2000 Disposable Drinking Cups
600 MRE’s (Meals Ready-to-Eat)
960 Survival Food Bars (3600 Calories)
450 Survival Food Bars (2400 Calories)

Oceanlake Disaster Cache – 600 Students/Staff
Located at Kirtsis Field parking lot in one steel shipping container

Shelter & Warmth
23 Tents (10 x 20, steel frame canopies)
23 Tarps (10 x 20, for floor of tents)
25 Tarps (12 x 20)
4,500’ Rope for tents
396 Tent Stakes
2 Step Stools
300 Rain Ponchos
300 Mylar Blankets
3 pair Moving Straps for tents
72 Wool Blankets (Red Cross)

Misc
300 Medical Gloves
2400 Masks
2400 4 x 4 gauze (12 packs of 200)
175 Rolls of Tape (medical tape 1” & 2” mixed)
1 100-Person Trauma Medical Kit
1032 Hand Wipes

Water & Food
16 Filled, 55-gallon Water Barrels (Refilled 2019)
600 Water Filter Straws (30 gallons each)

Emergency Supplies Stored in Oceanlake Elem School
1 Medical Treatment Kit, Ready-to-Roll Triage Kit
1 Light Search & Rescue Kit
10 Flashlights
5 AM/FM Radios
7 Tarps (3 – 9’4”x15’6” and 4 – 12’x16’)
4 Filled, 55-gallon Water Barrels
700 Rain Ponchos (divided into 20 backpacks)
319 Mylar Blankets
INVENTORY – WEST AREA

Newport Disaster Cache – 2000 Students/Staff
Located across the street from Newport Middle School by the Animal Shelter in 2 steel containers

Shelter & Warmth
57 Tents (10 x 20, steel frame canopies)
5 sets Forearm Lifting Straps (to move tents)
74 Tarps (10’ x 20’ blue poly)
13 Tarps (9’4” x 15’6” and 4 – 13’2” x 17’6”)
8 boxes Rope (500’ per spool) = 4000’ total (3/8 “ poly)
15 boxes Stakes (13 per box) = 195 total (12” spike nail)
1144 Mylar Blankets
4 Pop-up Tent Canopies
2000 Stocking Caps
1 box Socks
1 box Blankets

Medical Supplies
1000 Medical Gloves
1000 Medical Masks
2400 4 x 4 gauze (12 packs of 200)
175 rolls Tape (medical tape 1” & 2” mixed)
1032 Hand Wipes
1 100-Person Trauma Medical Kit
4 Triage Tarps (1 red, 1 yellow, 1 green, 1 black)
5 First Aid Kits
1 box Hospital gowns & linens
1 box Wash clothes

Other
40 Wind-up Flashlights
1 Search & Rescue Kit in large green garbage can
3 Sat Phones in individual bags
2 Fire Extinguishers
4 Poles
2 Duffel bags full of empty duffle bags
1 tub Food Grade Hoses
3 boxes Visqueen (20’ x 100’, clear, 6 mil)
2 flat Shovels (for scooping up broken glass & debris)
7 boxes Construction Bags (2’x4’, 20 per box)

Supplies stored in Newport Middle School
3 Filled, 55-gallon Water Barrels (downstairs)
450 Wool Blankets (Red Cross) (attic)

Newport High School Teen CERT Cache
Located in the NHS East Campus Parking lot in 2 steel containers. Some supplies are stored in the school.

60 Teen CERT Search & Rescue Backpack Kits
60 Teen CERT Medical Response Fanny Packs
4 Triage Tarps
Misc. Cribbing Supplies
Misc. Medical supplies (splints, bandages, blankets, etc.)
Misc Fire extinguishers
Misc. Stretchers
# Toledo Elementary Disaster Cache – 750 Students/Staff

Located next to the Generator building in a steel container.

<table>
<thead>
<tr>
<th>Shelter &amp; Warmth</th>
<th>Medical Supplies</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 Tents</td>
<td>1000 Medical Gloves</td>
</tr>
<tr>
<td>750 Mylar Blankets (most are in classroom yellow buckets)</td>
<td>1000 Masks</td>
</tr>
<tr>
<td>13 Tarps (4-13 x 17.5 and 9-9 x 15.5)</td>
<td>2400 4 x 4 gauze (12 packs of 200)</td>
</tr>
<tr>
<td>25 Tarps (10 x 20 for tent floors)</td>
<td>175 Rolls of Tape (medical tape 1” &amp; 2” mixed)</td>
</tr>
<tr>
<td>3000’ Rope (6 boxes @ 500’ per box)</td>
<td>1 100-Person Trauma Medical Kit</td>
</tr>
<tr>
<td>325 Tent Stakes (12”)</td>
<td>1032 Hand Wipes</td>
</tr>
<tr>
<td>122 Wool Blankets (Red Cross)</td>
<td></td>
</tr>
<tr>
<td>322 Rain Ponchos</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Water &amp; Food</th>
<th>Misc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 Filled 55-gallon Water Barrels</td>
<td>1 Search &amp; Rescue Kit (4-person)</td>
</tr>
<tr>
<td>750 Water Filter Straws</td>
<td>25 Wind-up Flashlights</td>
</tr>
<tr>
<td>2 Water Jugs</td>
<td>2 boxes Visqueen (20’ x 100’, clear, 6 mil)</td>
</tr>
<tr>
<td>2000 Disposable Drinking Cups</td>
<td>2 flat Shovels (for scooping up broken glass &amp; debris)</td>
</tr>
<tr>
<td>4 Hydration Packs</td>
<td>7 boxes Construction Bags (2’x4’, 20 per box)</td>
</tr>
<tr>
<td>40 Survival Food Bars</td>
<td></td>
</tr>
</tbody>
</table>

This is our newest cache. Many of these supplies are currently on order and should be in the cache by the end of 2019.

<table>
<thead>
<tr>
<th>Toledo Jr. Sr. High Disaster Cache – 350 Students/Staff</th>
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<tbody>
<tr>
<td>Located in the parking lot behind the gym in a steel container.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Shelter &amp; Warmth</th>
<th>Teen CERT Supplies</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 Tents (10 x 20)</td>
<td>25 Teen CERT Search &amp; Rescue Backpack Kits</td>
</tr>
<tr>
<td>12 Tarps (10 x 20)</td>
<td>4 Triage Tarps</td>
</tr>
<tr>
<td>1500’ Rope (3 boxes @ 500’ per box)</td>
<td>Misc. Cribbing Supplies</td>
</tr>
<tr>
<td>195 Tent Stakes</td>
<td>Misc. Medical supplies (splints, bandages, blankets, etc.)</td>
</tr>
<tr>
<td>200 Sandbags</td>
<td>Misc. Fire extinguishers</td>
</tr>
<tr>
<td>350 Rain Ponchos</td>
<td>Misc. Stretcher</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Water &amp; Food</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10 55-gallon Water Barrels</td>
<td></td>
</tr>
<tr>
<td>1 55-gallon Drum Dolly</td>
<td></td>
</tr>
<tr>
<td>350 Food Bars</td>
<td></td>
</tr>
</tbody>
</table>

LCSD DISASTER CACHE INVENTORY & INSTRUCTIONS 10/3/19
INVENTORY – SOUTH AREA

Waldport Disaster Cache – 750 Students/Staff
Located in an exterior building at Waldport High School just west of the main parking area

The tents are currently stored at the Waldport Public Works building just south of the school, and will be moved to this disaster cache. Items marked in yellow will be distributed to the City & Fire Department for storage in other disaster caches in the city and fire district.

Shelter & Warmth

35  Tents *(15 go to CITY/FIRE)*
726  Wool Blankets (Red Cross)
250  Mylar Blankets
74  Tarps (10’ x 20’ blue poly)
13  Tarps (4-13 x 17.5 and 9-9 x 15.5)
1  Pop up Canopy
23  boxes Rope (500’ ea) (3/8’poly) *(6 Boxes go to CITY/FIRE)*
559  Tent Stakes (12'' spike nail) *(195 go to CITY/FIRE)*
400  Sandbags

Water & Food

43  Filled 55-gallon Water Barrels
750  Water Filter Straws *(150 go to CITY/FIRE)*
1250  Survival Food Bars
2000  Paper Cups
2  Water jugs

Medical Supplies

1  100-person Trauma Medical Kit
1000  Medical Gloves
1000  Medical Masks
2400  Medical 4 x 4 gauze (12 packs of 200)
175  Rolls of Tape (medical tape 1” & 2” mixed)
1000  Hand wipes
15 boxes Hand wipes (1000 count) *(5 Boxes go to CITY/FIRE)*

Teen CERT Supplies

50  Teen CERT Backpacks w/protective gear
4  Triage Tarps
Misc.  Cribbing Supplies
Misc.  Medical supplies (splints, bandages, blankets, etc.)
Misc  Fire extinguishers
Misc.  Stretcher

Misc.

4-person Search & Rescue Kit
25  Wind-up flashlights
10 boxes Visqueen (20’ x 100’, clear, 6 mil)
2  flat Shovels (for scooping up broken glass & debris)
73 boxes Construction Bags (2’x4’, 20 per box)
32  5-gallon buckets *(ALL go to CITY/FIRE)*
2  Staple Guns & 5000 staples
WATER

Water is needed to survive! In a catastrophic disaster when water supplies are very limited, you will have to be creative, disciplined, and strategic about water collection and distribution. Water is needed for drinking, cooking, and sanitation. Here are some things to consider:

**Warning—Read this First:** If you suspect the water is unsafe because of chemicals, oils, poisonous substances, sewage or other contaminants, do not drink the water. Do not drink water that is dark colored, has an odor, or contains solid materials. Err on the side of caution.

**Water Collection Systems:** You will need to set up multiple water collection systems immediately. Be creative. Use buckets and containers of all sorts to collect rain water. Set up systems with tarps, pipes, gutters, whatever you can come up with to collect rain water. You will need a very large amount of water for a very long time to work to keep everyone hydrated and healthy. Do not wait. Set up these systems immediately! You never know when you will get rain.

**Creeks/Streams:** You may also consider collecting water from creeks, streams, lakes, ponds…but ONLY IF they have not been contaminated by tsunami waters. Water sources that have been inundated by the tsunami will carry a lot of hazardous materials in them. Also check the creeks/streams for other possible sources of contamination. Boil water collected from creeks or streams if feasible.

**Water Filter Straws:** Assign and distribute water filter straws as needed. These should be used to filter water collected from creeks, streams, rain and other sources. Most of our caches have enough water filter straws for 1 per person. They each filter 20 to 30 gallons of water depending on the model in your disaster cache. See water filter straw instructions located in the caches.

**Water Barrels:** Ration water carefully from the 55-gallon water barrels. Make it go as far as possible. This is good drinking water. Save this water for drinking rather than sanitation. Double check the expiration date on the water barrels. They have a water purifier solution which keeps the water safe for drinking for 5 years.

**Water Heater:** Depending on the situation at your school, you may be able to get water from a water heater unit at your school or from neighboring homes. Review the Water Heater Siphon Instructions located in the disaster cache to determine if this is a possibility.

**Boiling Water:** When in doubt, boil water to purify it. Filter cloudy water using coffee filters, paper towels, or a thin cloth, etc. Bring the water to a rolling boil for at least one full minute. Let the water cool before drinking. Add two drops of household bleach (non-scented) per gallon to maintain water quality while in storage. Avoid using bleaches that contain perfumes, dyes and other additives.

**Expired Survival Water Pouches:** If there are expired pouches of water in your cache, you may be able to use these water for sanitation purposes or use with the water filter straws for drinking water.
In a catastrophic disaster when food supplies are very limited, you will have to be creative, disciplined, and strategic about food distribution. Here are some things to consider:

**Food in School Kitchens:** We hope it will be safe to enter the school to salvage things like food. If you deem it is safe for buddy teams of staff to go in for very short periods to salvage things, use the hard hats, leather gloves and other protective gear in the Search & Rescue kit to enter the school. The food in our school kitchen is almost all edible without being cooked. Work with your kitchen staff to devise a plan to utilize this food.

Some considerations:

- **Carefully plan the rationing of food.** You may be on your own for several weeks. Make the food go as far as possible. You will probably have to think differently about portion size, frequency of meals, etc.
- **Make an inventory of what you have.** Devise a written plan based on what you have and how many people you are caring for. Try to make it stretch out for as many weeks as possible.
- **Open refrigeration units as infrequently as possible.** Work to make a list of what is inside each refrigeration unit so you can plan without having to open the units very often.
- **Eat perishable foods first.**

**Survival Food Bars:** The survival food bars are perforated so they can easily be rationed. Use this food source last, since kitchen food sources may spoil with no electricity to keep them fresh.

The survival food bars should have a very tight seal to each package. If the seal is broke (if it appears to have air inside the package), the food is not safe to eat. It must be discarded.

The survival food bars have an expiration date. If the seal is in place and it is not expired, it should be safe to eat. If the seal is in place and it is expired, you will have to decide whether or not to eat it. MREs (meals ready to eat) are usually good to eat years beyond their expiration date as long as the seal is fully in place. In a survival situation, you will need to make that difficult decision.

**Local Forest Edibles:** Determine who knows about edible foods that may grow near the school and make a task group to organize and begin hunting for and harvesting edibles. There is a small, laminated picture guide of local forest edibles in each disaster cache.
Shelter and warmth are key elements to survival. Work to keep people dry and warm. This will help prevent hypothermia.

**Tents:** Consider how to set up a “tent city”. Think about how school classrooms are configured with walking space (halls) in between classrooms and other areas. Schools also have gathering areas (MP Rooms, Cafeterias, etc.). Position the tents practically, in a manner that will allow for movement and access. Consider how to label them so that students and staff can be assigned a tent and easily identify which tent they are assigned to. You may just use a sharpie pen to number the tents. There are step stools in the disaster cache to assist with reaching the beams for attaching the side panels.

Rain will gather on and fall from the top of the tents—this may be a water collection source. Remember this when positioning the layout and organization of tents.

**Secure Tents:** Stake, tie, and secure the tents extremely well. This is very important. The wind can easily pick up these units, causing injury. Work to secure them firmly. Consider using the fencing on the athletic fields as part of the tie-down structure. You may be able to use rope, stakes, sandbags, or other items to help secure the tents. Do your best. Get creative. Think about the supplies available to you that you can salvage from the school that may be used to help secure the tents. Do not underestimate the power of the wind. Tie tents down securely.

**Heat Sources**! Do not use any heat sources inside the tents. This is a very important safety requirement! Do not have small campfires in the tents, do not use small space heaters (not that there will be power to do so anyway); and do not use any kind of heat source in the tents. The tents are flammable.

**Occupancy:** The tents are 10’ x 20’ and should shelter a classroom full of students. There are pole crossbeams that can be used to hang fabric or shower curtains or some other kind of screen for partitioning out sections of the tent if needed.

**Floors:** The tents do not have floors. There are enough 10’ x 20’ tarps in each cache for the floor of each tent. You may also be able to salvage things from the school to raise the floors and make the floors more practical and resistant to the damp ground.
WARMTH

**Blankets:** Mylar blankets are available—one per person in most caches. These blankets will keep you very warm, but they are fragile and can tear easily. Each person will need to be instructed to and reminded to take very good care of their mylar blanket. They may need to use it for several weeks. Label everyone’s blanket with a sharpie. A limited number of Wool blankets from the Red Cross may also be available.

**Hats:** Some caches have knitted hats.

**Salvage:** Salvage what you can from each school building, if it is safe to do so.

SANITATION & HUMAN WASTE DISPOSAL

In a catastrophic disaster when the sewer and water system is not operational, you will have to be creative, disciplined and strategic about restroom and sanitation needs. Here are some things to consider:

**Initial Considerations:**

**Yellow/Gray Toilet Buckets:** Immediately set up several temporary restrooms, using privacy screens made out of tarps or other available materials. All of our classrooms have 5-gallon buckets with toilet seat lids. These can be used for temporary toilets while working to set up short-term waste disposal latrines.

**Toilet Paper from School:** If it is safe to do so, attempt to salvage toilet paper from surrounding schools.

**Porta Potty:** Many of our schools have porta potty units at their athletic fields. Check to see if there are any around. They may provide a temporary place for toileting needs while you are constructing human-waste disposal sites.

Consider options for a short-term Human Waste Disposal Protocol as found in the following research paper:
This report provides a basic framework schools may use to safely manage and dispose of human waste after a catastrophic earthquake when traditional sewer systems are not available. It is designed to meet the needs of a school population of 600 students and staff who are living in tents for a one-month period due to the earthquake.

The timely development of a safe human waste disposal system will: a) provide a designated and private space for restroom needs, b) support a system to safely manage the human waste, and c) reduce and prevent the spread of disease.

An immediate and temporary system for restroom needs can be taken care through the use of buckets and privacy screens or tents. If buckets are used, extra strength trash bags can be placed inside of a 5-gallon bucket and human waste can be disposed of in the bag. Afterwards, human waste can be covered with disinfectant or dirt to reduce smell. Once the trash bag is at least 2/3 full, it can be tied off and then buried if sewage systems are still not available.

We will compare three different systems for disposing of human waste: 1) a Defecation Field, 2) a Deep Trench Latrine, and 3) a Simple Pit Latrine. Guidance will also be provided for materials needed to build each system, cleaning and maintenance of the systems, and personal sanitation recommendations.

**Human Waste Facilities**

**Location:**
Human waste disposal systems should be located so that they are easily accessible to the affected community, and the community should be consulted before the location is determined. To increase privacy standards, multiple facilities should be created in order to segregate each sex. Restroom systems should be no closer than 50 yards, and no further than 100 yards from the population’s dwellings, (Bastable, 2000, p. 8). Restrooms should be located downhill from all water sources and treatment stations, food storage and preparation areas, and the population’s settlement. The location should also be away from any major roads and buildings, and not be located in fields where crops are grown for human consumption.

**Operations**
Attendants and public health promoters should be recruited to encourage proper system usage and hand washing practices after usage. To ensure the sanitary use of the human waste systems:

- Provide full-time supervision;
- Provide anal-cleansing materials and methods for their safe disposal; and
- Provide hand-washing facilities (Harvey, 2007, p. 55).

Each disposal system should have two attendants available at all times. Users should then be guided to the necessary area for waste disposal to ensure that other areas are not used. Attendants can use marking tape or paint to mark off zones that are not currently available for use.

**Potential Resources for Construction**
- Shovels & Spades
- Partitions (shower curtain, cloth material, tarps)
- Nails, screws, rope, or zip ties to affix partitions
- Piping, metal rods, or wooden steaks to hold up partitions
- Garbage cans with liners
- Marking paint or tape
- Timber
**Cleaning and Maintenance: All human waste facilities should be cleaned regularly.**

If facilities are not clean, people will be discouraged to use them. Latrines should be cleaned on a daily basis to prevent disease transmission from human contact with human waste, flies, and also to prevent the spread of odors that are common with disposal methods during emergencies. Chlorine can be used to effectively clean floors and drop holes, but should not be exposed to the actual trench and feces because it interferes with the natural degradation of the waste. Mops and rags should be used for cleaning floorboards. Latrine attendants should be responsible for cleaning no less than once a day.

**Hand Washing: All human waste facilities should have a hand-washing station.**

Proper hand washing practices can significantly lead to the reduction of diseases. Human waste can directly cause diarrheal diseases, and provisions should be implemented that reduce the risk of fecal material from entering the domestic environment. Hand washing with soap, or other chemical compounds if soap is not available, is a key requirement of personal hygiene that should be promoted at three times: after defecation, after cleaning child defecation, and prior to handling, preparing, or cooking food. Soap should be provided for effective cleansing. If no soap is available, a chemical mix can be added to the plastic barrel. The barrel can have 15g of bleaching powder (approx. 35% active chlorine), to 2.5 gallons of water to create a safe hand-washing compound (Harvey, 2007, p. 55).

Miscellaneous water containers with taps will be most useful for users of the human waste facility (See Figure 1). Below the water container and tap should be a small mixed gravel soak way pit approximately 20 inches long by 20 inches wide, with a depth of no less than 3 feet. The pit should then be filled with gravel. Attached to this soak way pit will be an overflow channel that leads to a surface drainage channel. This will help communities manage where potentially contaminated water from hand washing will go, and direct such water away from any domestic environment and human waste facility.

![Figure 1. Note: Image provided by (Harvey, 2007, p. 167).](image)

**Anal Cleansing Material**

Arrangements must be made to assure the availability of appropriate anal-cleansing materials at or near all latrines, and an appropriate method of disposal if necessary, as this is essential for hygiene (Harvey, 2007, p. 170). Toilet paper should be the main source of wiping. It should not be assumed that the affected population will have their own supply of cleansing material during an emergency, and should be properly consulted on their preferred methods. Water, leaves, stones, and paper products are all materials that can be used for anal cleansing in an emergency environment.

Biodegradable objects, such as leaves, may be disposed of within the facilities. Solid waste materials, such as toilet paper, may cause latrines to fill up faster, so it may be necessary to provide receptacles where users can dispose of their waste materials, which can later be buried or burned away from the domestic environment so that they will not create a health hazard.

**Fly Reduction**

Flies tend to breed where human excreta is present, and are a major cause of the spread of illness and diseases. Flies may also determine whether or not the affected community uses the waste facilities. In order to control fly populations, human waste facilities should make sure all latrine lids are closed after usage. It is also necessary for human waste to be covered with soil on a daily basis when accessible. Regular cleaning of facilities is also a major fly reduction method.
Method #1: Defecation Field

A defecation field is simply a fenced off area for defecation which is managed in a controlled way. In extreme situations where there is a lack of resources, open defecation fields may need to be created for immediate relief. Defecation fields should only be used in extreme situations until other methods of waste disposal are available.

Defecation Field Set-up
The larger the area available for defecation fields is, the better. Allowing more space means the human waste on the ground will be less dense, reducing the probability of cross-contamination caused by human foot-traffic from the field, back to the residence dwellings. An access path approximately 3 yards wide should be created, and can also include entrance pathways and exit pathways. Strips of land should extend no longer than 20-30 yards from the access path, and should be approximately 1.5 yards wide. These strips of land should be marked with marking tape or paint. Only one strip should be open at any given time, unless a high volume of residents are using the field, then another strip may be opened in order to improve efficiency. A shallow drainage trench should be dug around the outside of the field in order to divert rain run-off from entering the field and contaminating further land downhill (see figure 2).

![Figure 2. Note: Image provided by (Adams & Wisner, 2002, p. 133).](image)

An improvement to the defecation field is to include a shallow trench (6 inches deep and 8 inches wide) within each strip of land [see figure 3] (Adams, 1999, p. 152). Feces can then be covered with soil after defecation occurs by using a shovel or a spade.

![Figure 3. Note: Image provided by (Harvey, 2007, p. 57).](image)

A perimeter should be set up around the field using plastic sheeting, cloth, tarps, thorny bushes, or other local materials to prevent individuals and animals from wondering through the field and spreading human waste beyond the designated land, and to increase privacy.

Pros of Defecation Field
- Rapid implementation
- Minimal resources required

Cons of Defecation Field
- Lack of privacy
- A large amount of space needed
- Difficult to manage

- Limits defecation to a controlled area
- Feces can be covered easily
- High probability of cross-contamination among users due to large amounts of traffic through the field
- Fields can only be used one time for this purpose, and will
require significant cleanup efforts.

- Extremely short life span
- User population must be properly educated and aware of cooperation needs
- Should only be used until a more sustainable option is available
- Can contaminate areas with high water tables

**Method #2: Deep Trench Latrine**

A deep trench latrine is similar to the shallow trenches utilized in a defecation field, but provide more depth and privacy (see Figure 4). This type of latrine is typically constructed in the immediate stages of an emergency, and is usable for up to three months.

**Figure 4.** Note: Image provided by (Adams & Wisner, 2002, p. 135).

**Deep Trench Latrine Set-up**

The trench should be no longer than 18 feet, providing enough space for six cubicles to be constructed. The trench should be approximately 2.5 feet wide. Depth of the trench may fluctuate depending on the soil and the depth of the known water table, but should be close to 6 feet deep for maximum efficiency. Walls within the trench should not be dug vertically; rather, sloping sidewalls of 5 degrees outwards should be dug to prevent the trench from collapsing.

The top 1.5 feet of the trench should be lined to provide support. One of the more practical, yet time-consuming methods of lining the trench is with wood. Poling boards (wooden planks) should be placed vertically on both sides of the trench every 1.5 feet, and should be long enough to cover the entire depth of the trench (6 feet). Wooden strut, approximately 4-inches by 4-inches, should be wedged across the width of the trench between the poling boards to provide supporting pressure to the walls. Sand bags may also be used to line smaller trenches and are usually locally available.

After the trench has been dug and supported internally, self-supporting plastic slabs or wooden planks should be added to the top of the trench where users will defecate. The purpose of the latrine slab is to cover the top of the trench and to provide a surface on which the user can squat (Harvey, 2007, p. 133). The plastic slabs or wooden planks should be able to support the weight of an individual and easy to clean. Wooden slabs may be the most efficient and readily available method to construct. Two cubicles, separated by partitions, will share the same wooden slab. For every two cubicles a latrine will have (two cubicles for every 6 feet), there should be three, 2-inch by 6-inch, joists that spread across the width of the pit, extending no less than 6 inches beyond the trench edge to ensure stability. Connecting and nailed to the three joists should be six, 3-inch by 7-inch by 36-inch floorboards. Each cubicle should have a “key” shaped squat hole human waste to fall into. Each squat-hole should be accompanied by a squat-hole cover made of wood, concrete, or other materials to reduce odor and the spread of flies.

The privacy structure should be constructed with an emphasis on promoting the most privacy possible. There should be a 2-inch by 2-inch post driven into the ground every three feet around the outside of the latrine. The front posts should extend 6 feet from the earth, and the back posts should be two inches shorter on the in the event a roof will need to be added to the structure to allow proper rain runoff. The posts parallel to one another across the latrine will be connected by a 1-inch by 2-inch rafter, cross tie, and a diagonal tie. Both a top long tie purlin and a long bottom tie should connect the back posts, and the front posts should follow in similar fashion (See figure 5). Once the privacy structure is pieced
together, privacy screens made of grass matting, cloth, or plastic sheeting should be added to surround the latrine, separate each squat hole, and to create doors, resulting in separate cubicles for usage. A roof can be constructed with similar local materials, but should ensure water does not breach the pit.

Figure 5 Note: Image provided by (Harvey, 2007, p. 145)

Pros of Deep Trench Latrine

- Low in cost
- No water needed for operation
- Easily understood by affected community
- Limits defecation to a controlled area
- Improved privacy compared to defecation field
- Life span up to 3 months

Cons of Deep Trench Latrine

- Possibility of contaminated water sources if built where the water table is high
- Chance of trench collapse if built on unstable soil
- Not practical for rocky environments
- Cleaning and maintenance of these communal facilities is often carried out poorly by the affected population
- Large amounts of timber may need to be salvaged for the construction of multiple latrines
**Method #3: Simple Pit Latrine**

This latrine consists of a pit that is circular, square, or rectangular in shape, covered by a plastic or wooden slab with a hole in which human waste may fall into. This is similar to deep trench latrines, but rather than having an elongated trench with numerous cubicles, a pit latrine is a single pit built for one toilet. A simplified privacy structure is then built around the outside of the pit providing maximum privacy.

**Simple Pit Latrine Set-up**

The pit should be as deep as possible, and no less than 5 feet deep. Although pits can be dug in square or rectangular shapes, an effort should be made to build them in the shape of a circle due to the decreased chances of a pit collapse. The diameter of the pit should be between 3 and 4 feet.

If there are concerns of the water table not allowing enough space for the necessary pits to be dug, the presence of solid rocks, or flooding dangers due to rainfall, alternatives may need to be used. In such conditions, the latrine may be constructed on a mound, similar to what you will find on a baseball field (See figure 6). A mound is meant to protect the pit and base from water runoff that might otherwise destroy the pit, and can be built by using the earth that has been excavated from the pit (World Health Organization, 2016, p. 25). If a mound is built, it should be lined at least 3 feet above ground level to prevent a collapse (see lining instructions within “Deep Trench Latrine Set-up”). To prevent the mound from eroding during heavy rainfall, the outside can be lined with rocks and gravel.

![Figure 6 Note: Image provided by (Stauffer & Spuhler, 2014).](image)

The floor should be constructed to withstand the weight of any one individual at a time, or an adult assisting a small child, as well as be easy to clean regularly. Every pit should have two, 2-inch by 6-inch joists that spread across the diameter of the pit, extending no less than 6 inches beyond the edge to ensure stability. Nails should connect six 3-inch by 7-inch boards that extend perpendicular to the joists across the pit diameter. Each pit floor should have a squat hole and cover like the deep trench latrine.

See “Deep Trench Latrine” section for guidance on how to construct the privacy structure. Both are identical in fashion, except the single pit latrine only requires a single cubicle for use.

**Pros of Simple Pit Latrine**

- Construction is simple enough where anyone who is physically able can help if they are given the proper tools
- Can be built and repaired with easily accessible local materials
- Depending on the amount of pits that need to be dug, simple pit latrines can be low in cost to build
- Long life span greater than three months if constructed properly (Stauffer & Spuhler, 2014).

**Cons of Simple Pit Latrine**

- If not covered correctly, flies may become a significant issue
• Constant odor problems
• Unless it is determined that the pit will be filled after usage is complete, it will require significant funds to empty excreta
• Disposing of anal-cleansing materials within pit will cause latrine to fill up much faster
• Susceptible to overflow or collapse during heavy rains
• Possibility of contaminating ground water (Stauffer & Spuhler, 2014).

**Recommendations**

The discussed human waste disposal systems are intended for the initial phase of an emergency, and should not be relied upon for longer than 1-3 months. These methods are presented in order to supply immediate relief to refugees while containing human waste to prevent the spread of illness. When dealing with emergency sanitation, it is important to act first, and improve later.

Although defecation fields are not the most ideal method of human waste disposal, they should be implemented while another option is being constructed. These fields may seem inconvenient for users, but it is important to contain defecation to an enclosed area to prevent the contamination of food and water sources, as well as the population’s living environment.

According to the United Nations High Commissioner for Refugees (1999), simple pit latrines are most suitable for low to medium population densities (up to 300 people), and are most effective when only used by a single family per pit. On the other hand, a single trench latrine that is 18 feet in length can serve nearly 150 individuals while taking up less space.

In a situation where 600 students and faculty may be living on schools grounds for one month following a Cascadia Subduction Zone earthquake, a trench latrine would be the most ideal human waste system. As little as four trench latrines would need to be built, and if relief efforts came within the first month after the earthquake, the longevity of the trenches wouldn’t be an issue. Privacy standards could be met with ease, and the school grounds should provide enough space for the necessary amount of latrines to be built in order to serve the 600 tent-city occupants.

**References**


Composting Human Waste by Anne Schatz

This plan is for long-term composting of human waste.

### Composting Human Waste Suggestions from Anne Schatz

**The System**

1. Construct a bin (at least one cubic yard) over bare ground using wood, pallets, cinderblocks, or other found materials. It should be covered to shed excess water and exclude animals and be close to the home (there will be no odor).

2. Fill the bottom of the bin with 18-24 inches coarse carbon material and forest duff to act as a sponge.

3. Put several inches of fine carbon material in the bottom of the bucket. Use the bucket as a toilet indoors. After each deposit, cover with fine carbon material.

4. When full (about 1 week), or at the maximum comfortable carrying weight, take bucket to bin. Empty bucket and cover with coarse carbon material. Clean bucket and dump water into compost bin.

5. For subsequent deposits into the bin, open a hole in the covering material and dump the bucket into the center. Add more cover material (coarse carbon material). You are striving to layer coarse carbon material between bucket contents. Add kitchen scraps and food waste, too, to limit refuse buildup.

6. Before the bin fills, construct a second bin.

7. When the first bin is full, add a thicker layer of cover material and allow to sit (ideally for a year). Repeat previous steps for the second bin.

8. When second bin fills, empty first bin into a pile and cover with a tarp (for additional curing) or spread contents outdoors.

### Minimum Supplies Necessary

- Bin to optimize heat, contain organic matter and cover materials, and preclude animals.
- Fine carbon material (sawdust, peat moss, shredded paper, needles, crushed leaves)
- Course carbon material (straw, weeds, intact leaves)
- Bucket

### Optional Supplies

- Extra buckets
- Lids for buckets

### Examples of Coarse Carbon-rich materials

- Straw, weeds, intact leaves

### Examples of Fine Carbon-rich materials

- Sawdust, peat moss, shredded paper, needles, crushed leaves

### Examples of Nitrogen-rich materials

- Green grass clippings, manure, carcasses, entrails, legumes

### Suggestions:

- Optimizing carbon/nitrogen ratio (20-35/1) in the presence of adequate moisture and oxygen will result in thermophilic (hot) compost.
- Composted organic material will be roughly one third of the original mass.
- Adding soil to compost will slow down microbial action and lower temperatures.
- The system, as described, produces no odors (if it does, add more carbon material), and has no flies.
- Adding human manure will ensure a concentrated nitrogen source for thermophilic composting. It really will get hot!
- With this system, it is not necessary (or desired) to turn the pile.
- Add buckets with lids (with optional items, if desired) and The Humanure Handbook to your emergency supplies.
- Read The Humanure Handbook. It’s available online free as PDF’s by chapter, or as an e-book for $10 (both at humanurehandbook.com) or as a paperback for $18.52 on Amazon.
- Watch “Humanure Compost Training in Haiti - Part 1 of 3” under videos at humanurehandbook.com to see how this system can be applied in a disaster scenario.

http://depoebaycert.org/resources/sanitation.html
Sanitation the right way and for the long haul ...

Remember that experts say that it may be as long as 1 to 3 years before our water and sewer utilities can be restored. Because of this, we need to know how to deal responsibly with pathogenic waste in a post-Cascadia earthquake scenario.

- **Presentation by Anne Schatz**
- **One page factsheet** (print this and put it with your sanitation supplies)
- **Compost bins**
  - [http://cwmi.css.cornell.edu/designscompostingsystems.pdf](http://cwmi.css.cornell.edu/designscompostingsystems.pdf)
- **Human Waste Composting**
  - [http://humanurehandbook.com/instructions.html](http://humanurehandbook.com/instructions.html)
  - [http://humanurehandbook.com/contents.html](http://humanurehandbook.com/contents.html)
- **Open Source Course from Johns Hopkins: Water Sanitation Needs in Complex Humanitarian Emergencies**
- **YouTube videos on Humanure Composting**
  - [https://www.youtube.com/view_play_list?p=FD5D0CE103FD3A56](https://www.youtube.com/view_play_list?p=FD5D0CE103FD3A56)
- **Hazards of various waste disposal methods**
  - [Factsheet on burnpits](#)
  - [Hazards of human waste in the wilderness](#)