

# ***SMALL FARM COMPOSTING GUIDE***



***For use in Whatcom, Skagit, Snohomish, San Juan, Island,  
Clallam and Jefferson Counties only***

Developed by:

USDA Natural Resources Conservation Service  
Lynden Field Office  
6975 Hannegan Road Lynden, WA 98225

With the assistance of and information from:  
Horses for Clean Water  
[www.horsesforcleanwater.com](http://www.horsesforcleanwater.com)

WSU Cooperative Extension

Whatcom Conservation District  
[www.whatcomcd.org](http://www.whatcomcd.org)

San Jaun County Conservation District  
[www.rockisland.com/~sjccd](http://www.rockisland.com/~sjccd)

## ***WHY COMPOST?***

A major concern for most people who have animals on their property is what to do with the huge mound of manure and stall waste that is generated in a short amount of time. There are a variety of concerns when managing a manure pile including the potential for pollution, excessive odors, convenience for chores and how to use the compost.



**Figure 1 Wastes piled on hillside**

Collecting manure and used bedding from your stalls, paddocks and confinement areas on a daily or regular basis and composting it has several benefits:

- It reduces the possibility of parasite reinfestation in your animals. The heat generated in the composting process kills worm eggs as well as pathogens and weed seeds.
- It reduces flies by eliminating their breeding ground
- It reduces odors
- It reduces the volume of material you have piled up. The composting process can reduce the size of a manure pile by about 50%
- It provides you with a free, easy source of compost; a valuable addition to your pastures, garden or yard
- It reduces the chance of manure contaminated runoff from your property reaching surface or ground waters in your area
- It makes your property more pleasing for you and your neighbors to look at and enjoy
- Composting your livestock manure will help ensure you are meeting environmental regulations while also meeting your needs as well as those of your animals.



Figure 2. Covered Compost Bin

## ***GETTING STARTED***

Before you can begin composting, you'll need to consider a few things.

➤ **Select a site for your composting facility.**

There are several key factors to consider when selecting your site:

- ✓ You should locate it in a high, level area away from streams, ponds, wells and property boundaries. Locating it in a wet area or a depression will turn your compost into a soggy mess and will increase the chances of polluting surface or ground water.
- ✓ Choose a location that is far enough away from your property line, wells, streams and ponds to meet local zoning requirements and to avoid any issues with your neighbors. To determine the minimum set backs, contact your local county planning department. Local contact information can be found at the back of this booklet.
- ✓ You should also consider access and convenience. Keep in mind that you'll need to be able to access the compost bin to: add and remove waste material, turn the material and add water to it as necessary.

➤ **Decide on the type and number of bins you'll need.**

Remember that depending on your location, number of animals and if you're using the material on or off site; you may need to have up to one year of 'storage' available

in the bins. To determine your monthly storage requirements, use the information provided in your farm plan or use the worksheet included on page 9 of this booklet. You should consider a minimum of a three-bin system, although a two-bin system may be adequate, depending on your site and how you plan to use the compost. With a three-bin system, you can fill one bin, then let it compost while filling the second. Then you can fill the third and have some flexibility on utilizing the finished compost in the first bin. Remember that the time it takes to get finished compost depends on how you manage your compost bin.

When selecting bins, you can use one of the standard designs included in this booklet, or contact your local Conservation District or NRCS office for assistance (the contact information is included in the back of the booklet). If a farm plan is required in your area, be sure your bins are sized to store wastes for the time specified in your plan.



**Figure 3 Roofed Three Bin System**

## ***COMPOSTING METHODS***

**Passive Compost Piles** can work well for composting on a smaller scale (from one to five horses) and if you don't have access to a tractor to turn the piles on a regular basis. To do this you simply pile the wastes in a composting bin and allow natural air movement to keep the pile composting for you. If you are thinking of using passive composting you'll want to select a bin that is no more than 8' by 8' and keep the pile no

more than 3 to 4 feet high. Remember that in this type of composting, maximizing the amount of airflow into the pile is the way to help minimize your composting time. To increase the airflow, you can use a compost bin that leaves spaces between the boards. You can also get some 5" diameter PVC drainpipes and put these in the middle of the pile. If possible, you'll want to turn the pile occasionally to get the manure on the outside to the center so the heating process in the center can kill weed seed and parasites. Passive composting requires the least work on your part, but can take over 6 months to complete the composting process.

**Turned Piles** have several advantages if you have a tractor with a front-end loader available to use to turn your piles. Turning your piles will improve the airflow in the pile and will speed up the composting process significantly. It also helps to compost all the material more evenly and will allow for more efficient and consistent destruction of weed seeds, parasites, pathogens and fly larvae. When selecting a bin to use for this process, keep in mind you'll need more room for moving around and accessing the piles, and you'll need a sturdier structure.

**Aerated Static Piles** use an aeration system to increase airflow into the piles with out turning them. The aeration system usually consists of a system of perforated pipes placed under the pile that are connected to a blower to periodically blow or draw air into the pile. This system is more sophisticated and requires more planning. It allows for more direct control of the composting temperatures and may also allow for larger piles.

## ***WHAT AND HOW DO I COMPOST?***

Now that you've selected a location, the type of bin you want to use and the method you'll use to compost, you need to look at what to add to your pile to start composting.



**Figure 4**

The organisms that decompose wastes into compost need carbon for energy and nitrogen for growth. To keep these organisms healthy and decomposing, you need to consider the amount of carbon compared to the amount of nitrogen that is available in your compost pile. This is called the carbon to nitrogen ratio. An ideal carbon to nitrogen ratio for composting is between 25:1 and 30:1, or 25-30 units of carbon for every one unit of nitrogen. Materials high in carbon include straw, wood chips, shavings, sawdust and leaves. High nitrogen materials include manure, fresh grass clippings and hay. On its own, horse manure has about the ideal ratio. However, if you add a lot of bedding to the pile, you may end up with too much carbon and not enough nitrogen.

If you have too much bedding, your pile will take longer to compost and the pile is less likely to compost completely. When unfinished compost is added to the soil, the compost may ‘rob’ nitrogen from the soil to complete the composting process, which makes the nitrogen unavailable to plants.

If you have too much carbon in your pile there are several things you can do to take care of this problem

- **Minimize bedding:** Most horses don’t need as much bedding as is often used, they just need enough to soak up urine and moisture. When cleaning stalls try to remove only soiled bedding or consider using rubber mats to reduce bedding requirements.
- **Consider your bedding options:** Since different types of bedding decompose at different rates, the type of bedding you use will affect how fast your pile composts. Straw and shredded newspapers add less carbon to your pile than sawdust or shavings. Wood pellets are more absorbent and break down into finer material so less bedding is used and what is used composts faster.
- **Add materials:** Another option if you have too much bedding is to add materials high in nitrogen; such as grass clippings, chicken manure, blood meal or commercial fertilizer high in nitrogen.



Figure 5 Compost Bin with a Thermometer

## ***HOW DO I MANAGE MY COMPOST PILE?***

There are several components to managing your pile to produce high quality compost.

### ➤ **Airflow**

You'll need to monitor the airflow in your pile.

Keeping air in a pile is critical to:

- ✓ prevent odors,
- ✓ get the temperature needed for effective composting and
- ✓ completing the composting in a relatively short time.

### ➤ **Temperature**

You should also monitor the temperature of your pile. Temperature is an indicator of how the manure is composting. To be sure you're getting rapid decomposition and killing weed seeds and disease, you'll need to monitor temperature to ensure it reaches the optimum range. However, you don't want to overheat your pile. Overheating can immobilize the organisms that do your composting. If your pile is overheating, try reducing the pile size.

You can buy a long-stemmed compost thermometer at local nurseries or home and garden stores to monitor the piles. Most piles start out around 50-110°F then increase to a higher temperature range (110-160°F) and then gradually drops to ambient temperature over a period of several weeks. Keep in mind that the air temperature can have an effect on the temperature of your pile.

### ➤ **Moisture**

Finally, a critical component to successful composting is monitoring your moisture and maintaining the correct moisture conditions.

- ✓ **Too much water** in the pile can cause the water to fill up the pore spaces and won't allow for proper airflow through your pile. It can also make the pile heavy, increasing settling and compaction. This can lead to odors and slow decomposition making high temperatures impossible to achieve.
- ✓ **Too little water** can cause the organisms that do the composting to dry out which prevents the pile from heating up.



**Figure 6** Compost bin with tarp cover

There are several steps you can take to be sure you have the right moisture content in your compost piles:

- ✓ **Use the squeeze test:** Take a handful of material from the middle of your

pile and squeeze it. It should feel similar to a damp, rung out sponge. If you pick up a handful and it drips with out being squeezed, it's too wet. If it looks dry and falls apart after you squeeze it, it's too dry. Compost with a good moisture content stays in a clumped shape after you squeeze it and will make your hand damp without dripping.

- ✓ **Cover your piles:** Remember, it's easier to add water than to get rid of it in a compost pile. With rainy winter weather, it's difficult (if not impossible) to keep an uncovered pile at the right moisture content. Covering your pile with a roof or tarp will keep the pile composting.
- ✓ **Add water when needed:** Composting creates high temperatures in your pile and can evaporate a large amount of water. You can add water with a hose when you turn your pile, or if you're doing static compost, you can add water to the wastes in the wheelbarrow before you add it to the pile.
- ✓ **Turn the pile to dry it:** If your pile does end up too wet; you can dry it out by turning the pile more often. This will help evaporate the water.

### ***Troubleshooting Your Compost Pile***

<b>Symptom</b>	<b>Other Clues</b>	<b>Possible source or reason</b>	<b>Solution</b>
Pile fails to heat	Cannot squeeze water from material	Pile too dry	Add water/wet the pile
	Materials look or feel soggy, pile doesn't stack well	Material too wet	Turn and/or cover pile
	Large amount of bedding, damp and smells fine	Not enough nitrogen,	Add high nitrogen ingredients, reduce bedding
	Pile height less than 3 feet, damp and warm in middle but nowhere else	Small pile size	Enlarge or combine piles
Temperature falls consistently over several days	Temperature declines gradually rather than sharply	Low oxygen	Turn and/or cover pile
	Cannot squeeze water from material	Low moisture	Turn pile, add PVC pipes, cover Add water
Inside of pile is dry		Not enough water	Add water when turning pile
Bad Odors	Low temperatures and/or soggy	Material too wet; not enough air	Turn pile, add PVC pipes, cover
Fly problem		Flies breeding in uncomposted manure	Cover pile with a tarp or a 6" layer of finished compost to prevent access

## ***HOW DO I KNOW IT'S DONE AND WHAT DO I DO WITH IT?***

Compost should go up in temperature quickly until it reaches a range of 120-160°F and stay there for several weeks. After the composting is slowed, the temperature drops to about 100°F then to the ambient air temperature. After this, you should let the compost 'cure' for a couple of weeks before you use it. You'll know it's ready when the pile looks evenly textured and is crumbly like garden soil. The length of time depends on how you manage your pile and can vary from 3 months to a year or more.

When your compost is complete there are several ways to use it:

- **Spread it on your pastures.** You can spread compost onto your pastures during the growing season in compliance with your farm plan. Before applying on your pastures, you should consider getting both the soil and compost tested to ensure you're applying it to the fields that need the nutrients the most.
- **Use it in your garden or landscape areas.** You can use compost in garden beds or as mulch around your flowers, shrubs and trees.
- **Sell or give away your compost.** If you end up with too much compost to use on your place you can either sell or give away the additional compost. You may want to try contacting local topsoil companies, tree farms, landscapers or organic farmers; however, keep in mind they may want test data on the nutrients in your compost prior to buying it. Depending on your location, you may try posting a sign or running an ad in a local paper to either sell or give away your compost if you can't find a steady buyer.

## Estimating Manure Generated per Month

Animal	Weight Lbs.	Storage Cubic ft per month	Animal	Weight Lbs.	Storage Cubic ft per month
Beef	1000	28.5	Swine	65	2.1
Beef	500	14.4	Swine	150	4.8
Horse	1000	24.3	Gestating Sow	275	4.5
Pony	700	16.8	Sow & litter	375	10.8
Sheep	100	1.8	Poultry, layers	4	0.11
Llama	330	6.93	Goats	50	.9

\*Based on Mid West Plan Services "Livestock Waste Facilities Handbook" and USDA NRCS farm plan data

Your Farm:

Animal	Number	Waste/month Cu. Ft.	Storage needed Per month

Total storage needed  
per month.....= \_\_\_\_\_

\*\*\*\*\*

Bedding Type	Lbs/month	Cu. Ft/lb.	Total

Bedding Type	cu.ft./lb	Total bedding.....= _____
Hay	0.24	x0.50 compaction (50%) = _____ cu/ft/month
Straw	0.35	
Wood shavings	0.11	
Sawdust	0.08	

\*\*\*\*\*

\_\_\_\_\_ Manure

\_\_\_\_\_ Bedding

\_\_\_\_\_ cu.ft./month

Total storage



# **NRCS NORTHWEST TEAM STANDARD DESIGNS**

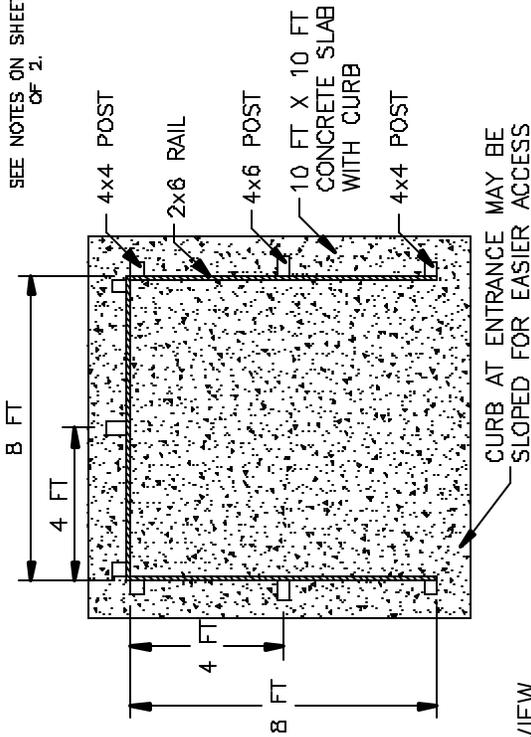
## **NOTES:**

- All designs assume that the compost bin will be covered with a tarp to eliminate runoff. If you are interested in an alternative design, contact the NRCS office.
- The structures shown must be properly located and quality materials must be used to ensure the bins will be structurally sound for the life of the bin and to ensure there will be no pollution concerns from the bins.
- Working with your local Conservation District and NRCS office will help ensure your bins are properly located and meet water quality protection regulations. To be sure the bins are located on an appropriate site, please contact your local NRCS office (contact information is located at the back of this booklet). Structures constructed without an NRCS site visit and inspection may not meet your local, county or federal requirements.

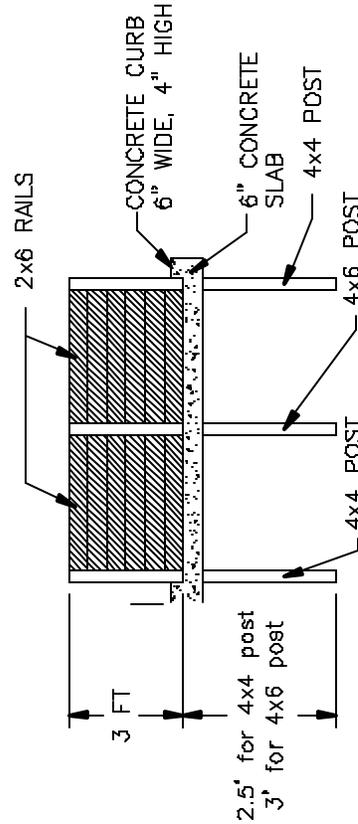


STANDARD COMPOST BIN WALL  
HEIGHT, H=3 FT 2"X6" RAILS

SEE NOTES ON SHEET 2  
OF 2.



PLAN VIEW  
NOT TO SCALE



BOLT REQUIREMENTS

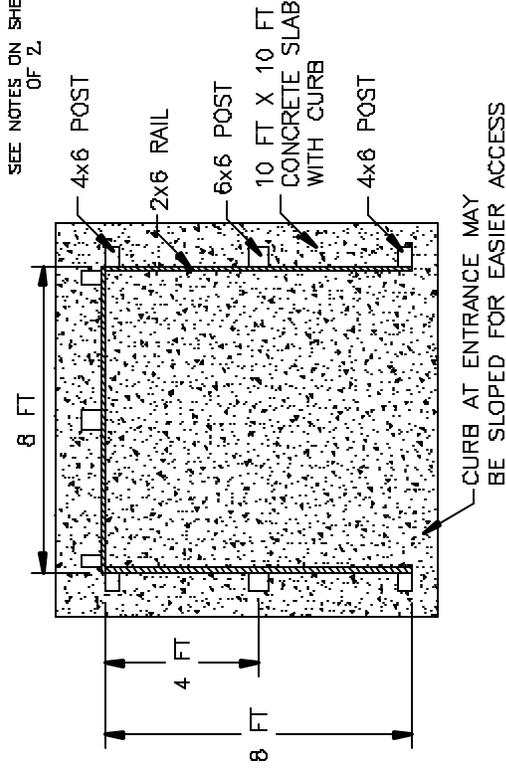
LENGTH OF BOLT	
4X4 POST	4X6 POST
6 IN	8 IN

ELEVATION VIEW  
NOT TO SCALE

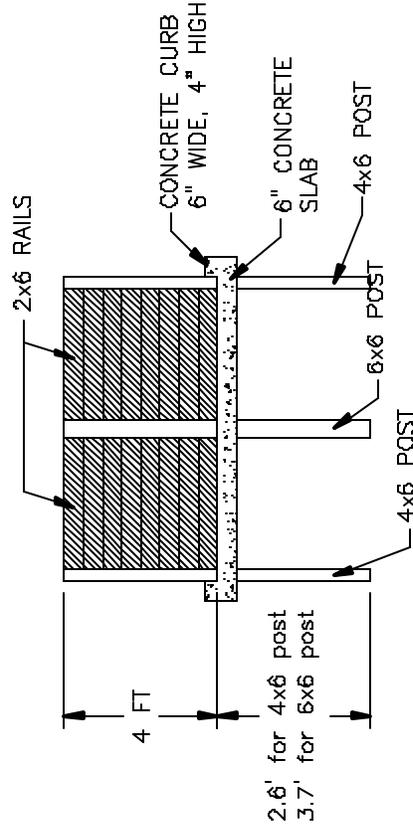
Storage Vol = 192 Cu. Ft. per bin

STANDARD COMPOST BIN WALL  
HEIGHT, H=4 FT 2"X6" RAILS

SEE NOTES ON SHEET 2  
OF 2.



PLAN VIEW  
NOT TO SCALE



BOLT REQUIREMENTS

LENGTH OF BOLT	
4X6 POST	6X6 POST
8 IN	12 IN

ELEVATION VIEW  
NOT TO SCALE

Storage Vol = 256 Cu. Ft. per bin

**COMPOSTING BIN**  
FREESTANDING W/O ROOF  
3 & 4 FT HIGH STRUCTURES

DESIGNED: CGT, RDH DATE: 8/98  
DRAWN: CGT, EAF DATE: 12/02  
TRACED: DATE: DATE: DATE: DATE: DATE: DATE:  
CHECKED: DATE: DATE: DATE: DATE: DATE: DATE:

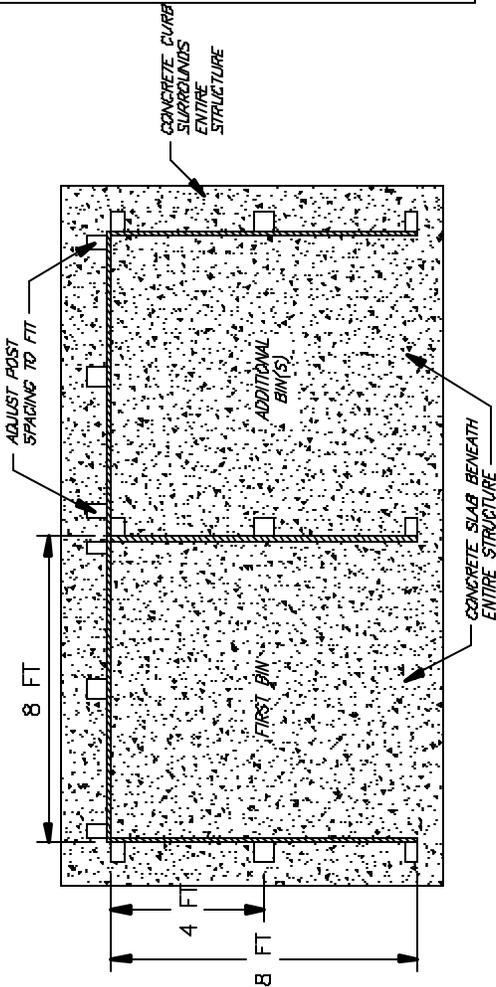
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REVISION NO. DRAWING NO. COMPOST1.DWG  
SHEET 1 OF 2

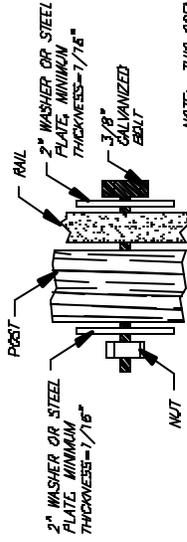


**NOTES:**

1. A concrete slab with curbs shall be included to contain leachate.
2. Concrete mix shall have the following properties:
  - a. 28 day compressive strength greater than 3,000 psi.
  - b. air entrained.
  - c. maximum coarse aggregate size shall not exceed 1-1/2 inches.
3. Concrete curb shall be 4 inches high by 6 inches wide & surround the entire structure.
4. Concrete curb shall be reinforced with rebar.
5. All wood shall be pressure treated.
6. Nominal dimensions for wood members may be used.
7. Post embedment depth shall not be less than 30 inches.
8. Entire compost bin, including curbs, shall be covered.
9. Cover shall be free of holes or tears.
10. Rafts may be spaced up to 1 inch apart to allow air into compost pile.
11. All posts shall be hand tamped or backfilled with low strength concrete.
12. Lag screw may be used in lieu of bolt where only purpose of connection is to hold up board and compost stored only on one side of wall.
13. Curb at entrance of bin may be sloped for easier access, provided required curb height is achieved.
14. 4" thick slab shall be cast on plastic over sand. Approved chairs or double blocks shall be spaced every other grid intersection or at 12" centers, whichever is smaller.
15. Posts shall be wrapped with 4 mil. plastic before pouring concrete.

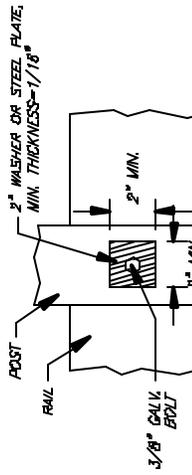


ADDITIONAL BIN DETAIL  
NOT TO SCALE



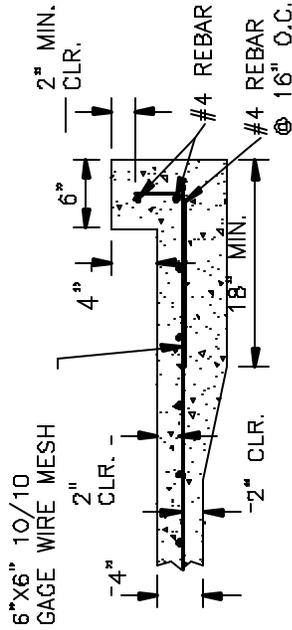
NOTE: THIS SCENARIO SHALL BE USED WHEN COMPOST IS STACKED ON BOTH SIDES OF WALL

BOLT DETAIL  
SECTION VIEW  
NOT TO SCALE

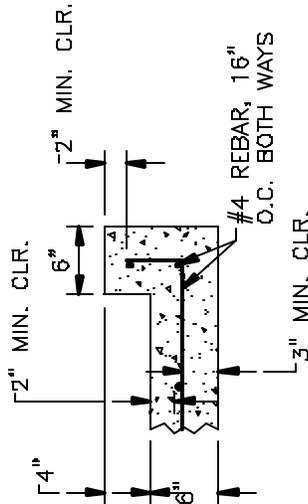


NOTE: THIS SCENARIO SHALL BE USED WHEN COMPOST IS STACKED ON BOTH SIDES OF WALL

BOLT DETAIL  
SIDE VIEW  
NOT TO SCALE



CONCRETE CURB & SLAB  
DETAIL (OPTION #2)  
NOT TO SCALE



CONCRETE CURB & SLAB  
DETAIL (OPTION #1)  
NOT TO SCALE

DESIGNED BY	CGT RDH	DATE	8/98
DRAWN	CGT EAF	DATE	12/02
TRACED		DATE	
CHECKED		DATE	

APPROVED BY		TITLE	
		TITLE	
		TITLE	

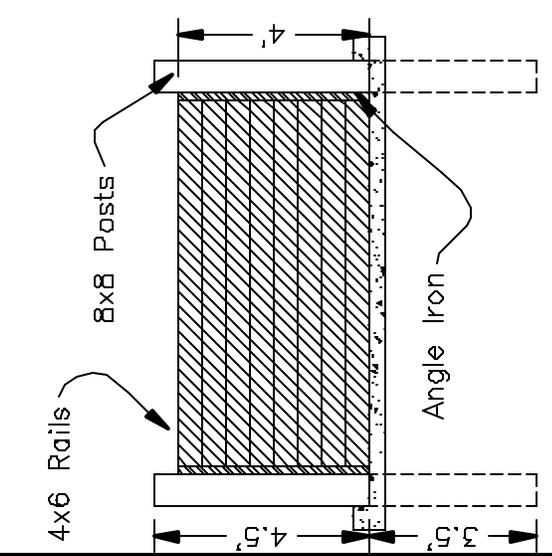
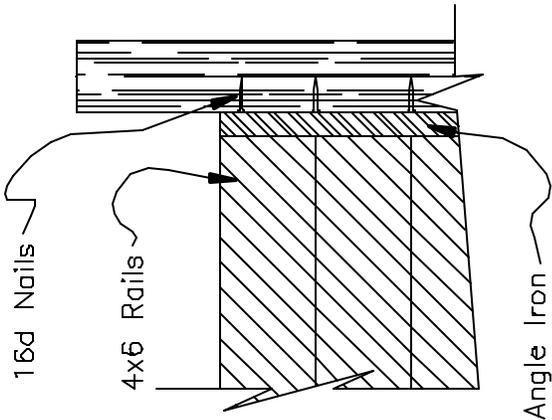
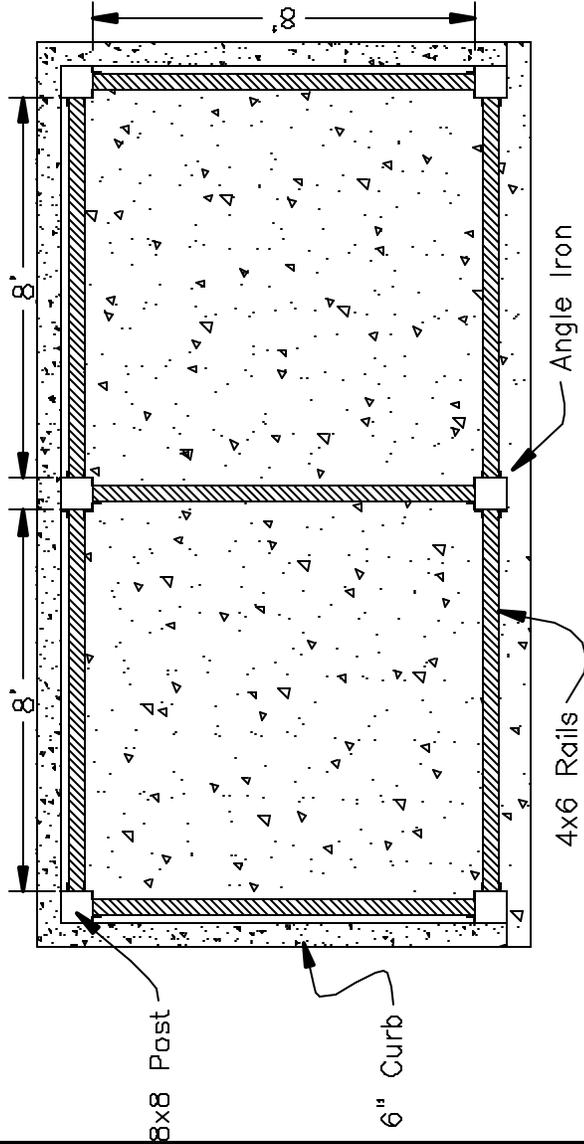
REVISION NO.	
DRAWING NO.	COMPOST1.DWG
SHEET	2 OF 2

**COMPOSTING BIN**  
FREESTANDING W/O ROOF  
MISC. DETAILS

WHATCOM  
U.S.D.A NATURAL RESOURCES CONSERVATION SERVICE

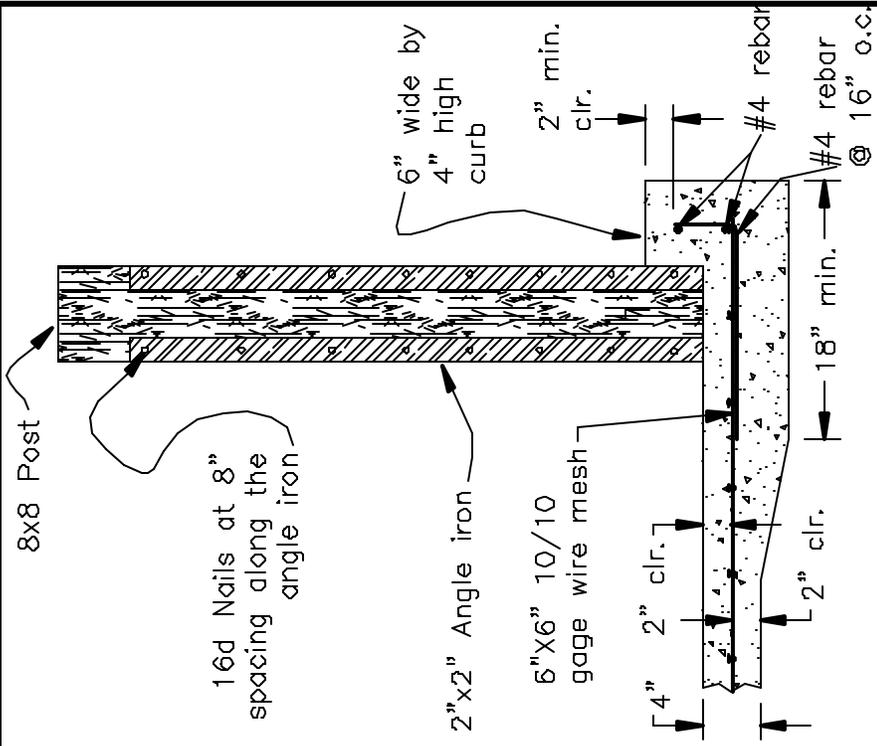


Storage Vol. = 288 Cu. Ft. per bin



NOTES:

- 1) Concrete pad is 4" thick and sloped approximately 2" over the length of the bin towards the back of the bin.
- 2) Concrete is reinforced with a 6"x6" 10 gauge woven wire mesh.
- 3) Backfill post holes with crushed, well compacted gravel.
- 4) All wood shall be pressure treated.
- 5) The entire compost bin, including the curbs shall be covered and the cover shall be free from tears and holes.



**COMPOSTING BIN**  
 VARIABLE WALL BIN OPTION #1  
 4' HIGH MAX.

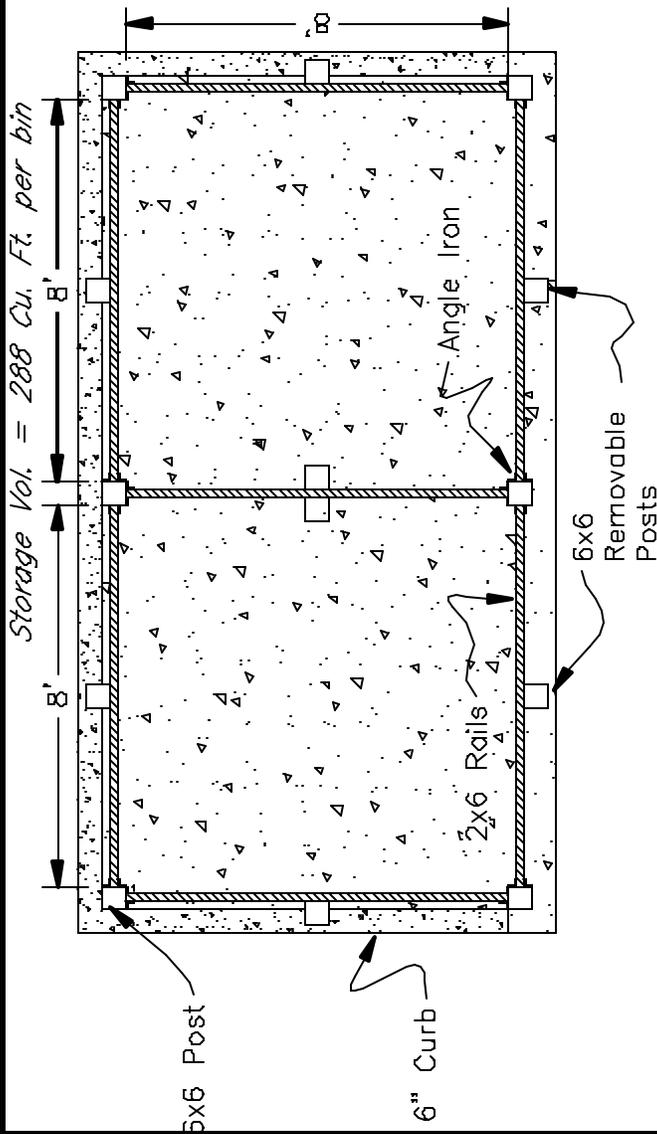
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 DRAWING NO.  
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 SHEET 1 OF 1

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 DRAWN: EAF DATE 1/03  
 TRACED: DATE  
 CHECKED: DATE

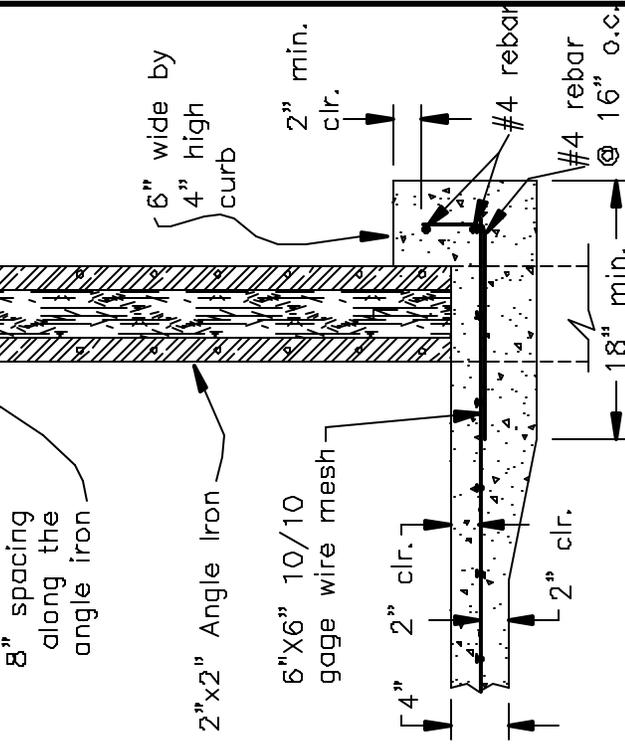
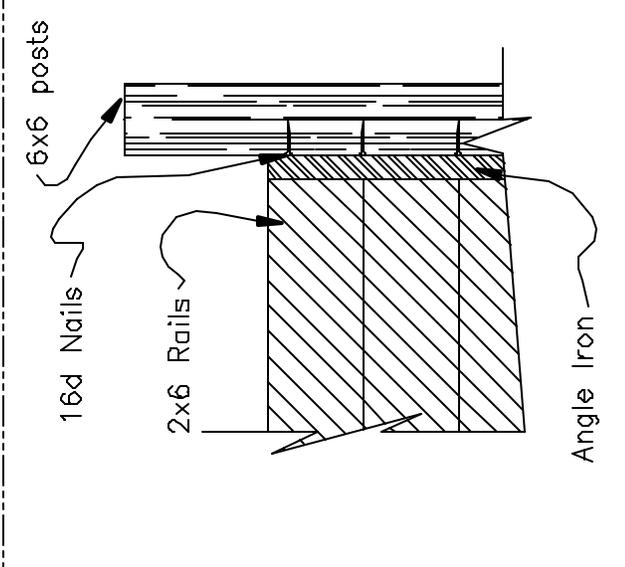
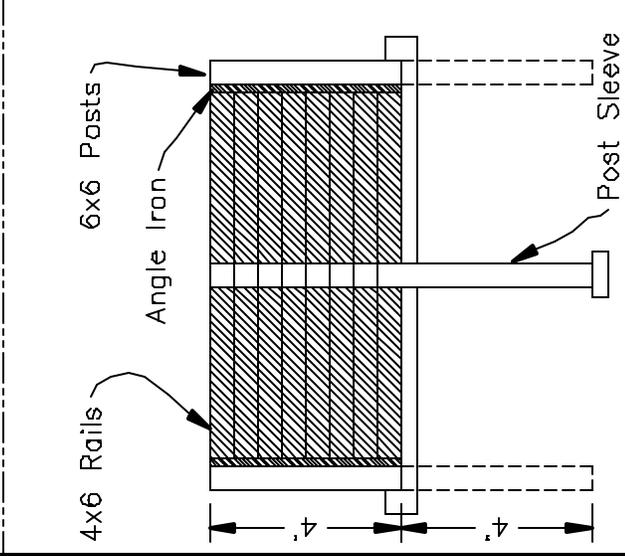
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Storage Vol. = 288 Cu. Ft. per bin



- NOTES:
- 1) Concrete pad is 4" thick and sloped approximately 2" over the length of the bin towards the back of the bin.
  - 2) Concrete is reinforced with a 6"x6" 10 gauge woven wire mesh.
  - 3) Backfill post holes with crushed, well compacted gravel.
  - 4) All wood shall be pressure treated.
  - 5) The entire compost bin, including the curbs shall be covered and the cover shall be free from tears and holes.
  - 6) Rails do no need to be nailed to middle posts.



REVISION NO.  
DRAWING NO.  
**COMPOST6.DWG**

**COMPOSTING BIN**  
VARIABLE WALL BIN OPTION #2  
4' HIGH MAX.

DESIGNED: EAF DATE: 4/03  
DRAWN: EAF DATE: 4/03  
TRACED: \_\_\_\_\_ DATE: \_\_\_\_\_  
CHECKED: \_\_\_\_\_ DATE: \_\_\_\_\_

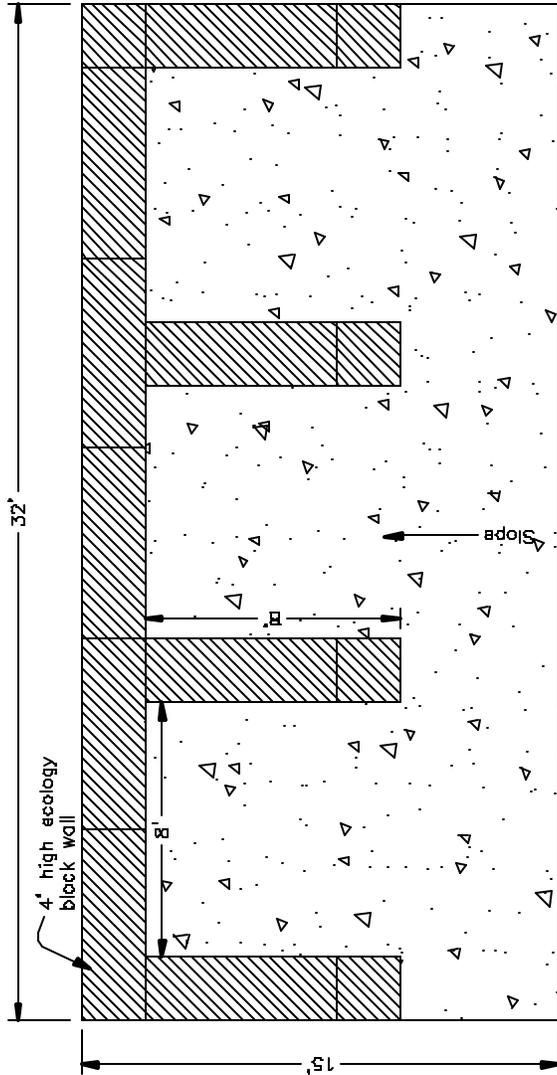
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WHA.TCCM

WA



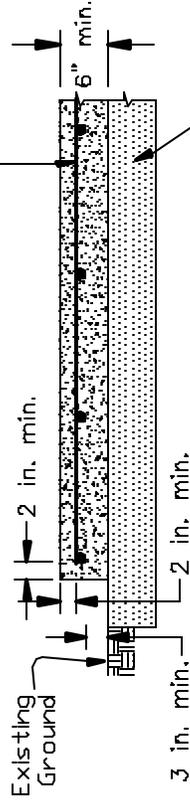
Storage Vol = 256 Cu. Ft. per bin



Notes:

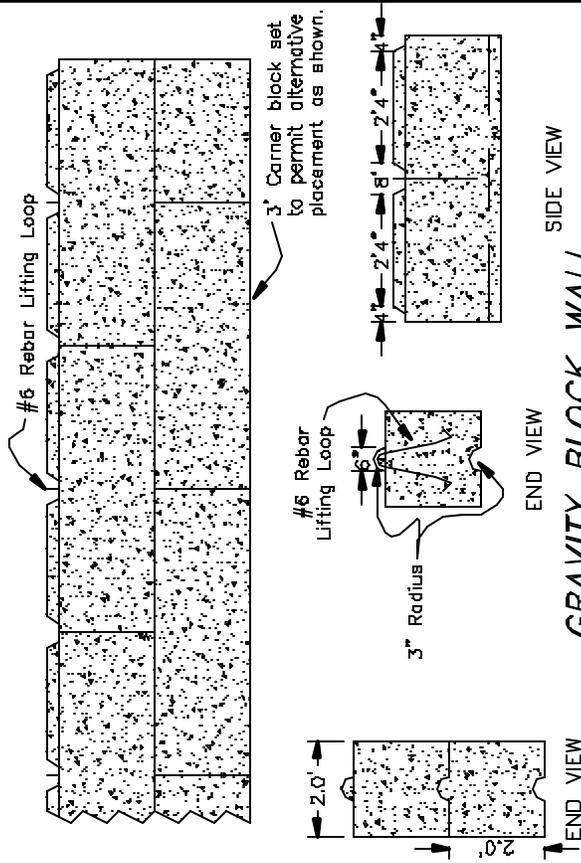
- All reinforcing steel shall have a two inch minimum cover of concrete except where concrete is placed against and/or permanently exposed to earth the minimum shall be three inches.
- All reinforcing steel shall be grade 40.
- Slabs having a span greater than 30 ft shall be provided with control joints at a maximum spacing of 30 ft or shall have additional steel reinforcement. Control joints shall be scores or saw cuts in the concrete surface with a minimum depth of one-fourth of the slab thickness. Steel reinforcing shall not extend through control joints.
- The technician shall be notified at least two working days prior to pouring concrete to allow adequate time to inspect forms and steel. The technician shall be present at all concrete pours and will conduct at least one slump test per load of concrete. The slump shall be between 3 and 5 inches.
- Concrete mix shall be approved by the SGS prior to pours and shall have the following properties:
  - 28 day compressive strength greater than 3500 psi.
  - Air entrained.
  - Maximum coarse aggregate size shall not exceed 1 1/2 inches.
- Minimum lap length of splices is 12 inches.

#4 by #4, 18 in. by 18 in. steel rebar  
(Min. lap length of splices is 12 inches)



**NONSTRUCTURAL CONCRETE SLAB DETAIL**

(Not to scale)



**GRAVITY BLOCK WALL**

(Not to scale)

**COMPOSTING BIN**  
ECOLOGY BLOCK WALL DESIGN  
4' HIGH

REVISION NO.  
DRAWING NO.  
COMPOST7.DWG

SHEET 1 OF 1

DESIGNED: EAF DATE 2/03  
DRAWN: EAF DATE 2/03  
TRACED: DATE  
CHECKED: DATE

APPROVED BY: \_\_\_\_\_  
TITLE: \_\_\_\_\_  
DATE: \_\_\_\_\_

WHA.TCCM

NA

U.S.D.A NATURAL RESOURCES CONSERVATION SERVICE



## ***MATERIALS LIST:***

Free Standing w/o Roof:

3' High Structure (1 Bin):

6' 4x4 Posts	6
6' 4x6 Posts	3
8' 2x6 Rails	18
Concrete	2.5 Cubic Yards
3/8" galvanized bolts w/ 2" washers or lag bolts	
6" long Bolts	36
8" long Bolts	18
4 mil. plastic	2' by 13'

4' High Structure (1 Bin):

7' 4x6 Posts	6
8' 8x6 Posts	3
8' 2x6 Rails	24
Concrete	2.5 Cubic Yards
3/8" galvanized bolts w/ 2" washers or lag bolts	
8" long Bolts	72
4 mil. plastic	2' by 16'

Ecology Block Wall (Three Bins):

Concrete	9 C.Y.
6'x2'x2' Ecology Blocks	16
4'x2'x2' Ecology Blocks	4
2'x2'x2' Ecology Blocks	8

Variable Wall Bin (Two bins):

Option #1

8' 4x6 Landscaping Timbers	56
8' 8x8 Posts	6
2x2 Angle Iron (cut in 4' sections)	112 ft
3" Deck Screws (8 per angle iron section)	224
Concrete	2 C.Y.

Option #2

8' 2x8 Landscaping Timbers	56
8' 6x6 Posts	14
2x2 Angle Iron (cut in 4' sections)	28
3" Deck Screws (8 per angle iron section)	256
Concrete	2 C.Y.

### **NOTE:**

All compost bins must be kept covered to control moisture and prevent runoff of leachate from the bins. You can construct a permanent roof or you can try creating a 'frame' with scrap lumber for a large tarp and keeping this over the stack. If you have an EQIP contract, check with the NRCS technician before installing the roof for design options before installation.