



# Debris Management Operations



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# Objectives

- Explain the purpose of debris management
  - Review the types of debris
  - Review reduction and disposal methods
  - Review available public assistance
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# What is Debris Management?

- The efforts to reduce, recycle, and reuse materials in an attempt to handle materials correctly according to environmental regulations

*"Disaster Recovery" by Dr. Brenda D. Phillips*

- A high priority function in the recovery phase
  - Challenges
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# Phase I Debris Management

- Clearance of debris that hinders immediate life saving actions being taken and poses a threat to public safety
- No attempt to dispose of debris, only to gain access





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# Phase I Debris Management

- Facilitates
  - Movement of emergency vehicles
  - Resumption of critical services
  - Assessment of damage to CI/KR
- First sign that recovery is taking place



# Phase II Debris Management

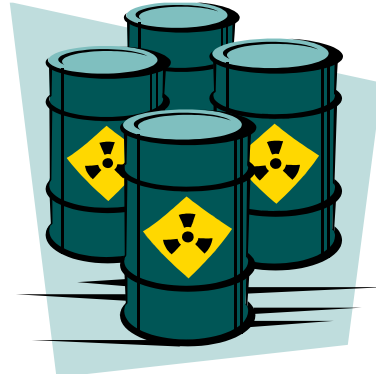
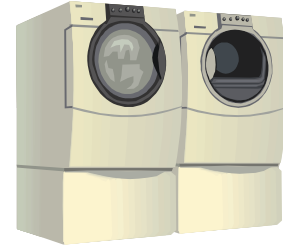
- Public Right-of-Way Removal
- Private Property Removal
- Household Hazardous Waste Removal





# Debris Types

- Eight general categories of debris





# Vegetative

- Trees, limbs, stumps, brush, leaves
- Community yard waste recycling?
- Reduce to mulch and use for community open spaces
- Larger trees used for wood heat







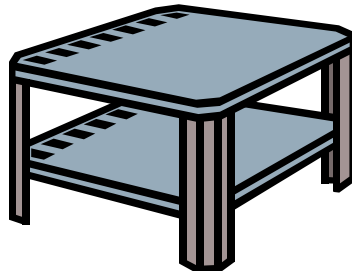
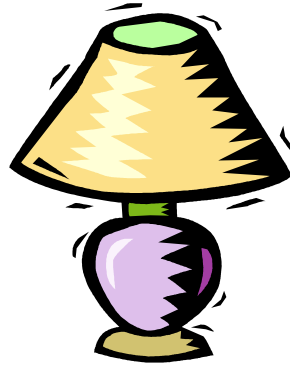
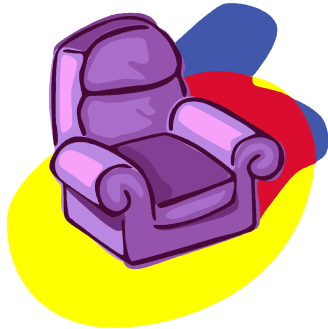
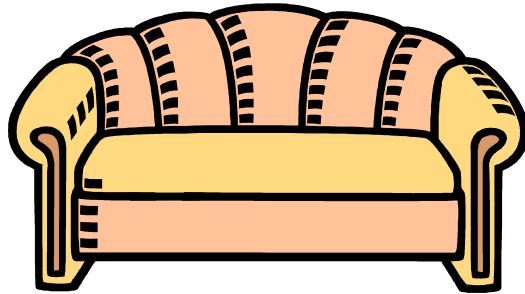
# Construction & Demolition

- May be referenced as C&D
- Items such as concrete, lumber, asphalt shingles, drywall
- Numerous programs through EPA





# Personal Property

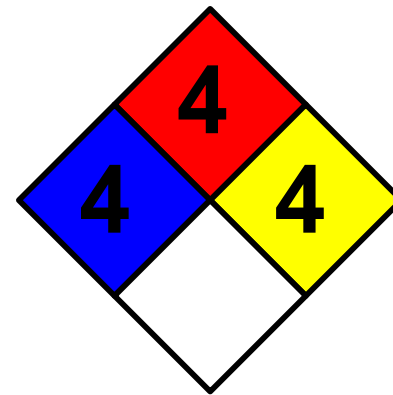


- Can be a variety of materials (anything & everything)
- May have to be sorted



# Hazardous Waste

- Any material that falls under one or more of the 9 DOT Hazard Classes
- Segregation of hazard classes is crucial (do not commingle products)
- Storage areas should be contained (earthen berm or booms)

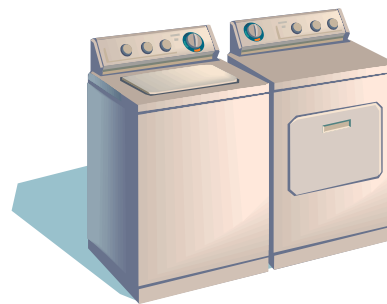




# White Goods

- Household items such as refrigerators, washers, dryers, dishwashers, stoves, hot water heaters

- Must remove hazardous materials (Freon)

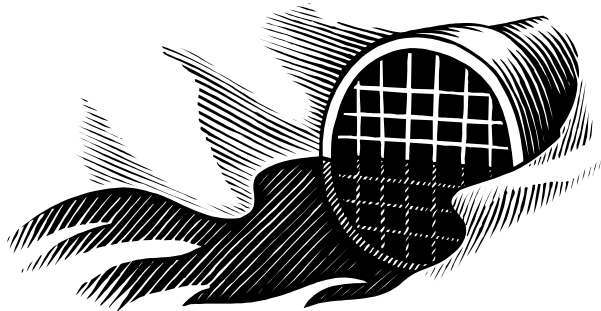




# Soil/Mud/Sand



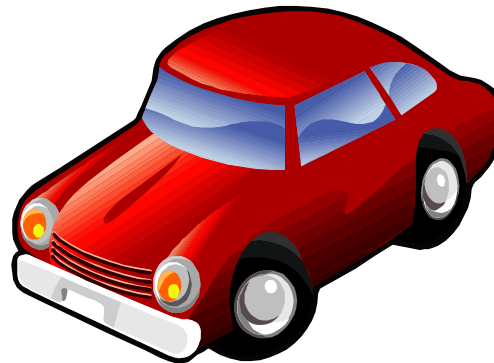
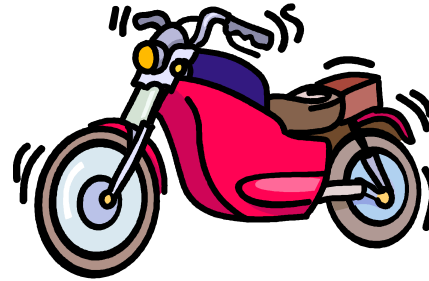
- Removal from right-of-ways or improved public property only
- Streams and creeks not applicable





# Vehicles

- Specific criteria must be demonstrated for reimbursement
- Involve local police department for assistance





# Putrescent

- Waste that can rot or decay quickly (fruits, vegetables, dairy products, animal carcasses)
- Isolated and disposed of quickly



		Typical Debris Streams								
		Vegetative	C&D	Personal Property	Hazardous Waste	HHW	White Goods	Soil/Mud/Sand	Vehicles	Putrescent
Types of Hazards / Disasters	Civil Disorder			X					X	
	Dam Failure	X	X	X	X	X	X	X	X	X
	Drought									
	Earthquake		X	X	X	X	X			
	Flooding	X	X	X	X	X	X	X	X	X
	Hazardous Materials				X	X				
	Hurricane	X	X	X	X	X	X	X	X	X
	Landslides	X		X	X	X		X	X	
	Nuclear Power Plant Accident									
	Power Failure									
	Public Health Emergency									
	Radon									
	Severe Weather	X	X	X	X	X	X	X	X	X
	Severe Winter Weather	X								
	Subsidence							X		
	Terrorism		X	X	X	X	X		X	
	Tornado	X	X	X	X	X	X	X	X	X
	Transportation Accident				X				X	
	Urban Fire		X	X	X	X	X			
Wildfire	X						X			





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# Debris Collection

- Curbside Collection
    - Parallels normal trash collection
    - Mixed debris or source-segregated
  - Collection Centers
    - Residents bring debris to a central location
    - Separate areas for debris types
    - Roll off dumpsters
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# Debris Estimating for Residences

$$L' \times W' \times S \times 0.20 \times VCM = \text{CY of Debris}$$

L = Length of Building in Feet

W = Width of Building in Feet

S = Number of stories

VCM = Vegetative Cover Multiplier  
(1.1 Light; 1.3 Medium; 1.5 Heavy)

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# Debris Estimating for Residences

$$L' \times W' \times S \times 0.20 \times VCM = \text{CY of Debris}$$
$$30' \times 50' \times 3 \times 0.20 \times 1.1 = 990 \text{ CYD}$$

Typical House (Square Feet)	Vegetative Cover Multiplier			
	None	Light (1.1)	Medium (1.3)	Heavy (1.5)
1000 sf	200 cy	220 cy	260 cy	300 cy
1200 sf	240 cy	264 cy	312 cy	360 cy
1400 sf	280 cy	308 cy	364 cy	420 cy
1600 sf	320 cy	352 cy	416 cy	480 cy
1800 sf	360 cy	396 cy	468 cy	540 cy
2000 sf	400 cy	440 cy	520 cy	600 cy
2200 sf	440 cy	484 cy	572 cy	660 cy
2400 sf	480 cy	528 cy	624 cy	720 cy
2600 sf	520 cy	572 cy	676 cy	780 cy



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# Debris Estimating for Outbuildings

$$L' \times W' \times H' \times 0.33$$

$$\text{-----} = \text{cubic yards of debris}$$

27

L = Length of Building in Feet

W = Width of Building in Feet

H = Height of Building in Feet

0.33 = Constant for "air space" in building

27 = conversion factor

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# Debris Estimating for Outbuildings

$$L' \times W' \times H' \times 0.33$$

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27

= cubic yards of debris

$$50' \times 30' \times 10' \times 0.33$$

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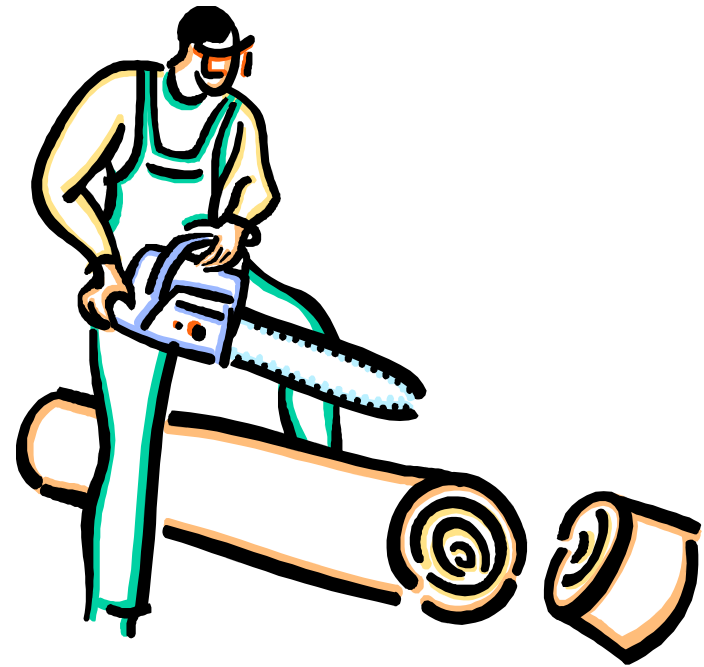
27

= 183 cubic yards of debris



# Vegetation Estimates

- Treat debris piles as a cube, not a cone
- 15 trees, 8" diameter = 40 cy
- One acre of debris, 3.33 yards high = 16,177 cy





# Volume – Weight Conversion

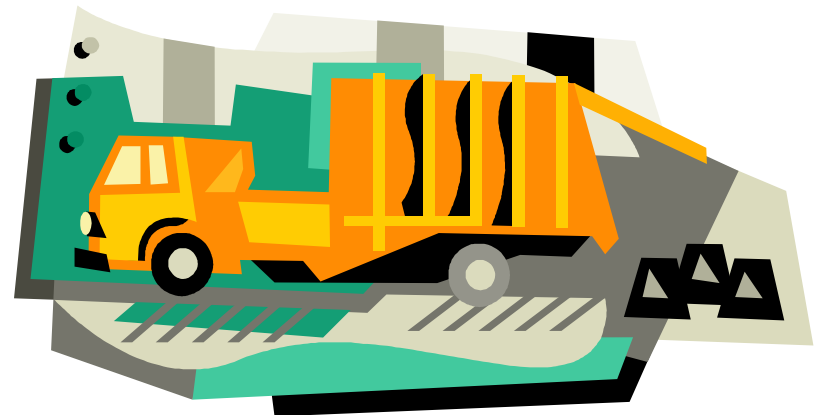
- Softwoods  $6 \text{ cy} = 1 \text{ ton}$
- Hardwoods  $4 \text{ cy} = 1 \text{ ton}$
- Mixed Debris  $4 \text{ cy} = 1 \text{ ton}$
- C&D  $2 \text{ cy} = 1 \text{ ton}$





# Monitoring Debris Removal

- Debris Monitor Reports
  - In the field or at DMS
- Truck Certification
- Load Ticket System





# TRUCK CERTIFICATION FORM

## GENERAL INFORMATION

APPLICANT	MONITOR
CONTRACTOR	DATE
MEASUREMENT LOCATION	COUNTY
DECLARATION NUMBER	

## TRUCK INFORMATION

MAKE	YEAR	COLOR	LICENSE	STATE	
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## TRUCK MEASUREMENTS

PERFORMED BY	DATE	VOLUME CALCULATED BY	DATE
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## DRIVER INFORMATION

NAME	ADDRESS	PHONE
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## OWNER INFORMATION

NAME	ADDRESS	PHONE
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TRUCK IDENTIFICATION



TRUCK CAPACITY



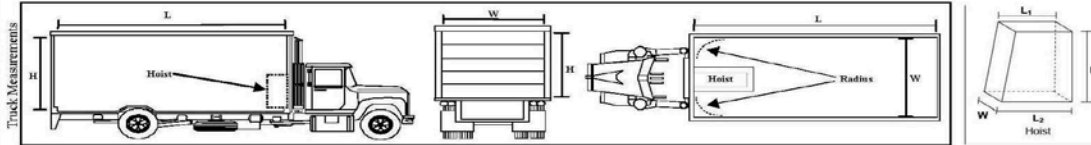
COMMENTS

Page 1  
Truck  
Certification  
Form

# TRUCK CERTIFICATION FORM

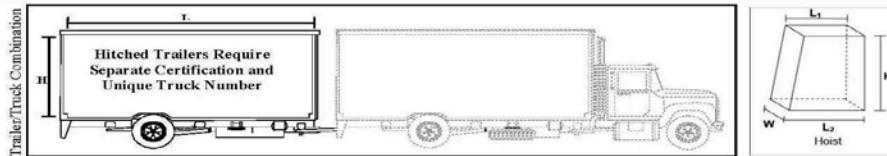
## DUMP TRUCK MEASUREMENTS (SEE DIAGRAM BELOW FOR MEASUREMENT GUIDE)

<b>TRUCK MEASUREMENTS</b>	Length (L)	Width (W)	Height (H)	
<b>HOIST MEASUREMENTS</b>	Length <sub>1</sub> (L <sub>1</sub> )	Length <sub>2</sub> (L <sub>2</sub> )	Width <sub>1</sub> (W <sub>1</sub> )	Height <sub>1</sub> (H <sub>1</sub> )
<b>RADIUS MEASUREMENTS</b>	Radius (R)	Height (H)		
<b>CALCULATIONS</b>	<b>BED VOLUME (BASIC)</b> $(L \times W \times H) / 27$		0	Cubic Yards (CYD)
	<b>HOIST VOLUME</b> $((L_1 + L_2) \times W_1 \times H_1) / 27$		0	Cubic Yards (CYD)
	<b>RADIUS VOLUME</b> $(3.14 \times R^2 \times H) / 27$		0	Cubic Yards (CYD)
	<b>TOTAL</b>		0	Cubic Yards (CYD)



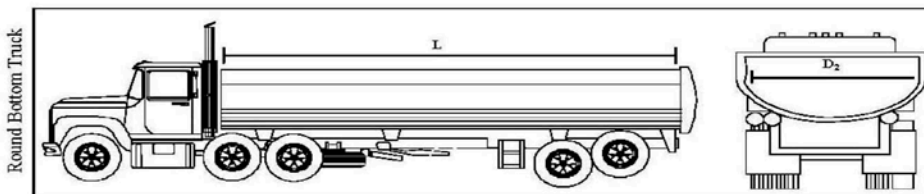
## EXTRA MEASUREMENTS (SEE DIAGRAM BELOW FOR MEASUREMENT GUIDE)

<b>TRUCK MEASUREMENTS</b>	Length (L)	Width (W)	Height (H)	
<b>HOIST MEASUREMENTS</b>	Length <sub>1</sub> (L <sub>1</sub> )	Length <sub>2</sub> (L <sub>2</sub> )	Width <sub>1</sub> (W <sub>1</sub> )	Height <sub>1</sub> (H <sub>1</sub> )
<b>RADIUS MEASUREMENTS</b>	Radius (R)	Height (H)		
<b>CALCULATIONS</b>	<b>BED VOLUME (BASIC)</b> $(L \times W \times H) / 27$		0	Cubic Yards (CYD)
	<b>HOIST VOLUME</b> $((L_1 + L_2) \times W_1 \times H_1) / 27$		0	Cubic Yards (CYD)
	<b>RADIUS VOLUME</b> $(3.14 \times R^2 \times H) / 27$		0	Cubic Yards (CYD)
	<b>TOTAL</b>		0	Cubic Yards (CYD)



## ROUND BOTTOM TRUCK MEASUREMENTS (SEE DIAGRAM BELOW FOR MEASUREMENT GUIDE)

<b>TRUCK MEASUREMENTS</b>	Length (L)	Diameter (D)	
<b>CALCULATIONS</b>	<b>APPROXIMATE VOLUME</b> $(3.14 \times (D/2)^2 \times L) / 27$		0



Page 2

Truck  
Certification  
Form





# LOAD TICKET #

MUNICIPALITY

PRIME CONTRACTOR

SUB-CONTRACTOR

## TRUCK INFORMATION

TRUCK NO.

CAPACITY

TRUCK DRIVER (PRINT LEGIBLY)

## LOADING INFORMATION

**LOADING**

TIME

DATE

MONITOR

LOCATION (ADDRESS OR CROSS STREETS)

GPS COORDINATES

WAS DEBRIS LOADED BY HAND OR BY EQUIPMENT?

HAND

EQUIPMENT

## UNLOADING INFORMATION

DEBRIS CLASSIFICATION

ESTIMATED %, CYS, OR ACTUAL WEIGHT

Vegetation

C&D

White Goods

HHW

Other (See Below)

**UNLOADING**

TIME

DATE

MONITOR

DMS NAME AND LOCATION

OTHER DEBRIS EXPLANATION

# Load Ticket Form

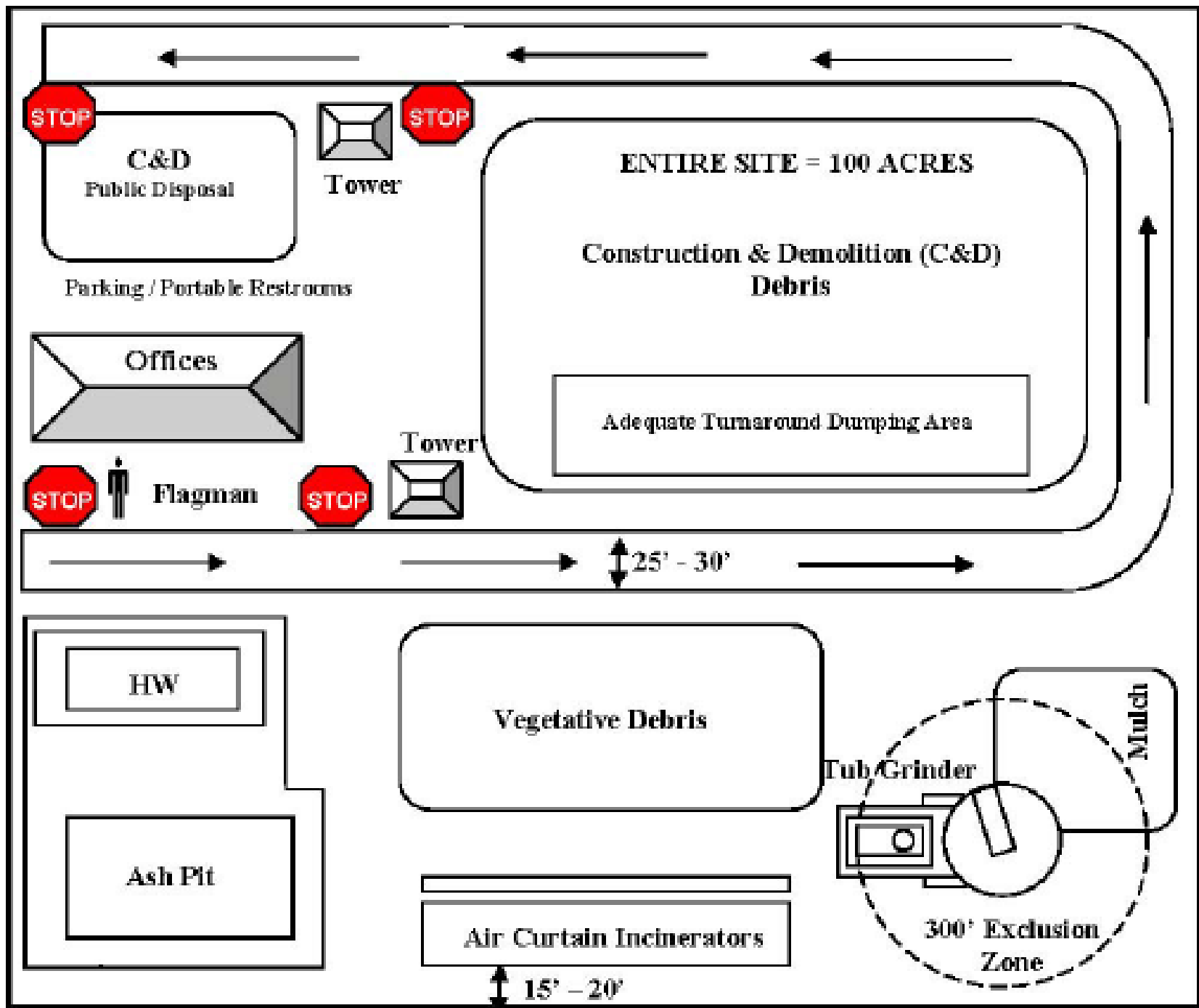


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# Debris Management Sites

- A location to temporarily store, reduce, segregate and process debris before it is hauled to its final disposition
  - Used when landfill space is limited or remote
  - Must consider environmental implications, permits, etc.
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# Debris Reduction Methods

- Volume Reduction by Burning
- Volume Reduction by Grinding & Chipping
- Volume Reduction by Recycling







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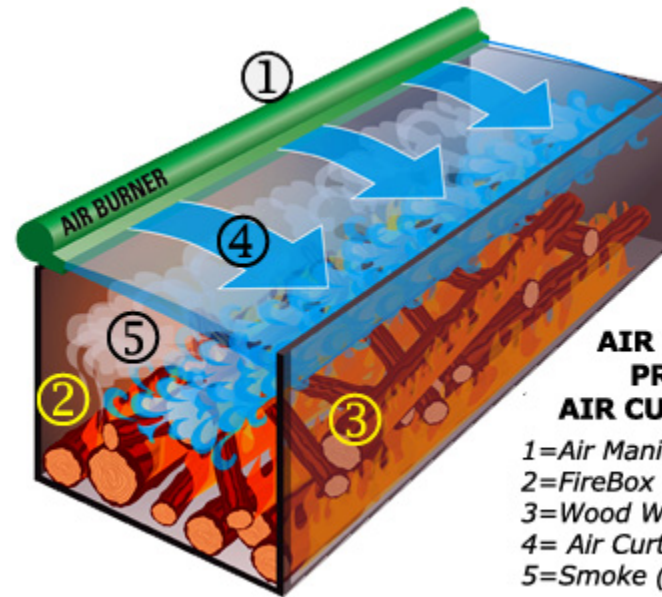
# Volume Reduction by Burning

- Uncontrolled Open Burning (Bon Fire)
- Controlled Open Burning
  - Air Curtain Pit Burning
  - Refractor Lined Pit Burning





# Controlled Open Burning



**AIR BURNERS, LLC  
PRINCIPLE OF  
AIR CURTAIN BURNING**

- 1=Air Manifold
- 2=FireBox Refractory Wall
- 3=Wood Waste or Wood Fuel
- 4= Air Curtain (left to right)
- 5=Smoke (PM)





# Open Burning Considerations

- Impact on community
- Setback of at least 1000' from debris and structures
- Removal and disposal of ash
- Reinforcement around pits
- Pit dimensions
  - $\leq 8'$  wide
  - 9-14' deep





# Volume Reduction by Chipping / Grinding

- Alternative for vegetative debris
- Municipal yard waste collection sites
- Waste products can be left as is
- No harm to the environment





# Volume Reduction by Recycling

- Autos
- C&D Materials
- Electronics
- Metals
- Putrescible Materials
- Road Materials
- Soil & Sediment
- Treated Wood
- Vegetative Debris
- White Goods





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# Public Assistance Eligibility

- Category must be approved by FEMA
- Operations must be a result of disaster
- Must be responsibility of the agency
- Operations must occur during defined time period





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# Field Eligibility Determinations

- Vegetative Debris
    - Must be within the public right-of-way
    - Additional guidance on hazardous trees, limbs, and stumps
  - C&D
    - Must document origin, reduction or recycling, and final disposition
  - White Goods
    - Removed from public right-of-way
    - Haz Mats are removed
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# Field Eligibility Determinations

- Soil, Mud & Sand
    - Must be within the public right-of-way or improved public property
  - Vehicles
    - Presents a public safety hazard
    - Is abandoned
    - Local ordinances have been followed
    - Documented chain of custody, etc.
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# Costs

- Force Account Labor
    - Applicant's employees' labor
    - Overtime, reassigned & seasonal employees
  - Force Account Equipment
    - Applicant's equipment
    - Time equipment is in use (no idle time)
    - Based on local rates or FEMA rates (lesser)
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DEPARTMENT OF HOMELAND SECURITY  
 FEDERAL EMERGENCY MANAGEMENT AGENCY  
**FORCE ACCOUNT LABOR SUMMARY RECORD**

APPLICANT	PA ID NO.	PROJECT NO.	DISASTER
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LOCATION / SITE	CATEGORY	PERIOD COVERING
-----------------	----------	-----------------

DESCRIPTION OF WORK PERFORMED

	DATES AND HOURS WORKED EACH WEEK								COSTS				
	DATES								TOTAL HOURS	HOURLY RATE	BENEFIT RATE/HR	TOTAL HOURLY RATE	TOTAL COSTS
NAME	REG.											\$ -	\$ -
JOB TITLE	O.T.											\$ -	\$ -
NAME	REG.											\$ -	\$ -
JOB TITLE	O.T.											\$ -	\$ -
NAME	REG.											\$ -	\$ -
JOB TITLE	O.T.											\$ -	\$ -
NAME	REG.											\$ -	\$ -
JOB TITLE	O.T.											\$ -	\$ -
NAME	REG.											\$ -	\$ -
JOB TITLE	O.T.											\$ -	\$ -
NAME	REG.											\$ -	\$ -
JOB TITLE	O.T.											\$ -	\$ -

**TOTAL COSTS FOR FORCE ACCOUNT LABOR REGULAR TIME**      \$ -

**TOTAL COSTS FOR FORCE ACCOUNT LABOR OVERTIME**      \$ -

I CERTIFY THAT THE INFORMATION ABOVE WAS OBTAINED FROM PAYROLL RECORDS, INVOICES, OR OTHER DOCUMENTS THAT ARE AVAILABLE FOR AUDIT

CERTIFIED	TITLE	DATE
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DEPARTMENT OF HOMELAND SECURITY  
 FEDERAL EMERGENCY MANAGEMENT AGENCY  
**FORCE ACCOUNT EQUIPMENT SUMMARY RECORD**

APPLICANT	PA ID NO.	PROJECT NO.	DISASTER
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LOCATION / SITE	CATEGORY	PERIOD COVERING
-----------------	----------	-----------------

DESCRIPTION OF WORK PERFORMED

TYPE OF EQUIPMENT		OPERATOR'S NAME	DATES AND HOURS USED EACH DAY							COSTS		
INDICATE SIZE, CAPACITY, HORSEPOWER, MAKE, AND MODEL	EQUIPMENT CODE NUMBER		DATE							TOTAL HOURS	EQUIPMENT RATE	TOTAL COST
			HRS									\$ -
			HRS									\$ -
			HRS									\$ -
			HRS									\$ -
			HRS									\$ -
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			HRS									\$ -
			HRS									\$ -
<b>GRAND TOTALS -----&gt;</b>												\$ -

I CERTIFY THAT THE INFORMATION ABOVE WAS OBTAINED FROM PAYROLL RECORDS, INVOICES, OR OTHER DOCUMENTS THAT ARE AVAILABLE FOR AUDIT

CERTIFIED	TITLE	DATE
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# Contract Services

- Must be reasonable
  - Competitively Bid
  - Comply with procurement standards
    - Small Purchase Procedures
    - Sealed Bids
    - Competitive Proposals
    - Noncompetitive Proposals
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# Contract Services

- Reimbursement is available for the following types of contracts
  - Lump Sum
  - Unit Price
  - Cost-Plus-Fixed-Fee
  - Time-and-Materials



