

Travis Chryps

**Waste Tire Applications in Civil Engineering Sample Homework:**  
(CIVL 131 Introduction to Civil Engineering Design)

Question 1: Could you list at least five common applications of waste tire in civil and highway engineering?

1. Tire Derived Aggregates
2. Drainage Filter material
3. Lightweight Backfill
4. Rubblized Asphalt material
5. Retaining wall Backfill
6. Highway Embankment

Question 2: A construction site needs 1500 yd<sup>3</sup> of embankment fill. Which one of the following two pits that you prefer to obtain the borrow soil?

Borrowing Pit	Expansion Factor	Unit Price, \$ / yd <sup>3</sup>
A - TDA	1.10	12
B - Common Borrow Soil	1.25	10

$$1500 \times 1.10 = 1650 \times 12 = 19,800$$

$$1500 \times 1.25 = 1875 \times 10 = 18,750$$

The Common Borrow Soil is Cheaper.

**Waste Tire Applications in Civil Engineering Sample Homework:**  
(CIVL 131 Introduction to Civil Engineering Design)

Question 1: Could you list at least five common applications of waste tire in civil and highway engineering?

1. FILLING VIBRATION DAMPERS
2. LIGHT WEIGHT FILL
3. REINFORCING CONCRETE
4. SINKAGE FILTER MATERIAL
5. SUBGRADES ROADWAY PAVING MATERIAL

Question 2: A construction site needs 1500 yd<sup>3</sup> of embankment fill. Which one of the following two pits that you prefer to obtain the borrow soil?

Borrowing Pit	Expansion Factor	Unit Price, \$ / yd <sup>3</sup>
A - TDA	1.10	12
B - Common Borrow Soil	1.25	10

TDA:

$V = 1500 \times 1.10 = 1650$  yds. needed

CBS:

$V = 1500 \times 1.25 = 1875$  yds. needed

COST ANALYSIS

$1650 \times 12 = 19,800$

$1875 \times 10 = 18,750$

CBS IS CHEAPER

BORROW FROM PIT B

**Waste Tire Applications in Civil Engineering Sample Homework:**  
(CIVL 131 Introduction to Civil Engineering Design)

Question 1: Could you list at least five common applications of waste tire in civil and highway engineering?

light weight fill

retaining wall back fill

Drainage Filter material

Reduced Asphalt paving material

use as base material for sandway embankment fill

land slide stabilization

Vibration damping layer for rail ties  
Insulation to limit frost penetration.

Question 2: A construction site needs 1500 yd<sup>3</sup> of embankment fill. Which one of the following two pits that you prefer to obtain the borrow soil?

Borrowing Pit	Expansion Factor	Unit Price, \$ / yd <sup>3</sup>
A - TDA	1.10	12
B - Common Borrow Soil	1.25	10

TDA

$$(1500 \text{ yd}^3 \cdot 1.10) \cdot (12 \text{ \$/yd}^3) = 19,800$$

Common Borrow Soil

$$(1500 \text{ yd}^3 \cdot 1.25) \cdot (10 \text{ \$/yd}^3) = 18,750$$

I'd Choose TDA, The price is higher but we will be recycling waste material. Plus The CIWMB may compensate you for using waste material

**Waste Tire Applications in Civil Engineering Sample Homework:**  
(CIVL 131 Introduction to Civil Engineering Design)

Question 1: Could you list at least five common applications of waste tire in civil and highway engineering?

- lightweight fill for highway embankments
- retaining wall back fill
- Drainage Filter material
- Submerged asphalt Paving material
- Insulation to limit frost penetration

Question 2: A construction site needs 1500 yd<sup>3</sup> of embankment fill. Which one of the following two pits that you prefer to obtain the borrow soil?

Borrowing Pit	Expansion Factor	Unit Price, \$ / yd <sup>3</sup>
A - TDA	1.10	12
B - Common Borrow Soil	1.25	10

$$1500 \text{ yd}^3 \cdot 1.10 \cdot 12 \text{ \$/yd}^3 = \$19,800$$

$$1500 \text{ yd}^3 \cdot 1.25 \cdot 10 \text{ \$/yd}^3 = \$18,750$$

We would use the common borrow soil because it would be less expensive.

**Waste Tire Applications in Civil Engineering Sample Homework:**  
(CIVL 131 Introduction to Civil Engineering Design)

Question 1: Could you list at least five common applications of waste tire in civil and highway engineering?

Expansion for highway embankments

Retaining wall backfill

drainage layers for landfills

Retention against sliding on side

Vibration damping layers for rail lines

expansion for that best practice

Question 2: A construction site needs 1500 yd<sup>3</sup> of embankment fill. Which one of the following two pits that you prefer to obtain the borrow soil?

Borrowing Pit	Expansion Factor	Unit Price, \$ / yd <sup>3</sup>
A - TDA	1.10	12
B - Common Borrow Soil	1.25	10


$$1500 \times 1.10 = 1650 \times 12 = \$19,800$$

$$1500 \times 1.25 = 1875 \times 10 = \$18,750$$

Amy Doman  
 3-4-08  
 CIVL 131/1203

**Waste Tire Applications in Civil Engineering Sample Homework:**  
 (CIVL 131 Introduction to Civil Engineering Design)

Question 1: Could you list at least five common applications of waste tire in civil and highway engineering?

- embankments → highways → lightweight fill
- base of retaining walls
- in rubberized asphalt concrete (as aggregate)
- landfill stabilization
- fill material when creating vertical profile + 
- vibration dampening layers for road bases
- insulation to limit frost penetration
- good drainage to remove too much water

Question 2: A construction site needs 1500 yd<sup>3</sup> of embankment fill. Which one of the following two pits that you prefer to obtain the borrow soil?

Borrowing Pit	Expansion Factor	Unit Price, \$ / yd <sup>3</sup>
A - TDA	1.10	12
B - Common Borrow Soil	1.25	10

A  $(1500 \text{ yd}^3)(1.10) = 1650 \text{ yd}^3 \rightarrow \$19800 \rightarrow \text{best!}$

B  $(1500 \text{ yd}^3)(1.25) = 1875 \text{ yd}^3 \rightarrow \$18750$   
 ↑  
 cheapest

**Waste Tire Applications in Civil Engineering Sample Homework:**  
(CIVL 131 Introduction to Civil Engineering Design)

Question 1: Could you list at least five common applications of waste tire in civil and highway engineering?

- lightweight fill
- retaining wall back fill
- drainage filter material
- rubberized asphalt paving material
- insulation to limit frost penetration

Question 2: A construction site needs 1500 yd<sup>3</sup> of embankment fill. Which one of the following two pits that you prefer to obtain the borrow soil?

Borrowing Pit	Expansion Factor	Unit Price, \$ / yd <sup>3</sup>
A - TDA	1.10	12
B - Common Borrow Soil	1.25	10

$$1500 \text{ yd}^3 \times 1.10 = 1650 \times 12 = \$19,800$$

$$1500 \text{ yd}^3 \times 1.25 = 1875 \times 10 = \$18,750$$

Common borrow soil

Travis  
Arendt

**Waste Tire Applications in Civil Engineering Sample Homework:**  
(CIVL 131 Introduction to Civil Engineering Design)

Question 1: Could you list at least five common applications of waste tire in civil and highway engineering?

- lightweight fill for highway embankments
- retaining wall backfill
- drainage filter material
- rubberized asphalt paving material
- insulation to limit frost penetration

lightweight fill  
retaining wall backfill  
drainage filter material  
rubberized asphalt paving material  
others

Question 2: A construction site needs 1500 yd<sup>3</sup> of embankment fill. Which one of the following two pits that you prefer to obtain the borrow soil?

Borrowing Pit	Expansion Factor	Unit Price, \$ / yd <sup>3</sup>
A - TDA	1.10	12
B - Common Borrow Soil	1.25	10

Cheapest!

A -  $1500 \text{ yd}^3 \times 1.10 = 1650 \text{ yd}^3 \cdot 12 = 19800 \$$   
B -  $1500 \text{ yd}^3 \times 1.25 = 1875 \text{ yd}^3 \cdot 10 = 18750 \$$



**Waste Tire Applications in Civil Engineering Sample Homework:** MATT BOWLING  
 (CIVL 131 Introduction to Civil Engineering Design)

Question 1: Could you list at least five common applications of waste tire in civil and highway engineering?

FILL, LAND FILL STABILIZATION, HIGHWAY EMBANKMENT, RETAINING WALL SOIL FILL, VIBRATION DAMPING FOR RAIL LINES, INSULATION TO LIMIT Frost, DRAINAGE LINES IN LANDFILLS, RUBBERIZED ASPHALT PAVING.

Question 2: A construction site needs 1500 yd<sup>3</sup> of embankment fill. Which one of the following two pits that you prefer to obtain the borrow soil?

Borrowing Pit	Expansion Factor	Unit Price, \$ / yd <sup>3</sup>
A - TDA	1.10	12
B - Common Borrow Soil	1.25	10

$1500 (1.10) \$12 = \$19,800$   
 $1500 (1.25) \$10 = \$18,750$  COMMON SOIL

Luke Smith

**Waste Tire Applications in Civil Engineering Sample Homework:**  
(CIVL 131 Introduction to Civil Engineering Design)

Question 1: Could you list at least five common applications of waste tire in civil and highway engineering?

Aggregate fill  
Base course  
Subgrade material  
Road shoulder  
Light paving materials  
Wetland banking layers for wetlands

Question 2: A construction site needs 1500 yd<sup>3</sup> of embankment fill. Which one of the following two pits that you prefer to obtain the borrow soil?

Borrowing Pit	Expansion Factor	Unit Price, \$ / yd <sup>3</sup>
A - TDA	1.10	12
B - Common Borrow Soil	1.25	10

TDA:  $(1.1)(1500) = 1650$        $1650(12) = 19,800 \$$   
CBS:  $(1.25)(1500) = 1875$        $1875(10) = 18,750 \$$

Common Borrow Soil is cheaper

Jaired Nye

**Waste Tire Applications in Civil Engineering Sample Homework:**  
(CIVL 131 Introduction to Civil Engineering Design)

Question 1: Could you list at least five common applications of waste tire in civil and highway engineering?

- 1 Lightweight Fill
- 2 Retaining wall
- 3 Drainage Filter Material
- 4 Rubber Asphalt
- 5 Others

Question 2: A construction site needs 1500 yd<sup>3</sup> of embankment fill. Which one of the following two pits that you prefer to obtain the borrow soil?

Borrowing Pit	Expansion Factor	Unit Price, \$ / yd <sup>3</sup>
A - TDA	1.10	12
B - Common Borrow Soil	1.25	10

$$A \quad 1500(1.10)(12) = 19800 \$$$
$$B \quad 1500(1.25)(10) = 18750 \$$$

The Borrow Soil is 1050\$ cheaper.

**Waste Tire Applications in Civil Engineering Sample Homework:**  
 (CIVL 131 Introduction to Civil Engineering Design)

Question 1: Could you list at least five common applications of waste tire in civil and highway engineering?

- Low strength fill for highway embankments
- Retention walls backfill
- Vicinity drainage ditches
- Inclusion in road base
- Drainage layer in roads
- Subgrade repair
- Strategic use of borrow pits

Question 2: A construction site needs 1500 yd<sup>3</sup> of embankment fill. Which one of the following two pits that you prefer to obtain the borrow soil?

Borrowing Pit	Expansion Factor	Unit Price, \$ / yd <sup>3</sup>
A - TDA	1.10     5500	12     66000
B - Common Borrow Soil	1.25     6250	10     62500

$5000 \times 1.10$   
 $5500$   
 $5000 \times 1.25$   
 $6250$   
 x12  
 x10

**Waste Tire Applications in Civil Engineering Sample Homework:**  
 (CIVL 131 Introduction to Civil Engineering Design)

Question 1: Could you list at least five common applications of waste tire in civil and highway engineering?

Lightweight fill, retaining wall back fill, drainage filter material, insulation to limit frost penetration, recycled aggregate base materials

Question 2: A construction site needs 1500 yd<sup>3</sup> of embankment fill. Which one of the following two pits that you prefer to obtain the borrow soil?

Borrowing Pit	Expansion Factor	Unit Price, \$ / yd <sup>3</sup>
A - TDA	1.10	12
B - Common Borrow Soil	1.25	10

$1500 \times 1.10 = 1650$

$1500 \times 1.25 = 1875$

$1650 \times 12 = 19800$

$1875 \times 10 = 18750$

B

**Waste Tire Applications in Civil Engineering Sample Homework:**  
(CIVL 131 Introduction to Civil Engineering Design)

Question 1: Could you list at least five common applications of waste tire in civil and highway engineering?

- 1) Tire Derived Aggregate
- 2) Using tires for highway embankments.
- 3) Landslide stabilization
- 4) Retaining wall backfill
- 5) Insulation to limit frost penetration

Question 2: A construction site needs 1500 yd<sup>3</sup> of embankment fill. Which one of the following two pits that you prefer to obtain the borrow soil?

Borrowing Pit	Expansion Factor	Unit Price, \$ / yd <sup>3</sup>
A - TDA	1.10	12
B - Common Borrow Soil	1.25	10

The Common Borrow soil would be best because it is cost efficient.

$$1500 \times 1.10 = 1650$$

$$1650 \times 12 = 19800$$

$$1500 \times 1.25 = 1875$$

$$1875 \times 10 = \text{\$}18750$$

**Waste Tire Applications in Civil Engineering Sample Homework:**  
(CIVL 131 Introduction to Civil Engineering Design)

Question 1: Could you list at least five common applications of waste tire in civil and highway engineering?

- lightweight fill
- retaining wall fill
- drainage filter material
- rubberized asphalt pavement material
- slope stabilization to prevent landslides
- vibration damping layers on rail lines
- insulation - prevent frost penetration

Question 2: A construction site needs 1500 yd<sup>3</sup> of embankment fill. Which one of the following two pits that you prefer to obtain the borrow soil?

Borrowing Pit	Expansion Factor	Unit Price, \$ / yd <sup>3</sup>
A - TDA	1.10	12
B - Common Borrow Soil	1.25	10

Pit A:

$$V_b = 1500 \text{ yd}^3 / 1.10 = 1364 \text{ yd}^3$$

$$\text{total cost} = \$19,800$$

Pit B:

$$V_b = 1500 \text{ yd}^3 / 1.25 = 1200 \text{ yd}^3$$

$$\text{total cost} = \$18,750$$

Use soil from Borrow Pit B - Common Borrow soil

**Waste Tire Applications in Civil Engineering Sample Homework:**  
(CIVL 131 Introduction to Civil Engineering Design)

Question 1: Could you list at least five common applications of waste tire in civil and highway engineering?

1. TDA (Tire Derived Aggregate) = good fill material
2. Landfill stabilization (good due to reduced weight)
3. Highway embankment
4. Insulation to limit frost penetration
5. Drainage layer
6. Subgrade for paving material

(1/2 portion accepted for railroads)

Question 2: A construction site needs 1500 yd<sup>3</sup> of embankment fill. Which one of the following two pits that you prefer to obtain the borrow soil?

Borrowing Pit	Expansion Factor	Unit Price, \$ / yd <sup>3</sup>
A - TDA	1.10	12
B - Common Borrow Soil	1.25	10

B - Common Borrow Soil would be cheaper @ \$18,750  
 A - TDA more expensive @ \$19,800



**Waste Tire Applications in Civil Engineering Sample Homework:**  
(CIVL 131 Introduction to Civil Engineering Design)

Question 1: Could you list at least five common applications of waste tire in civil and highway engineering?

- Fill material to reduce erosion
  - Backfill material - retaining walls
  - Good thermal protection of roads, prevent thermal expansion
  - Increase porosity of stone base materials, will then drain water from roadway - Control drainage at bridge
  - LANDSLIDE STABILIZATION
  - Asphalt concrete / Rubberized AC pavement
  - 1982augh bill for Highway Construction
- ASTM D6970

Question 2: A construction site needs 1500 yd<sup>3</sup> of embankment fill. Which one of the following two pits that you prefer to obtain the borrow soil?

Borrowing Pit	Expansion Factor	Unit Price, \$ / yd <sup>3</sup>
A - TDA	1.10	12
B - Common Borrow Soil	1.25	10

$C_{exp} = 0.8$

Value expansion factor

A =  $1500 \text{ yd}^3 \cdot 1.10 = 1650 \text{ yd}^3 @ \$12/\text{yd}^3 = \$19,800$

B =  $1500 \text{ yd}^3 \cdot 1.25 = 1875 \text{ yd}^3 @ \$10/\text{yd}^3 = \$18,750$

5.3% Cost difference

Scott Phillips  
3/4/08

**Waste Tire Applications in Civil Engineering Sample Homework:**  
(CIVL 131 Introduction to Civil Engineering Design)

Question 1: Could you list at least five common applications of waste tire in civil and highway engineering?

1. Lightweight fill
2. Retaining Wall Backfill
3. Drainage Filter Material
4. Rubberized Asphalt Paving Material
5. Insulation
6. Highway Embankment
7. Landslide Stabilization
8. Vibration Dampening

Question 2: A construction site needs 1500 yd<sup>3</sup> of embankment fill. Which one of the following two pits that you prefer to obtain the borrow soil?

Borrowing Pit	Expansion Factor	Unit Price, \$ / yd <sup>3</sup>
A - TDA	1.10	12
B - Common Borrow Soil	1.25	10

$$e = \frac{V_{\text{emb}}}{V_{\text{fill}}}$$

$$A \quad V = 1500 \times 1.10 = 1650 \text{ yd}^3 (\$12) = \$19,800$$

$$B \quad V = 1500 \times 1.25 = 1875 \text{ yd}^3 (\$10) = \$18,750$$

Common Borrow Soil would be the cheaper alternative to TDA.

**Waste Tire Applications in Civil Engineering Sample Homework:**  
(CIVL 131 Introduction to Civil Engineering Design)

Question 1: Could you list at least five common applications of waste tire in civil and highway engineering?

- Levee/river fill
- Low wall back fill
- Drainage filter material
- Aggregate base for roads
- Fill for ditches and drains

REGULATOR TO LIME (LSD) (2000)

Question 2: A construction site needs 1500 yd<sup>3</sup> of embankment fill. Which one of the following two pits that you prefer to obtain the borrow soil?

Borrowing Pit	Expansion Factor	Unit Price, \$ / yd <sup>3</sup>
A - TDA	1.10	12
B - Common Borrow Soil	1.25	10

A:  $1500 \times 1.10 = 1650 \text{ yd}^3$

$1650 \text{ yd}^3 \times \frac{\$}{12} = \boxed{\$19,800}$

B:  $1500 \times 1.25 = 1875 \text{ yd}^3$

$1875 \text{ yd}^3 \times \frac{\$}{10} = \boxed{\$18,750}$

DIFF = \$1000

CHOOSE OPTION B

**Waste Tire Applications in Civil Engineering Sample Homework:**  
 (CIVL 131 Introduction to Civil Engineering Design)

Question 1: Could you list at least five common applications of waste tire in civil and highway engineering?

- Light weight fill
- Retaining wall back fill
- Drainage Filter Material
- rubberized Asphalt paving materials
- highway embankment
- insulation to limit frost penetration
- drainage layers for landfills
- vibration damping layers for rail lines

Question 2: A construction site needs 1500 yd<sup>3</sup> of embankment fill. Which one of the following two pits that you prefer to obtain the borrow soil?

Borrowing Pit	Expansion Factor	Unit Price, \$ / yd <sup>3</sup>
A - TDA	1.10	12
B - Common Borrow Soil	1.25	10

$$V_{TDA} = 1.10 \times 1500 \text{ yd}^3 = 1650 \text{ yd}^3 \text{ needed} \times 12 \text{ \$/yd}^3 = \$19,800$$

$$V_{CSS} = 1.25 \times 1500 \text{ yd}^3 = 1875 \text{ yd}^3 \text{ needed} \times 10 \text{ \$/yd}^3 = \$18,750 \text{ C.B.S.}$$

Borrowing pit B is cheapest

**Waste Tire Applications in Civil Engineering Sample Homework:**

(CIVL 131 Introduction to Civil Engineering Design)

Question 1: Could you list at least five common applications of waste tire in civil and highway engineering?

- Rubberized asphalt Paving Material
- Retaining wall back fill
- Lightweight fill
- Drainage filter material.
- highway embankments

Question 2: A construction site needs 1500 yd<sup>3</sup> of embankment fill. Which one of the following two pits that you prefer to obtain the borrow soil?

Borrowing Pit	Expansion Factor	Unit Price, \$ / yd <sup>3</sup>
A - TDA	1.10	12
B - Common Borrow Soil	1.25	10

TDA = 1/1.1 Expansion Factor

$$= 1500 \text{ yd}^3 \cdot 1.10 \cdot 12 = \$19,800$$

Common Borrow Soil

$$= 1500 \text{ yd}^3 \cdot 1.25 \cdot 10 = \$18,750$$

Use Common Borrow Soil because it is cheaper.

Kooli H. H. H. H.  
1/20/04

**Waste Tire Applications in Civil Engineering Sample Homework:**  
(CIVL 131 Introduction to Civil Engineering Design)

Question 1: Could you list at least five common applications of waste tire in civil and highway engineering?

- light weight fill
- petrochemical waste rock fill
- drainage filter material
- recycled tires used as paving materials
- tire derived aggregate used for road construction
- tire derived aggregate used for road construction

Question 2: A construction site needs 1500 yd<sup>3</sup> of embankment fill. Which one of the following two pits that you prefer to obtain the borrow soil?

Borrowing Pit	Expansion Factor	Unit Price, \$ / yd <sup>3</sup>
A - TDA	1.10	12
B - Common Borrow Soil	1.25	10



$$1500 \text{ yd}^3 \times 1.10 = 1650 \times 12 = \$19,800$$

$$1500 \text{ yd}^3 \times 1.25 = 1875 \times 10 = \$18,750$$