

**CAREER
PATHS**

Construction II

Roads & Highways

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**Book
1**

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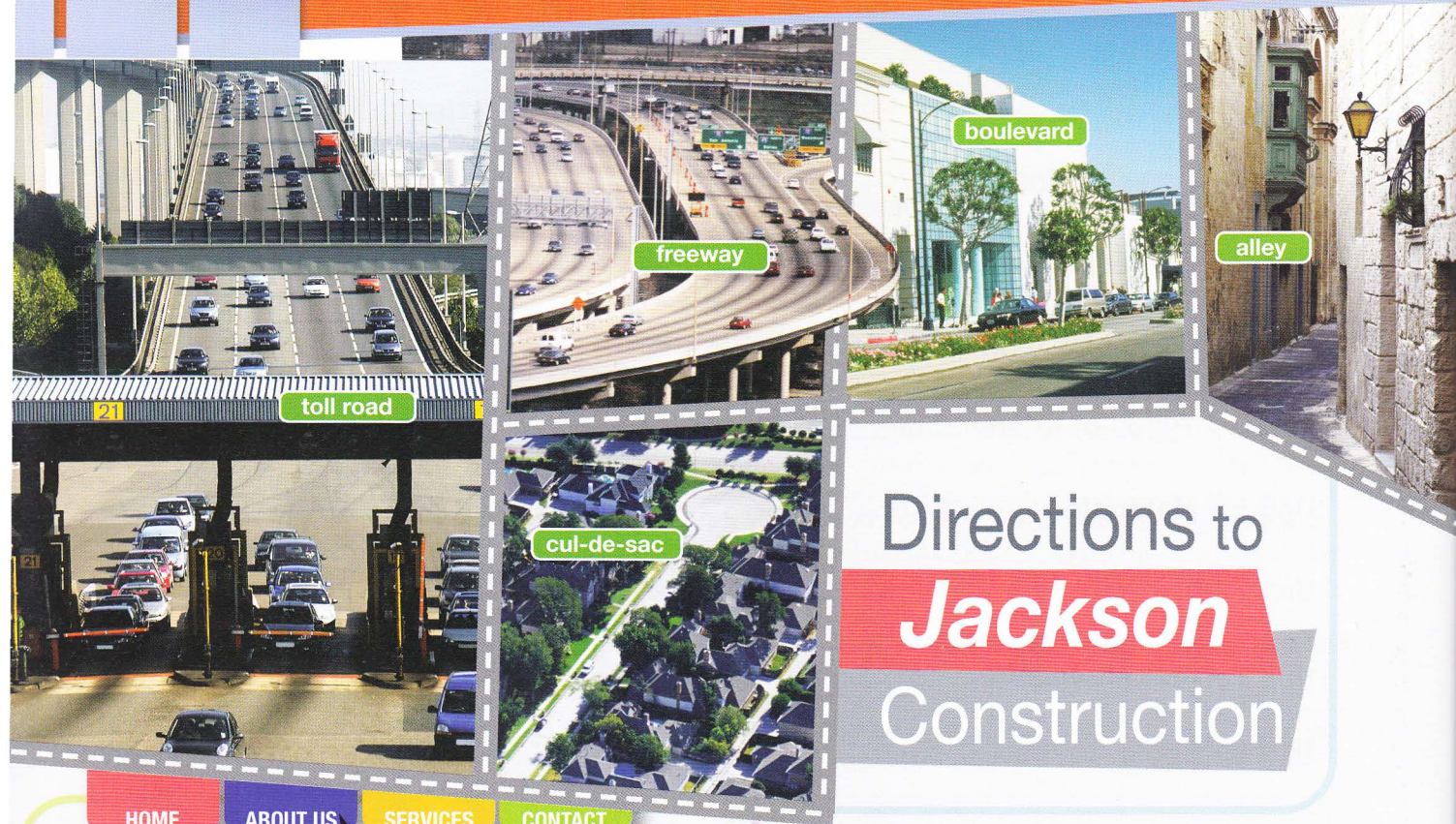
Scope and Sequence

Unit	Topic	Reading context	Vocabulary	Function
1	Types of Roads	Web page	alley, avenue, boulevard, cul-de-sac, dead end, freeway, highway, road, street, toll road	Giving directions
2	Parts of a Road	Newspaper article	corner, curb, gutter, lane, median, pavement, roadway, shoulder, storm drain, surface	Giving a reminder
3	Parts of a Highway	Newspaper article	breakdown lane, bypass, divider, exit, express lane, fast lane, interchange, guardrail, off ramp, on ramp	Talking about deadlines
4	Types of intersections	Book chapter	4-way, box junction, continuous flow intersection, intersection, jughandle, roundabout, the right way, T junction, traffic circle, turn lane, u-turn	Listing an exception
5	Materials	Informational pamphlet	asphalt, bitumen, Bituminous Surface Treatment (BST), concrete, fly ash, gravel, lime, rebar, rubber, steel	Listing options
6	Numbers	Chart	add, and, comes to, divided by, equals, -hundred, is, less, minus, multiplied by, plus, point, subtract, -ths, times	Talking about numbers
7	Measurements	Conversion chart	imperial, kilogram, kilometer, meter, metric, metric ton, mile, pound, short ton, yard	Estimating numbers
8	Tools	Sign out sheet	broom, dustpan, jackhammer, measure wheel, pickax, rake, round point shovel, sledgehammer, square shovel, wheelbarrow	Suggesting a replacement
9	Safety Equipment	Poster	dust mask, earplugs, face shield, first aid kit, goggles, grip gloves, hard hat, kneepads, leather gloves, PPE, safety glasses, steel-toe boots	Listing requirements
10	Basic Actions	Email	clear, drop off, load, mark off, measure, pick up, remove, spread, sweep, unload	Giving instructions
11	Machines	Website	articulated truck, backhoe, bulldozer, cement mixer, compactor, grader, loader, scraper, screed, sweeper, vibratory roller	Predicting needs
12	Communications	Advertisement	confirm, communicate, consult, contact, email, fax, PDF, scan, smart phone, two-way radio	Providing options
13	Soil	Report	bearing test, California Bearing Ration (CBR) test, clay, compaction, penetration test, sand, shear test, silt, soil, stability, sub grade	Asking about results
14	Describing Landscapes 1	Report	bend, body of water, flat, grade, hill, mountainous, rolling, sharp, valley	Asking for advice
15	Describing Landscapes 2	Email	curve, dip, dogleg, drop, rise, slight, slope, steep, straightaway, terrain	Describing progress

Table of Contents

Unit 1 - Types of Roads	4
Unit 2 - Parts of a Road	6
Unit 3 - Parts of a Highway	8
Unit 4 - Types of Intersections	10
Unit 5 - Materials	12
Unit 6 - Numbers	14
Unit 7 - Measurements	16
Unit 8 - Tools	18
Unit 9 - Safety Equipment	20
Unit 10 - Basic Actions	22
Unit 11 - Machines	24
Unit 12 - Communications	26
Unit 13 - Soil	28
Unit 14 - Describing Landscapes 1	30
Unit 15 - Describing Landscapes 2	32
Glossary	34

1 Types of Roads



Directions to **Jackson** Construction

HOME

ABOUT US

SERVICES

CONTACT

From the toll road:

Get into the right-hand lane. Take the exit for **Highway 203**. After exiting, drive straight until you reach 19th **Street**. Turn left onto 19th and drive until you reach Linden **Avenue**. Turn right onto Linden Avenue. Pass a **cul-de-sac** on the left, and turn onto Merton **Road**. (Note: Merton is a **dead end**.) We're the last building on the left.

From the freeway:

Take exit 19 onto Cherry **Boulevard**. Turn right onto Main Street. When you reach Linden Avenue, turn left. Just after the **alley**, turn left onto Merton Road. We're the last building on the left.

Get ready!

1 Before you read the passage, talk about these questions.

- 1 What are some different types of roads or streets?
- 2 What kind of road is not free to use?

Reading

2 Read the web page. Then, mark the following statements as true (T) or false (F).

- 1 ___ Linden Avenue intersects with 19th Street.
- 2 ___ Jackson Construction is located on Merton Road.
- 3 ___ Freeway exit 19 takes drivers onto Main Street.

Vocabulary

3 Match the words or phrases (1-6) with the definitions (A-F).

- | | |
|------------------|-----------------|
| 1 ___ boulevard | 4 ___ highway |
| 2 ___ cul-de-sac | 5 ___ avenue |
| 3 ___ street | 6 ___ toll road |

- A a road on which a driver must pay a fee
B a road that is perpendicular to a street
C a wide avenue
D a large paved road connecting two cities
E a short dead end street in a circle shape
F a public road in a town or city

4 Fill in the blanks with the correct words or phrases from the word bank.

Word BANK

freeways dead ends alleys roads

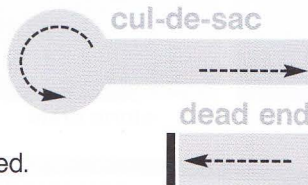
- 1 Most _____ have passing lanes for faster drivers.
- 2 _____ are usually too narrow for more than one car to drive down.
- 3 _____ have no exits.
- 4 Some rural _____ are nothing more than packed dirt.

5 Listen and read the web page again. What types of roads lead to Jackson Construction from the freeway?

Listening

6 Listen to a conversation between a manager and an employee. Choose the correct answers.

- 1 What is the conversation mainly about?
 - A changes to road designs
 - B ways to avoid traffic
 - C roads that need repair
 - D directions to an office
- 2 What is true of Washington Street?
 - A It is a dead end.
 - B It leads to the freeway.
 - C It is an exit off of highway.
 - D It is where the woman's office is located.



Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

I need directions.
You take ...
Next, you turn ...

Student A: You are a manager. Talk to Student B about:

- a delivery to a client
- roads to take to the client
- where the client is located

Student B: You are an employee. Talk to Student A about directions to a location.

Writing

9 Use the webpage and the conversation from Task 8 to record the directions.

Directions to Jackson Construction

- 1 _____
- 2 _____
- 3 _____
- 4 _____
- 5 _____

7 Listen again and complete the conversation.

Manager: Mike, can you drop these road designs off at the client's office?

Employee: Of course. But I need directions.

Manager: Sure. You take the 1 _____ south. Then you 2 _____ exit twenty onto highway nine.

Employee: All right. Is it off the 3 _____?

Manager: No, not quite. Next, you turn right onto Green 4 _____.

Employee: Got it, right onto Green. Then?

Manager: You 5 _____ Washington Street. It's a 6 _____. The client is at the end of Washington.

Jamestown Herald

June 18

STORM LEAVES ROADS IN RUIN

A severe storm has left Jamestown roads in terrible condition. Tree branches still block every **lane** of most **roadways**. Leaves and trash clogged the **storm drains** and filled the **gutters**. This caused flooding in many roads, with water levels rising well over the **curb**. Many drivers were unable to reach their destinations. Some left their cars on the **shoulder**.

The flooding caused serious damage in some locations. On the **corner** of Smith St. and 1st Avenue, a streetlight fell. The **median** of Highway 19 washed away in several areas.

Crews expect to find more damage to the **surface** of many roads. They ask that drivers report any problems with **pavement**.



curb

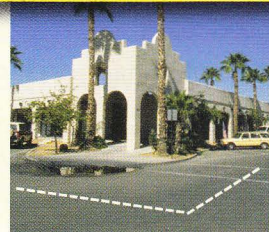
median



lanes



storm drain



corner



shoulder

Get ready!

1 Before you read the passage, talk about these questions.

- 1 What are some parts of a road?
- 2 How does water drain from roads?

Reading

2 Read the newspaper article about road conditions. Then, mark the following statements as true (T) or false (F).

- 1 ___ The roadways have been cleared.
- 2 ___ Leaves blocked the storm drains.
- 3 ___ The highway's pavement washed away.

Vocabulary

3 Match the words (1-5) with the definitions (A-E).

- | | |
|----------------|---------------|
| 1 ___ pavement | 4 ___ surface |
| 2 ___ lane | 5 ___ curb |
| 3 ___ median | |

- A a lengthwise division of a road that is meant for one line of cars to drive in
- B the entire flat top area of a road
- C an area in the middle of a road, separating opposite directions of traffic
- D a raised row of concrete along the edge of a road
- E a road covering made of concrete, stone, blacktop, or other material

4 Read the sentences and choose the correct words or phrases.

- 1 The office is on the **surface** / **corner** of 1st Street and Main Street.
- 2 The man stopped on the **shoulder** / **pavement** when his car broke down.
- 3 The **roadway** / **storm drain** was clogged with leaves.
- 4 Water flows into the **gutter** / **curb**.
- 5 The **surface** / **roadway** was closed until repairs were completed.

5 Listen and read the article about road conditions again. What is wrong with the roads in Jamestown?

Listening

6 Listen to a conversation between a manager and a road worker. Choose the correct answers.

- 1 What is the conversation mainly about?
A clearing a roadway
B expanding a median
C constructing a new road
D resurfacing a highway lane
- 2 What is the man supposed to do first?
A inspect the sewer
B clear the storm drains
C clear away large objects
D sweep the gutters

7 Listen again and complete the conversation.

Manager: John, your team is 1 _____ the roadway on 1st Street.

Worker: Okay. What do we 2 _____ ?

Manager: First, move any big objects off the roadway.

Worker: 3 _____. And after that?

Manager: Clear the storm drains of leaves. 4 _____, water can flow into the sewer.

Worker: 5 _____. I'll go get things started.

Manager: Wait. Don't forget to clear the gutters, too. If you don't, the drains will just 6 _____ again.

Worker: Of course.

Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

First ...

Clear the ...

Don't forget to ...

Student A: You are a manager. Talk to Student B about:

- a new job
- tasks to complete
- the order of tasks

Student B: You are a road worker. Talk to Student A about clearing a roadway.

Writing

9 Use the conversation from Task 8 to complete the work order.



Hanson Roadworks

Work Order

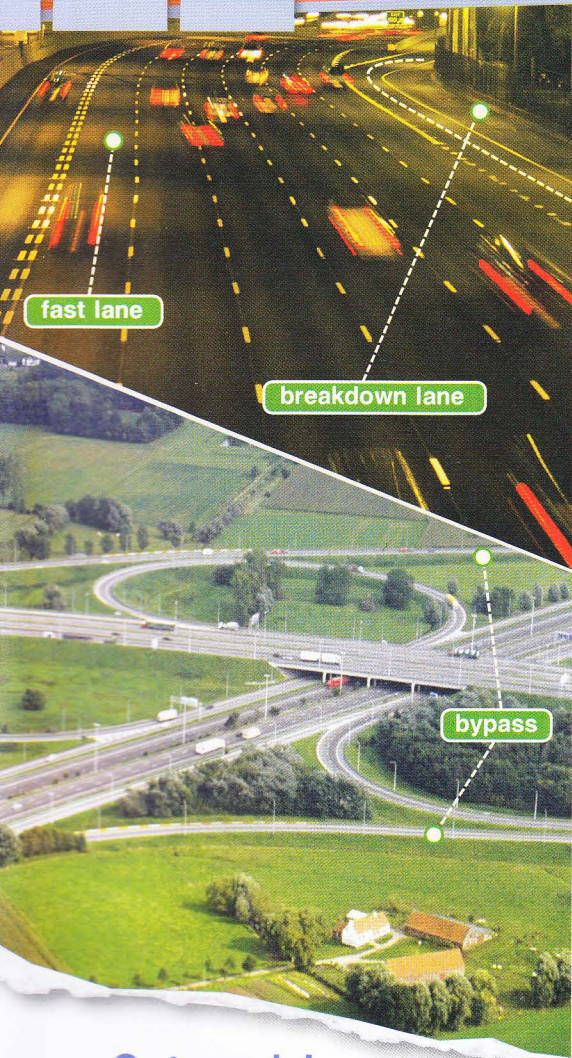
Task 1: _____

Task 2: _____

Task 3: _____

3

Parts of a Highway



NEW CONSTRUCTION PROJECT ON I-23



Local commuters will have trouble getting through I-23 for the next few months. Work is being done around **Exit 200** and the **interchange** with I-44. Work began on March 11 and will continue for nine months. The project will widen the **on ramps** and **off ramps** at the exits. It will also include the replacement of **dividers** and **guardrails** for that portion of the highway. In addition, all lanes, including the **express lane** and **fast lane**, will be repaved. A new **breakdown lane** will be created.

When the work is complete, traffic will move more quickly and safely. For now though, it will cause delays. To avoid this, commuters should take the McDonald **bypass**.



Get ready!

1 Before you read the passage, talk about these questions.

- 1 Where do drivers leave their cars if they have a breakdown?
- 2 How do cars leave a highway?

Reading

2 Read the newspaper article about highway construction. Then, complete the table.

Furniture	Styles
Widen	_____
Repave	_____
Replace	_____
Create	_____

Vocabulary

3 Match the words or phrases (1-6) with the definitions (A-F).

- | | |
|--------------------|-------------------|
| 1 ___ bypass | 4 ___ off ramp |
| 2 ___ guardrail | 5 ___ fast lane |
| 3 ___ express lane | 6 ___ interchange |

- A a long metal bar that borders the edge of a highway
- B the point where highways meet and intersect
- C a lane which allows vehicles to leave a highway
- D a highway that allows vehicles to go around business centers or local traffic
- E a single lane or lanes used to ease traffic during peak highway usage
- F the inside lane on a highway that is intended for higher speeds of traffic

4 Fill in the blanks with the correct words or phrases from the word bank.

Word BANK

exit breakdown lane on ramp divider

- The _____ is the only way to leave the highway.
- The _____ leaves space for drivers to pull over without stopping traffic.
- Take the next _____ to get onto the highway.
- A driver lost control, but the _____ prevented him from hitting oncoming cars.

5 Listen and read the newspaper article again. How will the project affect commuters?

Listening

6 Listen to a conversation between a city official and a project manager. Choose the correct answers.

- What are the speakers mainly discussing?
 - A the cost of a highway repair
 - B plans for a new highway
 - C lanes that must be repaved
 - D the deadline for a project
- What problem did the man encounter?
 - A the guardrails arrived late
 - B the divider was damaged
 - C the paver broke down
 - D the express lane was closed

7 Listen again and complete the conversation.

Official: Mr. Larsen, can we talk about the 1 _____ ?

Manager: Of course, Ms. Jessop. 2 _____ ?

Official: Well, will you be 3 _____ your August 29th deadline?

Manager: I think so, we're 4 _____ .

Official: I saw the new 5 _____ . What else needs to be done?

Manager: A few things. We still have to repave 6 _____ .

Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

Will you be able to meet your deadline?
That was supposed to be done by ...
What happened?

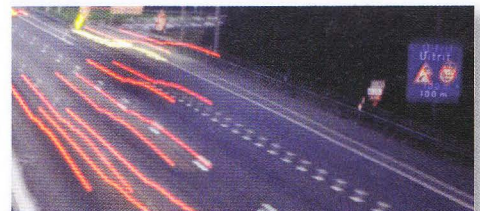
Student A: You are a city official. Talk to Student B about:

- a highway project
- meeting a deadline
- what still needs to be done

Student B: You are a highway project manager. Talk to Student A about the project.

Writing

9 Use the conversation from Task 8 to complete the project manager's schedule.



Highway 109

Construction Schedule

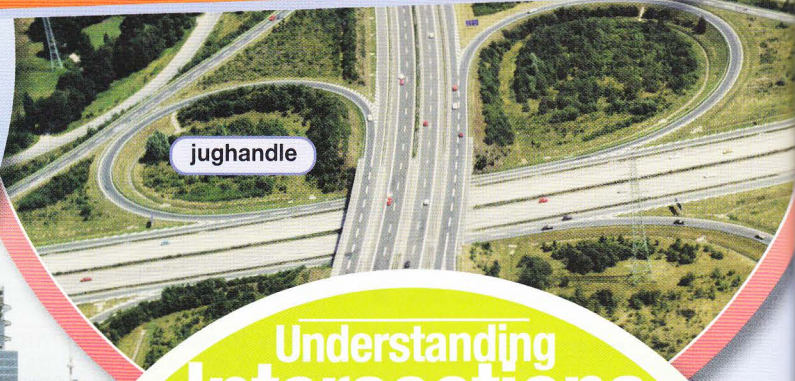
Installation/Task	Deadline
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____



Get ready!

1 Before you read the passage, talk about these questions.

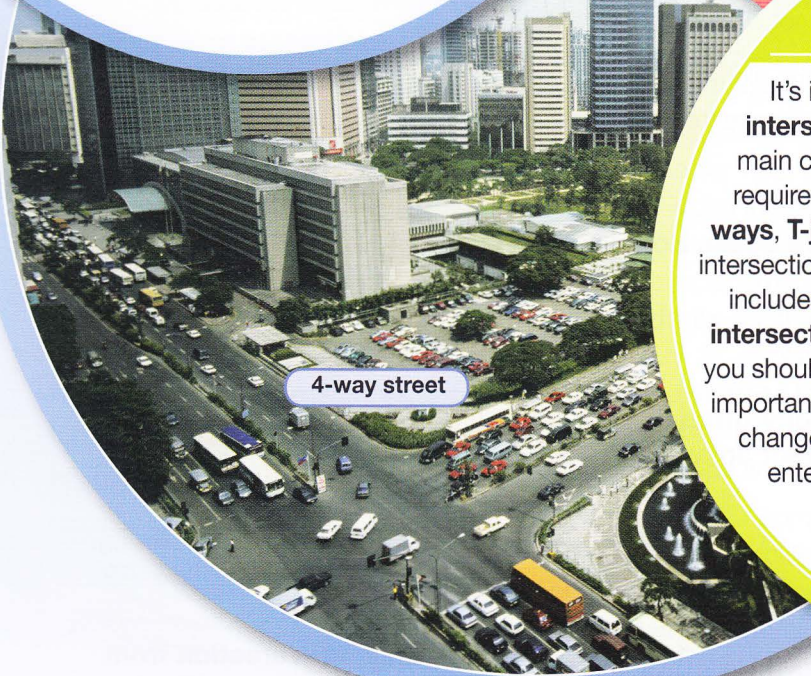
- 1 What are some common types of intersections?
- 2 What types of intersections do not require full stops?



Understanding Intersections

It's important to understand the different types of **intersections**. Intersections can be grouped into two main categories. The first category is intersections that require vehicles to come to a full stop. These include **4-ways**, **T-junctions**, and **box junctions**. The second type of intersection allows traffic to flow without stopping. This group includes **roundabouts**, **traffic circles**, **continuous flow intersections**, and **jughandles**. At any type of intersection, you should know the regulations that apply. For example, it's important to know which vehicle has the **right of way**. This changes by nation and region. Likewise, check how to enter a **turn lane** and whether or not **U-turns** are permitted.

*Driving Around the World
Chapter 10*



Reading

2 Read the chapter. Then, choose the correct answers.

- 1 What is the purpose of the passage?
 - A to describe the safety features of intersection types
 - B to give the pros and cons of full stop intersections
 - C to list different types of intersections
 - D to explain right of way in different intersections
- 2 Which intersection requires a driver to stop?

A roundabout	C traffic circle
B T-junction	D jughandle
- 3 Which of the following does NOT change by region or nation?
 - A how to enter turn lanes
 - B whether U-turns are allowed
 - C if box junctions require stops
 - D which vehicle has the right of way

Vocabulary

3 Match the words or phrases (1-7) with the definitions (A-G).

- | | |
|---------------------|-----------------------------------|
| 1 __ roundabout | 5 __ box junction |
| 2 __ traffic circle | 6 __ 4-way |
| 3 __ jughandle | 7 __ continuous flow intersection |
| 4 __ T-junction | |
- A an intersection where one road ends at a right angle
 - B an intersection where vehicles follow a gradual bend
 - C an indirect route over an intersection
 - D an intersection that contains yellow cross-hatching
 - E a road that eliminates left turns at intersections by leading drivers to another turn location
 - F an intersection where traffic coming from all four directions must stop
 - G a circular area at an intersection that allows for vehicles to pass between two roads

- 4 Fill in the blanks with the correct words or phrases from the word bank.

Word BANK

intersection the right of way
U-turn turn lane

- At the next _____, take a left
 - At a 4-way intersection, the vehicle on the right has _____.
 - It's illegal to make a(n) _____ on this road.
 - This street has a(n) _____ for both left turns as well as right turns.
- 5 Listen and read the chapter again. What are the two main types of intersections?

Listening

- 6 Listen to a conversation between a city planner and a construction manager. Mark the following statements as true (T) or false (F).
- ___ The design calls for a T-junction at 10th Street and Route 9.
 - ___ A roundabout will not fit in the area.
 - ___ The man suggests using a jughandle.
- 7 Listen again and complete the conversation.

Planner: Ms. Reed, I have an idea for the 1 _____ 10th Street and Route 9.

Manager: Sure, James. What is it?

Planner: Well, the plan 2 _____ a four-way stop.

Manager: Yes, that's correct.

Planner: I think that will 3 _____ traffic.

Manager: It will. But there's no room for a 4 _____ there.

Planner: I know. But I think we could fit a 5 _____.

Manager: You know, that's a good idea. Let's 6 _____ at the plans.

Speaking

- 8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

I have an idea for ...
I think that will ...
We could fit a ...

Student A: You are a city planner. Talk to Student B about:

- a planned intersection
- the current plan
- a change to the plan

Student B: You are a project manager. Talk to Student A about an intersection.

Writing

- 9 Use the conversation from Task 8 to complete the construction manager's email.

To: _____
From: _____
Subject: _____

Dear _____,

The Route 9 plan calls for a _____ intersection. I think this will _____. A _____ will not fit. Instead, I suggest we use _____. Let me know what you think.

Sincerely,



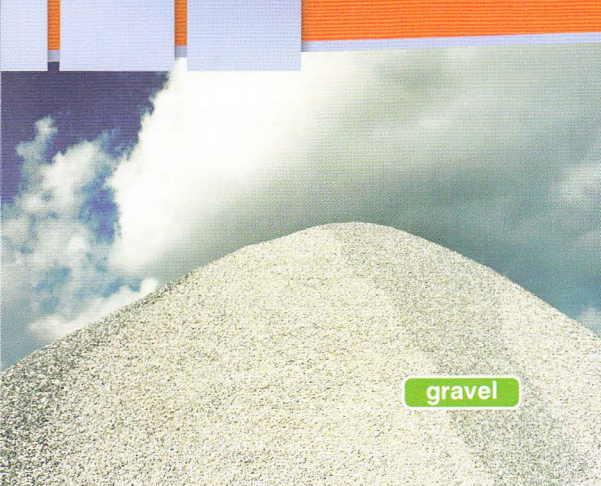
roundabout



T-junction



U-turn



gravel

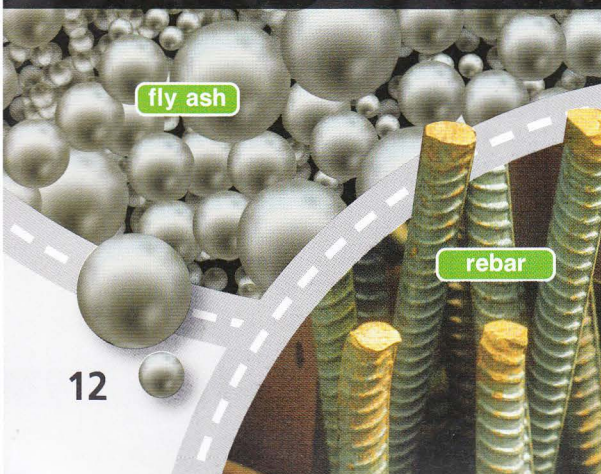
Modern ROAD Materials

The Old and the New

Today's roads are made from several materials. The material selected depends mainly on the expected traffic load of the road. For example, in rural areas **gravel** roads often perform well. Others may be coated with a **bituminous surface treatment (BST)**.

However, **asphalt** made of **bitumen** and a mineral aggregate is the most common material. It has largely replaced Portland cement **concrete**. **Lime** may be used as a stabilizer. Roads may be reinforced with **steel rebars** to increase their lifespan.

In recent years, recycled industrial materials have been added to asphalt. This lowers costs and improves performance. For example, **rubber** from old tires reduces the noise level of a road. **Fly ash** from burned coal makes concrete more durable.



fly ash

rebar



bitumen

rubber

asphalt

Get ready!

1 Before you read the passage, talk about these questions.

- 1 What materials are used to lay the surface of a road?
- 2 What is one material that can be recycled to be used in road building?

Reading

2 Read the informational pamphlet about road materials. Then, mark the following statements as true (T) or false (F).

- 1 Gravel roads are not coated with bituminous surface treatment.
- 2 Portland cement concrete has replaced asphalt.
- 3 Rubber in asphalt makes a road more durable.

Vocabulary

3 Match the words (1-5) with the definitions (A-E).

- | | | |
|-------------------------------------|----------------------------------|------------------------------------|
| 1 <input type="checkbox"/> concrete | 3 <input type="checkbox"/> BST | 5 <input type="checkbox"/> asphalt |
| 2 <input type="checkbox"/> lime | 4 <input type="checkbox"/> rebar | |

- A a steel bar used to reinforce concrete and masonry structures
- B a sticky, black liquid that is combined with a solid such as crushed stone to form a road covering
- C a mix of cement, water, gravel, and sand used as a building and roadway material
- D an inorganic material containing calcium, sometimes used to stabilize a roadway
- E a layer of asphalt and fine aggregate used as a roadway seal, especially on a roadway with a low traffic volume

- 4 Fill in the blanks with the correct words or phrases from the word bank.

word BANK

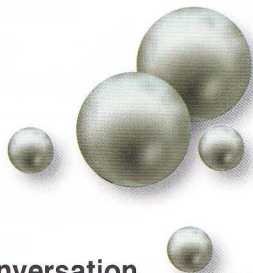
gravel steel rubber fly ash bitumen

- 1 _____ holds this asphalt together.
 - 2 A _____ road has loose rocks on the surface.
 - 3 Some pavements are reinforced with _____ bars.
 - 4 Does this concrete contain any recycled _____ from coal?
 - 5 Adding _____ from old tires to asphalt lowers road noise.
- 5 Listen and read the informational pamphlet about road materials again. Is a busy road more likely to have asphalt or gravel as a surface material?

Listening

- 6 Listen to a conversation between two construction company managers. Choose the correct answers.

- 1 What is the conversation mainly about?
 - A an error in a road design
 - B ways to use recycled materials
 - C how to strengthen a road
 - D how to reduce a road's noise level
- 2 What will the man likely do next?
 - A inspect the road
 - B send the client an email
 - C place an order for fly ash
 - D research recycled road materials



- 7 Listen again and complete the conversation.

Manager 1: Sheila, I 1 _____ from our client.

Manager 2: Oh, yeah? What 2 _____?

Manager 1: He'd like to use some 3 _____ for the road project.

Manager 2: Okay, we should be able to do that. Do you have 4 _____?

Manager 1: Well, 5 _____ mix rubber from old tires into the asphalt.

Manager 2: Yes, that would reduce the road's noise. Or, we could mix in some 6 _____ to the concrete portions.

Speaking

- 8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

*He'd like to ... / We could ...
That would ...*

Student A: You are a construction company manager. Talk to Student B about:

- using recycled materials in a road
- different options
- the benefit of each option

Student B: You are a construction company manager. Talk to Student A about using recycled materials in a road.

Writing

- 9 Use the conversation from Task 8 to complete the manager's email.

Dear Mr. Anderson,

I got your email about using recycled materials in the road. I think we have two good options.

First, we could _____

This would _____

Secondly, we could _____

This would _____

What do you think of those options?

Sincerely,

How do they say it?

Symbol/ Number	Interpretation/ Pronunciation	Example
=	is, equals, comes to	$\frac{1}{2} = 0.5$ One-half equals point five.
+	and, plus, add	$10 + 5 = 15$ Ten and five comes to fifteen.
-	minus, less, subtract	$10 - 5 = 5$ Ten less five is five.
X	times, multiplied by	$10 \times 5 = 50$ Ten times five equals fifty.
/	divided by, over	$10 / 5 = 2$ Ten divided by five is two.
$\frac{7}{8}$	seven eighths	$\frac{1}{8}$ The cable measured one eighth of a meter.
1,500	one thousand five hundred or fifteen hundred	The gravel cost fifteen hundred dollars.

Get ready!

1 Before you read the passage, talk about these questions.

- How do you say symbols like =, -, and x?
- What endings should you add to fractions when saying them aloud?

Reading

2 Read the chart. Then, mark the following statements as true (T) or false (F).

- ___ Four less two means the same thing as four minus two.
- ___ Nine times two equals two plus nine.
- ___ $\frac{7}{8}$ is pronounced seven times eight.

Vocabulary

3 Fill in the blanks with the correct words or phrases from the word bank.

word BANK

add times less plus
point comes to hundred

- Two _____ three is six.
- Four plus four _____ eight.
- Fifty _____ twenty equals thirty.
- One thousand plus five hundred is fifteen _____.
- To get three, _____ one and two.
- Thirteen _____ four is seventeen.
- Two million and six hundred thousand is equal to two _____ six million.

4 Read the sentences and choose the correct words or phrases.

- 1 Two **and / divided by** three is five.
- 2 Nine **over / less** six equals three.
- 3 Start with ten. **Subtract / Add** two. This equals eight.
- 4 Five **multiplied by / divided by** two is ten.
- 5 Eight **over / plus** two equals four.
- 6 Forty **less / divided** by four equals ten.
- 7 Two plus nine **equals / over** eleven.

5 Listen and read the chart again. What are some words used to describe increasing a total? What are some to describe a total amount?

Listening

6 Listen to a conversation between two managers. Choose the correct answers.

- 1 What is the dialogue mainly about?
 - A the cost of a gravel order
 - B the reason an order was late
 - C the amount of gravel to order
 - D the quantity of extra gravel ordered
- 2 What mathematical error did the man make?
 - A He subtracted too much.
 - B He forgot to add a number.
 - C He multiplied instead of adding.
 - D He divided instead of subtracting.

7 Listen again and complete the conversation.

- Manager 1: Kate, will you 1 _____ at this order?
- Manager 2: Sure. 2 _____?
- Manager 1: It's this bill. It's way too high.
- Manager 2: Really? We ordered six tons of gravel. It 3 _____ twenty dollars per ton. Six times twenty is one hundred twenty.
- Manager 1: Yeah, but the total 4 _____ one hundred fifty.
- Manager 2: Hmm. Did you 5 _____ shipping costs?
- Manager 1: Oh, no. I forgot.
- Manager 2: That's it, then. The total was one hundred twenty for the gravel, 6 _____ thirty for shipping.

Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

Will you take a look at this ...
It's way too ...
Did you remember to ...

Student A: You are a manager.
Talk to Student B about:

- an order
- the prices
- the total

Student B: You are a manager.
Talk to Student A about an order.

Writing

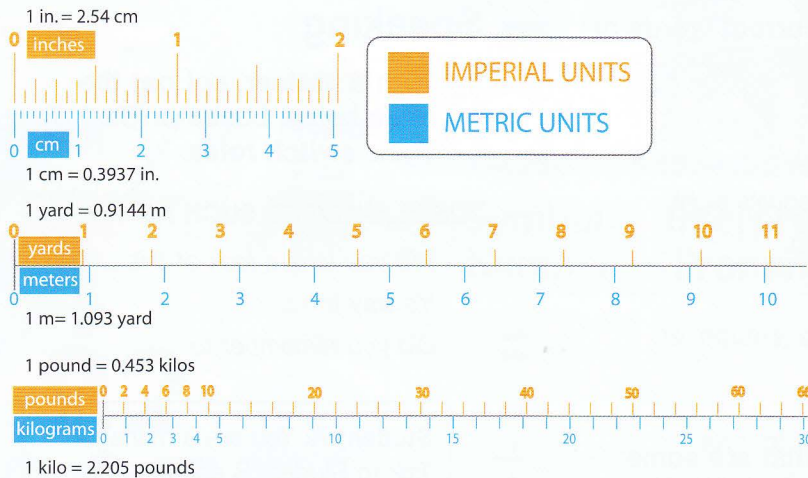
9 Use the conversation from Task 8 to complete the email.

To: _____
From: _____
Subject: Order Receipt

Dear _____,

I got your message about the receipt. But the total is not _____. We ordered _____ of gravel at _____ per ton. So the total for the gravel _____ dollars. But you _____ shipping costs. That's why the total was higher.

Sincerely,



Get ready!

1 Before you read the passage, talk about these questions.

- 1 What are some units of measurement of weight?
- 2 What are some units of measurement of distance?

Reading

2 Read the conversion chart. Then, mark the following statements as true (T) or false (F).

- 1 A yard and a meter are almost equivalent in length.
- 2 A kilogram is approximately half of a pound.
- 3 To change a measurement from imperial units to metric units, you have to divide.

Vocabulary

3 Match the words or phrases (1-4) with the definitions (A-D).

- 1 kilometer
- 2 kilogram
- 3 meter
- 4 short ton

- A a metric measurement of weight
- B a metric measurement of length that is nearly equal to a yard
- C a metric measurement of length used to measure long distances
- D an imperial measurement of weight

Metric vs. Imperial Units

Handy Conversion Chart

Don't know the difference between a pound and a kilogram? This chart will help you figure it out!

Measurements of Length/Distance

1 inch = 2.54 centimeters

1 foot = .3048 meters

1 yard = .91 meters

1 mile = 1.6 kilometers

Measurements of Weight

1 pound = .45 kilograms

1 short ton = .9 metric tonnes

To convert a measurement from imperial units to the metric system, just multiply.

5 yards to meters:

$5 \times .91 = 4.55$ meters.

To convert a measurement from metric units to imperial units, just divide.

16 kilograms to pounds:

$16 \div .45 = 35.5$ pounds

4 Read the sentence pairs. Choose which word or phrase best fits each blank.

1 imperial / metric

A In Europe, people use _____ units to measure things.

B The measurement is equivalent to 4 inches in the _____ system.

2 miles / pounds

A The box weighs about fifty _____ .

B The materials must be shipped to a facility that is 450 _____ away.

3 metric tons / yards

A The truck is carrying about two _____ of rock.

B Put the next fence post about three _____ away from this one.

- 5 Listen and read the conversion chart again. What measurements are nearly equal in metric and imperial systems?

Listening

- 6 Listen to a conversation between a company owner and a project manager. Choose the correct answers.

- What is the conversation mainly about?
 - A the location of the construction site
 - B the details of the road's measurements
 - C the different measurement systems
 - D the materials needed for the road
- What will the man and woman likely do next?
 - A measure the location of the road again
 - B convert the measurements to imperial units
 - C begin construction on the new road
 - D place an order for asphalt for the road.

- 7 Listen again and complete the conversation.

Manager: It's about 1 _____ .

Owner: Okay. And it's twenty-four feet 2 _____. So that's somewhere around seven meters?

Manager: Yes, 3 _____ seven and a half meters wide.

Owner: Thanks. We're 4 _____ a lot of asphalt.

Manager: Yes, 5 _____, we'll need 7,740 short tons. That's 6 _____ 7,000 metric tons.

Owner: Well, let's order now so we can start on time.

Speaking

- 8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

That's somewhere around ...

It's about ...

We'll need ...

Student A: You are a construction company owner. Talk to Student B about:

- a new project
- the measurements and metric conversions for the project
- the materials needed for the project

Student B: You are a project manager. Talk to Student A about the a new project.

Writing

- 9 Use the conversation from Task 8 to complete the project summary.

Jackson Construction

Project Summary

Type of road: _____

Length

Imperial: _____

Metric: _____

Width

Imperial: _____

Metric: _____

Material needed: _____

Amount

Imperial: _____

Metric: _____



round point shovel



sledgehammer

jackhammer



square shovel

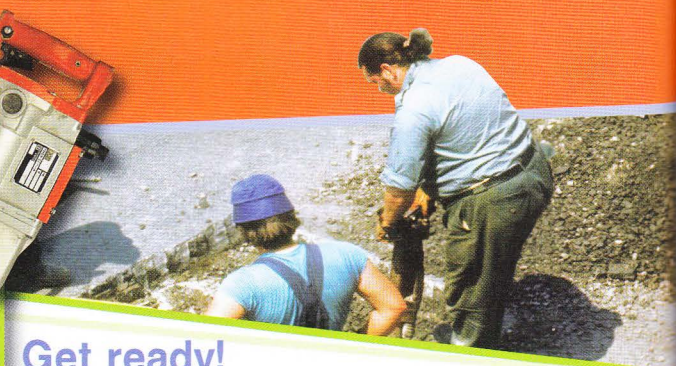
measure wheel



JACKSON

CONSTRUCTION

wheelbarrow



Get ready!

1 Before you read the passage, talk about these questions.

- 1 What are some tools used to collect and spread materials?
- 2 What tools are used to break up materials?

Reading

2 Read the sign out sheet. Then, choose the correct answers.

- 1 What is the purpose of the form?
 - A to request new tools
 - B to assess tool quality
 - C to prevent tool damage
 - D to keep track of tools
- 2 Which of the following was NOT used on the project?

A brooms	C wheelbarrows
B pickaxes	D square shovels
- 3 What is true of the tools used on the project?
 - A A pickax was damaged.
 - B A wheelbarrow needs repair.
 - C A sledgehammer was lost.
 - D A jackhammer failed to start.

Road Crew Tool Sign Out

The foreman will select all tools for each worksite. The foreman will account for all tools at the start and end of each shift.

Tool	# Checked Out	# Returned
Square Shovel	6	6
Round Point Shovel	10	9
Broom	3	2
Dustpan	2	2
Rake	5	5
Sledgehammer	0	-
Pickax	0	-
Jackhammer	1	1
Measure Wheel	1	1
Wheelbarrow	2	2

Foreman: **James Donelly**

Date: **October 10**

Notes: A round point shovel broke on the project. A broom was misplaced as well. One of the wheelbarrows has a loose wheel.

Vocabulary

3 Match the words or phrases (1-6) with the definitions (A-F).

- | | |
|---------------|--------------------------|
| 1 ___ broom | 4 ___ pickax |
| 2 ___ rake | 5 ___ square shovel |
| 3 ___ dustpan | 6 ___ round point shovel |

- A a tool with a two sharp spikes
- B a tool that holds materials that are swept into it
- C a tool with bristles that pushes or gathers materials
- D a tool with metal teeth that pushes or gathers materials
- E a tool with a rectangular metal plate
- F a tool with a curved metal plate

4 Read the sentence pairs. Choose which word or phrase best fits each blank.

1 wheelbarrow / measure wheel

- A Toss the loose dirt into the _____ .
 B Use the _____ to see how wide the road is.

2 jackhammer / sledgehammer

- A Using a _____ means a person must be strong enough to lift it over his head many times.
 B A _____ is incredibly loud, but it works much faster than a hand tool.

5 Listen and read the sign out sheet again. Who is responsible for the tools?

Listening

6 Listen to a conversation between two construction workers. Mark the following statements as true (T) or false (F).

- 1 ___ The man is breaking concrete.
 2 ___ The man's sledgehammer broke.
 3 ___ The woman goes to get the man a lighter sledgehammer.

7 Listen again and complete the conversation.

Worker 1: Lisa, do you 1 _____ ?

Worker 2: Yeah, sure. What do you need?

Worker 1: I'm breaking some concrete. But I'm pretty tired from using this 2 _____ .

Worker 2: Did you want me to 3 _____ ?

Worker 1: No, thanks. I was hoping you'd 4 _____ a jackhammer.

Worker 2: Oh, I think there's one in the truck.

Worker 1: Great! Can you 5 _____ ?

Worker 2: Yeah, I'll 6 _____ there now.

Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

Do you have a ...?

Did you want me to ...?

I think there's one in the truck.

Student A: You are a worker. Talk to Student B about:

- a task you are working on
- the tool you are using
- a tool you'd like to use

Student B: You are a worker. Talk to Student A about tools.

Writing

9 Use the conversation from Task 8 to complete the tool sign out sheet.

Jackson Construction

Tool Sign Out Sheet

Employee: _____

Tool(s) taken: _____

Task being performed/Reason tools taken: _____



JOB SITE SAFETY

Thousands of construction workers get hurt at work every year. Protect yourself by wearing safety equipment. On all job sites, workers must have:

- **steel-toe boots**
- **hard hats**
- **goggles or safety glasses**
- long pants
- brightly colored vests or shirts

Individual jobs require additional **PPE**.

- When grinding metals, use a **face shield**.
- Welders and electricians need thick **leather gloves**.
- Using power tools requires **grip gloves**.
- **Dust masks** are essential when sanding surfaces.
- You'll need **earplugs** to work in loud areas.
- **Kneepads** are required when kneeling on the ground.



safety glasses

dust mask



hard hat



face shield

grip gloves

ear plugs

Get ready!

- 1 Before you read the passage, talk about these questions.

- 1 What item of safety equipment protects a worker's head?
- 2 What protects a worker's ears?

first aid kit



First Aid

And always know where the **first aid kit** is.
Remember: better safe than sorry!

Reading

- 2 Read the poster from a construction site. Then, mark the following statements as true (T) or false (F).

- 1 ___ All workers need face shields while on a site.
- 2 ___ Electricians need to wear grip gloves.
- 3 ___ Sanding wood requires a dust mask.

Vocabulary

- 3 Read the sentences and choose the correct words or phrases.

- 1 I cut my hand. Please get me the **first aid kit / grip gloves**.
- 2 He got a piece of metal in his eyes because he wasn't wearing **goggles / earplugs**.
- 3 Always wear a **dust mask / hard hat** to protect your head on a job site.
- 4 **Kneepads / Steel-toe boots** will protect your feet if something heavy falls on them.

- 4 Match the words or phrases (1-8) with the definitions (A-H).

- | | |
|----------------------|-----------------|
| 1 ___ safety glasses | 5 ___ kneepads |
| 2 ___ face shield | 6 ___ dust mask |
| 3 ___ leather gloves | 7 ___ earplugs |
| 4 ___ grip gloves | 8 ___ PPE |

- A pieces of plastic or rubber that offer protection from loud noises
- B protective gear for your hands that is made with a thick material
- C cushions that protect the knees when kneeling or in a fall
- D eyewear with lenses that protect one's eyes
- E protective equipment with a rubber coating to prevent you from dropping something
- F a partial face covering that keeps dust particles out of the mouth and nose
- G a piece of equipment that protects the face from flying objects
- H a category of equipment used to protect workers

- 5 Listen and read the poster from a construction site again. What are some safety equipment items that all construction workers need?

Listening

- 6 Listen to a conversation between a manager and a new employee. Check (✓) the items that the employee must bring with him.

- 1 steel-toe boots 4 goggles
2 leather gloves 5 face shield
3 hard hat

- 7 Listen again and complete the conversation.

Manager: So Jacob, you'll start work 1 _____ . Do you have any questions?

Employee: 2 _____ . Do I need to bring any equipment to the job site?

Manager: Just a few things. You'll have to bring 3 _____ - _____ , for one.

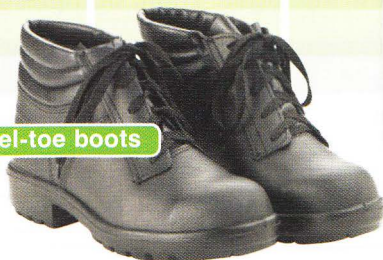
Employee: That's 4 _____ .

Manager: Good. You'll also need some 5 _____ .

Employee: That's fine. Will the company 6 _____ a hard hat, goggles, a face shield, and stuff like that?

Manager: Bring a hard hat, but we'll give you the other things.

steel-toe boots



Speaking

- 8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

You'll have to ...

You'll need ...

Student A: You are construction site manager. Talk to Student B about:

- when he or she will start work
- what equipment he or she needs
- what your company will provide

Student B: You are a new employee. Talk to Student A about what type of safety equipment you will need for the job.

Writing

- 9 Use the conversation from Task 8 to complete a new employee informational letter. Write the safety equipment items and the reasons they are needed.

Dear _____ ,

Welcome to Ace Construction! On your first day, you will need to bring several items with you, including:

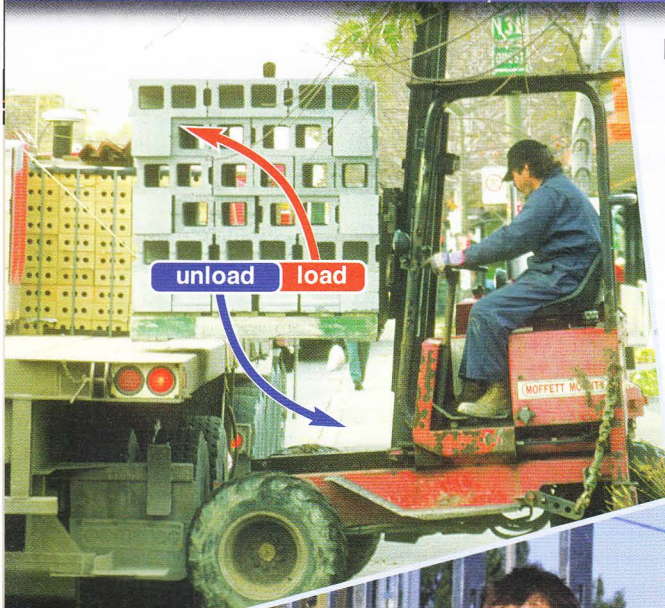
- 1 _____
2 _____
3 _____

The company will provide:

- 1 _____
2 _____
3 _____

Please direct all questions to your manager.

From: T.Klein@kleinconstruction.com
 To: E.Gregory@kleinconstruction.com
 Subject: Preparation for Memorial Road Project

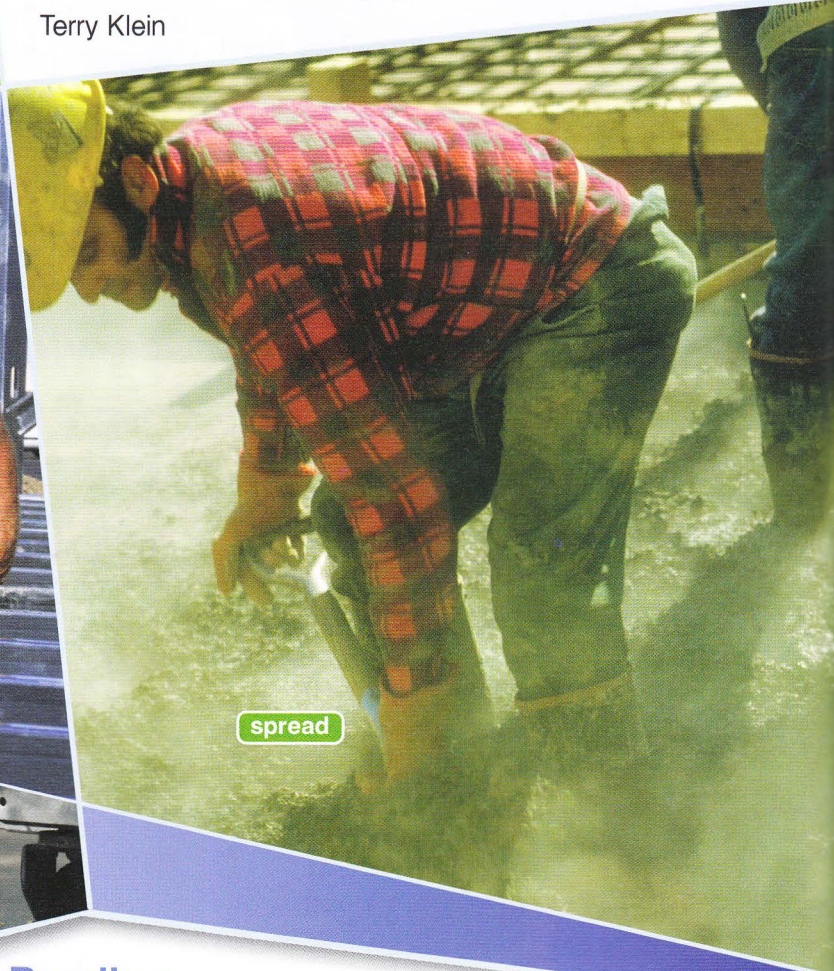
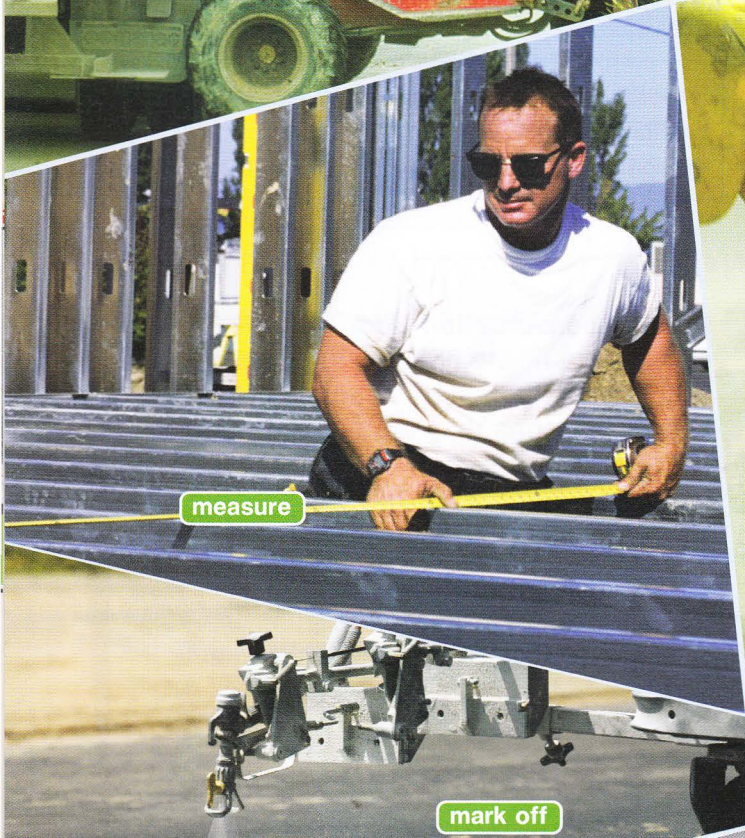


Hello Eric,

We just received the contract for the Memorial Road construction project. In two weeks, I need your crews to begin the preparation process. First, crews will **clear** the trees, **load** them onto trucks, and **remove** them from the area. After that, one group will **sweep** the area to remove debris. Another group needs to **measure** and **mark off** the boundaries for the road. Finally, your crew will **pick up** gravel from our suppliers and **drop it off** at the site. After that, they can **unload** the gravel and **spread** it over the area. Then we will be ready to begin the construction phase.

Please contact me with any questions.

Terry Klein



Reading

2 Read the email from a construction company owner to a crew manager. Then, complete the table.

Get ready!

1 Before you read the passage, talk about these questions.

- 1 What has to be done to prepare a site for road construction?
- 2 What is paint used for when preparing a work site?

Item to work on:	Tasks for each item:
Trees	_____ _____
Boundaries	_____ _____
Gravel	_____ _____

Vocabulary

3 Read the sentences and choose the correct words or phrases.

- 1 Drop off / Mark off these cans of paint at the office.
- 2 Get a broom and spread / sweep the dirt off the concrete.
- 3 Clear / Pick up some lumber from the hardware store.
- 4 A worker measured / cleared the fabric wrong, so it was too short.
- 5 The crew spread / removed the loose materials from the road before paving it.

4 Match the words or phrases (1-5) with the definitions (A-E).

- 1 ___ load 3 ___ mark off 5 ___ spread
 2 ___ unload 4 ___ clear

- A to remove items from a vehicle
 B to distribute something over an area
 C to put something in a vehicle
 D to take something away from an area
 E to put a barrier between two areas

5 Listen and read the email from a construction company owner to a crew manager again. Do the gravel suppliers deliver the gravel to the site?

Listening

6 Listen to a conversation between a supervisor and a foreman. Check (✓) the tasks that need to be done.

- 1 clear debris 3 drop off gravel 5 mark off
 2 spread gravel 4 remove asphalt lanes

7 Listen again and complete the conversation.

Foreman: Mr. Clark, what should the crew 1 _____ today?

Supervisor: Well, first, I need you to gather a group and start clearing the area.

Foreman: All right, I'll have some of the guys 2 _____ the debris.

Supervisor: Good. Then, we need to 3 _____ the boundaries of the new lane.

Foreman: Of course. I can 4 _____ that right away.

Supervisor: Great. Next, make sure that all the gravel is 5 _____ correctly.

Foreman: Okay. Got it.

Supervisor: Great. After that, we're 6 _____ spread it.

Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

First ...
 Then ...
 After that ...

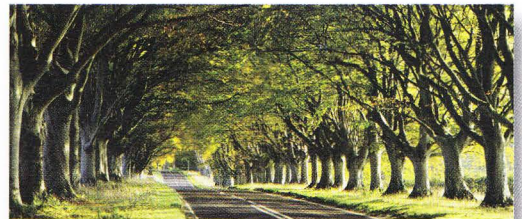
Student A: You are a supervisor. Talk to Student B about:

- tasks to complete
- the order of the tasks

Student B: You are a foreman. Talk to Student A about your tasks for the day.

Writing

9 Use the conversation from Task 8 to complete the list.



Tasks to Complete

The following tasks need to be completed on this construction project:

- _____
- _____
- _____
- _____
- _____



At RBP we manufacture all sorts of construction equipment, large and small. No matter what your job is, we can provide you with the right machine.



HOME

ABOUT US

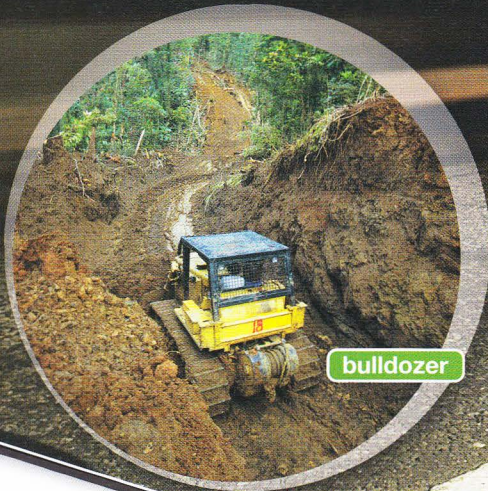
SERVICES

CONTACT

Earth and Material Moving: We make **scrapers** and **backhoes** to move dirt. We also have **bulldozers** and **loaders** capable of transporting many kinds of material. Most models are **articulated trucks** that move easily.

Road Construction: **Cement mixers** are available in various sizes. We also make large **vibratory rollers** and **compactors** to guarantee a solid, effective road.

Road Finishing: **Graders** are ideal for smoothing gravel roads. For smaller jobs, **screeds** are perfect for smoothing fresh concrete on sidewalks or driveways. Last, don't forget our line of **sweepers**, guaranteed to leave roads clean.



bulldozer



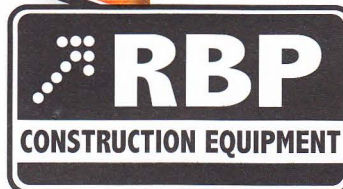
grader

loader

Get ready!

1 Before you read the passage, talk about these questions.

- 1 What are some machines used in road construction?
- 2 What is used to clean up a road after construction?



Reading

2 Read the website about construction vehicles. Then, choose the correct answers.

- 1 What is the benefit of an articulated earth mover?
 - A They make a road more solid.
 - B They carry different kinds of material.
 - C They can move more easily.
 - D They transport large amounts of dirt.
- 2 Which of the following is NOT used in road construction?

A vibratory roller	C compactor
B sweeper	D cement mixer
- 3 What kind of job should a screed be used for?

A highway	C earth moving
B gravel road	D sidewalk

Vocabulary

3 Match the words (1-5) or phrases with the definitions (A-E).

- | | |
|------------------------|----------------|
| 1 __ cement mixer | 4 __ compactor |
| 2 __ bulldozer | 5 __ scraper |
| 3 __ articulated truck | |

- A a vehicle used to flatten soil, gravel, rock, or asphalt when constructing a road
- B a vehicle that has a joint about which it can pivot, allowing it to turn sharply
- C a machine that combines water with cement, sand or gravel to form concrete
- D a construction vehicle that travels on tracks with a large blade on its front to push large amounts of material
- E a construction vehicle used to lift dirt off the ground and move it

4 Read the sentence pairs. Choose which word or phrase best fits each blank.

1 grader / screed

- A Use a _____ to make sure the concrete sidewalk is smooth.
 B The _____ drove over the gravel road to smooth it out.

2 loader / backhoe

- A Use a _____ to dig a ditch.
 B The _____ can move the gravel.

3 sweeper / vibratory roller

- A The _____ came by and now the street is very clean.
 B The _____ is slowly laying asphalt.

5 Listen and read the website about construction vehicles again. Would a bulldozer or a scraper be suitable for transporting a big load?

Listening

6 Listen to a conversation between a construction manager and an employee. Mark the following statements as true (T) or false (F).

- 1 ___ The company will be digging a ditch.
 2 ___ They will not need the bulldozer.
 3 ___ The backhoe and loader are on the same vehicle.

7 Listen again and complete the conversation.

Manager: We'll mainly be 1 _____ for a new lane on a road.

Employee: So we'll need the 2 _____, then.

Manager: Yes. 3 _____ the backhoe, too.

Employee: No problem. It has a loader on its 4 _____ too, right?

Manager: Yes. That'll save us having to bring 5 _____.

Employee: 6 _____. I'll go get the equipment ready.

Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

- We'll be ...*
We'll need the ...
We'll probably want the ...

Student A: You are a manager. Talk to Student B about:

- what job you are working on
- what equipment you will need
- why a certain piece of equipment is useful

Student B: You are a construction worker. Talk to Student A about a job and equipment.

Writing

9 Use the conversation from Task 8 to complete the worker's notes.



Job Notes

Task: _____

Equipment needed: _____

12 Communications



scan

communicate

smart phone

fax

two-way radio

Communications Plus

Helping You Stay in Touch at the Construction Site

You have to **communicate** on a busy job site. Communications Plus has everything you need to **contact** your people!

Get in touch with your work crews anytime you want. Just try our **two-way radios**. Talk to people up to five miles away at the touch of a button!

Looking for computer access without the big computer? **Smart phones** are the way to go. They aren't just phones. Send **emails**, view **PDFs**, order supplies online, and **confirm** all your appointments. Do it all without leaving the job site.

Every project manager needs an all-in-one printer at the office. Use it to **scan** building plans and send **faxes**. And of course, it prints!

Need more information? Call 555-1029 and **consult** a Communications Plus sales representative today.

Get ready!

1 Before you read the passage, talk about these questions.

- 1 What are some ways to communicate on a construction site?
- 2 What kind of messages can be sent from a smart phone?

Reading

2 Read the advertisement. Then, complete the table.

Item	Uses
Two-way radio	_____ _____
Smart phone	_____ _____
All-in-one printer	_____ _____

Vocabulary

3 Write a word that is similar in meaning to the underlined part.

- 1 Get in touch with Joe at Builder's Zone to order more plywood.
_ _ _ n _ _ _ t
- 2 Before we start building, I'd like to get advice from the architect.
_ o _ _ _ l _ _
- 3 She can't check her electronic messages sent from computers at the job site.
_ _ _ a i _ _
- 4 John and Eric do not exchange information well.
_ _ _ m _ u _ _ _ _ _ e

- 4 Fill in the blanks with the correct words or phrases from the word bank.

Word BANK

two-way radio smart phone
PDF confirm fax scan

- Sarah uses her _____ to send text messages and take pictures.
- Please _____ the document and print a copy of it.
- Please _____ that you will attend the meeting by sending a response to this message.
- This _____ receives signals from up to eight miles away on flat terrain.
- For some reason, I wasn't able to open the _____ on my computer.
- The _____ didn't go through because the line was busy.

- 5 Listen and read the advertisement again. Why are smart phones useful on a job site?

Listening

- 6 Listen to a conversation between a construction company owner and a project manager. Mark the following statements as true (T) or false (F).

- The man is about to pave the road.
- There might not be enough asphalt.
- The woman asks the man to send a fax.

- 7 Listen again and complete the conversation.

Manager: Pretty well. We're about to start 1 _____ the road.

Owner: 2 _____.

Manager: Yes, but there's a problem. We might not have 3 _____.

Owner: Find out and 4 _____ . That way I can order some more.

Manager: Okay. What's the best way 5 _____ you?

Owner: I'll be around the site for a while. So you could contact me on the two-way radio or just send me 6 _____.

Speaking

- 8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

We're about to ...

You could ... or ...

Why don't you ...?

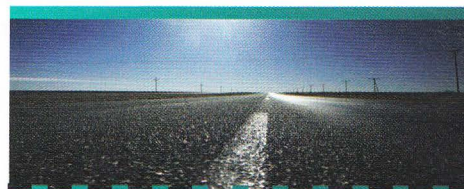
Student A: You are a construction company owner. Talk to Student B about:

- a problem on the job site
- how he or she can contact you about the problem

Student B: You are a project manager. Talk to Student A about a problem on your job site.

Writing

- 9 Use the conversation from Task 8 to complete the manager's report.



Project Status Report

Current status: _____

Possible problems: _____

Action: _____



soil

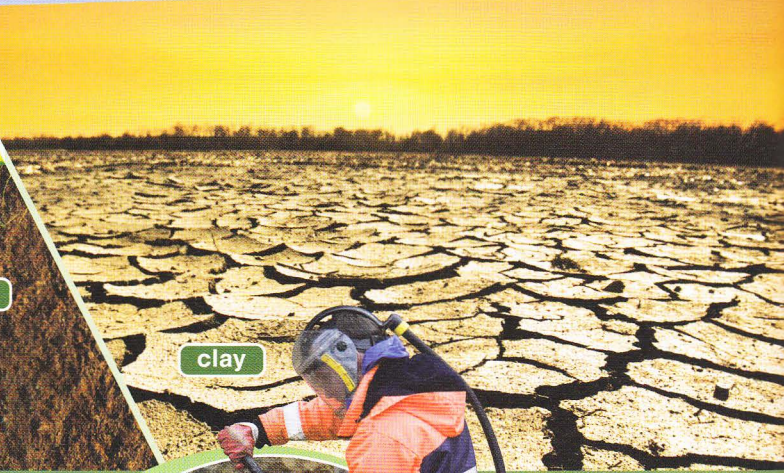
Report:

SOIL CONDITIONS on Clark Avenue Project Site

The soil tests for the project site are complete. They include tests of the potential **sub grade**. Mixtures of **clay**, **silt**, and **sand** soils were all found at the site. **Shear tests** and **bearing tests** were performed on all soil types.

Areas with clay showed the highest strength when dry. They also displayed good **compaction**. However, they may be subject to runoff during rain. Therefore, sand should be added to increase **stability**.

There may be trouble in an area with high silt. A **penetration test** showed possible weakness. A **California Bearing Ratio (CBR) test** was ordered to evaluate this concern. Results will be reported as soon as the test is performed.



clay



penetration test



sand



silt

Get ready!

1 Before you read the passage, talk about these questions.

- 1 What are some components of soil?
- 2 What is one test that measures the strength of soil?

Reading

2 Read the report on soil types on a new road site. Then, mark the following statements as true (T) or false (F).

- 1 ___ There was no sand found at the site.
- 2 ___ Sand should be added to the clay to increase its compaction.
- 3 ___ A CBR test was performed on the silt area.

Vocabulary

3 Match the words or phrases (1-6) with the definitions (A-F).

- | | |
|--------------------|------------------|
| 1 ___ bearing test | 4 ___ silt |
| 2 ___ sand | 5 ___ compaction |
| 3 ___ stability | 6 ___ shear test |

- A ground rock finer than gravel, found on beaches and in deserts
- B a test on sub grade soil to determine its stability and ability to handle loads
- C the ability of something to resist change or recover from a disturbance
- D a test to measure the strength of soil by taking several samples and analyzing them in a lab
- E very fine earth deposited from running water
- F the process of pressing something together so that it is denser

4 Read the sentences and choose the correct words or phrases.

- 1 The **sub grade / penetration test** under this road is very strong.
- 2 Perform a **sub grade / CBR test** to see how much pressure is needed to penetrate that area.
- 3 The **sand / soil** here can support a large amount of plant life.
- 4 **Clay / Silt** is the finest type of soil.
- 5 We will do a **compaction / penetration test** in this small area here.

5 Listen and read the report on soil types on a new road site again. What are the soil conditions on the site?

Listening

6 Listen to a conversation between a project manager and a technician. Choose the correct answers.

- 1 What is the conversation mainly about?
A the results of soil tests
B the composition of a silt soil
C the problem with a road's sub grade
D the difference between a CBR test and other soil tests
- 2 What news does the man receive?
A All of the soil tests are done.
B No soil will need to be moved.
C The silt can be used as sub grade.
D The clay is stronger than was thought.

7 Listen again and complete the conversation.

- Manager:** Claire, have you completed the 1 _____ on that silt area?
- Technician:** Yes, we just 2 _____ back.
- Manager:** Good. 3 _____?
- Technician:** I have 4 _____. The silt soil is actually stronger than we originally thought.
- Manager:** That's great to hear. So we can use it as 5 _____ after all?
- Technician:** Yes. It shouldn't 6 _____.

Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

- Have you ...?*
How did it go ...?
I have good/bad news ...

Student A: You are a project manager. Talk to Student B about:

- soil tests at a project site
- the results of the tests
- what more needs to be done

Student B: You are a technician. Talk to Student A about soil tests at a project site.

Writing

9 Use the conversation from Task 8 to complete the soil test report form.



Soil Test Report Form

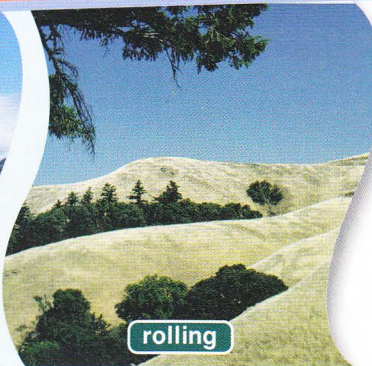
Test performed: _____

Results: _____

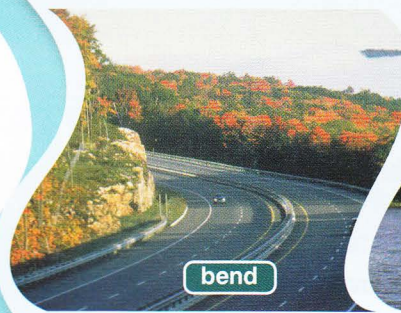
Next step: _____



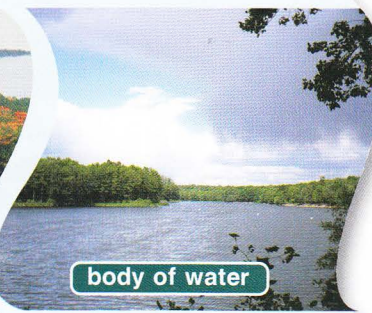
hill



rolling



bend



body of water



valley



mountainous

Landscape Assessment for the Waverly Road Extension Project

Presented by the
Newberry County Planning Board

Newberry County wants to extend Waverly Road to the southwest and connect it to Highway 15. However, the region is not **flat**. It has many **rolling hills** as you leave town. The **grade** of the hills is not high, but creating a level road will be difficult. Eight miles out, the landscape becomes **mountainous**. Building would require removing thousands of trees and would disturb wildlife. The road would need many **sharp** turns.

The Planning Board recommends extending Waverly to the north instead. As that area is a **valley**, construction will be easier. There is a **body of water**, Grand Lake, but it can be avoided by creating a **bend** in the road. The road would still connect to Highway 15. Overall, northern Newberry is ideal for the Waverly Road extension.

Get ready!

1 Before you read the passage, talk about these questions.

- 1 What landscapes are difficult to build roads on?
- 2 What landscape feature requires a bridge or a major rerouting of a road?

Reading

2 Read the report from a planning board. Then, choose the correct answers.

- 1 What is the report mainly about?
 - A the reasons for extending an existing road
 - B the pros and cons of building a new road
 - C the materials needed to build in mountains
 - D the problems with building in a certain area
- 2 Which of the following is NOT true of the area southwest of Newberry?
 - A It features many hills with low grades.
 - B It shifts from hilly to mountainous.
 - C It has a wildlife population.
 - D It is characterized by sharp turns.
- 3 Why does the Planning Board say the county should build to the north?
 - A There is a highway nearby.
 - B The area is not as challenging.
 - C It will be cheaper to build there.
 - D There are no bodies of water there.

Vocabulary

3 Match the words (1-5) with the definitions (A-E).

- | | | | |
|---|-----------|---|---------|
| 1 | — rolling | 4 | — grade |
| 2 | — valley | 5 | — sharp |
| 3 | — hill | | |

- A a low area between two hills or mountains
- B having a sudden change in direction
- C having lots of hills that are not very steep
- D the steepness of a piece of land
- E a geographic feature that is higher than the area around it, but lower than a mountain

4 Read the sentences and choose the correct words or phrases.

- 1 The area is very **flat / sharp**. It doesn't have any mountains.
- 2 The city will have to build a bridge over the **valley / body of water**.
- 3 There is a slight **grade / bend** where the road turns northwest.
- 4 The region has **mountainous / rolling** terrain. The steep slopes are quite dangerous in the winter.

5 Listen and read the report from a planning board again. What is the problem with building in hilly and mountainous areas?

Listening

6 Listen to a conversation between a construction company owner and a project manager. Mark the following statements as true (T) or false (F).

- 1 The first plan calls for building roads over hills.
- 2 The woman suggests building the highway on flatter ground.
- 3 The second plan requires building a bridge.

7 Listen again and complete the conversation.

Owner: What do 1 _____ the plan for Highway 28?

Manager: It's not the greatest. The area has rolling hills. To keep the road level, we'll need to 2 _____ them.

Owner: So there will be 3 _____ bends and sharp turns.

Manager: 4 _____.

Owner: 5 _____ it be better to build near Eagle Lake?

Manager: Much better, actually. Aside from the lake, the area is 6 _____.

Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

What do you think of ...?

Would it be better to ...?

Would you advise ...?

Student A: You are a construction company owner. Talk to Student B about possible routes for a new road.

Student B: You are a project manager. Talk to Student A about the landscape for a new a road.

Writing

9 Use the conversation from Task 8 to complete the report.

Northwest Construction

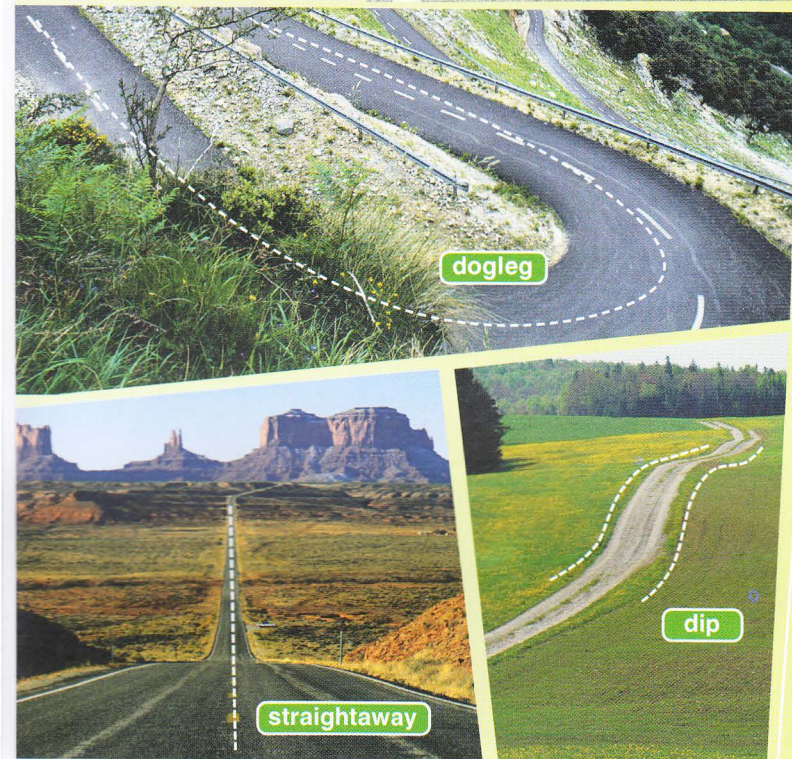
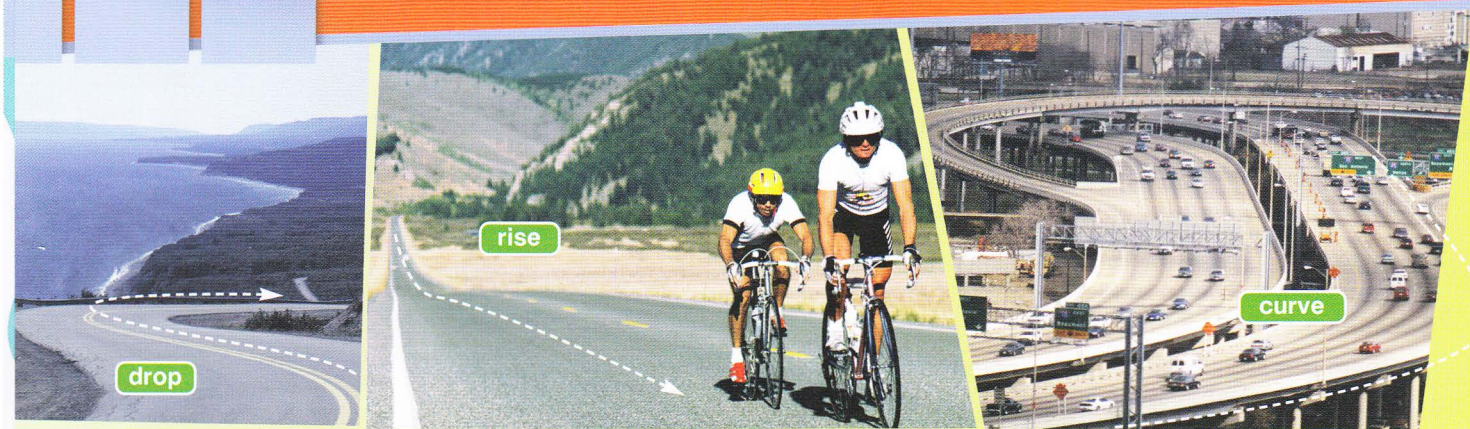
Landscape Assessment

Project: _____

Proposed route: _____

Possible problems: _____

Alternative route: _____



From: Josh Harrison

To: Ruth Bauman

Re: Landscape on Highway 35 expansion

Hi Ruth,

I have new information regarding the **terrain** for the planned Highway 35 expansion. The road will not be able to have as many flat **straightaways** as we hoped. There are several **steep slopes** along the route. This includes a sharp 30 meter **drop** that is too dangerous for a road. We will have to **curve** the road around it.

There are also some **slight rises**. But they shouldn't pose much of a problem. The main concern is the frequent **dips** between them. We may need to level them out a bit. Last, the planned route calls for a sharp **dogleg** as the highway turns into town. We may want to reroute that to avoid accidents. Thanks,

Josh

Get ready!

1 Before you read the passage, talk about these questions.

- 1 What are some landscape features present around hills?
- 2 What is one example of a sharp turn?

Reading

2 Read the email about the landscape for a possible road. Then, mark the following statements as true (T) or false (F).

- 1 The man recommends adding a straightaway.
- 2 The road will have to curve around a sharp drop.
- 3 The dogleg turn has caused several accidents.

Vocabulary

3 Match the words (1-5) with the definitions (A-E).

- | | |
|------------------------------------|-----------------------------------------|
| 1 <input type="checkbox"/> steep | 4 <input type="checkbox"/> straightaway |
| 2 <input type="checkbox"/> slope | 5 <input type="checkbox"/> dogleg |
| 3 <input type="checkbox"/> terrain | |

- A an area of land that runs evenly upward or downward
- B rising or falling quickly over a short distance
- C a long section of road that does not have any bends
- D the specific features of a piece of land
- E a sharp bend in a road

4 Fill in the blanks with the correct words from the word bank.

Word BANK

rise drop curve slight dip

- There is a _____ slope upward in the road ahead.
- Be ready for a sharp right _____ in the road.
- There is a steep _____ down after this hill.
- Do not drive too fast over a _____, even if it is small.
- The steep _____ causes traffic to slow down because cars cannot drive up it quickly.

5 Listen and read the email about the landscape for a possible road again. What are some landscape features of the planned road?

Listening

6 Listen to a conversation between a construction company owner and a manager. Choose the correct answers.

- What is the conversation mainly about?
 - A progress on a road project
 - B how to finish a road faster
 - C different kinds of terrain features
 - D the distance of a road expansion
- What problem does the man describe?
 - A a rise is too steep
 - B the crew is too small
 - C a turn is too sharp
 - D the highway is too long

7 Listen again and complete the conversation.

Owner: Josh, how is the Highway 35 1 _____ coming?
Manager: Well, 2 _____ great until yesterday.
Owner: Really? 3 _____?
Manager: We 4 _____ two kilometers from the end of the expansion. Then we ran into trouble.
Owner: What kind of trouble? A problem 5 _____?
Manager: Yeah. We reached a sharp rise. We planned on going over it. But it's too steep.
Owner: So we'll 6 _____ around it?

Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

How is the ...?
We got as far as ...
We have to ...

Student A: You are a construction company owner. Talk to Student B about:

- progress on a road project
- a problem with the landscape
- what will be done about the problem

Student B: You are a construction company manager. Talk to Student A about progress on a road project.

Writing

9 Use the conversation from Task 8 to complete the project progress report.

Josh Harrison

**Highway 35
Expansion Progress**

Point reached: _____

 Problem: _____

 Solution: _____

Glossary

- 4-way** [N-COUNT-U4] A **4-way** is an intersection at which traffic coming from all four directions must stop before proceeding.
- add** [V-T-U6] To **add** numbers is to combine them.
- alley** [N-COUNT-U1] An **alley** is a narrow passageway between buildings or houses that connects one street to another.
- and** [CONJ-U6] **And** is used when combining or adding numbers. For example, one and one equals two.
- articulated truck** [N-COUNT-U11] An **articulated truck** is a vehicle that has a joint about which it can pivot, allowing it to turn sharply.
- asphalt** [N-UNCOUNT-U5] **Asphalt** is a sticky, black liquid that is combined with a solid such as crushed stone to form a road covering.
- avenue** [N-COUNT-U1] An **avenue** is a public road that runs perpendicular to a street.
- backhoe** [N-COUNT-U11] A **backhoe** is a machine with a large digging bucket at the end of a two-piece articulated arm.
- bearing test** [N-COUNT-U13] A **bearing test** is a test on sub grade soil to determine its stability and ability to handle loads.
- bend** [N-COUNT-U14] A **bend** is a part of a road that curves.
- bitumen** [N-UNCOUNT-U5] **Bitumen** is a sticky, tar-like form of petroleum that is a binding agent in asphalt.
- Bituminous Surface Treatment (BST)** [N-UNCOUNT-U5] **Bituminous Surface Treatment (BST)** is a layer of asphalt and fine aggregate used as a roadway seal, especially on a roadway with low traffic volume.
- body of water** [N-COUNT-U14] A **body of water** is a geographical feature that is made up of water, such as a lake or an ocean.
- boulevard** [N-COUNT-U1] A **boulevard** is a wide avenue that often has trees or flowers on the sides.
- box junction** [N-COUNT-U4] A **box junction** is a type of intersection that contains yellow cross-hatching. Cars may only enter the specified area when their exit is clear.
- breakdown lane** [N-COUNT-U3] A **breakdown lane** is an area on a highway that is reserved for vehicles that have broken down and are waiting for repair.
- broom** [N-COUNT-U8] A **broom** is a tool with a long handle and bristles at the bottom that is used to push materials across a surface.
- bulldozer** [N-COUNT-U11] A **bulldozer** is a construction vehicle that travels on tracks with a large blade on its front to push large amounts of material.
- bypass** [N-COUNT-U3] A **bypass** is a highway or road that allows vehicles to go around business routes or local traffic.
- California Bearing Ratio (CBR) test** [N-COUNT-U13] A **California Bearing Ratio (CBR) test** is a penetration soil test that measures the pressure required to penetrate a soil sample in a standard area.
- cement mixer** [N-COUNT-U11] A **cement mixer** is a machine that combines water with cement, sand or gravel to form concrete.
- clay** [N-UNCOUNT-U13] **Clay** is a very fine material found in nature and made of various minerals.
- clear** [V-T-U10] To **clear** an area is to remove objects from it.
- come to** [V-PHRASAL-U6] To **come to** a number is to equal that number.
- communicate** [V-I or T-U12] To **communicate** is to express information in a way that can be understood by others.
- compaction** [N-UNCOUNT-U13] **Compaction** is the process of pressing something together to make it denser.
- compactor** [N-COUNT-U11] A **compactor** is a vehicle used to flatten soil, gravel, rock, or asphalt when constructing a road.

concrete [N-UNCOUNT-U5] **Concrete** is a mix of cement, water, gravel, and sand used as a building and roadway material.

confirm [V-T-U12] To **confirm** something is to make sure that something will happen or did happen as agreed upon.

consult [V-T-U12] To **consult** someone is to seek out advice from someone who is knowledgeable about a particular subject.

contact [V-T-U12] To **contact** someone is to get in touch with that person.

continuous flow intersection [N-COUNT-U4] A **continuous flow intersection** is an intersection where turning vehicles follow a gradual bend and turn, rather than making a sharp turn.

corner [N-COUNT-U2] A **corner** is one of the four points off a road intersection where two roads meet.

cul-de-sac [N-COUNT-U1] A **cul-de-sac** is a short dead end street that usually ends in a circle shape.

curb [N-COUNT-U2] A **curb** is a raised row of concrete along the edge of a road.

curve [N-COUNT-U15] A **curve** is a gentle bend in a road.

dead end [N-COUNT-U1] A **dead end** is a road that is one-ended and has no outlet.

dip [N-COUNT-U15] A **dip** is a small lowered section in a road.

divider [N-COUNT-U3] A **divider** is a partition that separates lanes of traffic on a highway or street.

dogleg [N-COUNT-U15] A **dogleg** is a sharp bend in a road.

drop [N-COUNT-U15] A **drop** is an area of land that runs downward.

drop off [V-PHRASAL-U10] To **drop off** something is to transport it to a place and leave it there.

dust mask [N-COUNT-U9] A **dust mask** is a partial face covering that prevents the wearer from getting dust particles in his or her nose or mouth.

dustpan [N-COUNT-U8] A **dustpan** is a three-sided container with a handle, into which materials are pushed by a broom.

earplugs [N-COUNT-U9] **Earplugs** are small, flexible pieces of rubber or plastic that are put in the ears to protect them from loud noises.

email [N-COUNT-U12] An **email** is an electronic message sent between computers or other electronic devices.

equal [V-T-U6] To **equal** a number is to be the same as it is.

exit [N-COUNT-U3] An **exit** is a marked off ramp that leads off of the highway.

express lane [N-COUNT-U3] An **express lane** is a single lane or a system of multiple lanes that can be reversible in times of heavy traffic flow.

face shield [N-COUNT-U9] A **face shield** is a piece of safety equipment, typically made of plastic, glass, or wire, that protects the entire face from dangers like flying objects.

fast lane [N-COUNT-U3] A **fast lane** is the inside lane on a highway, reserved for passing and for vehicles traveling at a high speed.

fax [N-COUNT-U12] A **fax** is a message, using words or images, that is sent through a phone line and recreated on paper when it reaches the receiving end.

first aid kit [N-COUNT-U9] A **first aid kit** is a container that has all of the basic supplies needed to treat a minor injury.

flat [ADJ-U14] If a piece of land is **flat**, it is level and not bumpy or hilly.

fly ash [N-UNCOUNT-U5] **Fly ash** is particles produced from the burning of coal which is used as a mineral filler in concrete mixes.

freeway [N-COUNT-U1] A **freeway** is a large high-speed highway with four or more lanes.

Glossary

- goggles** [N-COUNT-U9] **Goggles** are a type of protective eyewear that cover the eyes and the area around them. They protect the eyes from particles that may fly out while using power tools or doing construction work.
- grade** [N-COUNT-U14] The **grade** of a piece of land is its inclination.
- grader** [N-COUNT-U11] A **grader** is a construction vehicle with a long, flat blade that can create a smooth surface.
- gravel** [N-UNCOUNT-U5] **Gravel** is small fragments of rock used as a roadway surface, especially in rural areas.
- grip gloves** [N-COUNT-U9] **Grip gloves** are gloves that have a rubbery coating on the outside, which allows the user to hold onto things more firmly.
- guardrail** [N-COUNT-U3] A **guardrail** is a long metal rail that borders the edge of a highway to keep cars from going off the highway in the case of an accident.
- gutter** [N-COUNT-U2] A **gutter** is a lowered channel along the side of a road that collects rainwater.
- hard hat** [N-COUNT-U9] A **hard hat** is a helmet made of metal or plastic, used to protect the head on construction sites.
- highway** [N-COUNT-U1] A **highway** is a large paved road connecting two cities.
- hill** [N-COUNT-U14] A **hill** is a land feature that is lower than a mountain, but higher than the area surrounding it.
- **hundred** [N-COUNT-U6] **Hundred** is combined with another number to abbreviate numbers in the thousands. For example, the number 2,300 could be stated twenty-three hundred.
- imperial** [ADJ-U7] If a measurement is **imperial**, it is part of a system that uses inches and pounds.
- interchange** [N-COUNT-U3] An **interchange** is the point where two or more highways meet and intersect.
- intersection** [N-COUNT-U4] An **intersection** is the point where two or more streets or roads come together.
- is** [V-I-U6] If the answer to a mathematical problem **is** a number, it equals that number.
- jackhammer** [N-COUNT-U8] A **jackhammer** is a power tool that drives a metal spike up and down to break up hard materials.
- jughandle** [N-COUNT-U4] A **jughandle** is a type of road that eliminates left turns in a four-way intersection by leading drivers away from the main intersection to make the turn.
- kilogram** [N-COUNT-U7] A **kilogram** is a metric measurement of weight.
- kilometer** [N-COUNT-U7] A **kilometer** is a metric measurement of length used for long distances.
- kneepads** [N-COUNT-U9] **Kneepads** are a type of protective equipment that provide cushioning to protect the knees in the case of a fall and provide comfort when doing tasks that involve kneeling.
- lane** [N-COUNT-U2] A **lane** is a lengthwise division of a road that is meant for one line of cars to drive in.
- leather gloves** [N-COUNT-U9] **Leather gloves** are a type of safety equipment that protect the hands while doing hazardous work.
- less** [PREP-U6] **Less** is used when taking away one number from another.
- lime** [N-UNCOUNT-U5] **Lime** is an inorganic material containing calcium that is used to stabilize a roadway.
- load** [V-T-U10] To **load** something is to put it into a vehicle.
- loader** [N-COUNT-U11] A **loader** is a construction vehicle with a large bucket on its front, used to lift asphalt, dirt, snow, gravel, rock, or other material.
- mark off** [V-PHRASAL-U10] To **mark** something **off** is to divide one area from another using some sort of barrier, such as a rope.
- measure** [V-T-U10] To **measure** something is to determine its size.
- measure wheel** [N-COUNT-U8] A **measure wheel** is a tool with a wheel attached to a handle. The wheel is rolled on the ground to measure distances.

median [N-COUNT-U2] A **median** is an area in the middle of a road that separates opposite directions of traffic.

meter [N-COUNT-U7] A **meter** is a metric measurement of length.

metric [ADJ-U7] If a measurement is **metric**, it is part of a measurement system that is used throughout most of the world.

metric ton [N-COUNT-U7] A **metric ton** is a measurement of weight used in the metric system for heavy loads.

mile [N-COUNT-U7] A **mile** is an imperial measurement of distance that is used for long distances.

minus [PREP-U6] **Minus** is used when taking away one number from another.

mountainous [ADJ-U14] If a piece of land is **mountainous**, it has mountains on it.

multiplied by [V-PHRASE-U6] If a number is **multiplied by** another, it is added onto itself that number of times.

off ramp [N-COUNT-U3] An **off ramp** is a special lane where vehicles leave a highway to go onto a street or road.

on ramp [N-COUNT-U3] An **on ramp** is a special lane where vehicles enter from a street or road onto a highway.

pavement [N-UNCOUNT-U2] **Pavement** is a road or walkway covering made of concrete, stone, blacktop, or other material.

PDF [N-COUNT-U12] A **PDF** (portable document format) is a type of computer file that can be opened and printed from any computer.

penetration test [N-COUNT-U13] A **penetration test** is similar to a bearing test but done in a smaller area with a relatively heavier load.

pick up [V-PHRASAL-U10] To **pick up** something is to go somewhere to get it.

pickaxe [N-COUNT-U8] A **pickaxe** is a tool with two large spikes that is used to break up earth and soil.

plus [PREP-U6] **Plus** is used when adding a number to another number.

point [N-COUNT-U6] **Point** represents a decimal or comma when speaking numbers aloud.

pound [N-COUNT-U7] A **pound** is an imperial measurement of weight and mass.

PPE (Personal Protective Equipment) [N-UNCOUNT-U9] **PPE (Personal Protective Equipment)** is safety gear which reduces a worker's exposure to hazards.

rake [N-COUNT-U8] A **rake** is a tool with a long handle and a group of metal teeth at the bottom that is used to gather or spread materials on a surface.

rebar [N-COUNT-U5] A **rebar** is a steel bar used to reinforce concrete and masonry structures.

remove [V-T-U10] To **remove** something is to take it away from an area.

rise [N-COUNT-U15] A **rise** is an area of land that runs upward.

road [N-COUNT-U1] A **road** is a long narrow track that allows vehicles to pass from one place to another.

roadway [N-COUNT-U2] A **roadway** is the main portion of a road used for vehicle traffic.

rolling [ADJ-U14] If a piece of land is **rolling**, it has many gentle slopes, or hills that are not very high.

round point shovel [N-COUNT-U8] A **round point shovel** is a tool with a long handle and a scooped metal blade with a rounded edge and point.

roundabout [N-COUNT-U4] A **roundabout** is a circular, indirect route over an intersection.

rubber [N-UNCOUNT-U5] **Rubber** is a bendable material that is either manmade or comes from the sap of the rubber tree.

safety glasses [N-COUNT-U9] **Safety glasses** are a type of protective eyewear which have plastic lenses that will not shatter.

sand [N-UNCOUNT-U13] **Sand** is ground rock finer than gravel, found on beaches and in deserts.

Glossary

- scan** [V-T-U12] To **scan** something is to convert an image or document into a digital file using a piece of equipment that has a special light which passes over the document.
- scraper** [N-COUNT-U11] A **scraper** is a construction vehicle used to lift dirt off the ground and move it.
- screed** [N-COUNT-U11] A **screed** is a flat board or aluminum tool used to smooth concrete after it has been laid.
- sharp** [ADJ-U14] If land feature is **sharp**, it has an abrupt change in direction.
- shear test** [N-COUNT-U13] A **shear test** is a test to measure the strength of soil by taking several samples and analyzing them in a lab.
- short ton** [N-COUNT-U7] A **short ton** is an imperial measurement of weight used for very heavy loads.
- shoulder** [N-COUNT-U2] A **shoulder** is part of a road on the edge where drivers may stop if they have an emergency.
- silt** [N-UNCOUNT-U13] **Silt** is very fine earth deposited from running water.
- sledgehammer** [N-COUNT-U8] A **sledgehammer** is a hand tool with a heavy metal cylinder at the head that is used to break up hard materials.
- slight** [ADJ-U15] If something is **slight**, it is small, gentle, or not severe.
- slope** [N-COUNT-U15] A **slope** is an area of land that runs evenly upward or downward.
- smart phone** [N-COUNT-U12] A **smart phone** is a type of phone that is used not only to make calls and send and receive text messages, but also to access the internet, watch videos, take pictures, and listen to music, among other features.
- soil** [N-UNCOUNT-U13] **Soil** is a mixture of sand and organic material that supports the growth of plants.
- spread** [V-T-U10] To **spread** something is to disperse something throughout an area.
- square shovel** [N-COUNT-U8] A **square shovel** is a tool with a long handle and a square metal blade at the bottom that is used to dig or spread materials.
- stability** [N-UNCOUNT-U13] **Stability** is the ability of something to resist change or recover from a disturbance.
- steel** [N-UNCOUNT-U5] **Steel** is a strong metal alloy made of iron and carbon. It can be shaped when hot.
- steel-toe boots** [N-COUNT-U9] **Steel-toe boots** are boots that have extra reinforcement at the toe, typically a plate made of steel. This protects the wearer's feet from heavy falling objects.
- steep** [ADJ-U15] If a road is **steep**, it rises or falls quickly over a short distance.
- storm drain** [N-COUNT-U2] A **storm drain** is an opening on the side of a road through which rainwater flows into the sewer.
- straightaway** [N-COUNT-U15] A **straightaway** is a long section of road that does not have any bends.
- street** [N-COUNT-U1] A **street** is a public road in a town or city that is paved.
- sub grade** [N-UNCOUNT-U13] **Sub grade** is the soil found underneath a road's pavement, which can be either natural or compacted.
- subtract** [V-T-U6] To **subtract** a number from a total is to reduce the total by that number.
- surface** [N-COUNT-U2] The **surface** is the entire flat top area of a road.
- sweep** [V-T-U10] To **sweep** something is to clear dust, dirt, or other small items from an area, generally using a broom.
- sweeper** [N-COUNT-U11] A **sweeper** is a large, drivable machine with water tanks, sprayers, and brooms, used to clean roads.
- terrain** [N-UNCOUNT-U15] **Terrain** is the specific features of a piece of land.
- th** [N-SUFFIX-U6] **-th** is combined with the second number of a fraction when it is said aloud.

the right of way [N-UNCOUNT-U4] **The right of way** is when one vehicle has the right to proceed in advance of another vehicle, according to traffic regulations.

times [PREP-U6] **Times** is used when multiplying numbers.

T-junction [N-COUNT-U4] A **T-junction** is an intersection at which one road ends at a right angle to a second road.

toll road [N-COUNT-U1] A **toll road** is a road where a driver must pay a fee to use the road.

traffic circle [N-COUNT-U4] A **traffic circle** is a circular area at an intersection that allows for the passage of vehicles from one road to another.

turn lane [N-COUNT-U4] A **turn lane** is a lane at a specific point in a street or highway which allows traffic to move into position for turning.

two-way radio [N-COUNT-U12] A **two-way radio** is a radio that can send and receive signals over a short distance.

unload [V-T-U10] To **unload** something is to take it off of a vehicle.

u-turn [N-COUNT-U4] A **u-turn** is a maneuver in which a vehicle turns to proceed in the opposite direction from its original course.

valley [N-COUNT-U14] A **valley** is an area of low land that is located between two hills or mountains. Streams or rivers can usually be found in valleys.

vibratory roller [N-COUNT-U11] A **vibratory roller** is a vehicle used to lay asphalt down on roadways.

wheelbarrow [N-COUNT-U8] A **wheelbarrow** is a cart with one wheel in front and two handles in back that is used to transport materials.

yard [N-COUNT-U7] A **yard** is an imperial measurement of length.

**CAREER
PATHS**

Construction II

**Roads &
Highways**

Book

2

Virginia Evans

Jenny Dooley

Mark Chavez



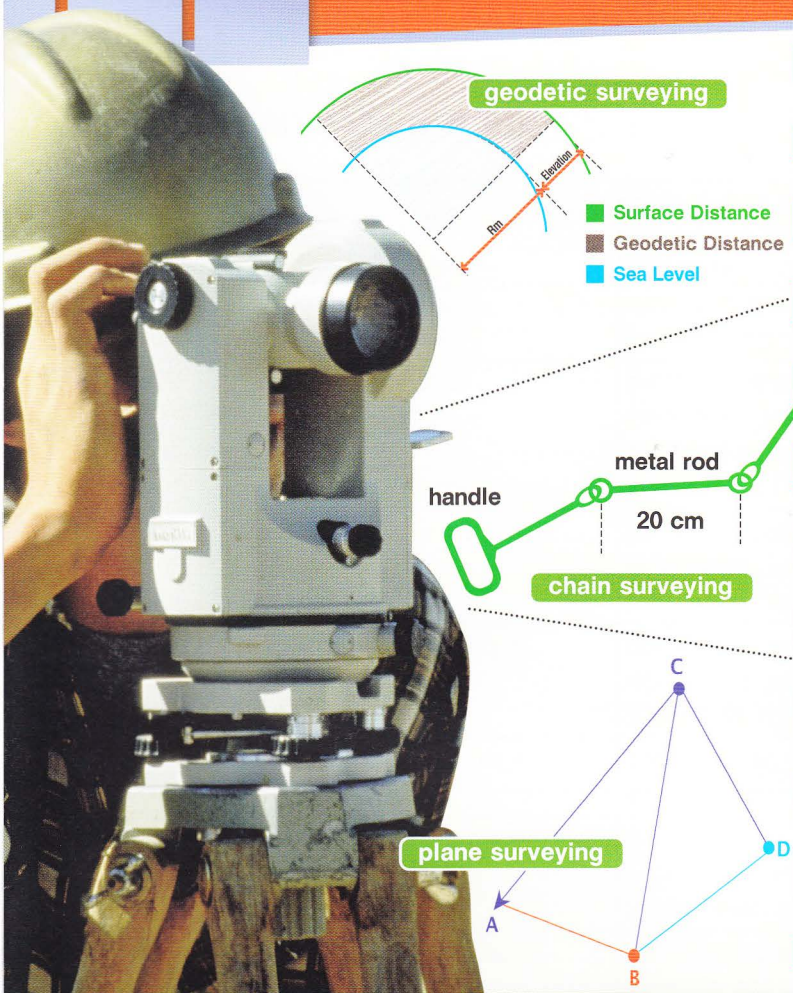
Express Publishing

Scope and Sequence

Unit	Topic	Reading context	Vocabulary	Function
1	Surveying	Guide	accumulated error, accurate, chain surveying, geodetic surveying, measuring tape, plane surveying, point, position, ranging rod, station peg, surveying, triangulation	Talking about time
2	Surveying Equipment	Email	automatic level, digital level, GPS, gyroscopic theodolite, laser level, optical level, optical micrometer, optical plumb, optical scale reading, optical square, theodolite, total station	Making comparisons
3	Plans	Email	centerline, cross section, detail drawing, elevation, exaggerate, horizontal scale, longitudinal section, map, plan, scale, transverse section, vertical scale	Expressing a concern
4	Setting Out Lines	Handbook	calculate, curve ranging, link, nylon line, radiused corner, repeated alignment, right-angle, set out, steel pin, straight, swing, take off	Asking for clarification
5	Earthworks 1	Web page	backfill, clear, compact, embankment, excavate, existing base, fill, mill, preparation, remove	Talking about prices
6	Earthworks 2	Web page	erosion control, fascine construction, gabion wall, geotextile, lime stabilization, load-bearing capacity, marsh, plastic mesh, slope reinforcement, stabilize, swamp	Offering solutions
7	Drainage	Newspaper article	cambered, drain, drainage, drainage area, gradient, manhole, saturation, self-cleansing velocity, sewer line, standing water, storm water, subsoil drainage	Asking for advice
8	Pipes	Product listing	bolting, caulking, corrugated metal pipe, culvert, flange, flexible, gasket, joint, pipe, polyethylene, rigid, socket, welding	Expressing confusion
9	Drains	Workman's guidebook	cross drain, discharge, edge drain, fin drain, French drain, land drain, pipe underdrain, sand drain, siphon, slope drain, soakaway, trench	Disagreeing with an opinion
10	Flexible Pavement 1: Structure	Textbook chapter	base course, binder course, capping layer, flexible construction, pavement, sub-base course, sub-grade course, surface course	Correcting an error
11	Flexible Pavement 2: Design	Email	assess, axle weight, commercial vehicle, cumulative, design life, design thickness, estimate, private vehicle, standard axles, traffic growth, traffic load	Confirming information
12	Flexible Pavement 3: Surfacing	Inspection report	abrasion, aggregate, friction test, grade, polished stone value, PSV test, rolled asphalt, skid-resistant, split friction, surface	Delivering bad news
13	Flexible Pavement 4: Defects	Article	alligator cracking, bleeding, block cracking, defect, excess, irregularity, raveling, reflective cracking, rutting, shoving, slippage, transverse cracking, uneven	Describing road damage
14	Rigid Pavement 1: Slabs and Joints	Publication	CRCP, joint, joint groove, JRC, rigid pavement, URC, sealant, slab, transverse joint	Asking about progress
15	Rigid Pavement 2: Formwork	Email	by hand, cube-crushing test, expansion joint, formwork, slump test, small-scale, strike, tamp, tamper bar, vertical temperature gradient, warping joint	Talking about completion

Table of Contents

Unit 1 - Surveying	4
Unit 2 - Surveying Equipment	6
Unit 3 - Plans	8
Unit 4 - Setting Out Lines	10
Unit 5 - Earthworks 1	12
Unit 6 - Earthworks 2	14
Unit 7 - Drainage	16
Unit 8 - Pipes	18
Unit 9 - Drains	20
Unit 10 - Flexible Pavement 1: Structure	22
Unit 11 - Flexible Pavement 2: Design	24
Unit 12 - Flexible Pavement 3: Surfacing	26
Unit 13 - Flexible Pavement 4: Defects	28
Unit 14 - Rigid Pavement 1: Slabs and Joints	30
Unit 15 - Rigid Pavement 2: Formwork	32
Glossary	34



Surveying Methods

There are two main methods of surveying: **geodetic surveying** and **plane surveying**. Geodetic surveying requires a lot of time and advanced instruments. Plane surveying can be done using a chain and **measuring tape**. It is faster and **accurate** enough for everyday uses. The following steps will guide you through the process.

Chain Surveying

Chain surveying relies on the principle of **triangulation**. Always begin with larger distances to minimize **accumulated errors**.

- Preliminary survey - Review the layout of the area before beginning the survey. Locate and sketch the **positions** of all major features.
- Marking station - Decide on the locations of stations and place **station pegs**.
- Measuring survey line AB - Place **ranging rods** at end of line to be measured. Walk towards **point B** with the chain and markers. At the end of the chain push marker into ground. Survey line is the length between point A and the marker.
- Taking offsets - Measure distance from marker to each feature using measuring tape.

Get ready!

1 Before you read the passage, talk about these questions.

- What is one method of surveying land?
- What is some equipment used when surveying land?

Reading

2 Read the surveying guide. Then, mark the following statements as true (T) or false (F).

- Geodetic surveying takes longer than plane surveying.
- Using triangulation helps avoid accumulated errors.
- Ranging rods should be placed before station pegs.

Vocabulary

3 Match the words or phrases (1-6) with the definitions (A-F).

- | | | | |
|---|---------------|---|---------------------|
| 1 | — ranging rod | 4 | — point |
| 2 | — station peg | 5 | — accumulated error |
| 3 | — accurate | 6 | — triangulation |

- A something precise in measurement
 B a miscalculation made worse by repeated use
 C a tall pole used to mark intermediate points in chain surveying
 D a defined position
 E a short wooden pin used to mark stations in chain surveying
 F a process of determining a distance to a point from an already established line

4 Read the sentence pairs. Choose which word or phrase best fits each blank.

- geodetic surveying / plane surveying**
 A _____ can be done with simple tools.
 B _____ accounts for the curve of the Earth.
- surveying / position**
 A The _____ of the obstruction is marked on the map.
 B When will the _____ be complete?

- 5 Listen and read the surveying guide again. How can surveyors avoid accumulated errors?

Listening

- 6 Listen to a conversation between a supervisor and a surveyor. Choose the correct answers.

- 1 What is the conversation mainly about?
- A the steps of plane surveying
 - B tasks for a preliminary survey
 - C the benefits of geodetic surveying
 - D equipment needed to complete a survey
- 2 What is true of the site?
- A It is flat.
 - B It is rather large.
 - C Its station locations are set.
 - D It will require a team to survey.

- 7 Listen again and complete the conversation.

- Supervisor:** Ms. Norris, do you have the instruments ready for this afternoon's survey?
- Surveyor:** I think so. Am I going 1 _____ ?
- Supervisor:** I think that's best. Today you can do preliminary 2 _____ .
- Surveyor:** Oh? But that won't 3 _____ the whole day.
- Supervisor:** It might. The site is fairly big. It'll take you a while to note the 4 _____ of all the features.
- Surveyor:** Is there anything special I should 5 _____ ?
- Supervisor:** Yes. Thanks for asking. Watch out for the slope of the field. It seemed 6 _____ .
- Surveyor:** Okay, will do.

Speaking

- 8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

Today you can ...

It'll take you a while to ...

Then, decide ...

Student A: You are a supervisor. Talk to Student B about:

- a survey
- how long it will take
- tasks to accomplish

Student B: You are a surveyor. Talk to Student A about a survey.

Writing

- 9 Use the conversation from Task 8 to fill out the site survey.



Jackson Construction

Site Survey

Employees/Crew: _____

Tasks

- 1 _____
- 2 _____
- 3 _____

Estimated time needed: _____



gyoscopic theodolite

optical level

optical plumb

optical micrometer reading

Get ready!

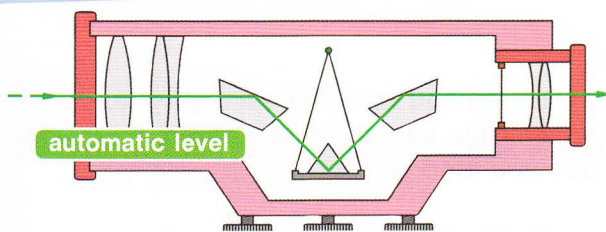
1 Before you read the passage, talk about these questions.

- 1 What are some examples of surveying equipment?
- 2 Which is more accurate, a digital level or an optical level?

Reading

2 Read the email from the surveyor about road construction. Then, choose the correct answers.

- 1 What is the purpose of the email?
 - A to list available surveying equipment
 - B to request new surveying equipment
 - C to recommend surveying equipment
 - D to approve surveying equipment purchases
- 2 Which of the following is NOT a problem for the surveyor?
 - A The theodolite gives only an optical scale reading.
 - B The automatic level shakes easily.
 - C The optical micrometer reading is incorrect.
 - D The maps they are using have too much writing on them.
- 3 Why does the surveyor want newer equipment?
 - A The equipment she has is broken or malfunctioning.
 - B The total station cannot measure angles correctly.
 - C The equipment she has is too complicated.
 - D The newer equipment is more accurate.



From: Elena Kulic
To: Jim Robertson
Subject: Surveying equipment

Hi Jim,

This is Elena. The old road we're working on is rather uneven, so we'll need better equipment. We already have a **theodolite** with an **optical plumb**. The problem is that our theodolite gives only an **optical scale reading**. A theodolite which gives an **optical micrometer reading** is more accurate. I know we have a **gyoscopic theodolite** in the office. However, we don't need that. If we have one, a **total station** would be more useful. There are so many angles at different distances on the road.

An **optical square** can help us build the new road evenly. A **laser level** is ideal, since we'll mark off the road. If not a laser level, a **digital level** would be great. The **automatic level** we use is easily affected by vibrations. Even an **optical level** would be an improvement.

Finally, our maps have too much writing on them. It would be easier to mark our positions with a **GPS** system.

Many thanks,
Elena

optical theodolite

Vocabulary

3 Match the words or phrases (1-8) with the definitions (A-H).

- | | |
|---------------------|-----------------------------|
| 1 ___ total station | 5 ___ optical plumb |
| 2 ___ GPS | 6 ___ theodolite |
| 3 ___ digital level | 7 ___ optical scale reading |
| 4 ___ laser level | 8 ___ optical square |

- A an instrument which measures distance and electronically measures and sets out angles
- B instrument used to level an instrument such as a theodolite over a station
- C an often self-adjusting level used in construction which also emits a horizontally-level, straight line of light
- D an instrument which can measure the horizontal level of the ground to a tenth of a millimeter
- E a range of geographic values determined by satellites
- F an instrument which measures horizontal and vertical angles
- G a measurement of an angle by an optical scale
- H an instrument which can set out right angles over a short distance

4 Read the sentence pairs. Choose which word or phrase best fits each blank.

1 optical level / gyroscopic theodolite

- A While working below ground, city workers needed a(n) _____ to measure angles.
- B The construction workers used a(n) _____ to make sure the foundation was on even ground.

2 automatic level / optical micrometer reading

- A In order to get an accurate measurement of an angle, we took a(n) _____.
- B To make sure the building's foundation was even, the contractors used a self-adjusting _____.

5 Listen and read the email from the surveyor about road construction again. Why are accurate levels important for road construction?

Listening

6 Listen to a conversation between a surveyor and a supervisor. Mark the following statements as true (T) or false (F).

- 1 ___ The woman wants a gyroscopic theodolite.
- 2 ___ The woman wants the new equipment for her team permanently.
- 3 ___ The woman would prefer an digital level to an optical level.

7 Listen again and complete the conversation.

- Surveyor:** Fine Jim. Did you get my email 1 _____?
- Supervisor:** I did. Unfortunately, 2 _____ some of the items you wanted.
- Surveyor:** Okay. So, 3 _____?
- Supervisor:** We can give you the optical square and an 4 _____ . But the laser level is out.
- Surveyor:** That's too bad. Don't we have a digital level? That would be 5 _____ .
- Supervisor:** Well, we need that for an upcoming project. Could you be done with it before the end of next week?
- Surveyor:** That doesn't give us much time. But we could probably return it 6 _____ .
- Supervisor:** All right, then. It's yours. Also do you definitely need a total station?

Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

- We can give you the ...*
Don't we have a ...?
Could you be done with it before ...?

Student A: You are a supervisor. Talk to Student B about:

- what is available for a project
- what instruments Student B might need
- when instruments should be returned

Student B: You are a surveyor. Ask Student A about what instruments you can use.

Writing

9 Use the conversation from Task 8 to fill out the equipment sign out sheet.

Jackson Construction

Equipment Sign Out Sheet

Equipment taken by: _____

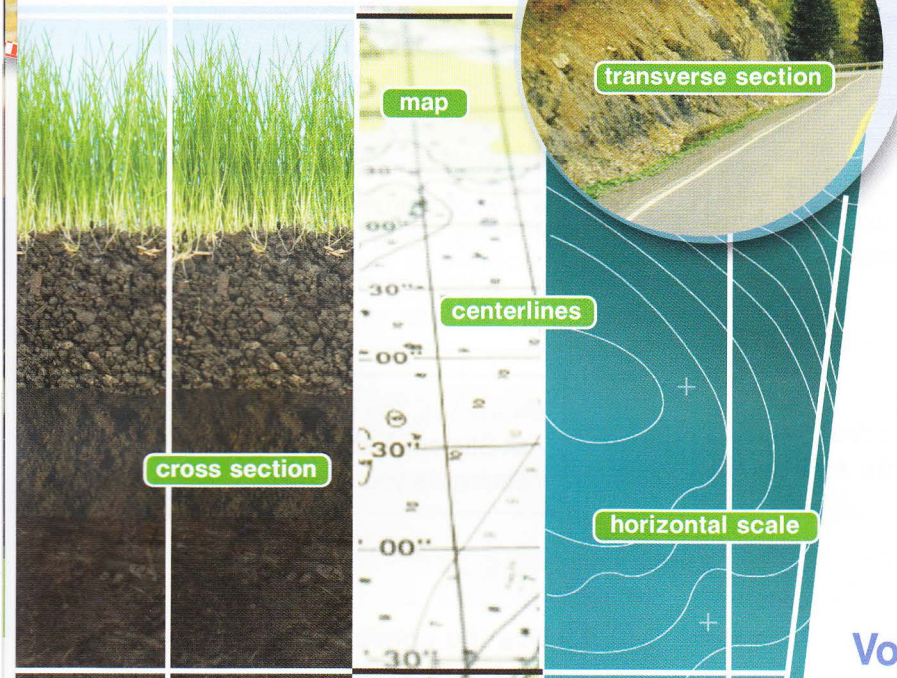
Equipment taken: _____

Equipment is needed for: _____

Get ready!

1 Before you read the passage, talk about these questions.

- 1 What document is used to identify and mark different land features?
- 2 What are some features of a map or plan for road construction?



From: Veronica Blake
To: Mark Jensen
Subject: Plans

Hi Mark,

I have more information about the downtown road project. Now we need a **map** and several **plans** for the area. The map should be to **scale**, with accurate vertical and horizontal ratios. Let the **centerlines** be four inches, or four miles apart. The map will have a **horizontal scale** of 1:500. We'll use a different **vertical scale** because of the hills and different **elevations**. The vertical scale will be 1:100 to **exaggerate** the changes.

Also, we need a **detail drawing** on the map. We'll enlarge the south downtown area in it.

Be sure to include a **cross section**, too. We should see how the road will cut through one of the hills. We'll also need a **transverse section** and a **longitudinal section** for the same reason.

Thanks,
Veronica

Reading

2 Read the e-mail from a surveyor to an engineer. Then, choose the correct answers.

- 1 What is the purpose of the email?
 - A to describe the features of the downtown area
 - B to request additional copies of road plans
 - C to explain the components and scales for a map
 - D to report a change in the scale for a new map and plan
- 2 Which of the following will NOT be included in the map?
 - A a detail drawing of south downtown
 - B a cross section of the road
 - C a horizontal scale of 1:100
 - D an exaggerated vertical scale
- 3 What will the transverse section display?
 - A the downtown area
 - B the changes in elevation
 - C the entire length of the road
 - D the road's path through a hill

Vocabulary

3 Match the words or phrases (1-8) with the definitions (A-H).

- | | | | |
|---|-----------------|---|------------------------|
| 1 | — centerline | 5 | — vertical scale |
| 2 | — exaggerate | 6 | — detail drawing |
| 3 | — cross section | 7 | — horizontal scale |
| 4 | — elevation | 8 | — longitudinal section |

- A a feature's distance above sea level
- B a section taken through the lengthwise direction of a structure on a map
- C a straight line between two or more divisions on a gridded map
- D a point of view of a geographic feature in a map or plan as if part of the area was cut away
- E to overemphasize something's size, number or quality
- F a section of a map where an area is enlarged
- G the ratio of actual distance to the distance represented on the x-axis of a plan
- H the ratio of actual distance to the distance represented on the y-axis of a plan

4 Read the sentence pairs. Choose which word or phrase best fits each blank.

1 map / transverse section

- A The _____ will show a direct view of how the bridge crosses the river.
- B Do you have a _____ of the city which shows all of the city limits?

2 plan / scale

- A Draw up a _____ to show the path of the proposed highway.
- B Use a _____ of 1:150 on the new map.

5 Listen and read the e-mail from a surveyor to an engineer again. Why might the vertical and horizontal scales be different?

Listening

6 Listen to a conversation between a worker and an engineer. Mark the following statements as true (T) or false (F).

- 1 ___ The woman found an error on the map.
- 2 ___ The vertical and horizontal scales should be equal.
- 3 ___ The hill is higher than it is wide.

7 Listen again and complete the conversation.

- Worker:** It's this plan. There seems to be a lot of **1** _____ the hill here.
- Engineer:** What do you mean?
- Worker:** It just seems that the vertical scale is **2** _____.
- Engineer:** The vertical scale has a 1:100 ratio compared to the **3** _____. It has a 1:500 ratio. We wanted to make sure we stressed the elevation.
- Worker:** Why's that? Is there really that much **4** _____ elevation from the bottom of the hill to the top?
- Engineer:** The hill is higher than it is wide. It's a pretty steep slope. There are important details for the road **5** _____ the slope.
- Worker:** Okay. It looked a little weird to me at first.
- Engineer:** Don't worry, it looks that way **6** _____. Any more questions?

Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

- I have a question about ...*
Why is the scale ...?
I thought I'd check on ...

Student A: You are a worker.

Talk to Student B about:

- a concern about a map
- the vertical scale
- why the scales are different

Student B: You are an engineer.

Talk to Student A about a plan.

Writing

9 Use the conversation from Task 8 to explain the scales on a plan.

DOWNTOWN PROJECT Plan/Map notes

Horizontal scale: _____

Vertical scale: _____

Reason for difference: _____

THE ROAD WORKER'S HANDBOOK

Chapter 4 Setting out lines

1 First, determine the type of line you need to **set out**. Decide if the line is **straight** or curved. Check whether points one and two can be seen from one another.

2 Determine how you will **link** the two points. If a line has a curve, use **curve ranging**. If the end is not visible from the starting point, use **repeated alignment**.

3 Carefully **calculate** any curves.

4 Use **steel pins** and **nylon line** to set out your line. Always double check your calculations when you **swing** a curve.

5 Consider any secondary lines you need to **take off** from the first line. If there are secondary lines, calculate the angle. Use **right-angles** if possible, as they are easier to set out. Use **radiused corners** where applicable.

Get ready!

1 Before you read the passage, talk about these questions.

- 1 What is one method of setting out a line?
- 2 What is some equipment used when setting out a line?

Reading

2 Read the handbook. Then, complete the chart.

Situation	Action required
The starting point cannot be seen from the end point.	1 _____ _____
The line has a curve.	2 _____ _____
A crew just swung a curve.	3 _____ _____
Secondary lines must be taken off.	4 _____ _____

Vocabulary

3 Match the words or phrases (1-8) with the definitions (A-H).

- | | |
|--------------------------|-----------------|
| 1 ___ set out | 5 ___ straight |
| 2 ___ take off | 6 ___ calculate |
| 3 ___ repeated alignment | 7 ___ link |
| 4 ___ radiused corner | 8 ___ swing |

- A to connect two things
 B to use math to solve a problem
 C to create a line connected to an existing line
 D not having turns or curves
 E to turn from a pivot
 F a method of connecting two points that are not visible to each other
 G a connection between two straight lines
 H to mark a path or curve



4 Write a word or phrase that is similar in meaning to the underlined part.

- Take off a line at a 90 degree angle.
_ i _ _ t - a _ _ l _
- Use metal bars to mark this line.
_ t _ _ l _ _ i _ _
- Run a synthetic material between those markers.
n _ _ o _ _ _ i _ _
- Use a method to set out curves when you set out the line for the highway.
c _ _ v _ _ _ a _ _ _ n _

5 Listen and read the handbook again. What is the easiest way to take off a secondary line?

Listening

6 Listen to a conversation between a worker and a foreman. Mark the following statements as true (T) or false (F).

- The crew will set out two lines.
- There is a large hill in the road path.
- The man will use curve ranging.

7 Listen again and complete the conversation.

- Foreman:** Hi, Jack! Today we're 1 _____ a line.
- Worker:** Okay, I'd like to start right away. Where are the supplies?
- Foreman:** They're in the truck. We have 2 _____ and everything else you need.
- Worker:** Wait, are we setting out 3 _____ lines today?
- Foreman:** We'll start with line one. Line two will take off from line one, later.
- Worker:** Sounds good. 4 _____ a simple straight line?
- Foreman:** 5 _____. The road path is a straight line, but it's over that big hill.
- Worker:** I see. So we'll use 6 _____?
- Foreman:** Yes, definitely. Make sure the other workers understand, too.

Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

- Are we setting out ...?*
- So it's just a straight line?*
- So we'll use ...?*


Student A: You are a worker. Talk to Student B about:

- the work for the day
- the number of lines
- methods to use

Student B: You are a foreman. Talk to Student A about setting out lines.

Writing

9 Use the conversation from Task 8 to fill out the work order.



Harrison Road Construction
Work Order Form

Date: _____

Project: _____

Goal for the day: _____

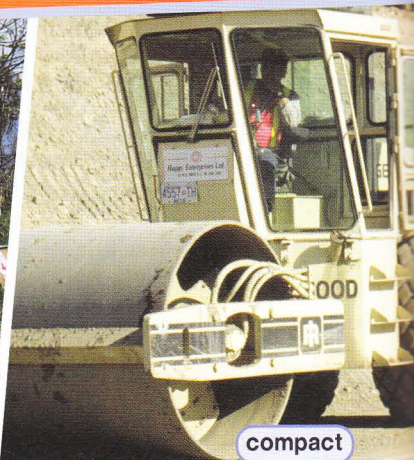
Steps/Notes: _____



excavate



preparation



compact



existing base



embankment

Get ready!

- 1 Before you read the passage, talk about these questions.
- Which parts of the preparation of a site require heavy machinery?
 - What needs to happen to trees to prepare a site for road construction?

Reading

- 2 Read the web page on excavation. Then, choose the correct answers.
- What is the purpose of the web page?
 - to explain the need for proper excavation
 - to provide instructions for site preparation
 - to compare different types of excavation
 - to describe services provided by a company
 - Which of the following does the excavation company NOT provide?

A backfilling	C soil compaction
B preparation	D asphalt stripping
 - What step must be taken before digging?
 - clearing bushes and trees
 - compacting topsoil
 - creating embankments
 - cutting high areas

Yarrow & Sons

EXCAVATION

Before you start any construction project, your site must be properly prepared. Let Yarrow & Sons **excavate** your land to make way for your development. We specialize in site preparation for roadways and parking lots.

Preparation - Do you need existing structures or surfaces removed? We provide thorough **preparation**. We will **remove** old concrete or asphalt. We'll also **clear** bushes, trees, and other obstacles.

Excavation - Ready to dig? At Yarrow & Sons, we know how to create the perfect surface for paving. We'll **fill** areas that are too low, and **mill** areas that are too high. And we'll **compact** the **existing base** so your project has a solid foundation. Our reliable **embankments** will give your road or parking lot excellent support for years to come.

The Yarrow Promise - At Yarrow & Sons, we pledge to provide high-quality workmanship. Whatever you use to **backfill** your site, you know you can depend on Yarrow & Sons for reliable site preparation.

Vocabulary

- 3 Match the words or phrases (1-6) with the definitions (A-F).

- | | |
|--------------------|-----------------|
| 1 __ fill | 4 __ compact |
| 2 __ clear | 5 __ excavate |
| 3 __ existing base | 6 __ embankment |
- a loose layer of dirt on the surface
 - to dig out dirt to prepare for construction
 - a wall or raised area that provides support
 - to remove debris from an area
 - to add material to make something higher
 - to press something tightly together

4 Read the sentences and choose the correct words or phrases.

- 1 The workers **removed** / **compacted** the old pavement before installing the new pavement.
- 2 Without the proper **embankment** / **preparation**, we cannot begin construction.
- 3 After excavation, we can start to **clear** / **backfill** the site.
- 4 You must **mill** / **fill** the areas of land that are too high.

5 Listen and read the web page on excavation again. What is the importance of site clearance?

Listening

6 Listen to a conversation between an excavation company representative and a customer. Mark the following statements as true (T) or false (F).

- 1 The woman is planning to build a parking lot.
- 2 The play equipment has been removed.
- 3 The construction site is completely flat.

7 Listen again and complete the conversation.

Representative: I'll need to know what kind of **1** _____ we're looking at. What's on the site now?

Customer: There's an old children's playground on that land, and a small tool shed.

Representative: Okay. So we'll have to clear the shed and **2** _____. Are there any trees or shrubs?

Customer: No, **3** _____ all the landscaping already.

Representative: Is the area **4** _____ ?

Customer: For the most part. But there is a small hill in one corner that **5** _____.

Representative: Okay. Give me just a few moments to **6** _____ an estimate for you.

Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

How much does it cost to ...?

There's a ... on the land, and a ...

So we'll have to ...

Student A: You are an excavation company representative. Talk to Student B about:

- an excavation project
- features on the site
- site clearance requirements

Student B: You are a customer. Talk to Student A about an excavation project.

Writing

9 Use the conversation from Task 8 to fill out the construction project details.



Yarrow & Sons
EXCAVATION

Construction project: _____

Items to be removed from site: _____

Land adjustments needed: _____

Get ready!

- 1 Before you read the passage, talk about these questions.
- 1 What are some areas of land that are difficult to build roads on?
 - 2 What type of construction uses sticks?



Feldman's specializes in surface preparation for tough-to-pave areas. Places with **swamps** or **marshes** are especially tricky because the ground is typically wet and very soft. Hilly or uneven areas are also difficult because soil tends to slide downwards. Achieving adequate **load-bearing capacity** in these areas is challenging.

Fascine construction: Fascine construction offers excellent support under roadways. It **stabilizes** foundation surfaces to prevent cracking and collapse in otherwise unstable areas.

Slope reinforcement: For those uneven spots, you often need supports to keep hills stable. **Erosion control** is vital for maintaining the integrity of any construction project. A **gabion wall** can give solidity to a slope or embankment.

Soil Stabilization: **Geotextile** products like **plastic mesh** provide durable, flexible support under many types of surfaces. And when you need to harden up the soil, **lime stabilization** is an excellent choice.

Reading

- 2 Read the web page for a paving company. Then, mark the statements true (T) or false (F).
- 1 Land in swamps and marshes has the best load-bearing capacity.
 - 2 An unstable foundation surface can cause a roadway to collapse.
 - 3 A gabion wall is a useful tool for erosion control.

Vocabulary

- 3 Match the words or phrases (1-5) with the definitions (A-E).

- 1 marsh
- 2 plastic mesh
- 3 fascine construction
- 4 erosion control
- 5 slope reinforcement

- A a strong, flexible support material
- B the prevention of unwanted soil movement
- C support provided by materials along hills
- D an area of wet land with soft soil
- E a construction method using bundled sticks

- 4 Fill in the blanks with the correct words or phrases from the word bank.

WORD BANK

lime stabilization
load-bearing capacity stabilize gabion
wall swamp geotextile

- 1 That slope is supported with a _____.
- 2 The land in the _____ is too soft to support a road.
- 3 We hardened the soil using _____.
- 4 By compacting the soil, the workers improved the road's _____.
- 5 Unless you _____ the embankment, the soil will slide down.
- 6 _____ materials are flexible yet durable.

- 5 Listen and read the web page for a paving company again. What is a challenge of building a road over a marsh?

Listening

- 6 Listen to a conversation between two construction workers. Choose the correct answers.

- 1 What is the purpose of the conversation?
- A to reprimand a worker for poor planning
 B to approve methods for an upcoming project
 C to compare different stabilization methods
 D to suggest ways to improve a construction plan
- 2 What does the woman suggest using on the road?
- A extra traffic C fascine construction
 B softer soil D lime stabilization

- 7 Listen again and complete the conversation.

- Worker 1: I'm 1 _____ about the land we're building on. Here, look at this map.
- Worker 2: What's the problem?
- Worker 1: The road will run right through this marsh. The soil is going to be 2 _____, and I don't think these plans include the right materials.
- Worker 2: Yeah, you're right. We don't want the new road to have a poor 3 _____ - _____. It's going to get a lot of traffic.
- Worker 1: What 4 _____ we should do?
- Worker 2: Well, we could try 5 _____. That would solidify the surface in preparation for the road.
- Worker 1: Good idea. What about 6 _____, too?

Speaking

- 8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

I'm a little concerned about ...
The road will run through ...
We could try ...

Student A: You are a construction worker. Talk to Student B about:

- a plan for a new road
- likely problems with the plan
- possible solutions

Student B: You are a construction worker. Talk to Student A about a plan for a new road.

Writing

- 9 Use the conversation from Task 8 to fill out the plan adjustment form.



Feldman's Paving

Plan Adjustment Form

Project number: **79-211A**

Suggested changes: _____

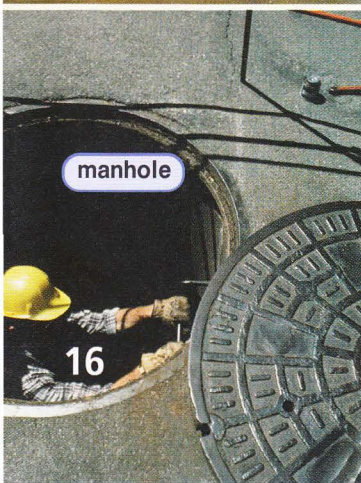
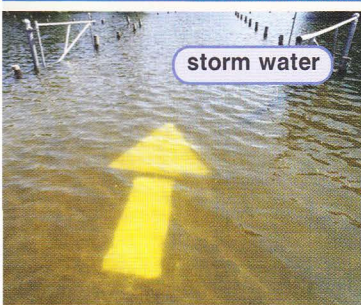
Reasons for changes: _____



Storm water causing drainage failure

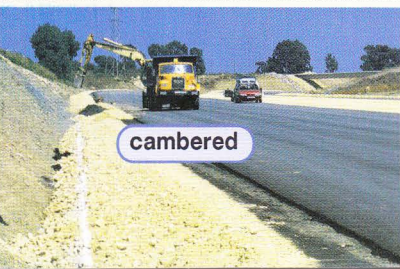
Marina Hersch

Last week's storm continues to cause trouble on city streets. City engineers say the large storm led to widespread soil saturation.



As a result, **subsoil drainage** became ineffective. Roadside **drainage areas** were too small to handle the extra water. Mud and trash entered the **sewer lines** from the overflowing ditches. Usually, the sewer's **gradient** is steep enough to create **self-cleansing velocity**. However, the obstructions from the ditches were too large and numerous. Because water cannot **drain** through the sewers, there is **standing water** on almost every street. The streets are **cambered**, which clears water from most storms. However, the storm was so large that the camber had almost no effect.

City engineers will work to clear the sewers soon. However, in order to access the sewer, they must find **manholes** that are not under water or covered by obstructions.



Get ready!

1 Before you read the passage, talk about these questions.

- 1 What can build up in an area after heavy rainfall?
- 2 How do workers gain access to a sewer system?

Reading

2 Read the newspaper article. Then, choose the correct answers.

- 1 What is the main idea of the passage?
 - A problems with road drainage design
 - B how road drainage systems failed
 - C ways to solve a road drainage problem
 - D the damage caused by a drainage failure
- 2 Which of the following did NOT lead to flooding?
 - A The soil reached saturation.
 - B The sewer line gradient was too steep.
 - C Mud and trash entered the sewer line.
 - D Drainage areas could not handle the storm water.
- 3 What must happen to remove the standing water?
 - A The drainage areas must be enlarged.
 - B The streets must be cambered.
 - C The engineers must find accessible manholes.
 - D The sewer line's gradient must be changed.

Vocabulary

3 Match the words or phrases (1-6) with the definitions (A-F).

- | | |
|----------------------|------------------|
| 1 ___ standing water | 4 ___ saturation |
| 2 ___ cambered | 5 ___ drainage |
| 3 ___ drainage area | 6 ___ drain |

- A way of filtering away or leading out liquid such as water
- to lead or filter away liquid such as water
- a long, narrow, man-made hole in the ground
- a condition where water has soaked through something, such as wet soil
- water that stays in one place and does not flow
- to be curved up at the middle

4 Read the sentence pairs. Choose which word or phrase best fits each blank.

1 gradient / manhole

A Construction workers had to go down the _____ to get to the sewer.

B The problem with the pipe was that the _____ was not steep enough.

2 storm water / sewer line

A When the city grew, it needed to build a new _____.

B After the hurricane passed, the road was full of _____.

3 self-cleansing velocity / subsoil drainage

A Sewers are angled to create _____.

B _____ is one method of removing water from an area.

5 Listen and read the newspaper article again. Why isn't the storm water draining properly?

Listening

6 Listen to a conversation between a city official and a contractor. Mark the following statements as true (T) or false (F).

- 1 There are obstructions in the sewer line.
- 2 The ditches are clogged with trash.
- 3 The woman cannot work until the manholes are clear.

7 Listen again and complete the conversation.

Official: Mrs. Thomas, I'm glad you could come in.

Contractor: My pleasure. So, what are we **1** _____?

Official: Well, that storm really **2** _____ our drainage.

Contractor: Yes, I saw the **3** _____. What's wrong with the sewer system?

Official: There must be some **4** _____.

Contractor: I can clear those. But shouldn't they reach **5** _____?

Official: Normally, yes. But the **6** _____ overflowed. Too much trash and mud got into the sewer.

Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

What are we looking at?

There must be ...

Where should I start?

Student A: You are a city official.

Talk to Student B about:

- a drainage problem
- the cause of the problem
- how to solve the problem

Student B: You are a contractor.

Talk to Student A about a drainage problem.

Writing

9 Use the conversation from Task 8 to fill out the infrastructure damage report.

Damage Report

Damaged sections of road: _____

Cause of damage: _____

Solution: _____


**RIDGE
Street**
**PIPING
COMPANY**

flexible

flexible

polyethylene joints

bolting

socket

joints

flange

6' Length / 4' Outside Diameter Metal
Culvert - Item #05628

This **rigid pipe** is ideal for directing water under roadways. It provides smooth and direct water flow. The culvert can be connected to another pipe through **bolting** or **welding**.

10' Length / 4' Outside Diameter
Corrugated Metal Pipe - Item #03425

This metal pipe is made from a copper, aluminum alloy. To prevent cracks, the pipe is somewhat **flexible**. The pipe's **flange** has a 2 1/2" outside diameter for support. The flange is flared to allow for easy **caulking**.

8' Length / 4' Outside Diameter
Polyethylene Joint - Item #07883

This **polyethylene** joint forms a 90 degree angle. The **sockets** of this joint are lined with a rubber **gasket** to create a water-proof seal. The joint's polyethylene material ensures a durable, long lasting product.

Get ready!

- 1 Before you read the passage, talk about these questions.
- 1 What are some ways to connect two pipes?
 - 2 What is the benefit of using rubber tube?

Reading

- 2 Read the product listing. Then, choose the correct answers.
- 1 What is the purpose of the document?
 - A to give a price listing for the products
 - B to describe the available pipes and joints
 - C to suggest which pipes should be used
 - D to instruct how to install the pipes
 - 2 Which of the following is NOT a quality of the corrugated metal pipe?
 - A it has a ridged surface
 - B it has a flared flange
 - C it is made from copper
 - D it forms a 90 degree angle

Vocabulary

- 3 Match the words or phrases (1-8) with the definitions (A-H).
- | | |
|----------------|--------------------|
| 1 ___ rigid | 5 ___ flexible |
| 2 ___ caulking | 6 ___ bolting |
| 3 ___ joint | 7 ___ culvert |
| 4 ___ socket | 8 ___ polyethylene |
- A a durable, lightweight material made from polymerized ethylene
 - B a space or niche in a joint where a pipe can fit
 - C a method of sealing or securing a connection between pipes and joints using bolts
 - D a way to seal joints and pipes using caulk
 - E being easy to bend and move out of shape
 - F being hard to bend and push out of shape
 - G an angled section where two pipes meet, and which changes the direction of flow
 - H a drain or pipe which leads water under an embankment, road, or railway

4 Read the sentence pairs. Choose which word or phrase best fits each blank.

1 gasket / metal pipe

A A tube made from a material like copper that is used in plumbing is called a _____.

B To prevent fluid from escaping from a connection between pipes, you should use a _____.

2 pipe / welding

A Semi-solid materials flow through a _____.

B _____ is a way of connecting pipes by heating them and causing them to meld together.

5 Listen and read the product listing again. How can the metal culvert be attached to other pipes?

Listening

6 Listen to a conversation between a worker and a supervisor. Mark the following statements as true (T) or false (F).

- 1 ___ The wrong size of joints arrived.
- 2 ___ The man should stop installing pipes.
- 3 ___ The crew will dig a trench.

7 Listen again and complete the conversation.

Worker: Those joints came in, right?

Supervisor: No, they're not **1** _____ a few days.

Worker: **2** _____, I thought they'd be coming sooner.

Supervisor: No, not until tomorrow **3** _____. Did you already start installing the pipes?

Worker: Yeah, but we need the joints to continue. Should we **4** _____ other parts of the street then?

Supervisor: Yes. Don't **5** _____ any other pipes for now.

Worker: Okay. I can do that. But what should we do until the joints arrive?

Supervisor: Hmm. We still need to dig the **6** _____.

Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

- I'd like to check on ...*
- Did you already start ...?*
- What should we do until ...?*

Student A: You are a worker. Ask Student B about:

- when materials are coming in
- what work still needs to be done
- when to begin work on the road

Student B: You are a supervisor. Talk to Student A about roadwork.

Writing

9 Use the conversation from Task 8 to fill out the status report.

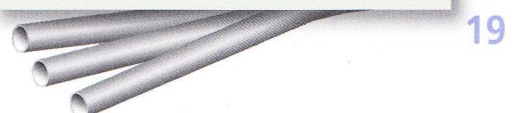
Murphy Street Pipe

Construction Status Report

Completed tasks: _____

Available materials: _____

Materials to be delivered: _____



Get ready!

1 Before you read the passage, talk about these questions.

- 1 What are some types of drains?
- 2 What type of drain runs below a road?



Guidebook for Installing Drains

Most drains resemble **trenches**. Each one utilizes a different method to prevent flooding and erosion. Because drains function differently, one must know how each one operates. The following list briefly describes common drains:

- **French, land, slope, and cross drains** mainly divert water away from an area.
- A **sand drain** utilizes sand and soil to encourage drainage.
- A **fin drain** diverts excess water to an existing pipe system.
- A **siphon** differs from other drains by enabling liquids to travel uphill. For this to work, the liquid's destination must be lower than its source.
- A **soakaway** is different from most other drains. It redistributes excess water to the surrounding ground.
- An **edge drain** does more than simply divert water. It also filters soil, particles, and other **discharge** from the water.
- A **pipe underdrain** soaks up underground water. This feature prevents water from ever reaching the surface.

Reading

2 Read the workman's guidebook. Then, mark the statements true (T) or false (F).

- 1 French drains and cross drains serve similar functions.
- 2 A siphon will not work if the destination is lower than the source.
- 3 A soakaway differs from other drains by soaking up water underground.

Vocabulary

3 Match the words or phrases (1-6) with the definitions (A-F).

- | | |
|----------------------------------------|----------------------------------------|
| 1 <input type="checkbox"/> sand drain | 4 <input type="checkbox"/> edge drain |
| 2 <input type="checkbox"/> siphon | 5 <input type="checkbox"/> fin drain |
| 3 <input type="checkbox"/> slope drain | 6 <input type="checkbox"/> cross drain |

- A a drain that diverts water and runoff from streets
 B a drain in the ground that is filled with fine soil or gravel
 C a tunnel that directs water from one side of a road to the other
 D a tunnel that collects water and filters out materials
 E a hose that enables a liquid to travel uphill
 F a drain that redirects water to a pre-existing pipe system

4 Read the sentence pairs. Choose which word or phrase best fits each blank.

1 discharge / soakaway

- A The drain was clogged with _____.
 B A _____ distributes water underground.

2 trench / French drain

- A A _____ is located underground.
 B A _____ is a long cut in the ground.

3 pipe underdrain / land drain

- A The _____ prevents water from reaching the surface.
 B The crew made a _____ by filling a trench with gravel.

- 5 Listen and read the workman's guidebook again. How is a pipe underdrain different from other drain types?

Listening

- 6 Listen to a conversation between a project manager and a contractor. Choose the correct answers.

- What is the conversation mainly about?
 - how to install a new drain
 - the cost of drain installation
 - a drain that is not working properly
 - the pros and cons of different drains
- What does the woman recommend?
 - adding an edge drain
 - installing a pipe underdrain
 - making the land drain larger
 - delaying the pipe installation

- 7 Listen again and complete the conversation.

Manager: Hi, Ms. Peters. Do you have a minute to discuss the 1 _____ on Elm Street?

Contractor: Sure. Is there something wrong with it?

Manager: There is. It overflows every time it rains.

Contractor: Okay. So what do you propose we do about it?

Manager: I say we install a 2 _____. It'll soak up the water before it has a chance to flood. What do you think?

Contractor: I 3 _____ I agree.

Manager: No? What do you 4 _____, then?

Contractor: Well, what are the drain's dimensions?

Manager: It's two feet deep and three feet across.

Contractor: I think we should 5 _____ it. Maybe to three feet by four feet?

Manager: I guess that 6 _____. How long would it take?

Speaking

- 8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

Is there something wrong with it?

What do you propose we do?

I think we should ...

Student A: You are a project manager. Talk to Student B about:

- a drain problem
- your recommendation
- his or her recommendation

Student B: You are a contractor. Talk to Student A about drains.

Writing

- 9 Use the conversation from Task 8 to fill out the email.



Mr. Carlson,

There is a problem with the _____ on Main Street. It _____.

The project manager wants to _____.

But I suggest that we _____. Please let me know what you would prefer.

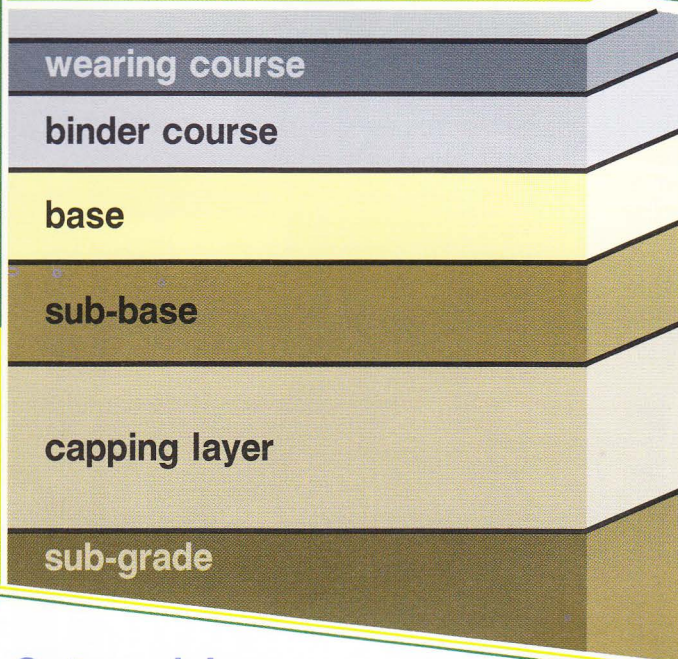
Mike Jackson
Jackson Contracting



Flexible construction creates flexible pavement through several levels of material. The main levels are: **sub-grade, sub-base, base, and surface courses.**

The layers work together to create a solid road or walkway. But each course must meet certain requirements to be effective. First, workers ensure that the sub-grade level can support the pavement. This requires the dirt in the sub-grade level to be solid. If it's not, the workers add a **capping layer** to strengthen it. The sub-base level also has an important function. This level prevents the road from sinking under pressure. Contractors occasionally skip this level to save money. But many times, they pay more to fix the problem this causes. The base layer protects the pavement from moisture and cold temperatures. The surface course endures the most pressure because it's the outermost layer. Sometimes it contains two levels: the **wearing course** and the **binder course**.

Road Cross Section



Vocabulary

3 Match the words or phrases (1-6) with the definitions (A-F).

- | | |
|-----------------------------|---------------------|
| 1 ___ flexible construction | 4 ___ base course |
| 2 ___ wearing course | 5 ___ pavement |
| 3 ___ sub-base course | 6 ___ capping layer |

- A the layer of a road used when the sub-grade level is not sufficiently solid
- B the level of a road located directly under the surface course
- C the layer above the capping layer
- D an artificial, smooth surface mainly used to create roads and walkways
- E the creation of flexible pavement that consists of several levels of material and can withstand pressure
- F the top level of a surface course, which comes in direct contact with traffic

Get ready!

1 Before you read the passage, talk about these questions.

- 1 What is the lowest layer of flexible pavement?
- 2 What is the top layer of flexible pavement?

Reading

2 Read the chapter on flexible pavement. Then, mark the statements true (T) or false (F).

- 1 ___ The base course is the top layer of flexible pavement.
- 2 ___ A sub-base is used to strengthen a weak sub-grade.
- 3 ___ A binder course and wearing course form a surface course.

4 Read the sentence pairs. Choose which word or phrase best fits each blank.

1 **surface course / base course**

- A Cars' tires do not touch the _____.
- B The _____ comes in direct contact with traffic.

2 **binder course / sub-grade course**

- A A surface course can include a _____.
- B The _____ is the lowest level of a road.

- 5 Listen and read the chapter on flexible pavement again. Which part of the pavement do contractors sometimes not include when constructing pavement?

Listening

- 6 Listen to a conversation between a construction employee and a supervisor. Choose the correct answers.

- What is the conversation mainly about?
 - the deadline for a project
 - why a project was delayed
 - the order of pavement layers
 - the cost of a construction error
- What task will the team do first?
 - finish the planning phase
 - lay the capping layer
 - repair the sub-base course
 - place the wearing course

- 7 Listen again and complete the conversation.

- Employee:** Well, I'm 1 _____ the 10th Street project. Is that starting soon?
- Supervisor:** Actually, yes. Now that we've finished the planning stage, the team will start 2 _____.
- Employee:** Okay. So we'll lay the 3 _____ - _____ course first?
- Supervisor:** No. That's not quite right. You'll need to lay the 4 _____ first.
- Employee:** Oh, right. I forgot that the sub-grade course is 5 _____.
- Supervisor:** Right.
- Employee:** Let me make sure I've 6 _____ then. The base comes after the capping layer. Then the wearing and binder courses come next?
- Supervisor:** No, that's the wrong order. You switched the binder and wearing courses. It's just the opposite.

Speaking

- 8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

The team will start ...

That's not quite right.

No, that's the wrong order.

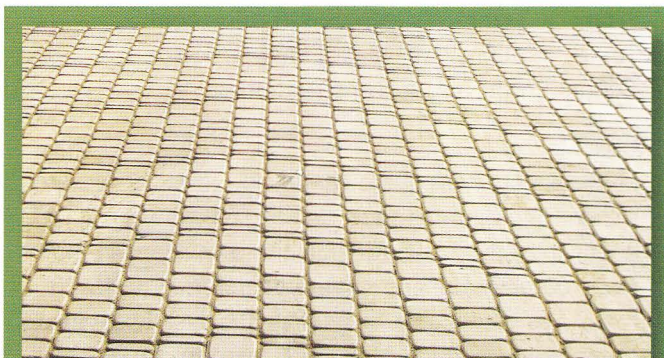
Student A: You are a construction employee. Talk to Student B about:

- an upcoming project
- the first layer of pavement
- how the road will be finished

Student B: You are a construction company owner. Talk to Student A about an upcoming project.

Writing

- 9 Use the conversation from Task 8 to fill out the work order form.



10th Street Project

Work Order Form

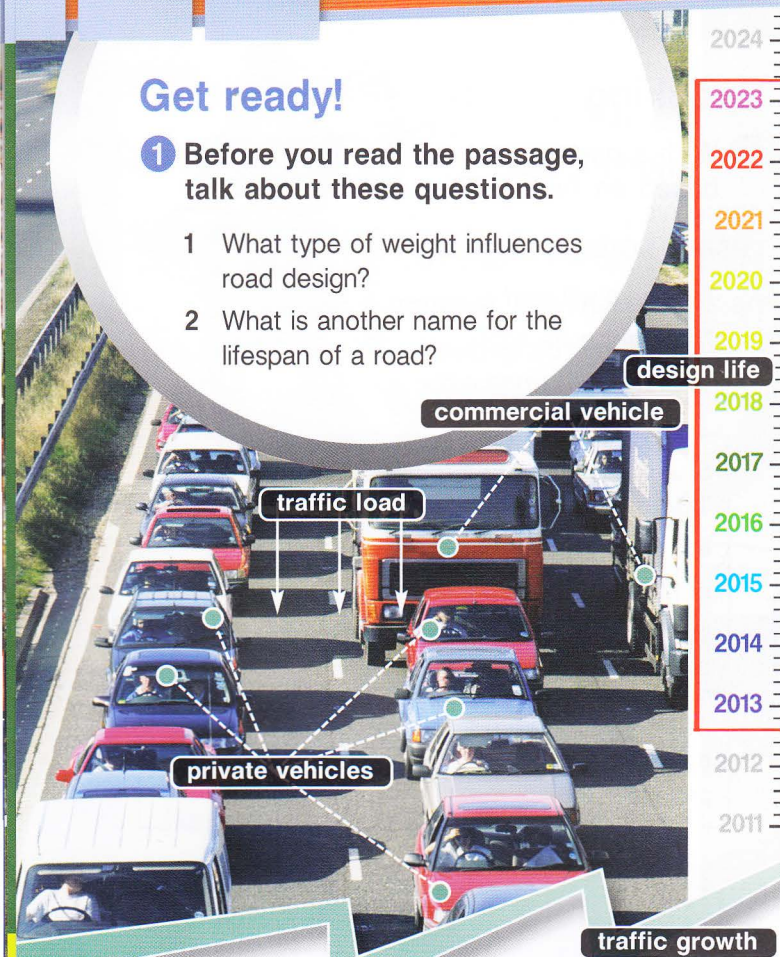
The 10th Street pavement will be laid in the following steps:

- _____
- _____
- _____
- _____
- _____

Get ready!

1 Before you read the passage, talk about these questions.

- 1 What type of weight influences road design?
- 2 What is another name for the lifespan of a road?



From: j.smith.j@deanconstruction.com
 To: allen.dean@deanconstruction.com
 Subject: Elm Street Construction

Dear Mr. Dean,

My engineers need more information to move forward with the Elm Street project. We need to know everything about the pavement's **design life**. For example, how many **commercial** and **private vehicles** will utilize this road? We also need to **assess** the last two years' **cumulative traffic growth**. I want a report that **estimates** the amount of traffic growth. Please include the average **traffic load** in the report as well.

I want to move on to the next stage by next Monday. This next step involves planning the **design thickness**. This normally takes about a week. We need that time to determine the **standard axels** the road will encounter. We'll also establish the traffic's average **axel weight**. This ensures that we're constructing a solid road. Thank you for your time. Please contact me if you encounter any problems or have questions.

Best,
 Janet Smith



Reading

2 Read the email. Then, choose the correct answers.

- 1 What is the purpose of the email?
 - A to explain the planned design life of a road
 - B to notify a supervisor about a road design error
 - C to state why a road design has been delayed
 - D to request information about a road's design life
- 2 Which of the following does Ms. Smith NOT request?
 - A the average traffic load
 - B the amount of traffic growth
 - C the axel weight of private vehicles to use the road
 - D the number of commercial vehicle to use the road
- 3 What will Ms. Smith do in the next stage of planning?
 - A specify the design life
 - B assess cumulative traffic growth
 - C prepare a report on traffic loads
 - D determine the standard axels

Vocabulary

3 Match the words or phrases (1-7) with the definitions (A-G).

- | | |
|----------------------|-------------------|
| 1 ___ traffic load | 5 ___ axel weight |
| 2 ___ traffic growth | 6 ___ estimate |
| 3 ___ design life | 7 ___ assess |
| 4 ___ cumulative | |

- A including all events or factors from the start of a process to the present state
- B to measure or determine something's performance
- C the average amount and weight of the traffic that uses a road
- D to predict how much something will be
- E an estimated percent of increased or decreased traffic on a road
- F the weight of an vehicle
- G the length of time that pavement is expected to last

4 Read the sentence pairs. Choose which word or phrase best fits each blank.

1 private vehicle / commercial vehicle

- A A _____ weighs more and puts more pressure on roads than other vehicles.
 B A _____ applies much less pressure on a road than a large delivery truck.

2 design thicknesses / standard axels

- A Roads designed for light vehicles have less _____ than roads made for heavy ones.
 B The planners used 80,000 pounds as the _____ for the road.

5 Listen and read the email again. What information about traffic does the woman request?

Listening

6 Listen to a conversation between an engineer and a contractor. Mark the following statements as true (T) or false (F).

- 1 ___ The woman should determine the design thickness first.
 2 ___ The man already has a report on traffic growth.
 3 ___ The traffic load report will include vehicle types.

7 Listen again and complete the conversation.

Engineer: I'm 1 _____ that I have things right. We have to determine the design life first, correct?

Contractor: That's correct.

Engineer: And you want a report of the 2 _____ and load?

Contractor: Yes. We can't 3 _____ without that.

Engineer: When would you like that?

Contractor: Please 4 _____ by Friday.

Engineer: Okay. And the next stage is planning the 5 _____, right?

Contractor: 6 _____. We have to know that before we can start construction.

Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

*We have to ... first, correct?
 When would you like that?
 I'll include that with the ...*

Student A: You are an engineer. Talk to Student B about:

- a road design project
- information that is needed
- the order of events

Student B: You are a contractor. Talk to Student A about a road design.

Writing

9 Use the conversation from Task 8 to fill out the engineer's email.

○○○ email

From: _____

To: All Engineers

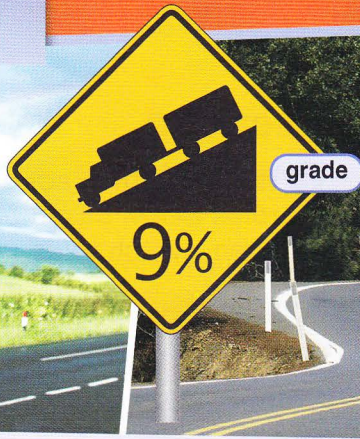
Subject: Elm Street Project

Hello everyone,
 I spoke to the contractor. Here is what we need to do for them: _____

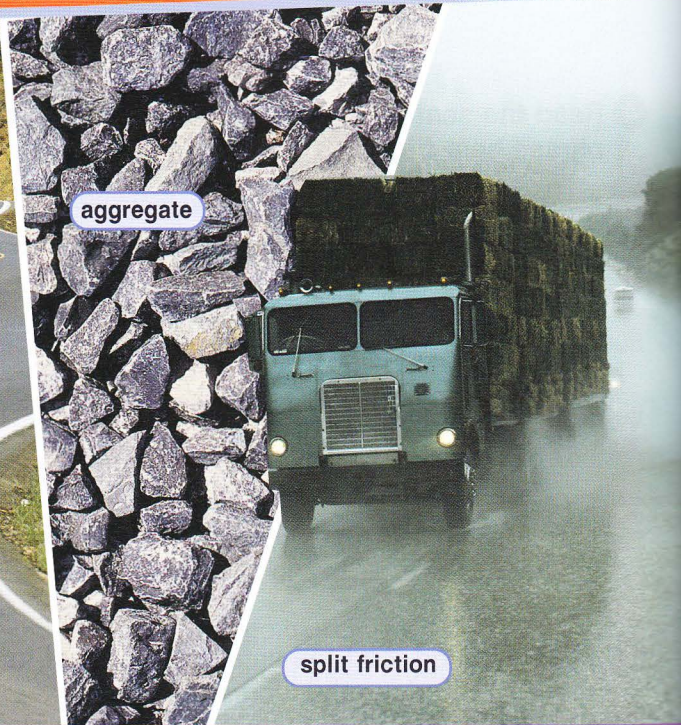
Please have this information prepared by _____.

Sincerely,

12 Flexible Pavement 3: Surfacing



rolled asphalt



Department of Transportation

Inspection Report: Highway 95

Highway 95 is a new **rolled asphalt** road in the northern corner of the state. It is sixty-five miles long and services eleven communities. Due to the local landscape, Highway 95 has an average **grade** of 3.2%. The road is in excellent condition. It is smooth, flat, and well-**surfaced**.

Our **PSV test** results were mixed. The highway proved to be highly **skid-resistant** and scored very well on our **friction test**. However, we are concerned about the **polished stone value** of the road in the future. This type of **aggregate** is less resistant to abrasion than others. Over time, **abrasion** will damage the highway. The result will be dangerous road conditions such as cracks, pot holes, and **split friction**. The road is safe right now, but it will need to be repaired sooner than expected. We estimate the highway will need to be surfaced again in two to three years.

Get ready!

1 Before you read the passage, talk about these questions.

- 1 What type of surface is most common on roads?
- 2 What is the name for the degree of slope in a road?

Reading

2 Read the inspection report. Then, mark the statements true (T) or false (F).

- 1 ___ The highway performed well on a friction test.
- 2 ___ The highway has split friction damage.
- 3 ___ The highway was most recently surfaced two to three years ago.

Vocabulary

3 Match the words or phrases (1-6) with the definitions (A-F).

- | | |
|----------------------|----------------|
| 1 ___ friction test | 4 ___ surface |
| 2 ___ rolled asphalt | 5 ___ PSV test |
| 3 ___ skid-resistant | 6 ___ grade |

- A a coarse aggregate surrounded by a mixture of bitumen, sand, and filler
- B a procedure that determines the polished stone value of an aggregate
- C to create or lay the upper portion of a road
- D the amount of inclination in a road
- E a procedure that measures the resistance between a tire and a road surface
- F not allowing things to slide easily

4 Fill in the blanks with the correct words or phrases: *aggregate, abrasion, split friction, polished stone value.*

- 1 _____ from tires and weather can reduce the skid-resistance of roads.
- 2 The road was repaved because of its poor _____.
- 3 A road with _____ will have more skid-resistance on one side than the other.
- 4 What type of _____ is needed to make rolled asphalt?

- 5 Listen and read the inspection report again. What test did the surface perform poorly on?

Listening

- 6 Listen to a conversation between a road construction company owner and a manager. Choose the correct answers.

- What is the conversation mainly about?
 - A the status of highway repairs
 - B the damage to a highway surface
 - C the results of a highway inspection
 - D the need for more testing on a highway
- What is true of Highway 95?
 - A It failed a friction test.
 - B It shows signs of split friction.
 - C It has a poor polished stone value.
 - D It needs several areas of surface replaced.

- 7 Listen again and complete the conversation.

Owner: Bill, can we talk 1 _____ in my office?

Manager: Yeah, of course. Is something wrong?

Owner: Well, there is a 2 _____. I got the inspection report on Highway 95 back from the Department of Transportation.

Manager: 3 _____, _____! I thought we did a great job.

Owner: It's 4 _____. The good news is that the friction test came out well. They're also very happy with the appearance of the road.

Manager: Good. I'm glad. But what's 5 _____?

Owner: The bad news is the 6 _____.

Speaking

- 8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

Can we talk ...?

I got the inspection report on ...

The good news is that ...

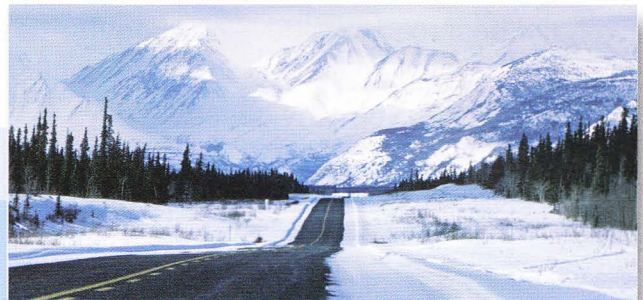
Student A: You are a construction company owner. Talk to Student B about:

- an inspection report
- good test results
- bad test results

Student B: You are a manager. Talk to Student A about an inspection report.

Writing

- 9 Use the conversation from Task 8 to fill out the inspection report.



Highway Nine

Inspection Report

Test: _____

Results: _____

Test: _____

Results: _____

Comments/Recommendations: _____

What's WRONG with your pavement?

shoving

transverse cracking

reflective cracking

ravelling

alligator cracking

Get ready!

1 Before you read the passage, talk about these questions.

- 1 What are some types of pavement damage or defects?
- 2 What is the name for cracking that occurs horizontally across a road?

Reading

2 Read the article. Then, choose the correct answers.

- 1 What is the purpose of the article?
 - A to define types of pavement defects
 - B to describe repairs for pavement defects
 - C to help contractors avoid pavement defects
 - D to explain the benefits of detecting defects early
- 2 Which of the following is NOT the result of weather?

A bleeding	C transverse cracking
B raveling	D block cracking
- 3 Which irregularity is caused by traffic?

A rutting	C alligator cracking
B slippage	D transverse cracking

Pavement **defects** are a common problem. Even the best roads will develop **irregularities** over time. But why do they occur? The fact is, **uneven** roads have many causes.

One common irregularity is **reflective cracking**. Reflective cracking often occurs due to movement over a crack or joint. **Slippage** has a similar cause. It happens when the top layer of pavement slips over the layer beneath it. This is often caused by traffic. **Shoving** is also a result of traffic. It usually develops where vehicles start and stop.

Of course, traffic doesn't cause all defects. **Rutting** and **alligator cracking** often occur due to structural defects. **Raveling** develops when the bond between the aggregate and asphalt binder weakens. Weather is also a problem. It causes several common defects, such as **block cracking**, **transverse cracking**, and the **excess** of bituminous binder that appears during **bleeding**.

Although different defects require different repairs, they should all be addressed. This prevents further damage and unsafe road conditions.

Vocabulary

3 Match the words or phrases (1-8) with the definitions (A-H).

- | | |
|----------------------|---------------|
| 1 ___ bleeding | 5 ___ defect |
| 2 ___ block cracking | 6 ___ excess |
| 3 ___ raveling | 7 ___ rutting |
| 4 ___ uneven | 8 ___ shoving |

- A a quantity of something that is more than necessary or desired
- B being bumpy, rough, or irregular
- C cracks that form rectangular pieces
- D the separation of aggregate particles in asphalt concrete, resulting in pock marks
- E ripples or a wave pattern across a pavement surface
- F the buildup of bituminous binder
- G a surface depression in the wheel path
- H a deformation

4 Write a word or phrase that is similar in meaning to the underlined part.

- The road has some half-moon shaped cracks near the stop sign.
_ l _ p _ _ g _
- The crew will repair cracks that run perpendicular to the centerline.
_ r _ _ s _ _ r _ _ _ r _ _ k _ _ _
- Cracking occurring over a joint can be expensive to repair.
r _ _ l _ c _ _ v _ _ c _ _ c _ _ n _
- Inspect the road for any parts that do not conform to the rest.
i _ _ e _ _ l _ _ i _ _ e _
- A set of small, connected cracks is often the result of structural defects.
_ l _ _ g _ _ o _ _ _ a _ _ i _ g

5 Listen and read the article again. How can weather damage pavement?

Listening

6 Listen to a conversation between a supervisor and a worker. Mark the following statements as true (T) or false (F).

- The woman spotted defects while driving.
- Both roads have signs of shoving.
- The man will send a crew to repair the block cracking on Washington Street.

7 Listen again and complete the conversation.

Worker: I drove down Washington Street earlier today. It's 1 _____.

Supervisor: What's wrong? I haven't seen it since last fall.

Worker: The winter 2 _____ a lot of damage.

Supervisor: I'm not surprised. The temperature kept dropping and then rising again. What kinds of 3 _____ did you see?

Worker: There was a lot of 4 _____. It's not too bad yet, but I also saw the start of some 5 _____.

Supervisor: That's not good. Take your crew out there 6 _____ you finish on Jackson Street.

Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

What's wrong?
There is a lot of ...
I also saw ...

Student A: You are a supervisor. Talk to Student B about:

- defects on a road
- the cause of the defects
- defects on your current project

Student B: You are a construction worker. Talk to Student A about pavement defects.

Writing

9 Use the conversation from Task 8 to fill out the road condition report.



Road Condition Report

Road or street: _____

Defects: _____

Possible causes: _____

CRCP

Continuously
Reinforced
Concrete
Pavement

Joints are the most effective way to control cracking in concrete. Only CRCP does not require joints in its design.

III.I Transverse Joints - For jointed URC pavement, transverse joints are spaced between 12 and 20 feet. For JRC pavement, transverse joints are spaced between 25 and 50 feet. It is necessary to use dowel bars to strengthen transverse joints. Position bars at mid-depth of the slab before pouring the concrete.

III.II Longitudinal Joints - Provide longitudinal joints if a lane is wider than 15 feet. It is necessary to use tie bars to strengthen longitudinal joints. Position bars at mid-depth of the slab before pouring the concrete.

III.III Sealing Technique - Cut all joint grooves after the concrete has set. Ensure that all grooves are clean before applying the sealant. Place the sealant as evenly and as quickly as possible.

longitudinal joint
transverse joint
joint groove

slab

concrete slab
base course

Vocabulary

3 Match the words or phrases (1-6) with the definitions (A-F).

- | | |
|------------|--------------------------|
| 1 ___ URC | 4 ___ transverse joint |
| 2 ___ JRC | 5 ___ joint groove |
| 3 ___ CRCP | 6 ___ longitudinal joint |

- A a type of concrete that uses both joints and steel to control cracking
- B a joint that is always perpendicular to the centerline of a road
- C a joint that runs down the centerline of a road
- D concrete without any materials added to make it stronger
- E a narrow cut along a joint in which the sealant is placed
- F a type of concrete pavement that uses only steel to control cracking

4 Fill in the blanks with the correct words or phrases from the word bank.

WORD BANK

sealant joint rigid pavement slab

- The worker placed a(n) _____ in the concrete so that it would not crack.
- The _____ protected the joint he placed from dirt or water damage.
- The short ramp to the highway was made of a single _____ of concrete.
- Because the ramp used _____, it could withstand heavy loads and a lot of stress.

Get ready!

1 Before you read the passage, talk about these questions.

- What are some joints used in pavement construction?
- What type of pavement is reinforced with steel?

Reading

2 Read the publication. Then, mark the statements true (T) or false (F).

- ___ JRC pavement requires fewer transverse joints than URC pavement.
- ___ Longitudinal joints are required on CRCP roads wider than fifteen feet.
- ___ Both longitudinal and transverse joints need joint grooves and sealant.

- 5 Listen and read the publication again. Where is sealant applied?

Listening

- 6 Listen to a conversation between a construction company owner and a manager. Choose the correct answers.

- 1 What is the conversation mainly about?
 A the progress of two projects
 B how to finish a project faster
 C the types of joints being installed
 D the benefits of different concrete types
- 2 What does the man say about jointed reinforced concrete?
 A It is stronger than URC.
 B It is harder to install than URC.
 C It is more expensive than URC.
 D It requires fewer joints than URC.

- 7 Listen again and complete the conversation.

Owner: Everything's 1 _____. We might finish the entire project by fall.

Manager: How about the Green Street project? Is it going well?

Owner: 2 _____. The engineers are still redesigning the joints. It's starting to get pretty expensive.

Manager: What if we used 3 _____ concrete? Would that be cheaper than URC?

Owner: Not at all! The price of steel is rising. So using reinforced concrete would be 4 _____.

Manager: I see. Is there any way to 5 _____?

Owner: I have a 6 _____. But we'll talk about that later.

Speaking

- 8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

Did you visit the ...?

Is it going well?

What if we used ...?

Student A: You are a construction company owner. Talk to Student B about:

- two road projects
- the progress of the projects
- types of concrete to use

Student B: You are a manager. Talk to Student A about two projects.

Writing

- 9 Use the conversation from Task 8 to fill out the project updates.

JACKSON
CONSTRUCTION

Main Street Project

Type of concrete being used: _____

Project status: _____

JACKSON
CONSTRUCTION

Green Street Project

Type of concrete being used: _____

Project status: _____

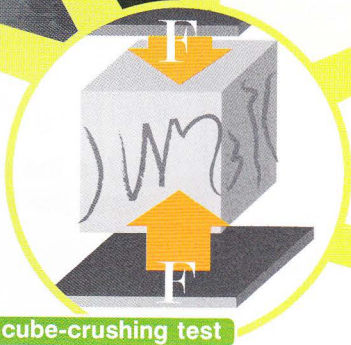


From: bill.shaw@shawconstruction.com
 To: samantha.jones@shawconstruction.com
 Subject: Elm Street Sidewalk Project

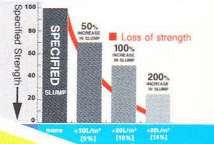
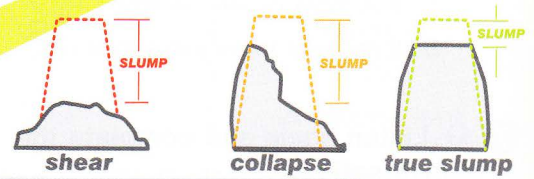
Samantha,
 Your crew will lay the concrete for the Elm Street sidewalk tomorrow. Divide the sidewalk into four small sections and lay each one separately. We need to ensure that the concrete is usable. So start by performing a **slump test** and **cube-crushing test**. If it passes both tests, start laying the concrete. Please make sure that you lay a solid **formwork** for the concrete. We want the sidewalk to look perfect. Don't forget to place **expansion** and **warping joints**. You know how severe the weather can get. We need to prevent any possible **vertical temperature gradients** from occurring. Lastly, please have your crew **tamp** the concrete. This sidewalk job falls on the **small-scale** side. So they can use a **tamper bar** to tamp the concrete **by hand**. Remember to **strike** the formwork when you're done. Please call or email me if you have any questions.
 Best,
 Bill Shaw

Get ready!

- Before you read the passage, talk about these questions.
 - What are some tests applied to building materials?
 - What type of joint is located on the surface of a roadway?



slump test



Reading

- Read the email. Then, choose the correct answers.
 - What is the purpose of the email?
 - to change the location of a project
 - to describe concrete testing methods
 - to list the equipment needed for a job
 - to provide details for an upcoming project
 - Which of the following should occur first?
 - laying the formwork
 - tamping the concrete
 - placing a warping joint
 - performing a slump test
 - What is NOT true of the project?
 - It will include expansion joints.
 - It needs formwork to be created.
 - It will form a sidewalk next to a road.
 - It requires a vertical temperature gradient.

Vocabulary

- Match the words or phrases (1-7) with the definitions (A-G).

1 — formwork	5 — strike
2 — small-scale	6 — tamper bar
3 — by hand	7 — tamping
4 — vertical temperature gradient	

 - the act of making concrete more compact
 - a tool that compresses concrete
 - to remove formwork
 - not being large or requiring many resources
 - a task done with hand tools and without the use of large machines
 - a situation that occurs when the top portion of concrete is much hotter or cooler than the bottom portion
 - a frame into which concrete is poured

4 Read the sentence pairs. Choose which word or phrase best fits each blank.

1 expansion joint / warping joint

- A** The _____ bore the weight of the load evenly, so the concrete did not bend under stress.
- B** A(n) _____ absorbed the vibrations of the road and held the pipes in place.

2 slump test/cube crushing test

- A** The engineer knew the concrete was usable after he performed the _____.
- B** He also tested the strength of the concrete with a(n) _____.

5 Listen and read the email again. What is the last action the crew should take?

Listening

6 Listen to a conversation between a manager and a worker. Mark the following statements as true (T) or false (F).

- 1 ___ The man performed a slump test.
- 2 ___ The crew finished tamping the concrete.
- 3 ___ The woman wants to inspect the formwork.

7 Listen again and complete the conversation.

Manager: First, you performed the 1 _____
_____?

Worker: Yes. I 2 _____ that
before we laid the concrete.

Manager: Good. I'll 3 _____.
Did you place expansion joints?

Worker: Yes. I saw Mr. Shaw's instructions.

Manager: 4 _____. Okay, up
next is tamping. Has the crew started that
yet?

Worker: No, not yet. We were 5 _____
start.

Manager: Sounds good. Be sure to let me know
when you 6 _____.
I want to examine the final product.

Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

- Do you have a minute to ...?*
- First, did you performed ...?*
- Did you place ...?*

Student A: You are a manager. Talk to Student B about:

- a checklist
- concrete tests
- joints

Student B: You are a worker. Talk to Student A about a concrete project.

Writing

9 Use the conversation from Task 8 to fill out the checklist.



Did the crew...	Yes / No
1 - _____	___ / ___
2 - _____	___ / ___
3 - _____	___ / ___
4 - _____	___ / ___

Glossary

- abrasion** [N-UNCOUNT-U12] **Abrasion** is the process of rubbing, grinding, or wearing away a surface by means of friction.
- accumulated error** [N-COUNT-U1] An **accumulated error** is the final error in measurement that results from minor errors building upon each other throughout the surveying process.
- accurate** [ADJ-U1] **Accurate** is something precise in measurement.
- aggregate** [N-UNCOUNT-U12] **Aggregate** is a mixture of hard materials such as gravel or crushed stone that is used to make asphalt or concrete.
- alligator cracking** [N-UNCOUNT-U13] **Alligator cracking** is a type of pavement cracking that begins in the wheel path and may over time start to look like the back of an alligator.
- assess** [V-T-U11] To **assess** something is to measure or determine its performance.
- automatic level** [N-COUNT-U2] An **automatic level** is a self-adjusting instrument that has the same function as an optical level.
- axel weight** [N-COUNT-U11] An **axel weight** is the weight of a vehicle.
- backfill** [V-T-U5] To **backfill** something is to place new material into an excavated area.
- base course** [N-COUNT-U10] A **base course** is the level of a road that is located directly under the surface course and can be made from aggregate substances or hot mix asphalt.
- binder course** [N-COUNT-U10] A **binder course** is a level in the surface course of a road that helps distribute weight evenly.
- bleeding** [N-UNCOUNT-U13] **Bleeding** is the buildup of bituminous binder on the pavement surface, often in the wheel path, creating a reflective pool that may be sticky to touch.
- block cracking** [N-UNCOUNT-U13] **Block cracking** is a system of cracks that break the pavement into rectangular pieces.
- bolting** [N-UNCOUNT-U8] **Bolting** is a method of sealing or securing a connection between pipes and joints using bolts.
- by hand** [ADV-U15] If a task is performed **by hand**, it is done with hand tools and without the use of a large machine.
- calculate** [V-T-U4] To **calculate** an answer is to use math to solve a problem.
- cambered** [ADJ-U7] If something is **cambered**, it is curved up at the middle.
- capping layer** [N-COUNT-U10] A **capping layer** is the layer of a road located between the sub-grade and sub-base levels and which is used when the sub-grade level is not sufficiently solid.
- caulking** [N-UNCOUNT-U8] **Caulking** is a way to seal joints and pipes using caulk.
- centerline** [N-COUNT-U3] A **centerline** is a straight line between two or more divisions or cells on a gridded map.
- chain surveying** [N-UNCOUNT-U1] **Chain surveying** is a type of plane surveying that measures distance using a chain.
- clear** [V-T-U5] To **clear** is to remove trees and other debris from an area.
- commercial vehicle** [N-COUNT-U11] A **commercial vehicle** is a vehicle used for a company job and normally weighs more than a private vehicle.
- compact** [V-T-U5] To **compact** something is to press something tightly together.
- CRCP** [N-COUNT-U14] **CRCP** (Continuously reinforced concrete pavement) is a type of concrete pavement that uses only steel to control cracking.
- corrugated metal pipe** [N-COUNT-U8] A **corrugated metal pipe** is a pipe or tube with a grooved surface made from a kind of metal such as copper.
- cross drain** [N-COUNT-U9] A **cross drain** is a tunnel that directs water from one side of the road to the other.
- cross section** [N-COUNT-U3] A **cross section** is a point of view of a geographic feature in a map or plan as if part of the area was cut away.
- cube crushing test** [N-COUNT-U15] A **cube crushing test** is a test performed on concrete to measure its strength.

culvert [N-COUNT-U8] A **culvert** is a drain or pipe that leads water under an embankment, road, or railway.

cumulative [ADJ-U11] If something is **cumulative**, it includes all events or factors from the start of a process to the present state.

curve ranging [N-UNCOUNT-U4] **Curve ranging** is a way to set out or create curves.

defect [N-COUNT-U13] A **defect** is a crack, deformation, or any other flaw in pavement.

design life [N-UNCOUNT-U11] The **design life** of pavement is the length of time that it's expected to last.

design thickness [N-COUNT/UNCOUNT-U11] The **design thickness** of a road determines how thick each layer of the pavement will be.

detail drawing [N-COUNT-U3] A **detail drawing** is a section of a map where an area is enlarged to emphasize details and features of that space.

digital level [N-COUNT-U2] A **digital level** can measure the horizontal level of the ground to a tenth of a millimeter.

discharge [N-UNCOUNT-U9] **Discharge** is an excess or release of a liquid or material.

drain [V-T-U7] To **drain** something is to lead or filter liquid, such as water, away from it.

drainage [N-UNCOUNT-U7] **Drainage** is a way of removing liquid such as water.

drainage area [N-COUNT-U7] A **drainage area** is a long, narrow, man-made hole in the ground.

edge drain [N-COUNT-U9] An **edge drain** is a tunnel that collects water, and filters out soil and particles in the water.

elevation [N-COUNT-U3] **Elevation** is the vertical or angular distance above sea level.

embankment [N-COUNT-U5] An **embankment** is a wall or raised area of earth that creates a barrier or supports a road.

erosion control [N-UNCOUNT-U6] **Erosion control** is the prevention of unwanted soil movement, usually down a slope.

estimate [V-T-U11] To **estimate** an amount is to predict about how much it will be.

exaggerate [V-T-U3] To **exaggerate** something is to overemphasize or overestimate its size, number or quality.

excavate [V-T-U5] To **excavate** something is to dig dirt or other materials out of an area to prepare for new development.

excess [N-COUNT-U13] An **excess** is a quantity of something that is beyond what is necessary or desired.

existing base [N-UNCOUNT-U5] **Existing base** is a loose layer of dirt near the earth's surface that has not been treated or worked on.

expansion joint [N-COUNT-U15] An **expansion joint** allows concrete to increase or decrease in size without being damaged or damaging nearby concrete structures.

fascine construction [N-UNCOUNT-U6] **Fascine construction** is a construction method that involves using bundled sticks to fill walls or embankments.

fill [V-T-U5] To **fill** something is to add material to a surface to make it higher.

fin drain [N-COUNT-U9] A **fin drain** is similar to a land drain except that it redirects excess water to a drainage pipe system.

flange [N-COUNT-U8] A **flange** is the rimmed section of a pipe that adds support to that pipe.

flexible [ADJ-U8] If something is **flexible**, it is easy to bend and move out of shape.

flexible construction [N-UNCOUNT-U10] **Flexible construction** is the creation of flexible pavement that consists of several levels of material and can withstand pressure.

formwork [N-COUNT-U15] A **formwork** is a frame that road workers build to help guide them when they pour concrete or similar materials.

French drain [N-COUNT-U9] A **French drain** is an underground tunnel that diverts water away from a certain area.

friction test [N-COUNT-U12] A **friction test** measures the resistance experienced between a tire and the surface of a road.

Glossary

- gabion wall** [N-COUNT-U6] A **gabion wall** is a supporting wall made from bags or boxes filled with stones.
- gasket** [N-COUNT-U8] A **gasket** is a piece material used to make a connection tight.
- geodetic surveying** [N-UNCOUNT-U1] **Geodetic surveying** is a method of surveying that takes into consideration the curvature of the Earth's surface.
- geotextile** [ADJ-U6] **Geotextile** is a strong, flexible material made from plastic, that can be used to support and strengthen a road.
- GPS (Global Positioning System)** [N-UNCOUNT-U2] **GPS (Global Positioning System)** is a system that provides a range of geographic values determined by satellites.
- grade** [N-UNCOUNT-U12] **Grade** is the amount of inclination in a road.
- gradient** [N-COUNT-U7] A **gradient** is the slope of a curve.
- gyroscopic theodolite** [N-COUNT-U2] A **gyroscopic theodolite** measures angles relative to true north and is useful in underground measurements.
- horizontal scale** [N-COUNT-U3] The **horizontal scale** on a map is the x-axis of the map or the ratio of distance represented in a map or plan to actual distance.
- irregularity** [N-COUNT-U13] An **irregularity** is a part of something that is different to the rest.
- joint** [N-COUNT-U14] A **joint** is an artificial crack in concrete designed to control actual cracking.
- joint** [N-COUNT-U8] A **joint** is an angled section where two pipes meet, and which changes the direction of flow.
- joint groove** [N-COUNT-U14] A **joint groove** is a narrow cut along a joint in which the sealant is placed.
- JRC** [N-UNCOUNT-U14] **JRC**, (Jointed reinforced concrete) is a type of concrete that uses both joints and steel to control cracking.
- land drain** [N-COUNT-U9] A **land drain** is a trench located by a road or highway that is filled with gravel and carries water away from the street.
- laser level** [N-COUNT-U2] A **laser level** is an often self-adjusting level used in construction that also emits a horizontally-level, straight line of light.
- lime stabilization** [N-UNCOUNT-U6] **Lime stabilization** is the addition of lime to soil to make it harder and more stable.
- link** [V-T-U4] To **link** one thing to another is to connect them.
- load-bearing capacity** [N-UNCOUNT-U6] **Load-bearing capacity** is the amount of weight that a road can support over long periods of time.
- longitudinal joint** [N-COUNT-U14] A **longitudinal joint** is a joint in the centerline of a road or highway.
- longitudinal section** [N-COUNT-U3] A **longitudinal section** is a section taken through the lengthwise direction of a structure on a map.
- manhole** [N-COUNT-U7] A **manhole** is a lid-covered tunnel in the ground through which people can enter a sewage system.
- map** [N-COUNT-U3] A **map** is a graphic representation of a geographic area and usually indicates north.
- marsh** [N-COUNT-U6] A **marsh** is an area of wet land with soft soil that usually contains various grasses and other plants.
- measuring tape** [N-COUNT-U1] A **measuring tape** is tape used in chain surveying to take small measurements.
- mill** [V-T-U5] To **mill** a surface is to remove material from it to make it lower.
- nylon line** [N-COUNT-U4] A **nylon line** is a synthetic material that is placed on steel pins to mark a line.
- optical level** [N-COUNT-U2] An **optical level** measures horizontal evenness and distance.
- optical micrometer reading** [N-COUNT-U2] An **optical micrometer reading** is the measurement of an angle according to an optical micrometer.

optical plumb [N-COUNT-U2] An **optical plumb** is an instrument used to level an instrument such as a theodolite over a station.

optical scale reading [N-COUNT-U2] An **optical scale reading** is a measurement of an angle by an optical scale.

optical square [N-COUNT-U2] An **optical square** sets out right angles over a short distance.

pavement [N-UNCOUNT-U10] **Pavement** is an artificial, smooth surface mainly used to create roads and walkways.

pipe [N-COUNT-U8] A **pipe** is a tube through which liquids and semi-solid materials flow.

pipe underdrain [N-COUNT-U9] A **pipe underdrain** is located underground near a road or highway and collects water before it has a chance to reach the surface.

plan [N-COUNT-U3] A **plan** is a large scale map or representation of an area that includes representations of buildings and structures for future construction.

plane surveying [N-UNCOUNT-U1] **Plane surveying** is a method of surveying which assumes that the surface of the Earth is flat.

plastic mesh [N-UNCOUNT-U6] **Plastic mesh** is a geotextile material that is used in road construction for its strength and durability.

point [N-COUNT-U1] A **point** is a defined position.

polished stone value [N-COUNT-U12] **Polished stone value** is the measure of resistance an aggregate shows to the polishing action of tires.

polyethylene [N-UNCOUNT-U8] **Polyethylene** is a durable, lightweight material made from polymerized ethylene.

position [N-COUNT-U1] A **position** is the exact location of a person or thing.

preparation [N-UNCOUNT-U5] **Preparation** is the process of removing buildings, facilities, and other fixtures from an area to get it ready for new development.

private vehicle [N-COUNT-U11] A **private vehicle** is a vehicle people have for their personal use and is normally lighter than a commercial vehicle.

PSV test [N-COUNT-U12] A **PSV test** is a test used to determine the polished stone value of an aggregate.

radiused corner [N-COUNT-U4] A **radiused corner** connects two straight lines.

ranging rod [N-COUNT-U1] A **ranging rod** is a tall pole used to mark intermediate points in chain surveying.

raveling [N-UNCOUNT-U13] **Raveling** is the separation of aggregate particles in asphalt concrete, resulting in pock marks on the pavement surface.

reflective cracking [N-UNCOUNT-U13] **Reflective cracking** is cracking in a flexible pavement or asphalt overlay that occurs directly over an existing crack or joint in the surface below.

remove [V-T-U5] To **remove** something is to take it away to a different location.

repeated alignment [N-UNCOUNT-U4] **Repeated alignment** is a way to connect two points that are not visible to each other.

right-angle [N-COUNT-U4] A **right-angle** is an angle that measures 90 degrees.

rigid [ADJ-U8] If something is **rigid**, it is hard to bend and push out of shape.

rigid pavement [N-COUNT-U14] **Rigid pavement** is pavement that changes very little under load or stress.

rolled asphalt [N-UNCOUNT-U12] **Rolled asphalt** is a coarse aggregate surrounded by a mixture of bitumen, sand, and filler used to surface roads.

rutting [N-UNCOUNT-U13] **Rutting** is a type of surface depression that happens in the wheel path.

sand drain [N-COUNT-U9] A **sand drain** is located in the ground and is filled with sand or gravel. It allows water to flow through easily.

Glossary

- saturation** [N-UNCOUNT-U7] **Saturation** is a condition where water has soaked through something, such as wet soil, and no more water can be absorbed.
- scale** [N-COUNT-U3] A **scale** is the ratio of distance and size on a map.
- sealant** [N-COUNT-U14] **Sealant** is a material used to close joints to prevent dirt and water from going in.
- self-cleansing velocity** [N-UNCOUNT-U7] **Self-cleansing velocity** is the speed of water or sewage needed to keep solids in sewage pipes in suspension and to prevent their decomposition.
- set out** [V-T-U4] To **set out** a line is to mark a path or curve.
- sewer line** [N-COUNT-U7] A **sewer line** is a section of pipe or line in a sewage system.
- shoving** [N-UNCOUNT-U13] **Shoving** is the development of ripples or a wave pattern across a pavement surface.
- siphon** [N-COUNT-U9] A **siphon** is a hose that enables a liquid to travel uphill as long as the end of the hose is at a lower level than the beginning of the hose.
- skid-resistant** [ADJ-U12] If a road is **skid-resistant**, tires will not slip on it.
- slab** [N-COUNT-U14] A **slab** is an individual block of concrete that is used in pavement.
- slippage** [N-UNCOUNT-U13] **Slippage** is a series of half-moon shaped cracks in the surface of asphalt where it has shifted over the underlying layer.
- slope drain** [N-COUNT-U9] A **slope drain** is a drain near a road or highway that diverts water and runoff from the street.
- slope reinforcement** [N-UNCOUNT-U6] **Slope reinforcement** is support provided by materials and structures along slopes.
- slump test** [N-COUNT-U15] A **slump test** is a test performed on concrete to measure its usability.
- small-scale** [ADJ-U15] If a job is **small-scale**, it is not a very big job and requires fewer workers and less machinery than a larger job.
- soakaway** [N-COUNT-U9] A **soakaway** is a drain that redistributes excess water to the surrounding ground.
- socket** [N-COUNT-U8] A **socket** is a space or niche in a joint where a pipe can fit.
- split friction** [N-UNCOUNT-U12] **Split friction** is when the friction of a road varies significantly between the tires on the left and right sides of a vehicle.
- stabilize** [V-T-U6] To **stabilize** something is to make something stronger so that is not easily disturbed or broken.
- standard axels** [N-COUNT-U11] A **standard axel** is a measurement of the force put on a road by traffic.
- standing water** [N-UNCOUNT-U7] **Standing water** is water that stays in one place and does not flow.
- station peg** [N-COUNT-U1] A **station peg** is a short wooden pin used to mark stations in chain surveying.
- steel pin** [N-COUNT-U4] A **steel pin** is a metal bar used to mark a line.
- storm water** [N-UNCOUNT-U7] **Storm water** is water that remains after a period of precipitation or rainfall.
- straight** [ADJ-U4] If a line is **straight**, it does not have a curve.
- strike** [V-T-U15] To **strike** formwork is to remove it.
- sub-base course** [N-COUNT-U10] A **sub-base course** is the layer of a road that is located between the base course and the sub-grade course. It may not be necessary if the sub-grade course is strong.
- sub-grade course** [N-COUNT-U10] A **sub-grade course** is the lowest level of a road, which consists of the soil on which the pavement rests.
- subsoil drainage** [N-UNCOUNT-U7] **Subsoil drainage** is a method of leading water away from soil.
- surface** [V-T-U12] To **surface** is to create or lay the upper portion of a road.
- surface course** [N-COUNT-U10] A **surface course** is the upper-most level of pavement and is the level that people and cars contact.

surveying [N-UNCOUNT-U1] **Surveying** is the technique of carefully measuring an area of land in order to draw a plan or map.

swamp [N-COUNT-U6] A **swamp** is an area of land that is covered partially or completely by water.

swing [V-T-U4] To **swing** a tape measure is to turn it on a pivot from one point to another point that is equally far from the pivot.

take off [V-T-U4] To **take off** a line is to create a line connected to an existing line.

tamper bar [N-COUNT-U15] A **tamper bar** compresses an area of soil, concrete or other materials by filling small holes with more material or removing excess material.

tamp [V-T-U15] To **tamp** is to use a tamper bar to make soil, concrete, or other material more compact.

theodolite [N-COUNT-U2] A **theodolite** is a tool that measures horizontal and vertical angles.

total station [N-COUNT-U2] A **total station** measures distance and electronically measures and sets out angles.

traffic growth [N-UNCOUNT-U11] **Traffic growth** is an estimated percent of increased or decreased traffic on a road.

traffic load [N-COUNT-U11] A **traffic load** is the average amount and weight of the traffic that uses a road.

transverse cracking [N-UNCOUNT-U13] **Transverse cracking** is a type of crack that runs perpendicular to the pavement's centerline.

transverse joint [N-COUNT-U14] A **transverse joint** is a joint that is always perpendicular to the center-line of a road.

transverse section [N-COUNT-U3] A **transverse section** is the view of a geographic area at a right angle to its long axis.

trench [N-COUNT-U9] A **trench** is a tunnel that is located in the ground and is normally deeper than it is wide.

triangulation [N-UNCOUNT-U1] **Triangulation** is the process of determining a distance to a point from an already established line by taking two measurements only and creating a triangle.

uneven [ADJ-U13] If a road is **uneven**, it is bumpy, rough, or irregular.

URC [N-UNCOUNT-U14] **URC**, (Unreinforced concrete) is concrete without any materials added to make it stronger.

vertical scale [N-COUNT-U3] The **vertical scale** is the ratio of vertical distance represented in a map or plan to actual vertical distance.

vertical temperature gradient [N-UNCOUNT-U15] A **vertical temperature gradient** occurs when the top portion of the concrete is much hotter or cooler than the bottom portion.

warping joint [N-COUNT-U15] A **warping joint** prevents bending stresses in concrete by evenly distributing weight, sealing against water and grit, and releasing tension.

wearing course [N-COUNT-U10] The **wearing course** is the top level of a surface course which comes in direct contact with traffic.

welding [N-UNCOUNT-U8] **Welding** is a way of sealing joints and pipes by heating and melting adjacent edges of two separate joints and pipes and causing them to meld together.

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**CAREER
PATHS**

Construction II

**Roads &
Highways**

Book
3

Virginia Evans
Jenny Dooley
Mark Chavez



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Scope and Sequence

Unit	Topic	Reading context	Vocabulary	Function
1	Curb Types	Email	barrier curb, curb, curb and cutter, curb cut, cut stone curb, half-batter curb, integral curb, radius curb, splayed curb, straight curb, vertical curb	Asking for repetition
2	Installing Curbs	Instructions	bonding, curb bed, curb line, curbing machine, dry bed, epoxy resin, haunching, haunch, precast, wet bed, windrow	Correcting an error
3	Paving Sidewalks	Website	block paving, bonding pattern, cobble, dry method, five-spot method, hydraulically pressed slab, interlocking paving, lay, open-mold slab, paving slab, sidewalk, whole bed method	Discussing prices
4	Bridges 1: Types	Web page	abutment, beam bridge, cable, cable-stayed bridge, cantilever, cantilever bridge, double-decked bridge, moveable bridge, simply supported, suspension bridge	Asking about experience
5	Bridges 2: Parts	Inspection report	anchor span, approach span, bent, bent cap, dead load, deck, end bent, hammerhead pier, live load, parapet, pier	Supporting an opinion
6	Fencing	Email	ancillary work, barbed wire, chain link fence, concrete wall, fencing, field side, livestock, post and rail fencing, post and wire fencing, snow fencing, strained wired fence, timber	Changing a plan
7	Site Safety	Poster	collapse, electrocution, evacuate, gas line, hazard, injury, personnel, power line, site, sloped, underground cable, vigilant	Talking about future events
8	Traffic Control	Manual	closure, detour, merge, merging taper, shifting taper, reflective, single file, stop/go board, traffic control, traffic flow, two-way	Expressing concern
9	Signage	Notice	approach speed, color scheme, crossing sign, guide sign, hazard, minimum visibility, mounting height, orientation, placement, range, regulatory sign, sitting, stop sign, warning sign	Confirming information
10	Street Furniture	Email	bench, bollard, bus stop, guard rail, mailbox, median barrier, phone booth, street furniture, streetlight, taxi stand, traffic light, trash can	Making a recommendation
11	Testing Materials 1	Web page	aggregate, batch plant, bituminous materials, EVT, penetrometer, quartering, riffing, ring and ball test, sample, standard sieve test, standard tar viscometer, viscosity	Making an appointment
12	Testing Materials 2	Order form	compacting factor test, consistency, cube, cube test, degree of compactibility test, flow table test, hopper, sampling plan, silt test, slum test, trap door, Vebe test, workability	Asking for repetition
13	Bridge Maintenance	Inspection report	apron, de-icing salt, inspection report, invert, sand blast, scouring, shrinkage crack, spalling, steam clean, structural crack	Discussing pros and cons
14	Road Maintenance 1	Newspaper article	deteriorate, cyclic, improvement, maintain, maintenance, patching, repaint, routine, resurface, structural, sweeping, widen	Correcting an error
15	Road Maintenance 2	Contractor bid notices	bush hammering, de-ice, fatted up, high pressure water retexturing, inject, physical abrasion, plowing, pressure grouting, retexturing, rock salt, rotating discs, salt, shot blasting, snow removal	Asking about costs

Table of Contents

Unit 1 - Curb Types	4
Unit 2 - Installing Curbs	6
Unit 3 - Paving Sidewalks	8
Unit 4 - Bridges 1: Types	10
Unit 5 - Bridges 2: Parts	12
Unit 6 - Fencing	14
Unit 7 - Site Safety	16
Unit 8 - Traffic Control	18
Unit 9 - Signage	20
Unit 10 - Street Furniture	22
Unit 11 - Testing Materials 1	24
Unit 12 - Testing Materials 2	26
Unit 13 - Bridge Maintenance	28
Unit 14 - Road Maintenance 1	30
Unit 15 - Road Maintenance 2	32
Glossary	34

1 Curb Types



From: c.leonard@leonardsconstruction.com
 To: s.adams@cityofbrighton.gov
 Subject: RE: Curb Types

Dear Ms. Adams,
 We have received your request for information on new curb options for the downtown construction area. We have several varieties of curb that would meet your needs. For Broad Avenue, we suggest a **barrier curb** for the dividing line. We also have **curb and gutter** options available to line Broad Ave. We would add sections of **splayed curb** so that cars can enter alleys and parking garages.

We suggest using **integral curb** or **half-batter curb** for the majority of the **straight curb** sections. Of course, **curb cuts** and **radius curbs** have to be placed in all corners. Where Broad Avenue passes under Oak Street Bridge, we would use **vertical curb**.

We also considered curbing options for the new development outside the city. **Cut stone curb** is an attractive option for the Arbor Hills neighborhood. We can also restore the cut-stone curb previously built there. If you have any questions, please don't hesitate to contact me. I look forward to doing business with the city.

Conrad Leonard,
 CEO Leonard Construction

Get ready!

1 Before you read the passage, talk about these questions.

- 1 What are some types of curbs?
- 2 Which type of curb allows cars to easily pass over it?

Reading

2 Read the email from the contractor. Then, choose the correct answers.

- 1 What is the purpose of the e-mail?
 - A to advertise a construction company
 - B to recommend curbs for different areas
 - C to describe damage to curbs in the city
 - D to explain how the curbs are constructed
- 2 Which of the following would NOT be used in the downtown area?
 - A radius curb
 - B vertical curb
 - C cut stone curb
 - D half-batter curb
- 3 What is true of straight curb sections?
 - A They divide lanes of traffic.
 - B They cannot use half-batter curbs.
 - C They allow cars to cross over them.
 - D They can be made of different curb types.

Vocabulary

3 Match the phrases (1-8) with the definitions (A-H).

- | | |
|------------------------|---------------------|
| 1 ___ splayed curb | 5 ___ vertical curb |
| 2 ___ integral curb | 6 ___ curb cut |
| 3 ___ barrier curb | 7 ___ straight curb |
| 4 ___ half-batter curb | 8 ___ radius curb |

- A a concrete ramp that slopes from the surface of a sidewalk to the street
- B a curb with walls high enough to prevent vehicles from passing over it
- C a curb which is curved
- D a section of curb low enough to allow vehicles to pass over it
- E a curb with no curves or bends
- F a curb which is poured and formed uniform with concrete pavement
- G a curb with a slightly sloping profile
- H a high protruding concrete barrier which is used to line bridges and tunnels



4 Read the sentence pairs. Choose which word or phrase best fits each blank.

1 cut stone curb / integral curb

- A The city didn't want a division between the pavement and the curb, so contractors formed a(n) _____.
- B A(n) _____ is a more expensive, but also more attractive curb option.

2 curb and gutter / vertical curb

- A The city needed to control water on the road by adding a _____.
- B A long stretch of _____ was built along the walls of the underground tunnel.

5 Listen and read the email from the contractor again. How is a barrier curb different from a vertical curb?

Listening

6 Listen to a conversation between a city planner and a contractor. Mark the following statements as true (T) or false (F).

- 1 ___ The woman is unsure of a barrier curb's function.
- 2 ___ A vertical curb is stronger than a barrier curb.
- 3 ___ The woman orders cut stone curbs for a residential project.

7 Listen again and complete the conversation.

Planner: Well, you mentioned a barrier curb. **1** _____ is that?

Contractor: Oh, a barrier curb goes between lanes of traffic. It's **2** _____ stop cars from crossing over it.

Planner: I see. That's what I thought. But how is that **3** _____ a vertical curb?

Contractor: A vertical curb isn't **4** _____ a barrier curb.

Planner: I'm sorry, I **5** _____. Did you say it isn't as long as a barrier curb?

Contractor: No, you misheard me. **6** _____ aren't as strong as barrier curbs.

Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

I have a few questions.

Did you say ...?

You suggested ...

Student A: You are a city planner. Talk to Student B about:

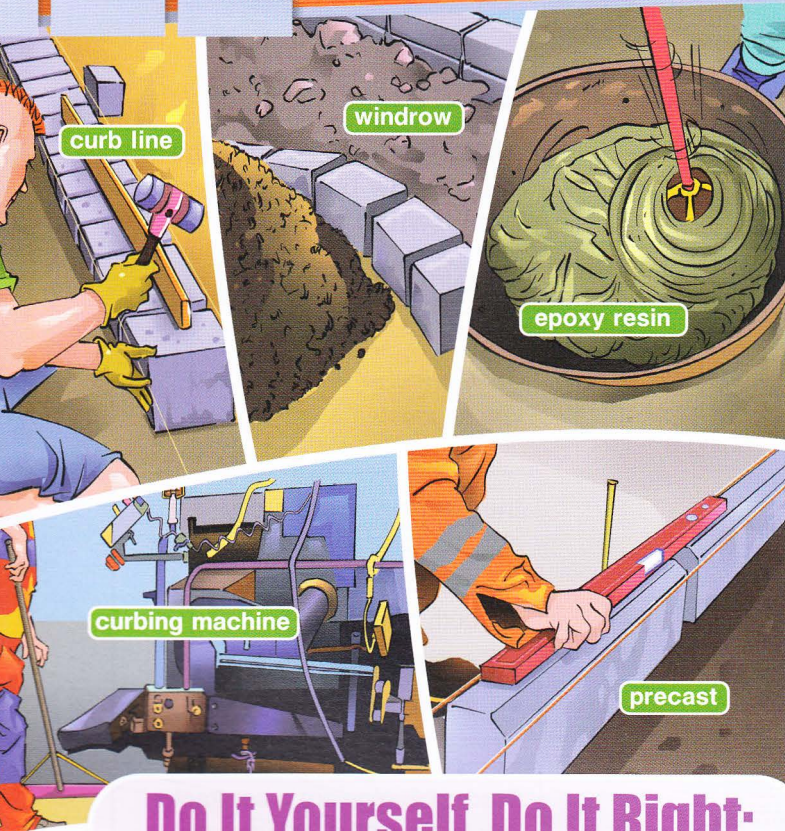
- the difference between two curb types
- a detail you didn't hear
- a curb Student B suggested

Student B: You are a contractor. Talk to Student A about curbs.

Writing

9 Use the conversation from Task 8 and the email to recommend curbs for a city project. Include: curbs to divide lanes, curbs that let people and cars exit, and curbs for a residential area.





Do It Yourself, Do It Right: Installing Curbs

Curb installation requires precision and proper materials to ensure strength and consistency. **Curbing machines** can be very useful, but machines aren't always available for small projects. This guide includes tips for constructing a strong, even curb without a machine.

Before installing a curb, you must provide a secure foundation along the **curb line**. This **curb bed** is what supports a curb and ensures it is positioned correctly.

Tips:

- If you use a **wet bed**, remember to place the curb before the concrete sets. You may want to use a **windrow** to support the curb edges during drying.
- If you use a **dry bed**, you will need **bonding** to affix the curb to the curb bed. A strong, durable adhesive like **epoxy resin** is appropriate.

Once the curb bed is laid, you are ready to install the curb.

Tips:

- Most experts recommend using **precast** concrete curbing instead of laying wet concrete directly into the curb bed. Precast concrete is easier to work with and generally allows for better strength and uniformity.
- **Haunching** is recommended to support the curb from the inside edge. Install a sturdy concrete **haunch** alongside the curb before placing pathway or sidewalk material.

Get ready!

1 Before you read the passage, talk about these questions.

- 1 What type of curb is already set before being installed?
- 2 What is one type of adhesive used to install curbs?

Reading

2 Read the instructions on curb installation. Then, choose the correct answers.

- 1 What is the purpose of the web page?
 - A to compare different curb materials
 - B to explain the need for curbing machines
 - C to give advice about curb installation
 - D to describe the importance of correct curb formation
- 2 Which of the following is NOT recommended on the web page?
 - A installing a concrete haunch
 - B avoiding the use of curbing machines
 - C affixing the curb with epoxy resin
 - D using precast concrete curbing
- 3 What is true of precast curbing?
 - A it is an alternative to haunching
 - B it provides strength and uniformity
 - C it is often difficult to work with
 - D it involves laying wet concrete into the curb bed

Vocabulary

3 Match the words or phrases (1-8) with the definitions (A-H).

- | | | | |
|---|-------------|---|-------------------|
| 1 | — bonding | 4 | — curb bed |
| 2 | — windrow | 5 | — curb line |
| 3 | — haunching | 6 | — curbing machine |

- A the foundation layer under a curb
- B a device that lays concrete for a curb
- C the boundary between a road and sidewalk
- D the process of adhering things together
- E the process of installing a concrete support
- F a mound of concrete along a curb bed

- 4 Fill in the blanks with the correct words or phrases from the word bank.

Word BANK

dry bed epoxy resin precast
wet bed haunch

- In a(n) _____, the concrete is not yet dry when a curb is laid.
 - _____ curbs are stronger than curbs poured directly into the bed.
 - Use an adhesive material to secure the curb into a(n) _____.
 - Install a(n) _____ on the inside edge of the curb for support.
 - _____ is a good adhesive because it is strong and flexible.
- 5 Listen and read the instructions on curb installation again. What is the difference between a wet bed and a dry bed?

Listening

- 6 Listen to a conversation between a construction company manager and an employee. Mark the following statements as true (T) or false (F).
- The man has not installed a curb before.
 - The man forgot to put in the haunch.
 - The curb is being installed in a dry bed.

- 7 Listen again and complete the conversation.

Manager: Okay, tell me what 1 _____ first.

Employee: Well, the 2 _____ is already laid. So all I need to do is make sure the curb is positioned correctly along the curb line.

Manager: Aren't you forgetting something?

Employee: Hmm. Let me see. Oh, do I need to 3 _____ haunch?

Manager: No, that comes later. I'll give you a hint. What 4 _____ in the curb bed?

Employee: When the 5 _____, it will secure the curb, right?

Manager: No, that's only the case in 6 _____. This is a dry bed.

Speaking

- 8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

All I need to do is ...
That's only the case in ...
So it needs ...?

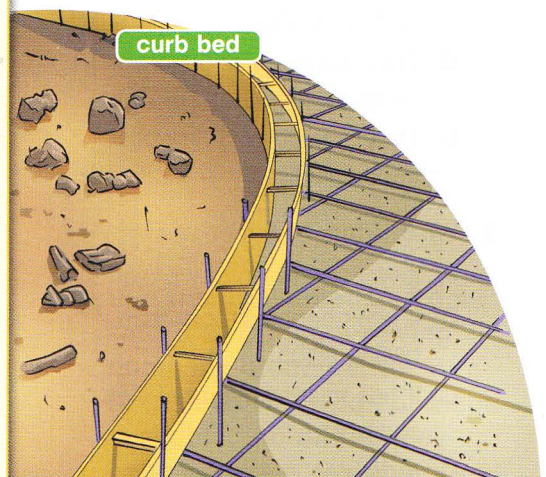
Student A: You are a construction company manager. Talk to Student B about:

- a curb installation
- types of curb beds
- the proper way to affix the curb

Student B: You are a construction company employee. Talk to Student A about a curb installation.

Writing

- 9 Use the conversation from Task 8 and the instructions to fill out an employee's notes about installing curbs. Include types of curb beds and curb installation methods for each type.



HOME

ABOUT US

SERVICES

CONTACT

Get ready!

1 Before you read the passage, talk about these questions.

- 1 What are some decorative types of pavement?
- 2 What are most sidewalks made up of?

Our services are ideal for both city planners and home owners. We work with city officials to **lay** pavement in public spaces. We are also available for paving projects at private homes. Call us today if you are seeking paving experts at the right price.

What can we pave?

We can help you to pave everything from public **sidewalks** to private patios.

What materials do we use?

Our most common paving materials are concrete **paving slabs**. We have both **hydraulically-pressed slabs** and **open-mold slabs** available. For more decorative projects, we also occasionally use **cobbles**.

What are our methods? For concrete slabs, we use different methods, depending on the specific project. Methods include the **whole-bed method**, the **dry method**, and the **five-spot method**. Normal **block paving** is available, but we can also use **interlocking paving** for a more interesting look. We use many different **bonding patterns**, and you can speak with us to determine which pattern is right for your project.

We always complete a consultation at the site prior to beginning a project. In this way we can ensure that our methods match your needs.

Jackson & Sons
PAVING COMPANY

Reading

2 Read the website about paving. Then, choose the correct answers.

- 1 What is the purpose of the website?
 - A to explain various paving services offered
 - B to give advice about choosing slabs
 - C to compare different paving companies
 - D to describe the five-point paving method
- 2 Why are cobbles used for paving projects?
 - A They give projects a more decorative look.
 - B They are cheaper than traditional slabs.
 - C They are best for private home projects.
 - D They are easier to lay than traditional slabs.
- 3 What is true of the company?
 - A It works only on city projects.
 - B It uses cobbles more than paving slabs.
 - C It has multiple types of slab available.
 - D It creates interesting patterns with block paving.

Vocabulary

3 Match the words or phrases (1-6) with the definitions (A-F).

- | | |
|---------------------------|----------------------------------|
| 1 ___ open-mold slab | 4 ___ hydraulically-pressed slab |
| 2 ___ interlocking paving | 5 ___ five-spot method |
| 3 ___ paving slab | 6 ___ lay |

- A a paving slab that is manufactured with a pressing process
- B to install concrete
- C a paving slab that is manufactured without a pressing process
- D a way to lay slabs by using five points of mortar
- E a piece of concrete that is used to pave a road or sidewalk
- F is a way to pave an area by using blocks with irregular or uneven shapes that interlock in a pattern

4 Read the sentence pairs. Choose which word or phrase best fits each blank.

1 cobble / block paving

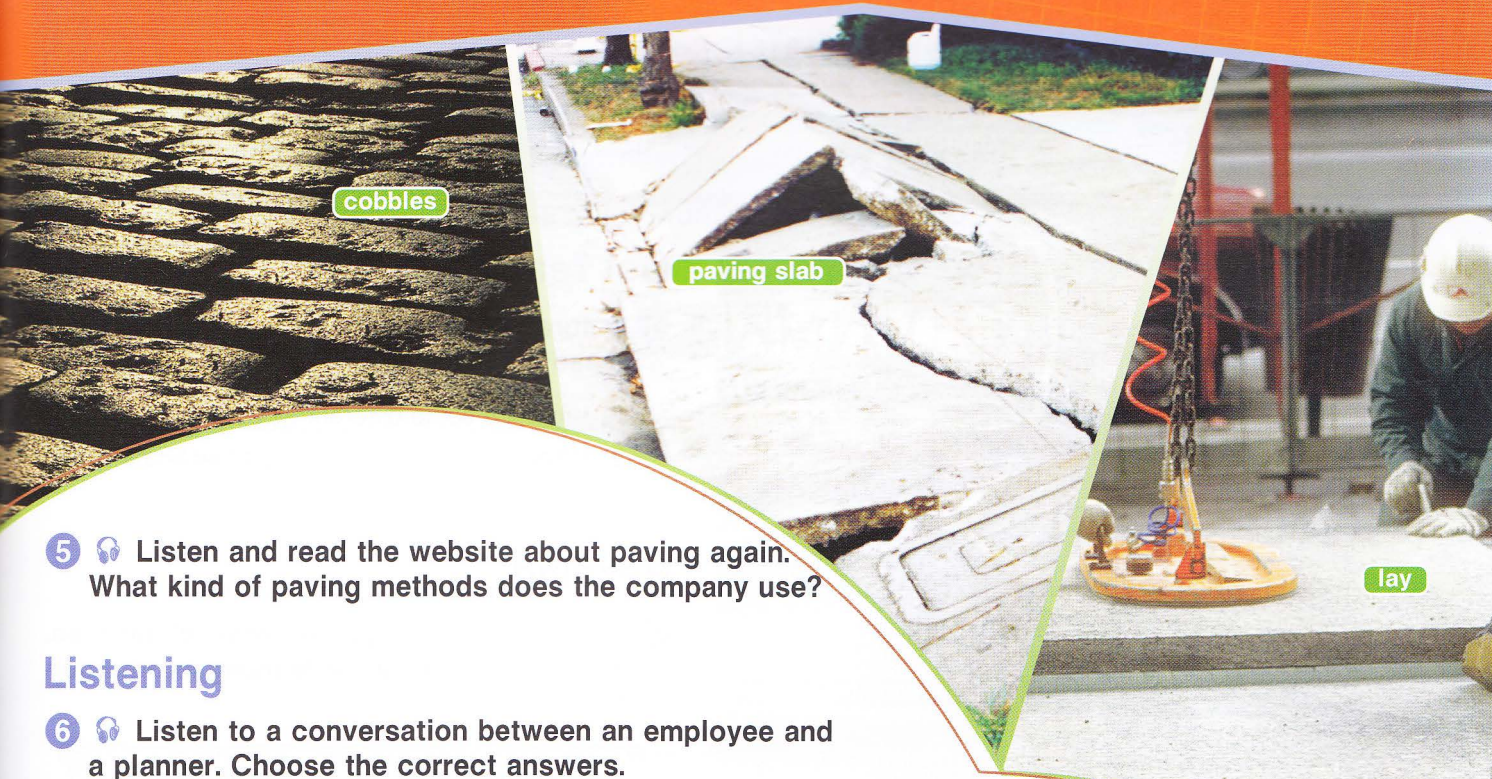
- A _____ is the most common way to put down slabs.
- B Use _____ for the patio to create a unique pattern.

2 dry method / whole-bed method

- A Water is not added to a mix in the _____.
- B The _____ uses a wet mixture to put down slabs.

3 sidewalk / bonding pattern

- A The _____ had to be repaired because of the crack.
- B The _____ can change the way the project looks.



cobbles

paving slab

lay

5 Listen and read the website about paving again. What kind of paving methods does the company use?

Listening

6 Listen to a conversation between an employee and a planner. Choose the correct answers.

- Why is the woman at the contractor's office?
 - to investigate sidewalk paving options
 - to make changes to an existing sidewalk order
 - to check on the progress of a sidewalk installation
 - to report a problem with a sidewalk installation
- Why does the man suggest hydraulically-pressed slabs?
 - They can be used for decorative projects.
 - They are stronger than open-mold slabs.
 - They are quicker to lay than other types of slab.
 - They can be made from materials other than concrete.

7 Listen again and complete the conversation.

Employee: I'm glad you chose to come here! Are these urban or 1 _____ sidewalks?

Planner: Some of both. I wanted to talk about prices.

Employee: Sure. Well, it depends on the material. 2 _____ you want concrete?

Planner: Yes. Do you have different types of concrete paving slabs?

Employee: Of course. We work with both hydraulically-pressed slabs and 3 _____.

Planner: What's the difference in cost?

Employee: Hydraulically pressed slabs go for about six dollars per 4 _____.

Planner: And how about open-mold slabs?

Employee: Those 5 _____ more like ten dollars per square foot.

Planner: Are there 6 _____ open-mold slabs?

Employee: Well, you can add different colors and textures.

Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

I wanted to talk about ...

It depends on ...

Do you have different types of ...?

Student A: You are an employee. Talk to Student B about:

- types of paving slabs
- the prices of paving slabs
- the features of the paving slabs

Student B: You are a planner. Talk to Student A about a sidewalk project.

Writing

9 Use the conversation from Task 8 to fill out a paving company brochure. Be sure to include the types of slabs available, the differences between them, and the prices of slabs.

4 Bridges 1: Types

HOME

ABOUT US

SERVICES

CONTACT

moveable bridge

double-decked bridge

cable

suspension bridge

beam bridge

FILLMORE & CO. CONSTRUCTION AND ENGINEERING

Fillmore & Co. has provided state-of-the-art bridge design and construction for more than 60 years. Our experienced engineers are dedicated to creating beautiful yet high-quality bridges for a variety of commercial applications. Notable projects include:

Washburn-Denton Bridge: This **beam bridge** is one of our more basic designs, but also one of our most elegant bridges. It is **simply supported** with industrial **abutments** at each end. The heavy-duty steel girder construction supports thousands of motorists daily.

Larstown City Bridge: Fillmore & Co. specializes in **cantilever bridges** such as this beauty, which spans the Larstown River. The bridge consists of two **cantilevers** extending from either side of the river. The middle section is a **moveable bridge** that swings out of the way of passing water vessels.

Edward P. Lewis Bridge: This **suspension bridge** is supported by sturdy wire **cables** across two towers. As a **double-decked bridge**, it accommodates road traffic on its upper level and the Northeast Railroad on its lower level.

South Bay Bridge: The South Bay Bridge carries Highway 9 across the South Bay. Since its span is relatively short, we were able to put in a strong **cable-stayed bridge** instead of incurring the more significant expense of a suspension bridge.

Get ready!

1 Before you read the passage, talk about these questions.

- 1 What are some different types of bridges?
- 2 What bridge can be lifted to allow boats to travel past?

Reading

2 Read the web page on types of bridges. Then, complete the table using information from the passage.

Bridge	Features
Washburn-Denton	_____
Larstown City	_____
Edward P. Lewis	_____
South Bay	_____

Vocabulary

3 Match the words or phrases (1-6) with the definitions (A-F).

- | | |
|------------------------|---------------------------|
| 1 ___ cable | 4 ___ suspension bridge |
| 2 ___ beam bridge | 5 ___ cantilever bridge |
| 3 ___ simply supported | 6 ___ cable-stayed bridge |

- A a bridge supported by abutments at each end
 B a bridge with beams supported at one end
 C a strong, thick rope of metal wires
 D a bridge supported by tall towers and large cables
 E held up by supports at both ends
 F a bridge supported by short towers and smaller cables

4 Read the sentence pairs. Choose which word or phrase best fits each blank.

1 abutment / cantilever

- A This bridge has a(n) _____ on each end to support the horizontal beam.
 B A(n) _____ is a beam supported only at one end.

2 double-decked bridge / moveable bridge

- A A _____ might have road traffic on one level and a railroad on the other.
 B The channel needs a _____ to accommodate ships passing underneath.

5 Listen and read the web page on types of bridges again. What bridge would be suitable to connect two points across a large bay?

Listening

6 Listen to a conversation between an interviewer and a job applicant. Mark the following statements as true (T) or false (F).

- ___ The woman has designed a double-decked bridge before.
- ___ The woman's last project was designing a beam bridge.
- ___ The company's next project is a large suspension bridge.

7 Listen again and complete the conversation.

Applicant: Well, for my last project, I was the 1 _____ on the Unibar Bridge construction.

Interviewer: That's a 2 _____, isn't it?

Applicant: Yes, it replaced the old beam bridge across the bay. The county needed something that could handle much 3 _____.

Interviewer: Wow. We do need someone with that 4 _____ . That must have been a major project.

Applicant: It was. We made it a 5 _____ - _____ with northbound traffic above and southbound traffic below.

Interviewer: Our 6 _____ is actually a moveable bridge that needs to accommodate passing boats. Are you prepared to take on a project like that?

Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

*What types of projects ...?
 For my last project, I ...
 Are you prepared to ...?*

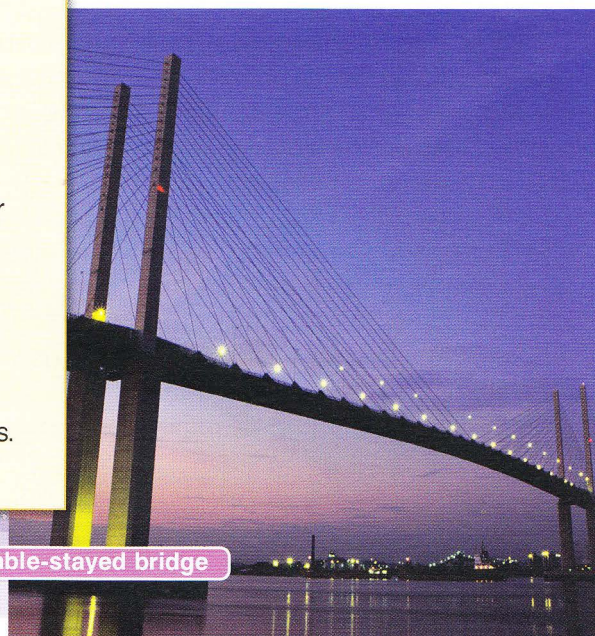
Student A: You are an interviewer for a construction company. Talk to Student B about:

- his or her bridge design experience
- types of bridges
- an upcoming project

Student B: You are a job applicant. Talk to Student A about your bridge design experience.

Writing

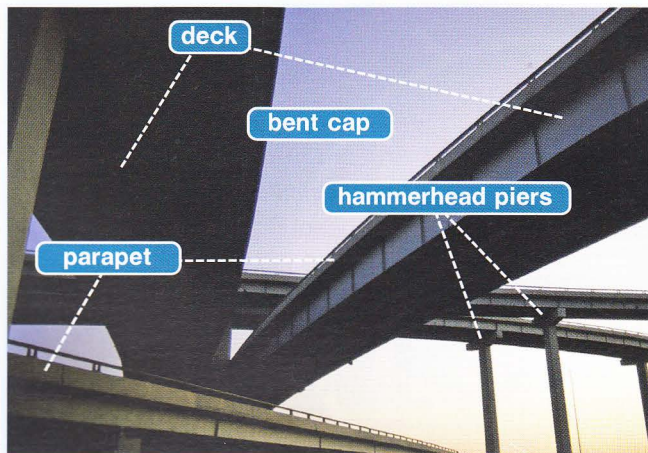
9 Use the conversation from Task 8 to fill out the interviewer's notes. Include the job applicant's experience and why or why not to hire him or her.



cable-stayed bridge

Get ready!

- 1 Before you read the passage, talk about these questions.
- 1 What are some parts of a bridge that provide support?
 - 2 What is one kind of load a bridge must support?



Results and Recommendations

Lane Avenue Bridge, NY 11597
 Inspection Date: September 15
 Report Number: 574835
 Inspector: Matthew Lloyd

Areas Passing Inspection: The following structures passed inspection: **anchor** and **approaching spans, bents, end bents, and bents caps**. The **hammerhead pier** also meets the requirements for durability and security.

The **pier** and other support structures can bear the required amount of **dead** and **live loads**. The company does not need to replace or repair any of these items.

Areas Requiring Further Work: The **deck** failed inspection due to large cracks and must be reconstructed. The current width of the lanes is not wide enough to meet new safety codes, and could lead to accidents during rush hours and bad weather. The **parapet** requires work due to its height. New regulations require parapets to reach a minimum height of four feet.

Recommendations: To address the problems mentioned above, the deck should be repaved. We recommend widening each road lane by three feet afterward. This will allow cars to pass each other more comfortably. This will require narrowing the width of each shoulder. Finally, the parapet must be raised by one foot to meet code requirements.

Reading

- 2 Read the inspection report. Then, mark the following statements as true (T) or false (F).
- 1 The hammerhead pier failed the inspection.
 - 2 The deck needs to be replaced because of cracks.
 - 3 The report recommends making the parapet taller.

Vocabulary

- 3 Match the words or phrases (1-7) with the definitions (A-G).
- | | |
|--------------------------------------------|------------------------------------------|
| 1 <input type="checkbox"/> bent cap | 5 <input type="checkbox"/> approach span |
| 2 <input type="checkbox"/> anchor span | 6 <input type="checkbox"/> end bent |
| 3 <input type="checkbox"/> parapet | 7 <input type="checkbox"/> bent |
| 4 <input type="checkbox"/> hammerhead pier | |
- A a structure at the end of a bridge that acts as a counterweight to the support on the opposite end
- B a single-post support that is attached to a bent cap
- C a support structure that connects a bent and bridge
- D a small wall located outside the deck
- E a vertical frame that helps support a bridge's weight
- F a structure that connect an abutment to the primary spans
- G a supporting frame that is also part of an abutment

- 4 Read the sentence pairs. Choose which word or phrase best fits each blank.

1 dead load / live load

- A Traffic is a type of _____ that bridges must support.
- B A _____ includes all the material that a bridge is made of.

2 deck / pier

- A The part of a bridge that cars drive on is the _____.
- B A _____ is one of the supports that hold up a bridge.

- 5 Listen and read the inspection report again. What parts of the bridge need to be worked on?

Listening

- 6 Listen to a conversation between an engineer and a contractor. Mark the following statements as true (T) or false (F).

- 1 The lanes on the bridge are not wide enough.
- 2 The man thinks repaving the entire deck is unnecessary.
- 3 The woman's crew will work on the parapets first.

- 7 Listen again and complete the conversation.

Engineer: Ms. Roy. I've got your inspection report here.

Contractor: Great. Were there any problems?

Engineer: Yes, a few, actually. The deck, lanes, and parapet 1 _____.

Contractor: What's wrong with them?

Engineer: The lanes are too narrow, the deck has cracks, and the parapet is too short.

Contractor: Okay. 2 _____ the lanes? We'll need to widen them?

Engineer: Yes. Right now, they're not wide enough to meet new safety codes.

Contractor: Of course. I'm glad you noticed that. What should we 3 _____?

Engineer: Since it will probably be the most work, I'd 4 _____ the deck and lanes.

Contractor: Okay. 5 _____ repaint the pavement that's already there?

Engineer: No. You should re-lay the whole road.

Contractor: Really? 6 _____ that's necessary?

Engineer: Absolutely. The cracks in the concrete are too severe.

Speaking

- 8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

I've got your inspection report.

What should we ...?

The deck has cracks.

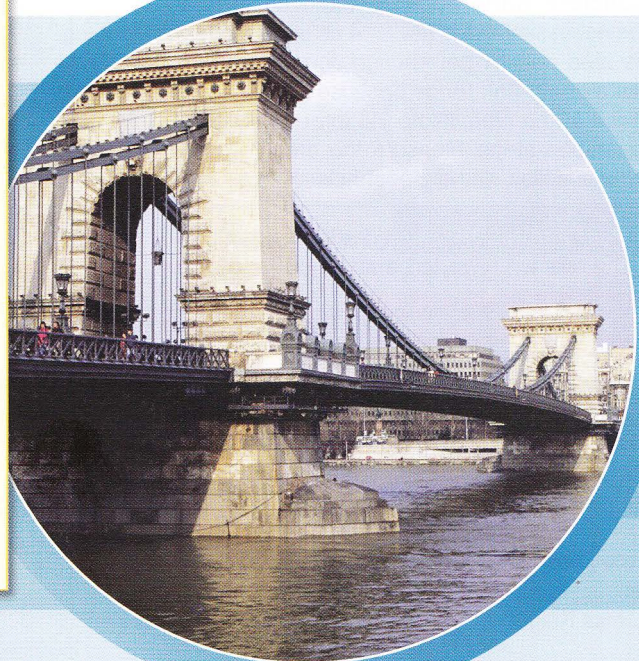
Student A: You are an engineer. Talk to Student B about:

- a bridge inspection
- parts needing work
- where to begin work

Student B: You are a contractor. Talk to Student A about an inspection report.

Writing

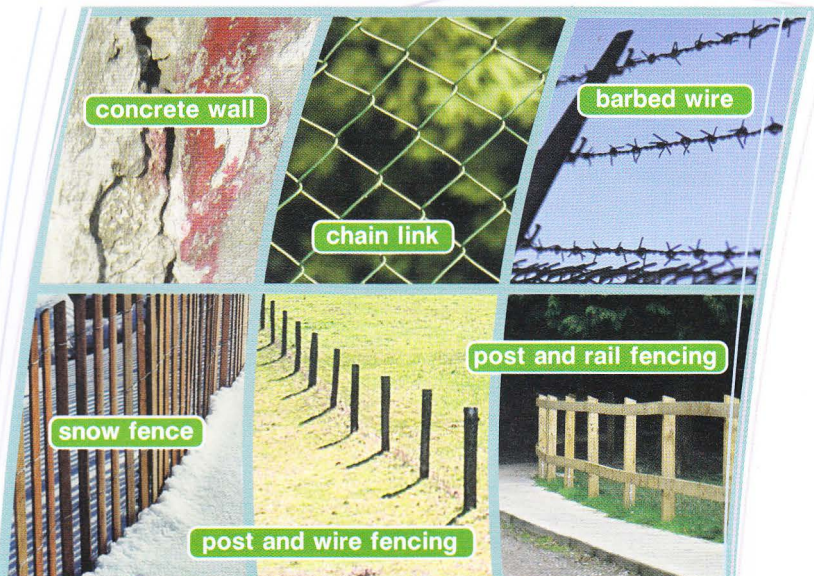
- 9 Use the conversation from Task 8 and the report to write a work order for bridge repair. Include: areas that need repair, how to repair them, and the order of repairs.



Get ready!

1 Before you read the passage, talk about these questions.

- 1 What are some types of fencing used along roads in rural areas?
- 2 What type of fencing might be used in areas with cold winters?



From: knight.thomas@knightconstruction.net
 To: allen.jenny@knightconstruction.net
 Subject: Seaton Highway Project

Dear Ms. Allen,

Now that the road is completed, we're ready to begin **ancillary work**. We have several **fencing** options, which I've listed below. I left out **concrete walls** because the area is rural, and so it shouldn't be necessary. I didn't include an option for **snow fencing**, either. This area doesn't get enough snow to require one. And I also left out a **chain-link fence** because it likely could not restrain the **livestock** in the area. (Note: All three options begin with the same preparation steps: Measure the area to determine fence length, order supplies, and dig post holes.)

Option 1: Post and rail fencing - We'll need **timber** for the posts and rail. The rails will have to be attached **field side**.

Option 2: Post and wire fencing - This is similar to option 1, but the rails are replaced with wire.

Option 3: Strained wire fence - In this case, we'd use **barbed wire**. First, we staple or tie barbed wire to a corner. Then, we run wire to each post, tighten it, and tie or staple the wire to it. This option requires additional safety equipment for crew members.

Let me know which option you'd like to use.

Best,
 Thomas Knight

Reading

2 Read the email. Then, choose the correct answers.

- 1 What is the main idea of the email?
 - A fences that need repair
 - B what fence materials to order
 - C possible types of fences to install
 - D the price of different fence types
- 2 What is a similarity between a strained wire fence and a post and wire fence?
 - A They use barbed wire.
 - B They have timber rails.
 - C They require post holes.
 - D They cannot restrain livestock.
- 3 What can you infer about installing a barbed wire fence?
 - A It is usually not done in rural areas.
 - B It can potentially lead to crew injuries.
 - C It is recommended in areas that get a lot of snow.
 - D It can be completed faster than a post and wire fence.

Vocabulary

3 Match the words or phrases (1-6) with the definitions (A-F).

- | | |
|------------------|-----------------------------|
| 1 ___ timber | 4 ___ post and wire fencing |
| 2 ___ fencing | 5 ___ barbed wire |
| 3 ___ field side | 6 ___ post and rail fencing |

- A a strong strip of metal with small, pointed spikes
- B the part of a fence that faces away from a road or highway
- C a barrier that consists of wooden posts and metal strips
- D wood that is used for construction purposes
- E a barrier that establishes a boundary line and can be used to keep something out or in
- F a barrier made of hardwood or softwood poles and rails

- 4 Fill in the blanks with the correct words or phrases from the word bank.

Word BANK

snow fencing strained wire
fence ancillary work
livestock concrete wall
chain-link fence

- 1 A(n) _____ frequently uses barbed wire.
- 2 Freeways in cities should be lined with a(n) _____ to keep people safe.
- 3 Fences must be strong enough to keep _____ from walking out of the fields.
- 4 A(n) _____ is the most common type of fencing around property in urban areas.
- 5 _____ is used to keep highways clear during winter weather.
- 6 Fencing is considered _____ and is completed after a highway is complete.

- 5 Listen and read the email again. What types of fencing does the man suggest?

Listening

- 6 Listen to a conversation between a construction company owner and a manager. Mark the following statements as true (T) or false (F).

- 1 ___ Work has not started on the fencing project.
- 2 ___ The crew does not have enough timber to complete a fence.
- 3 ___ The woman suggests digging post holes if no other work is available.

- 7 Listen again and complete the conversation.

Owner: What progress have you made so far?
Manager: We worked on the first quarter mile yesterday. We 1 _____ the holes for the posts. But we didn't have enough timber to finish the fence.
Owner: 2 _____. Didn't we order enough?
Manager: We did. But part of the shipment was delayed.
Owner: So what are you 3 _____ today?
Manager: Well, we need to stay on schedule. So we'll 4 _____ and start installing the posts.
Owner: Good. You can 5 _____ and finish building the fence when the rest of the timber gets here.
Manager: That's what I thought, too. But what should we do if we finish installing the posts?
Owner: Hmm. I think the best thing would be to 6 _____ post holes.

Speaking

- 8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

What progress have you made so far?
We didn't have enough ...
I think the best thing would be to ...

Student A: You are a construction company owner. Talk to Student B about:

- progress on fencing
- tasks to complete
- the cause of a delay

Student B: You are a manager. Talk to Student A about progress on a fencing job.

Writing

- 9 Use the conversation from Task 8 and the email to write an email about a fencing project. Include: completed tasks, delays, and tasks to complete.

Get ready!

1 Before you read the passage, talk about these questions.

- 1 What are some potential dangers when building a road?
- 2 What could be the result of a trench collapse?



What EVERY employee should know

When working on road excavations, it is important to be extremely **vigilant**. Make sure you are aware of all potential **hazards** before you begin work. Inform all **personnel** of any known dangers.

Always check on:

Traffic Utilities Soil condition
Weather Ground water

Be especially careful when checking on nearby utilities. Make sure you know their locations before digging. This includes the locations of **underground cables**. Failure to do so could result in **electrocution**, physical **injury**, or death. Always contact utility companies and alert them to the excavation. They will mark all **power lines** and **gas lines** so that you do not dig above them.

All trenches must be **sloped** to avoid **collapses**.

All personnel must be equipped with helmets and other appropriate gear. If you do not have enough gear on **site**, contact your construction manager immediately. Never allow any employee to work without gear.

What to do in case of emergency at an excavation:

- **Evacuate** all construction personnel
- Contact utilities, management, and emergency services
- Redirect traffic as needed
- Keep all personnel clear of the area

Questions? Comments? Talk to Randy Brown, General Construction Manager. Remember, safety always comes first!

Reading

2 Read the worksite safety poster. Then, choose the correct answers.

- 1 What is the poster mostly about?
 - A types of emergencies that occur on worksites
 - B the emergency equipment that must be kept on site
 - C how workers can stay safe during a road excavation
 - D what kinds of care a hurt person might receive
- 2 Which of the following is NOT suggested in the article?
 - A All trenches should be dug with a slope.
 - B Workers should repair any broken gas lines.
 - C Traffic should be redirected during an emergency.
 - D Managers should be notified about gear shortages.
- 3 What can you infer about power or gas lines?
 - A Utilities will turn off gas and electricity while crews are working.
 - B The lines will be marked above ground.
 - C Utility companies must approve of city projects near gas lines.
 - D Construction workers are responsible for locating power and gas lines.

Vocabulary

3 Match the words or phrases (1-8) with the definitions (A-H).

- | | |
|----------------|-------------------------|
| 1 ___ hazard | 5 ___ gas lines |
| 2 ___ injury | 6 ___ power lines |
| 3 ___ evacuate | 7 ___ electrocution |
| 4 ___ sloped | 8 ___ underground cable |

- A angled instead of being straight up and down
- B to leave an area because of dangerous conditions
- C occurs when a person is physically hurt
- D a pipe that transmits gas
- E an injury that occurs when a person comes into contact with electric power
- F a line that is buried under the ground
- G a cable that transmits electricity
- H a danger

4 Read the sentence pairs. Choose which word or phrase best fits each blank.

1 vigilant / power lines

- A It's important to stay _____ about safety even when you know the job.
- B _____ are often damaged during severe storms.

2 personnel / hazards

- A We are hiring more _____ to work on an upcoming project.
- B Falling objects are _____ of construction work.

5 Listen and read the worksite safety poster again. What is the first step to take in the case of an emergency?

Listening

6 Listen to a conversation between a contractor and a manager. Mark the following statements as true (T) or false (F).

- 1 ___ The woman is most concerned about unsafe trenches.
- 2 ___ The man must draw a map of utility line locations.
- 3 ___ Utility lines must be marked before any work begins.

7 Listen again and complete the conversation.

Contractor: We're starting the project next week and we'll need to do some 1 _____.

Manager: Sure, I've been looking into safety already. What do you need to know?

Contractor: I'm most concerned about 2 _____ and gas lines.

Manager: Okay. I talked with the 3 _____, and they say there are three power lines in the area.

Contractor: Is there anything 4 _____?

Manager: Yes, the electric company has one underground cable nearby.

Contractor: How about gas lines?

Manager: They're checking the 5 _____ today. They'll let me know by the end of the day.

Contractor: Good. When you find out, draw up a map that notes where the lines 6 _____.

Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

- Can we talk about ...?*
- I'm concerned about ...*
- We'll need to ...*

Student A: You are a contractor. Talk to Student B about:

- possible safety concerns
- how to address safety concerns
- what must be done before the project begins

Student B: You are a manager. Talk to Student A about safety concerns.

Writing

9 Use the conversation from Task 8 to fill out the project safety report. Include: possible safety concerns, the steps taken to address them, and when they must be completed.





Get ready!

1 Before you read the passage, talk about these questions.

- 1 What happens when traffic merges?
- 2 Why might a road closure be necessary?

Reading

2 Read the manual on traffic control. Then, complete the table using information from the passage.

Situation	Traffic control measure
Road closure	_____ _____
Reduced lanes	_____ _____
Two-way traffic in one lane	_____ _____

T P M Construction Manuals:

Controlling Traffic in Work Zones

This guide will help you manage traffic when performing construction on busy streets. The most important aspect of **traffic control** is clear communication. If drivers understand when and where to go, you will maintain safe and efficient **traffic flow**.

Changing the Route: To keep traffic moving smoothly through any work zone, drivers must be able to clearly see what alternate route to take.

- In the case of a road **closure**, drivers should see signs directing them to an appropriate **detour**.
- When two lanes must be reduced to one lane, make sure your **merging taper** gives drivers enough time to **merge** into the correct lane.
- Use cones to clearly mark the new route when using a **shifting taper**.

Signage: Signs are vital to effective work zone communication.

- If **two-way** traffic is consolidated into a single lane, proper signage helps prevent collisions. A worker with a **stop/go board** should be posted at each end of the affected area to let drivers know when it is safe to proceed in **single file**.
- Remember to use **reflective** signs to make sure drivers can navigate work zones at night.

Vocabulary

3 Match the words or phrases (1-7) with the definitions (A-G).

- | | |
|------------------|--------------------|
| 1 __ merge | 5 __ reflective |
| 2 __ closure | 6 __ traffic flow |
| 3 __ two-way | 7 __ stop/go board |
| 4 __ single file | |

- A a sign with instructions on both sides
 B moving one after another in a line
 C having light bounce easily off something
 D to move gradually together
 E a situation in which a road is blocked
 F having traffic move in both directions
 G the movement of vehicles

4 Read the sentence pairs. Choose which word or phrase best fits each blank.

1 traffic control / detour

- A Drivers must be directed to the _____ since the road is closed.
 B The workers are maintaining excellent _____ in the work zone.

2 merging taper / shifting taper

- A Use a _____ to move traffic from two lanes into one lane.
 B Use a _____ to move traffic from the normal lane onto the shoulder.

5 Listen and read the manual on traffic control again. What is the importance of a well-marked merging taper?

Listening

6 Listen to a conversation between a construction company owner and a supervisor. Mark the following statements as true (T) or false (F).

- ___ The woman is relieved that the accident was minor.
- ___ The accident happened because the work crew did not follow the manual.
- ___ The woman recommends a longer merging taper.

7 Listen again and complete the conversation.

Owner: Dale, I heard there was 1 _____ at the Third Street job today.

Supervisor: I'm afraid so, Ma'am. But it wasn't anything 2 _____.

Owner: Well, I don't like to hear there was an accident, even 3 _____. As you know, any accident can lead to a lawsuit.

Supervisor: I don't think we did anything wrong, Ma'am. We set up the work zone according to 4 _____.

Owner: I hope so. What happened?

Supervisor: Well, a car collided with the traffic barrier in 5 _____.

Owner: So the right lane was closed?

Supervisor: That's correct. We had a 6 _____ set up to get people into the left lane, but I guess this driver didn't realize until it was too late.

Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

I don't like to hear ...

We used a ...

Maybe you should ...

Student A: You are a construction company owner. Talk to Student B about:

- an accident
- the cause of the accident
- how to avoid future accidents

Student B: You are a construction company supervisor. Talk to Student A about an accident.

Writing

9 Use the conversation from Task 8 to fill out the accident report. Include the cause of the accident and measures to prevent future accidents.





color scheme



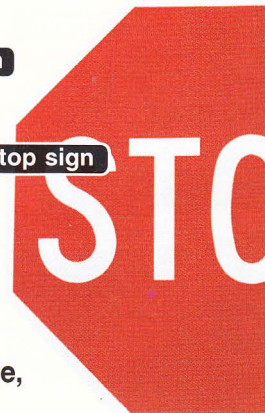
crossing sign



warning sign



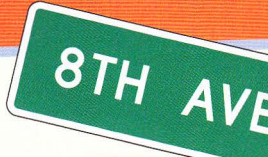
stop sign



mounting sign



mounting sign



HUNTSVILLE MUNICIPAL DEPARTMENT

Signage Changes and Guidelines

Regulatory signs will be placed in the following areas:

- * two **crossing signs** in front of Hayes Elementary School
- * two **stop signs** at the intersection of Ingrid Street and Willow Avenue
- * a **yield sign** on the corner of Juniper Street and Broad Avenue

Minimum visibility for all of the above signs is 60 feet.

Guide signs will be placed on Route 9 before the Interstate 10 connection. Signs should be placed for **approach speeds** with a range of 45 to 65 mph.

A **warning sign** is needed at the Wilson Bridge. The icy pavement during cold weather is a **hazard**. A **reduced-speed zone sign** will also be placed.

GUIDELINES

All signs must stand according to the described **placement** and **siting**. Signs must stand at the appropriate **mounting height** of seven feet. The **orientation** of signs on street corners will face oncoming traffic. All signs must have the appropriate **color scheme** according to the type of sign.

Get ready!

1 Before you read the passage, talk about these questions.

- 1 What are some examples of road signs?
- 2 What type of sign alerts drivers to dangers?

Reading

2 Read the notice on signs. Then, choose the correct answers.

- 1 What is the purpose of the notice?
 - A to describe changes to sign color schemes
 - B to assign work crews to sign placements
 - C to compare the functions of different sign types
 - D to list signs that will be installed and placement regulations
- 2 Which of the following is not one of the city guidelines?
 - A All regulatory signs have a minimum visibility of 60 feet.
 - B Guide signs require a mounting height of nine feet.
 - C Signs must follow color scheme by type.
 - D Signs on Route 9 should be placed for an approach speed of 45 to 65 mph.
- 3 What can you infer about the Wilson Bridge?
 - A It has a 45 mph speed limit.
 - B It becomes dangerous in cold weather.
 - C It has a lower minimum visibility for signs.
 - D It gets busier in the winter months.

Vocabulary

3 Match the words or phrases (1-8) with the definitions (A-H).

- | | |
|-------------------|----------------------|
| 1 __ range | 5 __ approach speed |
| 2 __ warning sign | 6 __ mounting height |
| 3 __ placement | 7 __ guide sign |
| 4 __ orientation | 8 __ color scheme |

- A traffic sign which provides information to drivers about possible danger or risks they may encounter on the road
- B the height at which a sign must be placed above the surface of a road
- C a sign which provides information to drivers about roads or locations
- D the determination of where a traffic sign is to be located
- E the direction which a sign is facing
- F the pattern or selection of colors on a traffic sign
- G the speed at which a driver is moving towards a certain destination
- H a list of different approach speeds at which different people may be driving

4 Read the sentence pairs. Choose which word or phrase best fits each blank.

1 minimum visibility / warning signs

A _____ determines how far away from a sign drivers must be able to see it.

B _____ inform drivers of possible dangers they might encounter on the road.

2 approach speed / hazard

A Ice is a common _____ on roads.

B The _____ of traffic on a highway is faster than it is on residential roads.

5 Listen and read the notice on signs again. What will the warning sign notify drivers about?

Listening

6 Listen to a conversation between two employees. Mark the following statements as true (T) or false (F).

- 1 ___ The woman does not have the order paperwork.
- 2 ___ A yield sign was removed from the order.
- 3 ___ The order includes two animal crossing signs.

7 Listen again and complete the conversation.

Employee 1: No worries. I'll 1 _____ on the major stuff now.

Employee 2: Okay. What's 2 _____?

Employee 1: First, we're shipping two stop signs. We're also adding a yield sign to the order.

Employee 2: 3 _____. Are there any other signs on the order?

Employee 1: Yes, a few more. There's a warning sign about 4 _____ and two crossing signs.

Employee 2: What kind of 5 _____ do we need? Animal crossing signs?

Employee 1: No, both are children crossing signs. They're going near a school.

Employee 2: And that's it?

Employee 1: Yeah, that 6 _____.

Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

Did you get the order from ...?

First, we're shipping ...

What kind of ...?

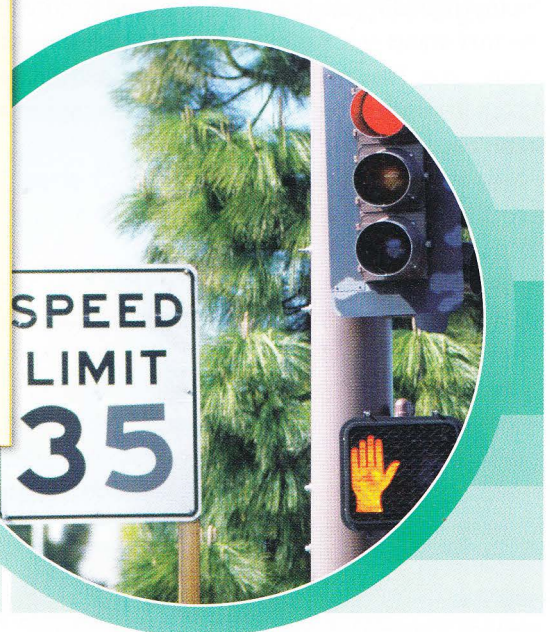
Student A: You are an employee at a sign manufacturer. Talk to Student B about:

- a new order
- the signs on the order
- a clarification on a sign type

Student B: You are an employee at a sign manufacturer. Talk to Student A about an order.

Writing

9 Use the conversation from Task 8 and the notice to write an email about new signs for a city. Include: the signs needed, the location, and guidelines.



Get ready!

1 Before you read the passage, talk about these questions.

- 1 What street furniture is installed for safety reasons?
- 2 Where do people wait for a bus?



From: Amanda Peterson
To: John Parker
Subject: Block II Improvement Project: Street Furniture and Highway 19

Dear Mr. Parker,

I finalized the list of **street furniture** we need for the Block II Improvement Project. First of all, we need to provide **benches** for the **taxi stand** and the **bus stop**. In total, we need four benches for the area. They must be black in color and made out of steel to match the surrounding structures. The intersection also needs four **trash cans**.

We decided to stay with our old vendor for **streetlights** and need a total of eighteen. We also decided to take the **phone booth** out of the proposal. With today's use of cell phones it is an unnecessary expenditure. We'll place a **mailbox** in that space instead. We need eight **traffic lights** mounted at street corners. **Bollards** will serve as decorative landscaping and traffic control, and we need a total of twenty-two.

Regarding Highway 19, the **median barrier** must be 32" high and made of pre-cast concrete to be effective. **Guard rails** must be installed on each side of the road. We have to determine the length for each from the construction plans.

Feel free to give me a call with any questions.

Regards,
Amanda Peterson

Reading

2 Read the email about street furniture. Then, choose the correct answers.

- 1 What is the purpose of the email?
 - A to describe the street furniture needed on two projects
 - B to explain what street furniture expenses have been approved
 - C to illustrate the need for new street furniture in a city
 - D to order street furniture for two projects
- 2 Which of the following will NOT be installed on the Block II Improvement project?
 - A benches
 - B trash cans
 - C a phone booth
 - D a mailbox
- 3 What is true of Highway 19?
 - A It needs eighteen streetlights.
 - B It already has guard rails installed.
 - C It will have a median barrier.
 - D It should use bollards for traffic control.

Vocabulary

3 Match the words or phrases (1-8) with the definitions (A-H).

- | | |
|-----------------------|--------------------|
| 1 __ street furniture | 5 __ taxi stand |
| 2 __ bollard | 6 __ bus stop |
| 3 __ bench | 7 __ phone booth |
| 4 __ streetlight | 8 __ traffic light |

- A a permanently placed outside chair made for more than one person
- B a light fixture mounted on tall posts along streets and roads that illuminates outside areas
- C a designated location at which cabs wait for customers
- D a designated location at which public transportation vehicles pick up and drop off passengers
- E a device that regulates the flow of traffic
- F a short post used to guide the flow of traffic
- G a narrow structure that contains a payphone
- H objects and structures in outside spaces designed to direct traffic and create pleasant environments

4 Write a word or phrase that is similar in meaning to the underlined part.

- The metal structure on the side of the road prevented the car from leaving the highway.
_ u _ _ d _ _ i _
- Most residential buildings have individual containers for receiving and sending mail on the street.
_ a _ l _ o _ _ s
- Install a bin designed to hold garbage on the sidewalk.
_ _ a _ h _ a _
- The driver crashed into the wall between opposite lines of traffic.
_ e _ _ _ n _ a _ r _ _ r

5 Listen and read the email about street furniture again. What street furniture will have an effect on traffic?

Listening

6 Listen to a conversation between a project manager and a contractor. Mark the following statements as true (T) or false (F).

- The man lost information on the project.
- The bollards should be selected first.
- The woman states the length of the guard rails.

7 Listen again and complete the conversation.

Contractor: So, where should I start?
Manager: Well, 1 _____ you arrange the street and traffic lights first. Then 2 _____ for the benches and trash cans.
Contractor: Okay. And then?
Manager: 3 _____ the bollards next. They have to be both functional and attractive.
Contractor: Do we have a vendor?
Manager: We do. We used him on our last project. Look at his catalog and see if there are any that complement the site.
Contractor: Will do. 4 _____ the highway project? What should we do there?
Manager: 5 _____, I would ask the engineers about the median barrier and guard rail lengths first.
Contractor: 6 _____. I'll call them right away.

Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

This is embarrassing, but ...
Where should I start ...?
Do we have a vendor?

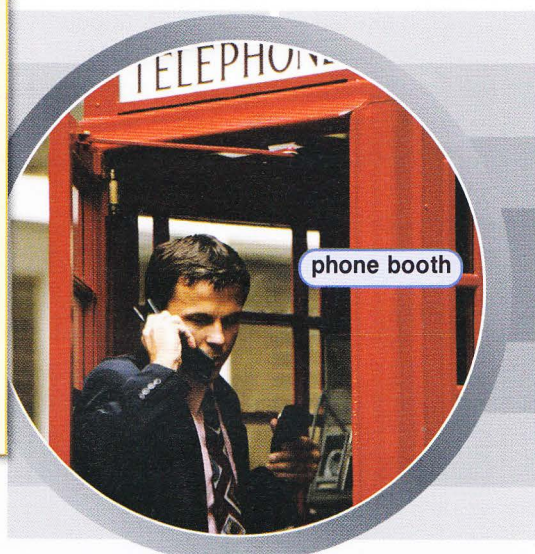
Student A: You are a contractor. Talk to Student B about:

- missing instructions
- how to begin selecting street furniture
- street furniture for a highway project

Student B: You are a project manager. Talk to Student A about street furniture.

Writing

9 Use the conversation from Task 8 and the email to write an email on street furniture requirements. Include: furniture that affects traffic, furniture for the sidewalk, and where all items should go.



Levy Chem Testing

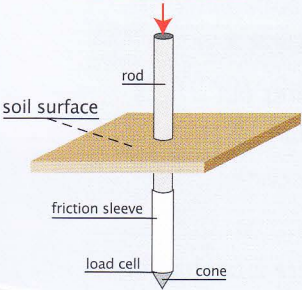
HOME

ABOUT US

SERVICES

CONTACT

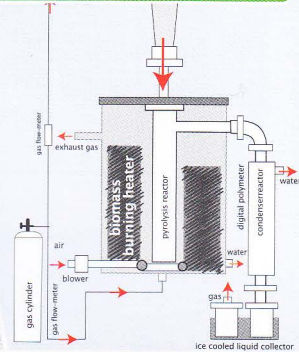
penetrometer



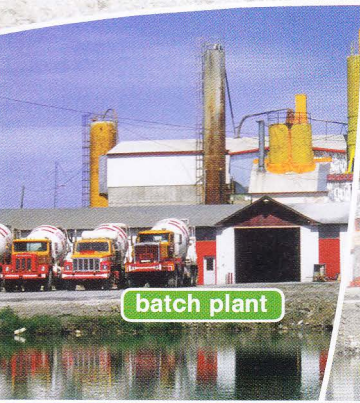
aggregate



standard tar viscometer



batch plant



Tars & Bitumens

Paving shouldn't be a guessing game. Improperly set pavement can be costly and time-consuming to correct, not to mention a waste of materials. Here at Levy, we understand how important it is to understand the properties of your **bituminous materials** before you start paving. We offer a variety of chemical tests that we'll perform for your convenience right at your **batch plant**.

First, we'll make sure we have an adequate **sample** to test the properties of your material. Most samples can be derived through **riffling**. For **aggregates** that may have varied properties throughout, we prefer **quartering** to ensure we are getting a sample that best represents the whole.

Next, we'll perform the appropriate test for the particular material. A **standard sieve test** will give us an idea of the size and grade of the material, so you know you're using the right stuff for the job. To determine viscosity, we use top-of-the-line **penetrometers** for harder materials and **standard tar viscometers** for softer materials. Our precise **ring and ball tests** provide accurate **EVTs** to tell you how hot your materials should be for optimum paving.

Get ready!

1 Before you read the passage, talk about these questions.

- 1 What are some examples of concrete testing equipment?
- 2 Where are paving materials produced?

Reading

2 Read the web page on testing materials. Then, mark the following statements as true (T) or false (F).

- 1 The company uses riffling for all samples.
- 2 The company uses both penetrometers and standard tar viscometers.
- 3 The company usually performs tests in its own labs.

Vocabulary

3 Match the words or phrases (1-8) with the definitions (A-H).

- | | |
|--------------------------------------|-------------------------------------------------|
| 1 <input type="checkbox"/> EVT | 5 <input type="checkbox"/> batch plant |
| 2 <input type="checkbox"/> sample | 6 <input type="checkbox"/> bituminous materials |
| 3 <input type="checkbox"/> viscosity | 7 <input type="checkbox"/> standard sieve test |
| 4 <input type="checkbox"/> aggregate | |

- A a mineral compound of multiple materials
 B compounds that become softer when heated
 C a test for measuring the grade of aggregates
 D a measure of heat needed for proper flow
 E a factory where materials are produced
 F a substance's thickness or runniness
 G a small amount of something used for testing

4 Place the words or phrases from the word bank under the correct headings.

Word BANK

- quartering penetrometer riffling
 ring and ball test standard tar viscometer

Measuring temperature	Measuring viscosity	Taking samples
_____	_____	_____
_____	_____	_____

- 5 Listen and read the web page on testing materials again. What is the result of using a paving material with higher viscosity?

Listening

- 6 Listen to a conversation between a testing company representative and a client. Choose the correct answers.

- 1 What is the purpose of the conversation?
- A to compare different types of tests
 - B to schedule the tests needed for a new batch
 - C to explain how to test viscosity
 - D to determine the type of material to be tested
- 2 Why does the material need to have a high viscosity?
- A to make the final surface smoother
 - B to make the material easier to lay
 - C to create a hard surface
 - D to reduce project costs

- 7 Listen again and complete the conversation.

Rep.: Thanks for calling Levy Chem Testing. How 1 _____ ?

Client: Hi, this is Linda Wilson with Wilson's Paving. I need to have someone come out to examine 2 _____ of tar.

Rep.: I can schedule a visit to your 3 _____ this afternoon. What types of tests do you need?

Client: Well, I know we need to determine the viscosity. This tar is thicker than our usual stuff, since we're using it for an especially 4 _____.

Rep.: Then we'll probably need to send a penetrometer. And since the tar is 5 _____, it probably has a higher EVT.

Rep.: Right. So we need to know 6 _____ it should be before we start laying it.

Speaking

- 8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

We need to determine ...

And since the ... it probably has ...

We'll set you up for ...

Student A: You are a testing company representative. Talk to Student B about:

- services he or she needs
- what tests to perform
- why to perform particular tests

Student B: You are a client. Talk to Student A about services you need.

Writing

- 9 Use the conversation from Task 8 and the webpage to fill out the representative's order notes. Include: the types of tests and why each test must be performed.

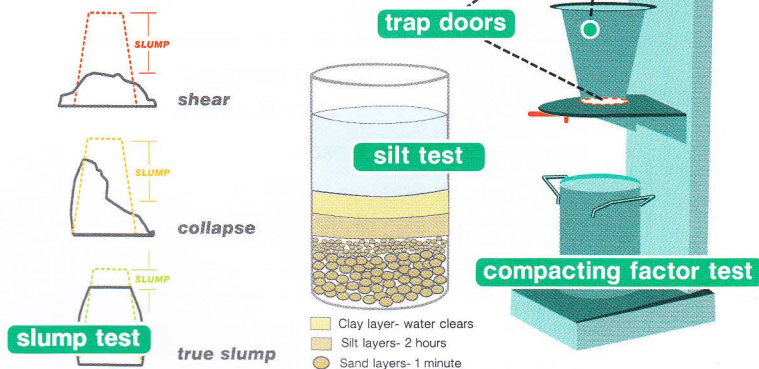


bituminous material

Get ready!

1 Before you read the passage, talk about these questions.

- 1 What are some important tests performed on concrete?
- 2 A trap door is part of what testing apparatus?



Johanson's Construction & Building Inc.

Concrete Test Order Form

Date: September 20
 From: Oliver Smith, Johanson's Construction & Building, Inc.
 To: U.S. Concrete Testing Services

Details

Please complete all tests and provide invoice by September 30. Tests to be completed: **Slump test**, **silt test**, **compacting factor test**.

Test details:

- 1 **Slump test:** Compact concrete inside of slump cone. Remove slump cone and measure slope of concrete to test **consistency**.
- 2 **Silt test:** Mix salt water and concrete mixture in a cylinder. (Consult the following page for specific measurements.) Measure the amount of silt above the sand layer. Silt layer should not exceed 8 mm for concrete mixture to have an acceptable **workability**.
- 3 **Compacting factor test:** This test requires two **hoppers** with **trap doors** placed vertically above a cylinder. Weigh the empty cylinder. Weigh the initial concrete mixture. Allow the concrete mixture to flow through both hoppers into the cylinder. Then weigh the cylinder containing the partially compacted concrete.
- 4 All tests should use a standard **sampling plan**.

Possible further testing: Pending results of the first three tests we may request a **cube test**. Please advise us if you do not have equipment for the creation of concrete **cubes**. Other tests may include: **Vebe test**, **flow table test**, **degree of compactibility test**.

Reading

2 Read the test order form. Then, mark the following statements as true (T) or false (F).

- 1 ___ The company will perform four tests.
- 2 ___ The silt test requires two hoppers with trap doors.
- 3 ___ A Vebe test may be requested after the initial tests.

Vocabulary

3 Match the words or phrases (1-7) with the definitions (A-G).

- | | |
|-----------------------|---------------------|
| 1 ___ consistency | 5 ___ sampling plan |
| 2 ___ hopper | 6 ___ cube |
| 3 ___ trap door | 7 ___ workability |
| 4 ___ flow table test | |

- A a measure of how easy concrete is to use
 B the opening at the bottom of a hopper
 C an instrument that concrete flows through in a compacting factor test
 D a test that measures how easily a concrete mixture flows
 E a three-dimensional shape with six equal squares
 F a measure of how well concrete flows
 G a way to select concrete from a batch for testing

4 Read the sentence pairs. Choose which word or phrase best fits each blank.

1 Vebe test / slump test

- A A _____ can be performed with just wet concrete and a cone.
 B A _____ measures the energy required to compact concrete.

2 degree of compactibility test / silt test

- A The _____ showed a large amount of fine soil in the concrete's aggregate mix.
 B A _____ measures how easily concrete is compacted.

3 cube test / compacting factor test

- A A _____ measures the weight of partially compacted concrete.
 B The concrete failed a _____ because the corners broke apart.

- 5 Listen and read the test order form again. What type of plan should all tests use?

Listening

- 6 Listen to a conversation between a concrete testing company employee and a client. Mark the following statements as true (T) or false (F).

- 1 ___ The man calls to get test results.
- 2 ___ The concrete failed a slump test.
- 3 ___ The woman recommends adding Portland cement.

- 7 Listen again and complete the conversation.

Client: Well, it's just that we performed a slump test. And it collapsed.

Employee: I'm sorry, I didn't hear you. 1 _____ it was slumped or collapsed?

Client: It collapsed. So we know that the concrete was 2 _____.

Employee: Hmm. Okay, that's definitely a problem if the consistency is wrong.

Client: I agree. But, the other tests were normal, 3 _____?

Employee: Yes, that's true.

Client: Well, whatever the 4 _____, I can't use this concrete.

Employee: No, Sir. 5 _____ the slump test. We'll send a representative out to your site immediately.

Client: I was about to add more Portland cement to the mix. Should I 6 _____?

Employee: I would. Our representative will run all the tests again.

Speaking

- 8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

We performed ...

That's definitely a problem.

We'll send a representative out immediately.

Student A: You are a concrete testing company employee. Talk to Student B about:

- a test result
- using the concrete
- what to do next

Student B: You are a client of Student A's company. Talk to Student A about a failed concrete test.

Writing

- 9 Use the conversation from Task 8 and the test order form to fill out a report on concrete test results. Include the tests performed, the results, and recommended tests.





Oakdale County Bridge Inspection Report 9/17

Location: Larabee Street Bridge
 Engineer completing **inspection report**: David Carlyle
 Date completed: 9/17
 Date of last inspection: 1/15

Inspection Details

FOUNDATION Condition: Needs repair
 Notes: Slight **scouring** of the soil is apparent around the foundation bases. Scouring is currently minor, but could advance quickly. Otherwise, the foundation is in good condition and has no visible cracks.

ABUTMENTS Condition: Good
 Notes: There are no apparent cracks or signs of **spalling**.

INVERT Condition: Very good
 Notes: There are no apparent issues. The **invert** and **apron** are in good condition.

DECK Condition: Needs repair
 Notes: Bridge deck has apparent **shrinkage cracks** but no major **structural cracks**. Most notable problem is spalling in concrete near the ends of the bridge. Spalling is most likely due to the regular use of **de-icing salt**. Beams are in good condition.

Recommended Repairs

The scouring could progress dramatically. We recommended filling the trenches created by scouring with sand bags to prevent major damage.

The bridge deck requires repairs to address spalling. We suggest removing the spalling by **sand blasting** the exposed areas. Then fill in gaps with mortar after sand blasting. Finally, **steam clean** all concrete on the deck to remove sediment and salt.

Get ready!

1 Before you read the passage, talk about these questions.

- 1 What are some problems that can affect a bridge?
- 2 Is a shrinkage crack more serious than a structural crack?

Reading

2 Read the bridge inspection report. Then, choose the correct answers.

- 1 What is true of the inspection?
 - A It found damage from de-icing.
 - B It located major structural cracks.
 - C It suggests sand blasting the foundation.
 - D It recommends closing the bridge until repairs are complete.
- 2 Which of the following is NOT a problem at the bridge?
 - A shrinkage cracks on the deck
 - B scouring of the soil near the foundation
 - C spalling near the ends of the bridge
 - D structural cracks on the invert and apron
- 3 What can you infer about the bridge?
 - A Very little traffic uses it.
 - B The river below it is very deep.
 - C It has not been inspected before.
 - D Ice often builds up on it in the winter.

Vocabulary

3 Match the words or phrases (1-6) with the definitions (A-F).

- | | |
|-------------------------|----------------|
| 1 ___ inspection report | 4 ___ apron |
| 2 ___ scouring | 5 ___ invert |
| 3 ___ de-icing salt | 6 ___ spalling |

- A being broken into small pieces
- B a part of a bridge that reaches past the bridge limits
- C a material used to melt frozen water
- D a part of a bridge that provides support
- E an assessment of a structure
- F a process in which water erodes a material

4 Read the sentence pairs. Choose which word or phrase best fits each blank.

1 structural crack / shrinkage crack

- A A _____ will not make a surface unsafe.
B Repairing a _____ requires replacing large areas of concrete to replace.

2 steam clean / sand blast

- A _____ the damaged concrete off of the deck.
B _____ the concrete to remove sediment and dirt.

5 Listen and read the bridge inspection report again. What is the condition of the deck?

Listening

6 Listen to a conversation between an engineer and a contractor. Mark the following statements as true (T) or false (F).

- 1 ___ The man suggests repairing the scouring with sand bags.
2 ___ The spalled concrete will be removed with sand blasting.
3 ___ Mortar should be used to replace large areas of removed concrete.

7 Listen again and complete the conversation.

- Engineer:** Another issue, though, is the 1 _____ on the deck.
Contractor: Yes, we need to 2 _____ that, too.
Engineer: First, you need to cut out the spalled concrete. Then sand blast it.
Contractor: Right. 3 _____ sand blasting, we fill it with new concrete.
Engineer: Actually, I would suggest mortar. You 4 _____ use new concrete for large areas.
Contractor: Really? Concrete is much stronger. I'm afraid that if we use mortar, the spalled concrete will 5 _____.
Engineer: Well, it 6 _____ the size of the area.
Contractor: Maybe we could just use concrete for any areas that are particularly large.

Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

*The first problem is ...
Another issue is ...
I'm afraid that ...*

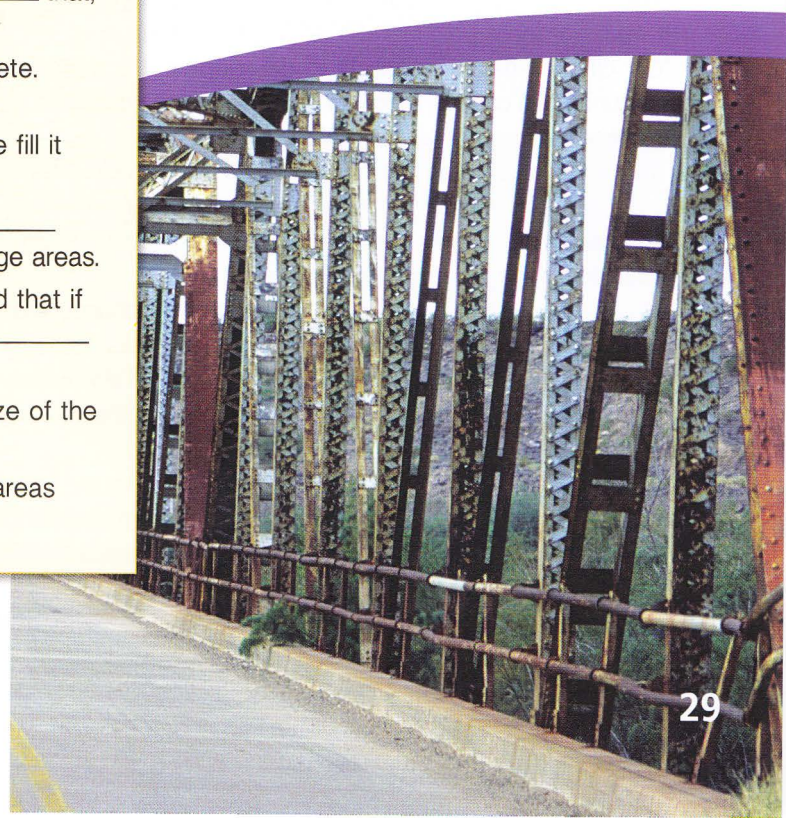
Student A: You are a contractor. Talk to Student B about:

- a bridge inspection
- problems with the bridge
- possible repair options

Student B: You are an engineer. Talk to Student A about a bridge inspection.

Writing

9 Use the conversation from Task 8 and the report to write an email about an inspection report. Include: areas that are okay, damage to the bridge, and suggested repair options.



14 Road Maintenance 1



MAYOR APPROVES FUNDING FOR MAJOR ROAD MAINTENANCE PROJECT

WOODVILLE: Mayor John Eshmond released a statement last Friday announcing his approval of a road maintenance project. The project will cost 10 million dollars, the mayor said. It will cover roads from Main Street to Carlton Avenue.

“Our city’s roads are beginning to **deteriorate**,” the mayor announced. “In order to **maintain** reasonable road conditions, we need to do some serious **maintenance** work.”

The reconstruction and **improvements** will begin in July. They should be completed by October. The mayor asked Woodville’s citizens to be patient. Driving will be more difficult during construction, but easier after its completion.

The project will involve both major **structural** maintenance and more minor **routine** maintenance. In structural tasks, workers will **resurface** parts of several major roads. They will also **widen** a portion of Main Street in the downtown area. On other streets, workers will work on **repainting** and **patching**.

The funding will also cover **cyclic** road maintenance in the future. “In the past we have not always prioritized small maintenance tasks,” Mayor Eshmond said. “This new bond includes more funding for things like **sweeping** and trash clean-up.”

“We’ve needed this for a long time,” said city councilman Nate Mertel. “I’m glad the mayor is taking action.”



Get ready!

1 Before you read the passage, talk about these questions.

- 1 What are some maintenance tasks that need to be carried out on roads?
- 2 How can more traffic be accommodated on a road?

Reading

2 Read the newspaper article about a road project again. Then, mark the following statements as true (T) or false (F).

- 1 The councilman approves of the mayor’s road project.
- 2 The road improvements will be completed by July.
- 3 The project will widen a street in the downtown area.

Vocabulary

3 Match the words (1-8) with the definitions (A-H).

- | | |
|----------------------------------------|----------------------------------------|
| 1 <input type="checkbox"/> sweeping | 5 <input type="checkbox"/> deteriorate |
| 2 <input type="checkbox"/> resurface | 6 <input type="checkbox"/> patching |
| 3 <input type="checkbox"/> improvement | 7 <input type="checkbox"/> widen |
| 4 <input type="checkbox"/> cyclic | 8 <input type="checkbox"/> maintenance |

- A to enlarge the space between two sides
- B to replace a road’s entire surface
- C act of repairing small parts of a road’s surface
- D happening on a regular basis
- E the act or process of making something’s condition better
- F the act or process of keeping something in good condition
- G to fall into bad condition
- H the act of cleaning a road by removing dirt or garbage from its surface

4 Read the sentence pairs. Choose which word or phrase best fits each blank.

1 repaint / maintain

- A Crews will _____ the lanes of the highway tomorrow.
- B The city hired a contractor to _____ the quality of the concrete on Route 7.

2 routine / structural

- A An earthquake caused _____ damage to the bridge, so it was closed.
- B Traffic causes _____ damage to roads.

5 Listen and read the newspaper article about a road project. What improvements did the mayor approve?

Listening

6 Listen to a conversation between two contractors. Mark the following statements as true (T) or false (F).

- 1 Patching and resurfacing the streets will be split between two teams.
- 2 The contractors plan to widen Fifth Avenue.
- 3 Repainting is the last step of the road project.

7 Listen again and complete the conversation.

Contractor 1: Hi, Karen. We should start thinking about Fifth Avenue.

Contractor 2: Good idea. That street needs major 1 _____.

Contractor 1: Yes, definitely. And it usually has 2 _____.

Contractor 2: So what do you think we should do first?

Contractor 1: Let's start with 3 _____. The intersection at Fifth and Carlton Street is really problematic.

Contractor 2: I agree. Patching should be enough there. What else?

Contractor 1: We'll need to do some 4 _____ as well.

Contractor 2: But what about bigger structural projects? We need to make 5 _____ on Fifth Avenue.

Contractor 1: Yeah, we'll have to 6 _____ some parts of the street.

Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

We should start thinking about ...?

Let's start with ...

In my opinion ...

Student A: You are a contractor. Talk to Student B about:

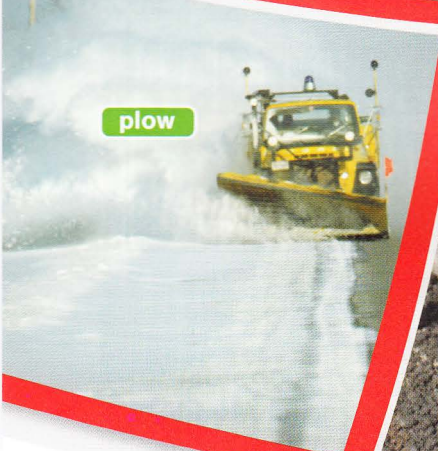
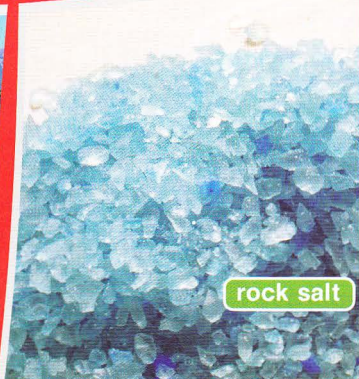
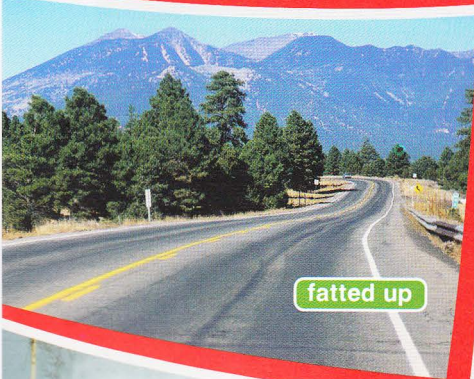
- Which streets need improvements
- What kinds of improvements are needed
- How to organize the project

Student B: You are a contractor. Talk to Student A about the kinds of improvements that are needed.

Writing

9 Use the conversation from Task 8 and the article to fill out the project plan. Include: streets that need improvements, improvements to complete, and how the project will be carried out.





ATTENTION

Roadwork Contractors

Springfield City Hall seeks contractors for highway maintenance tasks. Tasks include **snow removal**, **pressure grouting**, and **retexturing**. See details below.

Snow removal: Seeking a contractor to complete **plowing** and to **de-ice** roads. Contractor must **salt** a broad network of city roads. The city will pay for, but not deliver, **rock salt**.

Pressure grouting: Seeking a contractor to **inject** water into road surfaces for stabilization. Contractor must consult city hall regarding grouting mechanism to be used. This work will take place on Main Street between Fifth and Fifteenth Avenues.

Retexturing: Seeking a highly experienced contractor to enhance the texture of **fatted up** city roads. Jackson Avenue between Fifth and Eighth Avenues and 60th Street between Jackson and North Avenues. Contractor must consult city hall regarding the type of **physical abrasion** to be used. We prefer retexturing with **rotating discs**, **shot blasting**, or **bush hammering**. We would like to avoid **high pressure water retexturing**.

If interested, please contact us with a bid. We are open to contracting with multiple companies or one company for all jobs.

Please call: Janet Marlow, Assistant Director of City Maintenance, 919-555-4567.

Or email at: jmarlow@springfield.gov

Get ready!

1 Before you read the passage, talk about these questions.

- 1 What is used to remove snow from roads?
- 2 What type of salt is commonly used to salt roads?

Reading

2 Read the notice for contractors. Then, mark the following statements as true (T) or false (F).

- 1 ___ Contractors must pay for de-icing materials and delivery.
- 2 ___ Main Street requires pressure grouting.
- 3 ___ The city wants to avoid using any physical abrasion on Jackson Avenue.

Vocabulary

3 Match the words or phrases (1-8) with the definitions (A-H).

- | | |
|---------------------------------------|-----------------|
| 1 ___ de-ice | 6 ___ fatted up |
| 2 ___ pressure grouting | 7 ___ inject |
| 3 ___ rock salt | 8 ___ salt |
| 4 ___ physical abrasion | |
| 5 ___ high pressure water retexturing | |

- A being too smooth to provide resistance
- B to put liquid into something
- C the process of injecting water into the ground in order to stabilize it
- D to sprinkle salt on a surface for de-icing
- E a type of salt that is made of sodium chloride
- F to remove ice from a surface
- G the process of blasting a road with water to enhance its texture
- H a way to enhance texture by using rough materials

4 Read the sentence pairs. Choose which word or phrase best fits each blank.

1 bush hammering / shot blasting

A _____ uses many small, metal balls.

B _____ retextures roads by hitting them repeatedly with blunt metal rods.

2 plowing / retexturing

A _____ should start as soon as the snow starts falling.

B Roads with fatted up surfaces require _____.

3 rotating disk / snow removal

A The city hired a company to carry out _____ during the winter.

B A _____ will scoop out small lines on the surface of a road.

5 Listen and read the notice for contractors again. What are some retexturing methods that might be used?

Listening

6 Listen to a conversation between a city employee and a contractor. Choose the correct answers.

- Why does the man call the woman?
 - to request road maintenance
 - to talk about a highway maintenance bid
 - to ask for an update on a maintenance project
 - to change the work order on highway maintenance project
- What is true of the man's company?
 - It does not provide snow removal services.
 - It has little experience with shot blasting.
 - It cannot participate in the pressure grouting project.
 - Its most expensive technique is bush hammering.

7 Listen again and complete the conversation.

Contractor: We don't specialize in that. Although I'd **1** _____ help you find someone.

Employee: Well, **2** _____ talking about retexturing.

Contractor: Yes, it looks like that's the biggest project.

Employee: Which abrasion techniques do you typically use?

Contractor: We've got a lot of experience with both **3** _____ and bush hammering.

Employee: Great. Which one is **4** _____?

Contractor: Hmm, the prices are very close between those two. Shot blasting costs could **5** _____, though.

Employee: How is that determined?

Contractor: It depends on how much concrete has to be removed. The deeper we go and the larger the area, the **6** _____.

Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

Are you calling to discuss ...?

We have experience with ...

Which one is more expensive?

Student A: You are a city employee. Talk to Student B about:

- a highway maintenance project
- services offered
- the cost of services

Student B: You are a contractor. Talk to Student A about a highway maintenance project.

Writing

9 Use the conversation from Task 8 and the notice to create a bid for a highway maintenance project. Include: physical abrasion methods, snow removal and de-icing, and general costs.

Glossary

- abutment** [N-COUNT-U4] An **abutment** is a heavy structure that supports a bridge at one end.
- aggregate** [N-COUNT-U11] An **aggregate** is a mineral compound of two or more materials.
- anchor span** [N-COUNT-U5] An **anchor span** is located at the very end of the bridge and acts as a counterweight to the support on the opposite end.
- ancillary work** [N-COUNT-U6] **Ancillary work** is secondary parts of a project that are completed once the major project is complete.
- approach span** [N-COUNT-U5] An **approach span** connects a bridge's abutment to the primary spans.
- approach speed** [N-COUNT-U8] **Approach speed** is the speed at which a driver is moving towards a certain destination in a vehicle.
- apron** [N-COUNT-U13] An **apron** is part of the invert that reaches beyond the bridge limits.
- barbed wire** [N-UNCOUNT-U6] **Barbed wire** is strong wire that has small, pointed spikes located throughout its length.
- barrier curb** [N-COUNT-U1] A **barrier curb** is a curb with walls that are high enough to prevent vehicles from passing over it.
- batch plant** [N-COUNT-U11] A **batch plant** is the location where paving materials are produced.
- beam bridge** [N-COUNT-U4] A **beam bridge** is a bridge made of horizontal support beams held up by abutments at each end.
- bench** [N-COUNT-U10] A **bench** is a permanently placed outside chair made for more than one person.
- bent** [N-COUNT-U5] A **bent** is a vertical frame that helps support the bridge's weight.
- bent cap** [N-COUNT-U5] A **bent cap** is a support structure that connects a bent and a bridge.
- bituminous materials** [N-COUNT-U11] **Bituminous materials** are products in asphalt that become softer when heated so they can be spread, then harden to create a paved surface.
- block paving** [N-UNCOUNT-U3] **Block paving** is a way to pave an area by using concrete blocks.
- bollard** [N-COUNT-U10] A **bollard** is a short post used to guide the flow of traffic by acting as a barrier.
- bonding** [N-UNCOUNT-U2] **Bonding** is the process or means of adhering things together.
- bonding pattern** [N-COUNT-U3] A **bonding pattern** is a pattern that is used to lay out paving slabs.
- bus stop** [N-COUNT-U10] A **bus stop** is a designated location at which buses pick up and drop off passengers, often featuring covered benches.
- bush hammering** [N-UNCOUNT-U15] **Bush hammering** is the process of pounding a road with small steel hammers to enhance its texture.
- cable** [N-COUNT-U4] A **cable** is a strong, thick rope made of metal wires.
- cable-stayed bridge** [N-COUNT-U4] A **cable-stayed bridge** is a bridge with beams that are supported by cables attached to a tower. A cable-stayed bridge typically has shorter towers and smaller cables than a suspension bridge.
- cantilever** [N-COUNT-U4] A **cantilever** is a beam that is supported only at one end.
- cantilever bridge** [N-COUNT-U4] A **cantilever bridge** is a bridge with beams that are supported only at one end.
- chain-link fence** [N-COUNT-U6] A **chain-link fence** consists of woven wires that run vertically, giving the fence a "zigzag" appearance.
- closure** [N-COUNT-U8] A **closure** is a situation in which an area is blocked or out of use while construction is performed.
- cobble** [N-COUNT-U3] A **cobble** is a piece of stone that is used for decorative paving.
- collapse** [N-COUNT-U7] A **collapse** is an event when something falls down suddenly.
- color scheme** [N-COUNT-U8] A **color scheme** is the pattern or selection of colors on a traffic sign.

compacting factor test [N-COUNT-U12] A **compacting factor test** is a test that measures the weight of partially compacted concrete.

concrete wall [N-COUNT-U6] A **concrete wall** is a thick wall of concrete built along highways in urban areas to protect nearby businesses and homes and to reduce traffic noise.

consistency [N-UNCOUNT-U12] The **consistency** of concrete is a measure of how well the concrete flows.

crossing sign [N-COUNT-U8] A **crossing sign** is a sign which informs drivers that they are approaching an area where people, other vehicles, trains or animals may cross.

cube [N-COUNT-U12] A **cube** is a three-dimensional shape with six equal squares.

cube test [N-COUNT-U12] A **cube test** is a test that measures how easily concrete stays in cube form.

curb [N-COUNT-U1] A **curb** is a concrete barrier which borders a street.

curb and gutter [N-COUNT-U1] A **curb and gutter** is a concrete border lining a street and includes a shallow ditch to lead water away from the street.

curb bed [N-COUNT-U2] A **curb bed** is the foundation layer under a curb.

curb cut [N-COUNT-U1] A **curb cut** is a concrete ramp which slopes from a sidewalk to the adjacent street.

curb line [N-COUNT-U2] A **curb line** is a boundary between a road or gutter and a sidewalk.

curbing machine [N-COUNT-U2] A **curbing machine** is a device used for laying concrete along a curb line.

cut stone curb [N-COUNT-U1] A **cut stone curb** is a curb made from stones held together with concrete.

cyclic [ADJ-U14] If an action is **cyclic**, it happens on a regular basis.

de-ice [V-T-U15] To **de-ice** a road is to remove ice from its surface.

de-icing salt [N-UNCOUNT-U13] **De-icing salt** is salt that is used to melt ice.

dead load [N-UNCOUNT-U5] **Dead load** is the weight of the stationary materials that form the bridge structure.

deck [N-COUNT-U5] The **deck** is the road and shoulders portion of the bridge.

degree of compactibility test [N-COUNT-U12] A **degree of compactibility test** is a test that measures how easily concrete is compacted.

deteriorate [V-I-U14] To **deteriorate** is to fall into bad condition.

detour [N-COUNT-U8] A **detour** is an alternate route that traffic takes when a normal route is closed.

double-decked bridge [N-COUNT-U4] A **double-decked bridge** is a bridge with two horizontal surfaces, one above the other.

dry bed [N-COUNT-U2] A **dry bed** is a curb bed in which the concrete is allowed to dry before the curb is placed.

dry method [N-COUNT-U3] The **dry method** is a way to lay slabs by using a dry mixture.

electrocution [N-COUNT-U7] **Electrocution** is an injury that occurs when a person comes into contact with electric power.

end bent [N-COUNT-U5] An **end bent** is a supporting frame that is also part of the abutment.

epoxy resin [N-COUNT-U2] An **epoxy resin** is a strong, flexible adhesive material.

evacuate [V-T-U7] To **evacuate** is to leave an area because of dangerous conditions.

EVT [N-COUNT-U11] **EVT** (Equi Viscous Temperature) is a measure of how hot a bituminous material must be to flow properly.

fatted up [ADJ-U15] If a road is **fatted up**, it is too smooth to provide resistance.

fencing [N-UNCOUNT-U6] **Fencing** is a barrier that establishes a boundary line and can be used to keep something out or in.

Glossary

- field side** [N-COUNT-U6] The **field side** is the side of the fence that faces away from a road or highway.
- five-spot method** [N-COUNT-U3] The **five-spot method** is a way to lay slabs by using five points of mortar.
- flow table test** [N-COUNT-U12] A **flow table test** is a test that measures how easily a concrete mixture flows.
- gas line** [N-COUNT-U7] A **gas line** is a pipe that transports gas.
- guard rail** [N-COUNT-U10] A **guard rail** is a continuous structure installed along the side of a road that prevents vehicles from swerving off the road.
- guide sign** [N-COUNT-U8] A **guide sign** is a sign which provides information to drivers about their location or the destination of a particular road.
- half-batter curb** [N-COUNT-U1] A **half-batter curb** is a curb with a slightly sloping profile.
- hammerhead pier** [N-COUNT-U5] A **hammerhead pier** is a single-post support that is attached to a bent cap.
- haunch** [N-COUNT-U2] A **haunch** is a concrete piece that supports a curb.
- haunching** [N-UNCOUNT-U2] **Haunching** is the process of installing a concrete support piece beneath the sidewalk or pathway alongside a curb.
- hazard** [N-COUNT-U7] A **hazard** is a danger.
- high pressure water retexturing** [N-UNCOUNT-U15] **High pressure water retexturing** is the process of blasting a road with water to enhance its texture.
- hopper** [N-COUNT-U12] A **hopper** is an instrument that concrete flows through in a compacting factor test.
- hydraulically-pressed slab** [N-COUNT-U3] A **hydraulically-pressed slab** is a paving slab that is manufactured with a pressing process.
- improvement** [N-COUNT-U14] An **improvement** is the act or process of making something's condition better.
- inject** [V-T-U15] To **inject** is to put liquid into something.
- injury** [N-COUNT-U7] An **injury** occurs when a person is physically hurt.
- inspection report** [N-COUNT-U13] An **inspection report** is a written report that details the condition of a structure.
- integral curb** [N-COUNT-U1] An **integral curb** is a curb which is poured and formed uniform with concrete pavement.
- interlocking paving** [N-UNCOUNT-U3] **Interlocking paving** is a way to pave an area by using blocks with irregular or uneven shapes that interlock in a pattern.
- invert** [N-COUNT-U13] An **invert** is the part of a bridge under the deck that provides support.
- lay** [V-T-U3] To **lay** a slab is to set it in the ground.
- live load** [N-UNCOUNT-U5] **Live load** is the weight of the traffic, weather, or any other object or phenomenon that puts pressure on the bridge.
- livestock** [N-UNCOUNT-U6] **Livestock** is a category of animals used to produce food and products, such as cattle and sheep.
- mailbox** [N-COUNT-U10] A **mailbox** is a box where people leave mail which they want to send.
- maintain** [V-T-U14] To **maintain** something is to keep it in good condition.
- maintenance** [N-UNCOUNT-U14] **Maintenance** is the act or process of keeping something in good condition.
- median barrier** [N-COUNT-U10] A **median barrier** is a barrier that separates lanes with opposing directions of traffic.
- merge** [V-I-U8] To **merge** is to move gradually together.
- merging taper** [N-UNCOUNT-U8] A **merging taper** is a situation in a construction zone in which the number of lanes is reduced, requiring drivers to gradually move from two lanes into one lane.
- minimum visibility** [N-UNCOUNT-U8] **Minimum visibility** is the closest distance from which a traffic sign may be seen by drivers.

mounting height [N-COUNT-U8] The **mounting height** of a sign is the height at which a sign must be placed above the surface of a road.

moveable bridge [N-COUNT-U4] A **moveable bridge** is a bridge that can be lifted to allow the passage of vessels that do not fit under it.

open-mold slab [N-COUNT-U3] An **open-mold slab** is a paving slab that is manufactured without a pressing process.

orientation [N-COUNT-U8] **Orientation** is the direction which a sign is facing.

parapet [N-COUNT-U5] A **parapet** is a small wall located outside the deck that helps protect cars and pedestrians.

patching [N-UNCOUNT-U14] **Patching** is the act or process of repairing small parts of a road's surface.

paving slab [N-COUNT-U3] A **paving slab** is a piece of concrete that is used to pave a road or sidewalk.

penetrometer [N-COUNT-U11] A **penetrometer** is a device that tests the viscosity of bituminous materials.

personnel [N-UNCOUNT-U7] **Personnel** are the people involved in a project.

phone booth [N-COUNT-U10] A **phone booth** is a narrow structure that contains a payphone and is designed for the caller's privacy.

physical abrasion [N-UNCOUNT-U15] **Physical abrasion** is a way to enhance texture by using rough materials.

pier [N-COUNT-U5] A **pier** is located between abutments and is a column that supports the ends of a multi-span bridge.

placement [N-UNCOUNT-U8] The **placement** of traffic signs is the determination of where a traffic sign is to be located.

plowing [N-UNCOUNT-U15] **Plowing** is the act of removing snow from a road.

post and rail fencing [N-COUNT-U6] **Post and rail fencing** consists of hardwood or softwood posts and rails.

post and wire fencing [N-UNCOUNT-U6] **Post and wire fencing** is fencing that consists of wooden posts and wire rails.

power line [N-COUNT-U7] A **power line** is a cable that transmits electricity.

precast [ADJ-U2] If concrete or other substance is **precast**, it is molded into shape before being placed in its intended location.

pressure grouting [N-UNCOUNT-U15] **Pressure grouting** is the process of injecting water into the ground in order to stabilize it.

quartering [N-UNCOUNT-U11] **Quartering** is a method of extracting a sample that involves dividing a larger piece into quarters, combining two diagonally opposite parts, and repeating the process until the desired sample size is achieved.

radius curb [N-COUNT-U1] A **radius curb** is a curb which is curved.

range [N-COUNT-U8] A **range** is an ordered list of different approach speeds at which different people may be driving.

reduced-speed zone sign [N-COUNT-U8] A **reduced-speed zone sign** is a sign which instructs drivers to reduce the speed at which they are driving to or below the listed speed. They usually precede schools or construction sites.

reflective [ADJ-U8] If something is **reflective**, light bounces off it to make it more easily visible.

regulatory sign [N-COUNT-U8] A **regulatory sign** is a traffic sign which provides guidelines and information to drivers while they are driving in a certain location or situation.

repaint [V-T-U14] To **repaint** a road is to paint over the original layer.

resurface [V-T-U14] To **resurface** a road is to replace its entire surface.

retexturing [N-UNCOUNT-U15] **Retexturing** is the act of enhancing the texture of a road's surface.

riffling [N-UNCOUNT-U11] **Riffling** is a method of extracting a sample that involves dividing a larger piece into halves until the desired sample size is achieved.

Glossary

- ring and ball test** [N-COUNT-U11] A **ring and ball test** is a test that determines how hot a bituminous material must be to flow properly.
- rock salt** [N-UNCOUNT-U15] **Rock salt** the mineral form of sodium chloride.
- rotating discs** [N-COUNT-U15] **Rotating discs** are roughened materials that rotate inside a retexturing machine.
- routine** [ADJ-U14] If an action is **routine**, it is common and regular.
- salt** [V-T-U15] To **salt** a road is to spread salt on its surface for de-icing.
- sample** [N-COUNT-U11] A **sample** is a small amount of something that is used to test the qualities of a larger batch.
- sampling plan** [N-COUNT-U12] A **sampling plan** is a way to select concrete from a batch for testing.
- sand blast** [V-T-U13] To **sand blast** a concrete surface is to remove rough parts by blasting it with abrasive materials.
- scouring** [N-UNCOUNT-U13] **Scouring** is a process in which water erodes a material, often on bridges near water.
- shifting taper** [N-UNCOUNT-U8] A **shifting taper** is a situation in a construction zone in which traffic is gradually shifted to an alternate path.
- shot blasting** [N-UNCOUNT-U15] **Shot blasting** is the process of blasting a road with steel balls to enhance its texture.
- shrinkage crack** [N-COUNT-U13] A **shrinkage crack** is a crack that is caused when concrete condenses over time.
- sidewalk** [N-COUNT-U3] A **sidewalk** is a strip of pavement next to a road where people can walk.
- silt test** [N-COUNT-U12] The **silt test** is a test that measures the amount of silt in a concrete mixture.
- simply supported** [ADJ-U4] If a bridge is **simply supported**, it is held up by supports at both ends.
- single file** [ADV-U8] If a series of people or things move **single file**, they move one after another in a line.
- site** [N-COUNT-U7] A construction **site** is a location where construction is occurring.
- siting** [N-UNCOUNT-U8] The **siting** of a traffic sign is the placement or location of a sign with consideration of its visibility to drivers.
- sloped** [ADJ-U7] If a trench wall is **sloped**, it is angled instead of being straight up and down.
- slump test** [N-COUNT-U12] A **slump test** is a test that measures how easily a concrete mixture can be shaped.
- snow fencing** [N-UNCOUNT-U6] **Snow fencing** is a type of fencing that protects roads from drifting snow by blocking the snow before it reaches the road.
- snow removal** [N-UNCOUNT-U15] **Snow removal** is the act of getting snow off of a road.
- spalling** [ADJ-U13] If concrete is **spalling**, it is breaking into smaller pieces.
- splayed curb** [N-COUNT-U1] A **splayed curb** is a section of curb low enough to allow vehicles to pass over it.
- standard sieve test** [N-COUNT-U11] A **standard sieve test** is a test for measuring the grade and size of an aggregate by shaking a sample through various sizes of mesh.
- standard tar viscometer** [N-COUNT-U11] A **standard tar viscometer** is a device that tests the viscosity of bituminous materials that are too soft to be measured with a penetrometer.
- steam clean** [V-T-U13] To **steam clean** a concrete surface is to clean it by blasting it with water vapor.
- stop sign** [N-COUNT-U8] A **stop sign** is a sign which informs drivers that it is necessary to come to a stop before passing the sign.
- stop/go board** [N-COUNT-U8] A **stop/go board** is a two-sided sign with an instruction for drivers to go on one side and an instruction to stop on the other.
- straight curb** [N-COUNT-U1] A **straight curb** is a curb which has no bends.
- strained wire fence** [N-COUNT-U6] A **strained wire fence** is a fence consisting of wire strands that are stretched between straining posts, as well as stapled to the smaller, intermediate posts that are located between the straining posts.

street furniture [N-UNCOUNT-U10] **Street furniture** is a category that includes objects and structures installed permanently in outside spaces and designed specifically to direct traffic and create more pleasant and livable outside environments.

streetlight [N-COUNT-U10] A **streetlight** is a light fixture mounted on tall posts along streets and roads that illuminates outside areas at night.

structural [ADJ-U14] If something is **structural**, it is related to the support and design of the road.

structural crack [N-COUNT-U13] A **structural crack** is a large crack in the deck of a bridge.

suspension bridge [N-COUNT-U4] A **suspension bridge** is a bridge with beams that are supported by cables attached to towers. A suspension bridge typically has longer towers and larger cables than a cable-stayed bridge.

sweeping [N-UNCOUNT-U14] **Sweeping** is the act of cleaning a road by removing dirt or garbage from its surface.

taxi stand [N-COUNT-U10] A **taxi stand** is a designated location at which taxi cabs wait for customers.

timber [N-UNCOUNT-U6] **Timber** is another name for wood.

traffic control [N-UNCOUNT-U8] **Traffic control** is the act or process of safely routing vehicles through an area of road construction.

traffic flow [N-UNCOUNT-U8] **Traffic flow** is the movement of vehicles through a particular area.

traffic light [N-COUNT-U10] A **traffic light** is a set of lights that regulates the flow of traffic by using color signals.

trap door [N-COUNT-U12] A **trap door** is the opening at the bottom of a hopper.

trash can [N-COUNT-U10] A **trash can** is a bin specifically designated for garbage.

two-way [ADJ-U8] If a road is **two-way**, its traffic moves in both directions.

underground cable [N-COUNT-U7] An **underground cable** is a line that is buried under the ground.

vebe test [N-COUNT-U12] The **vebe test** is a test that measures the energy required to compact concrete.

vertical curb [N-COUNT-U1] A **vertical curb** is a high protruding concrete barrier which can line bridges, walls, and tunnels along streets.

vigilant [ADJ-U7] If a person is **vigilant**, he or she is cautious, and alert to possible danger.

viscosity [N-UNCOUNT-U11] **Viscosity** is a substance's thickness or runniness.

warning sign [N-COUNT-U8] A **warning sign** is a traffic sign which provides information to drivers about possible danger or risks they may encounter on the road.

wet bed [N-COUNT-U2] A **wet bed** is a curb bed in which the concrete has not completely dried before the curb is placed.

whole bed method [N-COUNT-U3] The **whole bed method** is a way to lay slabs by using a wet mixture.

widen [V-T-U14] To **widen** a road is to enlarge the space between its two sides.

windrow [N-COUNT-U2] A **windrow** is a mound of concrete along the edge of a curb bed.

workability [N-UNCOUNT-U12] The **workability** of concrete is a measure of how easy the concrete is to use.

wrong way sign [N-COUNT-U9] A **wrong way sign** is a sign that faces away from the direction of traffic to warn drivers not to enter a road driving in the wrong direction.

yield sign [N-COUNT-U8] A **yield sign** is a sign which instructs drivers to slow down, and give up the right-of-way to drivers in the passing lane.



Construction II Roads & Highways

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