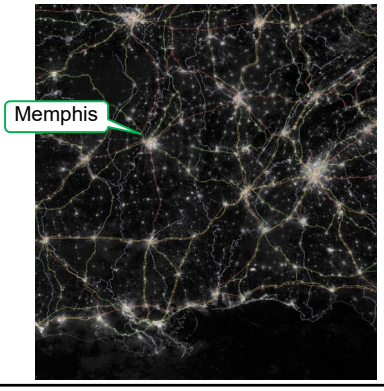
Interstate Highway System

61

Interstate Highway System



62

Long-Span Bridges

- Bridges of increasing size and span have created phenomenal changes in the social patterns and economic conditions of areas by effectively eliminating water barriers between communities.
- They open new routes of communication between disintegrated and isolated communities, provide safe and efficient access to work, schools, and recreation for people, and spur economic growth by facilitating trade within and between regions.
- From the late 19th century through the early 20th century, the use of steel enabled the production of increasingly longer, continuous main spans traversing large, deep bodies of water.

63

Long-Span Bridges

Golden Gate Bridge

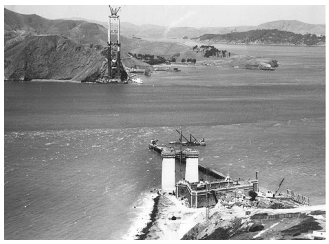
One of the most recognized landmarks in the world, the Golden Gate Bridge, connects geographically isolated areas of California to the north, in Marin and Sonoma counties, with San Francisco.

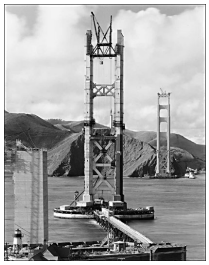
64

Long-Span Bridges

Golden Gate Bridge

When the bridge opened in 1937, with a main suspension span length of 4,200 feet, it was the longest in the world.





65

Long-Span Bridges

Golden Gate Bridge

The engineering obstacles posed by the mile-wide, turbulent Golden Gate Strait led engineers to devise a bridge that required four years to build, 83,000 tons of steel, 389,000 cubic yards of concrete, and enough cable to encircle the earth three times.

66

Long-Span Bridges

1915 Çanakkale Bridge

The bridge is the longest suspension bridge in the world, with a main span of 2,023 m (2.023 km; 1.257 mi). The bridge surpasses the Akashi Kaikyo Bridge (1998) in Japan by 32 m (105 ft).


67

Long-Span Bridges

1915 Çanakkale Bridge

The year "1915" in the official Turkish name honors a significant Ottoman naval victory against the navies of the United Kingdom and France during World War I.


68

Long-Span Bridges

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Long-Span Bridges

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70

Long-Span Bridges

Strait of Messina Bridge

The Strait of Messina Bridge is a planned 3.6-kilometre (2¼ mi) suspension bridge across the Strait of Messina, connecting Torre Faro in Sicily with Villa San Giovanni on the Italian peninsula.


71

Long-Span Bridges

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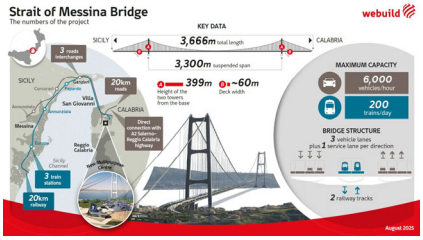

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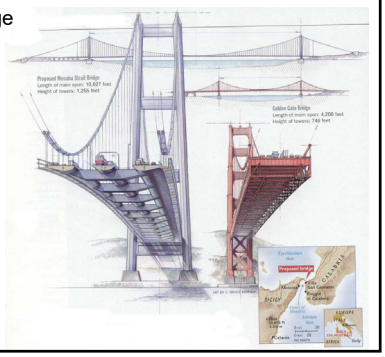
Long-Span Bridges

Strait of Messina Bridge



74

Long-Span Bridges

King's Crossing Bridge - Memphis

The new bridge is intended to replace the aging Memphis & Arkansas bridge (also called the I-55 bridge), which has ferried people between Tennessee and Arkansas since December 1949.

75

Rail Transportation

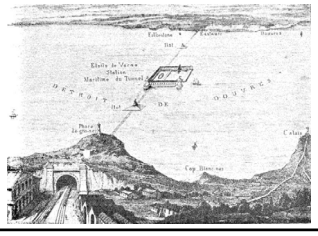
- Rail transportation was the first efficient cross-country mode of transportation for both passengers and cargo.
- Rail remains a significant method of transporting goods throughout the nation, and in many developed countries, it is the primary mode of passenger travel.
- Rail transportation generated hundreds of spin-off industries, ranging from rail cars and signal equipment to toy trains.
- It contributed to the growth and dominance of the U.S. iron and steel industries in the early part of the century.

76

Rail Transportation

Eurotunnel Rail System

The Eurotunnel Rail System fulfilled a centuries-old dream to link Britain and the rest of Europe. More than a tunnel, it rolls infrastructure and immense machinery into an underwater tunnel system of unprecedented ambition.



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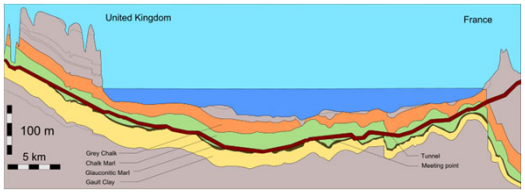
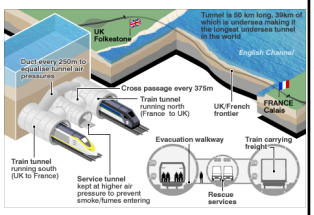


78

Rail Transportation

Eurotunnel Rail System

- Three five-feet-thick concrete tubes plunge into the earth at Coquelles, France, and burrow through the chalky basement of the English Channel, re-emerging at Folkestone, behind the white cliffs of Dover.



- The broadest trains ever built (14 feet wide double-deckers) travel through the tunnels at 200 mph. Passengers board in automobiles and buses, not on foot.

79

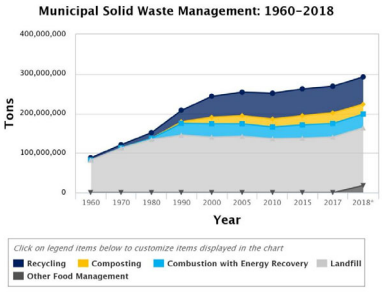
Sanitary Landfills/Solid Waste Disposal

- As American society changed from an agrarian culture to an industrialized nation, people moved to cities for work, in hopes of improving their quality of life.
- The subsequent increase in urban population density had a significant impact on garbage disposal practices.
- By 1946, the responsibility for garbage disposal shifted from scavengers to scientifically minded civil engineers, whose experimentation with various ways to properly dispose of waste led to the widespread use of sanitary landfills.

80

Sanitary Landfills/Solid Waste Disposal

Americans generate trash at an astonishing rate of about 4.9 pounds per day per person, which translates to almost 300 million tons per year!



81

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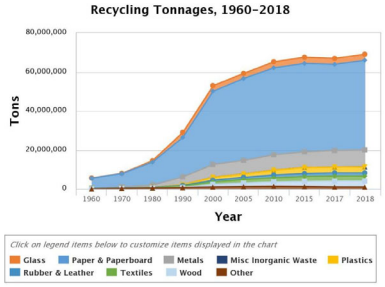

82

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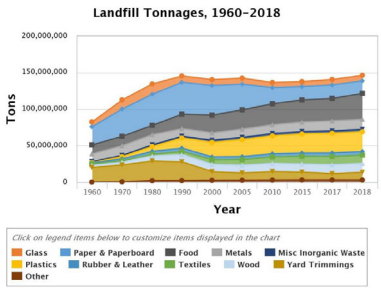

83

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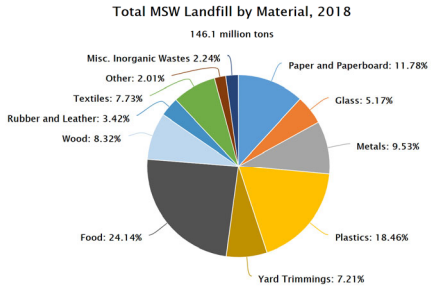


84

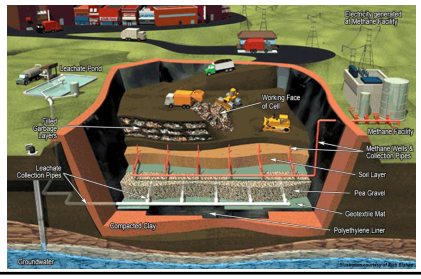
Sanitary Landfills/Solid Waste Disposal

Some trash gets recycled or recovered, and some is burned, but the majority is buried in landfills.

85

Sanitary Landfills/Solid Waste Disposal

A landfill's primary purpose and one of its biggest challenges is to contain trash, preventing environmental problems. The bottom liner prevents the garbage from coming in contact with the outside soil, particularly the groundwater



86

Sanitary Landfills/Solid Waste Disposal

The Fresh Kills Landfill on Staten Island is set to officially close on July 4, 2001, after more than 50 years in operation.

87

Sanitary Landfills/Solid Waste Disposal

It consists of four mounds, which range in height from 90 to approximately 225 feet and hold about 150 million tons of solid waste. The archaeologist Martin Jones characterizes it as "among the largest man-made structures in the history of the world."

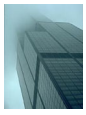
88

Sanitary Landfills/Solid Waste Disposal

New York's New Parkland at Fresh Kills will be one of the most ambitious public works projects in the world.

89

Skyscrapers



- Nineteenth-century buildings generally did not exceed 16 stories in height because the strength and thickness of their mandatory bearing walls limited them.
- Built upward, instead of outward, skyscrapers of the 20th century have solved many of the problems of rapid urbanization, including increasing population and land cost.
- Tall buildings were made possible by such innovations as the electric elevator, advances in structural steel making, and advances in heating, ventilation, air conditioning, and electrical systems.

90

Skyscrapers

Empire State Building

At 1,250 feet, the Empire State Building is the best-known skyscraper in the world and was the tallest building in the world for more than 40 years. The building's most astonishing feat, however, was the speed at which it rose into the New York skyline.

91

Skyscrapers

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92

Skyscrapers

Empire State Building

- Construction was completed in only one year and 45 days, without requiring overtime.
- Ironworkers set a torrid pace, riveting the 58,000-ton frame together in 23 weeks.
- Just below them, masons finished the exterior in eight months, plumbers laid 51 miles of pipe, and electricians installed 17 million feet of telephone wire.
- The building was so well engineered that it was easily repaired after a bomber crashed into it in 1945.

93

Skyscrapers

Tallest structure in the World?

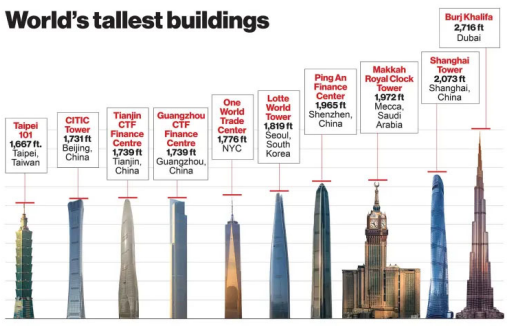
- Freestanding structure
- Freestanding structure on land
- Building – to the top of the antenna
- Building – to the highest point
- Building – to architectural top
- Building – to the top of the roof
- Building – to the highest occupied floor

- 2,717 feet high

Burj Khalifa known as Burj Dubai prior to its inauguration, in Dubai, United Arab Emirates

94

Skyscrapers



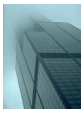
95

Skyscrapers

Tallest Building in the World

https://youtu.be/PuTqWxuAazI?t=8

96



Skyscrapers

Tallest Building in the World Under Construction

Burj Mubarak Al Kabir (2035) - 3,284 ft.

Jeddah Tower (2018) - 3,281 ft.

97

Wastewater Treatment

- Throughout the 19th century, people lived in filth, disposing of garbage and raw sewage by dumping it into streets, alleys, and waterways.
- As a result, they often suffered from such deadly diseases as cholera and typhus.
- Until the early 1900s, America's urban wastewater, including industrial waste, was dumped into the nation's waterways.
- As recently as 1968, the city of St. Louis discharged 300 million gallons per day of raw waste into the Mississippi River.
- By 1972, only one-third of U.S. waterways were safe for drinking and fishing. With the advent of wastewater treatment, cities became much more equipped to deal with population influx.

98

Wastewater Treatment

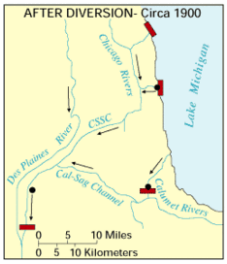
Chicago Wastewater System

- The reversal of the Chicago River, completed in 1900, enabled Chicago to continue its growth and progress after the Great Chicago Fire of 1871.
- Before the reversal, the safety of the Lake Michigan drinking water supply was constantly threatened by untreated sewage flowing directly into the river, which then poured back into the lake.
- The Chicago Sanitary District, as it was known then, undertook a monumental task when it built a 28-mile-long channel that would connect the Chicago River with the Des Plaines River to reverse the flow of the river away from Lake Michigan.

99

Wastewater Treatment

Chicago Wastewater System



100

Wastewater Treatment

Chicago Wastewater System

101

Water Supply and Distribution

- The collection, storage, treatment, transmission, and distribution of water played a significant role in urbanization, population growth, commercial agriculture, and land use.
- Clean, potable water piped from afar led to the development of such large cities as Las Vegas and the suburban areas around Chicago and Los Angeles.
- During the 20th century, water supply and distribution systems have led to an increase in life expectancy, reduction in infant mortality and morbidity, and improvements in environmental quality in developed countries.

102

Water Supply and Distribution

California State Water Project

- The California State Water Project was selected as much for its remarkable engineering aspects as for the positive impact it has had on regional economic trade and development.
- Conceived more than 60 years ago, a system of aqueducts, dams, reservoirs, and plants meets the water resources needs of 27 million people.

103

Water Supply and Distribution

California State Water Project

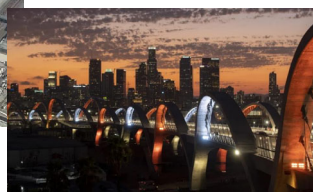
Features of the project include 32 storage facilities, reservoirs and lakes, 17 pumping plants, three pumping-generating plants, five hydroelectric power plants, and 660 miles of open canals and pipelines.

104

Water Supply and Distribution

California State Water Project

6th street viaduct in Los Angles, CA



105

Water Transportation

- The impact of canals and ports on economic and commercial development around the world is unsurpassed.
- Passageways between bodies of water connect continents and create efficient interstate portals for cargo ships.
- Canals and ports harness the capacity of water to carry extra-large, bulky cargo, spurring economic growth, agricultural development, commerce, and trade in all nations.
- As cargo ships increase in size, engineers are developing new ways to expand ports, including dredging.

106

Water Transportation

The Panama Canal

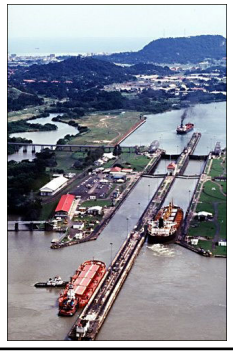
The dream of Spanish conquistadors, the Panama Canal is one of civil engineering's greatest triumphs. Forty-two thousand workers dredged, blasted, and excavated the canal.

107

Water Transportation

The Panama Canal

They moved enough earth and rubble between Colon and Balboa to bury Manhattan to a depth of 12 feet.



108

Water Transportation

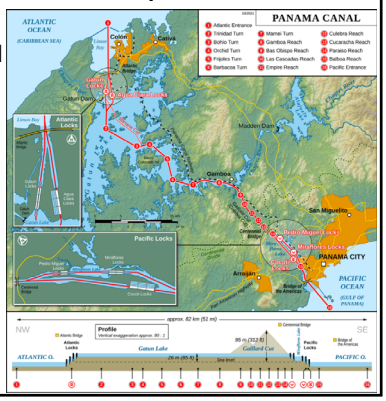
The Panama Canal

- The Third Set of Locks Project is a mega-project that will expand the Panama Canal.
- The expansion will be greater than at any time since the canal's construction.
- Panamanian President Martín Torrijos presented the plan on April 24, 2006, and Panamanian citizens approved it in a national referendum by 76.8% of votes on October 22, 2006.
- The project will double the canal's capacity and allow more traffic.

109

Water Transportation

The Panama Canal



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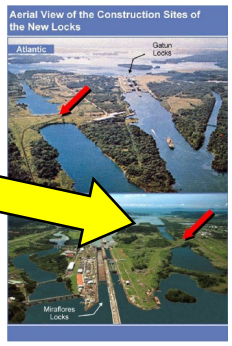
Water Transportation

The Panama Canal

111

Water Transportation

The Panama Canal



112

Water Transportation

The Panama Canal

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Water Transportation

The Panama Canal

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Water Transportation

The Panama Canal

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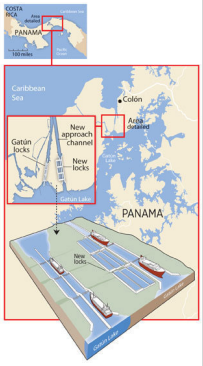
Water Transportation

The Panama Canal

The Panama Canal's expansion opened for commercial traffic in June 2016.



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What is Civil Engineering?

ASCE's members ranked the 10 greatest civil engineering achievements as:

1. Airport design and development
2. Dams
3. Interstate highway
4. Long-span bridges
5. Rail Transportation
6. Sanitary landfills/solid waste disposal
7. Skyscrapers
8. Wastewater treatment
9. Water supply and distribution
10. Water transportation

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What is Civil Engineering?

Any Questions?

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