

4000BC Copper Age -smelting of copper in the Middle East, India and China

3000BC Bronze Age - copper with the addition of tin, zinc or other metals. This lasted until about 1200BC when there was a decay of societies.

2000BC Development of the Roman Empire.



750BC 1st Iron smelting Hallstatt period (Austria)

450BC 2nd Iron period La Tene period

350AD End of the Roman Empire.

1700 Rolled **steel plates**.

1720 Abraham Darby (England) began smelting iron with coke instead of charcoal. This began the mass production of pig iron.

1779 100 ft span cast iron bridge at Coalbrookdale (England)

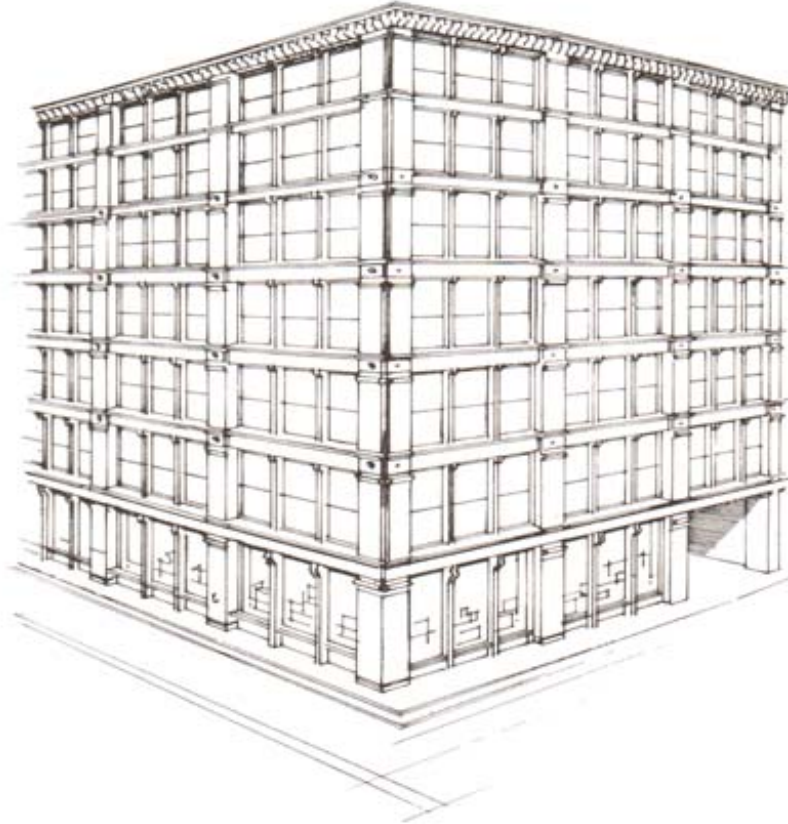


1784 Puddling process began, changing pig iron into wrought iron.

1826 Chain bridge 173 m long across the Menai Straits in England completed.



- 1830** Rolled railway rails.
- 1850** 300 m spans
- 1854** Rolling of I sections of wrought iron in France. The start of structural sections in Architecture.
- 1855** Henry Bessemer (England) invented the converter using air blown through the molten metal to remove unwanted impurities.
- 1864** Siemens-Martin invented the open hearth process to produce mild steel
- 1870 500m span Brooklyn Bridge New York.
- 1880 Chicago School of architecture.
- Chicago the gateway to the mid-west,
A centre of commerce – demand for office and storage space.
Demand for Office space led to the development of
skyscrapers.



Chicago. Leiter Building I 1879



Leiter Building – a 5 storey skyscraper.

Developments making high rise buildings feasible:

Otis Elevator (1853)

Vacuum systems for delivery

Development of telephone and telegraph for communications.

1946 Development and expansion of cable stayed-bridges as a short span alternative to suspension bridges.



Long's Creek Bridge (1967)



Helix Bridge in Seattle, designed by UBC engineers and fabricated by AMEC Dynamic Structures, Port Coquitlam