## **INNOVATIONS IN** REINFORCED CONCRETE PIPE

Pre-1920s

First jacking project takes place

Joseph Monir is the first person to patent reinforced concrete

France begins utilizing reinforcement in concrete pipe

First tamp machines are developed for RCP production

Reinforced concrete pipe is introduced in America

American Concrete Pipe Association is formed

Blast furnace slag began being used as supplementary cementitious material



1930 ASTM C76 is first published

**ASTM Committee C13 is formed** 

1920s-1930s

O-Ring rubber gasket joint is patented

- Modern admixture technology started with basic air-entrainment agents, retarders, accelerators and water reducers
- Fly ash began being used as a supplemental cementitious material
- Precasters can produce highly customized products









Cen Vi-Ro production process is developed utilizing centrifugal, vibration and roller processes, allowing

• Use of rubber gasket joints becomes widespread

• Introduction of liners allows concrete pipe to be used for sanitary sewer

Heger research on reinforcement in concrete pipe

ASTM C443 is created for rubber gasket joints for RCP and manholes

Pipe jacking becomes a popular installation method

Concrete admixtures become widely used throughout the industry



## Research program leads to the reduction of steel required in RCP

PIPECAR and BOXCAR design programs are introduced

Self-consolidating concrete is developed

Pre-lubricated gaskets save contractors time in the field

First use of dry-cast concrete

Offset step joint is introduced

Precast concrete box sections are developed

Arch and elliptical pipe are developed

Quadrant reinforcement optimization is added to ASTM C-76

• Superplasticizers are developed for use in concrete mixtures

Automatic cage machines allows faster production of reinforced pipe

New standard installations are incorporated in ASCE Standard 15

ASTM C443 is created for rubber gasket joints for RCP and manholes

• Silica fume began being used as a supplementary cementitious material

ACPA Q-cast program is developed

• First microtunnelling project in the U.S. takes place



**2010** Eriksson Culvert software

**2000**ASTM C1479 is created for RCP installation

Creation of Fill Height Tables meeting LRFD

ASTM C1675 is created for RCB installation

Eriksson Pipe software for pipe design

QCast accredited by ANSI

**ASTM C1894** 

Gasket production in QCast

- Robotic processes greatly increase production capabilities
- Gasketed joints for elliptical and arch pipe become available

Research program leads to the reduction of steel required in RCP top slab

• The development of pipe for trenchless applications eliminates open cuts, saving time in construction and reducing disturbance to the area









