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J. P. M. Pannell's "Man the Builder: An Illustrated History of Engineering" Précis

In his 1964's book, Pannell asserts that road construction and maintenance are massive civil engineering projects that demand extensive work and money more than any other civil engineering project. As such, his writings become the importance of road construction maintenance and the methodology and best practices through the first to the twentieth century.

Pannell explains that Britain had a significant role in the history and stages of roads. It is the place where the road construction first started. Therefore, it is important to use Britain as an example to explain the road system and its development throughout the decades.

Road settlements began when people used to meet at the ridges to trade goods during the Bronze and Iron Ages when the country was covered with forests, muddy plains, and no viable transportation routes.

The Romans then became the first road engineers. That became particularly evident when they concurred with the British lands. At that time, the Roman military supplies and logistics were extremely crucial for the success of the mission of the Roman Empire. Therefore, the construction and maintenance of roads were taken seriously to provide efficient and reliable transportation and movement tracks for the military. The Romans also occupied other regions such as Italy, Spain, Egypt, and Minor Asia. As a result, they expanded their road system to new frontiers and global outreach. An example of a great road construction project is the Appian Way, named after Appius Claudius, who initiated the project. However, Julius Caesar finished the road construction.

There are five classes of roads within the Roman Road system. Each was engineered to fulfill a purpose: The Via, The Actus, The Iter, The Semita, and the Callais. Later civilizations benefited from the road system of the Romans. The system provided great communication tools for later invaders such as Danish, Norman, and Saxons in the eighteenth century.

Moreover, Britain's independence and the Roman empire's death fundamentally changed the trading rules and routes. Britain became independent, cross borders trade died, and communities became self-sufficient. A new road system was created, which influenced the basis of roads today.

During the late eleventh century, there was a need for better travel routes. Significant roads in Britain, such as Watling Street, Ermine Street, The Fosse Way, and The Icknield Way, were used as travel routes, and the four of them collectively became the King's Highway. The King protected travellers on these roads so they could travel without inconvenience. By the twelfth and thirteenth centuries, a national geographic pattern was recognizable.

During the Norman control of the British territories, many organized religious groups were established and concerned with the road system's neglect. The Church maintained the roads, which provided an organized building programme that supplied skilled masons, carpenters, and other constructional trades to maintain the roads. Since the Church was influential in the community, it promoted and enforced structured and better road system maintenance. However, Henry VIII halted this system when he came to power, abandoning the Church programme and leading to road neglect and deterioration.

In the seventeenth century, road conditions worsened, leading to the passing of the first Turnpike Act in 1663. This act was established to make road users pay for road maintenance

each time they use it. Unfortunately, the Turnpike Act did not go as planned and led to riots and a rise in public violence. The Turnpike's purpose was to improve the roads, but it had been a failure. Unfortunately, the government struggled with the construction and maintenance of roads due to inefficient use of tax revenues on turnpikes.

In the eighteenth century, Facing the Scottish war campaigns and driven by the massive need for better and improved communications routes, General Wade organized an ambitious road construction programme carried out by the troops and engineering corps and built merely for military purposes. Inspired by General Wade's works, Robert Phillips proposed new road construction projects. Unfortunately, his proposals were unsuccessful due to the lack of skilled engineering workers. Meanwhile, John Metcalfe, known as Blind Jack, was the first to apply sound principles to road engineering in England and helped construct roads.

Additionally, Lieutenant John McAdam, a renowned highway engineering specialist and a road trustee, wrote extensively about his road-making methodologies. McAdam's writings were translated into several languages. His knowledge attracted many foreign engineers to come to Britain from different nations to spread his techniques. McAdam developed his cost-effective method of constructing roads. It mainly benefited from the natural native soil if well dried and properly drained to support traffic loads.

Finally, road engineers considered using concrete as road material in the nineteenth century, leading to Austria's first concrete roads appearing in the 1850s. There were also other new materials experimented such as tar and asphalt.

Pannell concludes that road construction engineering has witnessed many developments from its inception in Britain for military and commercial purposes until the nineteenth century and the introduction of concrete roads.

Bibliography

Pannell, J.P.M. "Roads." In *Man the Builder: An Illustrated History of Engineering*. Crescent Books, 1964, pp. 9-38.