Bridges

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Bridges must be one of the first structures constructed by early man. As his need to travel increased, he encountered more and more obstacles and many of those obstacles could only be overcome with bridges. From the single tree trunk felled across a creek to the long-span multi-lane suspension bridge, bridge design and construction techniques have progressed tremendously over the centuries. A wide selection of designs is now available for bridge engineers to meet the different physical conditions and budget constraints in different situations. A drive to different parts of our country will expose one to a great variety of bridges.

Before independence, our country's population was small and there were not many vehicles on the road. The few vehicles that plied between urban centres could not go very fast, and the roads had not been designed for high travelling speed and had relatively poor horizontal and vertical alignments, which means bridges were usually constructed at right angles over a river or railway line, thereby introducing kinks to the road alignment.

Our country has undergone tremendous development since independence, especially within the last 30 years. The population has increased several folds, and as the middle class grows bigger and bigger, car ownership increases correspondingly. This, coupled with greatly improved performance of the cars as a result of technological advancements, exerts great pressure on the government to widen and upgrade the road network.

Timber bridges were replaced with concrete ones to increase their service life, right bridges replaced with skewed or curved ones to improve road alignment, short span bridges replaced with larger span bridges to minimise obstruction to river flow, and the soffit levels of bridges over roads were raised to accommodate taller vehicles. At the same time, more attention was paid to the aesthetics of bridges.

An efficient transportation system is essential to the nation's economic development, and a good road network is one of the most important components of an efficient transportation system. Realising this, our government has spent billions and billions of ringgit under the various five-year development plans to build new roads and upgrade existing ones. Thousands of new bridges have been constructed and many more existing bridges replaced with better ones.

To meet the requirement to construct a large number of bridges within a short period of time, several series of standard precast prestressed concrete beams developed in the United Kingdom have been adopted. Such beams are produced by several manufacturers in the country and are supplied to bridge contractors. This practice not only speeds up the construction process, but ensures the quality of the beams as well.

About 35 years ago, the government embarked on an ambitious project to construct a 115km long road linking Grik in northern Perak to Kg. Jeli in Kelantan, cutting through the main range. Known as the East-West Highway, it was the biggest project ever undertaken by the Jabatan Kerja Raya (Public Works Department) with direct labour. The iron mine at Bukit Besi in Terengganu was closing down at that time and the mine workers, who would otherwise be jobless, were absorbed into this gargantuan road project.

The completion of the East-West Highway not only reduced greatly the travelling time between the northern states on the west coast and those on the east coast of Peninsular Malaysia, it also fulfilled an important function in the nation's security by becoming a physical barrier to members of the Communist Party of Malaya who were active in the forests near the Malaysia-Thai border.

The highway cuts across the reservoir impounded by the Temenggor dam which was under construction at the same time for hydro-electricity generation. A hill standing in the middle of the reservoir subsequently became Banding Island. The island is linked to the mainland by two major bridges. Today, the beautiful lake,

together with the surrounding Belum-Temenggor Forest Reserves, has become a tourist attraction. Nature lovers frequent this place to view the 10 species of hornbills found in Malaysia. One species of the Rafflesia, the biggest flower on earth, can also be found there.

Further south, an older east-west highway linking Selangor with Pahang was not doing well. It lost its major function as the 'umbilical cord' between the west and east coast.

Once a year, when the northeast monsoon struck – the middle span of the low-level bridge over Sg. Pahang near Temerloh had to be dismantled to prevent the bridge from being swept away by debris brought down by the rising river. In 1973, a high-level long-span bridge was constructed to replace the low-level bridge and thus solve the annual traffic disruption problem once and for all.

The new bridge had two large central spans over the river between the approaches. The central spans were of composite construction with reinforced concrete deck slab supported by two steel box girders. The steel box girders were fabricated on the river banks, and one end was placed on a pier in the middle of the river and the other end on a pier at the edge of the river. The physical act of actually manoeuvring such a long and heavy girder into position was itself a major engineering problem.

The late Professor Chin Fung Kee, who was then a professor of civil engineering at the University of Malaya, came up with a very ingenious solution to the problem. Each girder was placed on two trolleys that allowed it to be moved on a railway track. The girder was moved towards the river until its cantilever front end came to rest on a temporary support built on a pontoon at the edge of the river. The pontoon was then carefully manoeuvred across the river towards the central pier. Water could be pumped into or out of the pontoon to lower or raise the girder. This way, the girders were launched into position.

Much earlier, back in 1960, the government, under the second prime minister Tun Abdul Razak Hussein wanted to bridge a much larger expanse of water, the channel between Penang Island and Province Wellesley. The Penang Bridge, touted as one of the most

ambitious projects undertaken by the government, however, had a long gestation period and its construction did not commence until early 1982, soon after Tun Dr. Mahathir Mohamad became the 4th Prime Minister of Malaysia. The bridge was opened to traffic on 14 September 1985. At 13.5km long, Penang Bridge is not only Malaysia's pride, it is also the longest bridge in Asia and the third longest in the world.

Many other bridges across the country deserve to be mentioned. However, a separate book is required to do justice to all the bridges that have significantly shortened the physical distance between people and narrowed the gap between different communities. Suffice to say that bridges are easily one of the most ostensible contributions of engineers to national development. ■