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An Industrial Archaeological Study of bridges built during the British period in Kandy and Suburbs (Based on Selected sites)

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Abstract

As a result of the Industrial Revolution during British Colonial rule, during the period 1815 – 1947 many bridges were built in Kandy and surrounding areas. With the commencement of the plantation Industry in the Upcountry, a highway was built from Colombo to Kandy in 1820 to transport the plantation produce to the Port of Colombo. The British built several Civil engineering structures, including bridges and culverts, along the highway and other roads. Sir Edward Barnes, then Governor of Sri Lanka, paid special attention to the construction of bridges and culverts in Kandy and surrounding areas. The craftsmanship and construction materials used in contemporary bridge technology varied from brick-arched bridges to iron bridges. There have been many examples of such erections in Kandy and surrounding areas. Major Thomas Skinner, John Fresher, Captain Gordon, and Captain A. Brown were at the forefront of the design and construction of bridges during the period under the supervision of the Royal Department of Engineering. At present, due to public negligence and various development projects, many bridges in Kandy and its Suburbs are being destroyed without any investigation into their values. In this regard, field, and non-field study methods were used to uncover information. The main objective of this research is to identify bridges built during the British era and around Kandy and its Suburbs.

Keywords: Industrial revolution, British era, Bridges and culverts, Civil engineering construction, Kandy and suburbs

Introduction

At the beginning of the 19th century, the British Colonial rulers in Ceylon focused more on military interests than the economy. However, around 1822, with the establishment of a coffee plantation in the Sinhapitiya area of Gampola by George Byrd. Coffee cultivation became successful, and commerce took precedence. (Silva, 1973, p303 – 304). A road network was constructed to bring the plantation crops cultivated in the upcountry to the Port of Colombo easily. For that, several Civil engineering constructions including bridges and culverts were established on those roads. With the construction of the Colombo – Kandy highway in 1820 under the leadership of Governor Edward Barnes, bridges were built over the rest of the existing network of roads in and around Kandy. Thus, in the period from the early 19th century to the 20th Century, there was no complete identification of modern bridge technology in ancient Sri Lanka. The techniques and construction materials used in the past were varied. Accordingly, the technology of tiled arch bridges was first established in Sri Lanka. During the second half of the 19th century, although the aforementioned bridge technology remained the same, with the slightest change the iron bridge technology became prevalent throughout the island. (Kodithuwakku, 2006, p66-67). There are several prior research on bridges built during the British Colonial period. Among them, Dr. Kusumsiri Kodithuwakku's research on "Road bridges in Sri Lanka" is important for his Master's Degree.

He has divided the history of bridges in Sri Lanka into three main stages, including stone bridges, wooden bridges, and rural bridges. Major Forbes (1840), Emerson Tennant (1860), Robert Knox (1911), M.B. Ariyapala (1968), Prof. Senaka Bandaranayake (1974), Y.W. Nicholas (1979), John Deloche (1984), R.C.De.S Manukulasuriya, R.K. De Silva (1988) and Ulrich Von Schroeder (1990) conducted researches. Dr. Kusumsiri Kodithuwakku has divided the modern period into three sub-phases preliminary, transitional, and post-translational. These researches also did not provide specific opportunities for bridges built during the British era in Kandy and surrounding areas. And P.M. Bingham, A. M. Ferguson, Henry W. Cave, and Emerson Tennant's reports from British civil servants contain brief information

about some of the bridges built during the British era. This research aims to address the need for the identification of bridges built during British rule in Kandy and its Suburbs.

Materials & Methodology

British-period bridges in Kandy and its Suburbs are the main material of this research paper. In this regard, field, and non-field study methods were used to uncover information. The data record was created by the structural field survey, library survey, archival survey, Photographs, studying 1: 50,000 metric maps, and taking measurements. A Library survey and an Archival survey were done to get an idea of the colonial background of Kandy and its Suburbs, by studying previous research on this subject. The structural field survey was used to identify industrial archaeological data on bridges. Metric Maps, Photographs, and measurements were used to record the data.

Results and Discussion

In 1820 with the construction of the Colombo – Kandy highway, many of Sri Lankans' first bridge was built along this road. Sir Edward Barnes, then Governor of Sri Lanka, paid special attention to the construction of bridges and culverts in Kandy and its Suburbs. The craftsmanship and construction materials used in ancient modern bridge technology were varied and the brick arch bridges and iron grader bridges that were built. Existing bridges in Kandy and its Suburbs can be classified into three stages.

01. Early stage (1800 – 1850)
 02. Transitional Period (1850 – 1900)
 03. Post – Translational Period (1900 – 1950)
- (Kodithuwakku, 2006, p67).

Major Thomas Skinner, Lieutenant General John Fresher, Captain Gordon, and Captain A. Brown took the lead in designing and designing the bridges in Kandy

during the period under the supervision of the Royal Engineering Department. (Kodithuwakku, 2006, p67).

Early stage (1800 – 1850)

In 1826, Captain A. Brown built a three-arched brick bridge across the Nanu Oya on the Colombo – Kandy highway. (Bingham, 1716 – 1913). In the lower part of the arches, the soil that collides with the stream is made of stone. The upper part of the arches and the bridge are made of brick. The bricks are bonded together with lime mortar and the brick surface is not plastered. The upper part of the arch is made of bricks in a semi-circle and the bricks in the arch are firmly fastened together using a stone. The length of the embankment of the bridge is 5.90m, the width between the two embankments is 7.6m and the height of the section which is supported on both sides is about 80cm.



Fig. 1. Nanu Oya arch bridge



Fig. 2. Plaque of bridge

Work on the Peradeniya Satinwood bridge, a masterpiece in the history of bridges in Sri Lanka. Founded in December 1826. It was completed by October 1, 1833. (Bingham, 1921: p194, Silva, 1985: 218). The arch of the bridge over the Mahaweli River was commissioned by Colonel Fresher. (Bingham, 1921: p194). It was a single arch, 20 feet (62m) long, 22 feet (67m) wide (Silva, 1985: p219), and approximately 70 feet above water level. (Tennant, 1859: p727). The wooden part of this bridge was designed at the Quartermaster General's office in Colombo and

transported to Peradeniya and attached to the bridge. The wall was designed by Captain Brown, and under his command was Lieutenant Old Show. (Bingham, 1921: 203). The wooden arch here is made of single Satinwood without any nails or dents. (Cave, 1908: p249, Wimalananda (Ed), 1966: p105). About 1,200 workers were employed to prepare the access roads and fill in the soil during the construction of the bridge. (Skinner, 1890/ 1966: p105). 1: 30 model of the bridge, donated by Captain Edward Barnes in 1860, is currently on display at the Museum of Science in London. (Silva, 1985: p218).

During the reign of Governor Sir Henry Ward (1855 – 1860) the Satinwood bridge at Peradeniya was renovated under Captain Donald Graham. A model of the bridge is also on display at the South Kingston Museum. (Bingham, 1921: p194). In 1903, the Peradeniya Satin bridge was replaced by three iron arches, and the floodplain was made of bricks, with iron rings attached to it. For the construction of the earthen part of the bridge. It is said that the work was carried out from March to the end of April 1903. (Ceylon yearbook, 1960). The iron arched guider was 67 feet and 09 inches long. The width is 20 feet. The side walls and side walls were made of concrete, and the handrails were made of iron. The surface of the bridge is 17 feet and 6 inches wide. The road was paved with tar under the system. The bridge was built on double Octagonal concrete pits, measuring 35 feet 09 inches and weighing about 06 tons with an iron lattice.

The bridge also underwent some construction in 1904 for 81, 722. 63 is sold to have been spent. (Bingham, 1921: p204). The bridge was repaired and reopened on September 11, 1906. During the construction, an alternative bridge was built across the Getambe Port and it was designed and constructed by Head Office Architect by A, Woodson. The bridge was renovated again in 1915. (Highways and Road Development Authority, Kandy). A watchtower bridge was built outside the Colombo – Kandy highway in the year 1847. It is located in the Gurudeniya area on the Kandy – Haragama road, about 5 miles from the city of Kandy. This bridge was designed by Karsho's bridge. It is 35 feet (11m) long and 9.5m wide with two north-south brick arches. (Bingham, 1921: p203). The bridge's arches and bridges

are made of brick and lime mortar, reminiscent of the British era. The arch is reinforced with a stone, and the wall on the arch is 90cm high and 45cm wide.

In the year 1848, a culvert with a brick arch was constructed across a canal flowing through the Pallemahaiyawa area on the Kandy – Matale road. (Highways and Road Development Authority, Kandy). The 63.08 m (205ft) long bridge at the Provincial boundary near Kadugannawa was made of sandalwood and designed by John Fresher. The bridge that currently stands at the location was built in 1854. (*kadurata praweniya*, 2000: p139).

Transitional Period (1850 – 1900)

In addition to the tiled arch bridge technology that existed in the history of ancient bridges in Sri Lanka, the construction of large iron girder bridges took place during the Transitional Period. By this time, the road from Colombo – Kandy was under construction, and bridges were started connecting Kandy and surrounding areas to transport the fertilizer, equipment, labor, and consumer goods required for coffee cultivation. The largest number of bridges were built during this period, during the reign of Governor Henry Ward from 1855 to 1860. (Balasingham, 1968: p39). In 1859, Governor Henry Ward first connected coffee-growing areas such as Kotmale and Dimbula, separated from the Mahaweli River, to Kandy by the construction of a suspension bridge at Gampola. The bridge, designed by Captain Graham, was 20 feet (62m) long and 50 feet above water level. In 1918 this suspension bridge was removed, and a lattice girder bridge was built. (Bingham, 1921: p203/ Silva, 1985: p220). Emerson Tennant notes that the bridge is one of Sir Henry Ward's Public Works. (Tennant, 1860: p236).

In 1859, a bridge was built across the Mahaweli River at Katugastota to connect the areas of Matale, Panwila, Kabaragala, Rangala, Knuckles, and Kurunegala with the city of Kandy. (Bingham, 1921: p38). The bridge was opened to traffic in the year 1860. J.A. Caley was appointed as the Chief Engineer during the construction of the Katugastota bridge. Work Clerk in the woods, As W. Lapen has also worked construction was carried out by the pioneer's 4th and 5th batches. Major Thomas

Skinner was then the commissioner of the Department of Public Works. Designed in the style of an iron garage, the bridge had three sections of 140 feet each and a total length of about 420 feet. (Silva, 1985: p222).

The Katugastota bridge was built during the reign of Governor Henry Ward and was the longest bridge in Sri Lanka at that time. The piers of the bridge are made of prefabricated granite and this bridge has 05 piers. E.C. Davis supervised the construction of the bridge. The Katugastota bridge was rebuilt in 1939. The bridge deck was reinforced with additional towers by Chief Design Engineer S.K. Mahadeva and Factory Engineer G.C. Oram. The minister in charge of Communication and Works, Major J.L. Kotalawala, and the construction of the Katugastota bridge was carried out under the Public Work Department of the Government Factory.



Fig. 3. Katugastota bridge

During the period 1858 – 1864, several bridges were built by the British on the road from Katugastota to Kabaragala. A bridge 120 feet across the Piga Oya in Katugastota in 1859. Built by J. Robertson. Also, on the same road in the year 1860, a 50 feet bridge was built across the Pussel Oya at Nawayalatenna, built by W. Velupillai. In 1859 J.A. Caley built a 40-foot bridge across the Hulu Ganga river on the Bambarella road, a 50-foot bridge over the Lenagal Oya, and an 80-foot bridge over the Daluk Oya. That it is said that Caley himself built 80 –a footbridge across

the Maha Oya on the Hanguranketha road between 1859 – 1860 and also built an iron bridge on the Kelebokka road between 1855 – 1860. (Bingham, 1921: p204).

By 1858, many bridges were built across the tributaries of the Mahaweli River to build a road to Teldeniya, Rangala, Kabaragala, and Panwila. It is said that 75 feet and 130 feet long iron grinder bridge was built across the Haragama Oya on the road from Kandy to Maturata. (Hudson, 1935: p120). The bridge was built between 1859 – 1860 by J.A. Caley it was built by and is said to have cost around \$23,000. (Bingham, 1921: p205). Near Teldeniya during the period between 1858 and 1860, a 140 feet long bridge was built across the Hulu Ganga river at Orutota. It was built by C. Mason and cost \$ 52,000. (Bingham, 1921: p205). In 1861 on the road from Kadugannawa to Alagalla, near the Kadugannawa Railway Station, there was a small bridge 6.45m long and 4.4m wide with a stone wall. An 80-foot bridge across the Galmal Oya in 1862 was built by J.A. Caley. (Bingham, 1921: p205). It is said that in 1876 a bridge was built across the Kospotu Oya at Udalagama. (Lowrie, 1896/ Administration Report 1876).

Post – Transitional Period (1900 – 1950)

In the year 1900, a single brick arch was constructed across the Bolagala Oya which flows near the town of Hedniya on the Kandy to Kurunegala road. The bridge over the Thalathu Oya was built on a 30 feet long span in 1902 and the surface was paved with granite blocks. The bridge is 13. 62m long and 06m wide and has two iron girders. (Bingham, 1921: p205). The uphill arch bridge is believed to have been built across the Alakolanga Oya on the old Pilimathalawa – Poththapitiya road. The bridge is made of large steel beams and is 44.6m long and 3.60m wide. There are seven arches above the bridge and the height of one arch is 3.43m. In 1904 E.C. Davis built the Ulapane downward bowstring bridge, one of the rarest modern bridges in Sri Lanka. The bridge is located on the Ulapane – Kotmale road across the Mahaweli River and is about 58.90m long. It is said that a 40-foot bridge was built in 1906 on the Haragama – Kurundu Oya road. (Bingham, 1921: p205). A

bridge called Dumbara bridge was built in 1909 in the Teldeniya area. It is a bridge with 04 spans and is 32 feet long and 13 feet wide. The bridge is said to have been built by Government Factory. (Bingham, 1921: p205).

During British rule, a single-span 19.9m long bridge was built across the Rambukkan Oya in 1929 at Hatharaliyadda. It is a bridge with iron beams made of N- Trust type carpets. Several bridges can be seen on the retaining wall built on the earthen embankment of the bridge. On the 1932 types, Peradeniya to Gampola road a six-arched granite bridge was built over the railway line in the Angunawala area. Also known as the *Meewathura palama*, the bridge has an arch on either side that is 11.4m long and the four arches in the middle are about 9.4m long. There is a local legend that forged wood was used for the base. On November 15, 1936, a 17m long and 4.13m wide bridge with two spans was constructed across the Ovissa Oya on the Pujapitiya – Alawathugoda road. It is believed that Sir Ivor Jennings built a 9.2m long and 9.15m wide bridge across the river near the University of Peradeniya on a road built from Peradeniya to Deltota in 1871 using three arched stone blocks. The bridge is known as the *Gajasinghe palama* since four panels are engraved with the handrail of the bridge. There are also eight pipe systems on the bridge to drain the upper retaining water of the bridge using an artistic stone carving found in Hindu temples. The road also has a single arch bridge made of bricks across the Gal Oya in 1940 and the same year known as the *Kona palama* with three horseshoe-shaped arches across the Hal Oya. In the Wariyagala area, there is also a single-arched granite bridge. It is 14.36m long and 5.3m wide, In the Nilambe area, near the town of Galaha, there is a 40 feet long iron grader bridge made of iron through a small waterway. (Hudson, 1935: p120).



Fig.5. Gajasinghe palama



Fig.6. Kona palama

Conclusion

During the British Colonial rule, a highway system was built to easily bring coffee and tea crops grown in the Upcountry to the Port of Colombo, as well as for the transportation of fertilizer, equipment, labor, and consumer goods to the estates. It is seen that an integrated bridge technology has been restored and developed in Kandy and its Suburbs. These bridges were originally built on the Colombo – Kandy highway and later with the emergence of other road systems, this bridging technology became associated with it. It is clear that bridges were built in these areas during the early days under Major Thomas Skinner, John Fraser, Captain Gordon, and Captain A. Brown under the Royal Development of Engineering, and that bricks and various timber were used for those bridges during that period. By the transitional period, the design of iron grader bridges had begun and the technology of the existing arch bridges was also in use at the time. Granite blocks are used in the design of iron grader bridges. Box culverts as well as double culverts can be seen across the shallow ridges and waterways using granite slabs. Many bridges in Kandy and its Suburbs were built by the Engineers J.A. Caley, Captain Graham, C. Mason, J. Robertson, and W. Velupillai.

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