Bridging in Nepal

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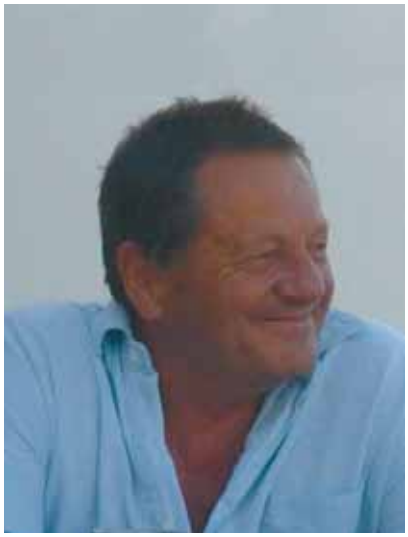

Rollo Reid joined the Royal Engineers in 1965, from the OTC at Birmingham University. He did a YO course and emerged into the Corps as a Lieutenant. He served for two and a half years as a troop commander in 2 Armoured Engineer Squadron, where his troop formed the Armoured Engineer element for the 4th Division. His next posting was to 54 Farelf Support Squadron in Singapore. This was a busy time including a long time on the Bukit Mendi project, among others, where the reinforced troop built roads, culverts, bridges and a small town.

Rollo then returned to Chatham on the Long Civil Course, which included 18 months on attachment to the US Army Corps of Engineers in Kansas City Missouri, again building roads and bridges around a large dam. The next posting was as 2IC of 16 Field Squadron in BAOR, incorporating a couple of tours in Northern Ireland.

He then returned to Chatham as an Instructor in the Civil Engineer school, where he started to learn about engineering: keeping one step ahead of a lot of bright smart alecs enforces a deeper and wider understanding of the subject.

At this stage the army seemed to be heading into the direction of a lot of paperwork, so Rollo left the Corps to work at REIDsteel. He maintained links with the Corps helping several PET courses with steel design. From the privileged position as a director of a family firm, he and the team have designed aircraft hangars, highway bridges, stadia, and the like, almost all exported. His defence related work included mortar roofs, rocket screens, anti VBIED gates and the bomb protected Medifac, Dfac and Dormitories at Basra air base, among others. He has travelled and been involved with structures in more than 140 countries and REIDsteel has won four Queen's Awards for export.

Nepal is a mountainous country with huge number of rivers. Communication is difficult and much of the country has either no road access or only seasonal access. Many bridges are needed. The Nepal government and various international bodies have a number of bridge projects as a priority.

Almost all of the major projects have gone to international companies and it is obvious that it would be better to encourage local contractors.

One case of this being put into practice was the Piluwa Kohla bridge (27º 15' 59" N, 87º 19' 23" E) 51km North of Dharan (Figure 1). The requirement was for 96m span highway bridge in a deep steep gulley, accessed by a fair weather cart-track. The company chosen for the contract was Kalika of Khatmandu, who had never built a bridge before, but they were ready to have a go with British Bridge Builders, Reidsteel of Christchurch.

The bridge had to be made of light, easily transportable pieces to be hand-erected on site, having been carried one by one to the site on an agricultural tractor trailer. The original plan was to build the structure over a causeway with culverts

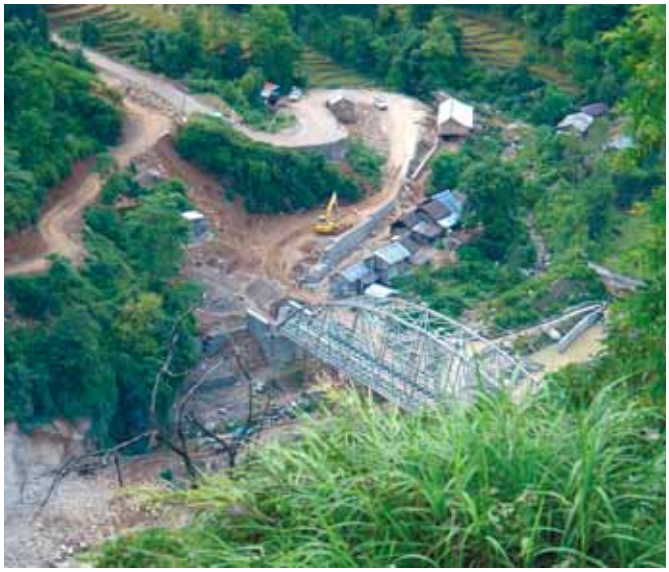

Figure 1. The very difficult approaches to the bridge site, 40 miles from Makalu, worlds fifth highest mountain.

Figure 2. The lower chord being built on old pylons resting on gabions, on aerial ropeways.

during the six month dry season. But the "dry season" river levels would have made this tricky so the contractor decided to make temporary piers of gabion bases and on these a number of towers, (which were disused electricity transmission steel poles).

There was no crane available. The contractor rigged two aerial ropeways from the mountain on one side to a mountain on the other side. With these, one by one, the lower chord member were lifted (by hand pulley) and slid over the gap (by hand controlled ropes to stop them whizzing down too fast) and bolted together by Ghurka hands (Figure 2). In the same way the transoms and bottom chord bracing were slung across and bolted together (Figure 3). At this moment a huge "dry season" flood surged down the river and several of the gabion bases and electricity pole props were swept away. Fortunately the main beams and bracing were strong enough to stay intact, though not quite with the correct cambers. With the flood abated, the gabions were replaced the poles were fished out of the river bed, and replaced. With clever jacking the correct shape of the lower chord was re-established.

Figure 3. Kalika workers sling in heavy members by hand suspended from aerial ropeways.

Then again piece by piece, the upper chords, lacing members and bracing were added, each slung fom the aerial ropeways by hand. The deck sacrificial formwork was placed (replacing the half round split bamboos which served as walkways).

The temporary posts were removed, the deck poured, and, Presto, a 96m clear span permanent highway bridge to British Standards was open to the public; the only bit of straight flat road within a 30 miles radius (Figure 4). An amazing achievement for Kalika and their brave Ghurka Steel erectors, who are now trying to repeat their success with two 120m Reidsteel bridges, this time over fast flowing rivers.

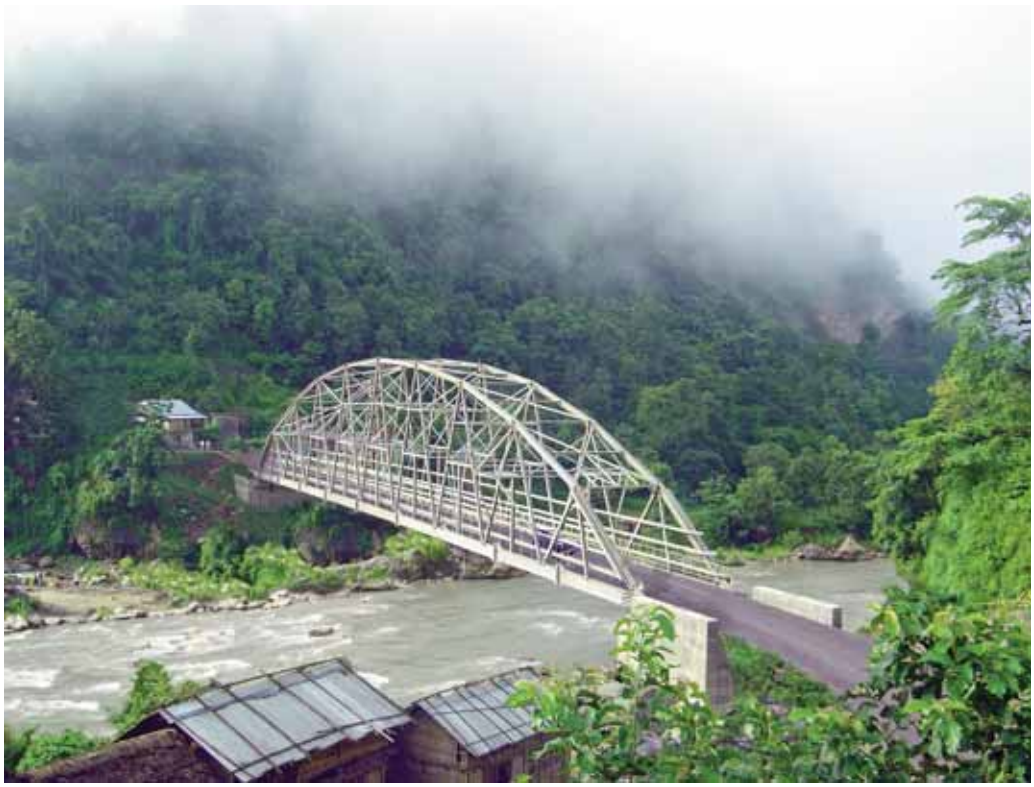

Figure 4. The finished bridge. Designer Peter Mrozinski, Draughtsman Kevin Williams, both of REIDsteel.