On the upgrade

Over 40 bridges in poor or dangerous structural condition are being renovated in Nigeria as part of improvements to highways connecting some of the country's major cities, including Lagos, writes Micha B Petri

The rehabilitation project began in 2017 and is still under way

Owner: Ministry of Works, Nigeria
Contractor: Reynolds Construction Company
Bridge consulting, rehabilitation and design: Kedmor Engineers

The government in Nigeria is improving links between different areas of the republic and, as part of these efforts, hundreds of kilometres of road upgrade projects are being undertaken by the Nigerian Ministry of Works, including the Lagos-Ibadan and Sagamu-Benin expressways.

Under the road upgrades, a large number of bridges were identified as being in poor structural and operational condition, requiring immediate attention in light of stability problems and damage to load-bearing components. The rehabilitation project currently under way began in 2017 and involves interventions on 43 different bridges, including the replacement of expansion joints, railings and sidewalks.

The traffic along the roads in the project is characterised by a large number of trucks that are sometimes loaded beyond their capacity, reaching 60t per truck in some cases, and with no control over the dimensions of the goods carried, in particular their heights. Bridges with varying clearance span the roadways, and bridge strikes are a frequent occurrence. In fact, the majority of the crossings surveyed showed damage to the beams facing the direction of oncoming traffic.

A typical intervention involves taking detailed measurement of the damaged bridge elements, as well as taking samples of concrete and reinforcing steel for analysis.

Damaged beams that require removal are also disassembled for inspection of the stressing cables so that the integrity of the bridge design can be assessed.

Replacement beams are constructed at a dedicated precast plant established at the contractor's site. Their installation also involves the replacement of elastomeric bearings and a concrete pour for a new slab on top of the new beams.

Another common issue encountered is fire damage. Heavy trucks are often in poor mechanical condition and a number of cases of fuel leakage and ignition were witnessed first hand during the project. When this happens, the fuel spilled from a truck often flows through drainage channels, leading to a fire that damages the underside of the bridge.

For fire-damaged bridges, concrete and steel samples are laboratory-tested so that the materials' current tolerance after the effects of fire can be understood. For many fire-damaged bridges, immediate replacement is often not possible due to site limitations and/or seasonal water flow. In these cases, traffic is allowed to continue until restoration can be completed, after which the bridge is monitored for about six months to detect cracking and subsidence. The rehabilitation of the damaged columns and head beams consists of 'jacketing' them with a concrete layer whose capacity is the same as the damaged component.

Restoration work on the bridges is ongoing and progressing at a satisfactory pace in tandem with road resurfacing, an approach that requires the contractor and designer to collaborate and compromise throughout the process. As the work progresses, additional structures can be identified that need restoration, and sometimes renovated structures are identified to have been subsequently damaged by fire or collision

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Most bridges surveyed showed damage caused by overloaded trucks