Inquiry into the circumstances surrounding the closure of the Forth Road Bridge

Supplementary submission to the Infrastructure and Capital investment Committee

Transport Scotland

Please find below additional information in relation to offers we made in our oral evidence on 20\textsuperscript{th} January 2016, to provide the Committee with some further information on the following:

- **The cost of the FRB’s structural monitoring system (Column 21 of the Official Report):**
  
  - The structural health monitoring system is designed to measure global movements of the truss end links, lateral displacements, rotations, temperature and strains in the steelwork, at the location the strain gauges are fitted. From this the stresses in the steelwork, at specific locations, can be calculated to measure the effect of the transient loads (also known as live loads – wind, temperature and traffic.) The instrumented sections of the links can then be used to determine the load effects (stress distribution, bending moments and axial force) and local rotations in the members and at the pin joints. This sophisticated system, which is state of the art, was fitted by Strainstall (who are fitting the new system to the Queensferry Crossing) will cost circa £1.0m to £1.5m to install to all 8 pin joints.

- **The cost of the next phase (Phase 2) of repairs (Column 25):**
  
  - Phase 1 repairs (the splint works) cost in the region of £3.0m. The implementation of the Phase 2 repairs (new bracket arrangement) has been dynamic and rapid with additional resources and short timescales on deliveries used to accommodate an accelerated programme. The Phase 2 repairs will cost circa £2.65m to install at the key 4 no. main span areas (NE, NW, SE, SW). This action will allow the bridge to be re-opened to HGV traffic.
  
  - The cost for Phase 2 repairs at the remaining 4 truss end link locations will not be undertaken as emergency works and will be procured next financial year as planned works via a traditional tender method. The costs to complete the remaining truss end links is estimated to be approximately £2.65m.

- **The cost to replace all linkages (Column 31):**
  
  - The Phase 3 works are not yet fully designed and options will be looked at to achieve best value. It is planned that Phase 3 works will be taken forward at the 4 no. main span areas first. Whilst fully developed
The cost estimates are not yet available, the following give an indication of cost and budget required.

- The preliminary estimate to install the Phase 3 repair works to the 4 main span areas is circa £5.7m, with side span Phase 3 works being similar.

- **A comparison the works proposed in 2009 and the work that is currently being carried out (Column 34);**

  - The nature, scope and structural details of the works proposed in 2009 were not developed to a stage that would allow a comparison. For example, it is not known if a bracket and hanger system would have been taken forward (as our Phase 2) or a bracket and pendulum system moving the load points above the deck. If the latter had been chosen, a complete new bracket system would have been required to be retrofitted within the tower and the tower strengthened to accommodate it. Then additional works to the main deck truss to enable loads to be taken from the top and not the bottom of the truss end link post (this is not the member that failed but the one through which the lower pin passes). All these presume that these modifications and additional works would have possible whilst the bridge remained in use. It is highly unlikely that the costs would have been lower than what has been implemented at Phase 1 and Phase 2 as evidenced by FETA’s original preliminary budget estimates.

  - The work inside the towers, associated with the Truss End Link Bracket weld strengthening of the existing brackets, was initiated/trialled by FETA at the NW tower leg as a trial in May 2015 and completed in summer 2015 by Amey through the handover transition. Similar strengthening works to the other 3 tower legs commenced immediately following the successful trial at the NW tower leg in summer 2015. These works were undertaken by Millar Callaghan, who has been undertaking the Phase 1 and 2 repairs, thus have an intimate knowledge of the bridge. The NW, NE and SE bracket strengthening works are complete and the SW bracket strengthening works will be completed when the Phase 2 scaffolding works are removed from this area to permit access.

Transport Scotland
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