5 BRIDGES

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Summary

Engineers consider 'safety' as the first priority. If the safety is ensured, what can be the next step? Most engineers will say 'Cost-effective'. But if there is an exact answer, it will be the 'Pursuit of the best values'. The 'Cost-effective' will be just one of the best values. I hope the solutions for 5 bridges can give more simple and elegant feelings to engineers.

Keywords: cable stayed bridge; arch bridge; double-tied arch; second tie; incremental launching; free cantilever method; slender bridge; elegance; traditional culture; Hahoe mask.

1. Bridge 1: Baekjeon bridge

As shown in Fig.1, construction is not easy because the pier height is over 100m. Moreover, the site is in a mountain valley. In original design, concrete box girders were designed by FCM and ILM. All of these methods are well-known and proven as economical solutions in this condition. It was a cost-effective design. What was changed in alternative design?

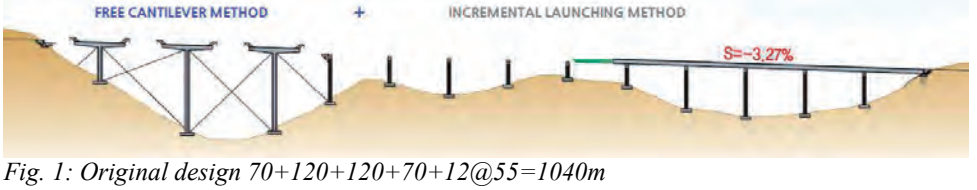

Fig. 1: Original design 70+120+120+70+12@55=1040m

2. Bridge 2: New-millennium bridge (Lot 1)

In this bridge, 510m was required for the length of the main span and 120m was required for the side span. But the road was just 12.5m wide for 2 lanes. Elevation of the deck was located at 45m above sea level. A first problem was that this bridge was too narrow to resist typhoons. This problem was more critical during construction stages. So we studied the well-known solutions such as widening box, separating box, intermediate piers and so on. But by these methods, the cost became increased highly. What solution can be used in this case?

3. Bridge 3: Gyopo bridge

Structural problem was faced that width of the bridge was only 6.6m for single track, but the required span length was 130 m. It was necessary to make the arch robust. As a solution, the concept of secondary ties was introduced to increase the system stiffness. It was called by 'Double Tied Arch System'. Considering these concepts, the bridge became to have a very

unique curve. The efficiency of total bridge system have been dramatically improved due to the cooperated member actions each other.

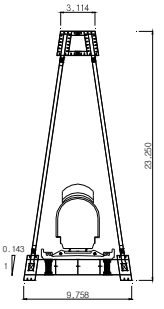

Fig.2: The bridge view (site)

4. Bridge 4: Seohae railway bridge

The original design was a series of 80m long rectangular trusses. It was not 'Cost effective' and it was far from 'Aesthetic'. New bridge was required to be an attractive landmark. Changing was initiated from the analysis of skylines of the bridge site.

Fig. 3: Line studies of Seohae railway bridge

5. Bridge 5: Andong railway bridge

The original concept of Andong bridge was a series of simple truss bridges, *8@80=640m*. After a turn-key competition in 2013, this bridge was totally changed to a twin cross arch bridge. The design philosophy was concluded as 'Imaging from traditional cultures' in order that railway bridges become more friendly to people. The chosen concept was 'Hahoe mask'. Features of the masks convey the expressions of joyful and pleasant feelings, and of the angry and grievous. The Andong railway bridge was designed using the characteristics of Hahoe mask as shown in Fig. 4.

Fig. 4: Hahoe mask dance

6. Conclusions

I introduced 5 bridges in Korea which were focused on 'Best values' rather than 'Cost-effective'. This is reflecting the human-oriented nature to pursuit more valuable one. I feel bridge engineers need to imagine the structures people can enjoy. I hope the presented bridges can give us more simple and elegant feelings.