Nordiska Vägtekniska Förbundet

Förbundsutskott 32, broar och tunnlar

Utmärkelse till en framstående konstruktion inom bro- och tunnelområdet

Nordiska Vägtekniska Förbundet

Stadgar i korthet:

- För ingenjörskonsten viktiga konstruktioner
- Behöver inte vara en ”rekordkonstruktion”
- Nordisk konstruktion som färdigställts de senaste 8 åren
- Priset delas ut vid ViaNordica dvs. en gång vart fjärde år

Nordiska Vägtekniska Förbundet

Val av vinnande konstruktion:

Juryn är förbundsutskott 32.

Medlemmarna i juryn får inte rösta på sina egna länders bidrag.

Nordiska Vägtekniska Förbundet

Nominering:

Tänkbara konstruktioner nomineras av de nationella utskotten inom NVF:s utskott 32.

Varje land får bidra med maximalt två bidrag.

Totalt kan alltså 10 olika konstruktioner bli nominerade.

Nordiska Vägtekniska Förbundet

Nominerade konstruktioner

Bryggebron, Danmark

Öresundsbron, Danmark

Tervalabron, Finland

Götatunneln, Sverige

Årstabron, Sverige

Thjorsabron, Island

Lærdalstunneln, Norge

Svinesundsbron, Norge

Nordiska Vägtekniska Förbundet

The Bridge over Thjorsá River –Þjórsárbrú, Iceland

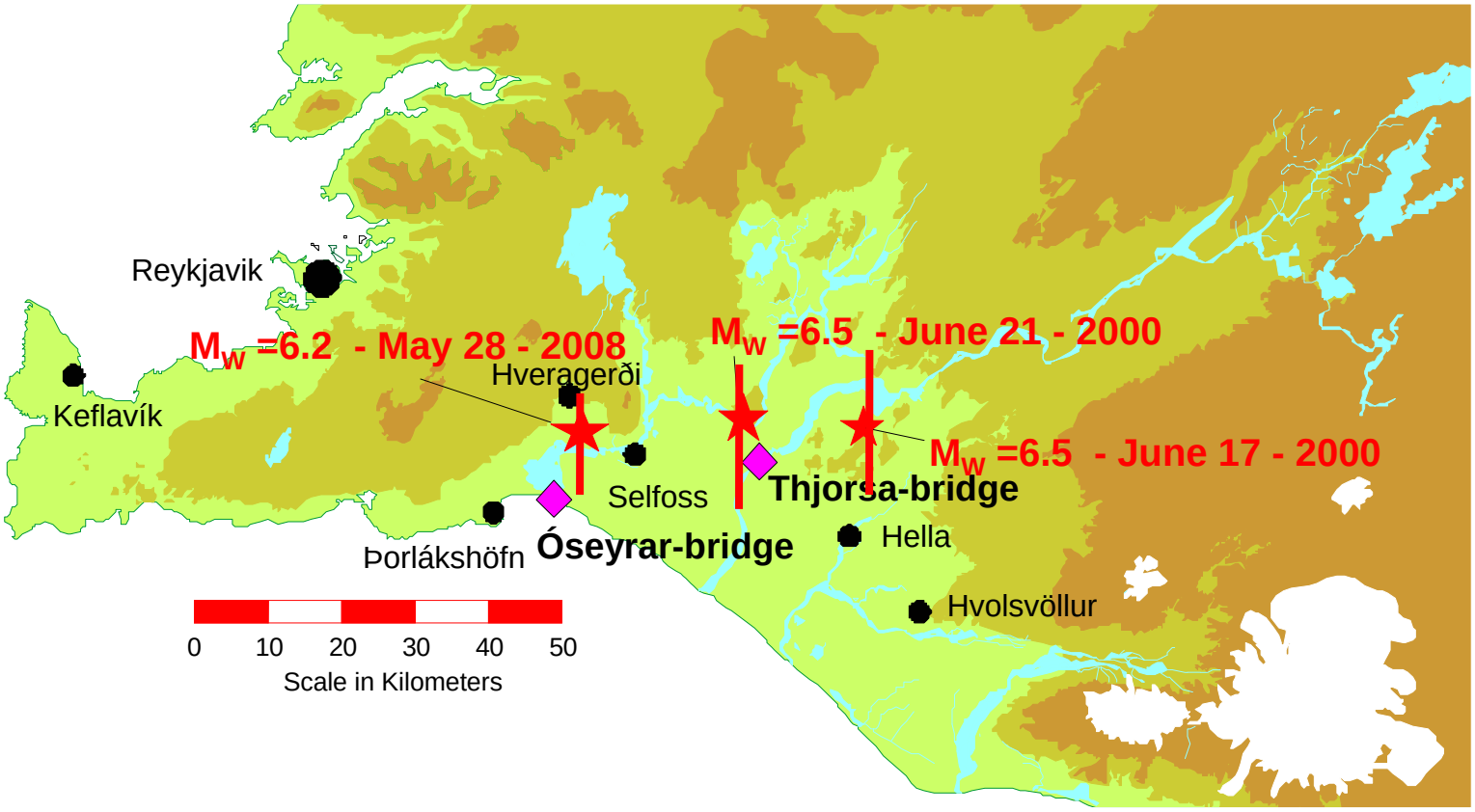
Icelandic Road Authorities

The Bridge over Thjorsá River -Þjórsárbrú

Islandsk kandidat til NVF's utmärkelse till en framstående konstruktion inom bro- och tunnelområdet 2008.

A bridge in an earthquake harassed environment

The South Icelandic Earthquakes of 17th and 21st of June 2000 and 29th of May 2008



The bridge is located on the main road in Iceland, Ring Road 1, in the middle of the south Iceland Seismic Zone where earthquakes up to magnitude of 7 can be expected

Via Nordica 2008 - Einar Haflidason - Icelandic Road Authorties - Bridge Departement

Valuable design data were collected from accelerometers in the old Thjorsa Bridge during the June 2000 earthquakes

- The old bridge was built in 1950.
- In1991 the bridge was “isolated” from the earthquakes by shifting out the conventional steel bearings for lead-rubber bearings. (Base isolation).

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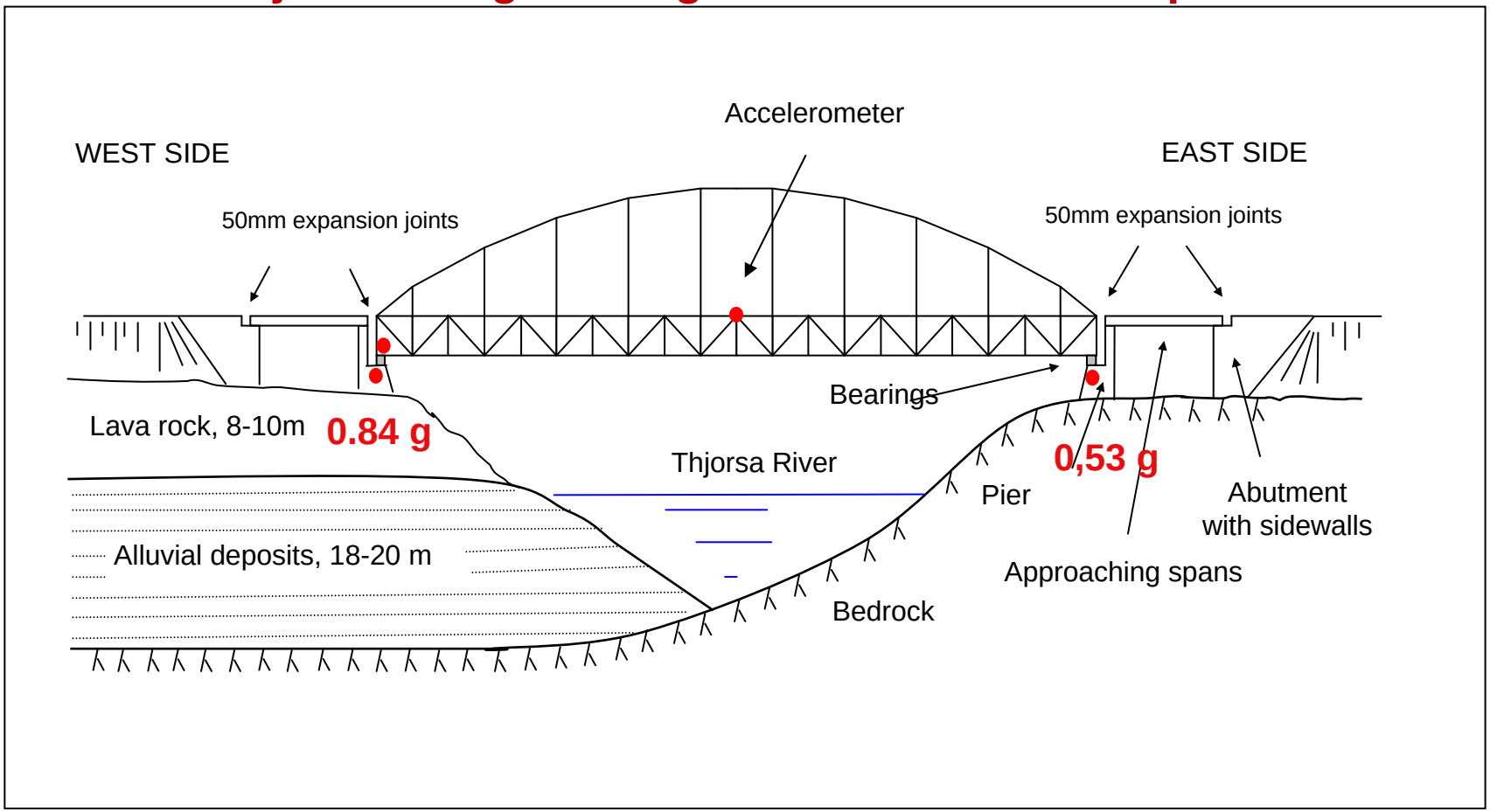

- Soil amplification was observed at the west side of the river.
- The base isolation worked as expected.
- The Lead-Rubber-Bearings deformed plastically and dissipated energy as expected

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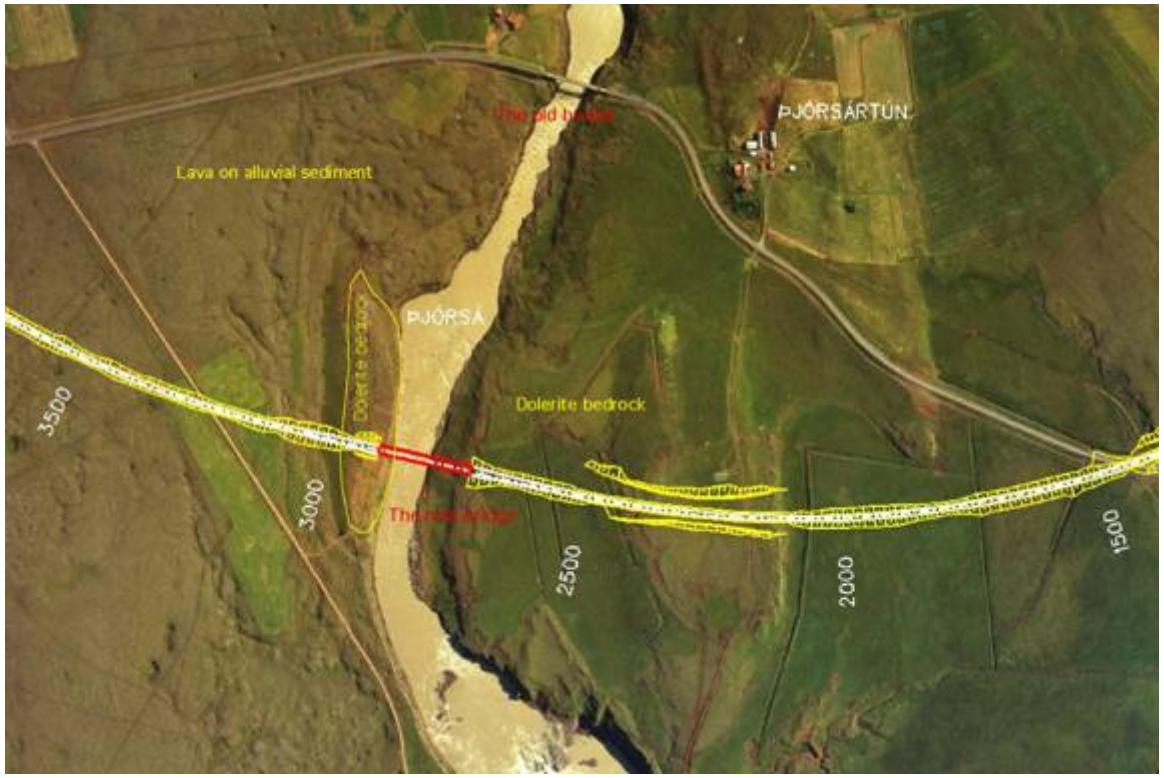
The new bridge is situated 700 m downstream from the old bridge founded on a Basalt bedrock on both sides of the river.

Because of the earthquake impact the flexibility and thus the natural period of the bridge (mode 1) was of great concern.

Several solutions where evaluated:



A composite arch bridge. A rather light and flexible construction. A care has to be taken considering the deflexions due to the earthquake loads.

A post tensioned bridge. Problematic solution due to the heavy weight of the superstructure. More expensive than the composite arch bridge.

A cable stayed or a suspension bridge. Expensive solutions. Problems due to the earthquake impact are minimal

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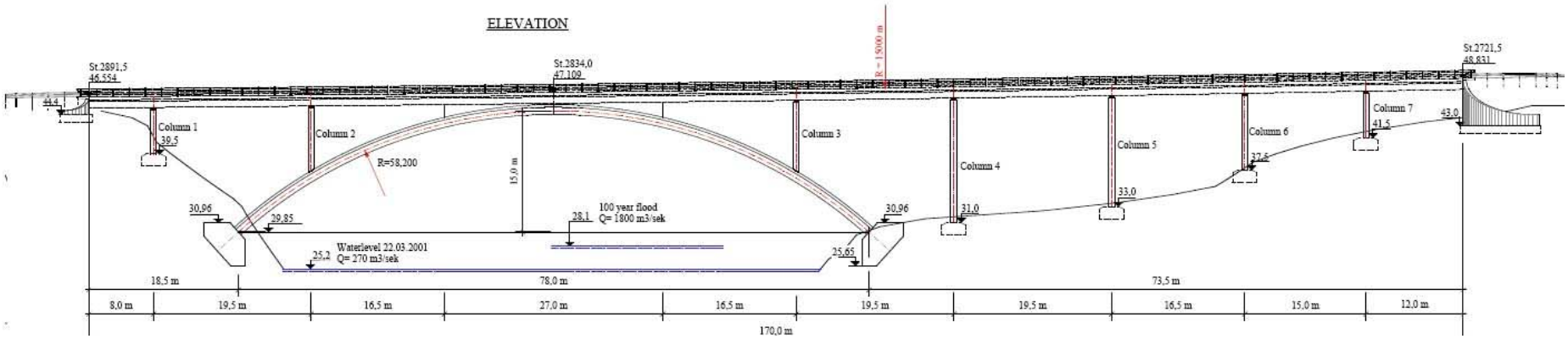
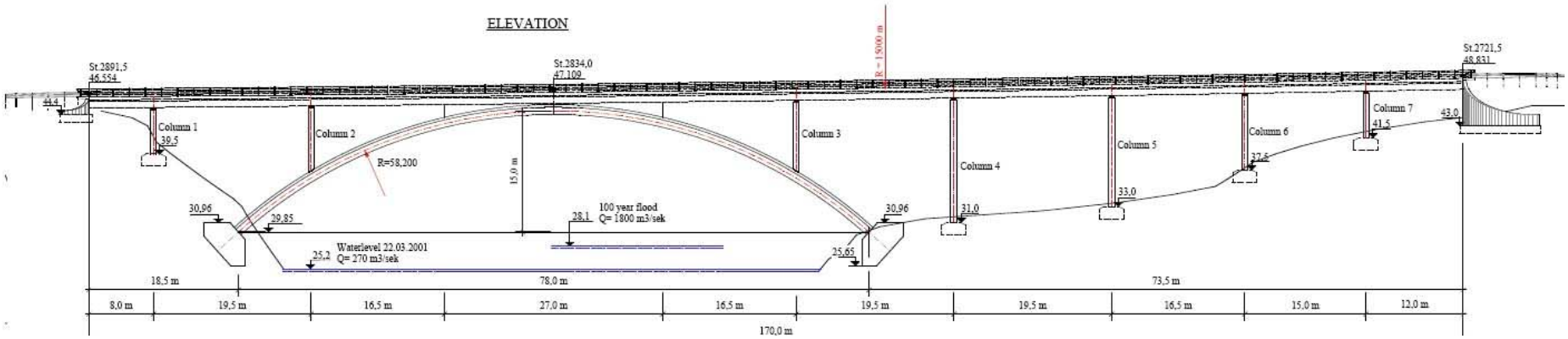
A composite arch bridge was chosen



- The bridge is 170 m long in 9 spans supported with a 78 m long arch and 7 pairs of concrete columns.
- The deck is fixed to the middle section of the arch.
- The arch complies fairly well with the road which crosses the river about 22 m over the riverbed.

The earthquake design



- An earthquake catalogue exists for the South Iceland Seismic Zone for the period from 1700 for all earthquakes with magnitude greater than 6.0.
- Time histories from the South Iceland earthquakes of June 2000 a long with the EL Centro records were used in the earthquake response analysis.
- The earthquake response was calculated using a non-linear time history analysis applied on a full three dimensional FE-model of the bridge.

The bridge deck and the arch is a composite construction of concrete slabs and welded box girders.

The bridge deck and the arch is a composite construction of concrete slabs and welded box girders.

The concrete slabs made of precast plates and in-situ concrete.

- **The columns were heavily reinforced and tied to the rock with ground anchors, the highest column being 15.2 m.**
- **A self compacted fibre reinforced concrete was used and each pair of column was cast in one lot without cold joints.**

- **Lead-Rubber bearings are used on the top of all the columns in order to disipate energy during earthquakes.**
- **The bearings are ø450x156 mm with a ø120 mm lead plug.**

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The bridge was designed at the Icelandic Road Authoritie's Bridge Department with support from Professor Bjarni Bessason at the University of Iceland

Thank you for your attention