

# Eesti Asfaldiliidu 42. ASFALDIPÄEV

- 12.30 - 12.55      **Teede kuumtaastamise kogemused ja väljakutsed**  
*Aivo Salum, Maanteeamet*
- 12.55 - 13.20      **Asfaldi eelsegamise ja termomöötmise mõttekusest, Teedeklastri ja Maanteeameti uuringud**  
*Erko Puusaag, Teede Tehnokeskus*
- 13.20 - 13.45      **Madalamargilise betooni kasutusvõimalused taristuehituses, Teedeklastri uuring**  
*Ain Kendra, Ramboll Eesti*
- 13.45 - 14.10      **Bituumeniuuringu vahetulemused, Maanteeameti uuring**  
*Sven Sillamäe, Tallinna Tehnikakõrgkool*
- 14.10 - 14.40      **Puitsildade olukord Eestis ja Põhjamaade kogemused, Teedeklastri uuring**  
*Per-Anders Fjällström, SP Sweden (inglise keeles)*



Regionaalarengu Fond



Eesti tulnikute heaks

# Timber bridges in Scandinavia

Per-Anders Fjellström

SP Wood, Skellefteå



*The Vik-bridge 1888, photo P-A Fjellström*

# What's about SP and timber bridges?

- International research projects.
- Education.
- Inspections.
- Handbooks and manuals.
- Test projects in laboratory and in field.
- SP Monitor, moisture monitor for timber bridges.
- Our customers are, Trafikverket, universities, manufacturers, local authorities and other companies.



*Full scale test, break load over 900kN, photo P-A Fjellström*



# Long tradition of timber bridges i Sweden

- The history goes back to the time of the Vikings.
- Wood was a common and local material and there were skilled timber men in every village.
- During the restoration of the Lejonström bridge, built 1737, dendrochronology tests on wood samples from the bridge showed that the trees started to grow between 1513 – 1562. They were cut down between 1750 – 1860, and have served as construction material in the bridge ever since.

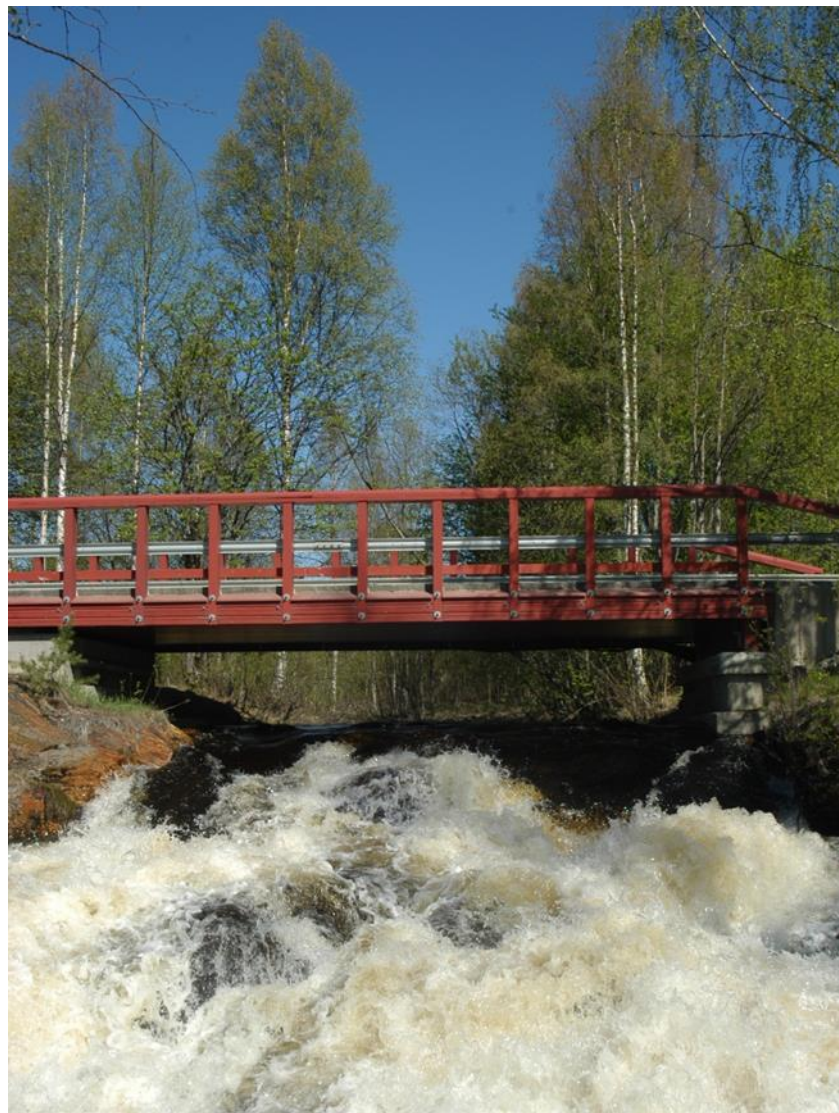
The bridge is 207m and open for traffic and the trees started to grow when Gustav Vasa was the King of Sweden!



*Lejonströms bridge 1737, photo P-A Fjellström.*

# Glulam timber bridges in Sweden

- Wood protection by design, the superstructure is covered with cladding. Dry constructions made of spruce and 80 years service life.
- Simple, semi-open constructions like trusses are made of preserved pine wood. 40 years service life.
- Eurocode 5 and national regulations TRVK, TRVR Bro 11 and TRVAMA
- More than 1000 bridges since 1990, two major manufacturers.



*Road bridge over Klintforsån 1999, photo P-A Fjellström*



# Glulam stress-laminated timber bridge decks

Developed in Canada 1976 and lots of research and adoption for Scandinavia during the Nordic Timber Bridge Project. A robust and simple design, the “key” to road bridges.

- Stressed laminated timber slab bridge in one or more span.
- Stressed-laminated timber T-beam bridge in one or more span.
- Stressed-laminated timber box beam bridge in one or more span.



*Road bridge over Voxnan 2005, photo P-A Fjellström*

# Other types of glulam timber bridges

- Small pedestrian truss bridges.
- Multi-beam bridges.
- Arch bridges.
- Cable stayed bridges.
- Cable suspension bridges.
- King post bridges

But in Sweden there are:

- No Creosote treatment
- No Wood-Concrete composite bridges
- No new covered bridges, yet.



*Älvsbacka pedestrian bridge 2011 and Skeppsvik 1995 ,  
photo P-A Fjellström*





# The key to durable timber bridges: Keep it dry!

- “Guidelines for Wood Protection by Design and Chemical Wood Protection of Timber Bridges” by Keld Henriksen Nordic Timber Bridge Project 1997
- Every bridge should have a maintenance plan.
- Regular inspections, in depth inspection every 6 year.
- Good co-operation between researchers, producers, authorities and owners.
- Continuous development of details and methods.



*Stackgrönnan bridge 2010, photo P-A Fjellström*



# Timber bridges in Norway, trebru

- Statens Vegvesen are very active and manages large projects like Tynset, Da Vinci, Rena and Evenstad.
- Statens Vegvesen have built over 100 new bridges since 1990.
- NTI, Sweco, Norconsult and Moelven are active in the development of timber bridges in Norway.
- The new E6 is a project that have led to many new timber bridges.



*Evenstad 1996, photo P-A Fjellström*

# Timber bridges in Norway



Tynset with a 70m span is a good example of Norwegian timber bridge. Spectacular design, creosote as preservative and copper cladding. They like records and have been talking about 1400m timber bridge over Mjösa in the E6 project.



Very nice details, but they use creosote and the bridges are expensive.



SP Sveriges Tekniska Forskningsinstitut



# Timber bridges in Finland

Very active 1995- 2005 but in the last years there have been no large bridge or research projects in Finland.

- Wood-Concrete composite bridges.

But times are changing 2014 they started a national timber bridge program.

- Two timber bridges in the E18 project between Forsby and Kotka.



# Good examples of timber bridges in Estonia

- Tagavere, Jaruska, Rouge and Pärnu





# The Timber Bridge Advantage

- Economy, good LCC.
- Ecological choice, stores CO<sub>2</sub>.
- Esthetics.
- Wood is a national resource.
- Prefabricated and short construction time at site.
- Light weight construction saves money at the substructure.
- Easy replacement for old steel bridges.



*Dala-Järna 1924, foto P-A Fjellström.*

# Problems with timber bridges?

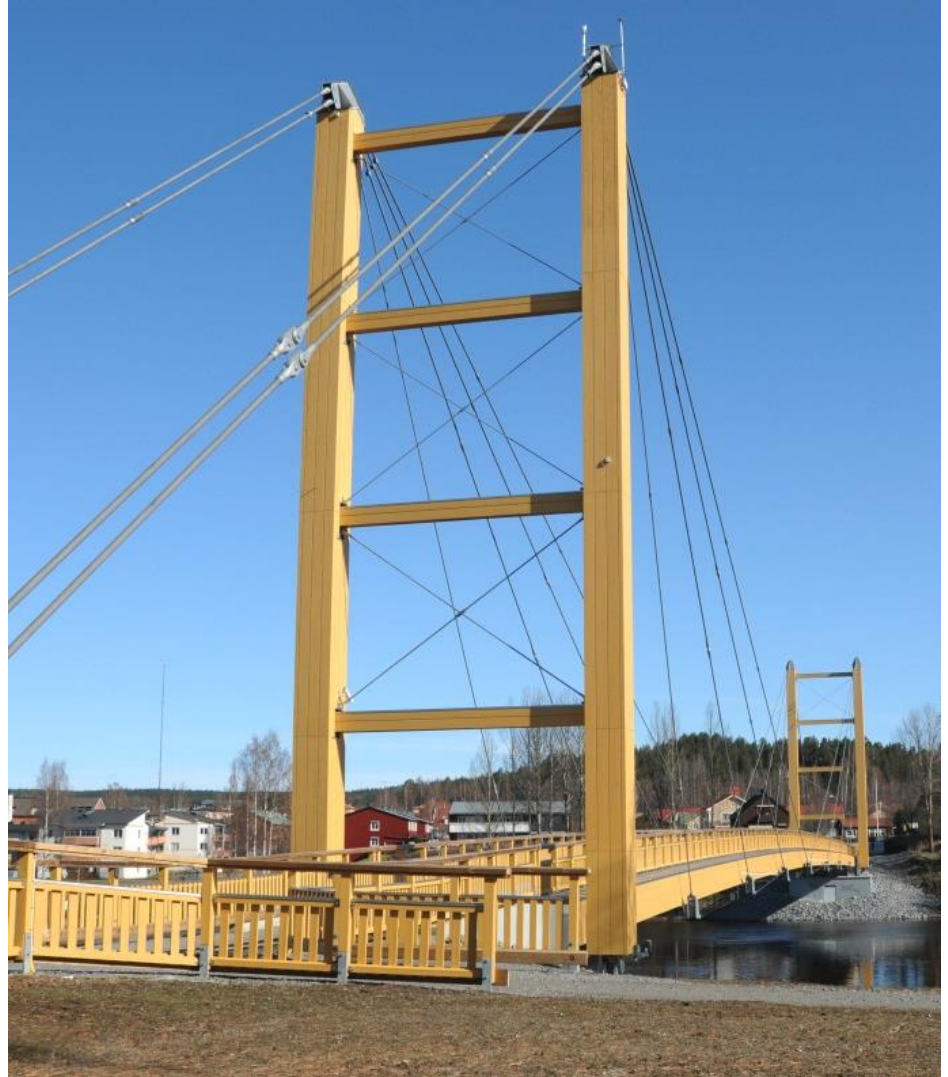
- The use of spruce in a “wet” superstructure.
- Poor or no wood protection by design, no claddings.
- Drainage at the sides of the bridge deck and at deck joints
- No or poor maintenance.
- Paint systems are not durable.
- Poor craftsmanship.





# What's in the timber bridge future?

- Smart bridge, sends information to bridge holder and inspector.
- New simple device for health monitoring.
- Results from all inspections is used to predict future damages.



# Bridges connect people in more than one way



*Dala-Floda 1920 and 1983, foto P-A Fjellström*



SP Sveriges Tekniska Forskningsinstitut



# Why build a timber bridge?

Because it can be the most suitable type of bridge at your bridge site.

Thank you for your time!

