



High Speed Turnouts Banedanmark

New line Copenhagen-Ringsted at Speed 250 m/h

SYM//Intelliswitch 2017.08.28 by Martin Hyldtoft, Banedanmark

banedanmark



Martin Hyldtoft

Technical System Supervisor, Banedanmark

- B.Sc.E Mechanics.
- Employed 1987 at DSB (BDK).
- Great Belt Bridge Track 1987-1997.
- Design, development, tendering and documentation of S&C and fastening systems.
- Leading engineer of High Speed S&C.



Ready for 250 km/h

New High Speed S&C

- Movable nose crossing.
- Sleeper integrated point machines.
- Elastic fastening system.
- LCC optimized design.
- EU tender.

EB-60E2-R1200-1:19



Ready for 250 km/h

Fastening system

Elastic
Fastening



Ready for 250 km/h

Movable Nose Crossing

- German-Austrian S&C design.
- Sleeper integrated point machines.
- >> Alstom MET.
- New interface design for brackets.

Manganese
Cradle



Background

Needing a new turnout design



60E2-R190-1:9
Design 1990

Non Elastic Fastenings

Background

Standard versus high speed S&C at Banedanmark

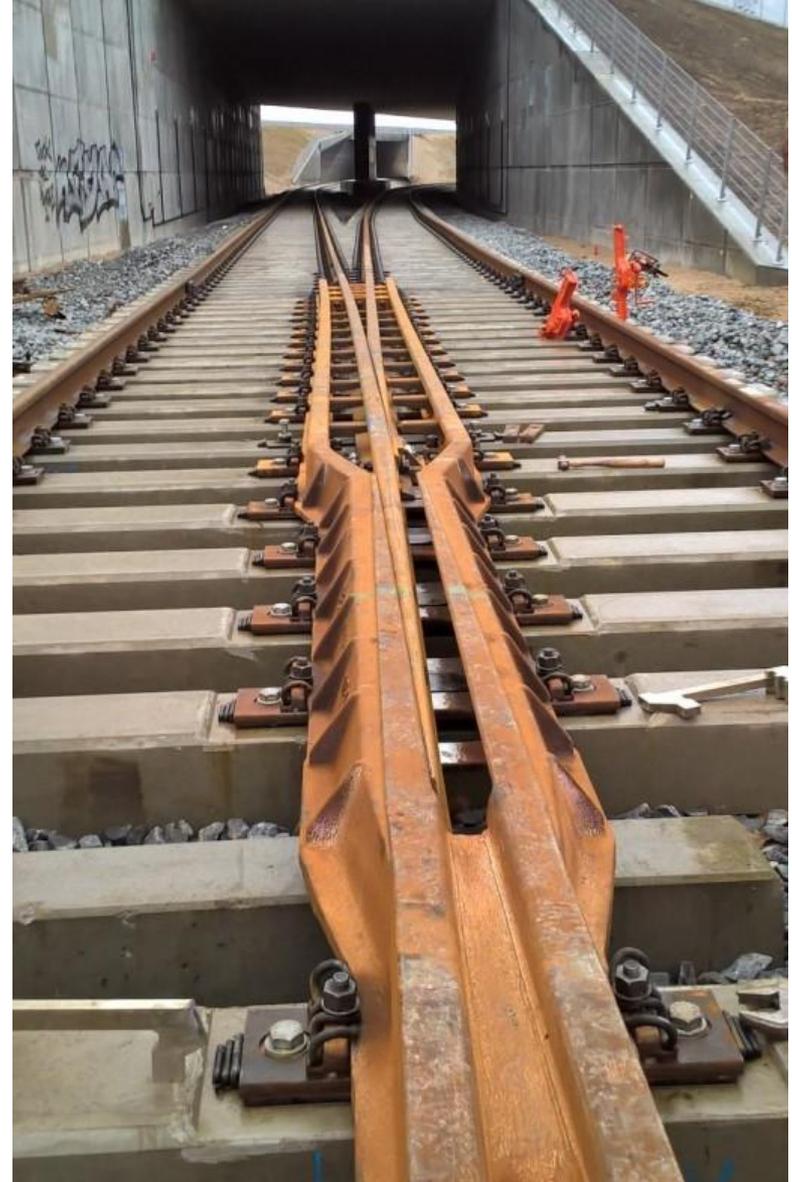
Krav	Design 1990 Existing	Requirements For HSSC
UIC60 rails	✓	✓
Inclination 1:40	✗	✓
Concrete ties	✓	✓
Movable nose crossing	✗	✓
LCC Optimized Elasticity	✗	✓
Adjustable fastening system	✗	✓
Transition Zones	✗	✓
Ties with USP	✗	✓
LCC Optimized Switch blade design	✗	✓



Issues for MNC

Movable nose crossing

- Low dynamics at contact area.
 - >> Reduced maintenance.
 - >> Long life time for crossing.
- Benchmarking.
 - Nordic countries and EU uses movable nose crossings at $v > 200/230$ km/h.
- Two point machines at the MNC.



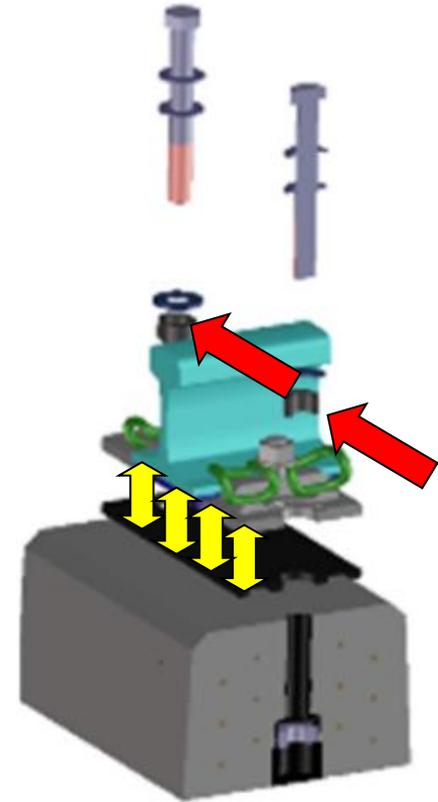
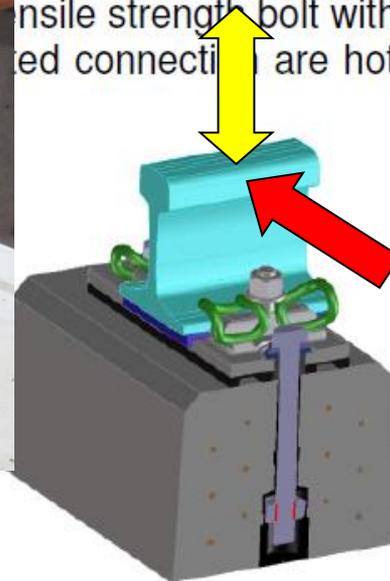
Ready for 250 km/h

Elastic fastening system



1 bolted connections required to fix
position as necessary for

etic tubes and housing for
insile strength bolt with the
ed connecti are hot dip



Elastic fastening system
BWG ERL 30 P

Detailed design

Elastic design

- Research and experience:

HSSC elasticity \leq Track elasticity

- S&C is a very rigid construction >> little deflection.
- Deflection must be put in the fastenings system and USP.
- A soft elasticity will minimize surface fatigue failures.

Elasticity of standard S&C

500 kN/mm

Elasticity of High Speed S&C

40-100 kN/mm

Detailed design

Under Sleeper Pads

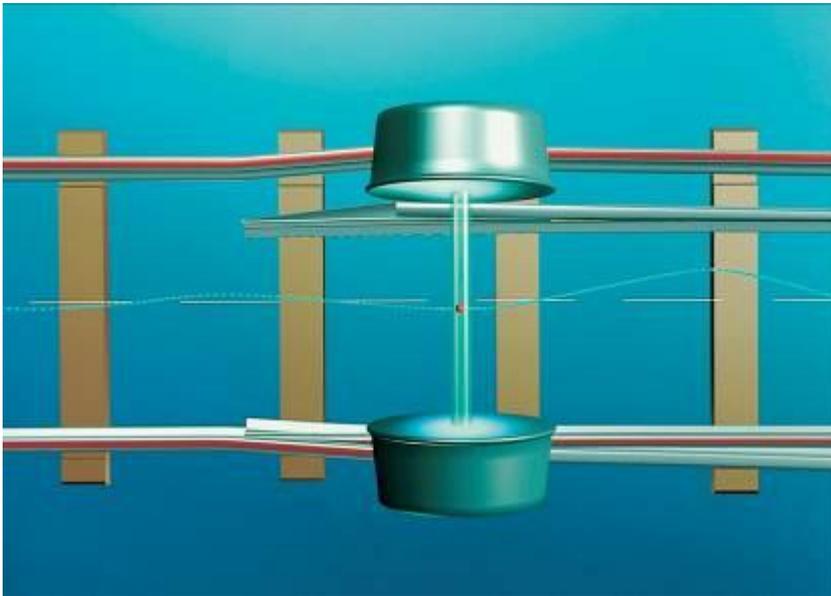
- Research recommends USP to prevent deterioration of the ballast.
- USP optimizes LCC since tamping is reduced and the ballast has a longer life cycle.
- The transition zones will also be equiped with HS S&C ties with USP.



Detailed design

FAKOP - KGO

Kinematic Gauge Optimization



The Basis for Tender

State-of-the-art HS design

- EU tender on functional requirements incl. Dialog rounds.
- We have aimed for well proofend or tested design, using the knowledge of the suppliers.
- Use of research from international surveys as INNOTRACK
- Use of experience and requirements from EU and Nordic Railway Managers.
- Use of our own experience from the resent 25 years of S&C in Banedanmak.
- Art-of-the-state...

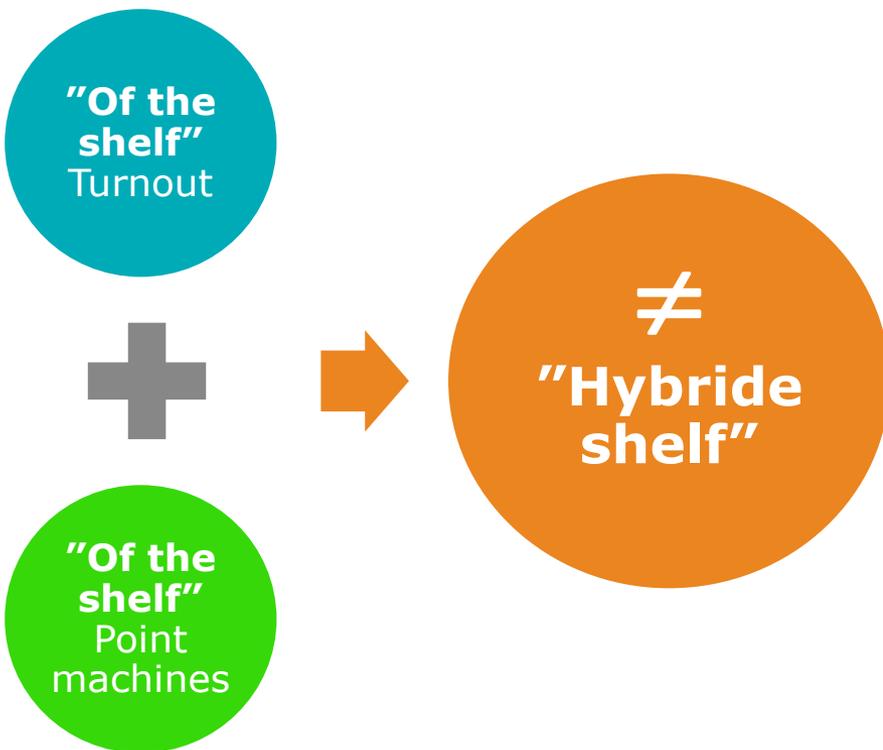
Types of High Speed S&C

Emne	Antal
Single EB 60E2-1:19-R1200	4
Single EB 60E2-1:26,5-R2500	3
Crossover TREB 60E2-1:19-R1200	2
Crossover TREB 60E2-1:27,5-R2500	6
Transition zones 35 meter	Ca. 48

The VoestalpineBWG HS design is based on a DB/German design.
The MNC is a mix of designs from Austria/VAE adapted to Alstom
MET point machines.

Interfaces

New point machines Alstom design



Learning curve

- The complexity and consequence of implementing a new S&C.
- The EU tender process with very few suppliers.
- The interface. S&C >< Point machines.
- Updating the National Standards.
- Approval of the new design.
- My personal involvement as a S&C specialist, project manager, supervisor.

