CLOSER

Nordic HCT - conference
High Capacity Transport - HCT
HCT-program (Closer)

“The program aims to create conditions for introduction of HCT in a designated part of the Swedish road network in describing and developing problem scenarios, development needs, possible solutions and also test and demonstrate these”
This has happened in Sweden about “dimensions” since the HCT-program started

<table>
<thead>
<tr>
<th>Year</th>
<th>Weight (ton)</th>
<th>Length (m)</th>
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<tbody>
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<td>60</td>
<td>25,25</td>
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<tr>
<td>2015</td>
<td>64</td>
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<td>2018</td>
<td>74</td>
<td>25,25</td>
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<tr>
<td>202X</td>
<td>64/74</td>
<td>34,5</td>
</tr>
</tbody>
</table>
Other important steps in Sweden

2013 Roadmap for HCT
2015 Assignment from government about HCT
2018 Introduced PBS (Vehicle regulations for 74 ton)
2019 Updated roadmap for HCT
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>09.30</td>
<td><strong>Introduction</strong>, Thomas Asp, CLOSER</td>
</tr>
<tr>
<td>09.40</td>
<td><strong>Future trends for the freight transport area including HCT</strong>, Jonas Eliasson, Swedish Road Administration</td>
</tr>
<tr>
<td>10.00</td>
<td><strong>Future trends for the freight transport area including HCT</strong>, Anders Åkesson, Swedish Parliament</td>
</tr>
<tr>
<td>10.20</td>
<td><strong>Intelligent Access from an international perspective</strong>, Loes Aarts, Dutch Ministry of Infrastructure and Water Management</td>
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<tr>
<td>10.40</td>
<td><strong>Coffee break</strong></td>
</tr>
<tr>
<td>11.00</td>
<td><strong>Experiences and results from EMS2-research in Netherlands</strong>, Rick Smits, Dutch Ministry of Infrastructure and Water Management</td>
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<tr>
<td>11.15</td>
<td><strong>What is happening within HCT in each Nordic country</strong>, Vesa Männistö, Finnish Transport Infrastructure Agency, Elin Norby, Norwegian Public Road Administration, Martin Frimann Mortensen, Danish Road Directorate, Kenneth Natanaelsson, Swedish Road Administration</td>
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<td>1215</td>
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<td>Topic</td>
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<tr>
<td>13.15</td>
<td>Autofreight, experiences and future challenges</td>
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<tr>
<td>13.30</td>
<td>74 tonne trial in Norway - Status, data collection and experiences so far</td>
</tr>
<tr>
<td>13.45</td>
<td>Analysis of allowing higher weight and dimensions to make transport more efficient and greener</td>
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<tr>
<td>14.00</td>
<td>Pilot projects around Geofencing and Intelligent Access in Sweden</td>
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<td>14.15</td>
<td>Coffee break</td>
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<tr>
<td>14.45</td>
<td>HCT Intermodal - evaluation of system effects for HCT solution linked to rail transport</td>
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<td>15.00</td>
<td>Haulier talks about how they use HCT and problems/opportunities with cross-border traffic</td>
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<tr>
<td>15.15</td>
<td>Intelligent boogies in Trailers</td>
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<td>15.30</td>
<td>Request for new rules for overloads and BK4</td>
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<tr>
<td>15.45</td>
<td>Conference ends</td>
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</table>
The past and future of domestic freight transport

“Everything changes, everything stays the same”
- Zen proverb

Jonas Eliasson
Director Transport Accessibility, Swedish Transport Administration
Professor of Transport Systems, Linköping University
A fossil free transport system

• Electrification goes faster than we thought (esp. heavy vehicles)
  – EU CO2 emission vehicle standards – challenging but (probably) reachable

• Charging infrastructure risks being a bottleneck
  – Static charging seems more and more efficient (compared to dynamic charging)

• Replacing the vehicle fleet takes time!
Carbon emissions per km

New heavy vehicles

New passenger cars

Heavy vehicle fleet

Passenger car fleet
Reaching the Swedish climate targets

Increased road transport

Energy efficiency

Non-fossil energy
With same volume of biofuels as today

Emissions relative to 2010

- 2030 target reached 2035,
- 2045 target reached 2048
Online shopping – a change in scale rather than in kind

• Now 14% of retail; in 2030 ~30% (?)
  – Delivery to door more common

• Logistics systems *qualitatively* (mostly) similar – but *volumes* much larger

• Relatively easy to increase capacity in (most parts of) logistics systems
Online competition fuels the suburban mall trend

• Hard to beat online prices and supply
• Physical stores need to reduce costs and increase product range  
  => suburban super malls

• Inner city retail may try to compete as a “shopping experience”
More efficient transport

- Some potential for more *efficient* transport (higher load factors etc.)
- But – logistics planners are generally smart people
  - Unlikely that substantial efficiency gains go unnoticed
- Ubiquitous sensors and info may facilitate increased load factors etc.
  through better matching of transport demand and available capacity
  - But transport synergies and planning is already the business case for many transport companies

- Allowing and enabling *heavier and longer vehicles* has significant potential
  - Reduces costs, emissions, *and* wear & tear
National infrastructure plan 2022-2033

- More money urgently needed for road maintenance
- Benefits of heavier and longer vehicles
- Investments >80% railway
- (Almost) no room for new investments
End of plan

High-speed rail

Road inv.

Maritime inv.

Rail inv.

Regional inv.

Other

Budget
Modal split of domestic freight transport

<table>
<thead>
<tr>
<th>Year</th>
<th>Road</th>
<th>Rail</th>
<th>Sea</th>
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<tbody>
<tr>
<td>1970</td>
<td>70%</td>
<td>20%</td>
<td>10%</td>
</tr>
<tr>
<td>1980</td>
<td>80%</td>
<td>15%</td>
<td>5%</td>
</tr>
<tr>
<td>1990</td>
<td>90%</td>
<td>5%</td>
<td>5%</td>
</tr>
</tbody>
</table>

**Forecast**

- Road: 90% (2021)
- Rail: 15% (2021)
- Sea: 5% (2021)
Nothing is more applicable than good theory.
“Everything changes, everything stays the same”

• Fossil free vehicles huge change for the *vehicle* industry – less so for the transportation industry
• Online shopping a change in scale (*volume*) rather than in kind (*systems*)
• Increased efficiency good – but don’t expect substantial savings in VKT
  – Heavier and longer vehicles very efficient in terms of costs, emissions etc.
• Changes in modal splits most likely limited
Nordic HCT Conference 2021

The Conference starts again 11.00

closer.lindholmen.se
www.linkedin.com/company/closerse
Recap of the last 2 years and future steps

Approval Proces EMS2 in the Netherlands

Recap of the last 2 years and future steps

Rick Smits
8th of December 2021
Rijkswaterstaat

- Dutch National Road Authority
  - Roads, waterways, Dikes (water protection)
- Governmental Organisation and part of Ministry of Infrastructure and Waterways
Introduction

- Rick Smits
- Advisor Freight Transport
- 2 year at Rijkswaterstaat
- Msc Civil Engineering
  - Transport Infrastructure & Logistics
- Major Projects:
  - Approval EMS2 team
  - Container data in the logistic chain
  - Corenetwork Logistics
Last Update beginning 2020

- 21 January 2020
- Mini-Symposium on Super Eco-Combis
- Helsinki

- In the Netherlands the EMS2 Approval team started
Organisations involved

- Ministry of Infrastructure and Waterways
- RDW (Dutch type-approval authority)
- Transport Logistic Netherlands
- Rijkswaterstaat (Road Authority)
- Transport Company
- TNO (Dutch Organisation for Scientific Research)

The Transport Company is paying in the Netherlands!
EMS2 approval team

Ministry of Infrastructure and Waterways

RDW (Dutch type-approval authority)

Transport Logistic Netherlands

Rijkswaterstaat (Road Authority)

Transport Company

TNO (Dutch Organisation for Scientific Research)

SWOV
Political Influences on the process

1. Traffic Safety

2. Costs for infrastructure
Dutch legal characteristics

• EMS1 accepted since 2006
• Regular Freight Traffic max. 50tonnes
• Infrastructure is designed with higher standards than European minimum
Recap last year

- Nov 2020 – May 2021
- Risk Analysis
- Over 300 risks analyzed
Vehicle test at RDW

• June 2021

• Negative advice on performance:
  – Acceleration speed
  – 1100 metres for onramp
  – Curves and underlying road network
Infrastructure test

- Two Bridges (Concrete and Steel)
- Impact comparison with regular traffic
Vehicles
Measurements
Coming steps

• Results Infrastructure Test
  – Extra funding from the Ministry
• No route based approach, but based on road characteristics!
• Cooperative attitude RDW
  – For now!
Conclusion

• Innovations are difficult to implement!
• New solutions are too often put into an existing approval proces

• Do you recognize the problems that the Netherlands are facing in the proces regarding the EMS2?
Thank you for listening

• Additional Questions?
What is happening within HCT in Finland?

Vesa Männistö

Nordisk HCT Årskonferens 2021

8.12.2021
Topics Today

- History of HCT
- Latest Experiences
- Winter Premium
- Plans for the Future
History of HCT
The Decree of Masses and Dimensions 1.10.2013

- Maximum allowed total weight was increased from 60 to 76 tonnes
- Maximum permitted height was increased from 4,2 to 4,4 meters
- The purpose of the reform was to improve Finland’s competitiveness and reduce transport costs
- Well and rapidly adapted by industries

Nordisk HCT Årskonferens 2021
HCT Trials

- Finnish Transport and Communications Agency granted HCT permits since 2013

- The goal of trials was to develop technology of bigger vehicle combinations and their suitability to Finnish transport system

- The trials have fulfilled their function and only few are being started
  - Industries want to have “more permanent permits”
The Decree of Long Vehicle Combinations 21.1.2019

- Based on the experiences from the HCT trials and needs of industries
- The new decree came into force on 21.1.2019, the main contents were
  - The maximum length of a vehicle combination increased from 25,25 to 34,5 metres.
  - Applies to the entire road, street and private road networks

Becoming business as usual. Volumes are increasing steadily.
Main users of longer vehicle combinations

• Regular long distance transport
  • Parcelled goods, mail (big volumes)
  • Food products to supermarkets
• Container traffic (harbours)
• Wood chips
• Plank, board and cardboard

• Every week new ideas pop up!
Monitoring of >28m combinations
Experiences (1)

• Our current traffic systems serves rather well long distance transport, especially on main road network.

• There are only few problematic crossings. This highlight the need to provide suitable parking places for trailers.

• HCT – “long and heavy” kill two birds with one stone: transport costs and emissions decrease hand in hand

• Longer vehicles and combinations brought big benefits to parcelled goods transportation. However, higher masses (80-84 t) are needed to reclaims full benefits of lenght, e.g. in container transport
Experiences (2)

• Tight technical requirements (stability, safety, turnability) and wide network seem to be right decisions

• Share of long combinations is really high in long distance transport

• However, HCT is not only long distance story – it is widely used e.g. in short transportation between factories and harbours

• Accidents can not be fully avoided, but reasons are the same irrespectively of ”HCT or not”

• Productivity of drivers is in many cases > 30 % higher than EU average

• Emissions per performance are also more than 25 % lower

Otto Lahti
Senior Advisor
**Experiences (3)**

- HCT is decreasing fuel consumption per transportation unit, and brings necessary savings to the branch
- HCT-pilots have activated road and bridge stress research in several countries
- HCT is not competing against forest product railway transport, but complements it
  - by HCT from the forest to railway loading terminal
Winter premium
Winter Premium: Utilisation of frozen road structures in heavy transport

University of Oulu and Finnish Meteorological Institute

2020-2022
Winter Premium in brief

Research questions:

1. How deep frost is needed for Winter Premium?
2. How can the frost depth be measured in a reliable way?
3. How to evaluate road network bearing capacity in a larger scale?
4. Would a road section based maximum allowed weight be feasible in the future?
Plans for the Future
Higher maximum weights?

• There is a demand for higher (84/90/XX t) maximum weight
• A more complicated issue than increase of other dimensions
• Can not be allowed to the entire road network
• No political decision made so far – was not included in the new long term transport plan

• Bottlenecks for current dimensions are again investigated
• 400 weight restricted bridges, how many of those are critical?
Thanks!

More info:
vesa.mannisto@vayla.fi
HCT-conference in Gothenburg
December 8th. 2021

Martin Frimann Mortensen
Danish Road Directorate (DRD)

Analysis af DUO2
Background

- Political agreement regarding green transition of the road transport on 4th of December 2020:

- Initiate an analysis regarding DUO2 (EMS2):
  - The curves/circulation area, hereby the need for road-space
  - Impact on traffic and traffic-safety
  - Technical demands for the vehicle and trailers
  - Economical consequences for society and business
  - CO2-reduction potential
  - Is it possible to have a road net for DUO2 in Denmark

- The analysis is made by the DRD (road) and the DRSA (vehicles)
  - It will be finish in late 2021
External analysis

• As part of the analysis we asked Sweco as an advisor to collect knowledge from European countries, who have any experience with the DUO2-vehicle.

• The frame for this task:
  • *The analysis must examine and describe the available and used international solutions for longer road trains of 32-34 meters, including advantages and disadvantages in some areas. However, the focus must primarily be on road trains of the type DUO2 (A-double).*
Focus areas

- Legislation (applicable rules, norms, guidelines, etc.)
  - EMS (EU-notifications "available")
- Vehicles
  - Maneuverability (turning radius corresponding to standards, etc.)
  - Supplementary rules in relation to EU/1230/2012 (increase passive and active security)
- Infrastructure
  - Traffic security
  - Adjustment / adaption of existing crossings and constructions
Method and countrys in the study

- Desk-top study
  - Literature study
  - Questionnaires
  - Interviews

- Countrys:
  - Finland
  - Sverige
  - Tyskland
  - Holland
  - Spanien

- Questionnaires to these countries
  - Similar to Vejdirektoratet
  - Similar to Færdselsstyrelsen
  - Similar to the Ministry of Transport
  - Interest organizations

- Low response rate - especially from Germany

- Interviews with Spain and Holland
Legislation

- As the EMS 25,25 m, the EMS2 is based on EF/96/53 art. 4, part 4 or part 5

- The EMS2 (DUO2):
  - Finland: Incorporated in ”Vägtrafiklagen” (on art. 4 part 4.)
  - Spain: Trials with operators on specific routes and specific vehicles (on art. 4 part 4.)
  - Sweden: Special permits for operators on specific routes and specific vehicles (on art. 4 part 5.)
  - Holland: Pilot trials and studies (on art. 4 part 4.)
  - Tyskland: Not allowed
  - Danmark: Not allowed
Legislation / EU-notifications – EMS2

• Response from the EU Commission:

• Indicates that there may be notifications in connection with pilot projects.

• In addition, reference is made to national legislation where vehicles, which exceeds the length requirement and the total weight limit, respectively, is permitted – cf. Directive EF/96/53, article 4, part 4
Vehicles in the EMS2

- Legal or dispensation to pilot projects.
- Similar demands to vehicles as for the EMS 25,25 m
- It is assumed that type-approved vehicles are used – as below:
  - Dimensions for width, length, height and allowed mass / weight
  - Turning ratio (regulation EU/1230/2012)
  - Demands for brakes
  - Demands for traction
  - From zero start on ascent
Vehicles EMS2 – additional demands

- Most common:
  - ATC (automatic traction-control)
  - EBS (electronic brake system)
  - ESC (electronic stability system)
  - Lane assistant
- Automatic distance control
- Additional mirrors and cameras
### Vehicles EMS/EMS2 – weight and length

<table>
<thead>
<tr>
<th>Country</th>
<th>Directive 96/53</th>
<th>Weight</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>Modular (art 4, 4)</td>
<td>40 (44) t</td>
<td>Max 25,25 m</td>
</tr>
<tr>
<td>Sweden</td>
<td>Trial (art 4, 5)</td>
<td>74 (90) t</td>
<td>Max 34,5 m¹</td>
</tr>
<tr>
<td>Finland</td>
<td>Modular (art 4, 4)</td>
<td>76 (104) t</td>
<td>Max 34,5 m</td>
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<tr>
<td>Spain</td>
<td>Trial (art 4, 5)</td>
<td>70 t</td>
<td>Max 32 m²</td>
</tr>
<tr>
<td>Holland</td>
<td>Trial (art 4, 5)</td>
<td>72 t</td>
<td>Max 32 m³</td>
</tr>
<tr>
<td>Denmark</td>
<td>Trial (art 4, 5)</td>
<td>60 t</td>
<td>Max 25,25</td>
</tr>
</tbody>
</table>

Remarks:

¹ Pilots. Fully granted in 2030 (expected)
² Pilots on specific routes
³ Literature study closed in 2021. Pilots on standby for now.
Infrastructure

Focus areas:

• Constructions (bridges) and geometry
• Traffic security
• Capacity
• Weight
• Driving path and demand for road-space
Traffic safety

• Equivalent as ordinary trucks / road trains:
  • Keep the different traffic users divided
  • Focus on known challenges (eg. right turn)

• The assessments, including accident data, tend to ensure that road safety is not impaired based on:
  • Routes that are suitable for heavy vehicles
  • Reduction of number of vehicles, based on experiences from EMS 25,25 (Germany and Holland)
Traffic safety 2

• Though:

• As the longer EMS and EMS2 primarily only uses more secure roads, with no or very few vulnerable road users, there are little empirical data on accidents = therefore a cautious approach is needed
Summary

• DUO2 is legal in Finland. In Spain and Sweden as pilot-project.
• Vehicle demands as in directive 96/53
• Infrastructure: some adjustments are needed
• Traffic safety
  • The experience from EMS 25.25 m as well as driving in Spain and Finland does not indicate increased risk *(assuming driving on the designated routes)*
  • A theoretical approach, from the Netherlands, points to risks regarding city driving. The risks correspond to driving with trucks (right turns, etc.). **But cautious approach**
• Possible environmental gain – though the same source is used
Thank you for listening.

Martin Frimann Mortensen
Vejdirektoratet
(Danish Road Directorate)

Mail: mfm@vd.dk

Tel.: + 45 7244 2711
HCT – Status in Norway 2021

Elin Elisabeth Norby
08.12.2021
EMS on the timber road network

- EMS 25.25 m: 5 500 km
- Timber 24 m: 55 000 km
- Consultation announced September 2019
  - EMS permitted on the entire 24 m timber road network
  - EMS type 1, 2 and 4
  - Adjusted tracking requirements
- Consultation period March – May 2020
- Responses
  - Transport industry, industry in general – very positive
  - Road owners (counties and municipalities) – less positive
EMS on the timber road network

• Conclusion – EMS would *not* be permitted on all roads permitted for 24 m timber transports

• Road owners’ decision to open or not

• As of October 2021
  • Almost all national roads
  • County roads ≈ 20 %
  • Municipality roads ≈ 7.5 %

• Ongoing process to open more roads
60 tonnes on roads limited to 8 t axle load

- BkT8 – 8 t single axle load, 50 or 40 t total weight
- County roads ≈ 30 %, municipality roads ≈ 15 %
- Initiative by the Norwegian Forest Owners’ Federation

- Public consultation December 2021 – March 2022
- Road owners’ decision to permit on their roads
- Earliest expected entry into force November 2022

<table>
<thead>
<tr>
<th>Veg</th>
<th>Vegstrekning</th>
<th>Veglengde (km)</th>
<th>Bk/totalet (tonn)</th>
<th>Bk/totalet vinter (tonn)</th>
<th>Tillatt vogntoglengde (m)</th>
<th>Tillatt for modulvogntog 1 og 2 med sporingskrav</th>
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<td>Dovreskogen x kv. - Sæstrom - Angard - Haugen x arm</td>
<td>10.266</td>
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<td><strong>Bk10/60</strong></td>
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</table>
60 tonnes on roads limited to 8 t axle load

- Proposed permitted weights
  - 9 axles (4 + 5) 60 tonnes
  - 8 axles (4 + 4) 58 tonnes
  - 8 axles (3 + 5) 55 tonnes
  - 7 axles (3 + 4) 52 tonnes

- Additional requirements
  - Distance from first to last axle at least 19.00 m
  - Motor vehicles must have two driving axles
  - Trailers must have twin mounted tires

- Timber transports and EMS types 1, 2 and 4 (24 m combination)
Other developments

• 74 tonne trial for timber transport – finally started!

• Next steps - increased weights for regular vehicle combinations?
Det går inte att visa bilden.
elin.norby@vegvesen.no
HCT Status in Sweden

Nordic HCT conference 2021
Kenneth Natanaelsson, Trafikverket
Agenda - HCT

• Status – implementation of BK4 at the Swedish road network

• Goals for future implementation of BK4 in the proposal of a new National plan for infrastructure 2022-2033

• The status of the implementation of longer vehicles
Max tillåten bruttovikt (ton)

Status of BK4 at the Swedish road network

Implementation plan – April 2020

National

BK4 - 2019
- State roads 20 %
- Strategic network 30 %

BK4 - 2022
- State roads 33 %
- Strategic network 52 %

BK4 - 2025
- State roads 40 %
- Strategic network 60 %

There are also other road administrators in Sweden (private and municipalities)
Facts and predictions of the progress for opening the network for BK4

**Status – end of 2020**
- Approximately 26% of the state roads are open for BK4
- Approximately 40% of the strategic roads are open for BK4

**Implementation plan – 2023**
- An ambition to open up to 40% of the state roads for BK4 until the end of 2023
- An ambition to open up to 60% of the strategic roads for BK4 until the end of 2023

An increase by 6 percent for the state roads and 10 percent for the strategic roads over a year

According to the new plan 2021 we will reach the goals we set for 2025 already at the end of 2023.

Link for implementation plan: https://www.trafikverket.se/for-dig-i-branschen/vag/bk--barighetsklasser-pa-vagar-och-broar

Upplåtet vägnät 2020
Approximately 4000 km within a year from decision

Additionally 500 km at 2025, might be changed due to the update of the National plan for infrastructure

Socio-economic analysis

• Benefits = 1 – 1,4 billion Euro
• Costs > 10 million Euro (tight roundabouts, road width in urban areas)
Thanks
Nordic HCT Conference 2021

The Conference starts again 13.15

closer.lindholmen.se
www.linkedin.com/company/closerse
AutoFreight
Experiences & Future Challenges

CLOSER Nordic HCT Conference 2021

Sara Thiel, Borås Stad
Lena Larsson, Volvo Technology

Link to film
AUTOFREIGHT-I (HAFT Highly Automated Freight Transport) ➔ AF-II

2017-2018: Automatization and self-driving units. REVERE truck & trailers
2019: Logistics
2020-2022: Field test (1 truck, 1 dolly & 5 trailers)
            Driver support functions, steering forces & traction
            Analysis of container flow + Time- & Fuel consumption
2020: COVID 19 effects on the container flow

2022 & forward: Logistics
            Expansion towards implementation of 34,5m roadnetwork
            Distributed propulsion & driver support
January 2020 to December 2021
➔ 2 years experiences

**Successes**
- Proven CO₂ reduction
- Fewer trucks on RV40
- Requested by transport buyers
- Borås Multi Client System opens for horizontal collaborations
- Shared result & knowledge
- Flexibility between companies –less seasonal variation.

**Challenges**
- All transport buyers want their loaded containers in the morning
- Matching of containers
- Find time thefts
- Find skilled drivers
- Make reverse manoeuvres easier
- Towards Zero emission
BACKGROUND TO AUTO FREIGHT – 2015/2016

Purpose:
Borås Stad, to support companies and stimulate efficient logistic traffic systems.
Volvo Technology, to test new technology and HCT solutions.

CITY OF BORÅS

- Leading e-commerce HUB
- Expansion of Viareds logistics center
- E-commerce drives logistics development with extreme demands on collaboration and business logistics
- The city has chosen to be proactivity in business logistics and environmental solutions

VOLVO

- Development and testing of autonomous solutions close to Gothenburg for:
  - Higher transport productivity
  - Increased Safety
  - HCT – combinations

Common possibility? YES!
Results

Logistics
- Reduced numbers of road trips
- The vehicle is capable to transport 2-3 times more cargo

Organization
- New horizontal collaboration methods “Borås Multi Client System”
- Transparency

Technology & environment impact
- Today 34% less fuel consumption only with import
- Reduction with 50% less fuel consumption can be achieved in coming project with technical or logistic improvements
- Safety and driver support system
- Data collection for automation systems
Borås the “HCT City”
Borås Multi Client System Vision

Port of Gothenburg

3 trips / day / combination

Autofreight HCT
3 combinations

Dry port

Local partner company in collaboration with GDL

Some empty containers can go to Volvo Buses for export

Import / export

Viared

VOLVO Buses

Outside Borås

Import / export

Outside Borås

VOLVO Buses

2021-12-08
HCT_Nordic_conference_AF_Sara_Thiel__Lena_Larsson
**Volvo & Chalmers Research vehicle**
Research platform
Test track
Fully sensor equipped
Full actuation, multiple lifting axles

**Volvo & GDL Research vehicle**
Daily operation
Public roads
Subset of sensors
Data collection, 1 liftable axle
Energy consumption to transport containers Loaded to Viared & empty to Gothenburg harbour

Hypothesis
DUO-trailer transportation will always be more energy efficient than single trailer

Up to now there has been no transport of 2 x 45 foot due to the dolly available
Container variation Autofreight
March to October 2021

Type of Containers

- 20 fot
- 40 fot
- 40 fot high cube
- 40 fot high cube refrigerated
- 45 fot high cube

2021-12-08
Research question & targets for coming 2 years

**RQ – For Container haulage between Göteborg Harbour & Borås City and surroundings with HCT combinations.**

1. How can the logistic system be more effective?
2. How shall driver support systems be designed for safe and effective transports?
3. What effectivity improvements can be achieved with electrification of vehicles?
4. How can business models be designed to support more effective transport?

**Targets:**

1. Increased number of Containers per HCT-combination and day with 30-50%
2. Lowered energy consumption for containers in Viared and Göteborg harbour with 10%
3. Test of new technology for distributed propulsion in DUO-trailer.
4. Possibility for lower energy consumption with electric driven trailing unit/s for HCT with 10%. 
5. Lower cost for container transportation compared between Göteborg & Viared with 10-20%
6. Reduced time for reversing of DUO-trailer (support & lifted/steered/driven axles) with 20%
Passage through Borås RV40
Over 64 tonnes by RV27 & RV41
Reversing support, Viared
Gothenburg harbor
- Queuing
- Reversing
Thanks to all partners and Closer!

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74 tonne timber transport trial

Status, data collection and experiences so far

Elin Elisabeth Norby
08.12.2021
Background

• Current max weight for 24 m timber transports is 60 tonnes

• Decision by the Norwegian Parliament and assignment from the Ministry of transport and communications to establish a trial for 74 t timber transports

• The trial aims to gather information about
  • Traffic safety
  • Accessibility
  • Emissions and environmental effects
  • Impact on roads and bridges
  • Transport costs
About the trial – trial area and vehicles

Trial area
• 11 municipalities in Innlandet
• National, county and municipality roads
• Trial area bordering with Sweden

Trial vehicles
• 24 m, 74 tonne vehicle combinations
  • Participants must also supply a 60 tonne reference vehicle, providing the same data as the trial vehicles.
Vehicle combinations

- Originally planned with 74 tonne combinations
  - 9 axles
  - 4-axle truck (32 t) and 5-axle trailer (42 t)

- However...

- 68 tonne combinations
  - 8 axles
  - 4-axle truck (32 t) and 4-axle trailer (36 t)

- 65 tonne combinations
  - 8 axles
  - 3-axle truck (26 t) and 5-axle trailer (39 t)
Status December 2021

• 1 April – 30 June Preliminary project – «pre-pilot»
  • Objectives
    • To develop and establish a system for collecting and processing vehicle data.
    • The system will collect data in a comparable format, independent of vehicle manufacturer.
  • 4 participating transport companies, 7 trucks and 11 trailers
  • Full use of the designated road network

Trial period July 2021 – July 2024
• Currently 10 trucks, 20 trailers, 4 transport companies
• Expected to add 6 trucks and 7 trailers, 1 additional company
• Deadline for participation – order placed for new vehicles no later than 31 December 2021
• Permits valid until July 2026
Online map of the trial area and road network
Current main activities

• Socioeconomic analysis by TØI
• Research on road technology
  • Report on pump effect during spring thaw
  • Programme to select and monitor heavily exposed roads
  • Master thesis on road degradation
• Trial with sensors to monitor stress spans in on steel bridges, how heavy goods transport affects steel bridges and to see if stress can be attributed to 74 tonne combinations
• Comparison of 3 different systems to monitor traffic loads
  • Automatic traffic sensors
  • Bridge WIM
  • Kistler
Data collection - overview

According to the permit for participation in the trial, the transport companies must agree to provide the following data:

Continuous registration

• Position data, GPS
• Data from gyros - sideways motion, acceleration and retardation. Additionally, limited trials in agreement with manufacturer and transport company to collect ESP data
• Axle loads and total weight
• Driving speed
• Fuel consumption
• Braking. Additionally, limited trials in agreement with manufacturer and transport company to collect ABS data and frequency of braking
• Engine running time, engine speed, idle time, crane time and use of cruise control

Manually reported to the NPRA

• Accidents and undesired incidents
• Costs of running and maintenance
• Investment cost of vehicles
• Number of axles and vehicle configuration
• Tire wear and tire pressure
• Calibration of on-board weighing systems
Linx – a cloud-based, brand neutral solution for data collection and information services related to commercial vehicles

December 2021
Linx collects data on a continuous basis from vehicles, trailers and construction equipment manufacturer APIs, as well as from IoT based sensor technology from 3rd party APIs.
Collection, processing and refinement of data

Actions required in order to create value from data.

- Manufacturers collect unique sensor data in different ways. They also define and tag similar sensor data differently. Also, similar sensor data are collected and reported through APIs during different time slots.
- Complexity, reporting errors and format/quality variety in raw data must be harmonized to secure relevance in user interface
Map solution

Det går inte att visa en bild.

VOLMAX
Kompetanse
Purpose specific information value in Linx solution

- Exact positions for specific vehicles during specific time-slots. For example:
  - Actual total weight on any given position
  - Actual tyre pressure and temperature pr tyre on all axels – both truck and trailer

- Processed data may be extracted.
  - Examples:
    - Energy consumption vs. tyre pressure
    - Energy consumption vs. total weight
    - Energy consumption vs. speed

- Currently, as manufacturers do not provide gyro-data - 3rd party suppliers of sensors providing sideways acceleration data are evaluated.
- Another challenge is currently to access data sets for braking (ABS, ESP etc.)
Stability

- **Why**
  - Traffic safety – high centre of gravity, increased risk of heeling, swerving and overturning
  - Road wear, economy for vehicle operators, sideways motion causes increased wear on both infrastructure and vehicles
  - Promotes economical driving

- **How**
  - Ideally – real time data from ESC/ESP
  - Minimum - retrofitted gyro systems, different systems on trailers
  - Lab tests in cooperation with vehicle manufacturers

*Foto: Marit Helene U. Kværnø.*
Experiences so far – load bearing capacity tests

• September 2020
  • Good load bearing capacity
  • Some cracking, damages to shoulders
  • 60 tonne combinations caused more damage than 74 tonnes
    • Results unclear due to different driving styles

• April 2021 (spring thaw)
  • Pumping
  • Is 74 tonnes worse than 60 tonnes?
  • Road heavily damaged after only 2 laps
Experiences so far – load bearing capacity tests

• Preliminary conclusions
  • Varying load bearing capacity, drastically reduced during spring thaw
  • Managing spring thaw is essential in any discussion about increased weights
  • Need for mutual understanding between road users and road owner concerning the vulnerabilities of the infrastructure
Experiences so far

- 74 tonne and 68 tonne combinations

- Load securing

Foto: Knut Opeide, Statens vegvesen
elin.norby@vegvesen.no

Prøveordning for tømmervogntog inntil 74 tonn | Statens vegvesen
Analysis of allowing higher weight and dimensions to make transport more efficiently and greener in Denmark

HCT konferens
8. december 2021
1. Background
2. Conditions
3. Actions included in the analysis
4. Vehicle stock
5. Time schedule
Political agreement regarding green transition of the road transport on 4th of December 2020:

- **Initiate an analysis regarding optimization of national rules for weight and dimensions**

The analysis must map for each possible action:

- The potential of CO2-reduction
- Consequences for infrastructure regarding bridges and roads
- Economical consequences for society and business
The Danish Road Safety Agency in coop with the Danish Road Directorate has made an overall list of possible actions within this task, with focus on:

- More green
- More effective
- More fleksibility
- More incentive for transition to alternative propellants and/or zero-emission

The list has been discussed with the danish transport business, who also made suggestions for further actions.

Finally all actions was prioritized and potential no. of vehicles estimated. The business also participated in this.
The frame for the selection of actions in the analysis:

- An possible action must be able to be used on the entire danish road net – as a starting point
- The vehicle must comply the rules for type-approval
- Demands for coupling of road trains must be immediate ready for control (e.g. roadside)
- There must be a reasonable balance between potential CO2-reduction and costs for society and business
- The action must be prioritized due to other incentives on green transitions
Rigid trucks and road trains

**Actions within increased weight/dimensions due to green transition:**

- Increased weight for rigid trucks, tractors and road trains, which uses an electrical working unit - e.g. a crane or a concrete mixer (up to +1,000 kg)
- Increased weight for all rigid trucks, tractors and road trains, which uses alternative propellants and/or zero-emission (up to +1,000 / +2,000 kg)
  - The EG-directive only mention this possibility for 2- or 3-axl trucks
  - Increased couplinglength for tractor to semi-trailer (+1 m)
    - Roadtrain 16,50 m -> 17,50 m
    - Max length of trailer: 13,60 m
    - If alternative propellants and/or zero-emission
Rigid trucks

Actions within increased weight due to effectiveness

- Increased weight for 4-axl rigid trucks, from 32.000 to 34.000 kg
  - Must comply minimum wheel base (TBD)

- Increased weight for 4-axl rigid trucks, from 32.000 to 35.000 kg
  - Must comply minimum wheel base (TBD)

- Increased weight for 5-axl rigid trucks, from 32.000 to 40.000 kg
  - Must comply minimum wheel base (TBD)

- Increased weight for 5-axl rigid trucks, from 32.000 to 42.000 kg
  - Must comply minimum wheel base (TBD)
Trailers (to rigid trucks)

**Actions within increased weight due to fleksibility:**

- Increased weight for 3-axl trailers with twin tires
  - From max 24 tons to 28 tons
  - Limit: No increase of the total weight for the entire road train

- Increased weight for 4-axl trailers with twin tires
  - From max 30 tons to 36 tons
  - Limit: No increase of the total weight for the entire road train

- Increased weight for 5-axl trailers
  - From max 30 tons to 35 tons
  - Limit: No increase of the total weight for the entire road train
Actions within increased length due to effectiveness:

- Increased length for semitrailers and roadtrains (+1,3 m)
  - Roadtrain 16,50 m -> 17,80 m
  - Semitrailer: 13,60 m -> 14,90 m
  - Must comply the EU regulations for turning radius

- Increased length for semitractor with crane and semitrailer (+2 m)
  - Roadtrain 16,50 m -> 18,50 m
  - Max length of trailer: 13,60 m
  - Must comply the EU regulations for turning radius

- Increased length for rigid truck with crane and trailer (+2 m)
  - Roadtrain 18,75 m -> 20,75 m
  - Total length of loadingspace must not exceed 15,65 m
  - Must comply the EU regulations for turning radius
Stock on March 1st 2021: Apx. 40,000 vehicles - 34,500 trucks og 5,500 coaches (N3/M3)
Questions?
Thank you for listening.

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Vejdirektoratet
(Danish Road Directorate)

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Pilot projects around Geofencing and Intelligent Access in Sweden

Jenny Lundahl
Senior researcher & legal expert at RISE
Geofencing

- Geofencing defines a digitalized geographic zone where the characteristics of vehicles can be stipulated – such as speed and whether they run on fuel or electricity. It is also possible to designate that only authorized vehicles may be driven in the area.
Smart Urban Traffic Zones
- It puts the people in focus

- This project comes from the Research and Innovation program for Geofencing in Sweden.

- The **project idea** is that Smart Urban Traffic Zones, based on geofencing, can be a powerful tool, to contribute to quieter, safer and healthier environments.

- The project includes **physical tests** in Stockholm and Gothenburg. The tests include:
  - adapting the speed to the number of unprotected road users moving in the area,
  - changing the driveline and regulating the speed for the vehicle to access driving in certain areas,
  - and sending warning signals to vehicles and unprotected road users around construction site exits to prevent accidents.

- A broad network of **participants** is included. The project is jointly managed by CLOSER and the Swedish Transport Administration, and **financed by** Vinnova within Challenge-Driven Innovation together with the project participants.

[https://closer.lindholmen.se/nyheter/smarta-urbana-trafikzoner-satter-manniskan-i-fokus](https://closer.lindholmen.se/nyheter/smarta-urbana-trafikzoner-satter-manniskan-i-fokus)
GeoSence
– Geofencing strategies for implementation in urban traffic management and planning

• GeoSence elaborates on geofencing solutions aiming at improving traffic flow, safety and air quality. The overall objective of the project is to design, trial and evaluate geofencing concepts and solutions for specific cases in cities, and to propose new ways of successfully deploying geofencing technologies.

• The project is a JPI Urban Europe project funded by European Union’s Horizon 2020, and gather project partners from Germany, Norway, Sweden and UK. For the Swedish participants, the funding is from the Swedish Energy Agency.

• Project partners: RISE Research Institutes of Sweden AB, City of Munich, SINTEF Community avd Trondheim, Chalmers University of Technology AB, Technische Universität Dresden, Norwegian Public Roads Administration, City of Gothenburg, City of Stockholm, Lindholmen Science Park AB (CLOSER) and University of Westminster + support partners.

• Duration: 2021–2024.

https://jpi-urbaneurope.eu/project/geosence/
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HCT City
- Case study: excavated material in cities – pilots and system analysis

• This project started in April and study how the High Capacity Transport concept can be applied in cities. The hypothesis that the project will test is that the HCT-concept will improve both productivity and transport efficiency as well as reduce emissions.

• Case study – excavated material in cities – pilots and system analysis.

• The project will also study digital access control and tools such as geofencing in order to control speed and routes.

• The project involves several public and private partners, is coordinated by RISE and financed by Vinnova.


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NordicWay 1, 2, 3

- The NordicWay projects 1, 2 and now 3 are a collaboration between public and private partners in Finland, Norway, Sweden and Denmark. NordicWay 3 build on the achievements of the previous projects and it has more cities involved.

- The project focuses on the digital ecosystem and several geofencing concepts are being tested. The services enable vehicles, infrastructure and network operators to communicate safety hazards and other information from roads in the Nordic countries between different stakeholders.

- The projects are co-financed by EU.

https://www.nordicway.net/
Digidisp

- This project has analyzed the process of granting exceptions to the traffic rules for abnormal vehicles (transports that are too wide, too heavy, or too long to be driven on public roads).
- The focus has been on increased digitalization and improved legal processes, and as a result several proposals for improvement measures has been submitted for consideration.
Nordic HCT Conference 2021

The Conference starts again 14.45

closer.lindholmen.se

www.linkedin.com/company/closerse
Intermodal HCT for Pre- and Post-Haulage
Franca Hiemisch & Ricardo Vaz
What is the market potential for intermodal HCT in Sweden?

➢ Barriers/obstacles for a national implementation
➢ Transport corridors that are suitable for IHCT
➢ Potential cost reductions for the main freight flows
Study Assumptions

➢ Focus only on longer vehicles (up to 34.5m)
➢ Employment on pre-determined distances to and from the nearest IRT terminal
➢ Comparison of two scenarios: transport of 3TEU vs. 4TEU
Results - Implementation

Barriers
- Bureaucracy
- Infrastructure
- Road network

Operational Improvements
- Less congestion
- Smoother terminal flows
- Benefits for large customers
- Less drivers required
Results - Costs

Due to partially missing data, the calculations could merely be executed for a part of the investigated relationships.

Average cost savings for PPH: **13.7%**, varying for IRT chain depending on distance.

<table>
<thead>
<tr>
<th></th>
<th>Vaggeryd</th>
<th>Hallsberg</th>
<th>Umeå</th>
<th>Jula Logistics (Falköping)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average reduction total IRT costs</strong></td>
<td>5.38%</td>
<td>3.4%</td>
<td>1.34%</td>
<td>6.01%</td>
</tr>
</tbody>
</table>
Conclusion

➢ Most terminals and LSPs could identify suitable freight corridors for IHCT
➢ Negative effects or investments are merely marginal
➢ Costs and emissions can be reduced
➢ The higher the PPH cost share and the lower the rail distance, the better the potential for cost savings
Thank you!

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HUHTALA

HCT CASES IN FINLAND
& VISION OF HCT POSSIBILITIES
THROUGHOUT EUROPE

KATI HUHTALA / CEO
8.12.2021 | NORDIC HCT-CONFERENCE
Family company
Established 1982 Kalevi & Sirpa Huhtala
Focused on industrial B2B customers / specialized in forest & metal industries’ needs / only volume transports
Personnel c.160

Domestic & international transports (Italy/ France/ Germany/ Switzerland/ Austria/ Benelux countries)
Turnover 20-21 20Meur
70 units in domestic transports & 40 units in international transports
Trailers inner length 18,70m & inner height 3,00 M
- 4 axels
- Total weight truck + trailer max 58tn / payload 39tn
- Fuel consumption 34-38 L/100km
- Specially made for transport of beams. Before customer had to transport these with open top trailer. Environmental impact also; client doesn’t have to put plastic on top of the product. Route 300km one way. Backload pulp. Excellent efficiency and fuel consumption compared with regular module combination
- In co – operation Metsä Group / Närkö Finland / Virtain Peruskone
• Total length of combination 34m / trailers 15,00m + 13,40m / total 220m3
• Running since 2017
• Special permission from Traficom
• 4 axels semitrailer + 5 axels fulltrailer
• Total weight truck + trailers max 100tn / Payload 68tn
• Fuel consumption 68-70 l/100km
• Specially made for transport of wood chips for sawmill located in the center of Pori. Rises the efficiency so much that every 3rd truck compared with old model is unneeded. Big safety factor in the city. Route 60km one way.
• In co – operation Upm Metsä / Volvo & Scania / I. Laurell
• Very short distance transport 6.5 km. Main efficiency achieved with full usage of loading space.
• Old model load fitting to combination 42tn / new hct measurements 48tn
• Combination 1 : 13.40m + 12.10m / combination 2 : 9.10m + 14.80m
• Every 7 load missing
• Total weight truck + trailer 76tn / payload 50tn (48tn loaded)
• Fuel consumption 72 /100km / average speed 23km/h
• In co – operation Metsä Group / Närkö Finland / Virtain peruskone
- Trailers 13.40m + 13.40m / total length 32m
- Total weight 76tn payload 48-50tn
- Fuel consumption 48-54l/100km (depending on the route)
- Efficiency achieved especially with difficult measurements for example paper, with HCT measures we can achieve full payload. In our experience the loading space should always be bit bigger to achieve always maximum payload.
- Also in lighter goods for example tissue papers
- Most trailers manufactured by Närkö Finland / Virtain peruskone
POSSIBILITIES & VISION FOR EUROPE

- Especially huge possibilities with 2 x semitrailer combinations; the basic structure needed exists already
- On main routes from city to city / similar to multimodal trains
- Safe spaces for truck depots would be needed
- Very fast way of rising efficiency in fuel consumption
- Very fast way of meeting needs for environmental issues; less trucks needed
- Safety issues too often forgotten
BIGGEST CHALLENGES

• ATTITUDE
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Intelligent bogie in HCT trailer

Otto Lahti
8.12.2021
Why HCT

- Driver productivity
- Emissions /load unit
- All technology that is needed in trucks is ready
- Infrastructure on main truck routes is ready

- Automation and electrification are going to be in use some day but those don’t help in near future
The biggest challenges in Nordic circumstances

The balance between
- Dynamic stability
- Traction in winter
- Agility in tight turns

Long wheelbase in 1. trailer
- Good stability and traction
- Wide driving lines
Basic techniques for better turning in low speeds

Steerable axle

Turning assistant
Intelligent trailer bogie combines two technologies

- Steerable axle
- Turning assistant
32 m A-double

- 0,5 m longer wheelbase compared to standard trailer
  - Good stability and load on driven axles
- Same time better agility in low speeds than original Duo2
Intelligent bogie in both trailers

- Old Nordic turning rule for 25.25 trucks
  - 12.5 / 2 m circle
- YES it full fills the rule with one meter gap
32 m A-double vs old Finnish 25,25 full trailer

same inside radius

The difference is in tail swing
Traditional 25,25 EMS1

- 6x2*4 (delivery) truck
- Same trailer with intelligent bogie and standard dolly
EU-turning rule / BO-kreis

- It’s possible also with normal dolly
- Tail swing is on same level in truck and in trailer
Safety

- Changes in axle loads influences to braking stability
- In low speed brake blocking is not a problem
  - Low braking force on heavy axle is a problem
- In high speeds everything is much more difficult
  - Stability assistant is much more complicated compared to turning assistant
- Everything has to be controlled by EBS-unit
Thank you

My contact information
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Request for new rules for BK4 and overloads

The suggested new rules is a work made of both the Swedish Transport Agency (Transportstyrelsen) and The Swedish Transport Administration (Trafikverket) and sent to the Swedish Government in November 2020.

A work with rules regarding overloads has just begun.
BACKGROUND

Roads with bearing class 4 (74 tonnes) was implemented in 2018. More axles and a lower average axle load was the basis for the implementation of BK4.

74 tonnes distributed on 9 axles has an average axle load of 8,2 tonnes.

Unfortunately there where no specific regulations regarding the maximum permissible gross weight for vehicle and vehicle trains. Only distance between axles och maximum axle loads.
Problem:
The lack of such rules has resulted that the average axle load have increased, which has led to increased road wear.
Mainly because of using long-bogie in the front of a trailer.
For example, vehicle trains with 7 axles and 69 tonnes gross weight (average axle load 9,86 tonnes), and vehicle trains with 8 axles and 73 tonnes gross weight (average axle load 9,13 tonnes).
What was suggested

• Maximum permissible gross weight for power driven vehicles. These are mostly the same as for roads with bearing class 1 (64 tonnes),

• Except:
What was suggested

Maximum permissible gross weight for power driven vehicle with 4 axles: 31/35 tonnes

Maximum permissible gross weight for power driven vehicle with 5 or more axles: 42 tonnes
What was suggested

Maximum permissible gross weight for Trailer with 4 axles: 
38 tonnes

Maximum permissible gross weight for Trailer with 5 or more axles: 42 tonnes
What was suggested

Maximum permissible gross weight for vehicle combinations with 7 axles: **64 tonnes**

Maximum permissible gross weight for vehicle combinations with 8 axles: **69 tonnes**
What was suggested

Terms regarding double mounted wheels on trailers

• Change regulation from demands in authorities regulations (Trafikverket) to generell requirements in the Road Traffic Ordinance (Trafikförordningen).

• The Swedish Transport Administration's mandate is suggested to be changed so that road authorities can announce exceptions from this requirement.
Advantages of this way of regulating:
• - Overload regulations can be applied,
• - The most common (70%) is the main rule,
• - Simpler wording for applicators and the Police to control.
• Conditions on double-mounted wheels will also apply on the municipal roads that are opened for BK4.
What was suggested

• The total number of axles with double-mounted wheels on coupled trailers that load the road surface must be:
  - 65% of the gross weight for coupled trailers must be loaded on axles fitted with double mounted wheels. Or:
  - two when the number of axles is two or three,
  - three when the number of axles is four,
  - four when the number of axles is five or more.
• Exemption: The terms do not apply to trailers that have been registered before 1 January 2019 and whose design has not subsequently changed significantly.
What was suggested

• Higher gross weight for trucks with driven front axles.
• According to the current regulation, they can not have a higher gross weight than maximum 25 tonnes.
• We suggest a changed wording so that these can reach a maximum gross weight of 28 tonnes.
The work with overload regulation

Within the framework of the work with new suggested rules for BK4, it was established that the overload regulations were not adapted to today's vehicles.

For example, these provisions have a “discount system” that entails a discount in relation to the number of axles.

This work has only just begun and if it becomes relevant, we will return to this issue.
Thank you!

Pär Ekström

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Thank you!

Pär Ekström
par.ekstrom@transportstyrelsen.se
Useful information

All presentations will be posted at closer.lindholmen.se/HCT. (you will get more information in a mail after the conference)

Next year will this conference probably be 6:th of October
Thanks for being here
and
Very welcome next year