



NIWS-Project

NMi International WIM Standard

Content

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Background

- 3 International standards
 - Each with own purpose and (dis-)advantages
 - Parts used in Tenders
 - Nothing for Direct Enforcement for HS-WIM
- Many National standards
 - All different
 - Often not practical
 - Barrier for market access

Approach

- Goal:
 - International Standard on Weigh-In-Motion Systems
- Approach:
 - Small Group of Experts on WIM and on Standardisation
 - Covering different; Technologies, Vendors, Countries
 - Published as NMI-Standard
 - Start with Blank sheet of paper
 - Guide with Explanation and Motivation

Approach

- NIWS-Project:

- Cock Oosterman Nederlands Meetinstituut, (NL)
- Paul Kok Nederlands Meetinstituut, (NL)
- Mathias Meijer Nederlands Meetinstituut, (NL)
- Andy Lees Q-free TDC, (UK)
- Emil Doupal Transport Research Centre, (CZ)
- Peter Favai Cestel, (Slo)
- Randy Hanson Int. Road Dynamics, (Can.)
- Hans van Loo Corner Stone Int., (CH)

Document

- Scope:
 - Automatic WIM-systems.
 - Performance Requirements
 - Minimum Testing Procedures
- Application:
 - Technology Independent
 - High Speed and Low Speed
 - Statistical and Legal Applications

4 Categories of WIM

- Vehicle Dynamics
- Lane changes

- No Vehicle Dynamics
- No Lane changes

<p>High Speed Free Flow Legal Applications OOP (CZ)</p>	<p>Low Speed Controlled Legal Applications OIML R134</p>
<p>High Speed Free Flow Statistical Applications COST-323 ASTM E1318</p>	<p>Low Speed Controlled Statistical Applications ???</p>

- Accuracy of each measurement
- Specified in MPE
- Legal Approval by NMI

- Accuracy of average measurement
- Specified in Standard Deviation
- Buyer-Vendor relation

Document Structure

I. General

- Terminology + Operating Conditions

II. Statistical Applications

- Specifications + Test Protocols

III. Legal Applications

- Specifications + Test Protocols

IV. Recommendations (non mandatory)

- Site selection + Example test protocols

Operating Conditions

- Ranges for:
 - Vehicle Speed, overlapping ranges
 - Temperature^{*}; -25°C to +55°C
 - Relative Humidity^{*}; 95% at +55°C
 - Electromagnetic Fields^{*}
 - Mains Voltage Variations^{*}

^{*} Based on OIML D11; General requirements for measuring instruments

- No requirements for:
 - Road Conditions or Durability

Technical Requirements

- Vehicle Record Completeness
- Accuracy requirements for:
 - Completion Rate
 - Length Measurements
 - Classification Rate
- Resolution requirements for:
 - Date + Time Recording
 - Speed Recording

Weighing Requirements

- Statistical Applications:
 - S(x)
 - $[-2\sigma, +2\sigma]$ interval
 - Includes 95% of measurements

Class	S(5)	S(7)	S(10)	S(15)	S(20)
GVW	5	7	10	15	20
Axle Group	8	11	15	20	25
Axle Load	10	15	20	25	30

Weighing Requirements

- Legal Applications:
 - L(x)
 - [-MPE,+MPE] interval
 - Includes 100% of measurements

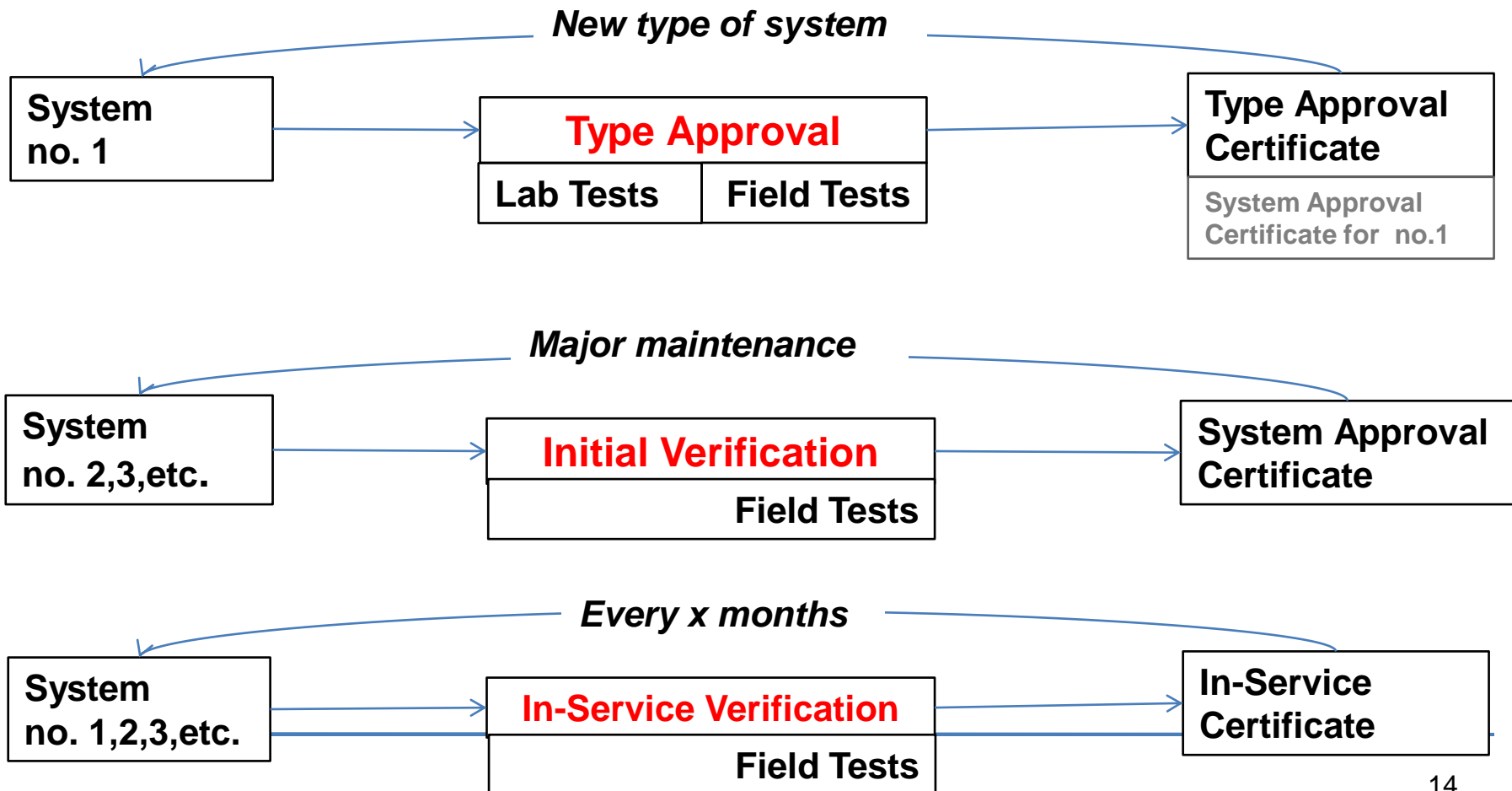
Class	L(3)	L(5)	L(7)	L(10)
GVW	3	5	7	10
Axle Group	5	8	11	15
Axle Load	7	10	15	20

Test Procedures

- Statistical Applications
 - 2 Test Levels; (Initial Verification, In-service Verification)
 - Relation between Buyer and Vendor
- Legal Applications
 - 3 Test Levels; (Type Approval, Initial Verification, In-service Verification)
 - Independent Legal Approval required
 - Testing and Certification by NMI
 - or National Authority approved by NMI

Test Procedures

Example: Legal Applications; 3 levels of testing



Test Procedures

- Field Tests
 - Most common Types of Vehicles
 - Fully Loaded only

Test / Application	Type Approval	Initial Verification	In-Service Verification
Statistical	n.a.	2 Vehicles, 10 runs each Total: 20 runs	1 Vehicle, 10 runs Total: 10 runs
Legal	3 Vehicles, 30 runs each Total: 90 runs	2 Vehicles, 30 runs each Total: 60 runs	2 Vehicles, 15 runs each Total: 30 runs

Benefits

- Combination of:
 - Statistical and Legal Applications
 - High Speed and Low Speed systems
 - Requirements, Test Protocols and Framework for Certification
 - Standard and Informative Guide
 - Independent of:
 - Technology / Type of Sensors
 - Vendor / Manufacturer
 - User / Country
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Benefits

- Practical:
 - Short and Simple,
 - Clear Structure, easy to use
 - Based on >100 years of combined experience
- Balance between:
 - Interests of Vendors and Buyers
 - Weighing-In-Motion and Legal Metrology
 - E.g. Number of test runs should be:
 - Large enough to provide sufficient confidence
 - Small enough to be realistic in daily practice

Benefits

- Open Standard:
 - Use is free of charge
 - Registration at NMI-website
 - Voluntary use of standard
 - As reference
 - In tenders
- More information:
 - www.nmi.nl
 - www.corner-stone-int.com