



International Society for Weigh - in – Motion

Submission to the

**International Organization of Legal Metrology
(TC9_SC2_p11_N018)**

For the

**Revision of R134: 2006 Automatic instruments
for weighing road vehicles in motion and
measuring axle loads**



Introduction

The purpose of this document is to present the International Society for Weigh - in – Motion ISWIM's submission to the TC9 SC2 p11 in charge of revising the International Recommendation R-134: *Automatic instruments for weighing road vehicles in motion and measuring axle loads*.

ISWIM

ISWIM is an international network of and for people and organisations active in the field of Weigh-In-Motion inclusive of on-road and on-board mass monitoring. As a global society, ISWIM has members from over 75 countries and representation from 23 vendor and consultancy companies.

The purpose of the ISWIM is to support the advances in and the more widespread use of weighing technologies and the application of weighing data, across the full spectrum of road-based transport usage. In particular for on-road and in-vehicle Weigh – in - Motion:

- support:
 - advances in Weigh-in-Motion technologies,
 - standardisation of Weigh-in-Motion technologies,
 - the more widespread use of Weigh-In-Motion,
 - the applications of WIM data.
- To disseminate knowledge and understanding of WIM by:
 - organising conferences, seminars, training courses and other events,
 - supporting, collecting, distributing and advertising scientific and technical publications on WIM,
 - facilitating exchanges of research staff and postgraduate students where this leads to a sharing of experience, results and data relating to WIM.
- To promote and support international research and development projects on WIM.
- To initiate, participate and/or monitor WIM standardisation activities by:
 - developing standards relating to WIM and its applications,
 - promoting and supporting common tests of WIM systems, developing harmonised procedures, and publishing scientific results useful for WIM users and manufacturers.
- To promote the use and application of WIM systems and data, currently mainly used for:
 - infrastructure design and maintenance (e.g. bridges and pavements),
 - detection and enforcement of overloaded vehicles,
 - road transport pricing and surveys,
 - road safety and environmental impacts.



Methodology

A Working Group (WG) was established of ISWIM Board members as follow:

- Bernard Jacob, representing Researcher members
- Olga Selezneva, representing End-user members
- Andrew Lees, representing the Vendors and Consultant College members

After a call to all ISWIM members, the WG distributed the OIML documents to the ISWIM members interested, collected their comments, synthetized them searching for consensus where this was possible.

The WG also was oversighted by Adriana Antofie in her capacity as Metrology Advisor and Chris Koniditsiotis as President of ISWIM.

ISWIM's membership is very diverse as it encapsulates the entire spectrum of interest in WIM. As such ISWIM is the only organisation that can attempt a synthesis with such a wide range of views, positions, and opinions. In total 19 members responded with a total of 418 collective comments.



TC9_SC2_P11_N018	Revision of R134: 2006 Automatic instruments for weighing road vehicles in motion and measuring axle loads
	Please type your comments in this form and post it (in Word format) to: iswim@free.fr with cc to: chrisk2.0@bigpond.com , adriana.antofie@spw.wallonie.be by June 27, 2020.
PLEASE INSERT THE CLAUSE NUMBER IN EACH ROW.	

Instructions for using this template:

- do not modify the structure of the table (columns), but add more lines if needed,
- do not merge any of the cells,
- enter one reference per row in the Clause/Sub clause column. If your comment applies to more than one clause, please repeat the row or make the reference in the Comments column. If you comment applies to the whole Recommendation, put G (general) in this column.

Please fulfil the following fields (mandatory):

ISWIM – Research and academics + End-users + Vendors & Consultants

Prepared by Bernard Jacob, Olga Selezneva and Andrew Lees.

July 22, 2020 (Final version)

1 **MB** = Member body (enter the ISO 3166 two-letter country code, e.g. CN for China)

2 **Type of comment:** ge = general te = technical ed = editorial

Country Code ¹	Part	Clause/ Sub clause	Paragraph / Figure/ Table/	Type of comment ²	COMMENTS	PROPOSED CHANGE	OBSERVATIONS OF THE CONVENER/PG on each comment submitted
ISWIM	1	all		ed	Terminology question on WIM (see clause 3.8).	“Weighing in motion” is the process of weighing, while “Weigh in motion” is used while talking about an equipment. Please harmonize everywhere.	
ISWIM	1	all	all	ed	Capitalize 1 st word in each paragraph.		
ISWIM	1	1.1	§ 1	ed	“Weighed in motion” or “weighing in motion” stated twice in the sentence.	Remove one reference, duplicative.	
ISWIM	1	1.1	Note	ed	A reference is needed to support: “to prescribe more extensive verification methods”	Please add a reference.	
ISWIM	1	1.2	§ 1 d)	te	HS-WIM should distinguish: (1) application to overload control and enforcement, and (2) other application (e.g. trade), because each application will have specific requirements (see below)	d) used for high-speed (HS-WIM) weighing applied to overload control and enforcement (3.3.1.3.2.a) e) used for high-speed (HS-WIM) weighing applied to other applications (3.3.1.3.2.b)	
ISWIM	1	1.2	Note	te	The note only concerns legal speed measurement.	Add after the 2 nd sentence: “This does not apply if the speed is only used to calculate loads or weights or to identify the vehicle class.”	
ISWIM	1	1.2	§ 2	te	The recommendation also does not apply to bridge WIM systems.	“This Recommendation does not apply to WIM instruments that.”, after b), add: “or c) use an instrumented bridge or part of a bridge as a load receptor (Bridge WIM systems)”	
ISWIM	1	1.2.	Table 1	te	Table 1 is not clear. The title is “WIM application” while most lines but the first one do not refer to any application.	Revise the table 1, and change the title into “WIM functional requirements”. All applications using certified measurements should be named “legal applications”.	
ISWIM	1	1.2.	Table 1	te	HS-WIM may also be implemented on a road without traffic (test track, closed road, etc.)	3 rd line last column: change into “with or without actual traffic”.	
ISWIM	1	1.2.	Table 1	te	The criteria “Static weighing capability” and “Test Load” are only relevant when the system is also used as an integral control instrument during tests. This is an option not a requirement.	Switch to “x” (not mandatory for legal applications” all this section.	
ISWIM	1	3.1.3		ed	This clauses does not apply to on-board WIM	The clause should exclude on-board WIM.	
ISWIM	1	3.2.1		ed	The clause does not only apply for weighing tests	Replace “weighing tests” by “weighing operations”	
ISWIM	1	3.2.2	Note, HS-WIM	te	For HS-WIM, road section can start from 100m in length, depending on the operating speed and pavement evenness.	Replace “of 200 m to” by “of 100 or 200 m to”, and add a second sentence: “This length depends on the operating speed and pavement evenness.”	
ISWIM	1	3.2.2	Note, HS-WIM	ed	“Evenness” can also be “road smoothness”. “Deflection” or “pavement strength”.	Change “deflection and evenness” into “deflection or pavement strength, and evenness or road smoothness”.	
ISWIM	1	3.2.2.1		ed	“approximately-level” is fuzzy.	Replace “approximately-level” by “levelled”, and add a footnote to provide a tolerance value/limit..	
ISWIM	1	3.2.2.2		ed	A word “pavement” is alone.	Remove the last isolated word “pavement.”	
ISWIM	1	3.2.5.4		te/ed	The measured quantity is not a mass for wheels and axles, but a static load. Static load is defined in 3.3.1 (to be completed, see below).	After “the measured quantity”, remove the first brackets “(mass)”. After “into another measured quantity” add in the brackets: “(output as static load)”.	

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ISWIM	1	3.3.1.3		ed	The introduction of the concept of a “corresponding static vehicle” complicates the definition of static weighing.	Replace “corresponding static vehicle” by “stationary vehicle”.	
ISWIM	1	3.3.1.3.1		te	The definition is not sufficient, the speed limit and weighing conditions should ensure that the vehicle dynamics does not affect the measurements. Controlled speed is not sufficient.	Add: “The maximum speed and weighing conditions shall ensure that vehicle dynamics does not affect the measurements. A maximum speed of 10 to 25 km/h should be indicated for the system.”	
ISWIM	1	3.3.1.3.2		te	This clause should distinguish HS-WIM for enforcement and for other application. HS-WIM may be done in partly controlled area.	3.3.1.3.2 High speed weigh in motion (HS-WIM) Weighing a vehicle in motion in the traffic flow and at actual traffic speed a. only for overload control and enforcement b. for all other purposes (e.g. trade)	
ISWIM	1	3.3.1.5		te	The vehicle mass also includes the cargo/payload.	Add at the end of the sentence: “and the cargo/payload”	
ISWIM	1	3.3.1.7		te	The definition of axle group does not only refer to axle spacing, but to the suspension design (bogie)	Add to the first sentence: “or belonging to a same bogie”	
IWIM	1	3.3.1.8		ed	Wording unclear.	Change “supported via the axle on...” to “applied by the wheels (tyres) mounted on the axle to...”.	
ISWIM	1	3.3.1.15		te	It should be specified that the vehicle is horizontal with all brakes released	Add “laid on a horizontal and flat surface with all brakes released”	
ISWIM	1	3.3.1.16		te	A new clause should be added to define Static Axle Load and Static Group of Axles Load	Axle load: 2 proposals to be chosen 1) Sum of the static wheel loads of the wheels belonging to an axle. 2) The portion of the vehicle mass imposed upon a weighing instrument by the tyres of a stationary axle at the time of weighing, due only to the vertical forces of gravity acting on the mass of the vehicle, laid on a horizontal and flat surface with all brakes released. Group of axle load: Sum of the axle loads of all axles belonging to a group.	
ISWIM	1	3.3.2		te	Add a clause 3.3.2.4 to specify a Minimum mass capacity for HS-WIM dedicated to overload control and enforcement. For overload control and enforcement, gross vehicle masses below the legal limits are not useful and could penalize the accuracy. Therefore, the applicant can specify a lower limit by type of vehicle, in agreement with the users.	Add a clause: 3.3.2.4 Minimum capacity for vehicle mass (only for HS-WIM applied to overload control and enforcement) Value of the load below which the weighing-in-motion results after totalizing may be subject to an excessive relative error. This value should be specified by the applicant, by type of vehicle.	
ISWIM	1	3.3.4.6		te	The proposed definition is not sufficient to avoid large dynamic effects which affect the weighing	Replace the proposed clause by: “Full control of the lateral movement of the vehicle and vehicle speed during weighing in motion. Maximum speed and apron quality ensuring that most of the vehicle dynamics are eliminated and their influence on the weighing may be neglected”.	
ISWIM	1	3.3.4.7		te	Incomplete definition	Add: “The vehicle speed corresponds to the current free flow traffic conditions”.	
ISWIM	1	3.4.4.2/3		ed	The clauses 3.4.4.2 and 3.4.4.3 are identical but their titles.	Either delete or revise one clause.	

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ISWIM	1	3.6.5	2 nd §	te	The confidence level depends on the test conditions (see COST323), i.e. the repeatability or reproducibility conditions and the sample size. Higher the repeatability higher the required confidence level. Larger the sample size, higher the required confidence level. 95% is not the only one.	Replace the 2 nd § by: “The confidence level is used to qualify the reliability of the outcome of a test procedure. The required confidence level depends on the test conditions, i.e. the repeatability or reproducibility, and the sample size.”	
ISWIM	1	4.1.1		te	A class 30 should be added for average pavement quality and large overloads, e.g. in developing/low and middle income countries. The note 2 shall then be completed.	Add a class 30. Note 2: add “Class 30 may be relevant for HS-WIM on average pavements and for overload control when large overloads must be enforced.”	
ISWIM	1	4.1.2		te	Same as above, a class H should be added and note 3 completed.	Add a class H. Note 3: add “Class H may be relevant for HS-WIM on average pavements and for overload control when large overloads must be enforced.”	
ISWIM	1	4.1.3	§ 1	te/ed	This clause and the Table 2 should only be given as indicative, not mandatory. The reference should be to Table 2 and not 1.	Replace: “are as specified in Table 1 below” by “are as specified in Table 2 below, given for information. This relationship is not mandatory.”	
ISWIM	1	4.1.3	Table 2	te	Table to be completed.	Add a column for class 30 and a line for class H. Stick the boxes 5/F, 15/G, 20/G, 30/G, and 15/H, 20/H and 30/H.	
ISWIM	1	4.1.3		ed	Wrong reference to Table 2	Replace “in Table 1 below” by “in Table 2 below”.	
ISWIM	1	4.2	§ 1	te	The first § must be completed to allow to classify one instrument in different accuracy classes by type of vehicles.	Add a sentence: “For HS-WIM, a WIM instrument can be in different accuracy classes depending on the types of vehicles, defined by the number of axles, the axle spacing, the vehicle length or the mass limit.”	
ISWIM	1	4.2.1.1	Table 3	ed	The type approval verification is omitted.	Add “Type approval and” before “Initial verification” in the table heading.	
ISWIM	1	4.2.1.1	Table 3	te	Table to be completed. For initial verification, two sub-columns should appear, the half tolerances are OK for LS-WIM, while the full tolerance should apply for HS-WIM.	Add one line for class 30. Split the column “Initial verification” into 2 sub-columns: - LS-WIM: with the half tolerances as it is, - HS-WIM: with the full tolerance	
ISWIM	1	4.2.1.2.1	Table 4 § b)	te	Same as above.	Add a line for class H, with ±12.5% and 25%. Split the column “Initial verification” as above. Replace b) by b) 2 d for all verifications	
ISWIM	1	4.2.1.2.2	Table 5 § b)	te	Same as above.	Add a line for class H, with ±25% and 50%. Split the column “Initial verification” as above. Replace b) by b) 2 d x n for all verifications	
ISWIM	1	4.2.1.2.2		ed	Wrong references	Replace R134-2, 9.10 by R134-2, 9.12 Replace R134-2, 9.11 by R134-2, 9.12	
ISWIM	1	4.2.2	Table 6	te	Complete the table.	Add class 30 on the last line.	
ISWIM	1	4.3	Table 7	te	Complete the table.	Add a line for class 30.	
ISWIM	1	4.4	Table 8	te	Complete the table.	Add class 30 on the last line.	

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ISWIM	1	4.5.2		te	The definition of a “Controlled Weighing Area” is not consistent and should be harmonized throughout the document.	Rephrase: For low speed weighing in motion for the measurement of axle loads, the WIM instrument shall be installed in a controlled weighing area where the speed and lateral movement of the vehicle are controlled and limited during the measurement. Most vehicle dynamics will be eliminated and their influence on the measurement result may be neglected. The WIM instrument shall be capable of detecting disturbances in case of and due to variations in speed and lateral position. Additional installation and testing information are given in R 134-2, Annex B.	
ISWIM	1	4.7.2.1		te	The ambient temperature (air) and the road temperature at different levels should be distinguished, as they may highly differ. The given range (-10°C to +40°C) is for ambient temperature.	Add in the first sentence “ambient (or air)” before “temperature”. May be add for the pavement temperature: “and at pavement material temperature from -10°C to +80°C”.	
ISWIM	1	5.2.3		te	WIM systems are sensitive to environmental conditions such as surface and sensor temperatures.	Add an interlock for temperature.	
IWIM	1	5.4.4		te	Incomplete definition	Complete “weighings of the same load in the same conditions (vehicle, speed, loading conditions, etc.)”	
ISWIM	1	5.5.2		te	WIM instruments can measure only vehicle mass, or only single-axle loads, or both.	Adjust the clause to allow all options.	
ISWIM	1	5.5.2	Last §	ed	The individual axles are not included.	Add “or individual axle loads” after “the vehicle mass” in the last sentence.	
ISWIM	1	5.5.2		te	Add a note about the axle spacing.	Add: “Note: If the definition or load limits of axle groups depend on the axle spacing and wheelbase information, this should be explained and the reliability of the axle group identification should be assessed.”	
ISWIM	1	5.5.3		ed	Unclear wording. The clause should be rewritten.	Rewrite the clause as: “WIM instruments should give a clear warning on the indication or printout of the single-axle loads, axle-group loads or the vehicle mass, when the single-axle load (partial weighing) is less than Min or greater than Max + 9 d.”	
ISWIM	1	5.5.5		te	Point f) Every hard disk is exchangeable. This would require sealing of the PC such that opening the PC can be detected. Add a statement for the storage capacity.	Define exchangeable storage media more precisely in contrast to inbuilt-storage devices of PCs. Add: “h) The storage capacity of the WIM equipment should meet the needs of the customer.”	
ISWIM	1	5.5.6		te	Totalizing device is not defined.	Please add a definition of a “totalizing device”.	
ISWIM	1	5.5.8	§ 2	ed	Unclear sentence. Vehicle recognition is a separate technology.	Please replace the § 2 by: “The design of the WIM system, including the measurement process, should be linked to the user manual. A weight or overload indication should be delivered to a non-concerned vehicle, crossing, or overtaking vehicles.”	

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ISWIM	1	5.5.9		te	This sentence “ <i>The WIM system shall record vehicle classification and axle load data without interruption to traffic flow.</i> ” does not fit into this paragraph about vehicle guidance.	Add a new clause 5.5.11: “Weighing in traffic flow”: “A HS-WIM system operated on open road in the traffic flow, shall record vehicle classification and axle load data without interruption to traffic flow.”	
ISWIM	1	5.6.1		ed	Wrong references	Replace 3.2.9 by 3.2.8.2 Replace 3.2.6.4 by 3.2.6.5	
ISWIM	1	5.9.2		te	Complete the clause with the additional classes	Add classes 30 and H.	
ISWIM	1	6.1.2		te	According to definition (3.4.4.7) a ‘Significant fault’ is a fault exceeding the applicable fault limit value.	Include the reference of the definition “significant faults (3.4.4.7).....“	
ISWIM	1	6.6.2		ed	Wrong reference	Replace 3.2.9 by 3.2.8.2	
ISWIM	1	7.1.3	Last bullet point	te	The MPE specified in Table 6 (4.2.2) is relevant for all static reference control instruments, not only in cases where the WIM is used as a control instrument.		
ISWIM	1	7.3.1		ed	What is the difference between “Periodical Verification”, “In service inspection” and “Subsequent Verification”?	To better understand the difference between “subsequent verification” and “in-service inspection”, include the reference of the “Subsequence verification” [OIML V1, 2.13][2]	
ISWIM	1	8.2	§ 2	te	As above, we recommend using the full tolerance for span stability test	Replace “half the maximum permissible error” by “the maximum permissible error”.	
ISWIM	1	Annex A		te	Many new requirements on SW controlled devices are added. Existing WIM systems might not meet all these requirements.	Please double check which requirements are necessary and mandatory, and those which are not could be only recommended...	
ISWIM	1	Annex A		te	Most of the WIM systems can be maintained, updated or adjusted remotely, by Internet or other wireless communication. The recommendation should not refrain this ability.	Double check all the clauses related to remote action, require a tracable log of all undertaken action, but do not refrain it, but in exceptional and justified cases.	
ISWIM	1	Annex A		te	There are well established standards on Software Security.	Could the R-134 refers to them instead of introducing new clauses?	
ISWIM	1	Annex A A.1.1.1 A.1.3 A.1.4.2.c A.1.4.2.d A.1.4.2.e A.2 A.2.1.1a A 2.1.2.b A2.2 A 2.5.1 A 2.5.2 A 2.6 A 2.6.1 A 2.6.3.f A 2.6.3.h		ed	The whole Annex A contains many references to chapters or clauses which do not exist. Table 9/”Necessary tests” refers to Annex C chapters 3.10.2 and 3.10.3 Unknown reference to Annex G Unknown references : see 5.5.12.2 and 5.5.12.3 Unknown reference : see 5.6.6.3.g Unknown references : see also 5.6.3 and 5.6.4 Chapters 5.5.11 and 5.5.12 do not exist Chapter 1.1.2 does not exist Unknown references : in 5.5.7.2.a , (see 5.5.11) Unknown references : see also 4.4.4 and 4.14.4.5 Chapter 5.5.11.x does not exist Unknown reference : see 5.6.1.1.b Unknown references : 5.6.6.2 and 5.6.6.3 Unknown references : 5.5.12.2 and 5.5.12.3 Unknown references : (5.5.12.3.e) or (5.5.12.3.d) Unknown references : (5.5.12.3.g) or (5.5.12.3.a)	Please fix all these bugs	

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ISWIM	1	A.1.3		te	This requires disclosure of SW code, which is core know-how of manufacturers.	Add "under a NDA if required by the applicant" after "It shall be possible to examine algorithms and functions either by metrological tests, software tests or software examination".	
ISWIM	1	A.1.4.1		te	The acceptable solution is not understood by SW engineers. Additional solutions are still possible.	Mark "acceptable solutions" as examples	
ISWIM	1	A.1.4.1		ed	"Non-automatic"? Prevention of misuse: "... or intentional misuse are minimal."	Remove "Non"? Replace by "...or intentional misuse are impossible."	
ISWIM	1	A.1.4.2.b		te	Only user adjustable parameters are displayed. Be cautious not to disclose internal parameters.	Could this requirement be more specific regarding the kind of parameters? Add that displaying parameters should require a NDA on request of the applicant.	
ISWIM	1	A.1.4.2.c		te	Cryptographic means do not make an intervention evident. They make it difficult to intervene when not authorized. Sealing makes evident, cryptography tries to prevent misuse	Remove "cryptographic means" in context of "sealing".	
ISWIM	1	A.1.4.2.d		te	"...It shall not be possible to delete the audit trail...". This will lead to a disk overflow.	Changes to the audit trail such as deletion of entries should be logged in the audit trail.	
ISWIM	1	A.1.4.2.d		te	Preventing a software update from accessing the audit trail is practically impossible.	Changes to the audit trail such as deletion of entries should be logged in the audit trail.	
ISWIM	1	A.1.4.2.d		ed	NAWI abbreviation is not defined – What is NAWI?	Add definition of NAWI.	
ISWIM	1	A.1.4.2.d		te	Minimum information of the Audit trail is missing the user which is doing the modifications	Add "user who implemented the change" to the list of minimum information.	
ISWIM	1	A.1.5.1		te	"...signification defects..." need to be defined	Add definition of what kind of defects need to be achieved.	
ISWIM	1	A.1.5.1 A.1.5.2		te	The required documentation for evaluation contains sensitive information and know-how of the manufacturer.	Add "under a NDA if required by the applicant".	
ISWIM	1	A.1.5.2		te	What is meant by "durability"?	Please explain.	
ISWIM	1	A.2.1.1c		te	That's hardly always possible, e.g. for an encrypted hard disk. The encryption is done by the operating system (OS). This requirement would either ask for the OS to be considered legally relevant or to implement a custom solution which doesn't make sense. It will be nearly impossible to implement a software seal for the whole OS.	Please adjust the requirements to the feasibility.	
ISWIM	1	A.2.1.2a		ed	Manufacturers are often required to follow the example of the "acceptable solution" by authorities. "Non automatic weighing..."	Add "Example of" before "Acceptable solution" Is it "automatic weighing"?	
ISWIM	1	A.2.1.2.b		te	For internal communication between different modules this is difficult and probably an overkill. There is HTTPS termination on the gateway. Everything behind the gateway is HTTP because the gateway is protecting the other services.	Allow unprotected communication between internal SW parts, if the external communication is protected.	
ISWIM	1	A.2.1.2.b		te	Acceptable solution is not understood. Referenced chapters are not found in the document	Explain how the configuration of the OS ensures that legally relevant SW cannot be influenced.	

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ISWIM	1	A.2.1.2.c		te	<i>“Manufacturer shall attest that not hidden or undocumented properties exist”</i> This prevents remote support via SSH.	Allow remote support via SSH with a traceable log.	
ISWIM	1	A.2.3.6		te	What does mean “the transaction is settled” for an automated WIM system?	Please precise.	
ISWIM	1	A.2.4.5		te	Stopping the measurement process is too strict.	The measurement can continue in case of connection loss and the data be buffered until the connection is back.	
ISWIM	1	A.2.5.3		te	<i>“If a secure boot process is needed...”</i> Under what conditions must a secure boot process be implemented?	Precise under what conditions this is required.	
ISWIM	1	A.2.5.8		te	It is not possible to detect and handle every possible “unsuitable” configuration in software.	Allow the approach to protect the system from unintended/unwanted changes. Verify that resources like CPU, RAM, disk space, etc. are sufficient and stop data acquisition if not.	
ISWIM	1	A.2.6.3.g		te	<i>“After having reached the limit of the storage for the audit trail, it shall be ensured by technical means that further downloads are impossible without breaking a seal.”</i> Not practical.	E.g. the audit trail for the last two years shall remain, and the wiping is logged to the audit trail (user, timestamp, number of deleted entries, period covered by deleted entries...)	
ISWIM	2	1		ed	One part is missing in the first sentence.	4 separate parts	
ISWIM	2	7.6		ed	It is unclear what ‘9.2’ and ‘9.5.1’ refer to.	The requirements from the points 9.2 and 9.5.1 must be applied during the instruments control.	
ISWIM	2	7.6.2		te	The procedures described in (7.6.2.1) and (7.6.2.2) are only relevant to static weighing not WIM. The general method to assess error prior to rounding is not achievable for WIM system using strip sensors. Also, correction for error at zero is impossible.	Add: “NB: this method is not applicable for a WIM system”.	
ISWIM	2	8.1, 8.2		ed	The clauses mentioned refer to R 134-2. Mentioning (R 134-1) in the title of the articles is a bit confusing.	Delete (R 134-1, 7.1/2) from the title.	
ISWIM	2	8.1		ed	Since using the EUT also as an integral control instrument is the exception, use the same formulation as in (8.2) for the second line.	Replace” If the WIM instrument under test is to be used as an integral control instrument, the tests in 10.2 shall also be applied.” by “10.2 may be omitted if the instrument under test is not an integral control instrument.”	
ISWIM	2	9.3		ed	Chapter 9.3 is numbered as 93 and 9.31	Change numbering to 9.3 and 9.3.1	
ISWIM	2	9.3.2		ed	9.3.1 concerns the “integral control” and 9.3.2 concerns the “separate control”		
ISWIM	2	9.4.1	Sub-clause c)	te	For HS-WIM systems only used for overload control and enforcement, the sub-clause c) should either be deleted or amended.	Either delete the sub-clause c, or amend it into: “one load in between a) and b).”	
ISWIM	2	9.4.4		te	For HS-WIM systems only used for overload control and enforcement, switch to a load equal to the Min	For HS-WIM systems only used for overload control and enforcement, replace: “a load of about 50% of Max” by “a load equal to the Min”.	

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ISWIM	2	9.6		ed	It is suggested to split the clause in two parts, one for the type and number of reference vehicles, one for the loading cases.	9.6 Reference vehicles 9.6.1 Type and number of reference vehicles Containing the 5 first § 9.6.2 Loading of the reference vehicles Starting with § 7: “The reference vehicles shall be used...”	
ISWIM	2	9.6	§ 3	te	If appropriate, a van should be added to the list of other reference vehicles, above all for overload control and enforcement. Same with cars.	Add a fourth and a fifth bullet points with: • one van (a 2-axle vehicle limited to 3.5 t) if appropriate. • one car if appropriate.	
ISWIM	2	9.6	§ 7	ed	Duplication of “that”	Read “Vehicles carrying liquid loads or other products that may” (cancel one “that”)	
ISWIM	2	9.6		Te	A third sub-clause after 9.6.1 and 9.6.2 as above, should be added about the Max of axle load tests. It is necessary to consider that tests cannot be carried out with real vehicles too much overloaded, above all with respect of axle load, for vehicle, road and infrastructure safety reasons.	Add a sub-clause: 9.6.3 Max of axle load test The tests with reference vehicles will be carried out with axles up to the maximum load L_{max} compatible with vehicle and infrastructure safety on the test site. If the maximum capacity (Max, part 1, clause 3.3.2.1) for axle load exceeds L_{max} , a simulation test will be carried out in the range from L_{max} to Max.	
ISWIM	2	9.15.2		Te	For span stability test, the maximum permissible error MPE shall be used, rather than half the MPE	Rewrite into: “When the instrument is subjected to the span stability test specified in 13, the absolute value of the difference between the errors obtained for any two measurements shall not exceed the maximum permissible error for influence factor tests.”	
ISWIM	2	10.1.1.1		Te	It is not possible to test either the positive or the negative portion of the initial zero-setting range for WIM system using strip sensors.	Add: “NB: this clause must be applied whereas the technology allows it”.	
ISWIM	2	10.1.2		Te	It is not possible to test the accuracy of zero-setting for WIM system using strip sensors.	Add: “NB: this clause must be applied whereas the technology allows it”.	
ISWIM	2	10.2 11.1 11.2		Te	In all this article, some clauses dealing with static weighing are not applicable to all WIM sensors (e.g. strip sensors).	Add: “NB: this clause must be applied whereas the technology allows it”.	
ISWIM	2	11.1		Ed	Wrong reference 6.3.4	Replace 6.3.4 by 6.5	
ISWIM	2	12.1.1	1st alinea	Ed	This is not an Annex.	Replace: “this Annex” by “this Chapter”.	
ISWIM	2	12.1.1	3rd alinea	te	The WIM instrument should only be tested under static weighing conditions if test under real operating conditions and simulated operation is not possible and if the instrument is capable of measuring static loads.	Complete this alinea by: ”The WIM instrument may only be tested under static weighing conditions if the instrument is capable of measuring static loads”.	
ISWIM	2	12.1.2.2		ed	Wrong reference 6.3.5	Replace 6.3.5 by 6.6	
ISWIM	2	12.2.3.1		ed	Wrong reference 6.3.3	Replace 6.3.3 by 4.7.1	
ISWIM	2	12.2.3.1		ed	Wrong reference 6.3.3	Replace 6.3.3 by 4.7.1	
ISWIM	2	13		te	The span stability tests requires the use of test weights, not all WIM technologies are capable of measuring static weights or placing the weights on the sensors causes a practical problem.	Add: “NB: this clause must be applied whereas the technology allows it”.	
ISWIM	2	14.3.1.3		ed	Some unuseful double bars in a few formula.	In formula (4), (5), (10), (11), (12) and (13), remove one bar above CorrAxle or CorrGroup.	

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ISWIM	2	14.3.1.3	§ 5, after formula (5)	te	It is not possible to cover the weighing range of the instrument by loading the vehicle to its legal limit. See the proposed added clause 9.6.3.	Delete the end of the sentence after the formula (5): “such as the axle loads cover, as far as practicable, the weighing range of the instrument”. It is possible (but not mandatory, and it is not our proposal) to replace the above wording by: “such as the axle loads cover part of the weighing range of the instrument. The remaining range could be covered by simulation tests”.	
ISWIM	2	14.3.2.1		te	An instrument that may be used for overload control and enforcement will not always weigh vehicles at near its’ capacity and so linearity is as important.	Apply the same rules to all instruments	
ISWIM	2	14.3.2.2		te	The HS-WIM tests cannot only be carried out on an open road in real traffic flow, but can also be carried out on closed test sites with real vehicles.	Modify the first sentence, into “Weiging operation shall be carried out: - either on an open road in real traffic flow.... - or on a test site outside of the traffic flow, with operating conditions representatives of the running conditions of the test vehicles on an open road.”	
ISWIM	2	14.3.2.4		te	The procedures is not applicable for axle loads below the Min, i.e. for HS-WIM and overload control and enforcement, it only applies to axles above the legal limit or the specified Min.	Add to the first sentence: “, and to axle loaded above the Min (i.e. for overload control and enforcement, above the legal limit of the specified lowest value)”.	
ISWIM	2	14.3.2.4.2	Section 7)	te	Something missing for instrument used only for overload control and enforcement.	Add at the end of the first sentence, after “unloaded and loaded”: “or loaded only for WIM systems used for overload control and enforcement.”	
ISWIM	2	14.3.2.4.3	Title and section 1)	te	The title and first sentence should be revised according to the comment above on clause 14.3.2.2.	Title should be: “In motion tests on open road in actual traffic flow or on test sites” Section 1) should be completed by adding: “or on a test site”.	
ISWIM	2	14.3.2.4.3	Section 1)	ed	Reference to clause 14.3.2.2.2 is wrong.	Replace by “with 14.3.2.2”	
ISWIM	2	14.3.2.5		te	To be revised according to the comment made on clause 14.3.2.2.	First sentence, add: “or on a test site where the test vehicles can be operated”. After the second sentence, add: “This check can only be carried out on open road in real traffic.”	
ISWIM	2	14.3.2.5.2	§ 2	te	The method proposed to determine the reference speed is not the unique one. Alternative methods should be accepted.	Before the §2 add: “A possible method to assess the reference speed value is:” After this § add: “Any alternative method providing a reference speed with an appropriate accuracy is accepted, if agreed between the metrological authority and the applicant.”	
ISWIM	2	14.3.2.5.2	§ 3	te	The proposed maximum error on operating speed (1 km/h) is too low for HS-WIM. Even speed enforcement radars have a tolerance up to 5 km/h.	Replace in §3 “1 km/h” by “1 km/h for LS-WIM and 5% for HS-WIM, with an upper limit of 5 km/h”.	
ISWIM	2	14.3.2.5.3		te	The clause only applies to HS-WIM	Add “For HS-WIM only”.	
ISWIM	2	14.3.2.5.3	Last 2 §	te	The second proposed method is only applicable on open road, not on a test track or closed road.	In the 2 last § add “For test on open road...”	
ISWIM	2	14.3.2.5.3		ed	Wrong reference 5.5.7.1	Replace 5.5.7.1 by 5.5.8	
ISWIM	2	14.3.2.5.4		ed	Wrong reference 5.5.7.2	Replace 5.5.7.2 by 5.5.9	

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ISWIM	2	14.3.2.5.5		te	This clause only applies for tests carried on open road in the traffic flow. Therefore, it should not be mandatory.	Add a sentence: "This test is only mandatory on open road and in traffic flow. If the test is carried out on a test site outside the traffic flow, it should be agreed between the metrological authority and the applicant if this test is done apart on an open road, or as part of the initial verification, or is skipped out. This should be documented in the test report in R 134-3".	
ISWIM	2	14.3.2.5.5	§ 2	ed	The last sentence is confusing. Unknown reference : (R 134-1, 5.5.7.4)	After "as a correct test...", add: ", and if not shall not...".	
ISWIM	2	A.3.2	§ 2	te	"No longitudinal slope" is almost impossible, it means 0% slope. The COST323 recommends 1% max. slope.	Replace ""No slope" either by "No significant slope" or by "No more than 1% longitudinal slope".	
ISWIM	2	A.3.2	§ 3 and 4	te	"The aprons shall have a sufficient width." is not precise. "the width of the load receptor shall be clearly marked over the whole length of the apron" is not suitable for overload control and enforcement, it may give the opportunity to the violators to run outside of the sensors. "The apron (and load receptor) shall have sufficient width..." is not precise. Moreover, if the apron is too width, the risk of wheels running outside of the sensors increases.	Remove the 2 § and replace by: "The apron, sensors layout and eventual guidance system must ensure that all the vehicles will properly run on the sensors."	
ISWIM	2	B.1	§ 3	te	Some WIM systems (e.g. multiple sensor WIM systems, MS-WIM) can achieve a better accuracy on a less smooth pavement. This should be indicated right before the Table B-16.	Add after the sentence "The expected accuracy class... in accordance with Table B-16." The following sentence: "Some systems such as multiple sensor WIM systems may achieve a higher accuracy on a rougher pavement. For such systems, the controlled weighing area class indicated in the Table B-16 may be at least one level below, and depends on the number of sensor rows."	
ISWIM	2	B.1	Table B-16	te/ed	The caption of this table should refer to table B-17. The symbols in the table are confusing (e.g. 'x' and '(x)') and the legend (criteria) should be reworded. The second line of the table (accuracy class 2 or higher) is duplicated. Some changes are needed in the table.	Add to the table caption: "according to the weighing area classes defined in Table B-17." Replace in the table and legend, and write them from 0 to 2: 'x' by '0' = insufficient '√' by '2' = required '(x)' by '1' = sufficient Delete the second line of the table. For accuracy class 10, Excellent is required. For accuracy class 15, Good is required.	
ISWIM	2	B.2	§ 1	te	The full-draught weighing is also affected by the apron characteristics for HS-WIM. Moreover, the clause only applies to LS-WIM. For HS-WIM some figures should be modified (e.g. the apron length should be much longer), but it would be better to exclude HS-WIM from this clause.	Revise the title of the clause into "Apron characteristics for LS-WIM".	

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ISWIM	2	B.2.1		Ed	There is a clause B.2.1 but no B.2.2.	Either renumber B2.2.1 into B.3 and renumber the following clauses, or add a sub-clause B.2.1 “Apron surface” including the first part of the B.2 (before the current B.2.1) and renumber B.2.1 into B.2.2.	
ISWIM	2	B.2.1		te	The content of this clause seems too much detailed and restrictive, at least the §3.	Remove the §3. The clause could be simplified by writing: “Appropriate compliance checks of the apron characteristics should be carried out and reported in the test report. These tests shall be repeated periodically, when the apron characteristics are suspected to evolve.”	
ISWIM	2	B.3		te	To be consistent with the comments above...	Replace “the same control points” by “the same technique”.	
ISWIM	2	B. 4, 5, 7, 8, 9 and 10		te	These clauses only apply to HS-WIM.	Add in the titles: “for HS-WIM”.	
ISWIM	2	B.10	§ 1)	te	The table B-17 applies for an apron of 200 m before and 50 m after the weighing sensors.	Add after “The road surface smoothness and evenness”, “all along the apron, i.e. 200 m before and 50 m after the road sensors or weighing zone”.	