

EN15518 - a European Standard for Road Weather Information Systems (RWIS)

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ABSTRACT

Road Weather Information Systems are widely spread over the world. The acquisition of measurements and information about pavement status and weather conditions has become a strong decision-making basis for the road maintenance teams in their daily efforts to keep the roads safe during winter conditions.

However, the signification of measured parameters, the accuracy with which they are acquired and transmitted may vary greatly from one system to another. The European Committee for Standardization has decided to establish a clear terminology and definition of road maintenance related activities and equipments. Amongst the various standardization activities, a Project Work Group has been tasked to write a standard about Road Weather Information Systems. This document presents the current state of work of this group.

Keywords: Road, Weather, Standard, Europe, CEN.

1 INTRODUCTION

The European Committee for Standardization (CEN) [1] is an international non profit organization which provides a platform to foster the communization of requirements and specifications for goods and services within Europe. The purpose of this standardization is to ease the general trading processes for both the industry and the citizen by publishing European standards (EN)

The **European Commission** and the **EFTA (European Free Trade Association) Secretariat** act as CEN's **Counsellors** in terms of regulatory or public interest.

CEN works in a decentralized way. Its 32 members – the National Standardization Bodies (NSBs) of the EU and EFTA countries – operate the technical groups that draw up the standards; the **CEN-CENELEC Management Centre (CCMC)** in Brussels manages and coordinates this system.

The member countries accept to undertake the Standards published by CEN, as well as to withdraw any conflicting national standard. This ensures a wide and uniform market for the industry.

1.1 Organization of CEN

1.1.1 Sectors of the industry

CEN is active in most areas of economic activity. Its work is broken down into the following 22 sectors of the industry:

- Accessibility
- Air and Space
- Bio-based products

- Chemical
- Construction
- Consumer products
- Energy and utilities
- Environment
- Food
- Health and safety
- Healthcare
- Heating, Ventilation and Air Conditioning (HVAC)
- ICT
- Innovation
- Machinery safety
- Materials
- Measurement
- Nanotechnologies
- Pressure equipment
- Security and Defence
- Services
- Transport and Packaging

1.1.2 Technical Committees (TC)

Within each sector, Technical committees (TC) manage all the standardization activities and drive the production of deliverables (standards) according to a business plan. There are nowadays about 300 active TC's within CEN.

In our case, the sector of activity is "Machinery safety". Amongst many other TC's, the Technical Committee TC337 handles "Winter maintenance and road service area maintenance equipment (excluding machinery)"

1.1.3 Work Groups (WG)

The complete area of expertise of the Technical committee is broken down into logical topics, which are then assigned to Work Groups (WG). The Work Groups manage the standardization tasks within their topics and deliver the proposed standards to the TC for enquiry and formal approval within CEN.

The TC337 is made of the following Work Groups :

<i>SC/WG</i>	<i>Title</i>
CEN/TC 337/WG 4	Road cleaning equipment
CEN/TC 337/WG 3	Interface between tools and vehicle
CEN/TC 337/WG 1	Winter maintenance equipment

Table 1. Structure of TC337

In our case, The TC337 Work Group 1 is responsible, amongst others, for the Road Weather Information Systems.

1.1.4 Project Work Groups (PWG)

In specific cases, the task assigned to a Work Group can be further split through smaller bodies: the Project Work Groups (PWG). Projects Work Groups are made of a series of experts from the domain considered. They establish draft documents according to the directives of the Work Group.

In our case, the PWG5 "Road Weather Information Systems (RWIS)" within TC337 / WG1 deals with the standardization of components of a RWIS. The PWG is made of representatives of product manufacturers, road maintenance managers, weather offices and test laboratories

1.2 Phases of the creation of a standard

The creation of a new European Standard (EN document) has to go through the following phases:

- Generation of a Work Item
- Drafting of the corresponding Standard through the TC/WG/PWG
- CEN enquiry for public comments at national level
- Formal vote
- Implementation of an EN by giving it the status of national standards and withdrawing any conflicting national standards
- Review of the EN to ensure that the European Standard is still valid/applicable

The timeframe between the generation of the Work Item and the issuance of the corresponding draft Standard is limited to 3 years.

2 EN15518: ROAD WEATHER INFORMATION SYSTEMS

The main objective of this standard is to provide uniform understanding and requirements about Road Weather Information System components, so that users of such systems know exactly what information with which accuracy they are getting out of their equipment, regardless of manufacturer. Having set uniform requirements, the standard also defines uniform test methods, so that the compatibility of any component with the requirements can be demonstrated.

The initial task has been to define what one really understands under “Road Weather Information System” (RWIS). The “RWIS” acronym is used in Northern America to designate a set of sensors (pavement / atmospheric) to gather data about pavement status and road weather conditions, i.e what is commonly called a “weather station” in Europe.

However, the concept of Road Weather Information System cannot be limited to fixed equipment performing measurement on a specific location: it has to include all the various sources of information which allow the road maintenance manager to take timely and educated decisions.

The complexity of the overall concept has lead to break down the Standard into 10 parts:

- Part 1: Global definitions and components
- Part 2: Road weather – recommended observation and forecast
- Part 3: Requirements on measured values of stationary equipment
- Part 4: Test methods for stationary equipment
- Part 5: Requirements on measured values of mobile equipment
- Part 6: Test methods for mobile equipment
- Part 7: Requirements on measured values of portable equipment
- Part 8: Test methods for portable equipment
- Part 9: Description and requirements on thermal mapping
- Part 10: Data interface with other systems

3 PART 1: GLOBAL DEFINITIONS AND COMPONENTS

The part 1 is only a description of the various components making up a Road Weather Information System. The following figure gives an overview of the RWIS concept:

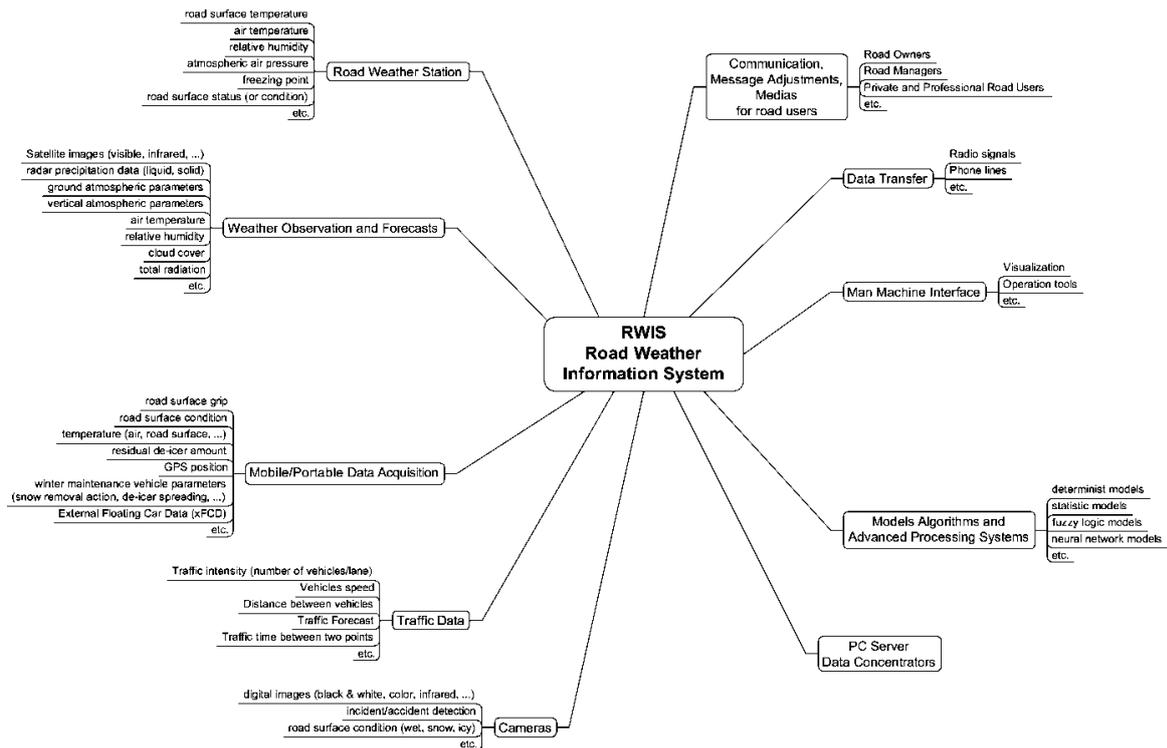


Figure 1. Excerpt of EN15518-1

The EN15518-1 was published in 2011 and is now in force within the CEN member countries.

4 PART 2: ROAD WEATHER – RECOMMENDED OBSERVATION AND FORECAST

This part of the standard provides a description of the usually available weather forecast. It has to be noted that this is just a recommendation about the requirements on weather forecast:

- **Text forecast:** this forecast usually describe the general weather conditions for a period covering the next 3 to 7 days. They are meant to be read and understood by human beings.
- **Numerical forecast:** these forecast provide values characterizing the weather evolution (temperatures, cloud covering, wind, precipitation, etc.) usually over the next 24 hours. They are meant for being integrated in information systems.
- **Radar / Satellite pictures:** this forecast usually describe the current and forecasted precipitation situation over a region. They are meant to be analyzed and understood by human beings
- **Weather alarms:** this information is usually generated by the weather offices before severe weather events (storms, freezing rain, etc.). It is meant to be analyzed and understood by human beings as well as to be eventually integrated in information systems.

The EN15518-2 has been published in 2011 and is now in force within the CEN member countries.

5 PART 3: REQUIREMENTS ON MEASURED VALUES OF STATIONARY EQUIPMENT

This part handles the requirements applicable to the road weather stations, which are a significant source of information to the road maintenance people. It first completes the terms and definitions related to winter maintenance (EN15144) with specific vocabulary for stationary equipment and measurements.

It then provides a list of parameters which are usually measured on the site of a road weather station, with the indication whether such parameter is considered as part of the basic (“B”) or optional (“O”) equipment.

For each parameter listed, the requirements about range of measurement, resolution and accuracy are specified. The purpose is to ensure that any maintenance manager, regardless of the technology and manufacturer of the equipment, knows the characteristics of the information he receives.

The following chapters describe the definition of the main pavement parameters as specified in the EN15518-3.

5.1 Pavement status

<i>Value</i>	<i>Situation over the sensor</i>
Dry:	no humidity over the sensor
Moist:	from (0,01 mm) water film thickness over the sensor
Wet:	from (0,2 mm) water film thickness over the sensor
Streaming water:	from (2 mm) water film thickness over the sensor
Slippery:	detection at least of the presence of partly or wholly solidified aqueous solution over the sensor

Table 2. Definition of pavement status

5.2 Freezing point temperature

This parameter is recognized as being one of the most important for the road maintenance people. It is also one of the very few parameters where technology can provide significant differences in capabilities. For this reason, two different “classes” of performance have been defined.

5.2.1 Calculated freezing point temperature

This class of performance corresponds to the classical “passive” method of determining the freezing point temperature of a liquid solution.

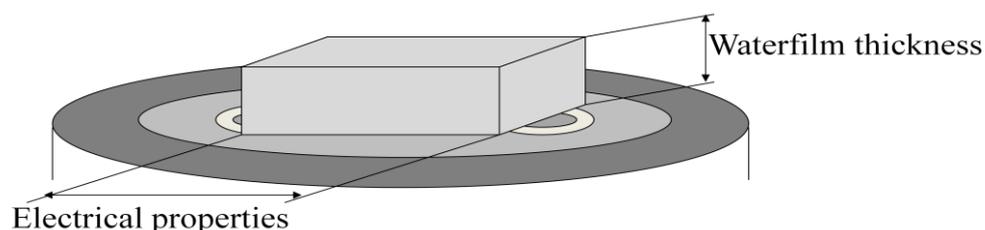


Figure 2. Schematics of passive pavement sensors

The thickness and electrical properties of the liquid solution are measured, which allows to calculate a chemical concentration; the nature of the chemical must be known in order to select the suitable phase curve, and hence determine the corresponding freezing point temperature.

Although fairly easy to realize, this technology has some limitations in the achievable accuracy. The requirements of the EN15518 for calculated freezing point temperature are:

<i>Characteristics</i>	<i>Values</i>
Measuring range :	– 30 °C to 0 °C
Resolution :	0,1 °C
Accuracy :	0 °C to – 2,5 °C, (± 0,5 °C)
	– 2,5 °C to – 30 °C, (± 20 %)

Table 3. Requirements for calculated freezing point temperature

5.2.2 Measured freezing point temperature

This class of performance corresponds to the “active” method of measuring the freezing point temperature of a liquid solution.

A small part of the surface of the sensor is artificially cooled down. The liquid solution present over the sensor is thus cooled down as well, until it freezes. This allows to actually measure the freezing point temperature.



Figure 3. Freezing of the liquid solution over an active sensor

This technology is totally independent of the chemical used and provides a great accuracy. The requirements of the EN15518-3 for measured freezing point temperature are:

<i>Characteristics</i>	<i>Values</i>
Measuring range:	– 30 °C to 0 °C
Resolution:	0,1 °C
Accuracy:	0 °C to – 15 °C, (± 0,5 °C)
	– 15 °C to – 30 °C, (± 1,5 °C)

Table 4. Requirements for measured freezing point temperature

The EN15518-3 Standard has been published in 2011 and is now in force within the CEN member countries.

6 PART 4: TEST METHODS FOR STATIONARY EQUIPMENT

This part specifies the various test methods which shall verify that the sensors and associated equipment of road weather stations meet the requirements set forth in EN15518-3.

The tests shall apply to the whole measuring chain (from sensor up to display software) in order to ensure that the requirements apply to the information as received by the road maintenance people. Further tests (for instance after a change in design of a sensor) can be performed on sensors only, provided the manufacturer can demonstrate that the rest of the data acquisition / transmission chain has no influence on the measured value.

Where controllable and repeatable tests conditions can be ensured, the test shall be performed in a climatic chamber. Otherwise, tests shall be performed outdoor under well defined weather conditions.

Because many of the test procedures are new to this domain, it has been decided to issue this part of the standard first as a Technical Specification (TS). This special type of standard is a normative document (no public enquiry) which leaves the opportunity to re-assess the document after a maximum of 2 x 3 years, thus allowing time to gather experience on the various test methods before to firm them up into a Standard.

European Laboratories are already entitled to deliver Test Certificates according to EN15518:



Figure 4. Excerpt of the certification report of the ARCTIS active pavement sensor from Boschung Mecatronic, stating that the sensor meets the requirements on measured freezing point temperature of EN15518-3 [2]

This Technical Specification is currently undergoing formal approval (target date is June 2012).

7 PART 5: REQUIREMENTS ON MEASURED VALUES OF MOBILE EQUIPMENT

This part shall standardize the various measurements which can be performed from a mobile platform (vehicle) to support the decision making process within road winter maintenance. In the same approach than the part dealing with stationary equipment, the objective shall be to precisely describe the nature and characteristics of the data delivered to the road maintenance manager.

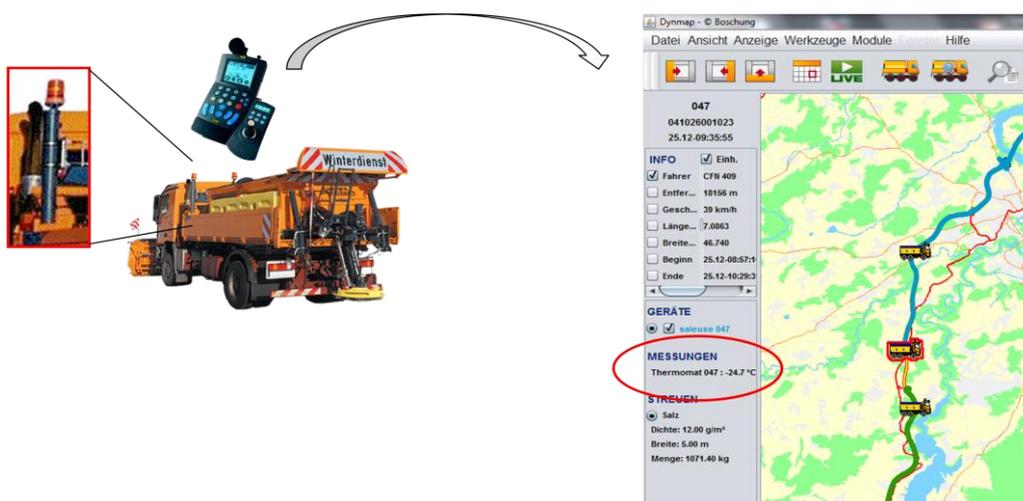


Figure 5. Typical example of measurement provided by a mobile sensor: the Thermomat from Küpper-Weisser

This part of the Standard is currently under work.

8 OTHER PARTS OF THE EN15518 STANDARD

The remaining other parts of the EN15518 Standard are still on the waiting list. Depending on the requirements of the industry, the priority list shall be defined by the PWG and may not follow the numbering of the parts.

9 CONCLUSION

Road Weather Information Systems are already widespread in Europe and over the world. As the technology becomes more and more important to support the decision processes, and because the expectations of road users on the quality and effectiveness of winter maintenance increase steadily, the standardization of this domain becomes of paramount importance.

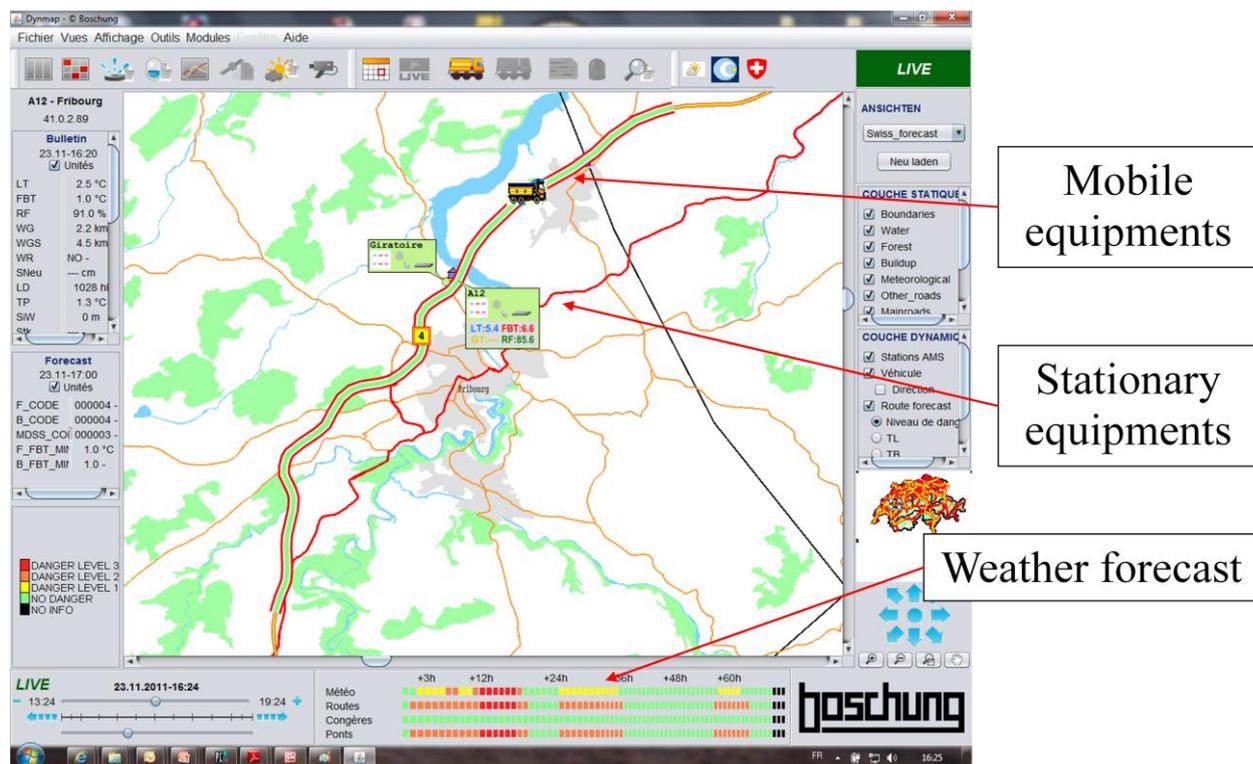


Figure 6. Typical Maintenance Decision Support System of Boschung.

10 REFERENCES

- [1] CEN, Avenue Marnix 17
1000 Brussels, Belgium
info@cen.eu
www.cen.eu
- [2] Bericht Nr. 50/07/09 über die Prüfung einer Bodensonde für die Gefriertemperatur – Bundesanstalt für Strassen, Bergisch Gladbach, Germany

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