

TOEPASSINGSREGLEMENT	TRA	346
	HERZ 2	2022/12

**TOEPASSINGSREGLEMENT VAN HET BENOR-MERK IN DE SECTOR VAN
STALENPRODUCTEN VOOR GEWAPEND BETON - CONTROLE
MODALITEITEN TOEPASSELIJK OP DE GEBRUIKERS VAN HET MERK
VAN WAPENINGSNETTEN**

HERZIENING 2

BENOR vzw

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REGLEMENT D'APPLICATION	TRA	346
	REV 2	2022/12

**REGLEMENT D'APPLICATION DE LA MARQUE BENOR DANS LE SECTEUR
DES PRODUITS EN ACIER POUR BETON – MODALITES DE CONTRÔLE
APPLICABLES AUX USAGERS DE LA MARQUE PRODUCTEURS DE
TREILLIS SOUDES**

REVISION 2

BENOR asbl

Approuvé par l'Organe d'Administration le 9/12/2022
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Application Regulation
TRA 346 Revision 02

**Application regulation of the BENOR-mark in the sector of
concrete reinforcements - Methods of assessment
applicable to the “Users of the mark” – Producers of flat
panels**

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1 Introduction

This Application Regulation (TRA¹) was prepared by the Technical Bureau 1 of OCAB-OCBS, sectoral organization, “Concrete reinforcing steels” for the BENOR certification of concrete reinforcements.

According to the regulation of use and control of the BENOR-mark² and its article 9, this Application Regulation of OCAB-OCBS constitutes the reference certification scheme to the BENOR-mark.

2 Reference documents and definitions

2.1 Reference documents

The last edition of the reference documents applies. When relevant, an addendum to the present regulation could be published in the event of incompatibility following a revision.

- Règlement d'usage et de contrôle de la marque BENOR / Algemeen reglement voor het beheer van het Benor-merk.
- Règlement général pour la gestion de la marque BENOR / Algemeen reglement voor het beheer van het Benor-merk.
- Règlement particulier d'usage et de contrôle de la marque BENOR dans le secteur des produits en acier laminés à chaud et dans le secteur des aciers écrouis à froid pour béton / Bijzonder reglement voor gebruik en controle van het BENOR-merk in de sector de warmgewalste staalproducten en in de sector van het koudvervormde staal voor gewapend beton, BRP 279.
- NBN A 24-301, Produits sidérurgiques - Aciers pour béton armé - Barres, fils et treillis soudés - Généralités et prescriptions communes / Staalproducten - Betonstaal - Staven, draden en gelaste wapeningsnetten - Algemeenheden en gemeenschappelijke voorschriften.
- PTV 302, Aciers pour béton armé, Barres à nervures ou à empreintes et fils à nervures ou à empreintes à haute ductilité / Gewapend betonstaal, Geribde of gedeukte staven en Geribde of gedeukte draad met hoge ductiliteit betonstaal.
- PTV 303, Aciers pour béton armé, Fils écrouis à froid à nervures à basse ductilité / Gewapend betonstaal, Geribde koudvervormde draad met lage ductiliteit.
- PTV 308, Aciers pour béton armé, Armatures soudés sous forme de panneaux plans / Betonstaal – Wapeningen die in de vorm van vlakke panelen worden gelast.
- TRA 418, Modalités de contrôle applicables aux Usagers de la Marque – Annexes statistiques / Controlemodaliteiten toepasselijk op de gebruikers van het Merk - Bijlage statistiek.
- ECU 606, Application of the BENOR-mark in the sector of concrete reinforcements - Methods of assessment applicable to the “Users of the mark, Processors and Distributors of BENOR products” - Equipment of control, determination of the “ λ -value” for the computation of f_R or f_P , simplified procedure for the setting of a straightening machine.
- Manuel de qualité de l'OCAB / Kwaliteitshandboek van het OCBS.

2.2 Basic definitions and requirements

2.2.1 Laboratories

2.2.1.1 Internal laboratory

It is the own internal laboratory (laboratory of the producer³). To be recognized as such, this laboratory must fulfil the following requirements:

¹ TRA: Toepassingsreglement – Règlement d'Application

² (Reference BENOR^{asblvzw} : NBN/RVB.CA/RM2012-10-02 and following editions in force)

³ COUNCIL DIRECTIVE of 25 July 1985 on the approximation of the laws, regulations and administrative provisions of the Member States concerning liability for defective products (85/374/EEC), Article 3.1: **'Producer'** means the manufacturer of a finished product, the producer of

- All the measurement and testing devices are compliant with the provisions in ECU 606.
- The tensile testing machines are equipped with a system of measurement of total elongation under the maximum load.
- The tensile testing machines of this laboratory must be calibrated in accordance with standard NBN EN ISO 15630-2. They must display the different levels of class defined by that standard regarding the loads and the elongations; the last calibration carried out by a service independent of the laboratory, cannot go back to more than one year.
- All the tensile testing machines used within the framework of BENOR certification must be the subject of paired comparisons with the tensile testing machine of the control laboratory⁴ according to the provisions of §3.2.33.1.6.1, §5.1.3.2 and §5.1.4.2.2.
- During the yearly check by the sectorial organization⁵ or his representative⁶, the test results of at least one testing machine must be subjected to the ones of a control laboratory. Each tensile testing machine must be subjected to a paired comparison with a control laboratory at least once every three years. If the producer uses other tensile machines in the internal laboratory, those machines are yearly compared with the machine for which the comparison with the control laboratory is carried out. If it is not possible to compare those other tensile machines with this machine (e.g. because of different capacity), a yearly comparison with a control laboratory must be carried out for each machine concerned.

2.2.1.2 Control laboratory

Laboratory accredited according to ISO 17025 and quoted by document OCAB-OCBS 503a⁷.

3 Preliminary examination prior to the granting of the authorization of use of the BENOR-mark

3.1 General information

The preliminary examination is based on the tests of current control carried out by the services of the producing factory and on complementary tests carried out by an external laboratory on request of the sectorial organization. The purpose of this preliminary examination is to check that the producer can manufacture the products for which he asks for the authorization of use of the mark and to maintain a regularity for the properties of these products in current manufacturing.

3.1.1 Principle

The conformity of the products to the prescriptions being the subject of standards NBN A 24-301 and -304 and technical specification PTV 308 is checked by the preliminary examination prior to the granting of the authorization of use of the BENOR-mark.

The authorization of use of the mark is granted by product. The products made from wires or bars of different grades are considered as different products (see PTV 308, § 5.1).

3.1.2 Technical file

Any producer applying for authorization to use the BENOR-mark for a given product must establish a technical file. This technical file describes the methods (processes) and means of production (machines) used in the manufacture of the products.

any raw material or the manufacturer of a component part and any person who, by putting his name, trademark or other distinguishing feature on the product presents himself as its producer.

⁴ See definition in 2.2.1.2

⁵ OCAB-OCBS

⁶ In the following of the text and for simplification reasons, the term "sectorial organization" includes her representative as well as the inspection body and his representative, as it is defined in the quality handbook of OCAB-OCBS.

⁷ Document 503 a, « Lijst – Liste – List, Keuringsinstellingen (OCI), Laboratoria (Labs), Organismes de contrôle (OCI), Laboratoires (Labs), Control Bodies (OCI), Laboratories (Labs) »

The initial technical file is sent to OCAB-OCBS. The technical file must be adapted for each change made to the administration (organization, ...) and production (other machine, other steel quality, diameters, etc...). The technical file, together with each of its amendments, shall be signed for approval by the representative of the sectoral organization for granting authorization to use the mark.

3.1.3 Random sampling

The sectoral organization selects, as much as possible randomly, the applicable number of products for control among the available products (see § 3.1.6 and 3.1.9).

All these available products come from the installations planned for the manufacturing of these products.

3.1.4 Requirements

It is necessary to check that the specified properties fulfil the criteria defined in the above-mentioned standards and technical specifications and clarified in articles 4.2 and 4.3 of this document.

3.1.5 Marking and Identification

The wires or bars with ribs or indentations shall be marked in accordance with NBN A24-301 and the PTV 302 or 303 normative documents enabling their origin to be identified. In addition, each bundle of flat panels is fitted with one or more labels bearing the following information (see also NBN A24-301 - § 4.7):

- the designation "panel"⁸
- the guaranteed grade of steel and the diameter by direction, the number of pitches⁹, the size of the pitches
- a reference number to ensure the traceability of the autocontrol (see 4.1.4)
- the name of the producer and the place of manufacture.

Labels must be indelible and strong enough to withstand the handling or manipulation of the flat panel. Labels must be submitted to the sectoral organization for approval.

The flat panels shall be accompanied by delivery slips in accordance with the requirements of Chapter 7 of document 279.

3.1.6 Presentation and sampling

The producer defines for which products and for which diameters per product, he requests the authorization of use of the BENOR-mark.

For the control of mechanical and geometrical properties, the producer shall present to the sectoral organization a quantity of products, in the condition in which they leave the plant, according to the following indications.

3.1.6.1 First product

If the product has four or more different diameters, the producer shall present at least 50 tons of the product with minimum 10 tons per type.

If the product consists of 3 different diameters or less, the types of flat panel presented (minimum 10 tons per type) must include all diameters¹⁰.

⁸ *panneau / paneel*

⁹ *Maille / Maas*

¹⁰ In that case, a maximum of three types of flat panels must be presented. The overall geometric properties of a flat panel shall be checked for each of the presented flat panel types, although depending on the sampling scheme, it is possible that only two fabrics must be tested for the other properties

The sectoral organization shall designate 3 types of flat panel, one with small diameters, one large diameters and one with the greatest ratio of diameters (R_d)¹¹ (in the absence of the latter type, a third type with intermediate diameters will be designated).

In each of the types the sectoral organization shall take 30 samples of bars or wires.

In the type with the small diameters, a representative small diameter is selected, in the type with the large diameters, a representative large diameter is selected.

In the type with the greatest ratio of diameters, the smallest diameter is chosen.

The three different diameters cover the full production range of the product.

The sampling is performed so as to test the different available presented coils.

If the whole flat panel is made from bars previously straightened, maximum 6 samples of different bars will be taken by flat panel.

If the flat panel is made partly from straightened bars and partly from coil, the sample shall be taken in order to obtain one sample per straightening line of coils and not more than 2 samples of previously straightened different bars shall be taken by flat panel. The sampling shall be taken over at least 3 different flat panels equally distributed over the presented products.

By designated type, the sectoral organization shall also take welded joints; the number is equal to the number of longitudinal wires of a flat panel. Each welded joint comes from a different longitudinal rod.

3.1.6.2 Extension to another grade

The sectoral organization shall designate 2 types of flat panel, one with small diameters and one with large diameters. For each type the producer shall present at least 10 tons of the product.

In each of the types the sectoral organization shall take 30 samples of bars or wires.

A representative small and large diameter will be selected.

The two different diameters cover the full production range of the product.

The sampling is performed so as to test the different available presented coils.

If the whole flat panel is made from bars previously straightened, maximum 6 samples of different bars will be taken by flat panel.

If the flat panel is made partly from straightened bars and partly from coil, the sample shall be taken in order to obtain one sample per straightening line of coils and not more than 2 samples of previously straightened different bars shall be taken by flat panel. The sampling shall be taken over at least 3 different flat panels equally distributed over the presented products.

By designated type, the sectoral organization shall also take welded joints; the number is equal to the number of longitudinal wires of a flat panel. Each welded joint comes from a different longitudinal rod.

3.1.6.3 Extension to another diameter

The producer shall present the extreme diameter(s). The sectoral organisation shall designate the types of flat panels. If the extension covers both small and large diameters, both extreme diameters shall be designated. For each type the producer shall present at least 10 tons of the product.

Sampling shall be carried out as described above.

3.1.7 Testing

The overall geometric properties of the flat panel shall be checked for each of the presented flat panel types, as follows:

- the *pitch* or distance between elements
- the overall flatness
- the *overhang*, namely the exceeding length at the extremities of the flat panel.

¹¹ R_d = "ratio of diameters" shall always mean: d_{max}/d_{min} .

During the examination for the issue of a first authorization of use of the BENOR-mark (see **Error! Reference source not found.** § 1 above), each sampled bar of wire is divided into three thirds: the first third is intended for control by the internal laboratory, the second third of one of the series is sent to the control laboratory, the third and last third of all the samples and the rest of the second thirds is to be kept in reserve.

The control laboratory proceeds on 30 samples of the corresponding series¹² dedicated to the determination of the tensile characteristics (determination of the conventional area and tensile test).

During the examination for the issue of an extension of the use of the BENOR-mark, the samples need not be additionally tested by the control laboratory. For producers who already benefit from an authorization to use the BENOR mark, tests in a control laboratory take place only once a year.

The producer shall, in the presence of the sectoral organization, carry out the following tests for each of the selected types:

on the first part of each of the 30 samples:

- tensile test
- conventional section

on the first part of 10 of the 30 samples:

- surface configuration¹³
- rebend test

on each of the sampled welded joints:

- determination of the shear force

The tests are carried out in accordance with the regulations of the standards and ECU 606.

The length of all cut samples must make it possible to carry out control of all the requested tests.

3.1.8 Tensile testing machines

The testing machines tension of the two laboratories must be in conformity with the regulations of § 2.2.1.1 of this regulation.

3.1.9 Chemical properties

The producer must be in possession of the certificates of analysis of the half-products unless these half-products are delivered under the BENOR mark. The results of these analyses must meet the "cast analysis" criteria of the standards.

3.1.10 Authorization of use of the BENOR-mark

The authorization of use of the BENOR-mark cannot be granted before the preliminary examination is completed.

¹² **IMPORTANT NOTICE:** It is to be recalled that each tensile machine of the internal laboratory concerned with the BENOR preliminary certification must be subjected to paired comparisons. Therefore, if the producer uses one tensile machine for the whole BENOR certification, only 30 samples are tensile tested in the control laboratory. In other cases where the producer uses several machines for the whole BENOR certification, each machine must be subjected to 30 tensile tests made in the control laboratory. The organization of the series of triplicate 30 samples must therefore be made in accordance with the actual encountered conditions.

¹³ The determination of the surface configuration can be made, at the choice of the producer:

1. Either through the measurement of the height and the spacing of the ribs (depth and spacing of the indentations)
2. Or through the measurement of the relative rib or indentation area f_R (f_P).

3.2 Interpretation of the results

The results of the factory must be in conformity with §§ 3.2.1, 3.2.2 and **Error! Reference source not found.** In addition, in the case of the examination for the delivery of the authorization of use of the BENOR-mark, the statistical comparison must be in conformity with § 3.2.3.

3.2.1 Controls by measurements

For each property being checked by measurement, namely:

1. yield strength
2. tensile strength
3. R'_m/R'_e ratio
4. total elongation under maximum load (A_{gt})
5. the relative rib or indentation area (f_R or f_P)¹⁴

one calculates, by diameter, the average “m”, the estimate of the standard deviation “s” and the estimate of the characteristic value “m - k.s”¹⁵.

One compares the estimates of the characteristic values with the values specified in the standards.

3.2.2 Controls by attributes

For each property being checked by attribute, i.e.:

- conventional section
- height of the ribs (depth of the indentations)¹⁶
- spacing of the ribs (spacing of the indentations)¹⁷
- rebend test
- chemical analysis on cast, semi-finished product, or (end) product
- pitch between the elements, overhangs and flatness of the flat panel
- shear strength of welded joints.

It is necessary to determine the number of specimens not answering the criteria of the standard.

3.2.3 Comparison between test results in the factory and the control laboratory

For the tensile strength and the yield strength, one proceeds to the statistical comparison of the results of the tests carried out with the factory with those of the control laboratory by the method of the paired observations (see Appendix A of document TRA 418).

The comparison must show that the series of tests are statistically identical.

If the comparison shows that the series of tests are not statistically identical, it is necessary to search the causes of them:

- if it appears that the causes are inherent to control by the internal laboratory, this one adapts its test procedure and starts again the tests on the products kept in reserve,
- if it appears that the causes are inherent to the control laboratory or, if it is not possible to detect the cause of the divergences, the sectoral organization considers measures to be taken.

The flow chart at the end of present chapter 3 summarizes the process to be followed.

It is needed that, for each diameter of the group of products chosen according to the indications of paragraphs 3.1.6, all the criteria of the standard are satisfied, namely:

¹⁴ In the case that the determination of surface configuration is achieved through the relative rib or indentation area $f_R - f_P$.

¹⁵ The coefficient k for $m = 30$ is equal to 2,08 (reliable failure rate 5% - probability β risk 10%) for properties 1, 2 and 5; and 1,66 (reliable failure rate 10% - probability β risk 10%) for properties 3 and 4 (see tables 4.2.2).

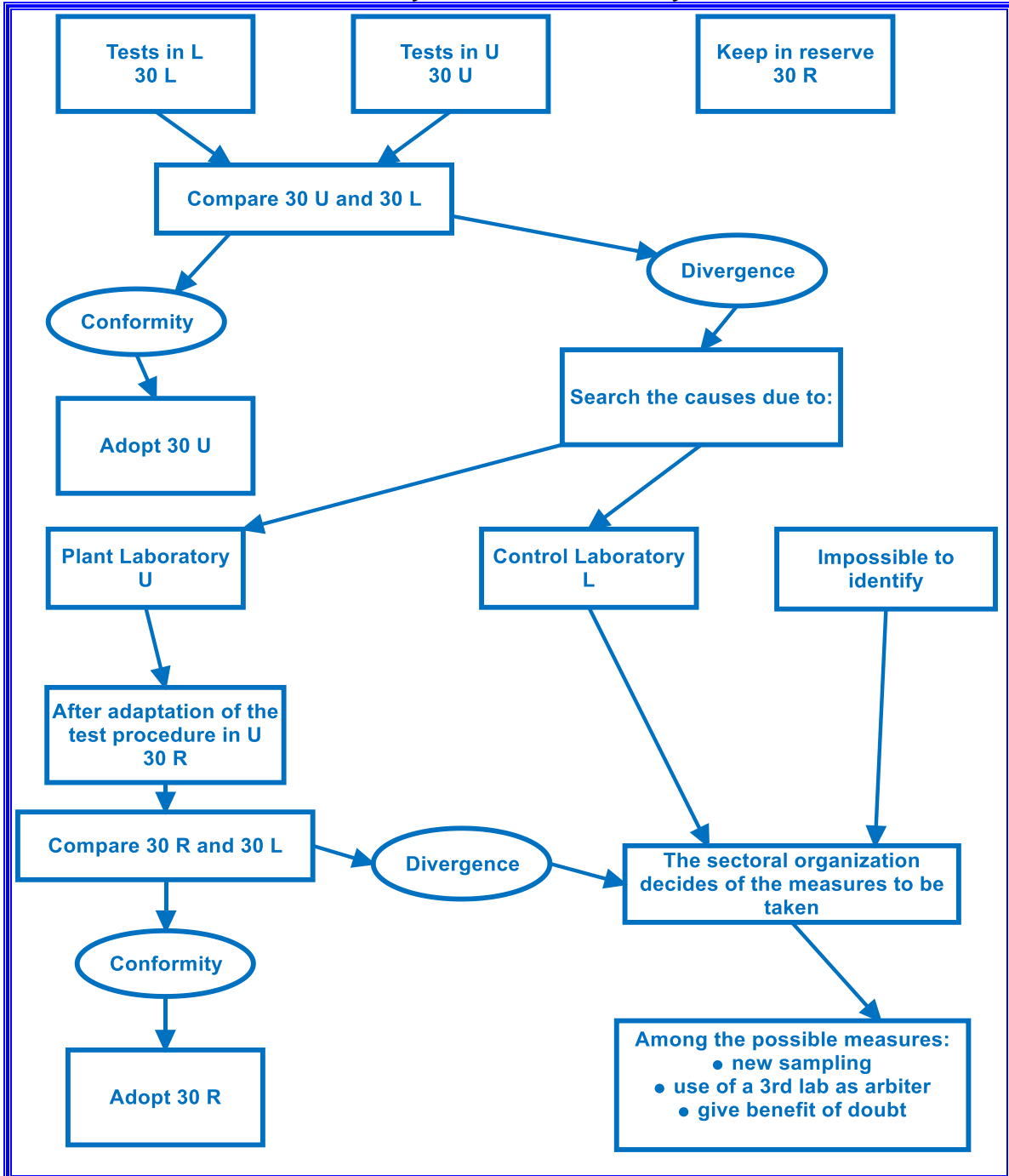
¹⁶ In the case that the determination of surface configuration is achieved through the height and the spacing of the ribs (depth and spacing of the indentations).

¹⁷ See above footnote over the determination of the surface configuration.

- for the properties controlled by measurements, values “m - k.s” must answer the criteria of the standard,
- for the properties controlled by attribute there can be no unsatisfactory specimen,
- the comparison of the tensile characteristics must show that they are statistically equivalent.

Flow chart for 1 diameter

L = control laboratory / U = internal laboratory / R = reserve



4 Industrial autocontrol

4.1 General information

4.1.1 Methods of control

The producer must have the methods of control allowing to check, during the manufacturing of one or several product(s) for which he obtained the authorization of use of the BENOR-mark, the respect of the criteria fixed by the standards relating to it for the entirety of the production bearing the recorded rolling marks (see § 3.1.5).

4.1.2 Sampling and tests (by product)

In all cases, statistical exploitation requires 30 test results of at least the same diameter per grade of steel from continuous or non-continuous production over a period of at least the last three months and at most twelve months.

Sampling and testing shall cover all manufacturing teams and machinery.

For this purpose, the producer shall sample:

- a) randomly at least one flat panel per maximum of 40 tons of products in order to carry out the tests prescribed by the standard, i.e.:
 - measurement of the conventional section
 - tensile test on the longitudinal wire
 - tensile test on the transverse wire
 - rebend test on the longitudinal wire
 - rebend test on the transverse wire
 - shear strength of welds
 - determination of the flat panel geometry, namely: the pitch, the overhand and the flatness
- b) at least one sample per maximum of 100 tons of products of the same nominal diameter intended for the control of the surface configuration.

Where rod guaranteed by the BENOR-mark is used for the manufacture of the products, the frequency of tests to be carried out on the assembled rods (measurement of the conventional section, tensile test, rebend test, surface configuration) may be reduced by half.

The tests shall be carried out in accordance with the standards and ECU 606.

4.1.3 Chemical analysis

4.1.3.1 Method and device of analyses

The method and the device used for the chemical analyses must give results representative of the product, whatever the structural heterogeneity of this last.

4.1.3.2 Chemical analysis on semi-finished products

The producer mill must have the certificate of analysis of all its semi-finished products per cast. Moreover, all the semi-finished products must be located with the indication of corresponding cast.

4.1.3.3 Chemical analysis on end products

The producer is not held to carry out the chemical analyses on end products; however, checks can be carried out by the sectoral organization at the time of the periodic visits at the same time as the calibration of the devices of chemical analysis. If the producer does not have the necessary equipment, the chemical analyses can be required in external laboratory at the cost burden of the producer.

4.1.4 Recording and analysis of the results of the autocontrol

All the results of controls are numbered and recorded. The classification of the tests is done in particular in reference to the numbers of manufacturing and identification of the products (see § 3.1.5) so as to ensure the traceability. One uses a register in pre-numbered and pre-signed pages by the sectoral organization. The register can be made up of loose sheets. If the monitoring service of the factory uses a system of continuous classification of the test results, or a computerized system, the aforementioned register is not essential. This system of classification must offer all the guarantees and be approved by the sectoral organization.

The results are kept for a period of 10 years by the producer.

The results are exploited statistically by the producer according to a calculation program approved by the sectoral organization and the results of this statistical exploitation are sent to the sectoral organization in the thirty end days of the month concerned. The producer can eliminate from this statistical exploitation the results coming from products withdrawn of the trade-circuit (see § 4.4) and certain too favourable aberrant results (see § 4.2.2). The attachments relating to the encountered problems and their solutions must be joined (see § 4.3.2).

4.2 Statistical control by measurements

This control applies to:

1. yield strength
2. tensile strength
3. R'_m/R'_e ratio
4. total elongation under maximum load (A_{gt})
5. the relative rib or indentation area (f_R or f_P).

4.2.1 Principle

The interpretation of the results of the tests is done using the statistical methods:

- by adopting a reliable failure rate of 5 % [$p = 0,95$] at a probability of 90 % (risk of 10 %) for properties 1 and 2 (R'_m , R'_e) and 5 (f_R or f_P)
- by adopting a reliable failure rate of 10 % [$p = 0,90$] at a probability of 90 % (risk of 10 %) for properties 3 and 4 (ratio R'_m/R'_e and A_{gt}).

4.2.2 Statistical interpretation of the results of the tests

The statistical interpretation of the test results shall be performed monthly by product from the production of the same diameter and grade of steel from the last 3 months.

However, the producer is free to divide his production into several homogeneous lots. In this case, this division must be clearly reflected in the statistical interpretation documents which it transmits for inspection to the sectoral organization.

For each examined property, one determines for n available results, the arithmetic mean "m" and the estimate of the standard deviation "s". One calculates the estimate of the characteristic value "m - k.s".

The tables hereafter give the constant of acceptance "k" according to the number of available results (according to NBN EN 10080: 2005).

If this value does not satisfy the specified value, the producer can draw aside no more than half of the values provided for control under consideration, but on the condition that doing it in the order of the values classified while starting with most favourable and to calculate: " $m_i - k_i \cdot s_i$ ".

If these new values still do not satisfy the specified value, the whole of the products considered is to be sheared to scrap in accordance with Article 2.6.1. of the Particular Regulation BRP 279.

Coefficient k as a function of the number (n) of test results for a reliable failure rate of 5 % ($p = 0,95$) at a probability of 90 %

n	k	n	k
5	3,40	30	2,08
6	3,09	40	2,01
7	2,89	50	1,97
8	2,75	60	1,93
9	2,65	70	1,90
10	2,57	80	1,89
11	2,50	90	1,87
12	2,45	100	1,86
13	2,40	150	1,82
14	2,36	200	1,79
15	2,33	250	1,78
16	2,30	300	1,77
17	2,27	400	1,75
18	2,25	500	1,74
19	2,23	1000	1,71
20	2,21	∞	1,64

Coefficient k as a function of the number (n) of test results for a reliable failure rate of 10 % ($p = 0,90$) at a probability of 90 %

n	k	n	k
5	2,74	30	1,66
6	2,49	40	1,60
7	2,33	50	1,56
8	2,22	60	1,53
9	2,13	70	1,51
10	2,07	80	1,49
11	2,01	90	1,48
12	1,97	100	1,47
13	1,93	150	1,43
14	1,90	200	1,41
15	1,87	250	1,40
16	1,84	300	1,39
17	1,82	400	1,37
18	1,80	500	1,36
19	1,78	1000	1,34
20	1,77		1,28

		∞	
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4.3 Statistical control by attributes

This control applies to the following properties:

- chemical analysis
- conventional section
- rebend test
- shear strength
- height of the ribs (depth of the indentations)¹⁸
- spacing of the ribs (spacing of the indentations)¹⁹
- the pitch (distance between elements)
- the overall flatness
- the overhang

4.3.1 Principle

The interpretation of the results of the tests is based on a simple sampling, by adopting a reliable failure rate of 10 % [$p = 0,90$] at a probability of 95 % (risk of 5 %).

4.3.2 Interpretation of the test results

The interpretation of the chemical analysis applies to all casts of steel. This interpretation takes place, prior to the production, on the basis of certificate of analysis of cast (see 4.1.3.2). No unsatisfactory result is accepted.

For the other examined properties, the interpretation of the results of the tests is to be carried out monthly for the products coming from the production the last three months in the same diameter. One admits a maximum number of insufficient results according to the number of results necessary to respect the criterion, as indicated in the table hereafter.

As soon as an unsatisfactory result arises and leads to the going beyond the admitted number, either the producer shears to scrap the concerned unit of autocontrol in accordance with article 2.6.1 of the Particular Regulation BRP 279, or he samples from this unit (40 tons or 100 tons according to the test – cf. § 4.1.2) a minimum of 5 samples including one in the same coil or the same bundle of bars and 4 others in a random way.

If all the results are satisfactory, the unit of autocontrol is accepted and the first result is not taken any more into account. In the contrary case, the products are sheared to scrap.

The anomaly, the results of the complementary tests, its probable cause as well as that the pursuant corrective action (measurements taken to cure it or put to scrap) must always be consigned and be the subject of an attachment to the transmitted results of autocontrol.

¹⁸ The determination of the height and the spacing of the ribs (depth and spacing of the indentations) may, at the request of the producer, be replaced by the determination of the relative rib or indentation area f_R (f_P) and shall in this case be evaluated following § 4.2.

¹⁹ See above footnote over the determination of the relative rib or indentation area (f_R , f_P).

Maximum admitted amount of unsatisfactory results	Minimum amount of results necessary to respect the criterion
0	29
1	46
2	63
3	78
4	92
5	106
6	119
7	132
8	145
9	158
10	170
11	182
12	195
13	207
14	219
15	231
16	243
17	255
18	267
19	279
20	291
21	303

4.4 Products not likely to bear the BENOR-mark

All precautions must be taken so that the products which do not fulfil the requirements of the standard and which cannot bear the BENOR-mark cannot be confused with those which bear the BENOR-mark.

4.5 Register of the claims

All the complaints being technical and relating to the delivered products are gathered in a register.

They are transmitted to the persons in charge concerned for treatment.

The register is held with provision of the sectoral organization.

5 Periodical checking by the sectoral organization

5.1 Products being in the producing factory

5.1.1 General information

The requirements on the authorization of use of the BENOR-mark (regularity in the manufacturing of the products and conformity of the products bearing the BENOR-mark to the standards) are checked periodically by the sectoral organization.

This checking consists in being ensured:

- that all the measurement and testing devices are in conformity and are calibrated in accordance with the regulations of § 2.2.1.1,
- that the producer disposes of all the certificates of chemical analysis of semi-finished products which he used,
- by means of representative samples, that the calibration of the devices used for the chemical analysis is correct,
- that the industrial autocontrol is carried out correctly,
- that the results of the industrial autocontrol are correctly interpreted.
 - With this intention, the sectoral organization carries out the checking of the statistical exploitation of at least two series of results a year.
- that the results of the industrial autocontrol are satisfactory,
- that the results obtained and recorded during this industrial autocontrol are in conformity with reality by carrying out check tests on products manufactured under the BENOR-mark and autocontrolled or on samples of casts or semi-finished products preserved to this end (see § § 4.1.3.1 and 4.1.3.2),
- that all actions were taken so that the products already provided with the BENOR-mark, but which must be sheared, are stored separately from conform BENOR steels,
 - The proof of shearing must be presented at initiative of the producer to the sectoral organization.
- the technical file is kept up to date and corresponds effectively to the methods (processes) and means (machines) used.
- that when anomalies were noted, necessary corrective actions were taken to cure it.

The producer makes all the provisions to facilitate this checking; in particular, he communicates to the sectoral organization:

- the name of the person in charge of the quality control services of the factory,
- the date of the start-up of a slightly modified production, i.e. products lying within the perimeter of the certification but comprising certain minor modifications.

He keeps at disposal all the results of autocontrol according to § § 4.1.3 and 4.1.4.

He also communicates to the sectoral organization, for each monthly period starting from the date of delivery of the authorization of use of the BENOR-mark, the quantity of products delivered under the BENOR-mark as well as the quantity of sheared products. The quantities are clearly subdivided by type of product (coil, bars, rod resulting from straightened coil, manufacturing processes, geometrical profile) and by diameter.

5.1.2 Periodicity of the visits of monitoring

For the period following a decision of the first certification, the user of the mark is subjected to a one-year probationary period comprising six visits.

During this period, documentary audits or complementary visits can be applied based on result of the initial audit (in function in particular amongst nonconformities) and of a decision of the Certification Committee.

The same principles are applicable in the event of extension during a one-year period, the number of basic visits being in this case limited to 4.

The audits which are conducted by the sectoral organization during the current time of certification, are made in theory four times a year.

This periodicity is of once a month in the following cases:

- on decision of the sectoral organization, when the results obtained on the samples taken during a routine checking and those obtained by the internal laboratory on the samples coming from the industrial autocontrol present a statistically significant difference (see § 5.1.4.2) and that the producer could not justify it satisfactorily,
- on decision of the sectoral organization, when other situations make it possible to question the level of product quality or its regularity.

5.1.3 Test sample selection

5.1.3.1 Routine checking

Each product is checked at least once a year. During the visit, the sectoral organization shall select at least one product and not more than two products.

By product, he takes 15 samples²⁰ distributed evenly over at least 3 identical flat panels from different production batches. Each of these 15 samples is of the same diameter and grade of steel. In case the flat panel is made from coils, the 15 samples come from different coils.

These samples shall be of sufficient length to permit a tensile test, a rebend test, a determination of the conventional section, a measurement of the rib configuration, a shear test of the welded nodes and possibly the chemical analysis. Artificial aging must be carried out just before the tensile test and in the presence of the sectoral organization (except for hot rolled bars where the choice - aged or not aged - is determined by the producer during his autocontrol).

If there are no finished products in stock, the sectoral organization shall check the production books and delivery notes by consulting them to ensure that the theoretical stock is effectively zero.

If the products are regularly insufficient to carry out the sampling of the 15 samples, the producer shall transmit to the sectoral organization the production program indicating the probable dates of dispatch.

5.1.3.2 Annual checking

Once a year, at the time of one of its visits, the sectoral organization takes the 15 samples and let them be cut out in two equal parts. First half is submitted for testing at the internal laboratory within the framework of routine checking according to § 5.1.3.1; the second half is sent for tensile test in a control laboratory.

For the producers who profit from an authorization of use of the BENOR-mark for several products, the tests in a control laboratory take place only once a year.

²⁰ Whenever possible, sampling shall be carried out in such a way as to enable the comparison of variances and means between self-checking and periodic inspection tests to be carried out satisfactorily.

5.1.4 Tests and interpretation of the results

5.1.4.1 Tests

The internal laboratory proceeds, in the presence of the sectoral organization, with the tensile tests on the 15 specimens, and with the rebend tests, the shear strength tests of the welded joints and measurements of surface configuration on at least 5 of the 15 specimens. The tests to be carried out are equally divided between the flat panels taken.

On the product under examination, a flat panel shall also be measured with regard to the pitch, the overhang and the flatness.

The chemical analysis is limited to 3 per diameter.

The samples for the possible chemical analysis are controlled in the internal laboratory. The calibration of the devices used for this purpose is controlled via representative samples (see §2.2.1.1).

5.1.4.2 Interpretation of the results

5.1.4.2.1 *Case of routine checking*

The interpretation of the test results of tensile consists in:

1. comparing the results of yield strength R'_e and tensile strength R'_m with those obtained during the autocontrol of the corresponding production. For this purpose, appendix B of TRA 418 is used.
2. checking that the results of R'_e and R'_m satisfy the following regulations
 - each individual value is higher than the specified characteristic value
 - and the mean value of R'_e and R'_m is higher than the specified characteristic value increased by 10 N/mm²
3. to check that for the R'_m/R'_e ratio and total elongation A_{gt} , each individual value is higher than the specified value.

All the results of the determination of the conventional section, the rebend test, the determination of the height of the ribs (depth of the indentations) and of the spacing of the ribs (or indentations) or the relative rib or indentation area, the shear strength test of the welded joints, the pitch, the overhang and the flatness, and any chemical analyses shall meet the standard.

5.1.4.2.2 *Case of the annual checks in control laboratory*

For the results of the yield and tensile strength obtained in the control laboratory, the interpretation consists in checking by the method of the paired observations (see Appendix A of document TRA 418) that there is conformity between these results and those obtained by the internal laboratory on the specimens coming from the same samples.

For information, the results of R'_e , R'_m , R'_m/R'_e , A_{gt} and of the conventional section are interpreted as described with 5.1.4.2.1.

5.1.5 Official report of monitoring

The results of the monitoring are consigned to each visit in a report.

This report must include the following indications:

1. producer and factory
2. identification of the products
3. data on the test sample selection
4. results of the tests carried out in the presence of the sectoral organization and corresponding results of the industrial autocontrol
5. overall evaluation
6. place and date
7. signatures.

The report, if necessary, is supplemented later by a copy of the official report of the tensile tests carried out in a control laboratory.

The report must be kept for a period of at least 10 years by the producer and by the sectoral organization.

5.2 Products bearing the BENOR-mark and being apart from the producing factory

5.2.1 Controls carried out on the initiative of the sectoral organization

5.2.1.1 Principle

If the sectoral organization judges it necessary, samples can be taken in the stores of the stockists-distributors, a processor-distributor or on a building site to check that the products there stored and considered to bear the BENOR-mark, answer the applicable criteria of the Belgian standards. According to the agreement taken beforehand and for the mechanical tests only, the tests are carried out in a control laboratory or, in the presence of the sectoral organization, in the internal laboratory.

5.2.1.2 Conditions for implementation of control

The taken samples are numbered and cut in 3 equal parts. A series of tests is carried out in a control laboratory as described in 5.2.1.1. The two other series are preserved for possible complementary tests in the producer or in a second control laboratory.

During the sampling, the sectoral organization takes note of markings, and copies of all the documents concerning to the controlled products. It preserves the labels attached there to find, if necessary, the results of the tests of autocontrol.

The results of the tests are communicated to the producer. In case anomalies or irregularities are noted, the producer is invited to provide a justification within a fixed deadline.

The costs of the tests are charged to the producer when anomalies or irregularities are noted.

In the event of registration of non-observance of the provisions of the regulations of the BENOR-mark or Particular Regulation (cf. chapter 2 of BRP 279), the concerned procedures are applied by OCAB-OCBS to the users of the mark.

In the event of disclosure of fraud, OCAB-OCBS reserves the right to prosecute the person in charge of the fraud.

5.2.2 Controls carried out by the sectoral organization in the case of an external claim

One or more sampling tasks are carried out, contradictorily, on the products being the subject of the litigation, by the sectoral organization, the producer or his representative in Belgium and the distributor having been duly convened.

The tests are carried out on the first and second thirds of samples during normal periodic controls in the internal laboratory and a control laboratory. The third and last third of the samples is preserved for possible complementary tests.

The possible chemical analyses on products are carried out in a laboratory selected by mutual agreement. The methods and devices used must give results representative of the average of the product, whatever the structural heterogeneity of this last.

The results of the tests are communicated to the producer. In case anomalies or irregularities are noted, the producer is invited to provide a justification within a fixed deadline.

After assessment of the results, the conclusions of the decision-making bodies of the sectoral organization are communicated to the producer, to the plaintiff and to the concerned internal bodies of the sectoral organization.

The costs of the tests are charged to the producer when anomalies or irregularities are noted.

In the event of registration of non-observance of the provisions of the regulations of the BENOR-mark or Particular Regulation (cf. chapter 2 of BRP 279), the concerned procedures are applied by OCAB-OCBS to the users of the mark.

In the event of disclosure of fraud, OCAB-OCBS reserves the right to prosecute the person in charge of the fraud.

5.2.3 Controls carried out on the initiative of a user

Whatever the results of the tests, the expenses of those are with exclusive charge of the user who took the initiative of it unilaterally.

The users who estimate themselves injured can address their claim justified to OCAB-OCBS.

As soon as possible, OCAB-OCBS rules on the admissibility of the claim and possibly decides to carry out controls and tests. OCAB-OCBS then applies the procedure described into 5.2.2 if the products being the subject of the litigation are still available or according to the procedure described into 5.2.1 in the contrary case.

6 History of the revisions

6.1 Revision 0

- Creation

6.2 Revision 1

- Reference to BENOR npo regulations
- Technical adaptations

6.3 Revision 2

- Edition in the English language
- Modification of sampling and testing for preliminary investigation
- Updating of requirements regarding sampling and surface configuration