IMPLEMENTATION RULES RÈGLEMENT D'APPLICATION TOEPASSINGSREGLEMENT	TRA	345
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IMPLEMENTATION RULES OF THE BENOR-MARK IN THE SECTOR OF CONCRETE REINFORCEMENTS - METHODS OF ASSESSMENT APPLICABLE TO THE USERS OF THE MARK – PRODUCERS OF WELDED FABRICS

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

TOEPASSINGSREGLEMENT VAN HET BENOR-MERK IN DE SECTOR VAN STALEN PRODUCTEN VOOR GEWAPEND BETON - CONTROLEMODALITEITEN TOEPASSELIJK OP DE GEBRUIKERS VAN HET MERK - PRODUCENTEN VAN WAPENINGSNETTEN

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FOREWORD

On 01.04.2024, the npo's PROBETON, BE-CERT, OCAB-OCBS and PROCERTUS merged in accordance with article 13 of the Code of Companies and Associations. On that date, PROBETON, BE-CERT and OCAB-OCBS were automatically dissolved, and all their rights and obligations were transferred to PROCERTUS, which alone continues their activities.

CONTENT

1 INTRODUCTION

These Implementation Rules (TRA[1]) of PROCERTUS, sectoral organisation, were initially established by the Technical Bureau 1 "Concrete reinforcing steels" of OCAB-OCBS, and are managed by PROCERTUS for the BENOR certification of concrete reinforcements.

According to the Rules for the use and control of the BENOR-mark[2] and its article 9, these Implementation Rules constitute 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. In the event of an incompatibility following a revision of one of the documents quoted hereafter, an addendum to the present Implementation Rules will be published if necessary.

- 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.
- NBN A 24-304, Produits sidérurgiques - Aciers pour béton armé – Treillis soudés / Staalproducten - Betonstaal - Gelaste wapeningsnetten.
- NBN EN ISO 15630-2, Aciers pour l'armature et la précontrainte du béton – Méthodes d'essai – Partie 2 : Treillis soudés et treillis raidisseurs / Staal voor de wapening en voorspanning van beton – Beproevingsmethoden, Deel 2: Wapeningsnetten en tralieliggers.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 304, Aciers pour béton armé, Treillis soudés / Gewapend betonstaal - Gelaste wapeningsnetten.
- NRN 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.

[1] **TRA**: **T**oepassings**r**eglement – **R**èglement d'**A**pplication

[2] Reference asbl BENOR vzw : NBN/RVB.CA/RM2012-10-02 and following editions in force

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 producer[3]). To be recognised as such, this laboratory must fulfil the following requirements:

- All 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 be older than one year.
- All 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 laboratory[4] according to the provisions of §3.2.3, 3.1.6.1, §5.1.3.2 and §0.
- During the annual check by the certification body[5] or its representative[6], 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 annually 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), an annual comparison with a control laboratory must be carried out for each machine concerned.

2.2.1.2 Control laboratory

Laboratory accredited according to ISO/IEC 17025 and listed in document 503a[7].

3 PRELIMINARY EXAMINATION PRIOR TO THE GRANTING OF THE AUTHORISATION 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 additional tests carried out by an external laboratory on request of the certification body. The purpose of this preliminary examination is to check that the producer can manufacture the products for which he asks for the authorisation of use of the mark, and can maintain a regularity for the properties of these products in current manufacturing.

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[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 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] PROCERTUS

[6] In the following of the text and for simplification reasons, the term "certification body" includes its representative as well as the inspection body and its representative.

[7] Document 503 a, « Lijst – Liste – List, Keuringsinstellingen, Laboratoria, Organismes d'inspection, Laboratoires, Inspection Bodies, Laboratories »

3.1.1 Principle

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

The authorisation 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 304, § 5.1).

3.1.2 Technical file

Any producer applying for authorisation 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.

The initial technical file is sent to PROCERTUS. The technical file must be adapted for every change made to the administration (organisation, …) 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 certification body for granting authorisation to use the mark.

3.1.3 Random sampling

The certification body 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 intended 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 - standards and technical specifications mentioned above, 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 PTV 302 or 303, enabling their origin to be identified. In addition, each bundle of welded fabrics is fitted with one or more labels bearing the following information (see also NBN A24-301 - § 4.7):

- the designation "welded fabric"[8],
- the guaranteed grade of steel and the diameter by direction, the number of pitches[9], 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 welded fabric. Labels must be submitted to the certification body for approval.

The welded fabrics shall be accompanied by delivery slips in accordance with the requirements of Chapter 6 of document 279.

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[8] *Treillis soudé / (gelast) wapeningsnet*

[9] *Maille / Maas*

3.1.6 Presentation and sampling

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

For the control of mechanical and geometrical properties, the producer shall present to the certification body 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 welded fabric presented (minimum 10 tons per type) must include all diameters[10].

The certification body shall designate 3 types of welded fabric, one with small diameters, one large diameter 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 certification body 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 welded fabric is made from bars previously straightened, maximum 6 samples of different bars will be taken by welded fabric.

If the welded fabric 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 welded fabric. The sampling shall be taken over at least 3 different welded fabrics, equally distributed over the presented products.

By designated type, the certification body shall also take welded joints; the number is equal to the number of longitudinal wires of a welded fabric. Each welded joint comes from a different longitudinal rod.

3.1.6.2 Extension to another grade

The certification body shall designate 2 types of welded fabric, 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 certification body 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.

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

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

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

If the welded fabric 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 welded fabric. The sampling shall be taken over at least 3 different welded fabrics, equally distributed over the presented products.

By designated type, the certification body shall also take welded joints; the number is equal to the number of longitudinal wires of a welded fabric. 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 certification body shall designate the types of welded fabrics. 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 welded fabric shall be checked for each of the presented welded fabric types, as follows:

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

During the examination for the issuing of a first authorisation of use of the BENOR-mark, 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 series[12] 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 authorisation to use the BENOR mark, tests in a control laboratory take place only once a year.

The producer shall, in the presence of the certification body, 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

[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 organisation of the series of triplicate 30 samples must therefore be made in accordance with the actual encountered conditions.

- on the first part of 10 of the 30 samples:
  - surface configuration[13]
  - rebend test
- on each of the sampled welded joints:
  - determination of the shear force

The tests are carried out in accordance with the requirements 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 tensile testing machines of the two laboratories must be in conformity with the requirements of § 2.2.1.1 of these Implementation Rules.

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 Authorisation of use of the BENOR-mark

The authorisation of use of the BENOR-mark cannot be granted before the preliminary examination has been completed.

3.2 Interpretation of results

The results of the factory must be in conformity with §§ 3.2.1 and 3.2.2. In addition, in the case of the examination for the delivery of the authorisation 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, in particular:

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.

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[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).

[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).

3.2.2 Controls by attributes

For each property being checked by attribute, in particular:

- 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 welded fabric
- shear strength of welded joints.

it is necessary to determine the number of specimens not conforming to 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 by the factory with those of the control laboratory, by the method of the paired observations (see Appendix A of document NRN 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 thereof:

- if it appears that the causes are due 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 due to the control laboratory or, if it is not possible to detect the cause of the divergences, the certification body considers measures to be taken.

The flow chart at the end of the present chapter 3 summarises 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 criteria of the standard are satisfied, in particular:

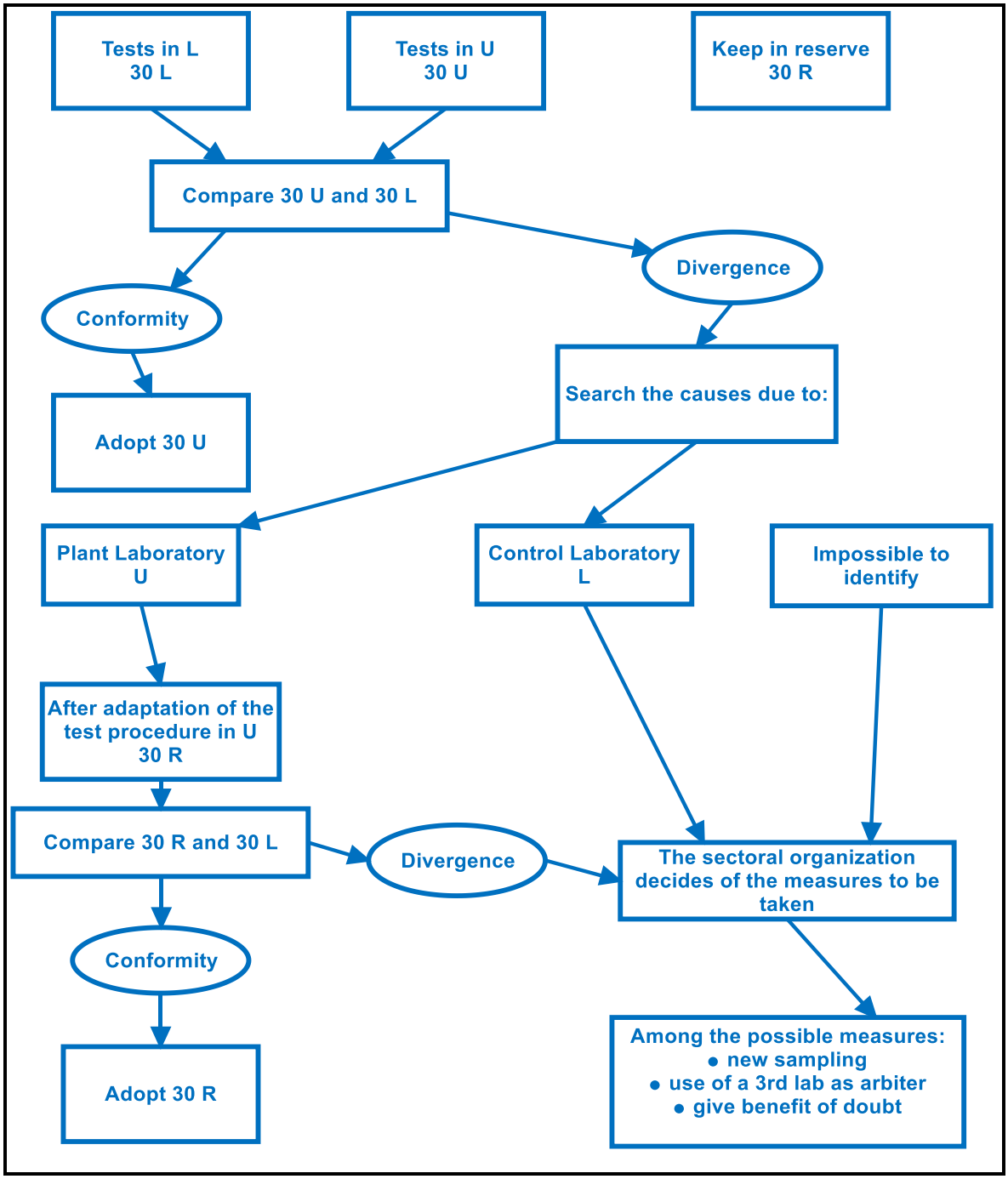
- for the properties controlled by measurements, values “m - k.s” must satisfy the criteria of the standard,
- for the properties controlled by attributes there can be no unsatisfactory specimen,
- the comparison of the tensile characteristics must show that they are statistically equivalent.

[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.

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

During the manufacturing of one or several product(s) for which he obtained the authorisation of use of the BENOR-mark, the producer must have the methods of control allowing to check the respect of the criteria fixed by the applicable standards, 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 analysis 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 welded fabric per maximum of 40 tons of products in order to carry out the tests prescribed by the standard, in particular:
   - 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 welded fabric 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 covered 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 analysis must give results representative of the product, whatever its structural heterogeneity is.

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 obliged to carry out the chemical analysis on end products; however, checks can be carried out by the certification body 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, realising the chemical analysis in external laboratory can be required, at the cost of the producer.

4.1.4 Recording and analysis of autocontrol results

All control results 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) to ensure traceability. One uses a register in pre-numbered and pre-signed pages by the certification body. 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 guarantees and be approved by the certification body.

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

The results are analysed statistically by the producer using a calculation program approved by the certification body, and the results of this statistical analysis are sent to the certification body within thirty days after the month concerned. The producer can eliminate from this statistical analysis the results coming from products withdrawn from the trade-circuit (see § 4.4), and certain too favourable aberrant results (see § 4.2.2). The attachments regarding 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 test results

The statistical interpretation of 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 that he transmits for inspection to the certification body.

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 put 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: "$m_i - k_i . s_i$".

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 2.7.1. of the Particular Rules 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

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 test results 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 test results

The interpretation of the chemical analysis applies to all casts of steel. This interpretation takes place, prior to 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 non-conforming results according to the number of results necessary to respect the criterion, as indicated in the table hereafter.

As soon as a non-conforming result arises and leads to exceeding the admitted number, either the producer shears to scrap the concerned unit of autocontrol in accordance with article 2.6.1 of the Particular Rules 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 additional tests, its probable cause as well as that the pursuant corrective action (measurements taken to cure it or put to scrap) must always be recorded and be the subject of an attachment to the transmitted autocontrol results.

[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 number of unsatisfactory results	Minimum number 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 to bear the BENOR-mark

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

4.5 Register of the complaints

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

They are transmitted to the persons responsible for their treatment.

On request, the register is made available to the certification body.

5 PERIODICAL CONTROLS BY THE CERTIFICATION BODY

5.1 Products being in the producing factory

5.1.1 General information

The requirements on which the authorisation of use of the BENOR-mark is based (regularity in the manufacturing of the products and conformity of the products bearing the BENOR-mark to the standards), are periodically controlled by the certification body.

These controls consists in making sure:

- that all measurement and testing devices are in conformity and are calibrated in accordance with the requirements of § 2.2.1.1,
- that the producer disposes of all certificates of chemical analysis of semi-finished products 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.
  - hereto, the certification body carries out the checking of the statistical analysis 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 line with reality, by carrying out control tests on products manufactured under the BENOR-mark and subjected to autocontrol, 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 bearing the BENOR-mark but that must be sheared, are stored separately from conform BENOR steels,
  - the proof of shearing must be presented at initiative of the producer to the certification body.
- that the technical file is kept up to date and effectively corresponds to the methods (processes) and means (machines) used.
- that when anomalies were noted, necessary corrective actions were taken to cure them.

The producer takes all measures to facilitate these controls; in particular, he informs the certification body about:

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

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

He also sends to the certification body, for each monthly period starting from the date of delivery of the authorisation 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 surveillance visits

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 the result of the initial inspection (in particular depending on the 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 inspections conducted by the certification body during the duration of certification, are in theory carried out four times a year.

This periodicity is once a month in the following cases:

- on decision of the certification body, 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 satisfactorily justify this,
- on decision of the certification body, 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 controls

Each product is controlled at least once a year. During the visit, the certification body shall select at least one product and not more than two products.

For every product, the certification body takes 15 samples[20] distributed evenly over at least 3 identical welded fabrics from different production batches. Each of these 15 samples is of the same diameter and grade of steel. In case the welded fabric 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 certification body (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 certification body shall check the production registers and delivery slips 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 certification body the production program indicating the probable dates of dispatch.

5.1.3.2 Annual control

Once a year, at the time of one of its visits, the certification body takes the 15 samples and has them cut out in two equal parts. The 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 dispose of an authorisation of use of the BENOR-mark for several products, the tests in a control laboratory take place only once a year.

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

5.1.4 Tests and interpretation of results

5.1.4.1 Tests

The internal laboratory proceeds, in the presence of the certification body, 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 welded fabrics taken.

On the product under examination, a welded fabric 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 tested 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 results

Case of routine control

The interpretation of the tensile test results 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, annex B of NRN 418 is used.
2. checking that the results of R'_e and R'_m satisfy the following criteria:
   - 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 ratio R'_m/R'_e and total elongation A_{gt}, each individual value is higher than the specified value.

All 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.

Case of the annual control in a 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 Annex A of document NRN 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 in 0.

5.1.5 Official control report of surveillance

The results of the controls are recorded 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 certification body and corresponding results of the industrial autocontrol

5. overall evaluation
6. place and date
7. signatures.

If necessary, the report is completed later on with 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 certification body.

5.2 Products bearing the BENOR-mark and being outside the producing factory

5.2.1 Controls carried out on the initiative of the certification body

5.2.1.1 Principle

If the certification body 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 stored there and considered to bear the BENOR-mark, meet the applicable requirements 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 certification body, in the internal laboratory.

5.2.1.2 Conditions for implementation of control

The samples taken 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 additional tests in the internal laboratory or in a second control laboratory.

During sampling, the certification body records markings and takes copies of all documents concerning the controlled products. It preserves the labels attached to find, if necessary, the autocontrol test results.

The test results are provided to the producer. In case anomalies or irregularities are found, 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 found.

In the event of observing a disrespect of the provisions of the rules of the BENOR-mark or Particular Rules (cf. chapter 2 of BRP 279), the corresponding procedures are applied by PROCERTUS to the users of the mark.

In the event of discovery of fraud, PROCERTUS reserves itself the right to prosecute the party responsible for the fraud.

5.2.2 Controls carried out by the certification body in case of an external complaint

One or more contradictory samplings are carried out by the certification body on the products being the subject of the litigation, 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 are preserved for possible complementary tests.

The possible chemical analysis 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 its structural heterogeneity is.

The test results are provided to the producer. In case anomalies or irregularities are found, the producer is invited to provide a justification within a fixed time frame.

After assessment of the results, the conclusions of the certification body are announced to the producer and to the plaintiff.

The costs of the tests are charged to the producer if anomalies or irregularities have been found.

In the event of observing a disrespect of the provisions of the rules of the BENOR-mark or Particular Rules (cf. chapter 2 of BRP 279), the corresponding procedures are applied by PROCERTUS to the users of the mark.

In the event of discovery of fraud, PROCERTUS reserves itself the right to prosecute the party responsible for the fraud.

5.2.3 Controls carried out on the initiative of a user

Whatever the results of the tests, their costs are at the exclusive charge of the user who took the initiative to execute them in an unilateral way.

Users who consider themselves disadvantaged, can address their substantiated complaint to PROCERTUS.

As soon as possible, PROCERTUS decides on the admissibility of the complaint and, if necessary, decides to carry out controls and tests. PROCERTUS then applies the procedure described in 5.2.2 if the products being the subject of the litigation are still available, or the procedure described in 5.2.1 in the contrary case.

6 HISTORY OF REVISIONS

Revisions 0 to 3

- Creation, updates

Revision 4

- General adaptation of the document to integrate the imprinted steels.
- Slight administrative changes of some chapters.

Revision 5

- Reference to BENOR$^{asbl}_{vzw}$ regulations
- Adaptation of the periodicity of inspection visits after a first certification.

Revision 6

- Edition in the English language
- Updating of requirements regarding sampling and surface configuration

Revision 7

- Modification of sampling and testing for preliminary investigation

Revision 8

- Transfer from OCAB-OCBS to PROCERTUS
- Change of vocabulary, where relevant, from sectoral organisation to certification body
- Editorial and linguistical corrections