

DRAFT UGANDA STANDARD

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**Cold rolled low carbon steel flat products for cold forming —
Technical delivery conditions**

DRAFT UGANDA STANDARD FOR PUBLIC COMMENTS



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Foreword

Uganda National Bureau of Standards (UNBS) is a parastatal under the Ministry of Trade, Industry and Cooperatives established under Cap 327, of the Laws of Uganda, as amended. UNBS is mandated to co-ordinate the elaboration of standards and is

- (a) a member of International Organisation for Standardisation (ISO) and
- (b) a contact point for the WHO/FAO Codex Alimentarius Commission on Food Standards, and
- (c) the National Enquiry Point on TBT Agreement of the World Trade Organisation (WTO).

The work of preparing Uganda Standards is carried out through Technical Committees. A Technical Committee is established to deliberate on standards in a given field or area and consists of key stakeholders including government, academia, consumer groups, private sector and other interested parties.

Draft Uganda Standards adopted by the Technical Committee are widely circulated to stakeholders and the general public for comments. The committee reviews the comments before recommending the draft standards for approval and declaration as Uganda Standards by the National Standards Council.

The committee responsible for this document is Technical Committee UNBS/TC 4, *Mechanical Engineering and Metallurgy*.

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Cold rolled low carbon steel flat products for cold forming — Technical delivery conditions

1 Scope

This Final Draft Uganda Standard applies to cold rolled uncoated low carbon steel flat products in rolled widths equal to or over 600 mm for cold forming, with a minimum thickness of 0.35 mm.

This standard does not apply to cold rolled narrow strip (rolling width < 600 mm) nor to flat cold rolled products in particular the following:

- cold rolled non-grain oriented magnetic steel sheet and strip;
- semi-processed steel strip for the construction of magnetic circuits;
- blackplate in coils;
- cold rolled flat products in high yield strength steels for cold forming;
- cold rolled uncoated non-alloy mild steel narrow strip for cold forming; and
- cold rolled low carbon steel flat products for vitreous enamelling.

2 Normative references

The following referenced documents referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

WDUS 1790, *Measurement of roughness average Ra and peak count RPc on metallic flat products.*

ISO 10474, *Steel and steel products — Inspection documents*

ISO 404, *Steel and steel products — General technical delivery requirements*

ISO/TS 4949, *Steel names based on letter symbols*

US 266, *Steel — Tensile testing (Metallic materials — Tensile testing at ambient temperatures)*

ISO 377, *Steel and steel products — Location and preparation of samples and test pieces for mechanical testing*

US ISO 6929, *Steel products — Vocabulary*

ISO 10113, *Metallic materials — Sheet and strip — Determination of plastic strain ratio*

ISO 10275, *Metallic materials — Sheet and strip — Determination of tensile strain hardening exponent*

ISO 14284, *Steel and iron — Sampling and preparation of samples for the determination of chemical composition*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in US ISO 6929 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at <http://www.iso.org/obp>

4 Designation

The steel names and the steel numbers shall comply with the requirements of ISO/TS 4949.

The designation consists of the word "sheet", "coil", "slit coil" or "cut length", followed in order by:

- reference to this Uganda standard, steel name or steel number (see Table 2);
- symbol concerning the surface quality (A for surface quality A or B for surface quality B); and
- if applicable, the symbol relating to the surface finish (see Table 1).

Table 1 — Surface finish and roughness values

Surface finish	Symbol	Roughness (cut off: 0.8 mm)
Bright	b	$R_a \leq 0.4 \mu\text{m}$
Semi-bright	g	$R_a \leq 0.9 \mu\text{m}$
Normal	m	$0.6 \mu\text{m} < R_a \leq 1.9 \mu\text{m}$
Rough	r	$R_a > 1.6 \mu\text{m}$

EXAMPLE 1 Designation of sheet made of steel grade DC01 (1.0330), surface quality A, surface finish normal (m):

- Sheet DUS 1633 – DC01–A–m; or
- Sheet DUS 1633 – 1.0330–A–m

EXAMPLE 2 Designation of coil made of steel grade DC06 (1.0873), surface quality B, surface finish semi-bright (g):

- Coil DUS 1633 – DC06–B–g; or
- Coil DUS 1633 – 1.0873–B–g

5 Requirements

5.1 Steelmaking and manufacturing processes

Unless otherwise agreed at the time of enquiry and order the steelmaking and manufacturing processes are left to the discretion of the manufacturer. The purchaser shall be informed of these processes if he or she specifies.

5.2 Deoxidation

For grade DC01, the method of deoxidation shall be at the manufacturer's discretion. Grades DC03, DC04, DC05, DC06 and DC07 shall be aluminium fully killed.

5.3 Chemical composition

The chemical composition based on ladle analysis shall be as given in Table 2.

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Table 2 — Characteristics of the skin-passed products

Steel name	Steel number	Classification	Surface quality	Absence of stretcher	R_e a	R_m	A_{80} b	r_{90} c d	n_{90} c	Ladle analysis chemical composition				
					MPa	MPa	min · %	min	min	C, max. %	P, max. %	S, max. %	Mn, max. %	Ti, max. %
DC01 ^e	1.0330	Non-alloy quality steel ^f	A		-/280 ^{gi}	270/410	28	-	-	0.12	0.045	0.045	0.6	-
			B	3 month										
DC03	1.0347	Non-alloy quality steel ^f	A	6 month	-/240 ^g	270/370	34	1.3	-	0.10	0.035	0.035	0.45	-
			B	6 month										
DC04	1.0338	Non-alloy quality steel ^f	A	6 month	-/210 ^g	270/350	38	1.6	0.180	0.08	0.030	0.030	0.40	-
			B	6 month										
DC05	1.0312	Non-alloy quality steel ^f	A	6 month	-/180 ^g	270/330	40	1.9	0.200	0.06	0.025	0.025	0.35	-
			B	6 month										
DC06	1.0873	Alloy steel quality	A	No limit	-/170 ^h	270/330	41	2.1	0.22	0.02	0.020	0.02	0.25	0.3 ⁱ
			B	No limit										
DC07	1.0898	Alloy steel quality	A	No limit	-/150 ^h	250/310	44	2.5	0.23	0.01	0.020	0.020	0.20	0.2 ^j
			B	No limit										

NOTE 1 MPa = 1 N/mm².

^a The values of yield strength are 0.2 % proof strength for products which do not present a definite yield point, and the lower yield strength R_{eL} for the others. When the thickness is less than or equal to 0.7 mm and greater than 0.5 mm, the value for yield strength is increased by 20 MPa. For thicknesses less than or equal to 0.5 mm, the value is increased by 40 MPa.

^b When the thickness is less than or equal to 0.7 mm and greater than 0.5 mm, the minimum value for elongation is reduced by 2 units. For a thickness less than or equal to 0.5 mm, the minimum value is reduced by 4 units.

^c The values of r_{90} and n_{90} only apply to products with a thickness equal to or greater than 0.5 mm.

- ^d When the thickness is over 2 mm, the value for r_{90} is reduced by 0.2.
- ^e It is recommended that products in grade DC01 should be formed within 6 weeks from the time of their availability.
- ^f Unless otherwise agreed at the time of enquiry and order, grades DC01, DC03, DC04 and DC05 may be supplied as alloy steels (for example with boron or titanium).
- ^g For design purposes, the lower limit of R_e for grades DC01, DC03, DC04 and DC05 may be assumed to be 140 MPa.
- ^h For design purposes the lower limit of R_e for grade DC06 may be assumed to be 120 MPa and 100 MPa for grade DC07.
- ⁱ The upper limit of R_e of 280 MPa for grade DC01 is valid only for eight days from the time of the availability of the product.
- ^j Titanium may be replaced by niobium. Carbon and nitrogen shall be completely bound.

5.4 Delivery conditions

5.4.1 The products shall be supplied in the skin-passed condition.

5.4.2 The products shall be delivered oiled. Both sides shall be corrosion protected by a layer of neutral non-drying oil, free of foreign bodies and uniformly spread. The layer of oils shall be capable of being removed by alkaline solutions or normal solvents.

If the purchaser does not require the surfaces to be oiled, this shall be clearly indicated at the time of enquiry and order.

If the conditions of transportation or storage are such that special protection against corrosion is required, the purchaser shall inform the manufacturer at the time of enquiry and order.

If the order is for non-oiled products, the manufacturer is not responsible for the risk of corrosion. The purchaser is also advised that there is a greater risk of the appearance of light scratches during handling, transportation, and application.

5.5 Mechanical properties

The mechanical properties given in Table 2 apply only to skin-passed products (see 5.7.2). The mechanical properties are valid for the period specified in Table 2 from the date on which the products are made available.

The validity of mechanical properties is not guaranteed for DC01 and is guaranteed for six months for DC03 to DC07, starting from the availability date at the manufacturer's works.

5.6 Surface characteristics

5.6.1 General

The surface characteristics consist of the surface quality and the surface finish. The surface quality and finish shall be specified by the purchaser at the time of enquiry and order.

5.6.2 Surface quality

The products are supplied with either of the surface qualities A or B.

- a) for products with surface quality A, defects such as pores, slight indentations, small marks, minor scratches and slight colouring that do not effect formability or the application of surface coatings are permitted; and
- b) for products with surface quality B, the better surface shall be free from defects which might affect the uniform appearance of a quality paint or an electrolytic coating (see 5.8). The other surface shall conform at least to surface quality A.

Where a single product has both surface quality A and B, the specification above should apply.

On the first wraps of the bore of a coil one shall expect a mark coming from the first wrap's displacement in height.

In the case of delivery of coil and slit coil, the percentage of defects may be greater than in the case of delivery in sheet or cut lengths. This shall be taken into account by the purchaser and the percentage of admissible surface defects shall be agreed at the time of enquiry and order.

5.6.3 Surface finish

The surface finish may be bright, semi-bright, normal or rough. In the absence of a requirement on the order, products shall be supplied with the normal finish.

By agreement at the time of enquiry and order, other ranges for surface roughness may be specified for specific and uses.

5.7 Stretcher strain marks

5.7.1 General

All products are generally subjected to a light skin-pass after annealing at the manufacturer's works, to avoid the formation of stretcher strain marks during subsequent forming.

The tendency to form such marks may reappear a certain time after the skin-pass. It is therefore in the purchaser's interest to form the products as soon as possible.

Products of grade DC06 and DC07 do not exhibit stretcher strain marks, whether delivered skin-passed or non-skin-passed.

5.7.2 Skin-passed products

The manufacturer shall ensure the absence of stretcher strain marks:

- a) for six months after products of grades DC03, DC04 and DC05 are made available by the manufacturer for surface qualities A and B; and
- b) for three months after products of grade DC01 are made available by the manufacturer for surface quality B.

5.7.3 Non-skin-passed products

Stretcher strain marks are permitted in the condition of delivery and on drawn items.

5.8 Suitability for surface coating

Products shall be supplied in accordance with the requirements specified by the purchaser. When such a coating is required, it shall be specified at the time of enquiry and order.

5.9 Weldability

Products are suitable for standard welding processes; however, the welding process should be specified at the time of enquiry and order, essentially in the case of gas welding.

5.10 Tolerances on dimensions and shape

5.10.1 Tolerances on out of squareness

The out-of-squareness (u) is the orthogonal projection of transverse edge over a longitudinal edge (see Figure 1) and shall not exceed 1 % of the actual width of the sheet.

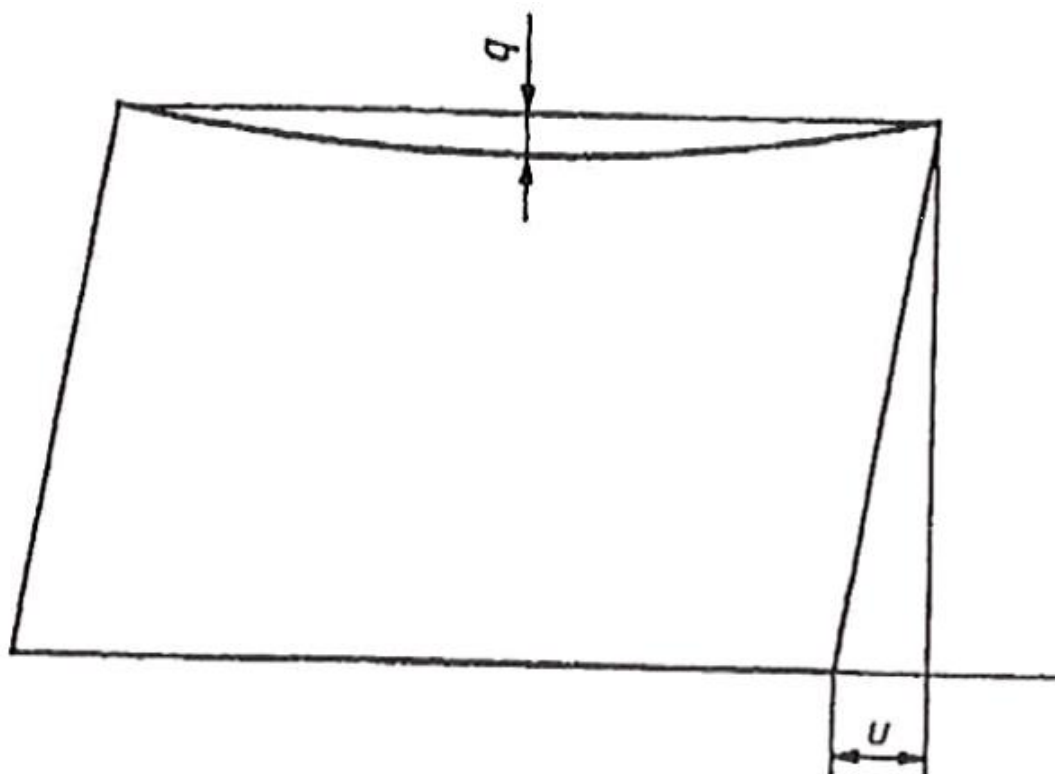


Figure 1 — Out - of - Squareness (U) and edge camber (q)

5.10.2 Tolerances on edge camber

Edge camber (q) is the maximum distance between a longitudinal edge and a straight edge supported on the latter (see Figure 1).

Edge camber shall be measured on the concave edge. The basis of measurement shall be a distance of 2 m taken at any point on the edge. In the case of sheets and cut lengths with a length less than 2 m, the basis measurement shall be equal to their length.

The edge camber shall not exceed 5 mm over a length of 2 m. For lengths less than 2 m, the edge camber shall not exceed 0.25 % of the actual length.

For slit wide strip of width less than 600 mm a special edge camber tolerance (CS) of 2 mm maximum on a 2 m length may be specified. This special edge camber tolerance is not applicable to slit wide strip of high yield strength steels.

5.10.3 Superimposition of dimensions

By agreement at the time of ordering, the tolerance on out-of-Squareness and edge camber may be replaced by a requirement that a perfect rectangle formed by the ordered width and length dimensions can be superimposed onto the sheets delivered.

6 Tests

6.1 General

The purchaser shall specify at the time of enquiry and order his or her requirements for:

- a) type of inspection and testing, specific or non-specific, (see ISO 404); and
- b) type of inspection document, see ISO 10474

Specific inspection and testing shall be carried out in accordance with 6.2 to 6.6.

Specific inspection and testing may not be specified either for the product analysis or for the surface finish.

6.2 Inspection units

The inspection unit is 30 t or a fraction of 30 t for products of the same grade and nominal thickness. When a coil exceeds 30 t it constitutes a single inspection unit, as do its products.

6.3 Number of tests

A tensile test shall be carried out for each inspection unit, and where appropriate, determination of the plastic strain ratio r and the tensile strain hardening exponent n (see Table 2).

6.4 Sampling

The requirements of ISO 377 and ISO 404 are supplemented by the following specific requirements:

- a) sheet and cut lengths: the selection of products to be tested and the position of the samples in the products is left to the discretion of the inspection representative; and
- b) wide strip and slit wide strip: the sample should be taken from the outer end.

If the width of the product permits, the test pieces for the tensile test shall be taken perpendicular to the direction of rolling.

6.5 Test methods

6.5.1 The products shall be tested in the condition of delivery. The tests shall be carried out at ambient temperature.

6.5.2 The tensile test shall be carried out as described in US 266 using type 2 test pieces (initial gauge length $L_0 = 80$ mm, width $b = 20$ mm).

6.5.3 Surface roughness shall be determined in accordance with DUS 1790

6.5.4 Determination of the plastic strain ratio r and the tensile strain hardening exponent n shall be carried out in accordance with ISO 10113 and ISO 10275.

6.5.5 To determine the chemical composition ISO 14284 shall apply.

6.6 Re-tests

The requirements of ISO 404 shall apply. In the event of disputed test results for coils, samples for retests shall be taken at intervals of at least one lap, but also at a maximum distance of 20 m from the appropriate end.

6.7 Inspection document

6.7.1 General

By agreement at the time of enquiry and order, an inspection document chosen from those given in 6.7.2 and 6.7.3 shall be supplied.

6.7.2 Inspection documents based on non - specific inspection

6.7.2.1 Declaration of compliance with the order “type 2.1”

This is a document in which the manufacturer declares that the products supplied are in compliance with the requirements of the order, without inclusion of test results.

6.7.2.2 Test report “type 2.2”

This is a document in which the manufacturer declares that the products supplied are in compliance with the requirements of the order and in which he supplies test results based on non-specific inspection.

6.7.3 Inspection documents based on specific inspection

6.7.3.1 Inspection certificate 3.1 “type 3.1”

This is a document issued by the manufacturer in which he declares that the products supplied are in compliance with the requirements of the order and in which he supplies test results.

The test unit and the tests to be carried out are defined by the product specification, the official regulation and corresponding rules and/or the order.

The document is validated by the manufacturer's authorized inspection representative, independent of the manufacturing department.

It shall be permissible for the manufacturer to transfer on to the inspection certificate 3.1 relevant test results obtained by specific inspection on primary or incoming products he uses, provided that the manufacturer operates traceability procedures and can provide the corresponding inspection documents required.

6.7.3.2 Inspection certificate 3.2 “type 3.2”

This is a document prepared by both the manufacturer's authorized inspection representative, independent of the manufacturing department and either the purchaser's authorized inspection representative or the inspector designated by the official regulations and in which they declare that the products supplied are in compliance with the requirements of the order and in which test results are supplied.

It shall be permissible for the manufacturer to transfer on to the inspection certificate 3.2 relevant test results obtained by specific inspection on primary or incoming products he uses, provided that the manufacturer operates traceability procedures and can provide the corresponding inspection documents required.

6.7.4 Validation and transmission of inspection documents

The inspection document shall be validated by the responsible person(s) (name and position).

The retention and transmission of documents shall be either in electronic data or paper form.

6.7.5 Transmission of inspection documents by an intermediary

An intermediary shall only pass on either an original or a copy of the inspection documents provided by the manufacturer without any alteration. This documentation shall be accompanied by suitable means of identification of the product, in order to ensure the traceability between the product and the documentation.

Copying of the original document is permitted, provided that:

- a) traceability procedures are operated; and
- b) the original document is available on request.

When producing copies it is permissible to replace the information on the original delivered quantity by the actual delivered partial quantity.

7 Marking

The manufacturer shall provide appropriate marking with the following information:

- a) manufacturer's name and address;
- b) surface finish;
- c) steel designation;
- d) country of origin;
- e) manufacturer coil number;
- f) coil size (width by thickness, minimum); and
- g) net weight of coil in metric tonnes.

8 Packing

The packing requirements shall be agreed at the time of enquiry and order.

9 Information to be provided by the purchaser at the time of order

The following information shall be provided by the purchaser at the time of order to allow the manufacturer to supply products conforming to this standard:

- a) full designation as given in Clause 4;
- b) nominal dimensions and tolerances according to the dimensional standard and the ordered quantities;
- c) if the product has to be delivered with mill edges or trimmed edges;
- d) if products are to be supplied non-skin-passed;
- e) limits on the mass and size of the coils and the individual bundles;
- f) intended application of products, including the surface coating;
- g) if the products are to be welded, an indication of the method to be used;
- h) if the products are to be supplied as suitable for making a specific part;
- i) if inspection documents are required, and their type;
- j) if an external inspection is to be carried out at the manufacturer's works;
- k) if oiling is not required;
- l) if other protective coatings are required;
- m) detailed description of all other special requirements;

- n) any special requirements for packing and marking; and
- o) position of the surface of better surface quality.

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Bibliography

- [1]. EN 606, *Bar coding – Transport and handling labels for steel products.*
- [2]. EN 10049, *Measurement of roughness average R_a and peak count R_{Pc} on metallic flat products*
- [3]. EN10130, *Cold rolled low carbon steel flat products for cold forming — Technical delivery conditions*

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Certification marking

Products that conform to Uganda standards may be marked with Uganda National Bureau of Standards (UNBS) Certification Mark shown in the figure below.

The use of the UNBS Certification Mark is governed by the Standards Act, and the Regulations made thereunder. This mark can be used only by those licensed under the certification mark scheme operated by the Uganda National Bureau of Standards and in conjunction with the relevant Uganda Standard. The presence of this mark on a product or in relation to a product is an assurance that the goods comply with the requirements of that standard under a system of supervision, control and testing in accordance with the certification mark scheme of the Uganda National Bureau of Standards. UNBS marked products are continually checked by UNBS for conformity to that standard.

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