ने.गु. १४१:२०७५
दोस्रो पुनरिक्षण
NS:141:2075

नेपाल गुणस्तर

Nepal Standard

GALVANIZED STEEL SHEETS

(PLAIN AND CORRUGATED) - SPECIFICATION

(Second Revision 2075)

नेपाल सरकार

उधोग,बाणिज्य तथा आपूर्ति मन्त्रलय

नेपाल गुणस्तर तथा नापतौल बिभाग

बालाजु ,काठमाडौँ

नेपाल गुणस्तर परिषद्
Nepal Council for Standardization (NCS)

अध्यक्ष

माननिय मात्रिका यादब, उधोग बाणिज्य तथा आपूर्ति मन्त्री

उपाध्यक्ष

श्री याम कुमारी खतिवडा, सचिव, उद्योग, बाणिज्य तथा आपूर्ति मन्त्रालय

सदस्यहरु

सि.नं.	नाम	पद	संस्था
१.	श्री शत्रुधन प्रसाद पुडासैनी	सह-सचिव	उद्योग, बाणिज्य तथा आपूर्ति मन्त्रालय
२.	श्री	सह-सचिव	उद्योग, बाणिज्य तथा आपूर्ति मन्त्रालय
३.	श्री सुरेन्द्र प्रसाद सुवेदी	सह-सचिव	शिक्षा, विज्ञान तथा प्रविधि मन्त्रालय
४.	श्री संजीव कुमार कर्ण	सह-सचिव	कृषि विकास मन्त्रालय (खाध प्रविधि तथा गुण नियन्त्रण वि.)
५.	श्री निर्मला अधिकारी भट्टराई	सह-सचिव	कानुन तथा संसदीय मामिला मन्त्रालय
६.	श्री रिकेश महर्जन	इन्जिनियर(प्रतिनिधि सदस्य)	भौतिक पुर्वाधार तथा यातायात व्यवस्था म
७.	श्री सुमनलाल श्रेष्ठ	सह-प्राध्यापक	त्रिभुवन विश्वविधालय
८.	श्री प्रा.डा. दिपक प्रसाद सुवेदी	प्राध्यापक	काठमांडौ विश्वविधालय
९.	श्री दिनेश श्रेष्ठ		नेपाल उधोग वाणिज्य महासंघ
१०.	श्री दिपक श्रेष्ठ		नेपाल चेम्वर अफ कमर्स
११.	श्री अनिता जोशी		उपभोक्ता सरोकारवाला संघ संस्था
१२.	श्री सिर्जना बुर्लाकोटी		उपभोक्ता सरोकारवाला संघ संस्था
१३.	श्री अरुणदेव भट्टराई		विज्ञ

सदस्य सचिव

श्री विश्ववाबु पुडासैनी, महानिर्देशक,ने.गु.तथा ना.तौ.वि.

Galvanised Steel Sheets (Plain And Corrugated) - Specification सम्बन्धि प्राविधिक समितिको सदस्यहरु

१. श्री विश्वबाबु पुडासैनि , महानिर्देशक ,ने.गु.तथा ना.वि

२.श्री रोमि मानन्धर, उप महानिर्देशक ,ने.गु.तथा ना.वि

३.श्री दीनानाथ मिश्र ,उप महानिर्देशक, ने.गु.तथा ना.वि

४श्री प्रमोदा प्रधान, उप महानिर्देशक, ने.गु.तथा ना.वि

५.श्री सञ्जीव कुमार ठाकुर, निर्देशक,ने.गु.तथा ना.वि

६.श्री अनिल शाक्य निर्देशक ने.गु.तथा ना.वि

७.श्री कृष्ण बहादुर सोडारी, मे.ई. ने.गु.तथा ना.वि

८.श्री माधव तिमिल्सेना, उपभोक्ता अधिकार अनुसन्धान मन्च

९.श्री प्रवीण आचार्य, राष्ट्रिय पुनर्निर्माण प्राधिकरण

१०.श्री अन्जन श्रेष्ठ, नेपाल उधोग बाणिज्य महासंघ

११.श्री शिवजी शर्मा मे.ई, ने.गु.तथा ना.वि

१२.श्री भरत मण्डल,ई.अ.स., पुल्चोक क्याम्पस

१३.श्री अरविन्द कुमार झा, हुलास स्टिल प्रा.लि

१४.डा.भानुभक्त न्यौपाने , रशायन शास्त्र विभाग किर्तिपुर

१५.श्री अब्दुल रउफ,राजेश मटेल क्राफ्टस्

१६. श्री बिबेक सिग्देल ,सहरी विकास तथा भबन निर्माण बिभाग

प्रस्तावना

१.नेपाल गुणस्तर (प्रमाण चिन्ह) ऐन २०३७ ले प्रदत्त अधिकार प्रयोग गरी नेपाल गुणस्तर निर्धारण गर्ने यस विभागलाइ भएको निर्देशन र नीति सार राष्टिय गुणस्तर स्तरमा प्रलेखहरु तयार पार्ने सिलसिलामा आवश्यक तरिका र ढाँचामा यो गुणस्तर प्रलेख तर्ज्मा गरी प्रस्त्त गरिएको छ। इसले नेपाल ग्णस्तर सँग सम्बन्धित सबै पक्षका निमित्त आवश्क निर्देशीकाको कार्य गर्ने छ।

२.यो प्रलेख तयार पार्दा ग्णस्तर निर्धारणको प्रलेख सम्बन्धमा अरु देशहरुले र अन्तराष्टिय संगठनले अपनाएका प्रचलन ,तरिका र ढाचाँलाई यथोचित ध्यानमा राखिएको छ। यसको तर्ज्माको लागि विशेष गरी देहायको विदेशि तथा अन्तराष्टिय संघ संस्थाको प्रलेख तथा साधानको सहयोग लिएको छ।

क) आइ ंएस.ओ. इर्न्टनेशनल अर्गनाइजेसन फर स्टाण्डर्डइजेसन

ख)वी.एस. आई ब्रिटिश स्टाण्र्डड इन्स्टिच्युसन

ग)वी. आइ.एस. व्य्रो अफ इडिया स्टाण्डर्ड

३. प्रलेख तयार पार्दा खास ध्यानमा राखिएका **बुदाहरु**

३.१ गुणस्तर प्रलेखको तर्जुमा गर्दा अन्य प्रलेखको कुनै पनि परिच्छेदको उलंघ हुन नजाओस भनि यथाशक्य होशियारी राखिएको छ। असावधानीवाट केहि उलंघन हुन गएको ज्ञात हुन आएमा यसमा चाहिने संशोधनको लागि यथाशिघ्र कदम उठाउने छ।

३.२ देशको ऐन नियम अन्तरगत परेको सबै बुदाँलाई यथोचित मान्यता दिइ यसको कुनै दफा तथा उरिच्छेदको उलंघन नहने गरी यो गुणस्तर प्रलेख तयार पार्ने कोशिस गरीएको छ। कथंदाचित गुणस्तर प्रलेखको कुनै भागमा उलेखित कुराहरु ह्याल प्रचलनमा भएका तथा भविष्यमा आउने ऐन नियम सँग बाझिन गएमा त्यस्ता (प्रलेख)का कुराहरु स्वत निष्कृय हुनेछ।

३.३ नायतौल इकाई तथा तिनिहरुको रुपानतर गर्दा स्टयाण्डर्ड नापतौल ऐन अर्न्तगत जे जति नियमहरु छन् सबैलाई यथोचित मान्यता दिई यिनिहरको प्रयोग गरिएको छ।

३.४ यस प्रलेखको तर्जुमा ने.गु.तथा आइ.एस.आई र त्यस्तै अन्य अन्तर्राष्ट्रिय संघ स.स्थाहरुका सम्वन्धित विषयमा निर्देशिका पुस्तिका तथा गुणस्तर निर्धारण र गुण नियनत्रण सम्बन्धी अरु कार्यहरुको प्रतिवेदन इत्यादिबाट सामाग्रीहरु इथासम्भव प्राप्त गरी तिनिहरुको सिफारिस अनुरुप सामन्जस्यता ल्याउन खोजिएको छ।

३.५ यस प्रलेखको तर्जुमा गर्दा नापतौल इत्यादि विभिन्न इकाइहरुको लागि अन्तर्राष्ट्रिय क्षेत्रमा चलिरहेको वहुमान्य इकाई तथ **आई.ए.सो.**ओ ले समेत सिफारिस गरेको एस .आइ .इकाई प्रणालीलाई यथासंभव प्रयोगमा ल्याइएको छ।

४. यस गुणस्तर प्रलेखमा उल्लेखित आवश्कताहरु अनुरुप छ वा छैन भन्ने कुरा निश्चित गर्ने गरिएको परीक्षण वा विश्लेषणको नतिजा प्रस्तुत गर्न संस्थाहरुलाई राउन्डिङ्ग अफ गर्दा नेगुण न.१७ अनुसार गरिनु पर्दछ।

५. यस गुणस्तर प्रलेखमा Galvanised Steel Sheets (Plain And Corrugated) - Specification सम्बन्धित प्राविधिक पक्षलाई मात्र समावेश गरिएको छ। **कारोबार** सम्बन्धी कुराहरु यस प्रलेखको क्षेत्र भित्र पर्दैन।

1. SCOPE

This standard prescribes the requirements of plain galvanized steel sheets and strips (coils) and corrugated galvanized steel sheets.

2. REFERENCES

The following standards contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

NS No.	Title
NS 234	Cold-rolled low carbon steel sheets and strips
NS 295	Hot-rolled carbon steel sheet and strip
NS 414	Glossary of terms relating to iron and steel: Part 3 Steel sheet and strip
NS 551	Recommended practice for hot dip galvanizing on iron and steel
NS 213	Method for determination of mass of zinc coating on zinc coated iron and steel articles
ISO 404:2013	General technical delivery requirements for steel and steel products

3. TERMINOLOGY

3.1 For the purpose of this standard, the definition given in NS 414 and the following shall apply.

3.2 Black Sheet- Hot rolled steel sheet prior to pickling operation

3.3 Cold Rolled Sheet or Coil- Cold-rolled sheet or coil prior to continuous galvanizing process.

3.4 Thickness of Sheet - Thickness of hot-rolled or cold-rolled sheet in cut length or coil form.

4. SUPPLY OF MATERIAL

The general requirements relating to the supply of galvanized sheets and strips shall conform to ISO 404:2013.

5. MANUFACTURES

5.1 The base metal of plain galvanized sheets and coils shall conform to NS 295 or NS 234 as the case may be.

5.1.1 When it is not possible to test the base metal before galvanizing, the base metal may be tested after stripping off the zinc coating.

5.1.2 For corrugated sheets, the maximum phosphorus content may be 0.09 percent.

5.2 Galvanizing shall be carried out by first pickling the black sheets or by cleaning the cold-rolled coils in the line and then dipping them in a bath of molten zinc at a temperature suitable to produce a complete and uniformly adhesive zinc coating. The zinc used for galvanizing shall conform to Table 1.

Table 1 Zinc for Galvanizing

S.N.	Constituent	Grade Zn 98.50 (%)
1	Zinc , Min	98.50
2	Lead, Max	1.25
3	Cadmium, Max	0.02
4	Iron, Max	0.02
5	Tin, Max	0.02
6	Copper, Max	0.02

NOTE: Other impurities do not preclude the possible presence of other unwanted elements. However, analysis shall regularly be made only for impurities listed in the table. The zinc shall be determined by difference between the sum of total elements analyzed and 100 percent. By agreement between the manufacturer and the purchaser, analysts may be required and limits established for elements not specified.

5.3 Passivation shall be carried out on the surface.

6. CLASSIFICATION

Base metal of galvanized plain coils and sheets (spangled and zero spangled) as well as corrugated sheets are classified as per Table 2.

Table 2 Classification of Grades of GP/GC Coils and Sheets

S.N.	Type	Designation	Grade Reference of Base Metal NS 295/NS234
i	Deep Drawing	GPD	Grade DD
ii	Extra Deep Drawing	GPED	Grade EDD
iii	Interstitial Free	GPIF	Grade IF

iv	Corrugated Ordinary	GC	Grade O
V	Ordinary	GP	Grade O
Vi	Ordinary –Hard	GPH	Grade O
vii	Lock Forming	GPL	Grade D

NOTE:-

1. Spangles shall not be allowed to form on the surface of zero spangled strips /sheets during galvanizing.

2. If grade designation GP is required by the purchaser, it may be manufactured from Grade O of NS 234

7. ZINC COATING

Unless otherwise agreed to between the purchaser and the manufacturer, the zinc coating shall conform to the requirement of any one of the grades prescribed in Table 4.

7. 1 The zinc coating shall conform to the requirement of any of the grades prescribed in Table 4. The mass of coating referred to in this standard shall represent the total mass of zinc, both sides inclusive.

7.2 Any other mass of coating, than those specified in Table 4, may be supplied, if agreed to between the purchaser and the manufacturer.

7.3 The following are recommended grades of zinc coating for the various thicknesses of sheets;

Table 3 grades of zinc coating for the various thicknesses of sheets

S.N.	Thickness (mm)	Grade of Zinc Coating (g/m^2)
I	0.18 to 0.28 (both inclusive)	200
Ii	0.30 to 0.55 (both inclusive)	220
iii	0.60 to 1.0 (both inclusive)	275
Iv	Above 1.0	350

NOTE:-

1. The minimum thickness for roofing application is 0.40 mm and corresponding grade of coating shall be 220 g/m^2.

2. If agreed to between the manufacturer and the purchaser for thickness 0.18 mm to 0.28 mm (both inclusive), other coating grades 180 and 120 may be used.

7.4 In addition, X-ray fluorescence method (on line/off line) can also be used for determining the zinc coating.

Table 4 Mass of Coating (Total Both Sides)

S.N.	Grade of Coating	Minimum Average Coating Triple Spot Test g/m^2	Minimum Coating Single Spot Test * g/m^2
i	600	600	510
ii	450	450	380
iii	350	350	300
iv	275	275	235
v	220	220	190
vi	200	200	170
vii	180	180	155
viii	120	120	100

*Minimum individual value obtained in triple spot test

7.5 If agreed to between the purchaser and the manufacturer, the grade of coatings 100 and 80 may be used for non-critical applications other than roofing. The mass of coating in such cases shall be as follows:

Table 5 The mass of coating for non-critical applications

Grade of Coating	Minimum Average Coating Triple Spot Test (g/m^2)	Minimum coating Single Spot test (g/m^2)
100	100	90
80	80	75

Note: - For the above grade of coating, the mandrel diameter for bend test for adhesion of zinc coating shall be subject to mutual agreement between the purchaser and the manufacturer.

8 BEND TEST

8.1 Test Samples

Bend test for the purpose of conformity shall be carried out at the rate of one set of 2 samples for every 1000 plain sheets or part thereof. However, bend test shall not be carried out on sheets intended for corrugation

8.1.1 One bend test shall be conducted for every coil

8.1.2 For bend test, the test piece shall be 230 mm long and 75 mm to 100 mm wide cut across the direction of rolling.

8.1.3 Specimens for bend tests shall be free from burrs. Filling or machining to remove burrs is permitted. Cracks of the base metal developing at the edge of the specimen or coarse grain developing at the line of the bend shall be disregarded.

8.2 Requirements

Samples of galvanized steel sheets selected as described in 8.1 shall withstand bending through 180^0 around a mandrel having diameter specified in Table 5 without peeling or flaking of zinc coating. Crack or fracture of base metal, except those indicated in 8.1.3 shall not be permitted.

Table 6 Mandrel Diameters for Bend Test (All dimensions in millimetres.)

S.N.	Grading of Coating	Diameter* of Mandrel For Thickness of Sheet										
		Over 3	Over 2.3 to 3	Over 1.6 to 2.3	Over 1.25 to 1.6	Over 1.0 to 1.25	Over 0.8 to 1.0	Over 0.5 to 0.8	Over 0.4 to 0.5	Over 0.3 to 0.4	Over 0.22 to 0.3	Over 0.16 to 0.22
i	600	4	6	8	8	9	10	11	12	-	-	-
ii	450	3	4	6	6	7	8	8	8	9	10	11
iii	350	3	4	4	4	5	6	6	7	8	8	8
iv	275	3	4	4	4	5	6	6	6	7	7	8
v	220	2	3	3	3	4	4	4	4	5	5	5
vi	200	2	2	2	3	3	3	3	3	4	4	4
vii	180	2	2	2	3	3	3	3	3	3	4	4
viii	120	2	2	2	3	3	3	3	3	3	4	4

*Expressed as number of times the thickness of sheet

9 COATING TEST

9.1 Test Samples

One set of three samples each 50 mm^2or 50 mm diameter, shall be selected at random from one sheet for every 1 000 galvanized sheets or part thereof. In the case of the galvanized sheets produced from black sheets, one set of three samples shall be taken, two from each extremities of a diagonal and one from the middle of the sheet. Whereas in the case of galvanized sheet produced from cold-rolled coils, one set of three samples shall be taken from the middle of the width of the sheet and one from each side of the sheet. The sample from extremities, diagonal or from the side of the sheet shall not be closer than 75 mm from the edge of the sheet.

9.1.1 In case of galvanized sheet supplied in coils, one set of 3 samples, each 50 mm^2 or 50 mm diameter shall be selected from one end of each coil across the width.

9.2 Determination of Mass of Zinc Coating

The average masses of zinc coating of samples as selected under 9.1 and determined by the method given in NS 213 or by any other established instrumental or chemical method shall conform to both the values specified in Table 4.

10 RETESTS

10.1 If any test sample fails to meet test requirements given in 8.2 and 9.2, two more set of test samples shall be taken for the specific test requirements from the same lot.

10.2 If any of the retest samples fails to meet the requirements of this standard, the entire batch of the sheets represented by the sample shall be deemed as not conforming to the standard.

11 FREEDOM FROM DEFECTS

11.1 Galvanized plain sheets, corrugated sheets and coils shall be reasonably flat and free from bare spots, holes, tears and other harmful defects.

11.2 Coils, however, may contain some abnormal imperfections which render a portion of the coil unusable since the imperfections in the coil cannot be removed as in the case with cut length.

12 MASS

12.1 Mass of sheets and coils shall be given in kg, of actual or calculated mass.

12.2 The mass of sheets and coils shall be calculated as given in Table 7 on the basis of nominal dimensions and mass of zinc coating.

Table 7 Calculation of Mass of Sheets or Coils

S.N.	Type of Material	Order of Calculation	Method of Calculation	Number of Numerals in Resultant value
i	Sheet	Mass of Single Sheet	Nominal mass of single sheet plus mass of zinc coating	Rounded off to 4 effective figures
		Total Mass	Mass of single sheet(kg) x Number of Sheets	Rounded off to integral value of kg
ii	Coil	Unit mass of coil	Unit mass of sheet (kg/m^2) X Width (mm) x 10^{-3}	Rounded off to 3 effective figures
		Mass of Single coil	Unit mass of coil(kg/m) x length (m)	-
		Total mass(kg)	Total mass of each coil	Integral number of kg

NOTES:

1 Nominal mass of single sheet shall be calculated by calculating the volume of the sheet and multiplying the same with density of sheet (density 7.85 g/cm^3) and rounding the same to 4 effective figures.

2 Mass of the coating shall be calculated by multiplying the surface area of the single sheet with indicated nominal coating mass (g/m^2) as shown for triple spot test (see Table 4),

3 For calculation of corrugated sheet mass, the width before corrugation considered while calculating the area.

13 DIMENSIONS AND TOLERANCES OF PLAIN SHEETS/COILS

13.1 Sizes of Plain Sheets

The plain sheets shall be supplied in any combination of the following lengths, widths and thicknesses:

a) Length:-1829, 2134, 2438, 2743, 3048 and 3658 mm

b) Width:- 762, 914, 1000 and 1220 mm

c) Thickness (uncoated sheets):- 0.18, 0.22, 0.25, 0.28, 0.32, 0.40, 0.45, 0.50, 0.55, 0.60, 0.70, 0.80, 0.90, 1.00, and 1.60 mm

NOTE: Sheets for other sizes (length, width and thickness) may also be supplied subject to the mutual agreement between the purchaser and the manufacturer.

13.1.1 Unless otherwise agreed, the internal nominal diameter of sheet supplied in coil shall be 450, 510 or 610 mm.

13.2 Tolerances

13.2.1 Length

No sheet shall be smaller in length than that specified. Tolerances on length on plus side shall be 15 mm or 0.5 percent of length whichever is greater.

13.2.2 The diagonal distance between opposite corners of any sheet shall not differ by more than 20 mm.

13.2.3 Width

No plain sheet shall be smaller in width than that specified. The positive tolerances on width shall be 10 mm.

13.2.4 Thickness

The tolerance on thickness of sheet and coil shall be according to NS 295 or NS 234 as applicable.

13.2.5 Tolerance on Mass

The tolerance on mass of individual sheets calculated in accordance with 12.2 shall be within. ±10 percent and tolerance on mass of each bundle of sheet shall be ± 5 percent.

14 DIMENSIONS AND TOLERANCES OF CORRUGATED SHEETS

14.1 Sizes of Corrugated Sheets

14.1.1 Length

The length of the corrugated sheets shall be as follows:

1829, 2134, 2438, 2743, 3048 and 3658 mm

NOTE: Sheets of other lengths may also be supplied subject to the mutual agreement between the purchaser and the manufacturer.

14.1.2 Number of Corrugations

The number of corrugations shall be as per table given below, depending on the width of the sheet. The overall width of the corrugated sheets before and after corrugation shall be as shown in Table 9.

Table 9 Overall Widths and Corrugations of Sheets

S.N.	Number of Corrugation	Grade	Overall width of Sheet	
			Before Corrugation mm	After Corrugation mm
i	8	A	762	665
ii	10	A	914	810
iii	11	A	1000	910
iv	13	A	1200	1110
v	14	A	1220	1125
vi	16	A	1350	1220
vii	18	A	1500	1370
viii	20	A	1650	1520
ix	8	B	750	680
x	10	B	914	830
xi	11	B	1000	930
xii	13	B	1220	1130
xiii	16	B	1350	1240
xiv	18	B	1500	1390
xv	20	B	1650	1540
xvi	10	C	840	720
xvii	12	D	1000	875

14.1.2.1 Sheets of sizes other than those specified above may be supplied, if agreed to between the contracting parties.

14.1.3 Depth and Pitch of the Corrugations

The depth and pitch of corrugation shall be as follows (see Fig. 1):

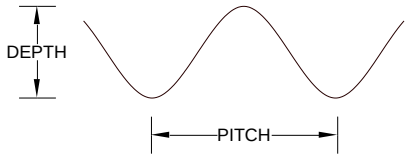

Table 8 Depth and Pitch of the Corrugations

Grade	Depth of Corrugation (mm)	Pitch of Corrugation(mm)
A	17.5	75
B	12.5	75
C	19.0	70
D	17.5	70

14.2 Tolerances

14.2.1 The tolerances on dimensions of corrugated sheet shall be as given in Table 10.

Table 10 Tolerance on Dimension of Corrugated Sheets

S.N.	Dimension	Tolerance*
i	Depth of Corrugation	± 2.5 mm
ii	Pitch of Corrugation	± 5 mm
iii	Overall width after corrugation	± 25 mm

*Average of four measurement

15 MARKING

15.1 Manufacturer's name or trade-mark, grade of coating, length, width, thickness and number of corrugations, grade in case of corrugated sheets and material identification (grade, quality, etc.), purpose of use (if roofing) shall legibly be marked on top of each sheet or shown on a tag attached to each bundle.

15.1.1 The material may also be marked with the Standard Mark.