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FOR USE IN THE DESIGN OF LOW-COST HOUSING

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"BLACK" AND GALVANIZED SHEETS FOR USE IN HOUSE CONSTRUCTION

Steel and iron for house construction are used chiefly in sheet or strip form and, to some extent, in the form of metal lath and concrete reinforcing bars. Bare strip steel is used for light structural framing and panels for prefabricated houses. In the more conventional type of house, bare sheet steel is not used extensively, preference usually being given to steel coated with zinc, or tin-lead alloys. Galvanized sheets are used for steel panels in certain prefabricated houses and in houses of the conventional type for gutters, leaders, heating and ventilating ducts, furnace casings, steel window frames, and occasionally, for roofs. However, the greater number of metal roofs are made of so-called "roofing tin" or terneplate--a steel or iron sheet coated with an alloy containing lead as the major constituent. (See TIBM .. 41 "Roofing Tin (Terneplate) for House Construction").¹

Sheet steel or iron is usually known only by a trade name or brand. More specific information such as commercial grade, size, gage, surface finish, weight, and type of zinc or other coating, and physical qualities, like tensile strength or bending properties, is generally lacking. This release presents briefly information of this kind and refers to a Federal Specification giving more details.

Black Sheets: Plain sheet steel, as supplied to the trade, for builders' use, usually has a light coating of oxide produced during a hot-rolling manufacturing operation. Such sheets are called "Black" sheets. If easily worked sheet material is desired, it may be secured by specifying "Black Sheets, One Pass Cold-Rolled Box Annealed" or "Black Sheets, Hot-Rolled, Box Annealed". For practically all uses in house construction flat rather than corrugated sheets are required. The

¹May be obtained free of charge from the National Bureau of Standards Washington, D. C.

metal used for making the sheets may be plain carbon steel, "copper-bearing" steel (See TIBM - 10 "Atmospheric Corrosion of Ferrous Metals")¹ or open-hearth iron. Stainless iron or steel, is occasionally used but at present is too costly for extended application.

Prime or first-grade black sheets should be free from laminations, blisters, slivers, open seams, pits from rolled-in scale, ragged edges or other defects affecting the appearance. Table I on page 4 of this digest gives useful data regarding black sheets.

Galvanized Sheets: Galvanized sheets are made by passing black sheets, after thorough cleaning by pickling in acid, through a bath of molten zinc. By this treatment, the sheet is covered on each side with an adherent layer of zinc, the thickness of which may be varied to meet different service requirements. The unique properties of a zinc coating for protecting steel against corrosion are referred to in TIBM - 17 "The Atmospheric Corrosion of Galvanized Ferrous Sheet Metals".¹ For a high degree of protection, a thick coating (2 oz. of zinc per sq. ft. of sheet, i.e., 1 oz. per sq. ft. on each side) is desirable, but if very severe bending or forming operations are necessary a thinner zinc coating is better.

The American Society for Testing Materials in its specification for Zinc-Coated (Galvanized) Iron or Steel Sheets (Designated as A93-27) classifies galvanized sheets as:

Class A - Extra heavily coated sheets that are not intended to be primed other than by corrugating.

Class B - Heavily coated sheets that are not intended to be primed other than by corrugating and curbing to large radii.

Class C - Moderately heavily coated sheets for moderate bending.

Class D - Ordinary coated sheets for general utility. These coatings approximate those of Class C except in medium gages in which coatings of Class D are appreciably lighter. Class D represents material generally available in warehouse stocks which is not intended for use where relatively long life, represented by Classes A, B, and C or severe forming, represented by Class E, is required.

Class E - Sheets having lighter, more tightly adherent coatings to reduce liability of flaking in severe forming. The sheet-maker should be made acquainted with the requirements of fabrication.

¹May be obtained free of charge from the National Bureau of Standards, Washington, D. C.

Some variation in the thickness of coating on different parts of a galvanized sheet is unavoidable. Galvanized sheets should be free from defects already described under black sheets, and also from bare or imperfectly coated spots, serious abrasions, drops of zinc, except on ends, sal ammoniac (flux) spots or similar defects affecting appearance or serviceability. Gages, weights per square foot, and thicknesses of zinc coated sheets, are shown in Tables II and III on page 5.

There is often considerable variation in the "spangle" or crystal structure of the zinc coatings on sheets produced by different manufacturers. This variation, however, has little effect on corrosion resistance. Occasionally galvanized sheets take on a white film as a result of being stored in damp places, or from other causes. This is essentially an oxidation product of zinc and has but little effect on the corrosion resistance of the sheets, unless the attack is exceptionally severe.

Further details regarding black and galvanized sheets are given in Federal Specification QQ-I-696 (March 6, 1934) for "Iron and Steel; Sheet Black and Zinc-Coated (Galvanized)".¹ See also Simplified Practice Recommendation R28 "Sheet Steel",² promulgated by the National Bureau of Standards, and Circular of the National Bureau of Standards C391 "Standard Thicknesses, Weights, and Tolerances of Sheet Metal (Customary Practice)".³

¹Obtainable from the Superintendent of Documents, Washington, D. C. (Price 5 cents).

²Obtainable from the Superintendent of Documents, Washington, D. C. (Price 10 cents).

³Out of print but may be consulted in Government Depository Libraries.

TABLE I

Weights of Black Sheets (United States Standard Gage)

Black Sheets						
Gage	:	Approx.	:	Approx.	:	Approx.
	:	Wt. per	:	Wt. per	:	Thick-
	:	Sq. Ft., *	:	Sq. Ft.,	:	ness
	:	Lbs.	:	Oz.	:	Decimal
	:	Avoir-	:	Avoir-	:	parts of
	:	dupois	:	dupois	:	an Inch
	:		:		:	Fractions
	:		:		:	of an
	:		:		:	Inch
16	:	2.500	:	40	:	1/16
18	:	2.000	:	32	:	1/20
20	:	1.500	:	24	:	3/80
22	:	1.250	:	20	:	1/32
24	:	1.000	:	16	:	1/40
26	:	0.750	:	12	:	3/160
27	:	.687	:	11	:	11/640
28	:	.625	:	10	:	1/64
29	:	.562	:	9	:	9/640
30	:	.500	:	8	:	1/80

*For single sheets there is a permissible plus or minus weight variation of 10 percent; for sheet packages a permissible plus or minus weight variation of 4 to 7 percent.

TABLE II

Desired or Ordered Weight of Zinc Coating. Oz/Sq.Ft. of Sheet

Galvanized Sheet Gage	Classes				
	A	B	C	D ¹	E ²
16	2.75	2.50	2.00		
18	2.75	2.50	1.75		
20	2.75	2.50	1.75		
22	2.75	2.50	1.75		
24		2.50	1.50		
26		2.25	1.25		
28		1.75	1.25		
29		1.50	1.25		
30		1.25	1.25		

¹No coatings specified. See page 2 paragraph 7.²No coatings specified. See page 2 paragraph 8.

TABLE III

Weight of Galvanized Sheets, All Classes

Gage	Approx. Wt. per Sq. Ft., Lbs. Avoir- dupois	Approx. Wt. per Sq. Ft., Oz. Avoir- dupois
16	2.656	42.5
18	2.156	34.5
20	1.656	26.5
22	1.406	22.5
24	1.156	18.5
26	0.906	14.5
27	0.844	13.5
28	0.781	12.5
29	0.719	11.5
30	0.656	10.5