

COMMON SYSTEMS
HARDWARE PRODUCTS AND MATERIALS SPECIFICATIONS

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1. GENERAL

1.01 This section provides the requirements for apparatus and materials used in the fabrication and assembly of hardware products used in network facilities. The primary purpose of this section is to establish default product/material requirements for suppliers of hardware products. The secondary purpose of this section is to provide a means of communicating those requirements in product specifications using generic terminology. For the purpose of this section hardware products are defined as:

"Non-circuit products used in network equipment environments"

1.02 Reserved for future use.

Application

1.03 This section should be referenced in hardware product specifications to ensure commonality among hardware products obtained from multiple suppliers and to minimize the material requirements content of technical publications. Accordingly, a general note similar to the below should be included at the beginning of product requirements documentation.

"Refer to BSP 800-000-100MP *Common Systems Hardware Products And Material Specifications* for material and fabrication information applicable to hardware products referenced herein."

1.04 This section should also be used as a materials reference when it is necessary to purchase hardware products locally in supplement to those furnished via a particular telephone company engineering order number.

2. MATERIAL SPECIFICATIONS

A. METAL

2.01 This part covers the material requirements for metals used to fabricate hardware products.

This part may be used to determine the acceptability of commercially available hardware products based on the materials used in the product.

2.02 **QUALITY:** Personnel safety in the handling of metal products is a prime concern. All metal products shall be free of sharp edges and burrs created by the product fabrication process. Sharp edges which are inherent to the material used, or the shape in which it is formed, are acceptable unless otherwise specified in product specifications. Welding of steel parts shall be done with welding materials and methods metallurgically compatible with the materials being welded.

2.03 **TOLERANCES:** Tolerances of ± 0.03 inches (1/32) are considered standard for shapes and hole *locations* in materials 3/16" and greater in thickness unless otherwise specified in product fabricating information. Standard tolerances for sheet metal products less than 3/16" thick are ± 0.02 inches for dimensions carried to the second decimal place, and ± 0.01 inches for dimensions carried to the third decimal place unless otherwise specified in product fabricating information. The standard tolerance for hole sizes is ± 0.015 inches (1/64) unless otherwise specified in product fabricating information.

2.04 **DIMENSIONS:** Decimal inches are used to specify product fabricating information. Whole and fractional inches are used to specify the material thickness of products to be fabricated from stock which is commonly referenced using whole and fractional inch numbers (1/8" Steel Sheet, 3/8" Steel Bar, etc.). The "gauge" equivalent of a material's decimal thickness is used to specify the material thickness of products to be fabricated from stock commonly referred to as sheet metal. See table following 2.05.

2.05 **MATERIAL FORMS:** The below forms of material shall be used in hardware product specifications to describe the material the products are to be fabricated from.

MATERIAL CHARACTERISTICS

FORM DESIGNATION	Thickness	Width	Steel Sheet and Strip Products			
			Gauge	Thick	Gauge	Thick
BAR	$\geq 3/16$ " Dia.	-	10	0.135	18	0.05
BAR	$\geq 3/16$ "	$< 3-1/2$ "	11	0.120	20	0.04
PLATE	$\geq 3/16$ "	$\geq 3-1/2$ "	12	0.105	22	0.03
SHEET	$< 3/16$ "	$\geq 3-1/2$ "	14	0.075	24	0.024
STRIP	$< 3/16$ "	$< 3-1/2$ "	16	0.06		

2.06 **BENDING:** Bends in material are considered to be 90 degrees unless otherwise specified in product fabricating information. The below maximum radii of bends are considered standard for the thickness of material indicated:

RADIUS	MATERIAL THICKNESS
0.13 (1/8)	≥ 0.187 inches (3/16)
0.06 (1/16)	> 0.06 and < 0.187 (No. 15 through 7 gauge)
0.03 (1/32)	≤ 0.06 (No.16 gauge through 24 gauge)

2.07 The following material specifications are the minimum requirements for steel products.

MATERIAL SPECIFICATION	TYPICAL PRODUCT LINE
ASTM A36 (low carbon)	Bars, plate, sheet and strip steel; bent bolts and threaded rods.
ASTM A120	Pipe.
ASTM A325 (medium carbon)	Hex nuts for bolts $\geq 3/8$ -inch diameter.
ASTM A513 (low carbon)	Square and round tubing.
ASTM A563 Grade A (low carbon)	Hex nuts for bolts $< 3/8$ -inch diameter.
SAE J429 Grade 2 (low carbon implied)	Headed bolts, screws and washers in general (non-seismic or structural applications).
SAE J429 Grade 5 (medium carbon implied)	Headed bolts, screws and washers in diameters $\geq 3/8$ -inches for applications in seismic zones 3 & 4.

3. FINISH SPECIFICATIONS

A. General

3.01 This part covers painted and plated finishes to be used with hardware products. Generally, painted finishes apply to hardware products, and plated finishes apply to hardware attachment components and to threaded fasteners and their associated nuts and washers.

- (a) The finish requirements contained in this part are intended to minimize the maintenance of hardware products after their installation, and to continue with reasonable continuity the aesthetics of equipment environments already established in network equipment environments.
- (b) This part may be used as reference for qualifying equipment supplier products for application in network facilities. In such cases, the intentions of this part, not the requirements themselves should be used for the acceptance or rejection of product finishes.

HEALTH AND SAFETY CONSIDERATIONS

ALL FINISHES APPLIED TO PRODUCTS USED BY NEVADA BELL, PACIFIC BELL AND SOUTHWESTERN BELL SHALL COMPLY WITH FEDERAL, STATE, AND LOCAL REGULATIONS GOVERNING THE HANDLING AND USE OF TOXIC MATERIALS.

IF A FINISH, THE MATERIALS USED IN A FINISH, OR THE PROCESS REQUIRED TO OBTAIN A FINISH DOES NOT COMPLY WITH APPLICABLE HEALTH AND SAFETY REGULATIONS, THE FINISH SHALL BE CONSIDERED AN INVALID REQUIREMENT OR SPECIFICATION FOR A PRODUCT AND THE PURPOSES OF THIS PART.

PRODUCT SUPPLIERS SHALL ASSUME THE RESPONSIBILITY FOR REGULATION COMPLIANCE FOR THE MATERIALS AND PROCESSES REQUIRED TO OBTAIN THE FINISHES SPECIFIED HEREIN.

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3.02 The following are considered good commercial practices and apply to hardware products without specific mention in product specifications:

- (a) Product surfaces shall be free of scale, foreign material, and clean but otherwise may be unprepared prior to finish application.
- (b) Finishes shall be uniform in appearance in as much as the finish material allows.
- (c) Minor nicks or scratches that are not in conspicuous places may be touched up with a material suitable to the appearance and purpose of the finish.
- (d) A product's surface or finish undercoating shall not be visible through the final finish.
- (e) Edges of holes, cut edges and sharp corners of product surfaces are exempt from finish thickness requirements.
- (f) Products shall be packaged in a manner that protects the finish from damage during normal shipping and handling routines.

B. Painted Finishes

3.03 In addition to the finish requirements listed in 3.02, painted finishes shall be in accordance with the following:

- (a) **MATERIAL:** High solids enamel is the standard finish material for painted finishes. The material may be baking or polyurethane enamel depending on the drying method used for the finish. The powder coating finish process is an acceptable alternative to the high solids solvent based paint finish process. Generally, the use of solvent based paints or the powder coating process is a business decision made by the product supplier.
- (b) **THICKNESS:** A film thickness of 0.0008 inches (minimum), after application and drying, is considered standard for solvent based paint finishes. A thickness of 0.0008 is generally considered met when two coats of paint are applied and the underlying product surface or finish undercoating cannot be seen. The determining factor of whether a finish is sufficiently thick is its ability to hide what is painted.
- (c) **TEXTURE:** A finish that is smooth and free of dirt and grit, and does not show objectionable orange peel or other surface unevenness is considered standard for hardware products in general. Textured paint finishes are acceptable for equipment framework assemblies and framework related hardware products.
- (d) **GLOSS:** In accordance with ASTM specification D523, a gloss measurement of 55 degrees, ± 5 degrees, is considered the standard finish sheen without mention for hardware products.

Non standard but acceptable paint sheens are SEMIGLOSS (25 degrees, ± 5 degrees), and FLAT (6 degrees). The application of a non standard sheen shall be specified in product requirements documentation when they are required. Textured finishes should have an approximate 10 degree of gloss.
- (e) **DRYING:** Finishes may be air dried or baked providing the proper finish material for the method of drying is used.
- (f) **METHOD OF SPECIFYING:** The word ENAMEL preceded by a color is used with product specifications to specify a painted or powder coated finish.

Example: FINISH - Gray Enamel (gloss sheen is implied, solvent based or powder coating).

Note: The product color shall be preceded by the word FLAT or SEMIGLOSS when a non-standard sheen is required.

3.04 Items 3.03 (a) through (f) are the standard (implied) finish requirements for hardware products. If a product is to have a paint finish that differs from those listed in 3.03, the finish requirement(s) shall be explicitly specified in the product's requirements documentation.

Approved Finishes

3.05 Listed below are the standard colors approved for application on hardware products. The colors are listed by the generic designation that will be referenced in product specifications. The materials for all paint codes listed were in compliance with applicable health and safety regulations in affect at the time of their inclusion herein.

Color Designation	Color Code	Description	Source Of Finish Material
Gray Enamel	6407-3784	Polyurethane Enamel	Cardinal Industrial Finishes San Jose, CA (408) 336-3345
	1108-4229	Gray Baking Enamel	
	2208-4229	Gray Aerosol Touch-Up	
Yellow Enamel	6409-13591-X	Polyurethane Enamel	South El Monte, CA (818) 444-9274
	T209-YL01	Powder Coating	
Gray Textured	P141-GR85	Powder Coating	City Of Industry, CA (818) 336-3345
Putty Textured	P003-BG40	Powder Coating (ADC)	
Lt. Blue Textured	P041-BL21	Powder Coating (Lucent)	
Brown Textured	C241-BR35	Powder Coating (NTI)	

3.06 The grouping of different paint codes under the same generic headings in 3.05 does not mean the colors are exact matches visually, however, the colors are similar enough visually for network equipment environment applications. When visual color matching of hardware products is required, the products shall be obtained from a single supplier, or it shall be stipulated in product specifications that:

- (a) Only a certain paint manufacturer's product code shall be used, or
- (b) That the color shall equal a common reference such as a Federal Standard 595A color.

C. Electroplated Finishes

3.07 Electroplated finishes consist of coatings on metal surfaces. Mechanical plating is NOT an acceptable coating under this specification. It is not anticipated that hardware suppliers will be directly involved with the plating of products, however, it is the responsibility of product suppliers to insure electroplated finishes comply with these requirements.

3.08 In addition to the finish requirements listed in 3.02, electroplated finishes of products shall be in accordance with the following:

- (a) The plated coating shall have the characteristic color of the electrodeposited metal and shall have a uniform appearance insofar as the basic metal allows.
- (b) Coatings shall be free of blisters and peeled areas.
- (c) Coatings shall be substantially free from any defects.
- (d) A slight darkening of electroplated coatings with age is to be expected, and is acceptable.

Approved Finishes

3.09 Listed below are the standard coatings approved for application on hardware products. The coatings are listed by the generic designation that will be referenced in product specifications.

COATING DESIGNATION	COATING SPECIFICATION
Zinc	ASTM-B-633-85 Service Class III with a yellow iridescent coating

4. THREADED FASTENERS

4.01 This part provides the requirements for threaded fasteners used in network facilities in general. The requirements contained in this part are implied and do not require specific mention in product specifications.

(a) **THREADS:** Threaded fasteners shall have the below American Standard Unified Course (UNC) threads with a fit tolerance of 2A for male and 2B for female threads.

Fastener Diameter Threads Per Inch	No.10	No.12	1/4	3/8	1/2	5/8
	24	24	20	16	13	11

(b) **THREAD LENGTH:** Thread lengths shall be a minimum of 2-1/2 times the diameter of the fastener for screws and bolts, and the entire length of studs and threaded rods. Thread lengths of bent bolts shall be as specified in product specifications.

(c) **SCREWS:** Threaded fasteners smaller than 1/4-inch in diameter shall be Phillips drive round head machine screws (RHMS).

(d) **BOLTS:** Threaded fasteners 1/4-inch and larger in diameter shall be hexagon head cap screws (HHCS).

(e) **LAG SCREWS:** Hexagon head lag screws are preferred, square head lag screws are acceptable.

(f) **NUTS:** The nuts for threaded fasteners shall be heavy type hexagon nuts having the below general characteristics. Regular hex nuts may be furnished with threaded fasteners smaller than 1/4-inch unless otherwise specified in product specifications. Listed below are the nominal dimensions of hex nuts.

Regular Nuts			Heavy Nuts		
Thread Size	Across Flat		Thread Size	Across Flat	
	Thick			Thick	
No. 8	11/32	1/8	1/4-20	1/2	15/64
No. 10	3/8	1/8	3/8-16	11/16	23/64
No. 12	7/16	1/4	1/2-13	7/8	31/64
1/4-20	7/16	13/64	5/8-11	1-1/16	39/64
3/8-16	11/16	5/16			
1/2-13	13/16	27/64			
5/8-11	1"	17/32			

- (g) **STUDS, THREADED RODS, BENT BOLTS:** Rolled threads are implied.
- (h) **PLAIN WASHERS:** Flat round Type A with an approximate SAE (narrow) pattern. Listed below are the nominal sizes of the various plain washer sizes.

Nominal Plain Washer Sizes							
Size	I.D.	O.D.	Thick	Size	I.D.	O.D.	Thick
No. 10	7/32	1/2	3/64	3/8	13/32	13/16	1/16
No. 12	1/4	9/16	3/64	7/16	15/32	59/64	1/16
1/4	9/32	5/8	1/16	1/2	17/32	1-1/6	3/32
5/16	11/16	11/16	1/16	5/8	21/32	1-5/16	3/32

- (i) **LOCK WASHERS:** Lock washers shall be the Type B external tooth type. Split ring type lock washers may be furnished by default for threaded fasteners smaller than 3/8-inch diameter unless otherwise specified in product specifications. Type B external tooth lock washers have the below nominal dimensions.

**Nominal External Tooth
Type Lock Washer
Dimensions**

Size	O.D.	Thick
3/8	11/16	0.04
1/2	29/32	0.045
5/8	1-1/16	0.05

- (j) **FINISH:** Threaded fasteners and their associated shims and washers shall have a zinc electroplated finish. Refer to 3.08.
- (k) **ENGAGEMENT OF THREADS:** For assembled products and arrangements, a sufficient number of threads shall be engaged to provide a secure fastening. Generally, this is accomplished when the threaded end of a bolt, screw, or threaded part is flush with or extends beyond a nut or tapped part by approximately two threads. Screws and bolts in tapped holes should be engaged to a depth equal to the diameter of the screw or bolt, or the thickness of the tapped panel or part, which ever is least. A screw or bolt can be considered too short if more than one thread in a nut or tapped object remains un-engaged.
- (l) **PROTRUSION OF THREADS:** For assembled products and arrangements, the end of a threaded fastener may extend beyond the tapped part by an amount equal to the diameter of the threaded fastener except where such a protrusion will interfere with equipment or wiring, or may present a personal injury hazard.