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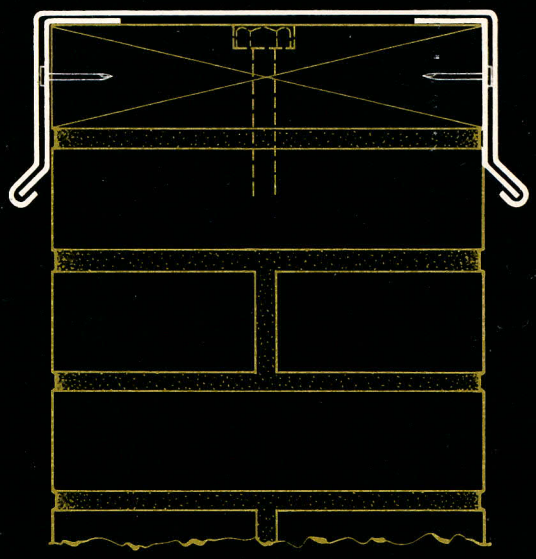
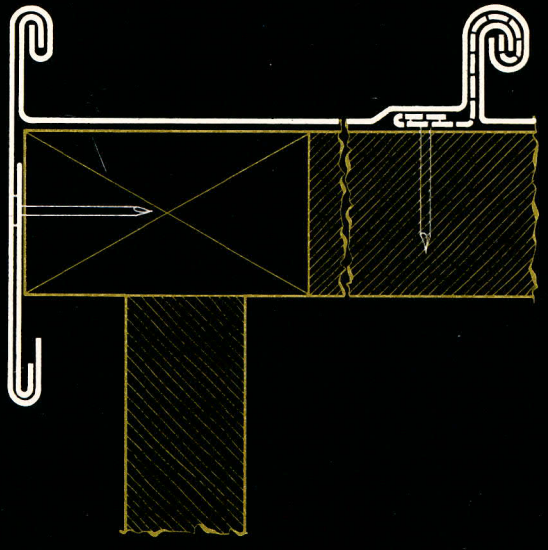
WASHINGTON, D.C.

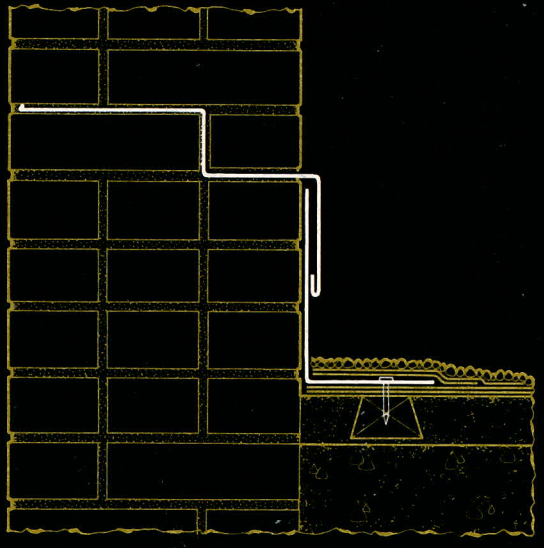
Aluminum Construction Manual

Section 5

ALUMINUM SHEET METAL WORK IN BUILDING CONSTRUCTION







THE ALUMINUM ASSOCIATION

FOREWORD

Aluminum has been used for roofing, flashing and other sheet metal applications in buildings for many years. As early as 1890, aluminum sheet was used as roofing on the cupola of the Church of St. Gioacchino in Rome, Italy and aluminum was also used for cornices on the Canada Life Building and the Canadian National Railways office building in Montreal, Canada at the turn of the century. Many installations of long standing exist in the United States including roofing and flashing on the Holy Ghost Church, Milwaukee, Wisconsin, erected in 1930, and roofing on the Mormon Tabernacle, Salt Lake City, Utah installed in 1947. Because of aluminum's corrosion resistance and economy, this use continues in both residential and nonresidential construction.

Prior to the publication of these Specifications in 1969, no comprehensive recommendations were available from the aluminum industry to provide guidance on alloy and gage selection, design and installation details, and the like. As a result, some differences were known to exist in requirements for aluminum sheet metal work in the specifications of various government agencies, in industry specifications, and in building codes and regulations.

In an effort to fill this void and to provide a basis for uniformity, these Specifications were prepared. Experiences of the past were drawn on heavily and proven practices are described.

Constructive comments on this Second Edition, which supersedes all previous issues of these Specifications, will be welcomed.

BUILDING INDUSTRY COMMITTEE

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W. J. Heidrich
A. W. Hess
M. J. Lefebvre
F. A. Loebach
W. R. Tyler

TASK GROUP ON SHEET METAL SPECIFICATIONS

W. J. Heidrich, Chairman
G. E. Thomas
W. R. Tyler
J. F. Whiting

September, 1971

Aluminum Construction Manual

Section 5

ALUMINUM SHEET METAL WORK IN BUILDING CONSTRUCTION

Second Edition
September, 1971

THE ALUMINUM ASSOCIATION
750 THIRD AVENUE, NEW YORK CITY 10017

Properties and Characteristics of Aluminum Sheet

WHY USE ALUMINUM?

Why use aluminum for roofing and flashing applications? Because it is economical, readily available, easy to fabricate, highly resistant to corrosion, can be left to weather in its natural state or may be painted or anodized for decorative purposes. As a painted material, it has the advantage that it will not rust if the protective paint coating is broken; thus, it requires little maintenance. As an anodized material, it is available in an attractive range of grey, black, bronze, gold and amber colors. Left in its natural state it will weather to a uniform grey.

This manual has been prepared to familiarize architects, contractors, building officials and students with what constitutes good practice in material selection, design and installation of aluminum sheet metal work for roofing and flashing that is custom fabricated for a specific job. It does not deal with products or proprietary systems such as siding and roofing and roof-deck systems.

Corrosion resistance

One of aluminum's most useful characteristics is its tendency to develop an extremely thin, tough, invisible oxide coating on its surface immediately on exposure to air. This oxide film, although only 2 to 4 ten-millionths of an inch thick on first forming, is almost completely impermeable and highly resistant to attack by corroding atmospheres. The thickness of this film increases with exposure time, but the rate of oxide formation gradually decreases as the increasing thickness of the film adds further protection against corrosion. Where corrosion may be caused by contact with dissimilar metals, measures such as specified in section 3.2 of the specifications included in this book may be taken. In urban and most industrial environments, aluminum does not need painting or anodizing, except for decorative purposes. In coastal areas, aluminum will long outlast most other metals and coated metals.

Workability

Aluminum is ductile and malleable and may be bent, formed, seamed or hammered into almost any desired shape. The ease with which aluminum may be handled, transported, bent, formed or otherwise worked may result in tangible savings. This is particularly so on large buildings and/or where handling and transportation are problems. Such savings may be effected not only on the job but in the shops as well. Here, the light weight and good formability of aluminum permit more work to be turned out per day with less fatigue on the part of the workers.

Joining and sealing

Mechanical seams and joints for aluminum are the same as for other sheet metals. Aluminum sheet is usually attached to the substrate with aluminum nails or cleats. Rigid joints are achieved through the use of double lock seams or riveting or, in some cases, welding. Soldering aluminum is not recommended, but since the tendency today is to avoid soldering sheet metal work because of the many difficulties involved with soldered joints, this limitation is of little relevance. Synthetic or rubber based sealants are used where watertightness cannot be achieved with standard seams, such as in the S-lock on top of an aluminum coping cover (see page 27) or in a reglet (see pages 25 and 27).

Finishes for aluminum sheet

Mill finish aluminum sheet is generally used for roofing and flashing applications and can be obtained plain or in a variety of embossed patterns. Embossed sheet has been found to be useful in minimizing oil canning and handling marks. Decorative and protective finishes can also be applied to aluminum sheet.

Painted sheet is available in a wide range of colors. This precoated, baked enameled sheet can be cut, pierced, drilled and formed without the finish separating from the base metal. Even if the enamel film should be broken or the metal exposed at a cut edge or drilled hole, there is no danger of the film flaking or staining, since there is no rust-like corrosion. Where prepainted aluminum is marred by metalworking tools in the field, the scratches can be touched up with matching enamel. Maintenance of a painted aluminum roof is less critical than maintenance of other painted metal roofs. The paint serves mainly a decorative function, since aluminum is itself corrosion-resistant.

Anodizing is one of the most important protective finishes for all types of aluminum. However, since the surface film may be crazed by forming and cannot be touched up, as a painted surface can, its use is normally limited to preformed shapes that may be anodized subsequent to forming. Anodizing is basically the artificial thickening, by an electrolytic process, of the natural oxide coating that forms on aluminum. The thickened coating is much more resistant to corrosion and all kinds of abrasion than the thinner natural film. Ordinarily, anodized aluminum sheet will be used with a clear anodized finish, but it can be impregnated with a colorant that produces a highly weather-resistant gold. Other colors suitable for exterior use, including various shades of grey, bronze and amber, can be achieved by integral color anodizing of certain aluminum alloys or by electrolytic deposition of inorganic colorants. Anodic colors achieved with organic dyes are not suitable for exterior use.

For more detailed information on aluminum finishes, refer to The Aluminum Association publication "Aluminum Finishes for Architecture."

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ALUMINUM SHEET ALLOYS AND TEMPERS

Definition of aluminum sheet

Aluminum sheet is defined as a rolled product, rectangular in cross section, having a thickness range of 0.006- through 0.249-inch, with the edges sheared, slit or sawed within close limits. It is available as flat sheet or in coiled form. If aluminum is thinner than 0.006 inches, it is known as foil, while if it is thicker than 0.249 inches, it is called plate.

Using The Aluminum Association Alloy Designation System

The alloy and temper generally used for sheet metal work is 3003-H14. Acceptable alternate alloys are 1100, Alclad 3003, 3004, Alclad 3004, 3005, 3105, 5005, 5050 and 5052, usually in the H14, H24 and H34 tempers. Where sheet is to be anodized, specific alloys must be employed to produce the desired effects. The composition and tempers of wrought aluminum and wrought aluminum alloys are designated by a standard system devised by The Aluminum Association and adopted by the American National Standards Institute (formerly the U.S.A. Standards Institute) as ANSI H35.1.

The Aluminum Association system divides aluminum and its alloys into eight groups, according to chemical composition:

Designations for Alloy Groups		Alloy No.
Aluminum—99.00% minimum and greater		1xxx
Aluminum Alloys grouped by Major Alloying Elements	Major Alloying Element	
	Copper	2xxx
	Manganese	3xxx
	Silicon	4xxx
	Magnesium	5xxx
	Magnesium and Silicon	6xxx
	Zinc	7xxx
	Other Element	8xxx
Unused Series		9xxx

Mechanical properties of aluminum and its alloys, such as tensile strength, ductility and hardness, vary widely not only from one alloy group to another but among different metallurgical states, or tempers, of a single alloy. A designation for temper is part of The Aluminum Association system and when used, follows the alloy designation, the two designations being separated by a dash.

The temper designation consists of a letter—O, H or T. O stands for "annealed," and indicates the lowest strength and softest state of any particular alloy. H is applied to alloys whose strength can be increased by work-hardening, while T is applied to the alloys that become stronger when heat-treated.

A two- or three-digit number is always part of an H designation. The first digit indicates the type of treatment and the second, the degree of work-hardening attained. H1 identifies alloys that have been work-hardened on[illegible] as been partially annealed after work-[illegible]e-what the degree of hardness. H3 i[illegible]es to magnesium-containing alloys. Th[illegible]d by H3 is called stabilization, as wi[illegible] these alloys tend to soften over a period of time at room temperatures. The second digit goes from 1 to 9, with 2, 4, 6 and 8 indicating ¼, ½, ¾ and fully hard (0 by itself denotes the fully soft state); 9 is used for extra-hard tempers, and the odd numbers show intermediate values of tensile strength. The third digit, when added, indicates a slight variation in temper or mechanical properties from the two-digit H temper designation to which it is added.

More information on aluminum alloys and tempers may be obtained from The Aluminum Association publication "Aluminum Standards & Data."

TYPICAL MECHANICAL PROPERTIES OF ALUMINUM ALLOYS AND TEMPERS MOST COMMONLY USED IN SHEET METAL WORK (FOR COMPARISON OF ALLOYS, NOT FOR DESIGN)

Alloy and Temper	Tensile Strength—ksi Ultimate	Yield	Elongation—percent in 2 in.
1100-H14	18	17	9
3003-H14 Alclad 3003-H14	22	21	8
3004-H34 Alclad 3004-H34	35	29	9
5005-H34	23	20	8
5050-H34	28	24	8
5052-H34	38	31	10

Specifications

1. SCOPE

These specifications shall apply to the proper use of aluminum in roofing, flashing and other sheet metal work in building construction. They are not intended to cover the details or specifications of proprietary or pre-formed sheet metal systems or products, such as horizontal siding, fascia and soffit systems, curtain wall systems, corrugated or ribbed roofing and siding, etc.

2. MATERIALS

2.1 Aluminum Sheet

2.1.1 ALLOY AND TEMPER of sheet shall be 3003-H14 unless otherwise specified. Acceptable alternate alloys are 1100, alclad 3003, 3004, alclad 3004, 3005, 3105, 5005, 5050 and 5052, usually in the H14, H24 and H34 temper.

Notes:

1. Alloy composition and mechanical properties shall conform to Aluminum Standards and Data published by The Aluminum Association.

2. Where severe forming is involved a softer temper may be employed and where little forming is required a harder temper may be used.

3. Alclad sheet products provide extra protection against pitting corrosion in severe industrial or in industrial-marine environments.

4. Other and/or new aluminum sheet alloys and tempers may be submitted to The Aluminum Association for approval.

2.1.2 THICKNESS of sheet shall be sufficient for the intended specification, but in no case shall be less than the minimum nominal thickness listed in Table 1.

2.1.3 DIMENSIONAL TOLERANCES of sheet shall conform to Aluminum Standards and Data published by The Aluminum Association.

2.1.4 FINISH of sheet shall be "Mill Finish" unless otherwise specified. Sheet finishes shall conform to standards of The Aluminum Association.

Note:

Embossed, anodized and/or painted sheet shall be acceptable under this specification provided it and/or they have the necessary strength and formability for the intended purposes.

2.2 Building Paper or Roofing Felt used over non-vented or poorly vented spaces, where condensation may occur, shall be vapor barriers conforming to Federal Specifications UU-B-790A, Type I, Grade A; HH-R-590A, Type II, Class C or, alternately, polyethylene sheet not less than 4 mils thick conforming to Federal Specifications L-P-378B or L-P-512A.

Over well vented spaces, the building paper or roofing felt shall be water repellent, but not necessarily vapor proof, and shall conform to Federal Specifications UU-B-790A, Type I, Grade C or D; HH-R-590A, Type II or HH-R-595B, Type I or II.

Note:

Some building papers and roofing felts conforming to the above Federal Specifications may contain additives of heavy metals or chemicals corrosive to aluminum and should be avoided.

For building papers or roofing felts, the minimum weight shall be 15 lb. type. The underlayment shall be overlapped at least 2 inches so as to shed water and shall be secured along the laps with large flat headed aluminum nails at 6 inch centers.

2.3 Sealants.

2.3.1 ONE PART SYNTHETIC OR RUBBER-BASE SEALANTS shall be those conforming to Federal Specification TT-S-230A(1). Use shall be in conformance with manufacturer's recommendations.

2.3.2 TWO PART SYNTHETIC OR RUBBER-BASE SEALANTS shall be those conforming to Federal Specifications TT-S-00227E (1) or ANSI A116.1. Use shall be in conformance with manufacturer's recommendations.

2.4 Elastic Cement shall meet requirements of Federal Specification SS-C-153.

2.5 Fasteners.

2.5.1 CLEATS shall be aluminum of the same alloy, temper and thickness as the sheet being applied unless otherwise specified. Cleats shall not be less than 2 inches wide and long enough to

Table 1 **Minimum Nominal Sheet Thickness, Inches**

	Residential	*Non-Residential*
Roofing		
Standing Seam	0.024	0.032
Batten Seam	0.024	0.032
Flashings		
Base	0.019*	0.032
Cap	0.019*	0.032
Ridge, Hip	0.024	0.032
Coping Covers	0.024	0.032
Scuppers	0.024	0.032
Splash Pans	0.032	0.040
Chimney	0.019*	0.032
Apron	0.024	0.032
Head	0.019*	0.032
Sill	0.019*	0.032
Curbs	0.024	0.032
Thru-wall		
Lintel	0.024	0.032
Spandrel	0.024	0.032
Sill	0.024	0.032
Parapets	0.024	0.032
Gravel Stops & Fascia	0.024	0.032
Edge Strips	0.024	0.032
Gutters		
Gutters	0.027	0.032
Cleats, Continuous	0.024	0.032
Hangers	0.064	0.080
Rainwater Goods		
Downspouts and Headers	0.019	0.032
Leader Heads	0.024	0.032
Clips	0.040	0.064
Straps	0.040	0.064
Valley	0.019*	0.032
Snow, Eave	0.024	0.032
Expansion joint, building		0.032

**Preferred thickness is 0.024".*

be fully incorporated into the seam with the other end folded back over the nail heads. They shall be fastened securely with two aluminum nails placed parallel to the seam.

2.5.2 NAILS for fastening aluminum sheet metal work shall be made of aluminum alloys 6061 or 5056 conforming to Federal Specification FF-N-105B, Type II, Style 20.

2.5.3 SCREWS, BOLTS AND NUTS. Screws and bolts shall be made of aluminum alloys 6061-T6 or 2024-T4 except that 2024-T4 alloy fasteners shall not be used in corrosive industrial and marine environments. Nuts shall be made of aluminum alloys 6061-T6 or 6262-T9. Stainless steel (300 series) screws, bolts and nuts shall be acceptable alternates. Washers shall be used beneath the heads to prevent tearing of the sheet or the sheet tearing off over the screw or bolt heads.

2.5.4 WASHERS shall be made from 1100-H18 alloy or from the same aluminum alloys as the sheet or fasteners being used. The minimum thickness of the washers shall be 0.040 inches. Where weathertightness is required a rubbertype washer shall be used beneath the aluminum washer or fastener head.

2.5.5 EXPANSION INSERTS, plugs, anchors and shields shall be of wood, fibre, plastic, lead or aluminum and shall be chosen to suit the environments of each particular application.

2.5.6 RIVETS shall be aluminum alloy 1100-H14 unless otherwise specified. The rivets shall have a minimum shank diameter of 0.187 inches and shall be sufficiently long to form a proper head. Blind rivets may be used where maximum watertightness, strength or corrosion resistance are not required. Acceptable blind rivets shall be 1100 sleeve, 5056 mandrel; 5050 sleeve, 5056 mandrel; 5052 sleeve, 5056 mandrel; 5052 sleeve, 7178 mandrel and 5056 sleeve, 1020 steel mandrel. Stainless steel or Monel blind rivets are acceptable alternates.

2.6 Paint for backpainting shall be bituminous paint of the cutback type conforming to specification MIL-C-450 B (1) or TT-C-494. Where appearance is a factor methacrylate type lacquers conforming to MIL-L-19537C (2).

3. PREPARATION OF SURFACES

3.1 General. All surfaces upon which aluminum sheet is to be placed shall be smooth, even and free of small projections and hollows. The surface shall be dry before and during the placing of the aluminum. For wood surfaces the lumber shall be of good quality, well seasoned, straight and free of knotholes and splits. It shall be laid with all joints true and even and firmly attached with all fastener heads flush with the top surface. On masonry surfaces adequate provision shall be made for receiving fasteners in accordance with the plans for sheet metal work.

3.2 Dissimilar Metals. Corrosion of aluminum caused by contact with dissimilar metals (galvanic corrosion) shall be prevented by proper design considerations and installation procedures.

Notes:

*1. **Indoors under dry conditions** — galvanic corrosion will not occur and, therefore, aluminum may be used in contact with any metal commonly used in buildings.*

*2. **Outdoors and indoors where moisture is present or condensation may occur** — galvanic corrosion between aluminum and:*

*(a) **Iron and steel** is very slow and can be prevented readily by painting the iron or steel with a good quality exterior grade primer and top coat or bituminous paint (Section 2.6).*

*(b) **Zinc** is insignificant and even tends to protect the aluminum.*

*(c) **Galvanized steel** is insignificant. However, when the zinc is consumed, the steel will rust which may cause staining. In severe industrial environments this can happen in a relatively short time and the precautions in (a) should be followed.*

*(d) **Cadmium** plated steel is insignificant. However, when the cadmium is consumed, the steel will rust which may cause staining. As the cadmium coating usually applied is very thin, this may happen in a relatively short time in industrial environments and the precautions in (a) should be followed.*

*(e) **Stainless steel** is insignificant.*

*(f) **Monel** is insignificant.*

*(g) **Copper, brass and bronze** will occur and, therefore, direct contact of aluminum and these metals should be avoided. Drainage of water off these metals onto aluminum should not be permitted.*

*(h) **Lead** is insignificant.*

*3. **Highly corrosive environments** — such as those on the seacoast and around chemical plants, mine and mill complexes, refineries, etc., may promote galvanic corrosion even though aluminum by itself has good corrosion resistance. In these environments, advice should be sought from specialists who will be able to recommend appropriate precautionary measures.*

3.3 Wood Sheathing or wood surfaces to be covered with aluminum shall be covered with building paper or roofing felt (Section 2.2). Alternately, the wood shall be thoroughly painted with two coats of unleaded paint or the aluminum shall be back painted (Section 2.6).

Notes:

1. Kiln dried lumber, impregnated against decay is recommended for sheathing, cant strips, coping blocks and fascia boards. Satisfactory preservatives are coal tar creosote, coal tar oil, chlorinated naphthalenes, zinc naphthenate, pentachlorphenol (with or without addition of zinc derivatives), tributyl tin oxide, orthophenylphenol. Other preservatives may be used but assurance should be obtained from the manufacturer that they are not harmful to aluminum.

2. Aluminum paint, consisting of 2 lbs. of aluminum paste pigment (ASTM Specification D962-66, Type 2, Class B) per gallon of varnish meeting Federal Specification TT-V-81F, Type II or equivalent, is an excellent primer and paint for wood. However, any good quality exterior type non-leaded paint may be used.

3.4 Concrete and Masonry surfaces to be covered with aluminum shall be covered with building paper or roofing felt (Section 2.2) or alternately the aluminum shall be back painted thoroughly (Section 2.6). Where aluminum is to be caulked into slots or reglets in masonry, brickwork, or concrete, the slot or reglet shall be filled with sealant (Section 2.3) so that the sealant covers both surfaces of that part of the flashing in the slot or reglet.

4. JOINING

4.1 Mechanical Seams and Joints for aluminum shall be the same as those used for other sheet metals. Lap and lock seams shall not be riveted or otherwise fastened together to restrict relative movement unless it is desired to transfer such movement to a different location.

4.2 Soldering of aluminum shall not be permitted.

4.3 Welding and Brazing Welding of aluminum sheet metal work in the field shall be done by the Gas Tungsten Arc Welding (TIG) and Gas Metal Arc Welding (MIG) processes only, using one of the appropriate filler alloys listed in Table 2. Oxy-gas welding and brazing in which paste fluxes are used shall only be used under shop conditions where complete removal of the flux residue after welding can be accomplished.

Table 2 **Aluminum Filler Alloys for General Purpose Welding**

Base Metal	5052	5005, 5052	3004, Alclad 3004, 3005	1100, 3003, Alclad 3003, 3105
1100, 3003, Alclad 3003, 3105	4043[ae]	4043[a]	4043[a]	1100[b]
3004, Alclad 3004, 3005	4043[ae]	4043[a]	4043[a]	
5005, 5050	4043[ae]	4043[ad]		
5052	5654[bc]			

a. 5183, 5356 or 5556 may be used.
b. 4043 may be used for some applications.
c. 5183, 5356, 5554, 5556 or 5654 may be used.
d. Filler metal with the same analysis as the base metal is sometimes used.
e. 4047 may be used for some applications.

Seams and Joints

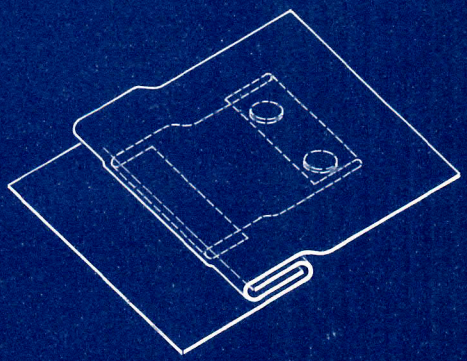
LAP SEAM

SINGLE OR LOOSE-LOCK SEAM

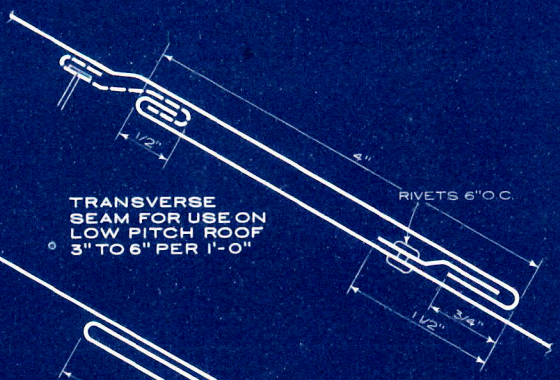
LAP SEAM RIVETED

DOUBLE LOCK SEAM

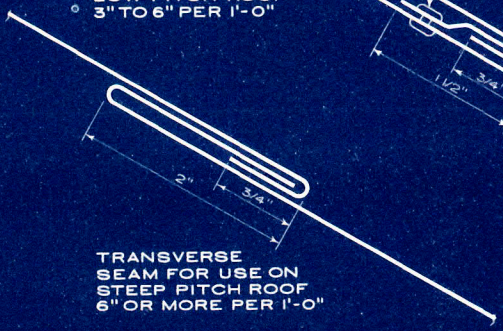
"S" LOCK SEAM



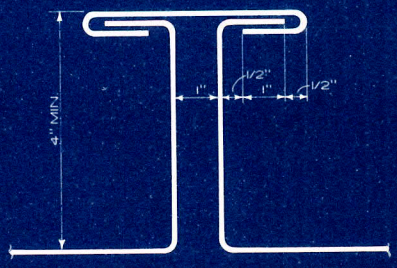
FLAT-LOCK SEAM CLEATED



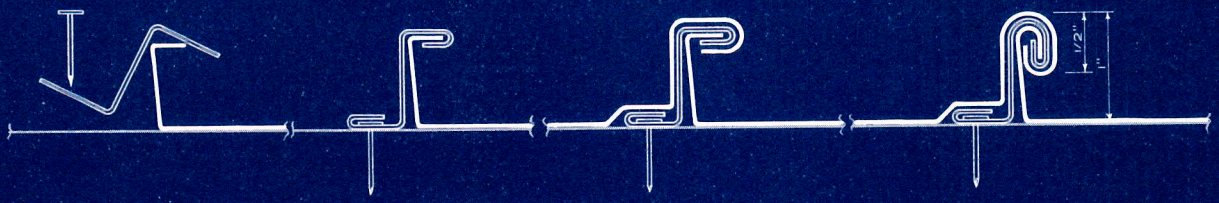
TRANSVERSE
SEAM FOR USE ON
LOW PITCH ROOF
3" TO 6" PER I'-0"



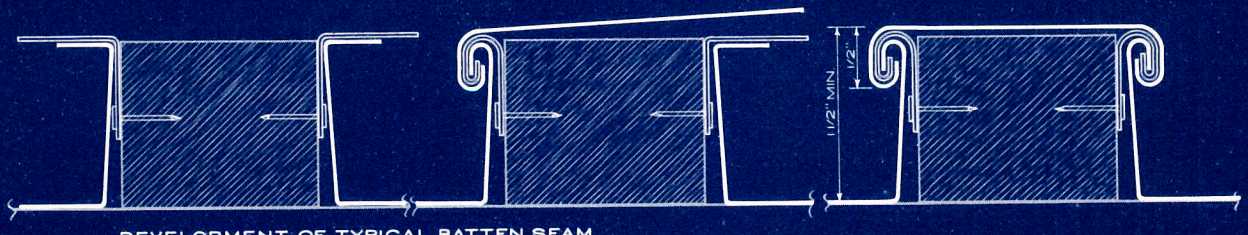
TRANSVERSE
SEAM FOR USE ON
STEEP PITCH ROOF
6" OR MORE PER I'-0"



TYPICAL EXPANSION JOINT



DEVELOPMENT OF TYPICAL STANDING SEAM



DEVELOPMENT OF TYPICAL BATTEN SEAM

Specifications

5. STANDING SEAM ROOFING

5.1 Roof Slopes to which these specifications apply shall be not less than 3 inches per foot.

Note:
Roof slopes less than 3 inches per foot require special precautions in design and installation.

5.2 Building Paper or Roofing Felt. Roof surfaces shall be covered with building paper or roofing felt (Section 2.2).

5.3 Roof Pans shall be formed of sheets not longer than 10 feet and no straight run of roofing shall exceed 30 feet. Sheet thickness shall be 0.024 inch where width of pan between standing seams does not exceed 20 inches or 0.032 inch where width of pan between standing seams is from 20 to 26 inches. To allow for expansion, pan width should be ⅛ inch less than the center to center spacing of standing seams.

Notes:
1. Standing seam roofing is best installed over wood decks since the cleats used to secure the aluminum roofing are nailed directly to the deck. If decks other than wood are used, properly located nailers should be incorporated in the deck construction.

2. When standing seams are formed or finished in the field the cleats become rigidly locked into the multiple folds of the seam; slippage does not occur between standing seam roof pans and the cleats that are secured to the deck. With long runs of roofing (over 30 feet) expansion movement may eventually loosen the nails in the deck, placing the roof installation in an unsafe condition.

3. Where long runs of standing seam roofing are unavoidable, expansion or sliding cleats should be used where the length on either side of the center of the run exceeds 15 feet.

5.4 Transverse Seams

5.4.1 FOR ROOF SLOPES 6 INCHES OR MORE PER FOOT the lower end of each pan shall be folded under ¾ inch. The fold shall be slit 1 inch away from the corner to form a tab where the pan turns up to make a standing seam. The upper end of each pan shall be folded over 2 inches. The ¾ inch fold on the lower end of the upper pan is hooked into the 2 inch fold on the upper end of the underlying pan. Alternate pans shall begin at the eaves with half length sheets, staggering transverse seams.

5.4.2 FOR ROOF SLOPES 3 TO 6 INCHES PER FOOT the lower end of each pan shall be folded under ¾ inch. The fold shall be slit 1 inch away from the corner to form a tab where the pan turns up to make the standing seam. The upper end of each pan shall be folded over ½ inch. A 1½ inch wide locking strip the full width of the pan shall be secured not less than 4 inches below the top folded edge by rivets spaced not more than 6 inches apart. The ¾ inch fold on the lower end of the pan shall hook into the locking strip of the underlying pan. Alternately, transverse seams may be made as specified in Section 5.4.1 and filling the seams with sealant (Section 2.3). Alternate pans shall begin at the eaves with half length sheets, staggering transverse seams.

5.5 Standing Seams shall finish 1 inch high except on curved surfaces where they may finish ¾ inch. One side edge shall be bent up 1½ inches and the other 1¾ inches. The first fold shall be a single fold ¼ inch wide and the second fold shall be ½ inch wide. The lock portion of the standing seam shall be five (5) plies in thickness. A space of not less than ⅛ inch shall be provided between adjacent pans at the bottom of each standing seam. At eaves, ends of standing seams shall be closed by folding over a tab provided at one side of each roof pan.

5.6 Cleats (Section 2.5.1) shall be not less than 2 inches wide and shall be spaced 12 inches apart in each standing seam. If the roof deck is a material other than wood, nailers shall be provided for the securement of cleats (Section 2.5.1).

5.7 Ridges and Hips shall be provided with standing seams constructed as for the main roof. Where standing seams of the main roof terminate at ridges or hips they shall be laid flat and folded into ridge or hip standing seams. Standing seams on opposite side of ridges or hips should be staggered to avoid excessive thicknesses of metal in the ridge or hip standing seam.

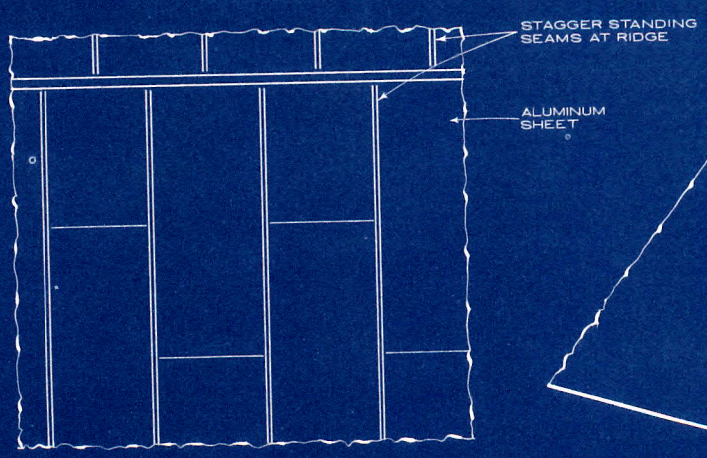
Alternate methods of finishing hips and ridges shall be as shown in the detail drawings.

5.8 Valleys shall be formed from aluminum sheets not exceeding 10 feet in length of the same gauge and alloy as used for the roof pans. Each sheet shall lap the lower one not less than 6 inches in the direction of flow. The valley sheet shall extend under the roof pans on both sides not less than 6 inches. At the valley line adjacent to the lower edge of the roof pans, a ¾ inch double fold shall be made to engage a ¾ inch single fold at the lower ends of the roof pans. The outer edge of the valley sheets shall be folded ½ inch for cleating and in these folds cleats shall be installed on 24 inch centers. Valley sheets shall be nailed along top edge only.

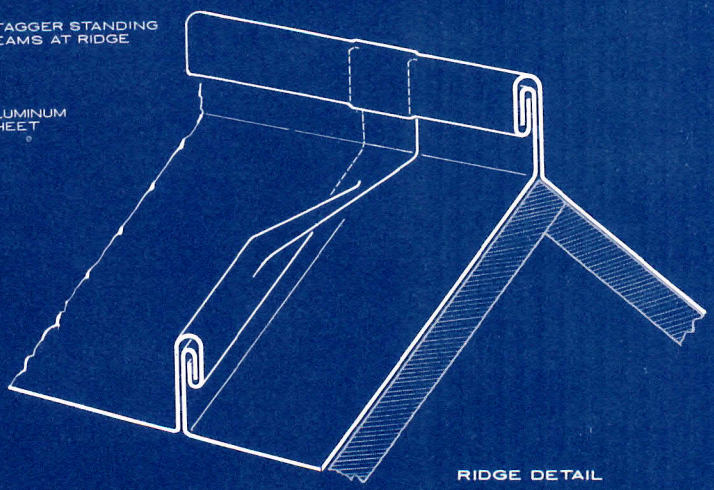
5.9 Eaves. At eaves, where no gutters occur, each pan shall be hooked ¾ inch over a previously placed aluminum edge strip. Edge strips shall be continuous and shall be formed from sheets not longer than 10 feet; ends of adjacent lengths shall lap at least 1 inch. The edge strip shall extend up on the roof deck at least 4 inches and be secured with nails spaced not more than 4 inches apart along the upper edge. The lower edge shall be turned out ¾ inch to form a drip. Face nailing of the edge strip shall not be permitted.

5.10 Gable Rakes. Side edges of pans at gable rakes shall finish over an edge strip as described in Section 5.9 or, alternately, shall turn up 1½ inches and be locked into an aluminum fascia strip forming a standing seam 1 inch high. Where the standing seam finishes at the roof edge, the lower edge of the fascia strip shall be hooked ¾ inch over a previously placed continuous edge strip that is secured to the decking with aluminum nails spaced 4 inches apart.

Standing Seam Roofing

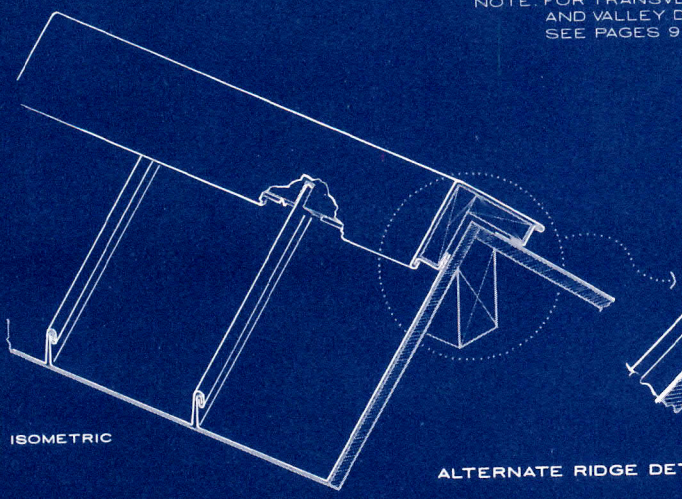


PARTIAL ROOF PLAN

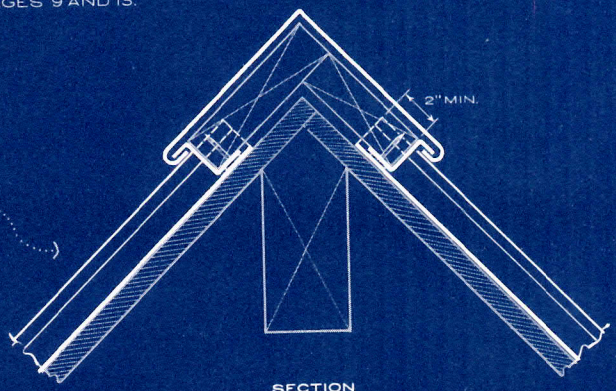


RIDGE DETAIL

NOTE: FOR TRANSVERSE SEAMS AND VALLEY DETAILS SEE PAGES 9 AND 13.

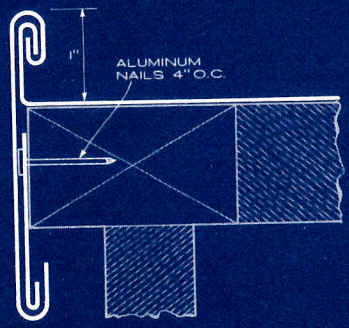


ISOMETRIC

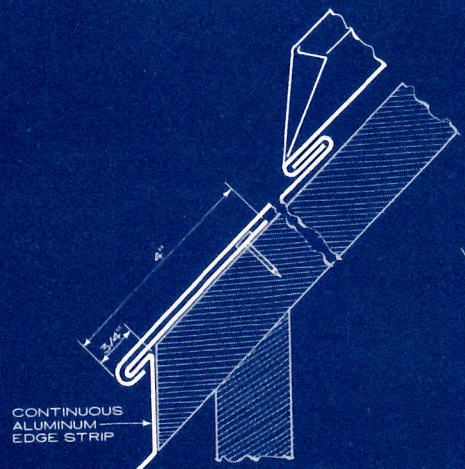


SECTION

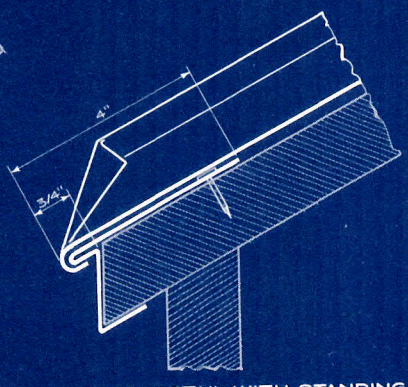
ALTERNATE RIDGE DETAIL



GABLE RAKE



EAVE DETAIL WITH STANDING SEAM BACK FROM EDGE



EAVE DETAIL WITH STANDING SEAM STOPPING AT EDGE

8. FLASHING DETAILS FOR NON-METALLIC SHINGLE ROOFS

8.1 Apron Flashing

8.1.1 GENERAL. Apron flashing shall be formed of sheets not longer than 10 feet. The ends of each length of flashing shall be lapped not less than 4 inches; or alternately, a 2 inch sealant filled "S" lock shall be formed at one end of the flashing sheet to receive the end of the adjacent sheet.

8.1.2 AT CHANGE OF ROOF SLOPE the flashing on the upper slope shall extend not less than 6 inches under the shingles and be secured by aluminum nails along the upper edge on 6 inch centers. An inverted V cant shall be formed in the flashing near the butt edge of the first shingle course. Alternately, a wood cant strip shall be placed under the butts of the first shingle course and be secured with narrow strips of aluminum attached to the roof deck above the flashing.

The flashing on the lower slope shall extend over the roofing not less than 5 inches. The lower edge shall be hemmed ½ inch for stiffness and be secured by blind cleats on 24 inch centers.

Where the flashing is to be concealed on the lower slope it shall be carried down between the shingles of the top double course of shingles to within ½ inch of the butts of the top shingle. With slate roofing, sealant shall be applied to the underside of the pre-drilled holes before the slates are applied.

8.1.3 WHERE SLOPING ROOFS MEET VERTICAL WALLS the flashing shall extend up the wall not less than 4 inches under the siding and be secured to the sheathing along its upper edge with aluminum nails on 24 inch centers. At masonry walls, the flashing shall extend up the wall face not less than 4 inches and be counter flashed as described in Section 12.

The flashing shall extend over the roofing not less than 5 inches. The lower edge shall be hemmed for stiffness and be secured by blind cleats spaced at 24 inch centers.

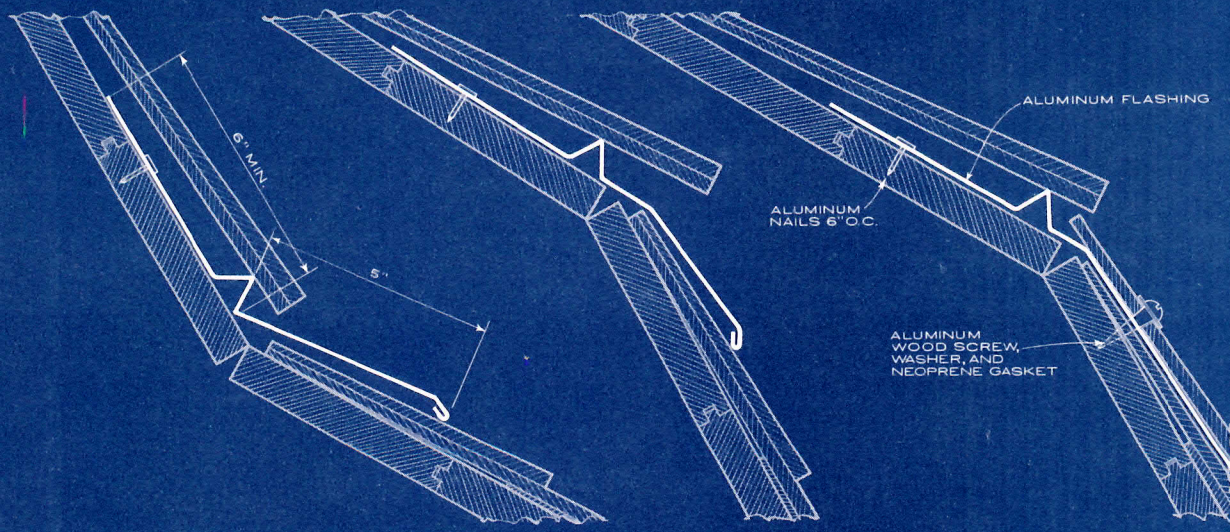
8.2. Eave Snow Flashing shall be formed and secured as for standing seam roofing (Section 5). Where the flashing extends up the roof slope more than 4 feet, center-to-center spacing of standing seams shall not exceed 26 inches. The flashing shall extend up the roof not less than 18 inches beyond the exterior wall face. Along the upper edge standing seams shall be laid flat for approximately 6 inches, and the top edge shall be folded over ½ inch to form a hook dam. Starter course of shingles shall be lapped over the top flat surface not less than 6 inches.

At eaves, the flashing shall be hooked ¾ inch over a previously placed aluminum edge strip as described in Section 5.9.

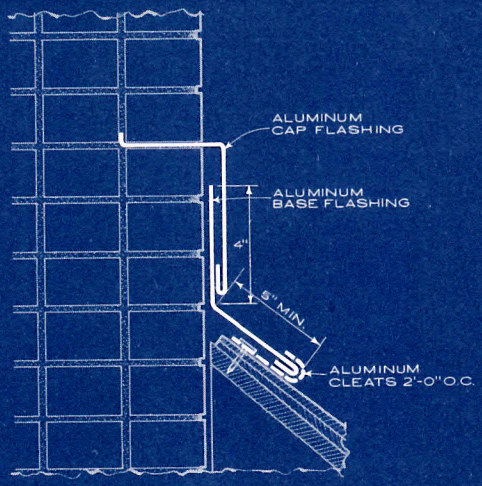
At gable rakes the flashing shall finish as described in Section 5.10.

At valleys a 1½" wide locking strip the full length of the snow flashing shall be secured to the valley sheet 6 inches from its outer edge by rivets spaced not more than 6 inches apart. The edge of the snow flashing at the valley shall be folded under ¾ inch and engage the locking strip that is filled with sealant (Section 2.3). Alternately, the outer edge of the valley shall be folded over ¾ inch and filled with sealant; into this shall be locked the edge of the snow flashing.

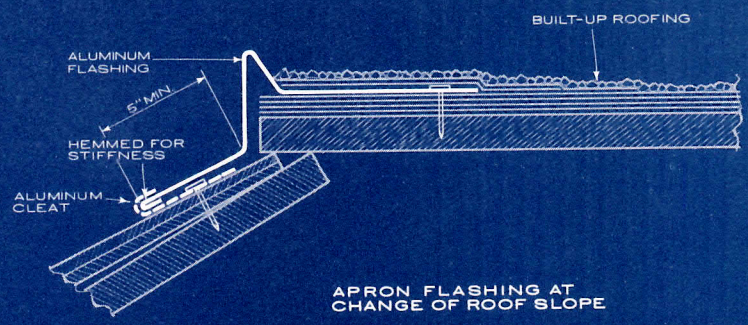
Apron Flashing



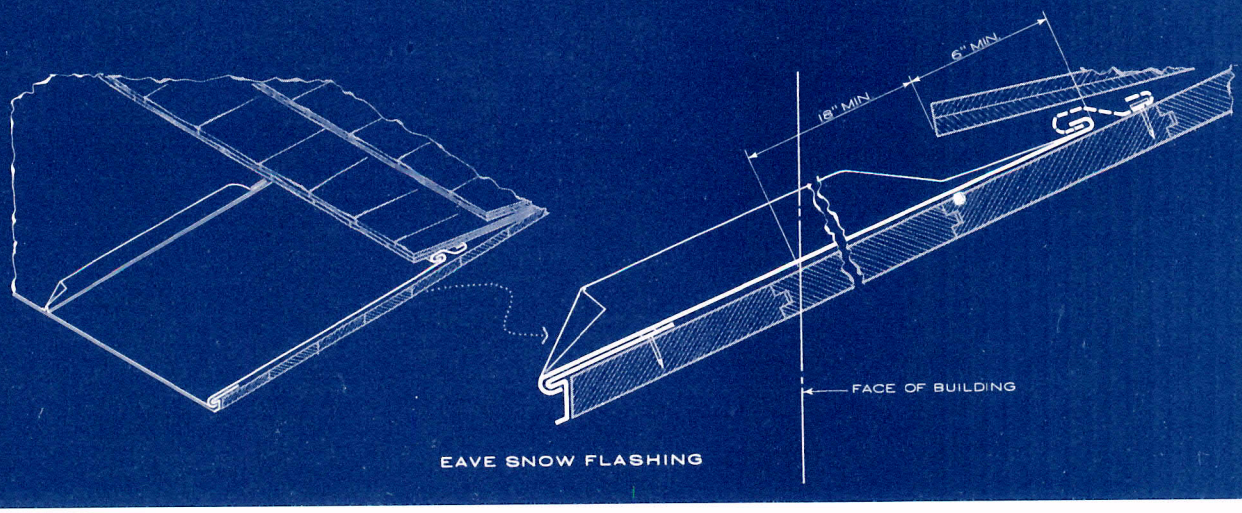
CHANGE OF ROOF SLOPE FLASHING



APRON FLASHING WHERE SLOPING ROOF MEETS VERTICAL WALL



APRON FLASHING AT CHANGE OF ROOF SLOPE



EAVE SNOW FLASHING

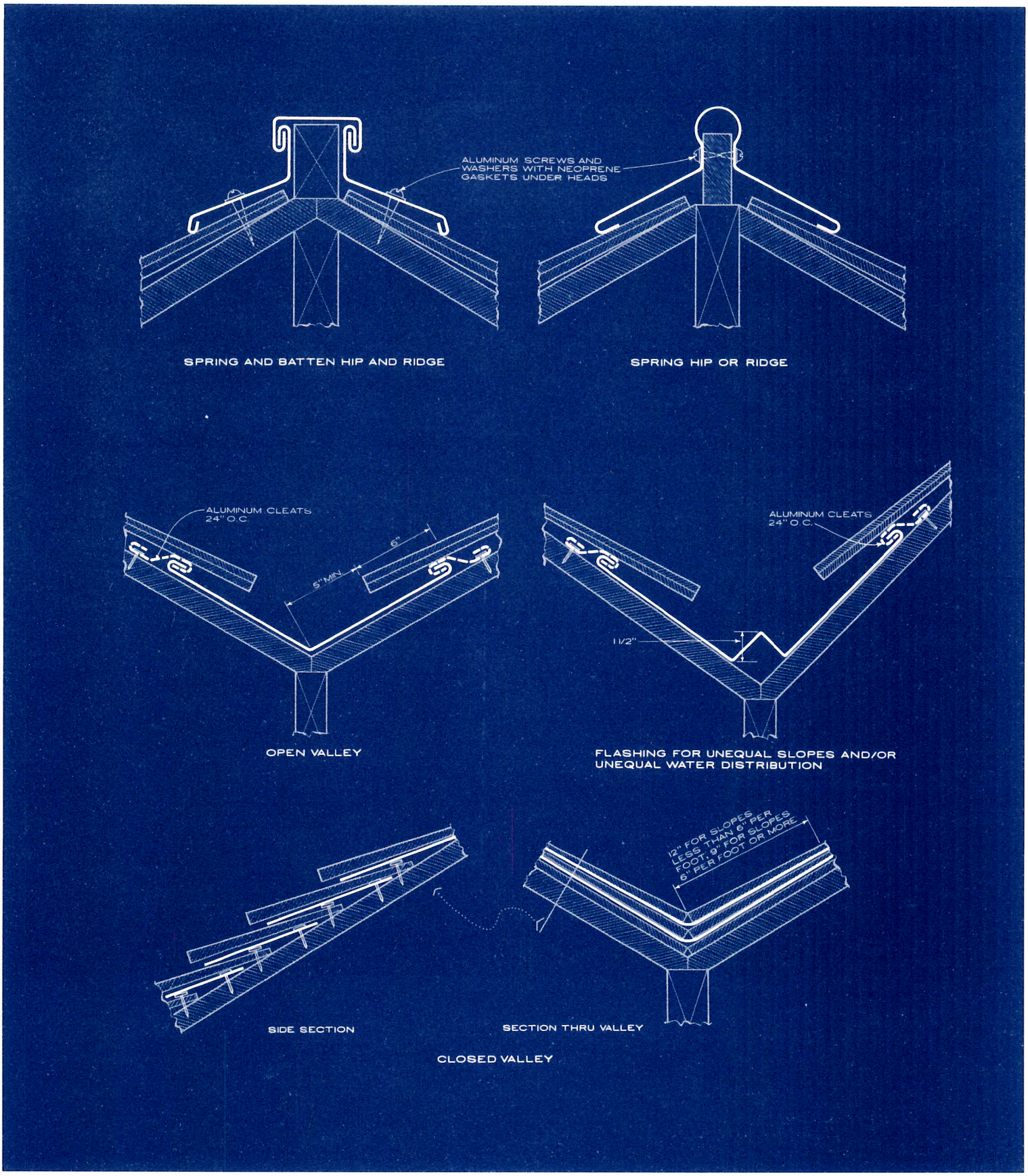
8.3. Hip and Ridge Flashings shall be of the design shown on the drawings. They shall be formed from sheets not longer than 10 feet; ends of adjacent lengths shall lap not less than 4 inches. The flashing shall be fastened on both side flanges by aluminum screws spaced on 24 inch centers. Screws shall be provided with washers having neoprene gaskets under the heads.

9. VALLEYS

9.1 Open Valleys. Valley flashing shall be formed of aluminum sheets not longer than 10 feet. The sheets shall extend not less than 6 inches under the roof covering on each side of the valley and the side edges shall be folded ½ inch for cleating. Sheets shall lap not less than 6 inches in the direction of flow and the upper end of each sheet shall be nailed to the roof deck. Side edges shall be secured with aluminum cleats spaced 24 inches on centers. The open portion of the valley shall be not less than 5 inches in width at the top and increase in width ⅛ inch per foot towards the eaves. Where intersecting roofs are on different slopes, an inverted V one inch high shall be formed in the metal along the center line of the valley and the lap of the valley sheets shall be increased to 8 inches unless otherwise shown.

9.2 Closed Valleys. Separate pieces of aluminum sheet shall be built in with each course of roofing material. The flashing shall be as long as the diagonal of the shingle at the center of the valley, and at least 18 inches wide where the roof slope is more than 6 inches to the foot and 24 inches wide where the roof slope is less than 6 inches to the foot. The bottom edge of each piece of flashing shall be ½ inch short of the butt line of the shingle in the succeeding course. Each piece of flashing shall be nailed along the upper edge with aluminum nails.

Hip, Ridge and Valley Flashing



10. GRAVEL STOPS

10.1 Sheet Gravel Stops shall be formed from sheets not longer than 10 feet. The horizontal flange shall extend onto the previously built-up roofing not less than 4 inches and be secured through the roofing and into the deck with aluminum nails not more than 3 inches apart. Wood nailing strips shall be provided in other than wood decks. Over the horizontal flange a layer of elastic cement shall be troweled; into this elastic cement shall be embedded a strip of fabric. A second strip of fabric shall be similarly applied or, alternately, the first strip of fabric shall be covered with hot pitch into which the top strip of felt shall be embedded. The top strip shall be surfaced the same as the adjacent built-up roofing.

The aluminum shall be bent to form a gravel stop not less than 1 inch high and the outer edge shall extend down as a fascia. For fascias 4 inches or less in depth the lower edge shall be hemmed not less than ½ inch and turned out ¾ inch at an angle of 45° to form a drip. For fascias more than 4 inches in depth the lower edge shall hook ¾ inch over a previously placed continuous aluminum edge strip.

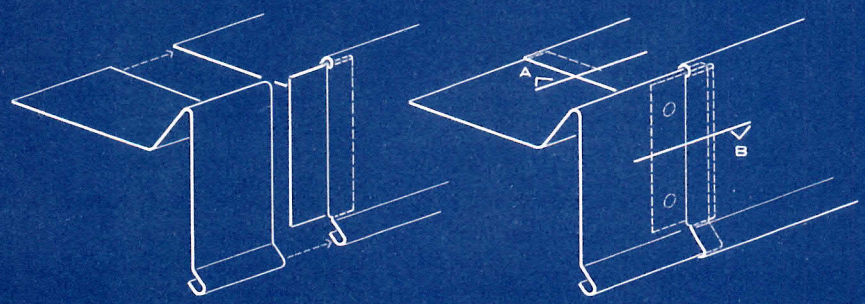
Ends of each length of gravel stop shall be lapped 3 inches and the horizontal portion on the roof shall be set in elastic cement. End joints of the fascia portion deeper than 4 inches shall be held tightly together by inserting the end of one length in a 2 inch deep "S" lock formed in the end of the adjacent length. Face nailing of end joints will not be permitted.

Where depths of fascias vary from 8 to 16 inches longitudinal steps or ridges shall be formed in the fascia to minimize waviness. Steps or ridges shall be at least ½ inch high and proportionally spaced not more than 6 inches apart.

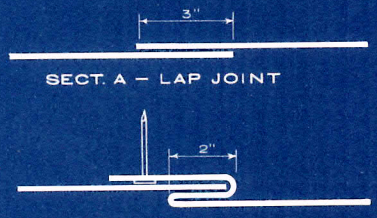
Edge strips shall be continuous and shall be formed of sheets not longer than 10 feet; ends of adjacent lengths shall lap at least 1 inch. The lower edge shall be turned out 45° to form a drip. Edge strips shall be fastened to wood with nails spaced 4 inches apart, or to masonry with screws in expansion sleeves spaced 10 inches apart.

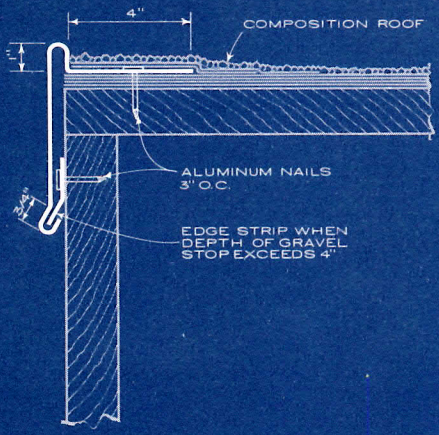
10.2 Extruded Gravel Stops shall be of the size and shape shown on the drawings. Installation shall be in accordance with manufacturer's recommendations.

Gravel Stops and Fascias

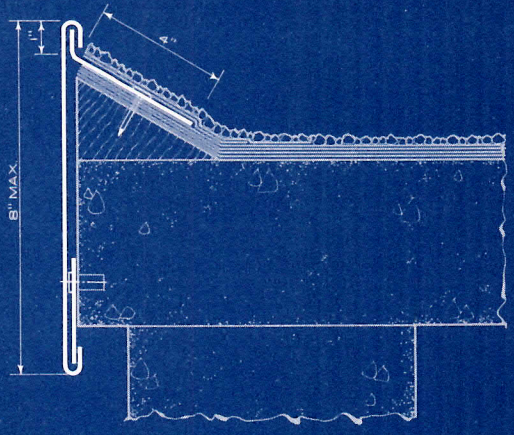


JOINT DETAIL FOR FORMED GRAVEL STOP AND FASCIA

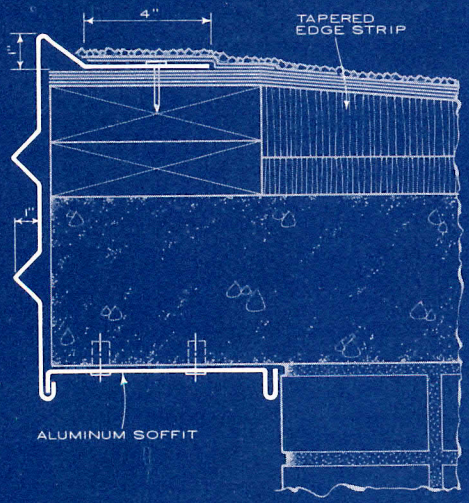




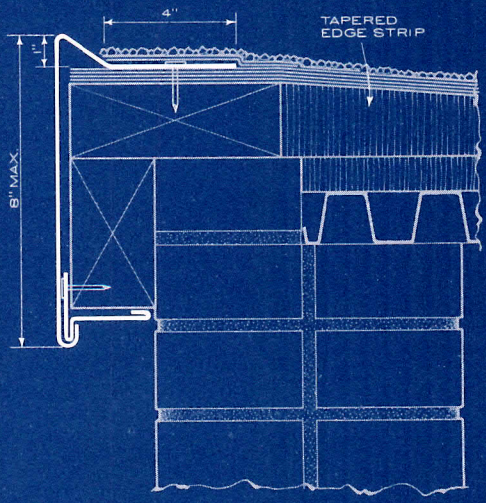
GRAVEL STOP AT FASCIA BOARD



TWO-PIECE FASCIA AND GRAVEL STOP



ONE-PIECE RIBBED FASCIA AND GRAVEL STOP FOR DEPTHS OVER 6"



ONE-PIECE FASCIA AND GRAVEL STOP

Specifications

11. BASE FLASHING

11.1 Straight Base Flashing for built-up roofing shall extend up on vertical surfaces at least 8 inches (unless otherwise shown on drawings) and to a height of at least 3 inches above the bottom of the cap flashing. It shall extend onto the previously placed built-up roofing 4 inches.

The base flashing shall be made of aluminum sheets not longer than 10 feet. Ends of sheets shall be joined by 1 inch wide loose lock seams that are filled with sealant. The horizontal leg of the base flashing shall be nailed along its outer edge with aluminum nails spaced 3 inches apart. On other than wood decks, wood nailers shall be provided. Over the horizontal flange a layer of elastic cement shall be troweled; into this elastic cement shall be embedded a strip of fabric. A second strip of fabric shall be similarly applied or, alternately, the first strip of fabric shall be covered with hot pitch into which the top strip of felt shall be embedded. The top strip shall be surfaced the same as the adjacent built-up roofing.

11.2 Stepped Base Flashing. Where slate, flat tile or shingle roofs abut vertical brick or other masonry surfaces, separate pieces of aluminum flashing shall be woven in with each course. Each piece of flashing shall extend out onto the roof 4 inches and up on the vertical wall at least 4 inches and under the cap flashing or finish siding not less than 3 inches. The flashing pieces shall extend from the top edge of the shingle on which it rests to within ½ inch of the butt of the course placed over the flashing. For slate or tile, the flashing piece shall extend 2 inches above the top edge of slate for nailing, or two lugs about 1 inch wide shall be made at the top of each flashing piece bent to hook over the top edge of the slate or tile. Flashings used with slate or tile roofing shall be 0.032″ minimum.

12. CAP FLASHING

12.1 Straight Cap Flashing shall be provided with all base flashings. The flashing shall be formed of sheets not longer than 10 feet and shall be built into the masonry 4 inches with the inner edge terminating in a ¼ inch hook dam or, alternately, turning up 1 inch behind the first brick course. The built-in portion of the flashing shall be painted (Section 2.6) before installation. The apron shall be of sufficient width to overlap the base flashing not less than 3 inches. Ends of adjacent lengths of flashing shall overlap not less than 3 inches and the built-in horizontal portion of the joint shall be set in elastic cement. The flashing shall have a layer of mortar above and below the horizontal flange in the wall.

12.2 Stepped Cap Flashing shall be provided at the intersection of pitched roofs with vertical surfaces. The flashing pieces shall extend into the wall 4 inches and terminate in a ¼ inch hook dam. The steps shall lap at least 3 inches over each other and at least 3 inches over the base flashing.

12.3 On Existing Masonry Walls the mortar joint to receive the flashing shall be raked out to a depth of 1 inch. The flashing shall extend into the raked-out joint with the inner edge bent back to form a hook dam. It shall be secured by aluminum wedges or plugs spaced not more than 8 inches apart and the raked-out joint shall be filled with sealant (Section 2.3).

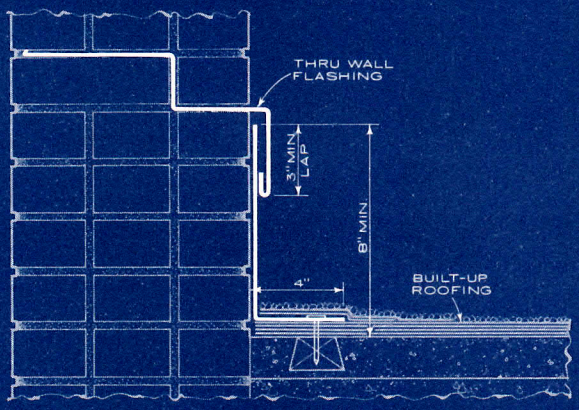
13. CHIMNEY FLASHING

13.1 Chimneys on Sloped Roofs. At the front of the chimney, an apron flashing of aluminum shall extend over the roofing material not less than 5 inches and up on the chimney face at least 4 inches. The lower edge of the apron flashing shall be hemmed ½ inch for stiffness and be secured in place with blind cleats or screws with neoprene gaskets not more than 18 inches apart. Along the chimney sides, separate pieces of aluminum at least 8 inches long bent to extend 4 inches onto the roof and 4 inches up on the chimney wall shall be woven in with each course of roofing material. At the chimney corners the base flashing shall be connected to the apron flashing by a lapped or locked seam filled with sealant (Section 2.3). Crickets above chimneys shall be flashed and the aluminum shall extend under the roofing material at least 6 inches and terminate in a ½ inch fold. All joints shall be lapped or locked and filled with sealant.

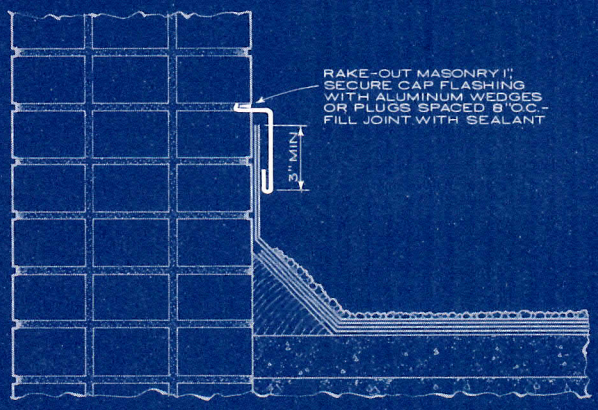
Cap flashings shall extend through the chimney wall and the back edge shall turn up 1 inch against the flue lining. Pieces of stepped cap flashing shall lap the base flashing at least 3 inches and each other not less than 3 inches.

13.2 Chimneys on Flat Roofs shall be flashed as Straight Base and Cap Flashing (Sections 11 and 12).

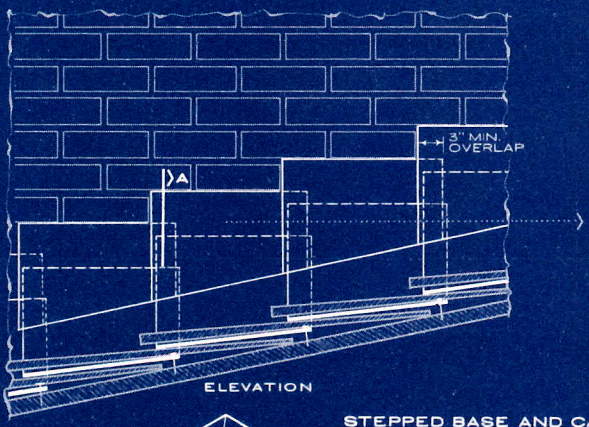
Base and Cap Flashing



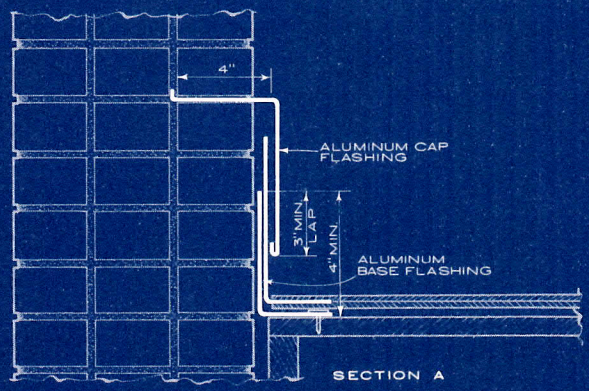
STRAIGHT BASE AND CAP FLASHING



ALUMINUM CAP FLASHING WITH BUILT-UP BASE FLASHING AT EXISTING MASONRY WALL

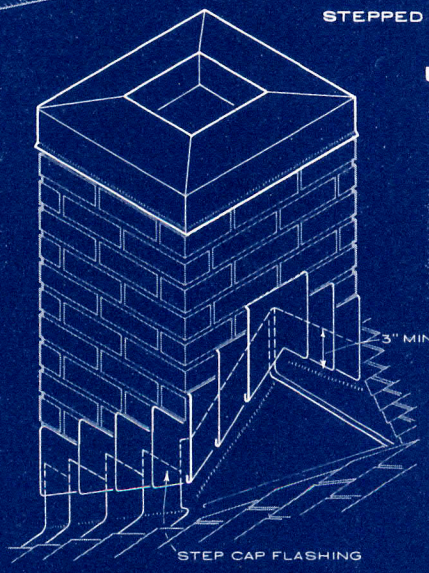


ELEVATION

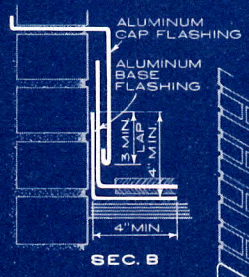


SECTION A

STEPPED BASE AND CAP FLASHING FOR SLOPING ROOF



TWO PIECE CHIMNEY CRICKET



SEC. B

FLASHING AT BASE OF CHIMNEY

14. THRU-WALL FLASHING

14.1 General. Thru-wall flashings shall be installed under parapet copings, for counter flashings in parapets and in all rising masonry walls where roofs abut, over lintels of all exterior openings, under window sills and stone band courses, continuous over all spandrel beams and as elsewhere indicated on the drawings. All flashings in exterior walls shall extend through the wall to within ½ inch of the exterior face and turn up 2 inches on the interior wall face unless otherwise shown on the drawings. Flashings that form cap flashings shall turn down face of wall 4 inches minimum and shall overlap the base flashings not less than 3 inches. Flashings over spandrel beams and lintels and under band courses and sills shall be installed as indicated on drawings and elsewhere specified.

All thru-wall flashing shall be set with a bed of mortar above and below the flashing and shall be installed in strict accordance with the plans and specifications. The flashing shall be factory formed to provide a mechanical bond in the mortar bed in all directions. Samples shall be submitted for approval and the roofing and sheet metal contractor shall be responsible for its proper installation.

Where aluminum flashing is to be embedded in masonry walls it shall first be coated with bituminous paint or methacrylate lacquer (Section 2.6). Alternately, painted sheet conforming to Aluminum Association Standards for Painted Aluminum Sheet may be used.

14.2 Spandrel Flashings. A continuous thru-wall flashing shall be installed on top of all spandrel beams. The flashing shall extend through the masonry to within ½ inch of the exterior wall face. The rear edge of the flashing shall be turned up 2 inches against the interior face of the wall unless otherwise shown on the drawings. Where the flashing intersects columns, it shall turn up 2 inches against the sides and face of columns. At the bottom of concrete spandrel beams the flashing shall be let into a continuous reglet, placed so that the bottom edge of the receiving slot is 2½ inches above the top edge of the lintel or carrier angles or as detailed on the drawings. It shall extend down to the second brick joint or first stone joint above the horizontal leg of the carrier or lintel angle, and out within ½ inch of the exterior wall face. The ends of each length of flashing shall lap not less than 3 inches and be sealed with elastic cement (Section 2.4).

Where the front face of the steel spandrel beams are fireproofed with brick masonry, the thru-wall flashing on top of the beam shall be installed as heretofore specified. At the bottom of the spandrel, the lintels or carrier angles shall be flashed with a separate strip of flashing. The flashing shall extend through the masonry to within ½ inch of the exterior wall face in the second brick joint, or first stone joint above the horizontal leg of the angle. The flashing shall turn up at least 2 inches against the web of the steel beam and the joint between the flashing and steel shall be sealed with elastic cement.

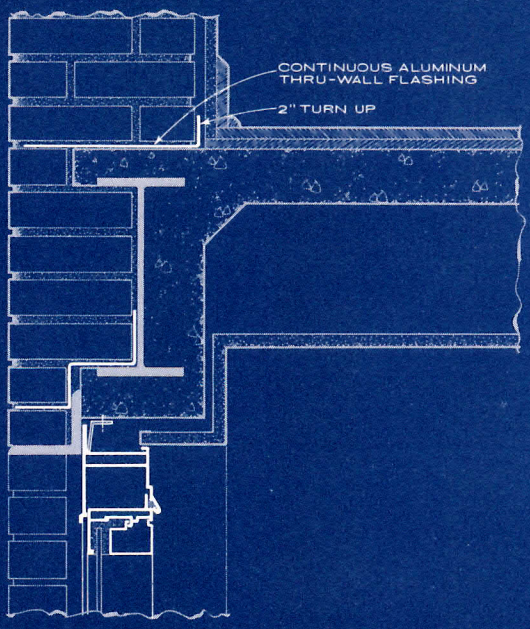
14.3 Sill Flashing. The flashing under masonry sills shall extend the full depth of sill or as detailed and 4 inches beyond the ends of sill. The front edge of the flashing shall be ½ inch back of the exterior wall face and the back edge shall turn up at least 2 inches unless otherwise indicated on the drawings.

14.4 Lintel Flashing. Where openings occur in solid brick or tile walls, the flashing shall extend the full length of lintel. It shall extend through the wall one brick course above the structural lintels and one brick course above the outer lintel to within ½ inch of the exterior face of masonry wall, or alternately, shall be bent down to lap over the vertical leg of the outer lintel angle not less than two inches. The back edge of the flashing shall be bent up 2 inches against the interior wall face.

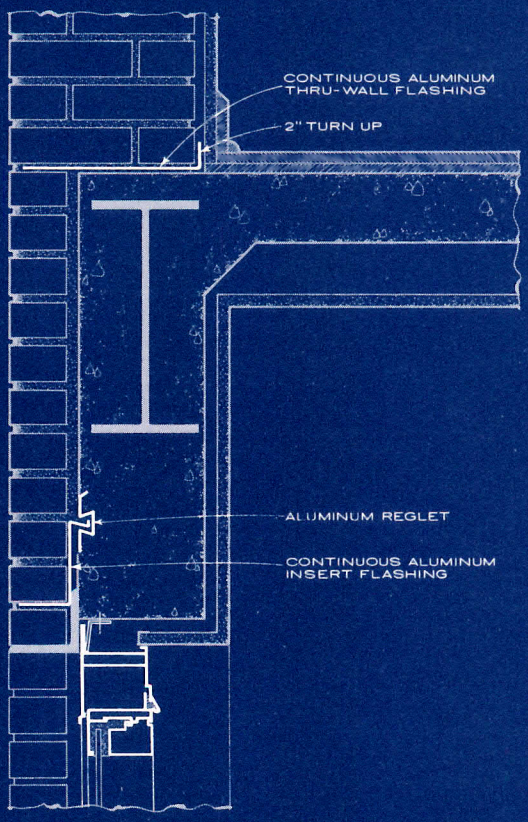
Where the bottom of concrete spandrels form the head of openings a reglet shall be installed in the face of the spandrel the full length of the lintel. The reglet shall be so placed that the bottom edge of the receiving slot is 2½ inches above the top edge of the lintel, or as detailed on the drawings. The flashing shall be inserted the full depth of the reglet and shall extend horizontally through the mortar joint to within ½ inch of the exterior face of masonry wall, or alternately, shall lap over the vertical leg of the lintel not less than 2 inches.

Where the front face of the steel spandrel beams are fireproofed with brick masonry, the flashing shall extend the full length of the lintel. The flashing strip shall lap over the vertical leg of the lintel not less than 2 inches and be bent to extend up onto the web of the steel spandrel not less than 2 inches. The joint between the flashing and steel shall be sealed with elastic cement.

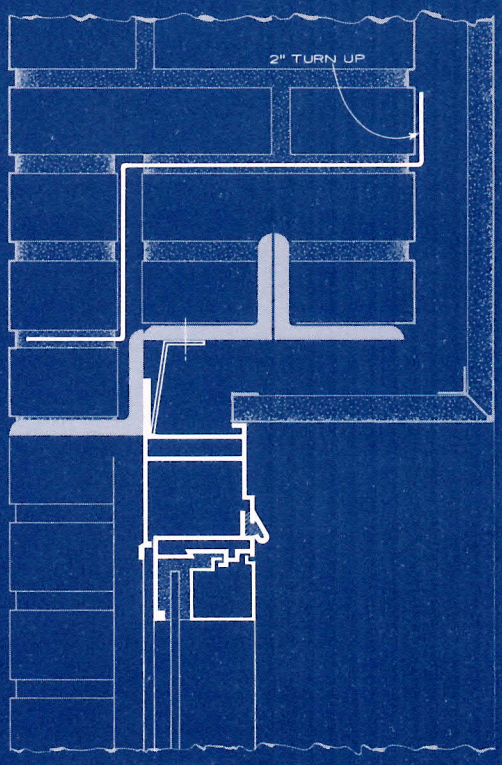
Thru-Wall Flashing at Spandrels, Sills and Lintels



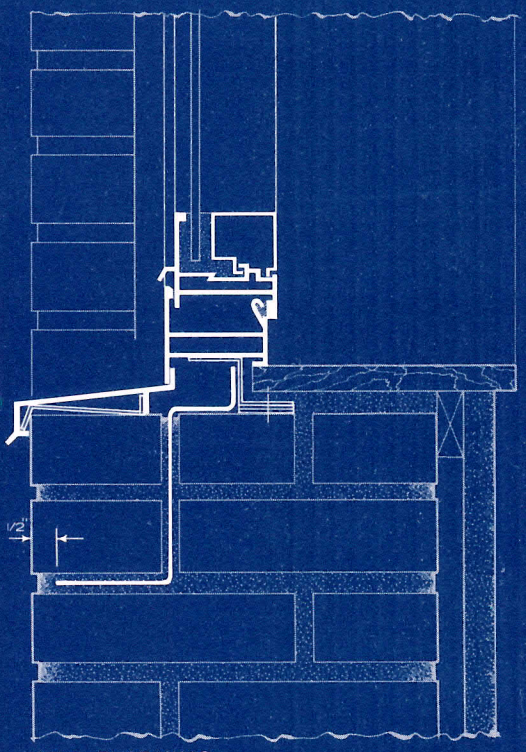
EXPOSED WEB SPANDREL



DEEP SPANDEL



LINTEL FLASHING



SILL FLASHING

14.5 Brick Parapet Walls. Where the height of the parapet is 6 inches to 15 inches from the roof line to the underside of the coping the thru-wall flashing shall be placed directly under the coping stone. Where the height to the underside of coping is less than 6 inches, a one piece combination coping and base flashing shall be installed. The outer edge of the combination flashing shall extend over the coping and be secured as specified under *Coping Covers* (Section 16). The inner edge of flashing shall extend 4 inches onto the roof deck and be installed as specified under *Base Flashings* (Section 11).

Where the height of the parapet is more than 15 inches from the roof line to the underside of the coping, a thru-wall flashing shall be installed directly under the coping stone. The flashing shall extend to within ½ inch of the exterior wall face and the edge shall be folded over ¼ inch to form a hook dam. At the inside face of the wall, the flashing shall project ½ inch and be bent down at an angle of 45° to form a drip. Directly above the base flashing a cap flashing that extends 4 inches into the wall shall be installed.

14.6 Concrete Parapets and Walls. For counter flashings and other flashings which are to connect with concrete walls, furnish and install in the concrete a reglet receiver for metal flashings where indicated on the drawings.

The flashing shall be inserted the full depth of the reglet and be secured with aluminum wedges 16 inches on centers. The reglet shall then be filled with sealant (Section 2.3). The ends of each piece of counter flashing shall lap not less than 3 inches. A slight bend shall be made in the counter flashing to provide spring action of the lower edge against the base flashing.

15. STANDING SEAM SIDING

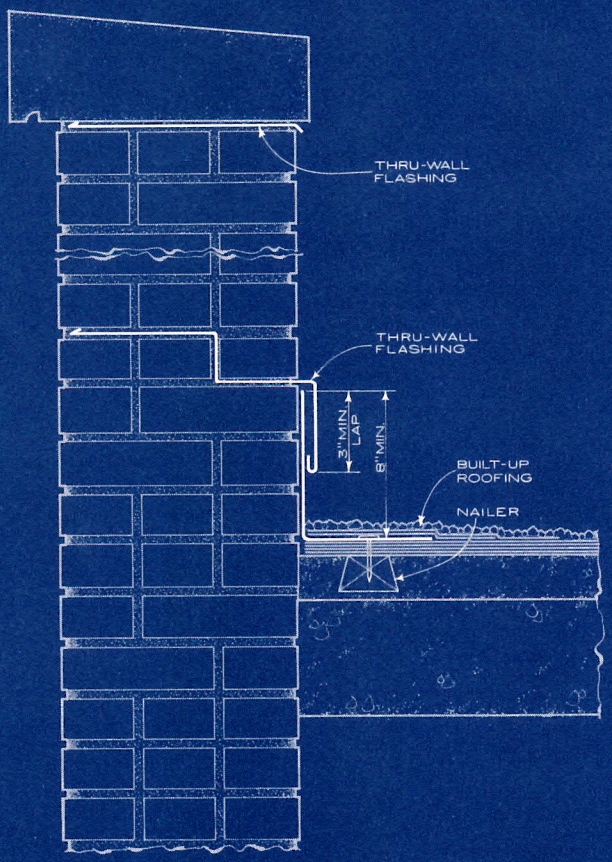
Where drawings call for metal covering on minor vertical surfaces (walls of penthouses, monitors, skylights, fascias, the inside face of parapet walls, etc.), covering shall be Standing Seam Siding constructed according to the specification for *Standing Seam Roofing* (Section 5).

The upper edge of the siding shall be counterflashed and the lower edge shall lap over the base flashing a minimum of 3 inches.

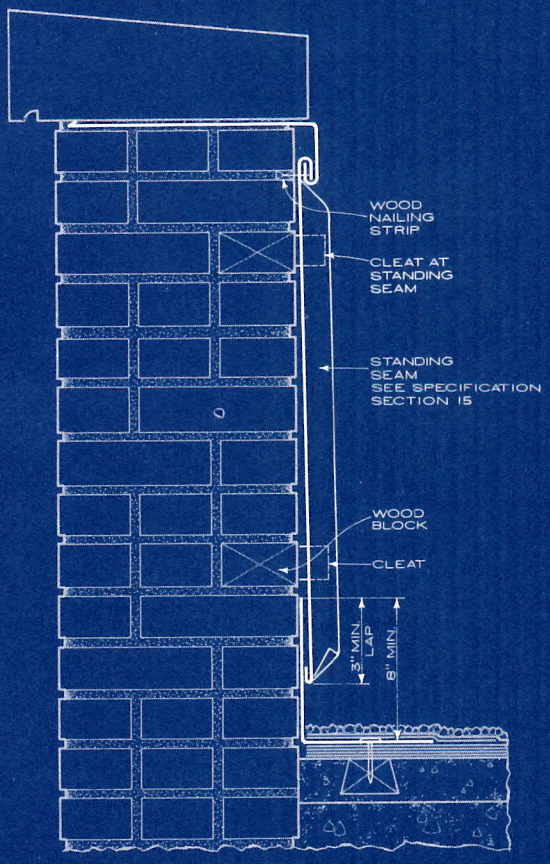
Note:

See page 27 for standing seam fascia detail.

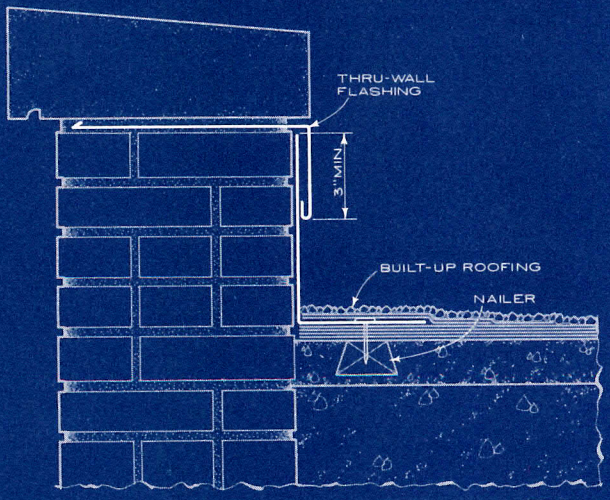
Thru-Wall Flashing at Parapets and Walls



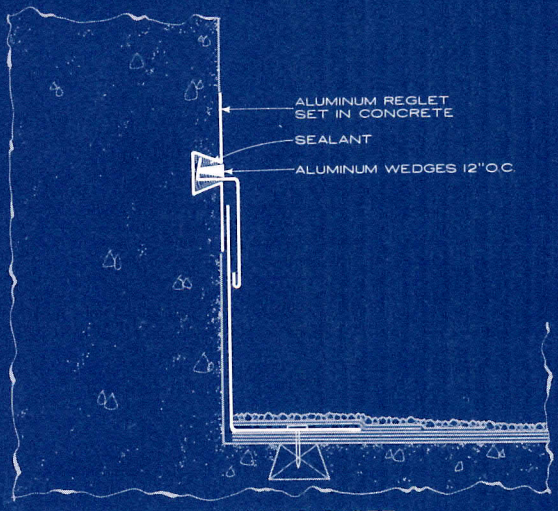
FLASHING AT COPING ON PARAPET MORE THAN 15" ABOVE ROOF LINE



ALUMINUM PARAPET LINING



FLASHING AT COPING ON PARAPET BETWEEN 6" AND 15" ABOVE ROOF LINE



FLASHING AT CONCRETE PARAPET

16. COPING COVERS

16.1 Flat Seam Coping Covers shall be formed of sheets not longer than 10 feet, joined by 1 inch loose lock seams that are filled with sealant (Section 2.3).

On stone copings where the covering extends down over the front face of the stone, the aluminum sheet shall hook ¾ inch over a continuous edge strip made of 8 or 10 foot long lengths of aluminum. Edge strips shall be secured with aluminum screws in expansion sleeves spaced 10 inches apart. Ends of adjacent lengths shall lap at least 1 inch.

Where the covering does not extend over the front face a separate continuous locking strip of aluminum shall be secured into a reglet in the stone with aluminum wedges, or aluminum screws in expansion sleeves, and the reglet filled with sealant (Section 2.3). Ends of adjacent lengths of locking strip shall lap not less than 2 inches. The aluminum covering shall engage the locking strip with a ¾ inch loose lock seam. The inner edge of the coping shall lock into the aluminum base flashing or be secured by cleats spaced not more than 2 feet apart. Cleats shall be secured to the stone coping with two aluminum screws in expansion sleeves.

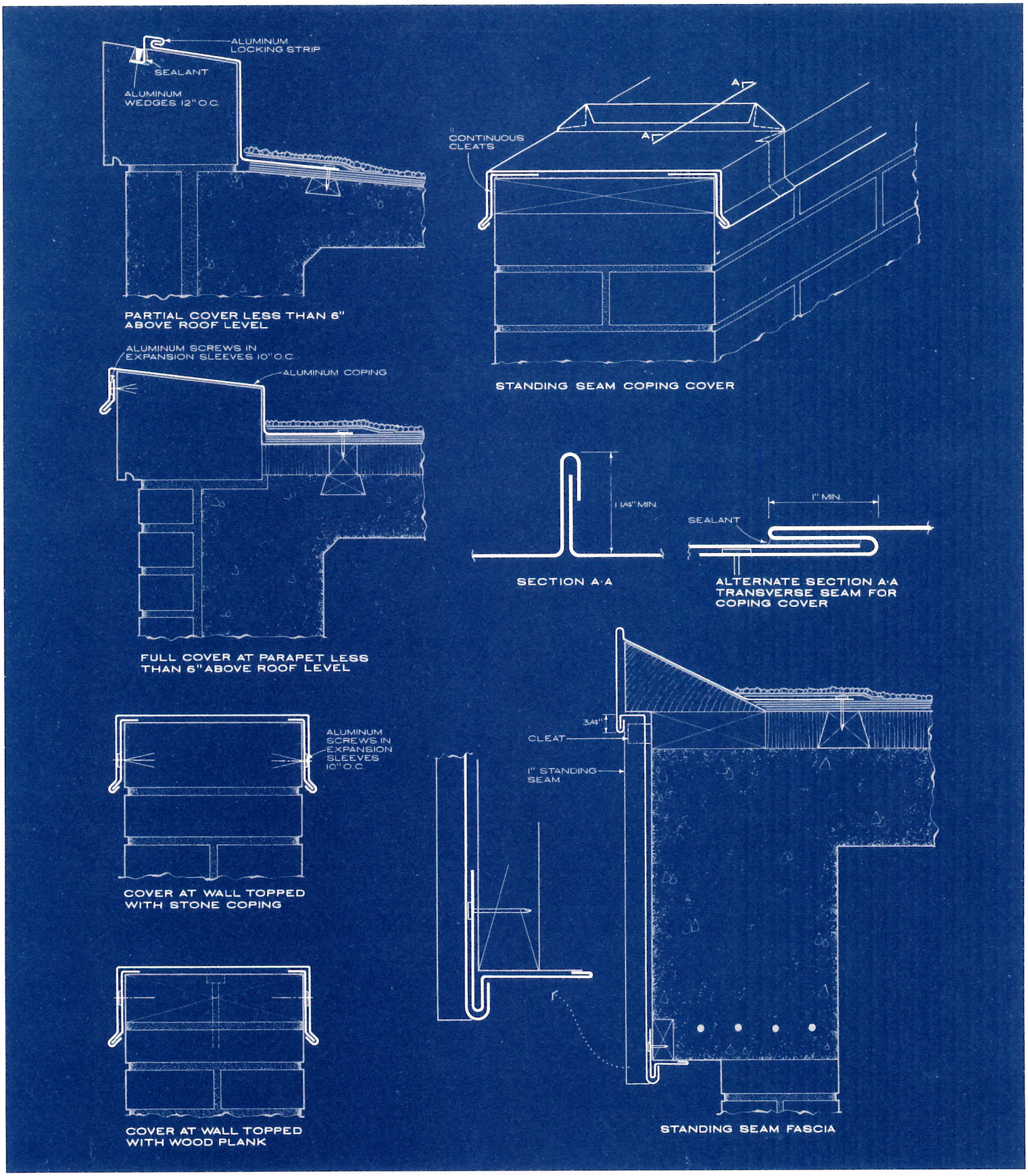
Walls topped with wood plate shall have a continuous edge strip, made of 8 or 10 foot long lengths of aluminum, secured along the front edge with aluminum nails spaced 4 inches apart. The coping cover shall be hooked over the edge strip with a ¾ inch loose lock seam. The inner edge of the aluminum coping shall lock into the top of the aluminum base flashing with a ¾ inch loose lock seam. Where aluminum base flashings are not provided, it shall hook over an edge strip as specified for the front edge or, alternately, it shall be secured by aluminum cleats spaced not more than 2 feet apart. Cleats shall be secured to the wood plate with two aluminum nails.

Where the height of the coping above the roof deck is less than 6 inches, a one-piece combination coping cover and base flashing shall be installed. The inner edge of the flashing shall extend onto the previously placed built-up roofing 4 inches and shall be nailed along its outer edge with aluminum nails spaced 3 inches apart. The horizontal flange shall then be stripped into the built-up roofing (Section 11.1). Where the height of the coping above the roof deck is more than 6 inches, the inner edge of the coping cover shall lock into the aluminum base flashing or be secured by cleats spaced not more than 2 feet apart.

16.2 Standing Seam Coping Covers shall be formed from sheets not longer than 10 feet. Ends of sheets shall be connected by a single fold standing seam finishing not less than 1¼ inches high. The tab at the ends of standing seams shall be folded over to close the ends of seams. Front and rear sides of the aluminum coping shall extend down over the edge of the wood plate and lap over the masonry not less than 2 inches. The lower edges shall be bent out to form a drip and hook over continuous edge strips. Edge strips, in 8 or 10 foot lengths, shall be attached to the inner and outer faces of the wood plate with aluminum nails spaced 4 inches apart. Edge strips shall extend over the top of the wood plate at least 2 inches.

16.3 Extruded Coping Covers shall be of the size and shape shown on the drawings. Installation shall be in accordance with manufacturer's recommendations.

Coping Covers and Standing Seam Fascia



17. MISCELLANEOUS

17.1 Scupper Flashing shall cover the interior of the opening provided in the wall and shall extend through and project outside the wall as shown on the drawings. There shall be ½ inch clearance between the masonry and aluminum. On the roof side, the scupper lining shall be of sufficient length to be built into a membrane base flashing at least 4 inches or locked to the aluminum base flashing with a ¾ inch sealant filled seam (Section 2.3). The bottom edge shall extend at least 4 inches into the built-up roofing and where required a ¾ inch high gravel stop ridge shall be formed around the scupper inlet.

17.2 Splash Pans shall be installed under all downspouts discharging onto composition roofs. Pans shall be made of sheets 24 inches long by 18 inches wide unless otherwise indicated on the drawings. On two sides and one end of the sheet shall be formed 1 inch high continuous inverted V members placed 4 inches from the outside edges. Filler pieces shall be provided at the corners so that they lap over the flanges on the sides not less than 3 inches with the lapped joints being set in elastic cement. The rear side of the pan shall be not less than 8 inches high and shall extend under the side wall covering or be cap flashed on masonry walls. Pans shall be bedded in elastic cement and the 4 inch side flanges shall be stripped and mopped into the built-up roofing as specified in Section 11.1.

17.3 Curb Flashing shall be provided on all curbs, roof scuttles, etc. The flashing shall extend up the full height and over the top of the curbs. The lower edge shall extend 4 inches onto the roof deck and with built-up roofing be installed as specified in Section 11.1 or with slate, tile or shingle roofing be installed as specified in Section 10.2.

17.4 Door Sills. The sills of doors leading onto flat roofs except where the bottom of the sill is at or above the level of cap flashing, shall be provided with aluminum flashing. The flashing shall extend under the sill and be turned up behind and at the two ends of sill at least 2 inches. The sill flashing shall be joined to the base flashing by a ¾ inch lock seam filled with sealant (Section 2.3); all lock seams and joints shall be made watertight with sealant.

18. RAINWATER GOODS

18.1 Hung Gutters should be of the size and shape shown on the drawings. Outer edges shall be rolled or beaded to provide stiffness. Inner edges shall finish not less than 1 inch above outer edges. Gutters shall be secured by continuous cleats engaged along the inner edge or, alternately, by hangers or straps spaced not more than 32 inches apart. Ends of gutter sections shall be joined in a separate "S" lock or, alternately, the ends shall lap not less than 3 inches in the direction of flow, be riveted and the joint then covered with sealant (Section 2.3). Gutters shall slope not less than 1/16" per foot toward leaders. Expansion joints shall be provided on long straight runs at spacings not greater than 50 feet and at inside and outside corners at spacings not greater than 20 feet.

Note:
The use of alclad sheet products is recommended for gutter construction, particularly in severe industrial or industrial-marine environments or where other corrosive conditions may be present. (See Note 3, Section 2. 1. 1.)

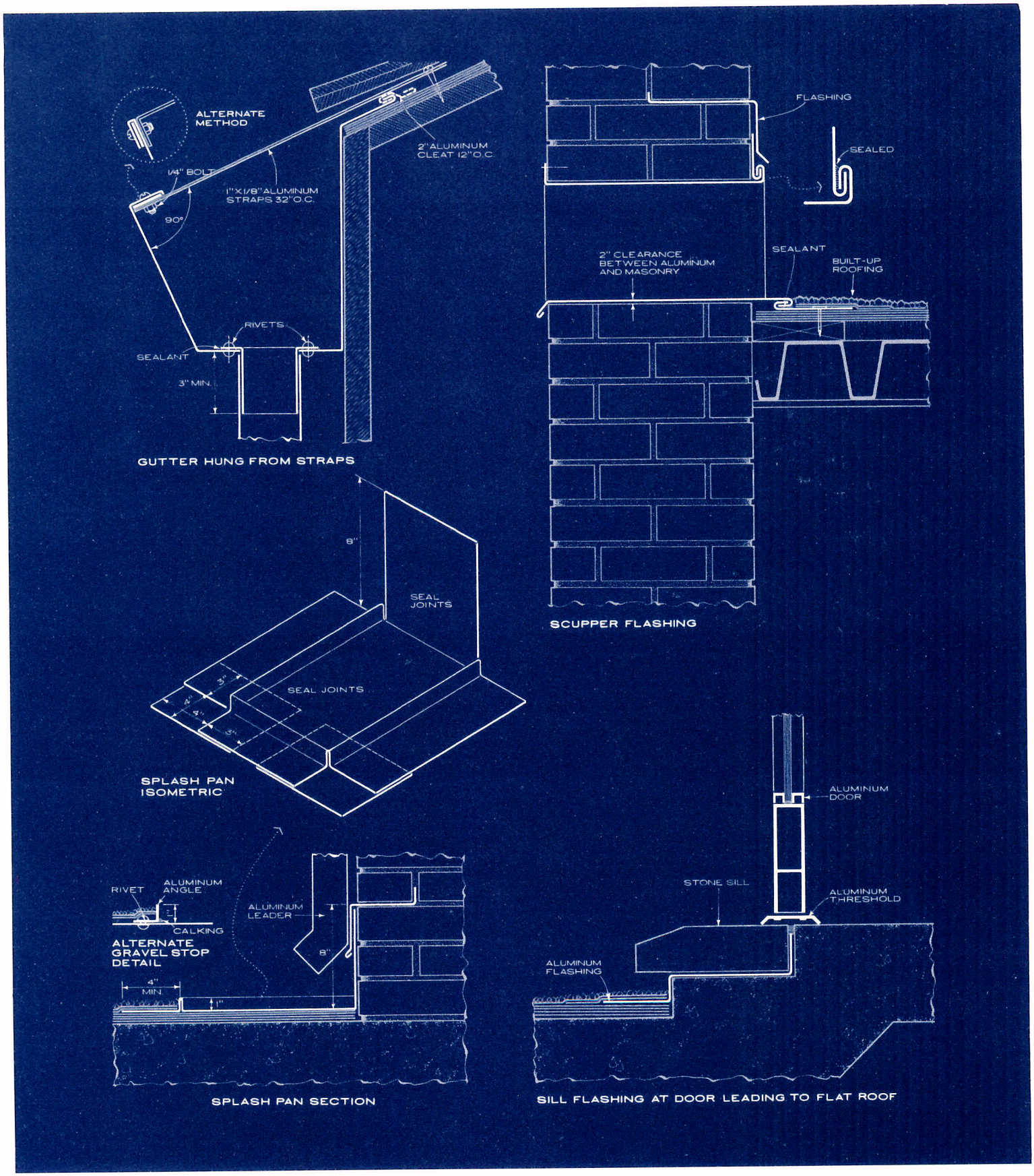
18.2 Outlet Tubes shall be of the size and shape required to fit the gutter. They shall be located as shown on the drawings, but at spacings not more than 50 feet. Holes shall be provided in the gutter bottom through which the outlet shall extend. The flanges formed at the top of the outlet tube shall be riveted to the gutter and the connection sealed (Section 2.3). Outlet tubes shall extend not less than 3 inches into leaders.

18.3 Leader Heads shall be of the size and shape shown on the drawings.

18.4 Leaders or Downspouts shall be of the size and shape shown on the drawings. They shall be formed in not less than 10 foot lengths where possible. End joints shall telescope not less than 1½ inches and longitudinal joints shall be locked. All necessary elbows, offsets, etc., as required shall be provided.

18.5 Leader Straps shall hold leaders in a position clear of the wall. Leader straps shall be spaced as shown on the drawings, but in no case shall the spacing be more than 10 feet. They shall be securely attached to the wall with aluminum fasteners, and shall grip the leader securely by means of punched prongs, screws, rivets, or other mechanical fastening devices.

Rainwater Goods and Miscellaneous



About the Aluminum Association

The Aluminum Association is an industry-wide trade organization representing over 50 companies including all the primary producers of aluminum in the United States, leading manufacturers of semi-fabricated aluminum products and principal foundries and smelters.

The Association's aims are to increase public and industrial understanding of aluminum and the aluminum industry and—through its technical, statistical, marketing and informational activities—to serve industries, consumers, financial analysts, educators, students, government agencies and the public generally.

For the aluminum industry and those industries that use aluminum, the Association helps develop standards and designations systems, helps prepare codes and specifications involving aluminum products and studies technical problems of the industry.

The Association maintains and periodically issues industry-wide statistics and records which are used as an authoritative source.

Association members also join together on a number of commodity and end-market committees to conduct industry-wide market development programs.

Other Aluminum Association Technical Publications

ALUMINUM CONSTRUCTION MANUAL

Section 1 — Specifications for Aluminum Structures . . . . SAS

November 1968 (64 pages)

Contains design and fabrication specifications for structures made of a wide range of aluminum alloys. Allowable stresses for bridge and building type structures, both welded and non-welded, are presented in tabular form. Design rules and fabrication procedures are also outlined.

Section 1A — Commentary on Specifications for Aluminum Structures . . . . . CS

March 1971 (16 pages)

Adds additional detail to "Specifications for Aluminum Structures." Provides excellent background and references for those who wish to explore further the basis for the Specifications.

Section 2 — Aluminum Formed-Sheet Building Sheathing Design Guide . . . . . ABS

November 1969 (16 pages)

Originally published by the American Society of Civil Engineers, it deals with the design, testing and installation of building sheathing formed from aluminum alloy sheet.

Section 3 — Engineering Data for Aluminum Structures . . ED

August 1969 (96 pages)

Supplements Specifications for Aluminum Structures with engineering properties of various aluminum shapes and fasteners and other important information such as beam and structural formulas.

Section 5 — Specifications for Aluminum Sheet Metal Work in Building Construction . . . . . ASM

December 1969 (8 pages)

Provides specifications for the proper use of aluminum in roofing, flashing and other sheet metal work in building construction. Also provides guidance in alloy and gage selection and design and installation details.

MILL PRODUCTS

Aluminum Standards and Data . . . . . ASD

1970-1971 (200 pages)

Issued biennially, this is a comprehensive reference book containing data on mechanical, physical and other properties, tolerances and other useful information on aluminum mill products in general use. Includes separate sections on sheet and plate, rolled rod and bar, extruded rod, bar, tube and shapes, forging, electrical conductors and other aluminum forms and shapes.

Drafting Standards — Aluminum Extruded and Tubular Products . . . . . DSE

Sixth edition, March 1969 (72 pages)

Outlines basic practices for preparing drawings for aluminum extruded rod, bar and shapes, extruded and drawn tube, pipe and structural shapes. Specifications on line work, lettering, dimensioning and other drafting factors are also included.

Aluminum Association Standard Structural Shapes . . . . SSS

April 1968 (6 pages)

Introduction to new Aluminum standard I-beams and channels. Includes tables of dimensions and weights plus interchangeability chart showing how the new shapes can substitute for the old.

Single copies of these publications are available free.

THE ALUMINUM ASSOCIATION
750 THIRD AVENUE, NEW YORK. N.Y. 10017