

**'ROOFING, BUILT-UP, TYPE 4AWS,
CONSTRUCTION OF**

I. GENERAL SPECIFICATIONS.

The latest issues of the following Federal and United States Army specifications, basic numbers as indicated, form a part of this specification insofar as the terms are applicable:

Federal specifications:

Felt, rag, asphalt-saturated, for roofing and water-proofing	No. III-F-191a A#1
Asphalt for mineral-surfaced roofing	SS-A-666

United States Army specifications:

Flashings, metal, installation of, with bituminous built-up roofing	81-23
Flashings, plastic, installation of, with bituminous built-up roofing	81-24
Materials, surfacing, for bituminous built-up roofing	81-7

II. GRADE.

Not applicable to this specification.

III. MATERIAL.

Roofing of type 4AWS shall contain not less than the following quantities of materials per 100 square feet:

	Pounds
Four layers asphalt-saturated rag felt	60
Asphalt for mineral-surfaced roofing	105
Roofing gravel	400
or	
Roofing slag	300

IV. GENERAL REQUIREMENTS.

Not applicable to this specification.

V. DETAIL REQUIREMENTS.

1. This roofing shall consist of four layers or plies of asphalt-saturated rag felt cemented together with asphalt and surfaced with slag, gravel, or similar surfacing material as called for in the invitation for bids.

2. Flashings of the type required under the specification for the building shall be included and shall conform to United States Army Specifications Nos. 81-23 or 81-24, referred to in section I hereof.

3. Roofing of type 4AWS shall be laid in the following manner:

(a) The asphalt shall not be heated above 400° F. and shall be hot when the felts are laid.

(b) The layers of felt shall be laid so as to be free from wrinkles and buckles.

(c) The surfacing material shall always be dry when applied, and in addition shall be heated in cold weather.

(d) The board-roof surface installed by other contractors, before being considered satisfactory for laying the roof covering, shall be smooth and free from loose boards, large cracks, or projecting ends which might injure the roofing. All dirt and foreign material shall be removed. Precast gypsum slabs shall be firmly set, well pointed, and free from any unevenness which might injure the roofing.

4. (a) Lay two layers of 32-inch asphalt-saturated felt over the entire roof surface, lapping each sheet 17 inches over the preceding sheet. Lap the ends of the sheets not less than 4 inches. When 36-inch felt is used, lap the sheets 19 inches.

(b) Carry these layers of felt up abutting vertical surfaces at least 4 inches.

(c) Nail the sheets along the edges sufficiently to hold them in place until the remaining felts are laid with nails driven through flat tin disks.

5. Mop the entire surface of this felt with a uniform coating of hot asphalt, using not less than 25 pounds per 100 square feet.

6. (a) Over this coating of asphalt lay two additional layers of 32-inch asphalt-saturated felt over the entire roof surface, lapping each sheet 17 inches over the preceding sheet. Lap the ends of the sheets not less than 6 inches. When 36-inch felt is used lap the sheets 19 inches.

(b) Cut off these layers of felt at abutting vertical surfaces.

(c) Mop each of these sheets the full width of the lap with hot asphalt, using not less than 20 pounds per 100 square feet in each mopping.

7. Over the entire surface apply a uniform coating of hot asphalt, using not less than 60 pounds per 100 square feet.

8. Into this asphalt, while hot, embed the surfacing material.

VI. METHODS OF INSPECTION, SAMPLING, AND TESTING.

The necessary inspection shall be made to determine compliance with the specification.

VII. PACKING AND MARKING.

Not applicable to this specification.

VIII. NOTES.

1. Roofing of type 4AWS is adapted to board sheathing with inclines not exceeding 3 inches to the foot or precast gypsum slabs with inclines not exceeding 1 inch to the foot and shall not be used on inclines steeper than these.

2. Roofing constructed in the manner specified is durable and should not require repairs or renewals on account of the action of the elements for a period of 10 years.

NOTICE.—When Government drawings, specifications, or other data are used for any purpose, other than in connection with a definitely

[No. 81-13A]

related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded, by implication or otherwise, as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

NOTE.—Unless otherwise specified in invitation for bids, bidders may obtain copies of this specification at the following points:
New York general depot, First Avenue and Fifty-eighth Street, Brooklyn, N. Y.
Chicago Quartermaster Depot, 1819 West Pershing Road, Chicago, Ill.
San Francisco general depot, Fort Mason, San Francisco, Calif.
Eighth Corps Area general depot, Fort Sam Houston, Tex.
[No. 81-13A]

AUGUST 22, 1933

SUPERSEDED

No. 81-14
July 10, 1924

ROOFING, BUILT-UP, TYPE 5AWS, CONSTRUCTION OF

I. GENERAL SPECIFICATIONS

The latest issues of the following Federal and United States Army Specifications, basic numbers as indicated, form a part of this specification insofar as the terms are applicable:

Federal Specifications:

Felt, Rag, Asphalt-saturated, for Roofing and Water-proofing	No. HH-F-191
Asphalt for Mineral-surfaced Roofing	SS-A-666

United States Army Specifications:

Flashings, Metal, Installation of, with Bituminous Built-up Roofing	81-23
Flashings, Plastic, Installation of, with Bituminous Built-up Roofing	81-24
Materials, Surfacing, for Bituminous Built-up Roofing	81-7

II. GRADE

Not applicable to this specification.

III. MATERIAL

Roofing of type 5AWS shall contain not less than the following quantities of materials per 100 square feet:

	Pounds
Five layers asphalt-saturated rag felt	76
Asphalt for mineral-surfaced roofing	125
Roofing gravel	400
or	
Roofing slag	300

IV. GENERAL REQUIREMENTS

Not applicable to this specification.

V. DETAIL REQUIREMENTS

1. This roofing shall consist of five layers or plies of asphalt saturated rag felt, cemented together with asphalt and surfaced with slag, gravel, or similar surfacing material as called for in the invitation for bids.

2. Flashings of the type required under the specification for the building shall be included and shall conform to United States Army Specifications Nos. 81-23 or 81-24, referred to in section I hereof.

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3. Roofing of type 5AWS shall be laid in the following manner:

(a) The asphalt shall not be heated above 400° F. and shall be hot when the felts are laid.

(b) The layers of felt shall be laid so as to be free from wrinkles and buckles.

(c) The surfacing material shall always be dry when applied and in addition shall be heated in cold weather.

(d) The board roof surface installed by other contractors before being considered satisfactory for laying the roof covering shall be smooth and free from loose boards, large cracks, or projecting ends which might injure the roofing. All dirt and foreign material shall be removed. Precast gypsum slabs shall be firmly set, well pointed, and free from any unevenness which might injure the roofing.

4 (a) Lay two layers of 32-inch asphalt-saturated felt over the entire roof surface, lapping each sheet 17 inches over the preceding sheet. Lap the ends of the sheets not less than 4 inches. When 36-inch felt is used lap the sheets 19 inches.

(b) Carry these layers of felt up abutting vertical surfaces at least 4 inches.

(c) Nail the sheets along the edges sufficiently to hold them in place until the remaining felts are laid with nails driven through flat tin disks.

5. Mop the entire surface of this felt with a uniform coating of hot asphalt, using not less than 25 pounds per 100 square feet.

6. (a) Over this coating of asphalt lay three additional layers of 32-inch asphalt saturated felt over the entire roof surface, lapping each sheet 22 inches over the preceding sheet, and nailing each sheet approximately 6 inches from its upper edge with nails driven through flat tin disks. Lap the ends not less than 6 inches. When 36-inch felt is used, lap the sheets 24½ inches.

(b) Cut off these layers of felt at abutting vertical surfaces.

(c) Mop each of these three sheets the full width of the lap with hot asphalt using not less than 20 pounds per 100 square feet in each mopping.

7. Over the entire surface apply a uniform coating of hot asphalt, using not less than 60 pounds per 100 square feet.

8. Into this asphalt, while hot, embed the surfacing material.

VI. METHODS OF INSPECTION, SAMPLING, AND TESTING

The necessary inspection shall be made to determine compliance with the specification.

VII. PACKING AND MARKING

Not applicable to this specification.

VIII. NOTES

1. Roofing of type 5AWS is adapted to board sheathing with inclines not exceeding 3 inches to the foot or precast gypsum slabs or blocks with inclines not exceeding 1 inch to the foot, and shall not be used on inclines greater than these.

2. Roofing constructed in the manner specified is durable and should not require repairs or renewals on account of the action of the elements for a period of 20 years.

[No. 81-14A]

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San Francisco General Depot, Fort Mason, San Francisco, Calif.
Eighth Corps Area General Depot, Fort Sam Houston, Tex.

[No. 81-14A]

AUGUST 22, 1933

SUPERSEDING

No. 81-15

July 10, 1924

ROOFING, BUILT-UP, TYPE 3ACS, CONSTRUCTION OF

I. GENERAL SPECIFICATIONS.

The latest issues of the following Federal and United States Army specifications, basic numbers as indicated, form a part of this specification insofar as the terms are applicable:

Federal specifications:	No.
Primer, Asphalt, for Roofing and Waterproofing-----	SS-A-701
Felt, Rag, Asphalt-saturated, for Roofing and Water- proofing-----	HH-F-191
Asphalt, for mineral-surfaced roofing-----	SS-A-686
United States Army specifications:	
Flashings, Metal, Installation of, With Bituminous Built-up Roofing-----	81-23
Flashings, Plastic, Installation of, With Bituminous Built-up Roofing-----	81-24
Materials, Surfacing, for Bituminous Built-up Roofing-----	81-7

II. GRADE.

Not applicable to this specification.

III. MATERIAL.

Roofing of type 3ACS shall contain not less than the following quantities of materials per 100 square feet:

	Over con- crete	Over gyp- sum
	Pounds	Pounds
Asphalt primer-----	7.5	15
3 layers asphalt-saturated rag felt-----	45	45
Asphalt for mineral-surface roofing-----	130	130
Roofing gravel-----	400	400
Or		
Roofing slag-----	300	300

IV. GENERAL REQUIREMENTS.

Not applicable to this specification.

V. DETAIL REQUIREMENTS.

1. This roofing shall consist of three layers or plies of asphalt-saturated rag felt cemented together with asphalt and surfaced with slag, gravel, or similar surfacing material, as called for in invitation for bids.

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2. Flashings of the type required under the specification for the building shall be included and shall conform to United States Army Specifications Nos. 81-23 or 81-24, referred to in section I hereof.

3. Roofing of type 3ACS shall be laid in the following manner:

a. The asphalt shall not be heated above 400° F. and shall be hot when the felts are laid.

b. The layers of felt shall be laid so as to be free from wrinkles and buckles.

c. When the roof surface is of gypsum, each sheet of felt shall be nailed at approximately 6 inches from its upper edge with nails driven through flat tin disks.

d. The surfacing material shall always be dry when applied and in addition shall be heated in cold weather.

e. Concrete and gypsum surfaces installed by other contractors before being considered satisfactory for laying the roof covering shall be smooth, firm, dry, and free from high spots, depressions, and all loose and foreign material. Precast slabs shall be firmly set and well pointed.

f. When the roof surface is of gypsum, apply a second coat of primer after the first coat has dried, using not less than 1 gallon per 100 square feet.

4. Coat the roof surface uniformly with asphalt primer, using not less than 1 gallon per 100 square feet, and allow to dry.

5. Over this apply a uniform coating of hot asphalt, using not less than 30 pounds per 100 square feet.

6. a. Over this coating of asphalt lay three layers of 32-inch asphalt-saturated felt over the entire roof, lapping each sheet 22 inches over the preceding sheet. Lap the ends of the sheets not less than 6 inches. When 36-inch felt is used, lap the sheets 24½ inches.

b. Mop each of these three sheets the full width of the lap with hot asphalt, using not less than 20 pounds per 100 square feet in each mopping.

c. Cut off the felts at abutting vertical surfaces.

7. Over the entire surface apply a uniform coating of hot asphalt, using not less than 60 pounds per 100 square feet.

8. Into this asphalt, while hot, embed the surfacing material.

VI. METHODS OF INSPECTION, SAMPLING, AND TESTING.

The necessary inspection shall be made to determine compliance with the specification.

VII. PACKING AND MARKING.

Not applicable to this specification.

VIII. NOTES.

1. Roofing of type 3ACS is adapted to concrete and poured gypsum surfaces with inclines not exceeding 3 inches to the foot and shall not be used on inclines greater than this.

2. Roofing constructed in the manner specified is durable and should not require repairs or renewals on account of the action of the elements for a period of 10 years.

[No. 81-15A]

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Eighth Corps Area General Depot, Fort Sam Houston, Tex.
[No. 81-15A]

ROOFING, BUILT-UP, TYPE 4ACS, CONSTRUCTION OF

I. GENERAL SPECIFICATIONS.

The latest issues of the following Federal and United States Army specifications, basic numbers as indicated, form a part of this specification insofar as the terms are applicable:

<i>Federal specifications:</i>	<i>Number</i>
Primer, asphalt, for roofing and waterproofing.....	SS-A-701
Asphalt for mineral-surfaced roofing.....	SS-A-666
Felt, rag, asphalt-saturated, for roofing and water- proofing.....	HH-F-191
<i>U. S. Army specifications:</i>	
Flashings, metal, installation of, with bituminous built-up roofing.....	81-23
Flashings, plastic, installation of, with bitumi- nous built-up roofing.....	81-24
Materials, surfacing, for bituminous built-up roofing.....	81-7

II. GRADE.

Not applicable to this specification.

III. MATERIALS.

Roofing of type 4ACS shall contain not less than the following quantities of materials per 100 square feet:

	Over concrete	Over gypsum
	<i>Pounds</i>	<i>Pounds</i>
Asphalt primer.....	7.5	15
Four layers asphalt-saturated rag felt.....	60	60
Asphalt for mineral-surfaced roofing.....	150	150
Roofing gravel.....	400	400
Or Roofing slag.....	300	300

IV. GENERAL REQUIREMENTS.

Not applicable to this specification.

V. DETAIL REQUIREMENTS.

1. This roofing shall consist of four layers or plies of asphalt-saturated rag felt cemented together with asphalt and surfaced with slag, gravel, or similar surfacing material, as called for in the invitation for bids.

2. Flashings of the type required under the specification for the building shall be included and shall conform to United States Army Specifications Nos. 8-23 or 8-24, referred to in section I hereof.

3. Roofing of type 4ACS shall be laid in the following manner:
 a. The asphalt shall not be heated above 400° F. and shall be hot when the felts are laid.

b. The layers of felt shall be laid so as to be free from wrinkles and buckles.

c. When the roof surface is of gypsum, each sheet of felt shall be nailed at approximately 6 inches from its upper edge with nails driven through flat tin disks.

d. The surfacing material shall always be dry when applied, and in addition shall be heated in cold weather.

e. Concrete and gypsum surfaces installed by other contractors, before being considered satisfactory, for laying the roof covering, shall be smooth, firm, dry, and free from high spots, depressions, and all loose and foreign material. Precast slabs shall be firmly set and well pointed.

f. When the roof surface is of gypsum, apply a second coat of primer after the first coat has dried, using not less than 1 gallon per 100 square feet.

4. Coat the roof surface uniformly with asphalt primer, using not less than 1 gallon per 100 square feet, and allow to dry.

5. Over this apply a uniform coating of hot asphalt, using not less than 30 pounds per 100 square feet.

6. a. Over this coating of asphalt lay four layers of 32-inch asphalt-saturated felt over the entire roof surface, lapping each sheet 24½ inches over the preceding sheet. Lap the ends of the sheets not less than 6 inches. When 36-inch felt is used, lap the sheets 27½ inches.

b. Mop the full width of each lap with hot asphalt, using not less than 20 pounds per 100 square feet in each mopping.

c. Cut off these layers of felt at abutting vertical surfaces.

7. Mop the entire surface of this felt with a uniform coating of hot asphalt, using not less than 60 pounds per 100 square feet.

8. Into this asphalt, while hot, embed the surfacing material.

VI. METHODS OF INSPECTION, SAMPLING, AND TESTING.

The necessary inspection shall be made to determine compliance with the specification.

VII. PACKING AND MARKING.

Not applicable to this specification.

VIII. NOTES.

1. Roofing of type 4ACS is adapted to concrete and poured-gypsum roof surfaces with inclines not exceeding 3 inches to the foot and shall not be used on inclines greater than this.

2. Roofing constructed in the manner specified is durable and should not require repairs or renewals on account of the action of the elements for a period of 20 years.

[No. 81-18A]

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San Francisco General Depot, Fort Mason, San Francisco, Calif.
Eighth Corps Area General Depot, Fort Sam Houston, Tex.
[No. 81-16A]

AUGUST 22, 1933

SUPERSEDING
No. 81-17
July 10, 1924

ROOFING, BUILT-UP, TYPE 5ACS, CONSTRUCTION OF

I. GENERAL SPECIFICATIONS

The latest issues of the following Federal and United States Army specifications, basic numbers as indicated, form a part of this specification insofar as the terms are applicable:

Federal specifications:	Number
Primer, asphalt, for roofing and waterproofing-----	SS-A-701
Asphalt, for mineral-surfaced roofing-----	SS-A-888
Felt, rag, asphalt-saturated, for roofing and water- proofing-----	HH-F-191
United States Army specifications:	
Flashings, metal, installation of, with bituminous built- up roofing-----	81-23
Flashings, plastic, installation of, with bituminous built- up roofing-----	81-24
Materials, surfacing, for bituminous built-up roofing----	81-7

II. GRADE

Not applicable to this specification.

III. MATERIAL

Roofing of type 5ACS shall contain not less than the following quantities of materials per 100 square feet:

	Over con- crete	Over gypsum
	Pounds	Pounds
Asphalt primer-----	7.5	15
5 layers asphalt-saturated rag felt-----	75	75
Asphalt for mineral-surfaced roofing-----	170	170
Roofing gravel-----	400	400
or Roofing slag-----	300	300

IV. GENERAL REQUIREMENTS

Not applicable to this specification.

V. DETAIL REQUIREMENTS

1. This roofing shall consist of five layers or plies of asphalt-saturated rag felt cemented together with asphalt and surfaced with

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slag, gravel, or similar surfacing material, as called for in the invitation for bids.

2. Flashings of the type required under the specification for the building shall be included and shall conform to United States Army Specifications Nos. 81-23 or 81-24, referred to in section I hereof.

3. Roofing of type 5ACS shall be laid by either the shingle or the two and three method. The shingle method is preferred and shall be used when no choice is specified.

4. The asphalt shall not be heated above 400° F. and shall be hot when the felts are laid.

5. The layers of felt shall be laid so as to be free from wrinkles and buckles.

6. When the roof surface is of gypsum each sheet of felt shall be nailed at approximately 6 inches from its upper edge with nails driven through flat tin disks.

7. The surfacing material shall always be dry when applied and in addition shall be heated in cold weather.

8. Concrete and gypsum surfaces installed by other contractors before being considered satisfactory for laying the roof covering shall be smooth, firm, dry, and free from high spots, depressions, and all loose and foreign material. Precast slabs shall be firmly set and well pointed.

9. When the roof surface is of gypsum apply a second coat of primer after the first coat has dried, using not less than 1 gallon per 100 square feet.

10. *Shingle method.*—(1) Coat the roof surface uniformly with asphalt primer, using not less than 1 gallon per 100 square feet, and allow to dry.

(2) Over this apply a uniform coating of hot asphalt, using not less than 30 pounds per 100 square feet.

(3) Over this coating of asphalt lay five layers of 32-inch asphalt-saturated felt over the entire roof surface, lapping each sheet 28 inches over the preceding sheet. Lap the ends of the sheets not less than 6 inches. When 36-inch felt is used lap the sheets 29 inches.

Mop each of these five sheets the full width of the lap with hot asphalt, using not less than 20 pounds per 100 square feet in each mopping.

Cut off these layers of felt at abutting vertical surfaces.

(4) Over the entire surface apply a uniform coating of asphalt, using not less than 60 pounds per 100 square feet.

(5) Into this asphalt, while hot, embed the surfacing material.

11. *Two and three method.*—(1) Coat the roof surface uniformly with asphalt primer, using not less than 1 gallon per 100 square feet, and allow to dry.

(2) Over this apply a uniform coating of hot asphalt, using not less than 30 pounds per 100 square feet.

(3) Over this coating of asphalt lay two layers of 32-inch asphalt-saturated felt over the entire roof surface, lapping each sheet 17 inches over the preceding sheet. Lap the ends of the sheets not less than 4 inches. When 36-inch felt is used lap the sheets 19 inches.

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Mop the full width of each lap with hot asphalt, using not less than 20 pounds per 100 square feet in each mopping.

Cut off these layers of felt at abutting vertical surfaces.

(4) Mop the entire surface of this felt with a uniform coating of hot asphalt, using not less than 20 pounds per 100 square feet.

(5) Over this coating of asphalt lay three additional layers of 32-inch asphalt-saturated felt over the entire roof surface, lapping each sheet 22 inches over the preceding sheet. Lap the ends of the sheets not less than 6 inches. When 36-inch felt is used, lap the sheets 24½ inches.

Mop each of these three sheets the full width of the lap with hot asphalt, using not less than 20 pounds per 100 square feet, in each mopping.

Cut off these layers of felt at abutting vertical surfaces.

(6) Over the entire surface apply a uniform coating of hot asphalt, using not less than 60 pounds per 100 square feet.

(7) Into this asphalt, while hot, embed the surfacing material.

VI. METHODS OF INSPECTION, SAMPLING, AND TESTING

The necessary inspection shall be made to determine compliance with the specification.

VII. PACKING AND MARKING

Not applicable to this specification.

VIII. NOTES

1. Roofing of type 5ACS is adapted to concrete and poured-gypsum surfaces with inclines not exceeding 3 inches to the foot and shall not be used on inclines greater than this.

2. Roofing constructed in the manner specified above is durable and should not require repairs or renewals on account of the action of the elements for a period of 20 years. While the surface of this type of roofing will require some attention in about the same time as roofing of type 4ACS, if the roofing is allowed to stand until complete failure, longer life can be expected from type 5ACS than from type 4ACS.

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Eighth Corps Area General Depot, Fort Sam Houston, Tex.

[No. 81-17A]

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ROOFING, BUILT-UP, TYPE 3TCS, CONSTRUCTION OF

I. GENERAL SPECIFICATIONS.

The latest issues of the following Federal and United States Army specifications, basic numbers as indicated, form a part of this specification insofar as the terms are applicable:

Federal specifications:

Felt, rag, coal-tar saturated, for roofing and waterproofing	No. HH-F-201
Pitch, coal-tar, for roofing	R-P-331

United States Army specifications:

Flashings, metal, installation of, with bituminous built-up roofing	81-23
Flashings, plastic, installation of, with bituminous built-up roofing	81-24
Material, surfacing, for bituminous built-up roofing	81-7

II. GRADE.

Not applicable to this specification.

III. MATERIAL.

Roofing of type 3TCS shall contain not less than the following quantities of materials per 100 square feet:

	<i>Pounds</i>
Three layers coal-tar saturated rag felt	45
Coal-tar pitch	160
Roofing gravel	400
or	
Roofing slag	300

IV. GENERAL REQUIREMENTS.

Not applicable to this specification.

V. DETAIL REQUIREMENTS.

1. This roofing shall consist of three layers or plies of coal tar saturated rag felt cemented together with coal-tar pitch and surfaced with slag, gravel, or similar surfacing materials, as called for in the invitation for bids.

2. Flashings of the type required under the specification for the building shall be included and shall conform to United States Army specifications nos. 81-23 or 81-24, referred to in section I hereof.

3. Roofing of type 3TCS shall be laid in the following manner:

a. The coal-tar pitch shall not be heated above 375° F. and shall be hot when the felts are laid.

b. The layers of felt shall be laid so as to be free from wrinkles and buckles.

c. When the roof surface is of gypsum, each sheet of felt shall be nailed at approximately 6 inches from its upper edge, with nails driven through flat tin disks.

d. The surfacing material shall always be dry when applied and in addition shall be heated in cold weather.

e. Concrete and gypsum roof surfaces installed by other contractors before being considered satisfactory for laying the roof covering shall be smooth, firm, dry, and free from high spots, depressions, and all loose and foreign material. Precast concrete slabs shall be firmly set and well pointed.

4. Mop the roof slab uniformly with hot coal-tar pitch, using not less than 40 pounds per 100 square feet.

5. Over this coating of coal-tar pitch lay three layers of 32-inch coal-tar-saturated felt over the entire roof surface, lapping each sheet 22 inches over the preceding sheet. Lap the ends not less than 6 inches. When 36-inch felt is used, lap the sheets 24½ inches.

Cut off these layers of felt at abutting vertical surfaces.

Mop each of these three sheets the full width of the lap with hot coal-tar pitch, using not less than 25 pounds per 100 square feet in each mopping.

6. Over the entire surface apply a uniform coating of hot coal-tar pitch, using not less than 70 pounds per 100 square feet.

7. Into this pitch, while hot, embed the surfacing material.

VI. METHODS OF INSPECTION, SAMPLING, AND TESTING.

The necessary inspection shall be made to determine compliance with the specification.

VII. PACKING AND MARKING.

Not applicable to this specification.

VIII. NOTES.

1. Roofing of type 3TCS is adapted to concrete and poured gypsum roof surfaces with inclines not exceeding 1 inch to the foot and shall not be used on inclines greater than this.

2. Roofing constructed in the manner specified is durable and should not require repairs or renewals on account of the action of the elements for a period of 10 years.

Notice.—When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever, and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data, is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell, any patented invention that may in any way be related thereto.

Nota.—Unless otherwise specified in invitation for bids, bidders on Government supplies may obtain copies of this specification at the following points:

New York general depot, First Avenue and Fifty-eighth Street, Brooklyn,

N. Y.

Chicago quartermaster depot, 1819 West Pershing Road, Chicago, Ill.

San Francisco general depot, Fort Mason, San Francisco, Calif.

Eighth Corps Area general depot, Fort Sam Houston, Tex.

[No. 81-18A]

U. S. GOVERNMENT PRINTING OFFICE : 1942

AUGUST 22, 1933

SUPERSEDING

No. 81-19
July 10, 1924

ROOFING, BUILT-UP, TYPE 4TCS,
CONSTRUCTION OF

I. GENERAL SPECIFICATIONS.

The latest issues of the following Federal and United States Army Specifications, basic numbers as indicated, form a part of this specification insofar as the terms are applicable:

Federal specifications:

Felt, rag, coal-tar saturated, for roofing and water-	Number
proofing-----	HH-P-201
Pitch, coal-tar, for roofing-----	R-P-381

U. S. Army specifications:

Flashings, metal, installation of, with bituminous	
built-up roofing-----	81-23
Flashings, plastic, installation of, with bituminous	
built-up roofing-----	81-24
Material, surfacing, for bituminous built-up roofing--	81-7

II. GRADE.

Not applicable to this specification.

III. MATERIAL.

Roofing of type 4TCS shall contain not less than the following quantities of materials per 100 square feet:

	Pounds
Four layers coal-tar saturated rag felt-----	60
Coal-tar pitch-----	185
Roofing gravel-----	400
Or	
Roofing slag-----	300

IV. GENERAL REQUIREMENTS.

Not applicable to this specification.

V. DETAIL REQUIREMENTS.

1. This roofing shall consist of four layers or plies of coal-tar saturated rag felt cemented together with coal-tar pitch and surfaced with slag, gravel, or similar surfacing materials, as called for in invitation for bids.

2. Flashings of the type required under the specification for the building shall be included and shall conform to United States Army Specifications Nos. 81-23 or 81-24, referred to in section I hereof.

3. Roofing of type 4TCS shall be laid in the following manner:

(a) The coal-tar pitch shall not be heated above 375° F. and shall be hot when the felts are laid.

(b) The layers of felt shall be laid so as to be free from wrinkles and buckles.

(c) When the roof surface is of gypsum, each sheet of felt shall be nailed at approximately 6 inches from its upper edge with nails driven through flat tin disks.

(d) The surfacing material shall always be dry when applied and in addition shall be heated in cold weather.

(e) Concrete and gypsum roof surfaces installed by other contractors before being considered satisfactory for laying the roof covering, shall be smooth, firm, dry, and free from high spots, depressions, and all loose and foreign material. Precast concrete slabs shall be firmly set and well pointed.

4. Mop the roof slab uniformly with hot coal-tar pitch, using not less than 40 pounds per 100 square feet.

5. (a) Over this coating of coal-tar pitch lay four layers of 32-inch coal tar saturated felt over the entire roof surface, lapping each sheet 24½ inches over the preceding sheet. Lap the ends of the sheets not less than 6 inches. When 36-inch felt is used, lap the sheets 27½ inches.

(b) Mop each of these four sheets the full width of the lap with hot coal-tar pitch, using not less than 25 pounds per 100 square feet in each mopping.

(c) Cut off these layers of felt at abutting vertical surfaces.

6. Over the entire surface apply a uniform coating of hot coal-tar pitch, using not less than 70 pounds per 100 square feet.

7. Into this pitch, while hot, embed the surfacing material.

VI. METHODS OF INSPECTION, SAMPLING, AND TESTING.

The necessary inspection shall be made to determine compliance with the specification.

VII. PACKING AND MARKING.

Not applicable to this specification.

VIII. NOTES.

1. Roofing of type 4TCS is adapted to concrete and poured gypsum surfaces with inclines not exceeding 1 inch to the foot and shall not be used on inclines greater than this.

2. Roofing constructed in the manner specified is durable and should not require repairs or renewals on account of the action of the elements for a period of 20 years.

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is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell, any patented invention that may in any way be related thereto.

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San Francisco General Depot, Fort Mason, San Francisco, Calif.
Eighth Corps Area General Depot, Fort Sam Houston, Tex.
[No. 81-19A]

AUGUST 22, 1933

SUPERSEDING
No. 81-20
July 16, 1924

ROOFING, BUILT-UP, TYPE 5TCS CONSTRUCTION OF

I. GENERAL SPECIFICATIONS.

The latest issues of the following Federal and United States Army specifications, basic numbers as indicated, form a part of this specification insofar as the terms are applicable:

Federal specifications:		No.
Felt, Rag, Coal-Tar Saturated, for Roofing and		
Waterproofing	HH-F-201	
Pitch, Coal-Tar, for Roofing	R-P-381	
United States Army Specifications:		
Flashings, Metal, Installation of, with Bituminous		
Built-Up Roofing	81-23	
Flashings, Plastic, Installation of, with Bituminous		
Built-Up Roofing	81-24	
Material, Surfacing, for Bituminous Built-Up Roofing	81-7	

II. GRADE.

Not applicable to this specification.

III. MATERIAL.

Roofing of type 5TCS shall contain not less than the following quantities of materials per 100 square feet:

	Pounds
Five layers coal-tar saturated rag felt	76
Coal-tar pitch	210
Roofing gravel	400
or	
Roofing slag	300

IV. GENERAL REQUIREMENTS.

Not applicable to this specification.

V. DETAIL REQUIREMENTS.

1. This roofing shall consist of five layers or plies of coal-tar saturated rag felt cemented together with coal-tar pitch and surfaced with slag, gravel, or similar surfacing materials, as called for in invitation for bids.

2. Flashings of the type required under the specification for the building shall be included and shall conform to United States Army Specifications Nos. 81-23 or 81-24, referred to in section I hereof.

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3. Roofing of type 5TCS shall be laid either by the shingle method or by the two-and-three method. The shingle method is preferred and shall be used when no choice is specified.

4. The coal-tar pitch shall not be heated above 375° F. and shall be hot when the felts are laid.

5. The layers of felt shall be laid so as to be free from wrinkles and buckles.

6. When the roof surface is of gypsum, each sheet of felt shall be nailed at approximately 6 inches from its upper edge with nails driven through flat tin disks.

7. The surfacing material shall always be dry when applied, and in addition shall be heated in cold weather.

8. Concrete and gypsum roof surfaces installed by other contractors before being considered satisfactory for laying the roof covering shall be smooth, firm, dry, and free from high spots, depressions, and all loose and foreign material. Precast concrete slabs shall be firmly set and well pointed.

9. *Shingle method.*—a. Coat the roof slab uniformly with hot coal-tar pitch, using not less than 40 pounds per 100 square feet.

(b) (1) Over this coating of coal-tar pitch lay five layers of 32-inch coal-tar saturated felt over the entire roof, lapping each sheet 26 inches over the preceding sheet. Lap the ends of the sheets not less than 6 inches. When 36-inch felt is used, lap the sheets 29 inches.

(2) Mop each of these five sheets the full width of the lap with hot coal-tar pitch, using not less than 25 pounds per 100 square feet in each mopping.

(3) Cut off these layers of felt at abutting vertical surfaces.

(c) Over the entire surface apply a uniform coating of hot coal-tar pitch, using not less than 70 pounds per 100 square feet.

(d) Into this pitch, while hot, embed the surfacing material.

10. *Two-and-three method.*—a. Coat the roof slab uniformly with hot coal-tar pitch, using not less than 40 pounds per 100 square feet.

(b) (1) Over this coating of coal-tar pitch lay two layers of 32-inch coal-tar saturated felt over the entire roof, lapping each sheet 17 inches over the preceding sheet. Lap the ends of the sheets not less than 4 inches. When 36-inch felt is used, lap the sheets 19 inches.

(2) Mop the full width of each lap with hot coal-tar pitch, using not less than 25 pounds per 100 square feet in each mopping.

(3) Cut off these layers of felt at abutting vertical surfaces.

(c) Mop the entire surface of this felt with a uniform coating of hot coal-tar pitch, using not less than 25 pounds per 100 square feet.

(d) (1) Over this coating of coal-tar pitch lay three additional layers of 32-inch coal-tar saturated felt over the entire roof, lapping each sheet 22 inches over the preceding sheet. Lap the ends of the sheets not less than 6 inches. When 36-inch felt is used, lap the sheets 24½ inches.

(2) Mop each of these three sheets the full width of the lap with hot coal-tar pitch, using not less than 25 pounds per 100 square feet in each mopping.

(e) Over the entire surface apply a uniform coating of hot coal-tar pitch, using not less than 70 pounds per 100 square feet.

(f) Into this pitch, while hot, embed the surfacing material.

[No. 81-20A]

VI. METHODS OF INSPECTION, SAMPLING, AND TESTING.

The necessary inspection shall be made to determine compliance with the specification.

VII. PACKING AND MARKING.

Not applicable to this specification.

VIII. NOTES.

1. Roofing of type 5TCS is adapted to concrete and poured-gypsum surfaces with inclines not exceeding 1 inch to the foot and shall not be used on inclines greater than this.

2. Roofing constructed in the manner above specified is durable and should not require repairs or renewals on account of the action of the elements for a period of 20 years. While the surface of this type of roofing will require some attention in about the same time as roofing of type 4TCS, if the roofing is allowed to stand without attention, until complete failure, longer life can be expected of type 5TCS than from type 4TCS.

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San Francisco general depot, Fort Mason, San Francisco, Calif.
Eighth Corps Area general depot, Fort Sam Houston, Tex.
[No. 81-20A]

ROOFING, BUILT-UP, TYPE 4TWS,

CONSTRUCTION OF

A. APPLICABLE SPECIFICATIONS.

A-1. Specifications.--The following specifications of the issue in effect on date of invitation for bids, unless otherwise indicated, form a part of this specification, except that in case of conflict, the requirements of this specification shall govern.

A-1a. Federal Specifications--

- HH-F-201. Felt; asphalt-saturated (for) flashings, roofing, and waterproofing.
- R-P-381. Pitch; coal-tar (for) mineral-surfaced built-up roofing, waterproofing, and dampproofing.
- UU-P-536. Paper; sheathing, waterproof.

A-1b. U. S. Army Specifications, Nos.--

- 81-23. Flashing, metal, installation of, with bituminous built-up roofing.
- 81-24. Flashing, plastic, installation of, with bituminous built-up roofing.
- 81-7. Roofing material, surfacing, built-up bituminous.

B. TYPE.

B-1. This specification covers only one type of tar and gravel or slag surfaced built-up roofing.

C. MATERIALS AND WORKMANSHIP.

C-1. Materials.--The materials used in the construction of tar and gravel or slag surfaced built-up roofing shall be as specified herein. Material not definitely specified shall be of the best quality normally used for the purpose in good commercial practice. All materials shall be free from such defects and imperfections that might affect the serviceability and appearance of the finished product.

**U. S. ARMY
SPECIFICATION**

**NO. 81-21B.
25 September 1943**

C-1a. Roofing of type 4TWS shall contain not less than the following quantities of material per 100 square feet:

One layer sheathing paper	5 lbs.
Four layers coal-tar saturated rag felt	60 "
Coal-tar pitch	125 "
Roofing gravel	400 "

OR

Roofing slag 300 "

C-2. Workmanship.--Workmanship shall be of the highest grade throughout.

D. GENERAL REQUIREMENTS.

D-1. See Section E.

E. DETAIL REQUIREMENTS.

E-1. This roofing shall consist of four layers or plies of coal-tar saturated rag felt cemented together with coal-tar pitch and surfaced with slag, gravel, or similar surfacing materials, as called for in invitation for bids.

E-2. Flashings of the type required under the specification for the building shall be included and shall conform to U. S. Army Specifications Nos. 81-23 or 81-24, as applicable.

E-3. Roofing of type 4TWS shall be laid in the following manner:

E-3a. The coal-tar pitch shall not be heated above 375 degrees F. and shall be hot when the felts are laid.

E-3b. The layers of felt shall be laid so as to be free from wrinkles and buckles.

E-3c. When the roof surface is of gypsum plank or precast gypsum, the sheathing paper may be omitted.

E-3d. The surfacing material shall always be dry when applied, and in addition shall be heated in cold weather.

**U. S. ARMY
SPECIFICATION**

**NO. 81-21B.
25 September 1943**

E-3e. The roof surface installed by other contractors before being considered satisfactory for laying the roof covering shall be smooth, dry and free from loose material, large cracks, or projecting ends or nails which might injure the roofing. All dirt and foreign material shall be removed. Precast slabs shall be firmly set, and properly grouted. Roof decks shall be properly graded to outlets.

E-4. Lay one layer of sheathing paper over the entire surface, lapping the sheets at least one inch and nailing along the edges to hold the sheathing paper in place until the felt is laid.

E-5. Over the entire sheathing paper surface, lay two dry layers of coal-tar saturated felt, lapping each sheet 17 inches over the preceding sheet for 32-inch wide felt, and 19 inches for 36-inch wide felt. Lap ends of sheets not less than 4 inches. Carry each layer of felt up abutting vertical surfaces not less than 4 inches. Nail the sheets along the edges sufficiently to hold them in place until the remaining felts are laid, using nails driven through flat tin disks.

E-6. Mop the entire surface of this felt with a uniform coating of hot coal-tar pitch, using not less than 30 pounds per 100 square feet.

E-7. Over this coating of coal-tar pitch, lay two additional layers of 32-inch coal-tar saturated felt over the entire roof surface, lapping each sheet 17 inches over the preceding sheet and nailing each sheet approximately one inch from its upper edge with nails driven through flat tin disks on 12 inch centers. Lap the ends not less than 6 inches. When 36-inch felt is used, lap the sheets 19 inches. Cut off these layers of felt at abutting vertical surfaces. Mop each of these two sheets the full width of the lap with hot coal-tar pitch, using not less than 25 pounds per 100 square feet.

E-8. Over the entire felted surface, apply a uniform coating of hot coal-tar pitch, using not less than 70 pounds per 100 square feet.

E-9. Into this pitch, while hot, embed the surfacing material.

F. METHODS OF INSPECTION.

F-1. Inspection.--Material furnished under this specification will be subject to inspection, during and after the process of manufacture, by authorized Government Inspectors, who shall be afforded proper facilities for determining compliance with the specification.

**U. S. ARMY
SPECIFICATION**

**NO. 81-21B.
25 September 1943**

G. PACKING AND MARKING.

G-1. Not applicable to this specification.

H. NOTES.

H-1. Roofing of type 4TWS is adapted to wood sheathing with inclines not exceeding 3 inches to the foot or precast gypsum slabs or gypsum plank with inclines not exceeding 2 inches to the foot, and shall not be used on inclines greater than these.

H-2. Roofing constructed in the manner specified is durable and should not require repairs or renewals on account of the action of the elements for a period of 10 years.

H-3. Copies of this specification may be obtained from the Office of the Chief of Engineers, Administrative Division, Office Service Branch, Washington, D.C.

H-4. The use of this specification, whenever applicable, is mandatory on all procuring agencies of the Army.

NOTICE.--When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever, and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications or other data, is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

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**ROOFING, BUILT-UP, TYPE 5TWS,
CONSTRUCTION OF**

I. GENERAL SPECIFICATIONS

The latest issues of the following Federal and United States Army specifications, basic numbers as indicated, form a part of this specification insofar as the terms are applicable.

Federal specifications:

Felt, rag, coal-tar saturated for roofing and water-proofing	Pounds HH-F-201
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Pitch, coal-tar, for roofing	R-P-381
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United States Army specifications:

Flashings, metal, installation of, with bituminous built-up roofing	81-23
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Flashings, plastic, installation of, with bituminous built-up roofing	81-24
---	-------

Materials, surfacing, for bituminous built-up roofing	81-7
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II. GRADE

Not applicable to this specification.

III. MATERIAL

Roofing of type 5TWS shall contain not less than the following quantities of materials per 100 square feet:

	Pounds
One layer sheathing paper or unimpregnated felt	5
Five layers coal-tar saturated rag felt	76
Coal-tar pitch	145
Roofing gravel	400

Roofing slag	or	300
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IV. GENERAL REQUIREMENTS

Not applicable to this specification.

V. DETAIL REQUIREMENTS

1. This roofing shall consist of five layers or plies of coal-tar saturated rag felt cemented together with coal-tar pitch and surfaced with slag, gravel, or similar surfacing materials, as called for in invitation for bids.

2. Flashings of the type required under the specification for the building shall be included and shall conform to United States Army Specifications Nos. 81-23 or 81-24, referred to in section I hereof.

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3. Roofing of type 5TWS shall be laid in the following manner:

(a) The coal-tar pitch shall not be heated above 375° F. and shall be hot when the felts are laid.

(b) The layers of felt shall be laid so as to be free from wrinkles and buckles.

(c) When the roof surface is of gypsum block, the sheathing paper may be omitted.

(d) The surfacing materials shall always be dry when applied and in addition shall be heated in cold weather.

(e) The board roof surface installed by other contractors before being considered satisfactory for laying the roof covering shall be smooth, and free from loose boards, large cracks, or projecting ends which might injure the roofing. All dirt and foreign material shall be removed. Precast gypsum slabs shall be firmly set, well pointed, and free from any unevenness which might injure the roofing.

4. Lay one layer of sheathing paper over the roof surface, lapping the sheets at least 1 inch and nailing along the edges to hold them in place until the felt is laid.

5. (a) Lay two layers of 32-inch coal-tar saturated felt over the sheathing paper over the entire roof surface, lapping each sheet 17 inches over the preceding sheet. Lap the ends of the sheets not less than 4 inches. When 36-inch felt is used, lap the sheets 19 inches.

(b) Carry these layers of felt up abutting vertical surfaces at least 4 inches.

(c) Nail the sheets along the edges sufficiently to hold them in place until the remaining felts are laid, using nails driven through flat tin disks.

6. Mop the entire surface of this felt with a uniform coating of hot coal-tar pitch, using not less than 25 pounds per 100 square feet.

7. (a) Over this coating of coal-tar pitch, lay three additional layers of 32-inch coal-tar saturated felt over the entire roof surface, lapping each sheet 22 inches over the preceding sheet, and nailing each sheet approximately 6 inches from its upper edge, using nails driven through flat tin disks. Lap the ends not less than 6 inches. When 36-inch felt is used, lap the sheets 24½ inches.

(b) Cut off these layers of felt at abutting vertical surfaces.

(c) Mop each of these three sheets the full width of the lap with hot coal-tar pitch, using not less than 25 pounds per 100 square feet in each mopping.

8. Over the entire surface apply a uniform coating of hot coal-tar pitch, using not less than 70 pounds per 100 square feet.

9. Into this pitch, while hot, embed the surfacing material.

VI. METHODS OF INSPECTION, SAMPLING, AND TESTING

The necessary inspection shall be made to determine compliance with the specification.

VII. PACKING AND MARKING

Not applicable to this specification.

VIII. NOTES

1. Roofing of type 5TWS is adapted to board sheathing with inclines not exceeding 3 inches to the foot or precast gypsum slabs or [No. 81-22A]

blocks with inclines not exceeding 1 inch to the foot and shall not be used on inclines greater than these.

2. Roofing constructed in the manner specified is durable and should not require repairs or renewals on account of the action of the elements for a period of 20 years.

NOTICE.—When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever, and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data, is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

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Eighth Corps Area General Depot, Fort Sam Houston, Tex.

[No. 81-22A]

FLASHINGS, METAL, INSTALLATION OF, WITH BITUMINOUS BUILT-UP ROOFING

I. GENERAL SPECIFICATIONS

The latest issue of Federal Specification TT-R-191, "Red Lead; Dry and Paste-in-Oil", forms a part of this specification insofar as the terms are applicable.

II. GRADE

Not applicable to this specification.

III. MATERIAL

Not applicable to this specification.

IV. GENERAL REQUIREMENTS

Not applicable to this specification.

V. DETAIL REQUIREMENTS

1. This specification covers the installation of all metal flashings and other metal fittings in connection with built-up bituminous roofing in the angles formed where the roof surface abuts walls, curbs, ventilators, pipe, and other vertical surfaces, and where required to make the roof covering water-tight. They shall be installed by the roofing contractor, or, at least, he shall be responsible for their proper installation.

2. The metal flashing sheets shall be 8 to 10 feet long, and the flashing sheets and hooks shall be of the weights, kinds, and shape specified for the particular job.

3. Unless otherwise specified before installation, both sides of flashings and counterflashings shall be given 2 coats of red lead and linseed-oil paint weighing not less than 25 pounds per gallon, conforming to Federal Specification No. TT-R-191, referred to in section I hereof.

4. The flashings shall be installed before the gravel, slag, tile, or other surfacing material or the top coating of asphalt or coal-tar pitch is applied to the roofing.

5. Parapet walls of concrete shall be constructed in such a manner so as to provide for a flashing groove or reglet $\frac{1}{2}$ inch wide and not less than $1\frac{1}{2}$ inches deep. The groove shall be at right angles to the wall except where a 45° cant is used, when it should be set or cut in the wall at that angle.

6. Brick parapet walls shall be provided with a groove $\frac{1}{4}$ to $\frac{3}{8}$ inch wide and not less than $1\frac{1}{2}$ inches deep either by the installation of a wooden strip between the courses of brick at the proper height which can be removed afterwards or by raking out the mortar.

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7. The line on which the cap or counterflashings are installed shall be not more than 10 inches nor less than 6 inches above the roof level. Step flashings shall be used where vertical surfaces abut sloped roof surfaces.

8. Three layers of asphalt-saturated felt in the case of asphalt roofing or coal-tar saturated rag felt in the case of coal-tar pitch roofing shall be set in the angle. They shall be cemented together and to underlying surfaces and the top layer coated. The asphalt used in the roofing or asphalt plastic roofing cement shall be used with asphalt-saturated felt. The coal-tar pitch used in the roofing or coal-tar plastic roofing cement shall be used with coal-tar saturated rag felt.

9. These layers of felt shall extend at least 6 inches up, abutting vertical surfaces. They shall extend out over the roofing and lap as follows: The first layers of felt shall extend out over the roofing at least 6 inches, the second layer shall lap the first approximately 5 inches, and the third layer shall lap the second approximately 4 inches.

10. A strip of the metal of the required width shall be rounded, not bent at sharp angles, into the proper shape and set in the angle against these layers of felt which have been mopped or coated as above. This metal strip shall extend out at least 6 inches over the roofing and up to within 1 inch of the flashing groove.

11. The strip of metal shall be lapped at the ends over adjoining sheets 3 inches and shall be nailed to the roof boards in the case of board sheathing through the roofing with nails spaced approximately 6 inches apart and on a line about 1 inch from the edge of the sheet. Nailing shall also be done in the same manner in the case of gypsum. The upper edge of the flashing shall be secured when possible with flashing hooks spaced about 12 inches apart.

12. Over the portion of the metal-flashing strip lying on the roofing lay two plies of asphalt or coal-tar saturated rag felt at least 15 inches wide, cementing them to the flashing strip and roofing and to each other with either hot asphalt or coal-tar pitch, depending upon the kind of felt used. The first layer shall extend out over the roofing at least 2 inches beyond the second layer.

13. The top coating of hot asphalt or coal-tar pitch, as the case may be, shall then be applied and the slag or gravel embedded.

14. The cap or counterflashing shall then be installed. It shall be bent so as to fit into the reglet of flashing groove to a depth of $1\frac{1}{2}$ inches and shall extend down over the base flashing at least 3 inches. The counterflashing shall be in lengths not exceeding 10 feet and shall lap at ends at least 3 inches. Counterflashing shall be held in place by lead wedges spaced 18 inches apart.

15. After placing the counterflashing the grooves or reglets shall be filled with plastic roof cement. The ends shall also be cemented and coated with plastic roof cement.

16. Roof leaders, vent connections, outlet boxes, ventilators, or other fittings extending through the roofing, also gravel guards, shall be installed before the top coating of asphalt or coal-tar pitch or the slag, gravel, or other surfacing material is applied. These fittings shall be provided with the proper metal flanges for making a water-tight connection with the roofing.

[No. 81-23A]

17. The flanges shall be set on top of the last layer of felt after a heavy mopping of asphalt or coal-tar pitch has been applied, depending upon the character of the bituminous material of which the roofing is composed. When possible they shall be nailed so as to be firmly held in place. They shall be covered with two layers of saturated felt not less than twice the width of the flange. These felts shall be cemented together and to the flange with hot asphalt or coal-tar pitch.

VI. METHODS OF INSPECTION, SAMPLING, AND TESTS

The necessary inspection shall be made to determine compliance with the specification.

VII. PACKING AND MARKING

Not applicable to this specification.

VIII. NOTES

None applicable to this specification.

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San Francisco general depot, Fort Mason, San Francisco, Calif.

Eighth Corps Area general depot, Fort Sam Houston, Tex.

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AUGUST 22, 1933

SUPERSEDING

No. 81-24

July 10, 1924

**FLASHINGS, PLASTIC, INSTALLATION OF, WITH
BITUMINOUS BUILT-UP ROOFING.**

I. GENERAL SPECIFICATIONS

None applicable to this specification.

II. GRADE

Not applicable to this specification.

III. MATERIAL

Not applicable to this specification.

IV. GENERAL REQUIREMENTS

Not applicable to this specification.

V. DETAIL REQUIREMENTS

1. This specification covers the installation of plastic base flashings with or without appropriate cap or counterflashings in connection with built-up bituminous roofing in the angles formed where the roof surface abuts walls and similar vertical surfaces and where required to make the roof covering watertight. They shall be installed by the roofing contractor or he shall at least be responsible for their proper installation.

2. Plastic flashings shall be composed of either asphalt-saturated felt or coal-tar saturated rag felt cemented together, respectively, with asphalt plastic roofing cement or coal-tar plastic roofing cement.

3. The flashings shall be installed before the gravel, slag, or other surfacing material or the top coating of asphalt or coal-tar pitch is applied to the roofing.

4. Parapet walls of concrete shall be constructed in such a manner so as to provide for a flashing groove or reglet $\frac{1}{2}$ inch wide and not less than $1\frac{1}{2}$ inches deep. The groove or reglet shall be at right angles to the walls except where a 45° cant is used when it should be set or cut in the wall at that angle.

5. Brick parapet walls shall be provided with a groove $\frac{1}{4}$ inch to $\frac{3}{8}$ inch wide and not less than $1\frac{1}{2}$ inches deep either by the installation of a wooden strip between the courses of brick at the proper height, which can later be removed, or by raking out the mortar.

6. The line on which the cap or counterflashings are installed shall be not more than 10 inches nor less than 6 inches above the roof level. Step flashings shall be used where vertical surfaces abut sloped-roof surfaces.

7. Cant strips or fillings are recommended and shall be used wherever practicable for all flashings. They shall be at least 5 inches high unless otherwise indicated and shall be laid at an angle of 45° from the vertical.

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8. (a) Three layers of asphalt-saturated felt in the case of asphalt roofing, or coal-tar saturated rag felt in the case of coal-tar pitch roofing shall be set in the angle. They shall be cemented together and to underlying surfaces with either asphalt plastic roofing cement or coal-tar plastic roofing cement, respectively.

(b) If the reglet is set at an angle of 45° and opens out directly on the cant strip, these layers of felt should be extended up into the reglet to its full depth.

(c) If the reglet is at right angles to the vertical surface, these layers of felt should extend only up to it.

(d) These layers of felt shall extend out over the roofing and lap as follows: The first layer of felt shall extend out over the roofing at least 6 inches, the second layer shall lap the first approximately 5 inches, and the third layer shall lap the second approximately 4 inches.

9. Over the last layer of felt a 1/16-inch to 1/8-inch coating of plastic roofing cement shall be applied by means of a trowel.

10. (a) The counterflashing shall then be installed. It shall consist of metal bent into proper shape or a combination of metal and a strip of 50 pounds prepared roofing. The metal portion of the latter shall be bent flat on itself along its upper edge so as to form a groove or lap 1 1/4 inches wide into which the prepared roofing shall be securely fastened.

(b) In installing metal counterflashing the metal strip shall be bent so as to fit in the reglet or flashing groove to a depth of 1 1/2 inches and shall extend down over the base flashing at least 3 inches.

(c) In installing a metal and prepared roofing combination counterflashing, the lapped portion in which the sheet of prepared roofing is held shall be inserted into the reglets or flashing grooves, the back of the prepared roofing strip shall be coated with plastic roofing cement and the projecting metal and prepared roofing shall be turned down over the base flashing at least 3 inches. The exposed face of the counterflashing, including the metal part, shall be coated uniformly with plastic roofing cement.

11. Strips for counterflashing shall not exceed 10 feet in length and the end joints shall be lapped not less than 3 inches and sealed with plastic roofing cement. The reglets or flashing grooves shall also be pointed up with plastic roofing cement.

VI. METHODS OF INSPECTION, SAMPLING, AND TESTING

The necessary inspection shall be made to determine compliance with the specification.

VII. PACKING AND MARKING

Not applicable to this specification.

VIII. NOTES

None applicable to this specification.

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