



RFP #18-02 for College-Wide Roof Repairs

Repairs Specifications

Attachment 3

POLK STATE COLLEGE

DEFECT/DAMAGE LIST HURRICANE IRMA

1. MISSING DRAIN BASKET
2. DAMAGED DRAIN BASKET
3. LOOSE MEMBRANE AT DRAIN SUMP AREA
4. MINERAL SURFACING ERODED BY WIND DRIVEN RAIN
5. DAMAGED EXPANSION JOINT COVER
6. PUNCTURED MEMBRANE
7. CLOGGED DRAIN LOCATION
8. ROOF MEMBRANE POSSIBLY UPLIFTED FROM WINDS
9. DEBRIS ON ROOF
10. DAMAGE TO EQUIPMENT- VENTS, POWER VENTILATORS, HOODS
11. DAMAGE TO AC UNITS
12. LOOSE BASE FLASHINGS
13. DISPLACED OR DAMAGED METAL FLASHINGS
14. GUTTER/DOWNSPOUT DAMAGED
15. BILISTERS PRESENT IN MEMBRANE
16. DAMAGE TO BRICK WALL
17. DAMAGED THRU-WALL FLASHING
18. DAMAGE TO SHINGLE ROOF SYSTEM, BROKEN SHINGLES, MISSING FLASHING
19. MISSING SIGNAGE
20. WATER BEHIND BASE FLASHING IN SINGLE PLY ROOF SYSTEM
21. POSSIBLE IMPACT DAMAGE TO STUCCO FINISH

Table 1

#	DEFECT/REPAIR NOTATION	REFERENCE FOR REPAIR	NOTES
1	MISSING DRAIN BASKET	REPLACE WITH LIKE BASKET	
2	DAMAGED DRAIN BASKET	REMOVE AND REPLACE WITH LIKE BASKET	
3	LOOSE MEMBRANE AT DRAIN SUMP AREA	NRCA REPAIR MANUAL SECTION 2- MB8	
4	MINERAL SURFACING ERODED BY WIND DRIVEN RAIN- ALUMINUM COAT ROOF AREA	KARNAC #97 ALUMINUM ROOF COATING	
5	DAMAGED EXPANSION JOINT COVER	SMACNA 6TH EDITION- 5.11 FIG 5-5A	
6	PUNCTURED MEMBRANE	NRCA REPAIR MANUAL SECTION 2-MB1/ SINGLE PLY NRCA SECTION 3- TP2	
7	CLOGGED ROOF DRAIN	REMOVE OBSTRUCTION	
8	ROOF MEMBRANE UPLIFTED	REMOVE LOOSE AREA AND MAKE REPAIRS OF LIKE MATERIALS AND ATTACHMENT	
9	DEBRIS ON ROOF	REMOVE ALL DEBRIS FROM ROOF AREAS	
10	DAMAGE TO EQUIPMENT	REPLACE OR PROVIDE NEW HOOD, VENT, POWER VENTILATOR	
11	DAMAGE TO AC UNITS	LOOSE PANELS MUST BE REPLACED OR REINSTALLED AS REQUIRED	
12	LOOSE BASE FLASHINGS	NRCA REPAIR MANUAL SECTION 2-MB16. SINGLE PLY SECTION 3-TP21	
13	DISPLACED OR DAMAGED METAL FLASHINGS	SMACNA 6TH EDITION- 2.3 FIG 2-1A, 2-1B OR SECURE AS REQUIRED	
14	GUTTER DOWNSPOUT DAMAGED	REPAIR SECTIONS AS REQUIRED-RESECURE IS REQUIRED/ SMACNA 6TH EDITION 1.13 FIG 1-2	
15	BLISTERS REPAIR IN MEMBRANE	NRCA REPAIR MANUAL SECTION 2- MB8	
16	DAMAGE TO BRICK WALL	POINT MORTAR JOINTS THAT ARE OPEN AND REMOVE LOOSE JOINTS AND REPLACE	
17	DAMAGE TO THRU-WALL FLASHING	SECURE TO WALL AS REQUIRED	
18	DAMAGE TO SHINGLE ROOF SYSTEM, REPLACE BROKEN, MISSING OR DAMAGED SHINGLES	NRCA ROOFING AND WATERPROOFING MANUAL-5TH EDITION. PAGE 341,342,343	
19	MISSING SIGNAGE	NO PART OF THIS SPECIFICATION OR REPAIR	
20	WATER BEHIND BASE FLASHING IN SINGLE PLY ROOF	CUT BASE FLASHING TO REMOVE WATER AND REPAIR PER SINGLE PLY SECTION 3-TP21	
21	DAMAGE TO STUCCO FINISH	MAKE REPAIRS TO STUCCO IN DESIGNATED LOCATIONS PER DAMAGE REPORT.	

Blisters

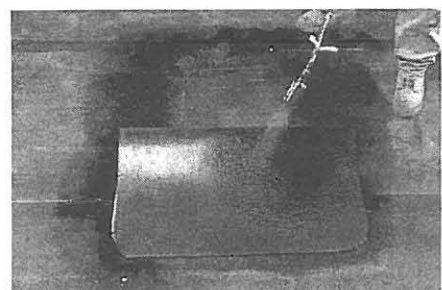
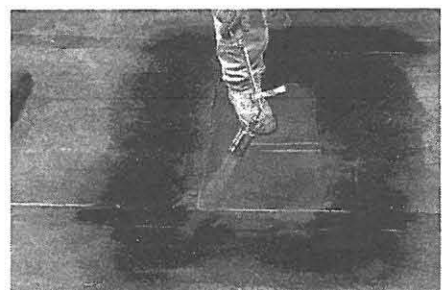
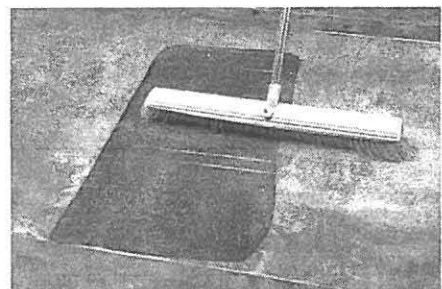
The decision whether to cut out and remove, patch over to reinforce or simply monitor blisters is a judgement that should be made by someone who is familiar with modified bitumen membrane blisters and their effect on the waterproof integrity of the roof system. In general, blisters that are keeping air in will keep water out and unless the blisters have certain characteristics, it may be preferable to leave them undisturbed. Some characteristics that may determine the need to repair blisters are:

- * Loss of granules or other surfacing
- * Membrane deterioration
- * Blisters in seams which have reduced lap coverage
- * Blisters that have breaks that can admit moisture
- * Blisters that have fatigue cracking around their circumference
- * Blisters that occur in areas of high traffic

Should it be determined that blister removal is necessary, the following steps should be used.

- 1 Carefully cut back the blistered membrane until good adhesion is reached.
- 2 Inspect the membrane for possible moisture infiltration.
- 3 If water infiltration is suspected, inspect the insulation and deck for damage. Remove wet or damaged insulation and repair or replace the deck as required. Install new, dry insulation consistent with the thickness of the existing insulation and compatible with the other roof system components.
- 4 To promote thorough adhesion of a patch, it is essential to begin by preparing the surface. Remove debris, contaminants, surfacing or ballast from the surface of the membrane or flashing to be repaired. The area to be prepared should extend beyond the perimeter of the patch to provide an ample clean work area on which to install the patch.
- 5 Clean the surface of the membrane. If the membrane surface has been flood coated and aggregate embedded, carefully spud the aggregate free from the surface and sweep clean. The exposed asphalt flood coat may need to be heated with a torch in order to smooth out all irregularities, then allowed to cool.

Repair instructions continue on back of this page ▼

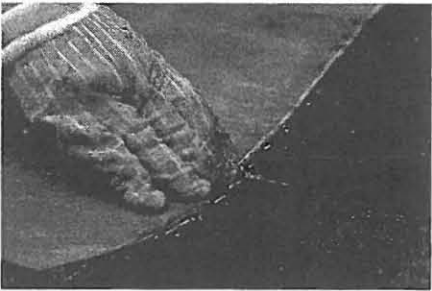


Blisters continued



6 Prime the surface of the membrane with asphalt primer and allow to dry. Primer contains solvents and is used to enhance adhesion; however, overuse of primer can harm the membrane.

7 Cut a patch of like material 8 inches (203mm) larger in all dimensions than the defect to be repaired. Round the corners of the patch to prevent peeling of square corners.



8 Install the patch in hot asphalt (SBS only), cold adhesive or by heat welding in accordance with the patch material manufacturer's recommendations over the repair area, extending 8 inches (203mm) in all directions from any part of the defect. When using hot asphalt as the method of application, use Type IV asphalt and take care to maintain the asphalt at a minimum of 400°F (205°C) at the point of application. When torching, work gradually, applying heat only sufficient to achieve adhesion without damaging the membrane reinforcement or scorching surrounding membrane.

9 Apply moderate pressure to the patch to assure adhesion to the existing membrane.

97 Fibered Aluminum Roof Coating

DESCRIPTION:

Karnak #97 Fibered Aluminum Roof Coating is made of selected asphalts and pigment flakes of pure aluminum blended with refined solvents and reinforcing fibers for heavy duty service. When Karnak #97 Fibered Aluminum Roof Coating is applied to the roof, the aluminum flakes leaf to the surface providing a reflective metallic shield over the base of the coating.

FEATURES, BENEFITS AND ADVANTAGES:

The advantages of this metallic aluminum shield are twofold:

1. The asphaltic oils in the base coating are protected from harmful intense rays of the sun by the reflective properties of the aluminum. Most of the sun's rays are reflected by this aluminum shield, thereby preventing these oils from being "cooked" out of the base coating. The coating, therefore, retains its resilient characteristics and will not prematurely crack or dry out.
2. During the hot summer months, Karnak #97 Fibered Aluminum Roof Coating may help reduce indoor building temperatures and improve inside living and working conditions, by reflecting the sun's rays and reducing roof surface temperatures.

One coat of Karnak #97 Fibered Aluminum Roof Coating will extend the life of modified bitumen membrane, not only by limiting fire-spread, (as indicated by the U.L. Class "A" Rating) but its high aluminum content and excellent reflectivity afford solar protection and weather durability.

Modified Bitumen: Karnak #97 Fibered Aluminum Roof Coating is U.L. Class A rated over specified Modified Bitumen Systems, UL Listing #RI2199(N).

USES:

Karnak #97 Fibered Aluminum Roof Coating helps reduce indoor building temperatures. It's ideal for use on modified bitumen membranes, metal corrugated decks, steep asphalt that has aged for 90 days, or any Karnak emulsion coating that has been allowed to cure for 3-5 days.

SURFACE PREPARATION:

Prepare all surfaces by sweeping clean of dust, dirt, oil and loose particles. Repair all cracks and blisters by spreading Karnak #19 Ultra Rubberized Flashing Cement over the damaged area, then embed Karnak Cotton, Glass or Poly-Mat reinforcement and apply another coat of Karnak #19 Ultra Rubberized over the entire patch. New asphalt roof surfaces should weather a minimum of 90 days

KARNAK

330 CENTRAL AVENUE, CLARK, NJ 07066
732-388-0300 • 800-526-4236 • FAX: 732-388-9422
WEB: <http://www.karnakcorp.com>



97 Fibered Aluminum Roof Coating

Karnak's experience, laboratory and field tests, as well as NRCA, RCMA and ARMA reports, indicate that aluminum coating will reduce the combined effects of ultraviolet rays, heat and moisture, which, especially on APP modified bitumens, enhance exudation that can cause discoloring and delamination of any surface coating.

COLD-PROCESS SYSTEMS AND COATINGS, EITHER EMULSION OR SOLVENT BASED, SHOULD ONLY BE INSTALLED ON DECKS WITH POSITIVE DRAINAGE.

PER NRCA, (NATIONAL ROOFING CONTRACTORS ASSOCIATION) "THE CRITERIA FOR JUDGING PROPER SLOPE FOR DRAINAGE IS THAT THERE BE NO EVIDENCE OF STANDING WATER ON THE DECK 48 HOURS AFTER IT STOPS RAINING."

CAUTION:

Do not use near open flame. Avoid breathing solvent fumes and prolonged contact with skin. Do not take internally. If swallowed, **do not induce vomiting**. Call a physician immediately. Keep out of reach of children. Keep container covered when not in use. **Do not thin**. Dispose of in an environmentally safe manner. Cover air intakes during application and while drying.

CARE OF TOOLS:

Equipment may be thoroughly cleaned after use with mineral spirits, taking the necessary precautions when handling combustible materials.

PACKAGING:

Available in 1 gallon cans, 5 gallon pails and 55 gallon drums.

If further information is required, please contact Karnak's Technical Service Department at 1-800-526-4236.

Please see page 222 for additional mold and safety information.

KARNAK

330 CENTRAL AVENUE, CLARK, NJ 07066
732-388-0300 • 800-526-4236 • FAX: 732-388-9422
WEB: <http://www.karnakcorp.com>



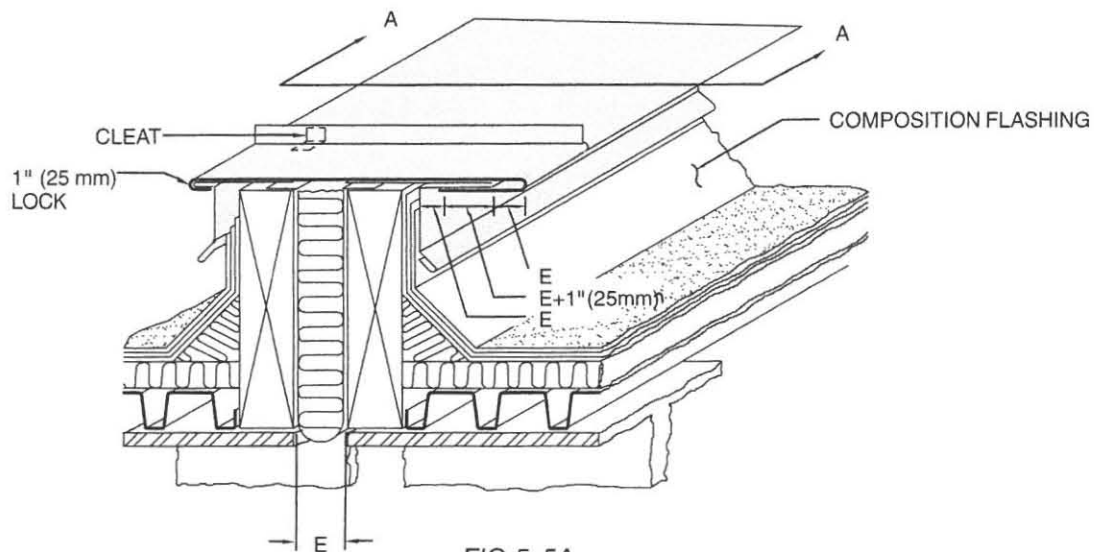
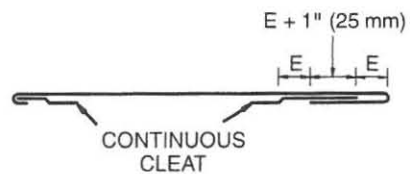


FIG 5-5A



CLEAT DETAIL SECTION A-A

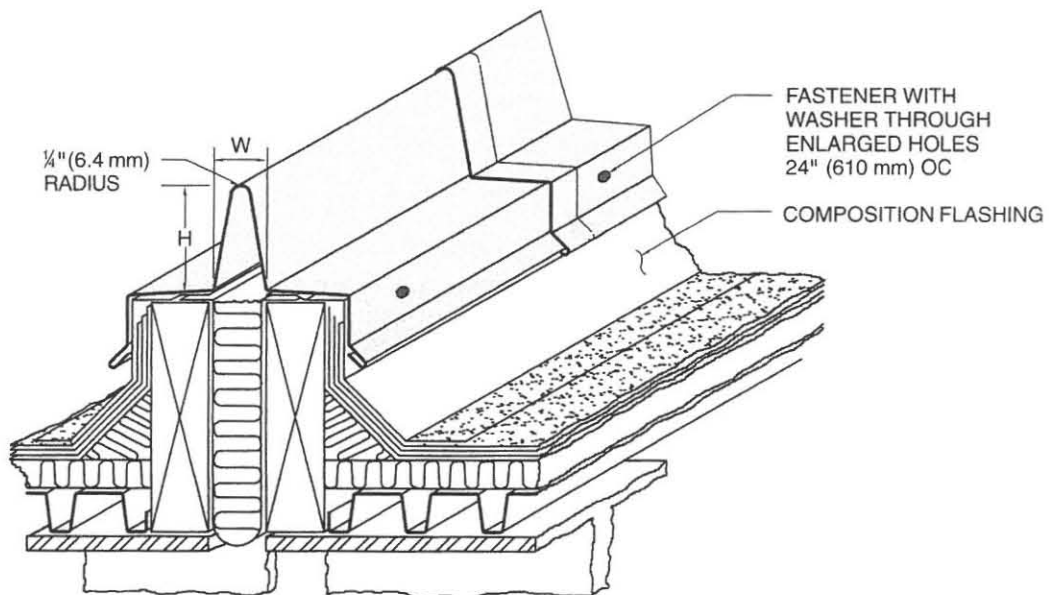


FIG 5-5B

FIGURE 5-5 BUILDING EXPANSION JOINTS — ROOF



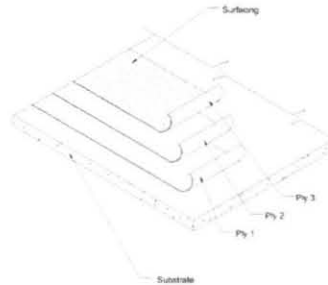
Quality You Can Trust Since 1886...From North America's
Largest Roofing Manufacturer



AD0023852

**Polk State College
Student Center Bldg.
Winter Haven, FL**

4/20/18



SPECIFICATION: N1225HGPER

COMPONENT	TYPE	REQUIRED	ATTACHMENT	RATE OF APPLICATION
DECK	Lightweight Insulating Concrete		Per Code	
ANCHOR SHEET	GAFGLAS® #75 Base Sheet ASTM D-4601	One (1) ply	Drill-Tec™ CR Base Sheet Fasteners	Per GAF® requirements
INTERPLY SHEET	RUBEROID® HW 25 Smooth ASTM D-6163	One (1) ply	Heat Welded	Adhered Per GAF® requirements
SURFACE MEMBRANE	RUBEROID® HW Plus Granule FR ASTM D-6164	One (1) ply	Heat Welded	Adhered Per GAF® requirements
FLASHING MEMBRANE 2X25H	RUBEROID® HW 25 Smooth ASTM D-6163	One (1) ply	Heat Welded	Adhered Per GAF® requirements
	RUBEROID® HW Plus Granule FR ASTM D-6164	One (1) ply	Heat Welded	Adhered Per GAF® requirements
GUARANTEE	RUBEROID®/GAFGLAS® Diamond Pledge™ NDL Roof Guarantee	Twenty (20) years		GUARANTEE FEE IS APPLICABLE

All GAF® accessories shall be used where applicable.

GAF® Perimeter Edge Metal shall be used where conditions exist.

This system shall be installed by a GAF® Master or Master Select™ Contractor.

NOTE: One way vents shall be installed every 10 squares (1000 sq ft).

Each roof has unique requirements. This specification is a graphic representation of products and their installation.

To properly assess specific roofing needs, code compliance, system configurations and warranty eligibility, contact Contractor Services.

Note: Your Field Services or Technical Services Managers are the only employees who can approve any deviation from GAF's published specification manual(s). Always review the appropriate Application & Specification Manual before commencing this project, as the Manual may contain information that is important for a successful installation.

This Cut Spec specification shall not waive, supersede or alter the requirements and recommendations found in the most current Application & Specification Manual(s) referenced above, printed technical bulletins or specific correspondence drafted for this project by Field Services or Technical Services Manager.

Architectural Information Services

ais@gaf.com

1-800-522-9224



SECTION 07550

MODIFIED BITUMINOUS ROOFING

***Polk State College
Student Center Bldg.
Winter Haven, FL***

PREPARED BY:

GAF® Architectural Information Services

PROJECT NO: AD0023853

Note: GAF® does not practice architecture or engineering. This Design Line is provided as a guide specification and is based on criteria provided to GAF®. GAF® has not observed the jobsite conditions, contract specifications, or other documents and shall not be construed in any manner to be the designer of record.

**GAF® RUBEROID® DESIGN LINE
GUIDE SPECIFICATION**

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes
 - 1. Asphaltic modified bituminous roofing
- B. Related Sections
 - 1. Section 06100: Rough Carpentry
 - 2. Section 07620: Sheet Metal Flashing and Trim
 - 3. Section 15430: Plumbing Specialties

1.02 REFERENCES

- A. Factory Mutual (FM Global) - *Approval Guide*
- B. Underwriters Laboratories (UL) - *Roofing Systems and Materials Guide* (TGFU R1306)
- C. American Society for Testing and Materials (ASTM) - *Annual Book of ASTM Standards*
- D. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - *Architectural Sheet Metal Manual*
- E. Asphalt Roofing Manufacturers Association (ARMA)
- F. National Roofing Contractors Association (NRCA)
- G. American Society of Civil Engineers (ASCE)

1.03 DEFINITIONS

- A. Roofing Terminology: Refer to ASTM D1079 and the glossary of the National Roofing Contractors Association (NRCA) *Roofing and Waterproofing Manual* for definitions of roofing terms related to this section.

1.04 PERFORMANCE REQUIREMENTS

- A. Provide an installed roofing membrane and base flashing system that does not permit the passage of water, and will withstand the design pressures calculated in accordance with the most current revision of ASCE 7.
- B. GAF® shall provide all primary roofing materials that are physically and chemically compatible when installed in accordance with manufacturers current application requirements.

1.05 SUBMITTALS

- A. Product Data: Provide product data sheets for each type of product indicated in this section.
- B. Shop Drawings: Provide manufacturers standard details and approved shop drawings for the roof system specified.
- C. Samples: Provide samples of insulation(s), fasteners and roll goods for verification of quality.
- D. Certificates: Installer shall provide written documentation from the manufacturer of their authorization to install the roof system, and eligibility to obtain the warranty specified in this section.

GAF® RUBEROID® DESIGN LINE
GUIDE SPECIFICATION

1.06 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: GAF® shall provide a roofing system that meets or exceeds all criteria listed in this section.
- B. Installer's Qualifications:
 - 1. Installer shall be classified as a *Master* or *Master Select™* contractor as defined and certified by GAF®.
- C. Source Limitations: All components listed in this section shall be provided by a single manufacturer or approved by the primary roofing manufacturer.
- A. Final Inspection
Manufacturer's representative shall provide a comprehensive final inspection after completion of the roof system. All application errors must be addressed and final punch list completed.

1.07 PRE-INSTALLATION CONFERENCE

- A. Prior to scheduled commencement of the roofing installation and associated work, conduct a meeting at the project site with the installer, architect, owner, GAF® representative and any other persons directly involved with the performance of the work. The installer shall record conference discussions to include decisions and agreements reached (or disagreements), and furnish copies of recorded discussions to each attending party. The main purpose of this meeting is to review foreseeable methods and procedures related to roofing work.

1.08 REGULATORY REQUIREMENTS

- A. All work shall be performed in a safe, professional manner, conforming to all federal, state and local codes.

1.09 DELIVERY, STORAGE AND HANDLING

- A. Deliver all roofing materials to the site in original containers, with factory seals intact. All products are to carry either a GAF® or GAF® label.
- B. Store all pail goods in their original undamaged containers in a clean, dry location within their specified temperature range.
- C. Store roll goods on end on pallets in a clean, dry, protected area. Take care to prevent damage to roll ends or edges. Do not double stack modified bitumen products.
- D. Do not expose materials to moisture in any form before, during, or after delivery to the site. Reject delivery of materials that show evidence of contact with moisture.
- E. Remove manufacturer supplied plastic covers from materials provided with such. Use "breathable" type covers such as canvas tarpaulins to allow venting and protection from weather and moisture. Cover and protect materials at the end of each work day. Do not remove any protective tarpaulins until immediately before the material is to be installed.
- F. Materials shall be stored above 55°F (12.6°C) a minimum of 24 hours prior to application.

1.10 PROJECT CONDITIONS

- A. Weather
 - 1. Proceed with roofing only when existing and forecasted weather conditions permit.
 - 2. Ambient temperatures must be above 45°F (7.2°C) when applying hot asphalt or water based adhesives.

GAF® RUBEROID® DESIGN LINE GUIDE SPECIFICATION

1.11 WARRANTY

- A. Provide Manufacturer's standard WeatherStopper® Diamond Pledge™ Guarantee with single source coverage* and no monetary limitation, where the manufacturer agrees to repair or replace components in the roofing system, which cause a leak due to a failure in materials or workmanship.

1. Duration: Twenty (20) years from the date of completion.

*Materials and workmanship of listed products within this section when installed in accordance with current GAF® application and specification requirements. Contact GAF® Contractor Services for the full terms and conditions of the guarantee.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

- A. GAF® - 1 Campus Drive, Parsippany, NJ 07054

2.02 BASE / PLY SHEETS

- A. Heavyweight asphalt coated glass fiber base sheet: Conforms to or exceeds requirements of ASTM D 4601, Type II, UL Type G2 BUR, and Federal Spec SS-R-620B Type II. Each roll contains three (3) squares (320 sq. ft.) of material, approximately 39.375" x 97.5' (1 m x 29.7 m); 68 lbs. (30.8 kg), **GAFLAS® #75** base sheet.
- B. Tough, resilient, smooth surfaced, asphalt modified bitumen membrane containing a core of non-woven glass fiber mat coated with flexible, SBS polymer-modified asphalt designed for heat weld application. Conforms to or exceeds requirements of ASTM D 6163 Type I Grade S. Contains one and one-half squares of material, approximately 39.375" x 50' (1 m x 15.2 m); 105 lbs. (47.6 kg), **Ruberoid® HW 25 Smooth** base / ply sheet.

2.03 MEMBRANE MATERIALS

- A. Premium, heavy-duty, fire-resistant, granule-surfaced asphalt modified bitumen membrane containing a core of non-woven polyester mat coated with flexible, SBS polymer-modified asphalt designed for heat weld application. Conforms to or exceeds requirements of ASTM D 6164 Type II Grade G. Each roll contains one square of material, approximately 39.625" x 32.6' (1 m x 10.3 m), 105 lbs. (47.6 kg), **Ruberoid® HW Plus Granule FR** roof membrane.

2.04 FLASHING MATERIALS

- A. Tough, resilient, smooth surfaced, asphalt modified bitumen membrane containing a core of non-woven glass fiber mat coated with flexible, SBS polymer-modified asphalt designed for heat weld application. Conforms to or exceeds requirements of ASTM D 6163 Type I Grade S. Contains one and one-half squares of material, approximately 39.375" x 50' (1 m x 15.2 m); 105 lbs. (47.6 kg), **Ruberoid® HW 25 Smooth** flashing membrane.
- B. Premium, heavy-duty, fire-resistant, granule-surfaced asphalt modified bitumen membrane containing a core of non-woven polyester mat coated with flexible, SBS polymer-modified asphalt designed for heat weld application. Conforms to or exceeds requirements of ASTM D 6164 Type II Grade G. Each roll contains one square of material, approximately 39.625" x 32.6' (1 m x 10.3 m), 105 lbs. (47.6 kg), **Ruberoid® HW Plus Granule FR** flashing membrane.

2.05 ACCESSORIES

- A. Mechanical Fasteners

GAF® RUBEROID® DESIGN LINE GUIDE SPECIFICATION

1. **Drill•Tec™ CR Base Sheet Fastener:** G-90 galvanized, CR-10 Corrosion resistant coating with 1.125" x1" head and 1.75" leg length. Preassembled with 2.75" diameter Galvalume steel roof disc.
- B. **One Way Vents**
 1. Pressure relief device consisting of a one-piece spun aluminum vent pre-flashed with modified bitumen. Internally, the vent contains a neoprene valve that allows air pressure and moisture vapor to escape out of the system without allowing additional air and moisture vapor to return. The **One Way MVent**, by MWeld®.
- C. **Standard Vents**
 1. A spun aluminum vent, pre-flashed with modified bitumen designed to waterproof soil pipes and roofing protrusions. The **Standard MVent**, by MWeld®.
NOTE: Not for use over active pipes that emit steam or excessive moisture vapor, condensation may occur. Not for use over boiler or heater/furnace vent pipes.
- D. **Adjustable Vents**
 1. A two-piece roof-flashing unit consisting of a pre-flashed spun aluminum base and a flexible upper boot, allowing for waterproofing of tall or awkward roof protrusions. The **Adjustable MVent**, by MWeld®.
- E. **Plumbing Vents**
 1. A pre-flashed with modified bitumen membrane and is designed to waterproof vent pipes. It can be used as a pipe cover to replace finger and cap flashing on standard vent pipe details. The **Pre-Flashed Plumbing Vent**, by MWeld®.
- F. **Drains**
 1. A spun aluminum (or copper) roof drain with gravel guard, strainer cap, and waterproofing plumbing seal attached. Pre-flashed with modified bitumen and available in full and insert sizes to accommodate new construction and retrofit applications. The **MDrain**, by MWeld®.
 2. A Pre-flashed metal through-wall roof drain designed for easy installation to aid in quick lateral removal of water. The **Mscupper**, by MWeld®.
- G. **Sealant Pans**
 1. A structural urethane outer shell, bonded to the roof surface, filled with a urethane rubber sealant. The urethane sealant conforms to the shape of any roof penetration through a roof surface to protect the roof system from moisture. The **M-Curb** and **M-Thane**, by MWeld®.
- H. **Expansion Joint Covers**
 1. Factory fabricated assemblies used to accommodate three-dimensional joints in a roof structure. Heavy reinforced flexible cover with a flexible flame retardant foam bellows for support. Nailing flanges conform to curb irregularities. The **Metalastic® Expansion Joint Cover**, by GAF®.
- I. **Gravel Guard**
 1. Three-piece fascia system with roof flange design that creates water and wind proof seals at the building perimeter. The **Gravel Guard MB**, by GAF®.
- J. **TOPCOAT® Flexseal**
 1. Solvent-based synthetic elastomeric sealant.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that the surfaces and site conditions are ready to receive work.

GAF® RUBEROID® DESIGN LINE
GUIDE SPECIFICATION

- B. Verify that the deck is supported and secured.
- C. Verify that the deck is cleaned and smooth, free of depressions, waves, or projections, and properly sloped to drains, valleys, eaves, scuppers or gutters.
- D. Verify that the deck surfaces are dry and free of ice or snow.
- E. Verify that all roof openings, curbs, pipes, sleeves, ducts, vents or other penetrations through the roof are solidly set, and that all flashings are tapered.

3.02 SUBSTRATE PREPARATION

- A. **Lightweight Insulating Concrete Deck**
 - 1. Lightweight insulating concrete decks are required to have a minimum thickness of 2" (5.1 cm), a minimum compressive strength of 125 psi (87,000 kg/m²) and a minimum density of 22 pcf (352 kg/m³).
 - 2. The lightweight insulating deck/fill must be installed by an applicator approved by the deck manufacturer.
 - 3. The roof system shall be installed immediately following deck curing to prevent damage from exposure to precipitation. The deck manufacturer determines the minimum curing time and maximum exposure limitations.
 - 4. LWIC should not be poured during rainy periods. Deck areas that have frozen before they have cured must be removed and replaced. Decks which receive precipitation prior to installation of the roof membrane, must be checked for moisture content and dryness.
 - 5. Where the mean January temperature (Reference current ASHRAE Fundamentals Handbook) is below 40° F (4.4°C), lightweight insulating concrete decks must be poured and roofed between April 1st and October 31st; this type of deck is unacceptable in Alaska.
 - 6. Lightweight insulating concrete decks are acceptable only on slopes up to 1" per foot (8.3 cm/m).
 - 7. Do not attach insulation directly to lightweight concrete decks. Over old, dry decks, additional board insulation may be solidly mopped to an approved mechanically attached anchor sheet (base sheet).
 - 8. **Local building code or individual deck manufacturer's standards apply when their specifications exceed the minimum thickness, compressive strength, or density requirements listed in this section.**

3.03 INSTALLATION - GENERAL

- A. Install GAF®'s Ruberoid® roofing system according to all current application requirements in addition to those listed in this section.
- B. GAF® Ruberoid Specification #: I1225HGPFR
- C. When the slope of the roof is ½" per foot or greater, install all plies parallel with the slope of the roof, and install intermediate wood nailers as required for the specific roof slope. Plies must extend over ridges and nailed on 6" centers.
- D. Start the application of membrane plies at the low point of the roof or at the drains, so that the flow of water is over or parallel to, but never against the laps.

3.04 BASE SHEET

- A. Roll the base sheet out over the deck and allow it to relax. Lap the base sheet so the flow of water is over or parallel to, but never against the laps.
- B. Lap the base sheet 2" (5.1 cm), and 4" (10.2 cm) on the ends. Keeping the base sheet taut, push out all wrinkles and buckles ahead as fastening proceeds.
- C. Turn base sheet up to the top of the cant.

GAF® RUBEROID® DESIGN LINE
GUIDE SPECIFICATION

- D. Stagger adjacent end laps a minimum of 18" (45.7 cm).
- E. A minimum FMRC 1-60 attachment is recommended. Refer to FMRC Approval Guide for FM Fastening patterns. Factory Mutual requires fastener density increases in perimeter and corner zones for FM 1-60 and FM 1-90 or greater. Refer to FM Loss Prevention Data Sheets 1-7, 1-28, 1-29 and 1-49.

Note: When fastening base sheets using screws and plates without insulation, the plate must be of a design that allows it to lie flat on the deck.

3.05 PLY / CAP SHEET

- A. The surface over which the membrane is to be installed must be clean, smooth, dry and prepared in accordance with article 3.02 "Substrate Preparation". Do not apply membrane directly to a fresh asphalt glaze or flood coat, or over base plies with excessive asphalt mopping bleed out at laps.
- B. For slopes 3/4 " per foot (6.2 cm per meter) and over, membrane must be run parallel to the roof slope and back nailed in accordance with GAF® steep slope application requirements. On slopes less than 3/4" per foot (6.2 cm per meter), install cap sheet perpendicular to the slope.
- C. Never apply membrane by any method except welding with a propane torch or other equipment specifically designed for application of torchable modified bitumen.
- D. The coiled membrane must be unrolled approximately 10 ft. (3 meters), and aligned. The propane torch flame is then applied uniformly across the exposed back surface of the membrane and lap areas until the compound reaches the proper application temperature and exhibits a slight sheen. A complete burn-off of release films where present on the underside of the rolls, membrane selvage edges or both surfaces is necessary. Avoid overheating which may result in damage to or improper adhesion of the membrane. (The flame should be moved from side to side in the shape of an "L", applying about 75% of the heat to the membrane and 25% to the substrate or underlying plies including the lap area of the previously installed courses.) The membrane is slowly unrolled as heat is applied to ensure proper adhesion. When complete, re-roll the opposite end of the membrane and install in the same manner.
- E. A minimum 3/8" (10 mm) bitumen flow-out must be obtained at all seam areas. Dry laps are not acceptable. To ensure the proper 3/8" (10mm) flow of bitumen at the seam areas, a roller may be used. Roller application should follow behind the torch no more than 4 ft. (1.2 m) nor less than 3 ft. (0.91 m) to be sure that the membrane will be at the proper temperature to produce proper flow. Hand rollers or "walking-in the seam" methods are also acceptable. Check all seams for full and uniform adhesion. Un-adhered seams must be lifted with a heated trowel and resealed by lightly torching the seam area.
- F. (Optional) Matching granules may be broadcast into the modified bitumen bleed out at seams while hot to enhance the finished appearance of the membrane.
- G. All end laps must be staggered a minimum of 18" (45.7 cm) so that no adjacent end laps coincide. If end laps fall in line or are not staggered the proper distance, a full width of membrane must be installed over the end laps. End laps, flashing sheets and other seams formed over granule surfaces require pre-heating of the top surface of the underlying granule surface membrane to a point where the granules just begin to sink into, and the modified bitumen compound comes up through the granules to ensure proper seam construction and adhesion.
- H. All laps must be parallel or perpendicular to the slope of the roof such that the flow of water is never against the lap.
- I. Interply and cap application: Over the base sheet or approved substrate, install 19 11/16" (50 cm) and 39 3/8" (100.0 cm) width Ruberoid® smooth starter plies, and follow with a 39 3/8" (100.0 cm) width granule surfaced

GAF® RUBEROID® DESIGN LINE GUIDE SPECIFICATION

sheet, applied shingle style. Lap plies 3" on side laps and 6" (15.2 cm) on end laps. Stagger adjacent end laps a minimum of 18" (45.7 cm).

- J. Membranes must not be applied during adverse weather or without precautionary measures in temperatures below 45°F (7.2°C). Contact GAF® Contractor Services for details.

3.06 BITUMINOUS BASE FLASHINGS

- A. Install GAF® base flashing specification 2X25H over all cant strips, horizontal to vertical transitions, roof edges and roof penetrations. Flashings are to be secured in accordance with current GAF® application guidelines.
- B. Nailable curbs and walls must be covered with a layer of approved GAFGLAS® Base Sheet or backer ply fastened 8" (20.3 cm) o.c. in all directions with approved fasteners. All vertical laps shall be 4" (10.2 cm). Base sheet or backer ply must extend out onto the field of the roof as shown in the applicable GAF® construction detail.
- C. Prime all metal and masonry surfaces with asphalt primer, and allow adequate drying time prior to adhering flashing plies.
- D. Backer plies installed over masonry or other non-nailable substrates must be cut into manageable lengths to ensure adequate adhesion to the cant strip and vertical surfaces without excessive voids. All vertical laps shall be 4" (10.2 cm). Backer plies shall extend onto the field of the roof as shown in the applicable GAF® construction detail.
- E. The finished ply of base flashing shall be run vertically to provide a selva edge that will aid in achieving proper adhesion at the 3" (7.6 cm) vertical laps. If the sheet is run horizontally, the vertical laps must be a minimum of 6" (15.2 cm) and the selva edge must be removed from the sheet or fully covered by the counterflashing. The finished flashing ply must extend out onto the field of the roof as shown in the applicable GAF® construction detail, and must be extended a minimum of 4" (10.2 cm) beyond the edge of the prior flashing plies. The flashing must be soundly adhered to the parapet, cant area and roof surface to result in a minimum void, non-bridging construction.
- F. Base flashing heights must be a minimum of 8" (20.3 cm) and a maximum of 24" (61.0 cm) above the roofline.
- G. Corner membrane flashings, such as "bow ties" for outside corners and "footballs" for inside corners or other membrane reinforcements are required to ensure that base flashing corners are sealed at cant areas. An alternate method of corner reinforcing is to install a smooth MB membrane reinforcement piece on the prepared corner substrate prior to final surfacing membrane. Refer to MB Flashing Details section of the GAF® *Application and Specifications Manual*.

3.07 SHEET METAL

- A. Metal should not be used as a component of base flashing. Because of the high coefficient of expansion of sheet metals and the large temperature changes that can be experienced on a roof, sheet metal or exposed metal components must be isolated from the waterproofing components of the roofing and flashing system as efficiently as possible to prevent the metal from splitting the membranes.
- B. All metal edge details scheduled to be included in the **Edge to Edge Coverage** of the Diamond Pledge™ Guarantee must be submitted and approved in writing by the manufacturer prior to project commencement.
- C. When it is unavoidable to use metal in the roofing system (i.e., lead flange at drains, gravel stops), treated wood nailers and insulation stops, 1" (25 mm) wider than the metal flange, should be provided for metal flange attachment. Metal flanges must always be set on top of the roof membrane with modified trowel grade cold adhesive applied material for SBS roof systems. The metal flange is then sealed using the applicable

GAF® RUBEROID® DESIGN LINE
GUIDE SPECIFICATION

construction detail to meet applicable guarantee requirements. Metal accessories (gravel stops, counter flashing, etc.) should be 16 oz. (0.56 mm) copper, 24 gauge (0.71 mm) galvanized or stainless steel, 2 1/2 to 4 lb (1.1-1.8 kg) lead, or 0.032" (0.81 mm) aluminum.

- D. Fabricate and install all sheet metal materials as shown in applicable construction details. Refer to SMACNA (Sheet Metal and Air Conditioning Contractors National Association, Inc.) for guidance on sheet metal treatments not addressed in this specification.
- E. Clean metal and apply asphalt primer to all sheet metal surfaces that will come into contact with asphalt or other bituminous materials; allow the primer adequate time to dry.
- F. Use fastener types compatible with the sheet metal type.
 - 1. Copper or lead-coated copper: use copper or bronze fasteners.
 - 2. Lead and galvanized steel: use galvanized or cadmium-plated sheet fasteners.
 - 3. Aluminum: use aluminum fasteners.
 - 4. Stainless steel: use stainless steel fasteners.
- G. Metal counter-flashing shall have a minimum 4" (10.2 cm) face with a drip lip. The bottom edge of the counterflashing shall cover the roofing membrane and/or base flashing by a minimum of 4" (10.2 cm). Metal counter flashing used for masonry walls, wooden walls, or through wall metal flashings should be a two piece design to allow for installation and later removal. Metal counter-flashings for stucco, EIFS, wood siding or similar materials should be designed appropriately, such as "Z" type flashing. End joints shall be lapped 3" (7.6 cm) or more. Adequate fasteners must be provided to secure against wind forces. Skirt fasteners shall be watertight.
- H. Metal termination bars shall be a minimum of 1/10" (3 mm) thick x 1" (25 mm) wide with preformed sealant edge lap. Bar should have 1/4" (6 mm) x 3/8" (10 mm) slotted holes on 4" (10.2 cm) centers to facilitate mechanical anchorage.

Note: Termination bars are not suitable in all base flashing and wall flashing conditions. Termination bars may only be used in conjunction with an appropriate counter-flashing extending a minimum of 4" (10.2 cm) below the termination bar.
- I. Metal flanges for gravel stops, eave strips, and pitch pockets to be used in conjunction with roofing shall be primed (both sides), set in modified trowel grade cold adhesive applied material for SBS roof systems. Flanges shall be a minimum of 3 1/2" (8.9 cm) wide for gravel stops or eave strips and 4" (10.2 cm) wide for projections and extensions through the roof. The gravel stop lip should be at least 3/4" (19 mm) high. Eave strip lips shall be at least 3/8" (10 mm) high. Provisions must be made for securing the skirt to the face of the wall. This may be a wood nailer strip for masonry and metal construction. In all cases, gravel stop and eave strip nailer should be fastened to the deck or deck system with adequate resistance against wind forces.
- J. Stacks shall have metal sleeve flashing a minimum of 8" (20.3 cm) high. Pitch pockets for brackets, supports, pad-eyes, etc., shall have a 4" (10.2 cm) minimum height metal sleeve.
- K. On re-roofing projects, provisions shall be made for reinstallation of existing sheet metal duct work, equipment, coping metal and counter-flashing removed in conjunction with the new work. Also, provide for cleaning and repairing of existing defective sheet metal, and replacement of missing and irreparable sheet metal to match existing types. Light gauge sheet metal flashings which are incorporated into the Ruberoid® roof system are not suitable for re-use and must be replaced with new material.
- L. Conduits and piping such as electrical and gas lines must be set on wood blocking or some other form of support. Wood blocking/supports must be set on pads constructed of an additional layer of roof membrane material.

GAF® RUBEROID® DESIGN LINE
GUIDE SPECIFICATION

- A. Walkways for normal rooftop traffic may be constructed from two plies of modified bituminous membrane of the same type as the field of the roof. This type of walkway is not for sidewalk or patio-type use.
- B. Construct walkways by solidly adhering a first ply of smooth surfaced membrane to the field of the roof followed by a granule surfaced membrane to the surface of the first ply.
- C. Walkway sections should be no longer than 10' (3 m), with a 6" (15.2 cm) minimum gap between each section to allow for drainage.

3.09 ROOF PROTECTION

- A. Protect all partially and fully completed roofing work from other trades until completion.
- B. Whenever possible, stage materials in such a manner that foot traffic is minimized over completed roof areas.
- C. When it is not possible to stage materials away from locations where partial or complete installation has taken place, temporary walkways and platforms shall be installed in order to protect all completed roof areas from traffic and point loading during the application process.
- D. Temporary tie-ins shall be installed at the end of each workday and removed prior to commencement of work the following day.

3.10 CLEAN-UP

- A. All work areas are to be kept clean, clear and free of debris at all times.
- B. Do not allow trash, waste, or debris to collect on the roof. These items shall be removed from the roof on a daily basis.
- C. All tools and unused materials must be collected at the end of each workday and stored properly off of the finished roof surface and protected from exposure to the elements.
- D. Dispose of or recycle all trash and excess material in a manner conforming to current EPA regulations and local laws.
- E. Properly clean the finished roof surface after completion, and make sure the drains and gutters are not clogged.
- F. Clean and restore all damaged surfaces to their original condition.

END OF SECTION

Membrane Patch Repair (SBS)

The following repairs are utilized in several different repair situations which require installing a patch to return the membrane to a water-tight condition.

1 If water infiltration is suspected, open the membrane and inspect the insulation and deck for damage. Remove wet or damaged insulation and repair or replace the deck as required. Properly attach new, dry insulation consistent with the thickness of the existing insulation and compatible with the other roof system components.

2 To promote thorough adhesion of a patch, it is essential to begin by preparing the surface. Remove debris, contaminants, surfacing, ballast or loose granules from the surface of the membrane or flashing to be repaired. The area to be prepared should extend beyond the perimeter of the patch to provide an ample clean work area on which to install the patch.

3 Clean the surface of the membrane. If the membrane surface has been flood coated and aggregate embedded, carefully spud the aggregate free from the surface and sweep clean. The exposed asphalt flood coat may need to be heated with a torch in order to smooth out irregularities, then allowed to cool.

4 Prime the surface of the membrane with asphalt primer and allow to dry. Primer contains solvents and is used to enhance adhesion; however, overuse of primer can harm the membrane.

5 Cut a patch of like material 8 inches (203mm) larger in all dimensions than the defect to be repaired. Round the corners of the patch to a minimum radius of 3 inches (76mm).

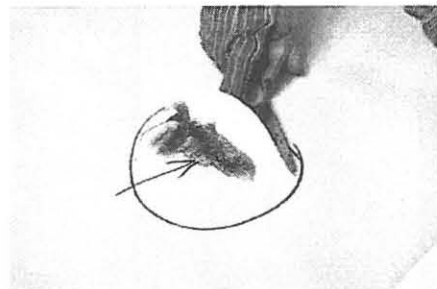
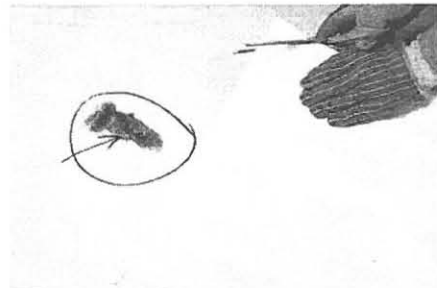
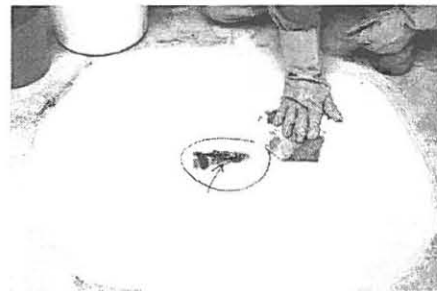
6 Install the patch in hot asphalt, cold adhesive or by heat welding in accordance with the patch material manufacturer's recommendation over the repair area, extending 8 inches (203mm) in all directions from any part of the defect. When using hot asphalt as the method of application, use Type IV asphalt and take care to maintain the asphalt at a minimum of 400°F (205°C) at the point of application. When torching, work gradually, applying heat only sufficient to achieve adhesion without damaging the membrane reinforcement or scorching surrounding membrane.

7 Apply moderate pressure to the patch to assure adhesion to the existing membrane.

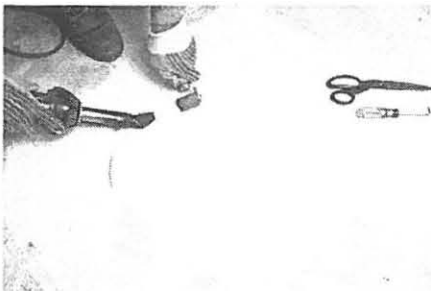


Holes, Tears, Splits or Abrasions

- 1 Check for any foreign debris; remove if present.
- 2 If water infiltration is suspected, open the membrane and inspect the insulation and deck for damage. Remove wet or damaged insulation and repair or replace the deck as required. Properly attach new, dry insulation consistent with the thickness of the existing insulation and compatible with the other roof system components.
- 3 In addition, if a slip sheet is present, inspect the slip sheet and restore by taping as necessary.
- 4 To promote thorough adhesion of a patch, it is essential to begin preparing the surface by removing debris, contaminants and ballast from the area of the membrane to be repaired. The area prepared should extend beyond the perimeter of the patch to provide an ample sized clean work area.
- 5 Scrub the repair area with a solution of detergent and water, such as Spic 'n Span™ or other detergent containing trisodium phosphate. Use warm (if available) water and a stiff bristle brush to scrub the membrane.
- 6 Rinse thoroughly with clean water and allow the membrane to dry. A rubber bladed squeegee and clean, absorbent, lint-free cloths may be used to facilitate drying.
- 7 If the existing membrane surface is excessively contaminated or degraded, carefully enlarge the hole (make round) to allow the insertion of the new patch material under the existing membrane so that welding of the patch may be accomplished to the underside (unexposed, less degraded side) of the existing membrane.
- 8 Cut a patch from a piece of new membrane material large enough to extend 4 inches (103mm) beyond any part of the defect. Round all corners of the patch to limit peeling of square corners.
- 9 Round the ends of the defect in the existing membrane.
- 10 Wipe the area of the existing membrane to receive the patch (the underside if necessary, and ensure moisture is not present) and the underside of the patch material with a clean, absorbent, lint-free cloth dampened with a solvent such as methyl



Holes, Tears, Splits or Abrasions *continued*



ethyl ketone (MEK) or acetone. Do not pour the solvent directly on to the membrane. Wipe the area with the solvent dampened cloth.

11 Allow the surface of the membrane and patch to air dry.

12 Weld the patch in place by using the three-step thermoplastic welding steps: tack-weld, pre-weld and final-weld as described in the following:

Tack-weld the patch to the existing membrane by using a hot-air welder to weld the membrane sufficiently to hold the patch in place taking care to not wrinkle the patch material.

Pre-weld the patch by inserting the hot-air nozzle under the patch and forming a continuous pre-weld approximately 2 inches (51mm) from the edge of the patch. This pre-weld will prevent heat leakage during the final-welding and is achieved by following the welder nozzle closely with a rubber-faced hand roller to provide pressure to adhere the back of the weld area.

Final-weld the outer 2 inches (51mm) by concentrating the heat on the remaining unadhered outer portion of the patch until the membrane and patch have reached the welding temperature. The hot-air welder should be moved quickly enough to avoid scorching the membrane, yet slowly enough to achieve a complete weld. Immediately behind the welder, roll the material to be bonded with the rubber faced hand roller, rolling parallel to the outside edge of the welder nozzle and pressing firmly to adhere and mate the materials.

13 After the welded area has cooled, check seams for voids with a rounded tip probe such as a screwdriver or awl with the tip rounded.

14 Where patches are made with reinforced membrane material, seam seal the outer perimeter with seam sealant or caulking paste compatible with the membrane. This will prevent water from wicking through the exposed edge of the reinforcement.

15 If the ballast was removed, redistribute the ballast over the exposed area.

Loose or Displaced Wall and Base Flashings:

- 1 Cut out flashing materials that are unadhered, wrinkled or displaced until reaching adhered material.
- 2 Inspect the flashing for possible moisture infiltration.
- 3 If water infiltration is suspected, cut open the flashing and inspect the underlying interplies and substrate. Replace any wet or damaged materials.
- 4 To promote thorough adhesion of a patch, it is essential to begin by preparing the surface. Remove debris, contaminants, surfacing, foil facing or ballast from the surface of the membrane and flashing to be repaired. The area to be prepared should extend beyond the perimeter of the patch to provide an ample clean work area on which to install the patch.
- 5 Clean the surface of the membrane. If the membrane surface has been flood coated and aggregate embedded, carefully spud the aggregate free from the surface and sweep clean. The exposed asphalt flood coat may need to be heated with a torch in order to smooth out all irregularities, then allowed to cool.
- 6 Prime the surface of the membrane with asphalt primer and allow to dry. Primer contains solvents and is used to enhance adhesion; however, overuse of primer can harm the membrane.
- 7 Cut a patch of like material 8 inches (203mm) larger in all dimensions than the defect to be repaired. Round the corners of the patch to prevent peeling of square corners.
- 8 Install the patch in hot asphalt (SBS only), cold adhesive or by heat welding over the repair area, extending 8 inches (203mm) in all directions from any part of the defect. When using hot asphalt as the method of application, use Type IV asphalt recommended by the membrane manufacturer and take care to maintain the asphalt at a minimum of 400°F (205°C) at the point of application. When torching, work gradually, applying heat only sufficient to achieve adhesion without damaging the membrane reinforcement or scorching surrounding membrane.



Except where noted, all repairs apply to both APP and SBS type modified bitumen systems.



Repair instructions continue on back of this page ▼

Loose or Displaced Wall and Base Flashings *continued*



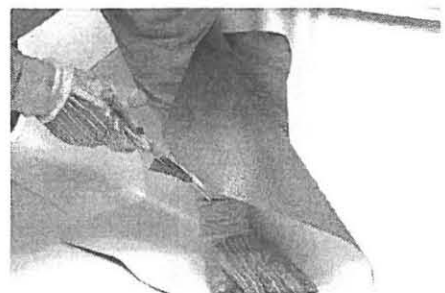
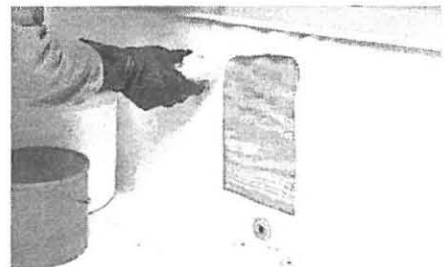
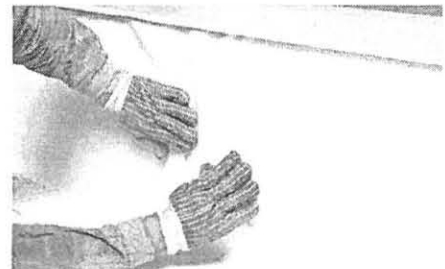
- 9 Apply moderate pressure to the patch to assure adhesion to the existing membrane.

Loose or Displaced Wall and Base Flashings

Some systems are installed unadhered to the substrate; check to ensure that the loose flashing are not found over the entire roof surface.

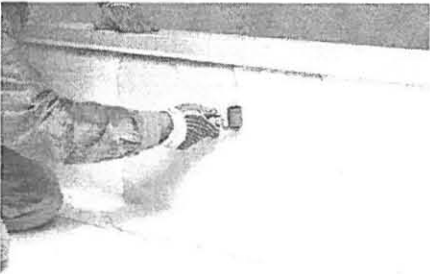
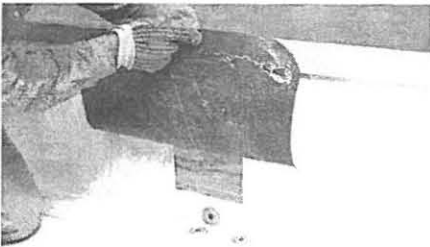
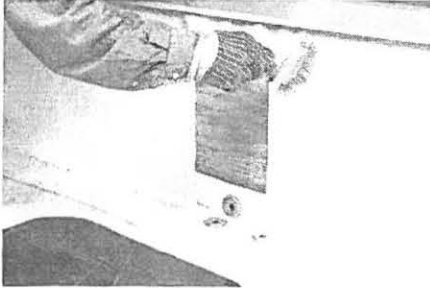
Repair unbonded flashings in the following manner:

- 1 After preparing the membrane (see steps 4-5), cut back flashing materials that are unadhered, wrinkled or displaced until reaching adhered material. If the cut will interface with the field of the roof, mechanically attach the field membrane prior to cutting the flashing.
- 2 Sweep and scrape clean the existing substrate to be flashed. Wipe down the underside of the membrane (surface to be adhered to the substrate) with solvent and allow to dry.
- 3 Readhere loose materials by hot-air welding or bonding adhesive recommended by the membrane manufacturer.
- 4 Install a patch to repair the cut location. To promote thorough adhesion of a patch, it is essential to begin preparing the surface by removing debris, contaminants and ballast from the area of the membrane and flashing to be repaired. The area prepared should extend beyond the perimeter of the patch to provide an ample sized clean work area.
- 5 Scrub the repair area with a solution of detergent and water, such as Spic 'n Span™ or other detergent containing trisodium phosphate. Use warm (if available) water and a stiff bristle brush to scrub the membrane.
- 6 Rinse thoroughly with clean water and allow the membrane to dry. A rubber bladed squeegee and clean, absorbent, lint-free cloths may be used to facilitate drying.
- 7 Cut a patch from a piece of new membrane material large enough to extend 4 inches (103mm) beyond any part of the defect. Round all corners of the patch to limit peeling of square corners.
- 8 Wipe the area of the existing membrane to receive the patch and the underside of the patch material with a clean, absorbent, lint-free cloth dampened with a solvent such as methyl ethyl ketone



Repair instructions continue on back of this page ▼

Loose or Displaced Wall and Base Flashings continued



(MEK) or acetone. Do not pour the solvent directly on to the membrane. Wipe the area with the solvent dampened cloth.

9 Allow the surface of the membrane and patch to air dry.

10 Weld the patch in place by using the three-step thermoplastic welding steps: tack-weld, pre-weld and final-weld as described in the following:

Tack-weld the patch to the existing membrane by using a hot-air welder to weld the membrane sufficiently to hold the patch in place taking care to not wrinkle the patch material.

Pre-weld the patch by inserting the hot-air nozzle under the patch and forming a continuous pre-weld approximately 2 inches (51mm) from the edge of the patch. This pre-weld will prevent heat leakage during the final-welding and is achieved by following the welder nozzle closely with a rubber-faced hand roller to provide pressure to adhere the back of the weld area.

Final-weld the outer 2 inches (51mm) by concentrating the heat on the remaining unadhered outer portion of the patch until the membrane and patch have reached the welding temperature. The hot-air welder should be moved quickly enough to avoid scorching the membrane, yet slowly enough to achieve a complete weld. Immediately behind the welder, roll the material to be bonded with the rubber faced hand roller, rolling parallel to the outside edge of the welder nozzle and pressing firmly to adhere and mate the materials.

11 After the welded area has cooled, check seams for voids with a rounded tip probe such as a screwdriver or awl with the tip rounded.

12 Where patches are made with reinforced membrane material, seam seal the outer perimeter with seam sealant or caulking paste compatible with the membrane. This will prevent water from wicking through the exposed edge of the reinforcement.

13 If the ballast was removed, redistribute the ballast over the exposed area.

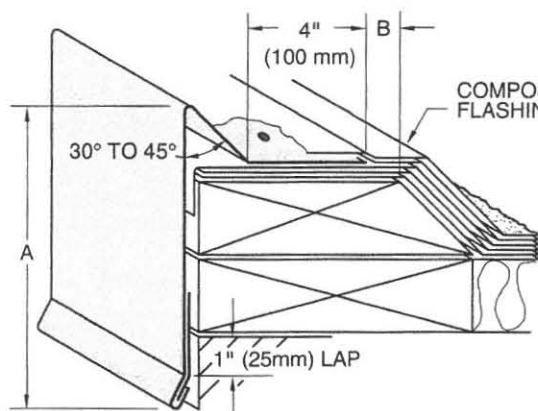


FIG 2-1A

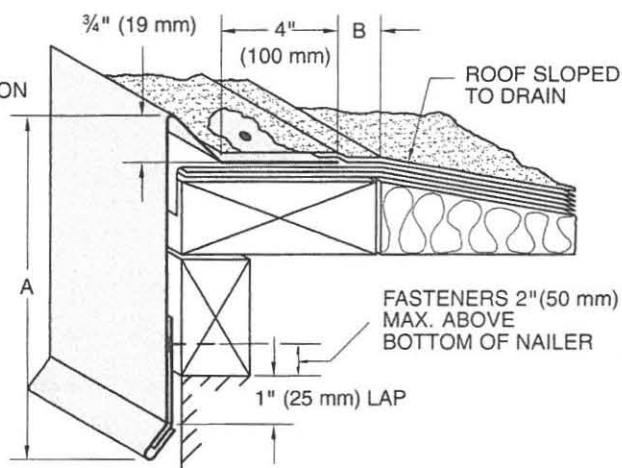
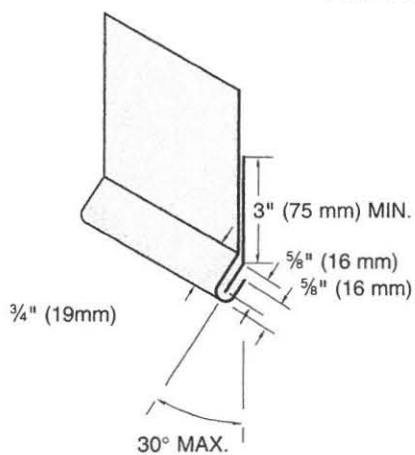


FIG 2-1B

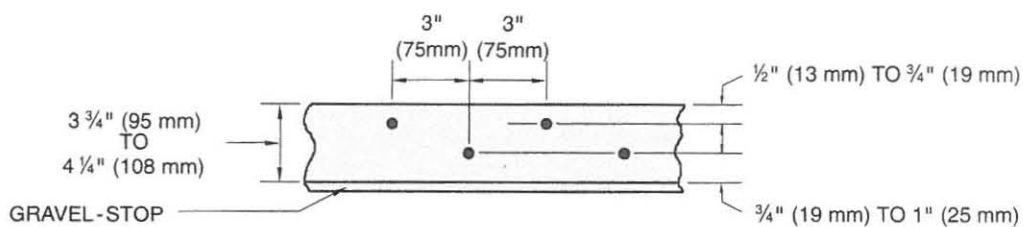
A = 4" (100 mm) MAX. UNCLEFTED

A = 10" (254 mm) MAX. CLEFTED

B = 1/2" (13 mm) MIN.

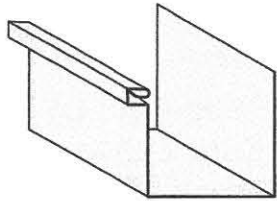


DETAIL 1

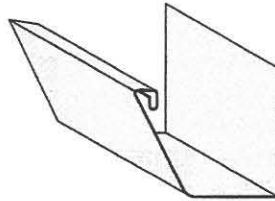


BASIC FLANGE NAILING PATTERN

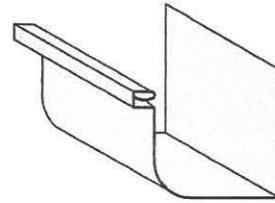
FIGURE 2-1 FORMED GRAVEL-STOP-FASCIA — DESIGN DATA



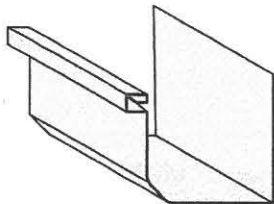
STYLE A



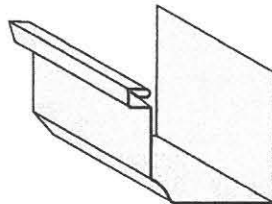
STYLE B



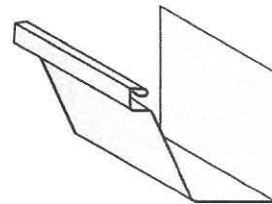
STYLE C



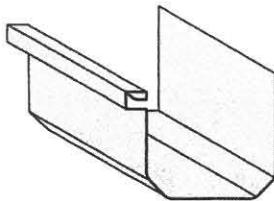
STYLE D



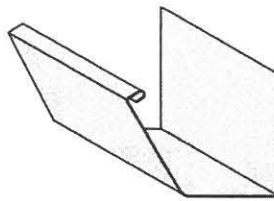
STYLE E



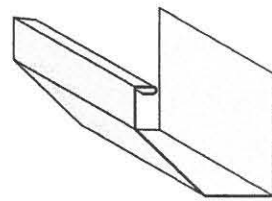
STYLE F



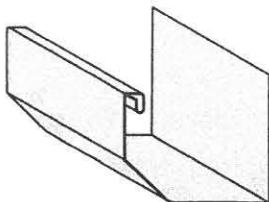
STYLE G



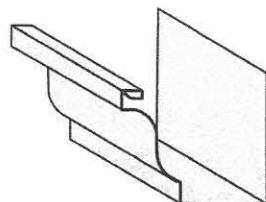
STYLE H



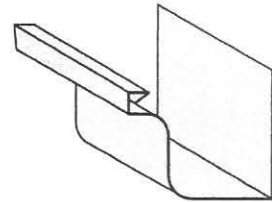
STYLE I



STYLE J



STYLE K



STYLE L

FIGURE 1-2 RECTANGULAR GUTTER STYLES

Nails should be driven straight, flush and snug to the surface of asphalt shingles.

The nailing of hips, ridges and some roof accessories may require the use of longer nails because fasteners must penetrate through more layers of roofing and/or material.

For full-width shingles, a minimum of four nails should be used per shingle. See Figure 7.

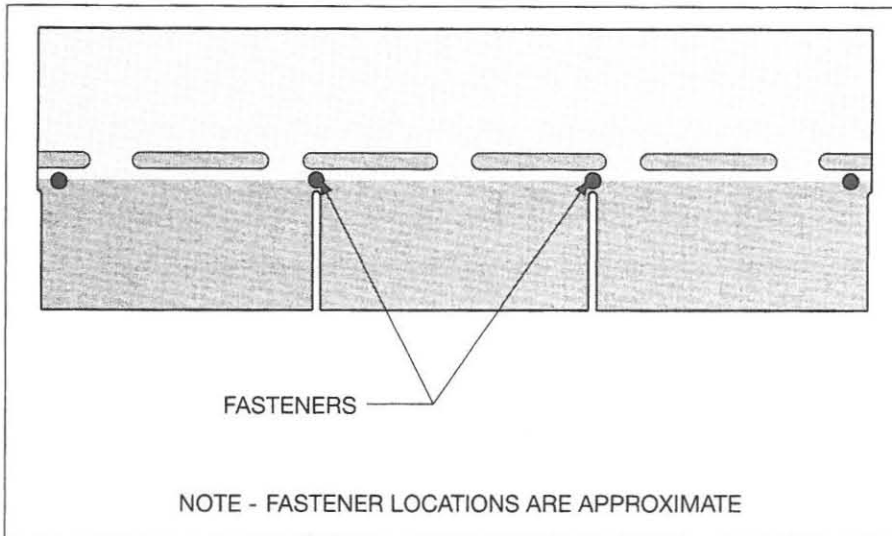


Figure 7: Approximate fastener locations for four-nail pattern

Six nails per full-width strip shingle may be required by building codes in some high-wind areas. See Figure 8.

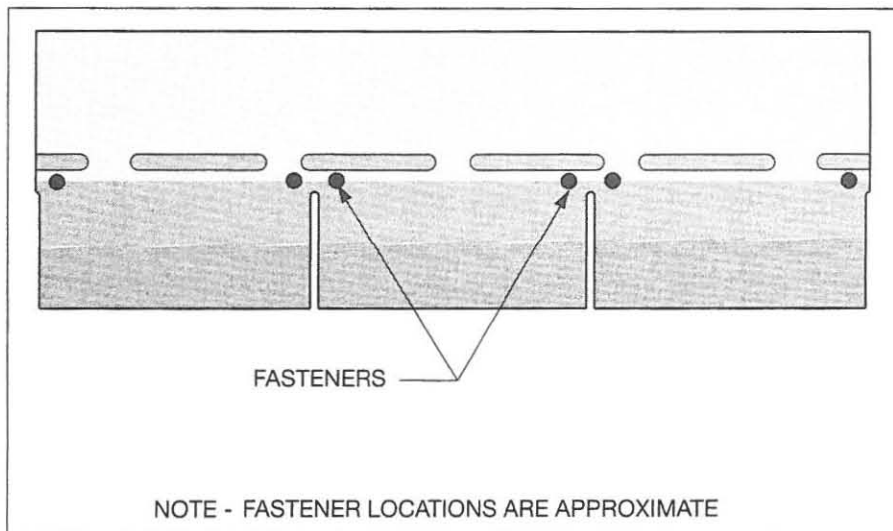


Figure 8: Approximate fastener locations for a six-nail pattern

For roof slopes 18:12 (56 degrees) and greater, NRCA recommends that asphalt shingles be fastened with six nails and manually sealed with asphalt flashing cement. The latter process is commonly known as "hand tabbing." Some manufacturers require six nails per shingle and hand tabbing on slopes as low as 12:12 (45 degrees) depending on the shingle product. Consult manufacturers for specific product requirements.

For individual shingles, a minimum of two nails should be used per shingle.

The locations for asphalt shingle fasteners as shown in Figures 7 and 8 and manufacturers' printed installation instructions should be recognized as the approximate locations where attachment is intended. Actual consistent fastener placement in the exact locations depicted is not possible in the application of asphalt shingles under normal rooftop conditions. The application of asphalt shingles in a rooftop environment is not an exact process and minor deviations from the intended fastener locations should be anticipated and tolerated.

3.5 Offset Patterns

There are several offset or side-lap gauge patterns used with three-tab shingles, and the pattern used generally is selected based on manufacturer or installer preference, regional or climatic experience or common practice. However, there are three general pattern variations that are common for the application of square-butt, three-tab strip shingles.

Following are descriptions of these three patterns.

- Cutouts that break joints on thirds, or the 4-inch method — A cutout is the section of a three-tab asphalt shingle that has been cut out at a factory to separate individual tabs. For standard size shingles, the offset pattern is achieved by offsetting the consecutive shingle courses by 4 inches (100 mm) as shown in Figure 9. For metric-sized shingles, the offset pattern is achieved by offsetting each consecutive course 112 mm (4 $\frac{3}{8}$ inches). Cutouts are also referred to as key-way or water-slots. However, it is the gauging of these cutouts in neighboring shingle courses that gives a shingle roof system a particular pattern. See Figure 9.

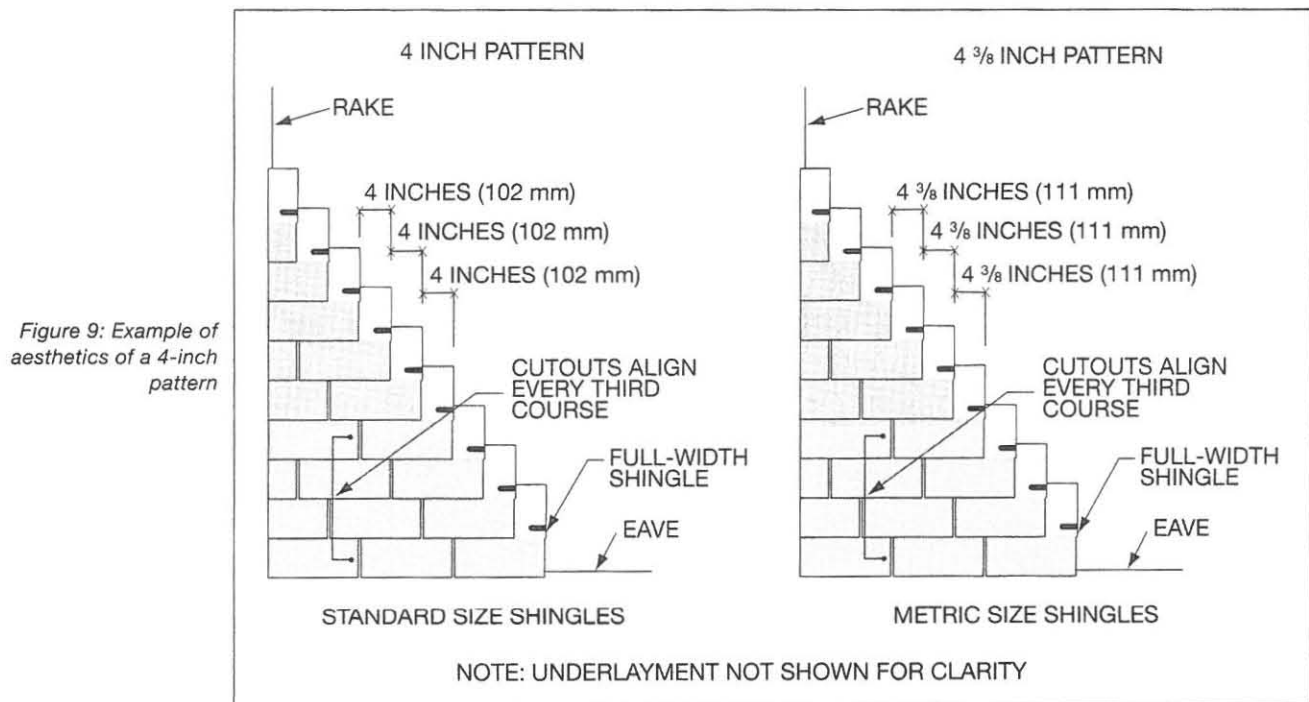


Figure 9: Example of aesthetics of a 4-inch pattern

- 5- and 5 $\frac{1}{2}$ -inch methods — A more random visual affect of a finished roof system can be achieved by offsetting cutouts in neighboring courses. For standard-sized shingles, the offset pattern is usually accomplished by removing approximately 5 inches (125 mm) from each consecutive course (after the first full-width shingle in the first course). For metric-sized shingles, this offset pattern is achieved by offsetting each consecutive course 143 mm (5 $\frac{1}{2}$ inches) as shown in Figure 10.

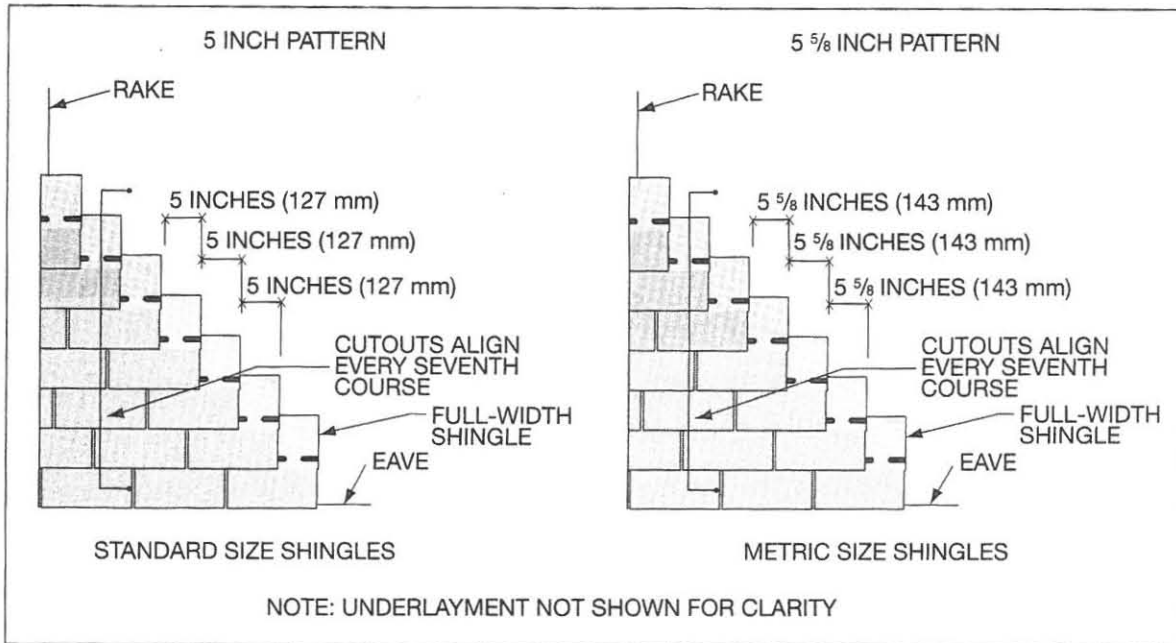


Figure 10:
Aesthetics of a
5-inch pattern

- Cutouts that break joints on halves, or the 6-inch method — This procedure will establish a sidelap gauge pattern for a roof system whereby the cutouts break joints on halves with the course below the cutouts line up in every other course. For standard-size shingles, the offset pattern is achieved by offsetting consecutive shingle courses by 6 inches (150 mm). For metric-sized shingles, the offset pattern is achieved by offsetting each consecutive course 168 mm (6 5/8 inches). (see Figure 11).

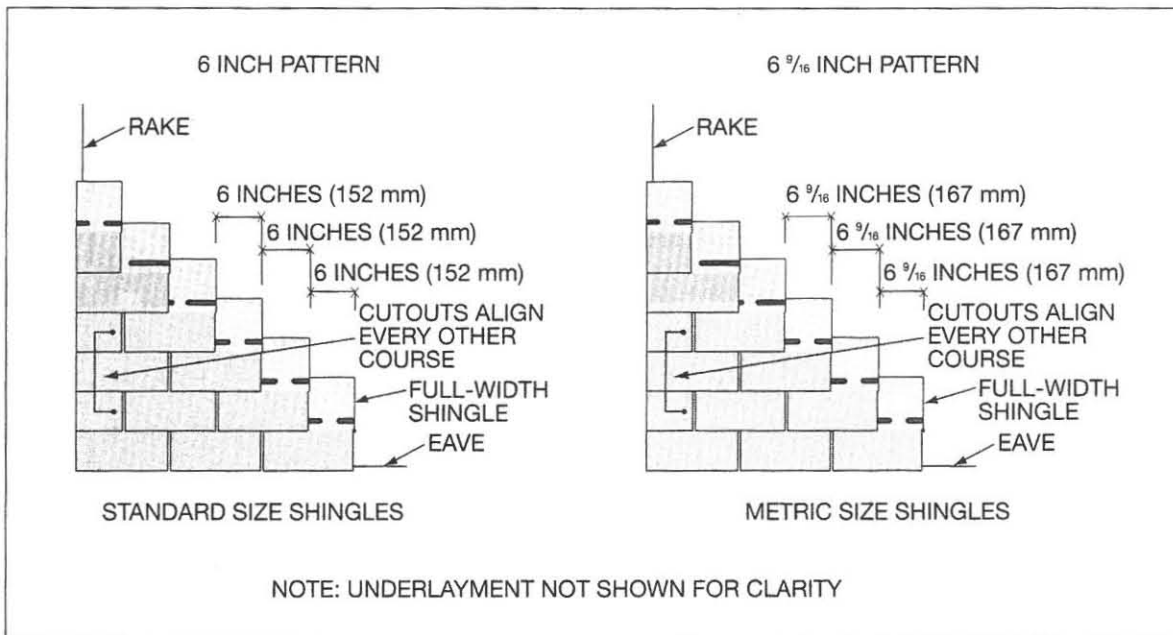


Figure 11:
Aesthetics of a
six-inch pattern



2

—

0

No Halve





Second Story



Low Slope



Ice & Water



Eye View



Street View



Roof Pitch



Dormer Pitch

24/12

2

1

0

0/12

-

No Half