Manufacturer Standard Details:

Reinforcing Accepted Standards as Common Knowledge

By John J. Serke, AIA, RRC

Introduction

Manufacturers of roofing materials recommend how their products are to be installed through details published in their literature. Many manufacturers publish details similar to those of other manufacturers. The National Roofing Contractors Association (NRCA) and other associations often publish duplicate versions of these details, expanding upon the quantity and sophistication of the information. If the industry accepts these documents as standards for performance, one might wonder why the roof consultant should bother to draw his or her own details?

This paper discusses an array of typical building details, including those for roof edges and parapets, roof curbs, and small and large penetrations from manufacturers and NRCA standard details. The advantages and shortcomings of making such standard details those of the consultant will be highlighted.

Construction drawings form part of the Project Manual and are legal documents for the purposes intended: to build new structures and repair or renovate old structures. The ultimate users of these drawings are the tradespeople in the field and those associated with overseeing and consulting on the work in progress. Clarity and completeness are the ultimate goals when preparing these documents in order to speed along the work without undue confusion. Information that is considered "accepted standard" need not be included in those details!

Construction drawings include a variety of architectural, structural, mechanical, electrical, and plumbing information, as well as other specialty items for incorporation into the building. *Appendix 1* includes a detailed breakdown of these drawings and how they are organized.

Roofing Details – a General Overview

Roofing details actually begin with the finished product – the roofing membrane. Manufacturers of roofing materials and associated products recommend how their products are to be installed through details published in their literature. Many manufacturers publish details similar to one another. SPRI provides a "Cross-Referenced Index to Manufacturers' Design Details" in its published manual. The NRCA, as well as other non-manufacturing groups, publish details, often duplicating and expanding upon the information published by the manufacturer. If the industry accepts man-

ufacturer details as standards for performance, why should the roof consultant bother to draw details?

The technological sophistication of our buildings is often reflected in the amount of equipment located on the roof. Prior to World War II, ventilation and plumbing devices were the only elements of a roofscape. A parapet wall that accommodated metal flashing and counterflashing terminated the perimeter. Coal tar pitch, asphalt, and rag felts comprised roof systems. Possibly a wooden curb with a heavy, wooden, sheet metal-covered access hatch was included. Today, the roof has become the top floor of the building, and the roofscape contains every conceivable piece of equipment to operate the building.

Details published by roofing manufacturers after WWII were relegated to flashings, drains, pitch pockets, and a few other standard conditions. As recently as 1976, the NRCA's *Manual of Roofing Practice* (orange cover) included 23 details, alpha-

Appendix 1

Blueprint Reading as it Pertains to Roofing

(Taken from a 1979 document prepared by John J. Serke, AIA)

Construction documents are divided into two (2) categories:
1. Drawings
2. Specifications.

The **drawings** are divided into the following:
- Architectural
- Structural
- Mechanical
- Electrical
- Plumbing

The purpose of drawings is to show the scope and extent of work.

Specifications are divided into two (2) major subdivisions:
- General
- Technica

The purpose of specifications is to identify the type of system or procedure to fulfill the scope of work.

When bidding a project, look at both documents in order to know everything about the job. The purpose of this outline is to identify where to look for all the information.

Architectural drawings contain:
- Site plans
- Floor plans
- **Roof plans**
- **Building elevations**
- **Building sections**
- **Wall sections**
- **Details**
- Door schedules/window schedules
- Finish schedules
- Reflected ceiling plans

Roof Plans show dimensions, general location, and size of projections, amount of equipment, section marks.

Building Elevations show building heights, window openings, section marks.

Building Sections show a general idea of the total building (sort of a road map) and building heights and serve as target markers for larger scale details.

Wall Sections show a single wall from foundation to parapet at a larger scale than building section. It is from this drawing that a good deal of the information is derived.

Details show, at a larger scale, certain components such as through-wall flashing, counterflashing, projection flashing, window flashing, and membrane waterproofing.

Structural drawings show the frame of the building. If the architectural drawings do not show a roof plan, it is quite likely that the structural drawings will. The roof plan is important because it shows:
- Structure
- Height and slope
- Major openings through roof

Mechanical drawings may include a roof plan, which shows equipment location. In addition, the mechanical drawings have a schedule of fans and air conditioning equipment that may go on the roof.

Electrical drawings do not usually relate to the roof.

Plumbing drawings and riser diagrams will show the number of vent stacks and roof drains.

General Specifications contain the advertisement for bidders, bid forms, instructions to bidders, and general and supplemental conditions. Alternates will be shown here, as well as adds, deducts, and unit prices.

Technical Specifications give the name of the manufacturer, as well as the specific type of material specification. In some cases, a performance specification will be issued, and a manufacturer must meet the criteria. The materials section is very important because it serves as a checklist against the drawings and visa versa.

Division (Section) 7 is called Thermal and Moisture Protection and is the most important of all technical sections. Other sections that might be referred to include: Mechanical, Plumbing, Structural, and Masonry.

Drawings and specifications are not always complete. There may be some gaps, omissions, mistakes, or discrepancies that cannot be answered. Bid what you can live with and logically defend.

***Appendix 1** continued on page 10*

Appendix 1 Blueprint Reading as it Pertains to Roofing *continued*

ESTIMATING CHECKLIST

1. Specifications
2. Section I (not necessarily in this order)
   - Introduction to Bidders
   - Table of Contents
   - List of Drawings
   - Instruction to Bidders
   - Proposal Form
   - General Conditions/Special Conditions
   - General Requirements (sometimes called Division 1)

3. Section II – Technical Specifications
   - Division 2 – Sitework – very rarely includes waterproofing
   - Division 3 – Concrete – very rarely includes waterproofing
   - Division 4 – Masonry – may include through-wall flashings
   - Division 5 – Metals
   - Division 6 – Wood and Plastics – rough carpentry related to roofing
   - Division 7 – Thermal and Moisture Protection
   - Division 8 – Doors and Windows
   - Division 9 – Finishes
   - Division 10 – Specialties - very rarely includes skylights, roof curbs, etc.
   - Division 11 – Equipment
   - Division 12 – Furnishings
   - Division 13 – Special Construction
   - Division 14 – Conveying Systems
   - Division 15 – Mechanical – includes HVAC, plumbing, fire protection
   - Division 16 – Electrical

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

07100 WATERPROOFING

Waterproofing is required if the foundation of the building sits in a water table where there is ground water. If specified, this can be a large dollar item. Roofers do the mastic, fluid, bentonite, and sheet membrane items but not metal oxide or cementations.

07150 DAMPROOFING

Usually called for at foundation walls, elevator pits, and sometimes on the outside of interior walls in a cavity wall. Less costly in material but requires some labor.

07190 VAPOR AND AIR RETARDERS

The only retarder we are concerned with is one that goes under the roof insulation. Visqueen or polyethylene under concrete slabs is not the roof consultant's concern.

07200 INSULATION

This section includes all insulation. The only insulation of concern is that for the roof. Very often roof insulation is specified in the roofing section.

07250 FIREPROOFING

Not part of the roofing trade.

07300 SHINGLES AND ROOFING TILES

Shingles aren't bid unless it is a small part of a large membrane roofing project.

07400 PREFORMED ROOFING AND CLADDING

Same as shingles.

07500 MEMBRANE ROOFING

This is where most work is done.

07570 TRAFFIC TOPPING

This may or may not be a concern. If the material is cementitious such as Dex-o-tex, we do not install it. We install fluid, mastic, Neoprene, and rubber products.

07600 FLASHING AND SHEET METAL

This section is always our responsibility.

07700 ROOF SPECIALTIES AND ACCESSORIES

Very often this is included under section 7600. The main items covered are the copings and accessory metal around the perimeter, roof hatch, and (sometimes) skylights. Some items, such as equipment curbs, drains, and penthouse ventilators, may be included but should be excluded.

07800 SKYLIGHTS

Pre-assembled skylights and smoke vents are usually bid, but not the more sophisticated ones that are assembled in the field.

07900 SEALANTS AND CAULKING

Not our trade section.

Appendix 1 *continued on page 12*

betized A through W. All details represented built-up roof conditions. By contrast, in the 1996, 4th edition, *NRCA Roofing and Waterproofing Manual*, this author counted 52 built-up roofing details, 52 modified bitumen details, 52 thermoplastic details, 50 thermoset details, 16 protected membrane details, and seven associated tables.

During the '50s and into the early '70s, typical roofing details drawn by architects shown on construction documents for new buildings included the roof hatch, roof vent stack, prefabricated skylight or equipment curbs, and manufacturers' expansion joint assemblies. Except for wood blocking and the structural deckinformation contained in these details was already published in the manufacturers' literature. Soon, architects copied and pasted manufacturer and NRCA details onto their detail sheet of construction documents. These published details replaced earlier onees that contained more building information for construction, such as wall and structural decking identification and attachment of wood blocking. Because manufacturer and NRCA details only represented the roofing membrane, information on substrate preparation and other non-roofing components was overlooked in the paste-up.

Today, architectural design is unlimited, very often pushing the edge of technology, and does not allow for manufacturers' standard details to cover complex roofing conditions. Relying on standard details to solve sophisticated design conditions often results in confusion, poor construction, and potential litigation. While manufacturers are publishing more global or universal

details that are general in nature, those details do not deal with specific architectural and building envelope design conditions such as geometric transitions and multiple material changes.

Are Manufacturers' Details Accepted Standards?

Manufacturers' details are accepted standards to the extent that they contain common information. Looking at *Illustrations 1, 2,* and *3,* it is logical to assume that manufacturer standard details and other non-manufacturer details do reinforce accepted standards.

- Is the manufacturer's detail an acceptable standard? Yes!
- Is NRCA detail BUR-3 an acceptable standard? Yes, if referenced on the detail (preferable) or in the specification!
- Is Consultant's Detail-1 an acceptable standard? Consultant's Detail-1 augments the manufacturer and NRCA details with specific information to replace wood blocking and upgrade code requirements. Consultant's Detail-1 implies that the roof will be installed correctly per the manufacturer's details because the specification requires it, as does the manufacturer's warranty.

What Constitutes a Manufacturer's Standard Detail?

Continuity!

Continuity over a period of time!

Continuity with other manufacturers!

Continuity between manufacturers and non-manufacturers (recognition by the industry)!

Manufacturers' Standard Details:

What are those standard details, and how much of an accepted standard do they provide? Drawing from the NRCA details, which reflect the manufacturer details, we find seven categories of standard details:

- Drains: scuppers, gutters, and internal
- Perimeter: parapet, raised edge, and metal edge
- Rising wall: integral with through-wall flashing, embedded, surface-mounted
- Curbs around penetrations: pipes, ductwork, structural components
- Supporting curbs: dunnage, HVAC, fans, skylights
- Pipes and conduits: vent stacks, electrical conduit
- Pitch pockets and premanufactured devices

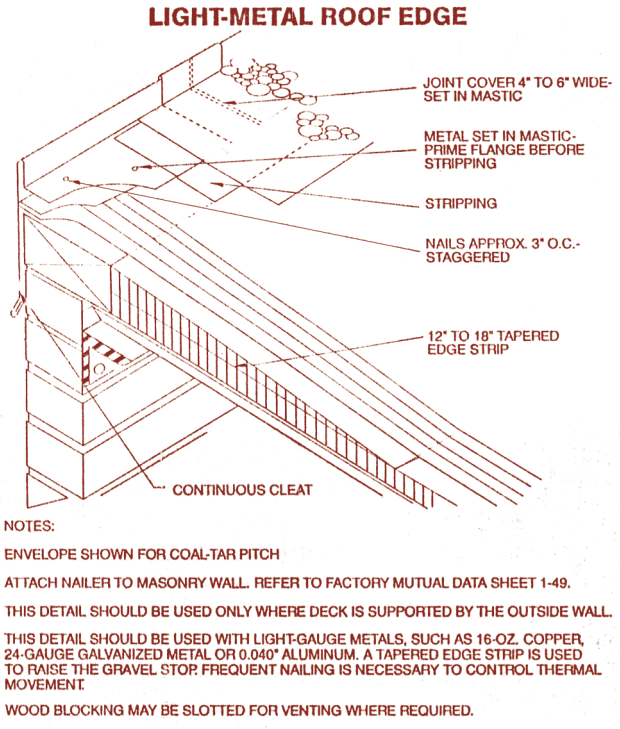

Illustration 1: Manufacturer's standard edge detail shows roofing system in place. There are no references to other building materials and construction. The manufacturer's publication references NRCA and FM publications for more information. This is a typical example of a manufacturer's accepted standard detail.

Appendix I Blueprint Reading as it Pertains to Roofing *continued*

TRADE ITEM BREAKDOWN

Part 1 – General

This usually refers to the general conditions and other documents in Section 1 of the specification. Sometimes they will include other trade sections that are important like carpentry, mechanical, etc.

Usually a description of the work involved is included and sometimes (especially 7600 – sheet metal) a breakdown of items is included. This is the first place where an idea of what will be estimated is obtained.

Requirements for submittals and samples are detailed. This is not important in takeoff – only if the firm lands the job.

Sometimes the guarantee requirements are included in the General section.

Part 2 – Products

This includes what will be installed. Usually one or more manufacturers is listed. This section can be extremely long or quite brief, depending on whether a manufacturer (or equal) is specified. This is where most of the specifier's time will be spent. Usually the items listed in this part of the specifications can be verified and coordinated with the contract drawings and Part 3 of the specifications (execution).

Part 3 – Execution

This describes how to install the products. Very often the directions are reprinted from a manufacturer. Sometimes there is a great discrepancy between the materials that are mentioned in Part 2 and Part 3. Careful attention must be paid to this section.

Editor's Note: Technical specification reference sections are currently undergoing revisions by CSI and may be changed.

BLUEPRINT READING AS IT PERTAINS TO ROOFING – *SELF TEST*

- Into which major subdivisions are specifications divided?
- Where are instructions to bidders found?
- In what section (division) of the specification can one find roofing and waterproofing? Insulation? Through-wall flashing?
- What is the difference between a building section, a wall section, and details?
- If there is no architectural roof plan, where should one look for information about the roof?
- Where can one find or check the list of equipment on the roof?
- How can one find out if the roof deck is sloped, and where can one determine the composition of the roof deck structure?
- Where is through-wall flashing shown, and how is the footage taken off?
- How is the height of the building verified?
- Where is insulation described, and how does one determine how it is adhered to the deck?

Incorporating Manufacturer Published Details into Projects:

Simple buildings with simple roof conditions often require moderate explanation of how manufacturers' roofing products are installed. More than one manufacturer of the same type system publishes the same or similar detail for a particular condition. When the roofing contractor and consultant are familiar and confident enough, manufacturer standard details provide an easy and reliable method to identify the conditions for the work product. This happens every day since many projects are completed between an owner and roofing contractor without a roof consultant, architect, or engineer. This author's experience has shown that a simple reroofing or recover project can be accomplished without publishing (incorporating into the Project Manual) any details, only under certain conditions:

- The contractors are prequalified.
- The roof manufacturers are preselected, and no exceptions are allowed.
- The construction of the building components to which the roofing system is attached meets code requirements.
- The project is not financed by public funds.

This writer's experience has also shown that all projects, with or without published details, benefit from the following:

- The specifications are clear as to the type system and the role of the manufacturer.
- The documents require the roofer to submit the manufacturer's standard details that will be used on the project.

What are Look-alike Details?

Roofing details incorporated into other building material manufacturers' details should not be confused with roofing manufacturers' standard details. Brick, CMU, EIFS, curtain wall, SMACNA (sheet metal manufacturers), FM, and others include roofing details for application of their products or conformance to their standards. Do not use their details as roofing details. They publish details or information that augment (see below) but do not set the standard for roofing. Some of these entities convincingly illustrate what appear to be good roof details. They may be, but they should not be considered in the same category as man-

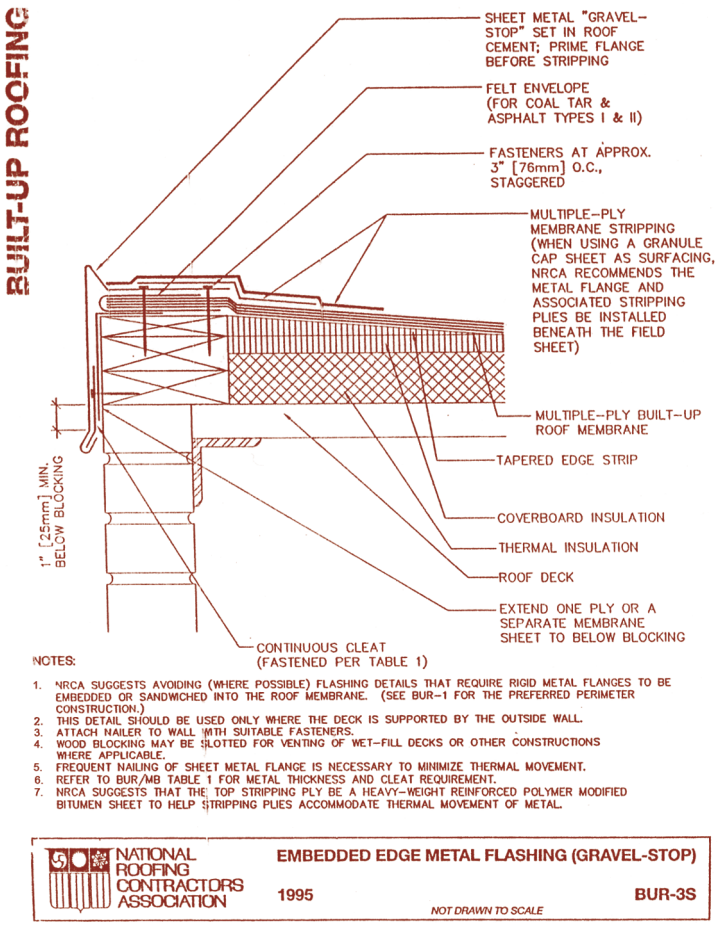

Illustration 2: NRCA detail BUR-3 shows very similar information as Illustration 1, with some additional guidelines. This BUR detail reflects many details of built-up roofing manufacturers. Both details (Illustrations 1 and 2) should be considered common knowledge as accepted industry standards.

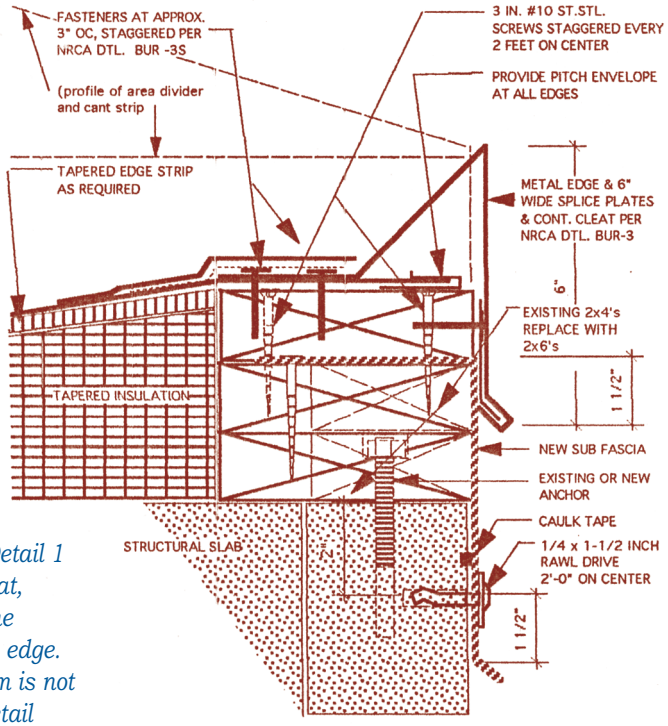

Illustration 3: Consultant Detail 1 describes the conditions that, along with the roof, form the building components at the edge. Note that the roofing system is not described in detail. This detail does reference NRCA detail BUR-3 (Illustration 2 above).

Appendix 2

Detail Guideline Checklist

DRAINS:

- Confirm that drainage system meets National Plumbing Standard and local codes for drainage based on roof areas.
- Assure adequate attachment and/or support.
- Provide for secondary drainage when required.
- Ensure proper minimum slope to drain.
- Facilitate additional slope at drain sump.
- Define which manufacturer's standard detail is to be incorporated into the work.

PERIMETER:

- Identify that the structure, the building envelope, and the roofing system can be joined together and made watertight.
- Calculate wind uplift design parameters (both metal edge and parapet).
- Determine existing or define new through-wall flashings to eliminate water or moisture vapor intrusion.
- Review manufacturer's details of other building components to assure compatibility (including caulking and sealants).
- Define the materials and procedures to overlap and seal various building components.
- Define which manufacturer's standard details are to be incorporated into the work.

RISING WALL:

- Confirm that the structure, the building envelope, and the roofing system can be joined together and made watertight.
- Determine existing or define new through-wall flashings to eliminate water or moisture vapor intrusion.
- Review manufacturers' details of other building components to assure compatibility (including caulking and sealants).
- Define the materials and procedures to overlap and seal various building components.
- Define which manufacturer's standard details are to be incorporated into the work.

CURBS AT PENETRATIONS:

- Confirm that the penetrations are adequately braced to support themselves.
- Review penetration manufacturer's details to assure compatibility (including caulking and sealants).
- Review mechanical and plumbing cuts of equipment to be flashed.
- Allow for expansion and contraction.
- Allow for insulation of piping.
- Allow for proper distance between penetrations to accommodate watertight flashings.
- Define the materials and procedures that are compatible to seal various kinds of penetrations.
- Define which manufacturer's standard details are to be incorporated into the work.

CURB SUPPORTING EQUIPMENT:

- Identify that the curbs are adequately attached to and supported by the structural deck.
- Determine if all supply penetrations are integral or require separate penetration flashings.
- Review mechanical and plumbing cuts of equipment to be flashed.
- Document which trade supplies and installs the counterflashing.
- Seal between the curb flashing and the equipment.
- Define which manufacturer's standard details are to be incorporated into the work.

PIPES, CONDUITS, AND STACKS:

- Identify that the penetrations are adequately braced to support themselves.
- Review mechanical and plumbing cuts of equipment to be flashed.
- Document which trade supplies and installs the counterflashing.
- Define which manufacturer's standard details are to be incorporated into the work.

PITCH POCKETS AND PREFABRICATED DEVICES:

- Identify that the penetrations are adequately braced to support themselves.
- Review mechanical and plumbing cuts of equipment to be flashed.
- Define which manufacturer's standard details are to be incorporated into the work.

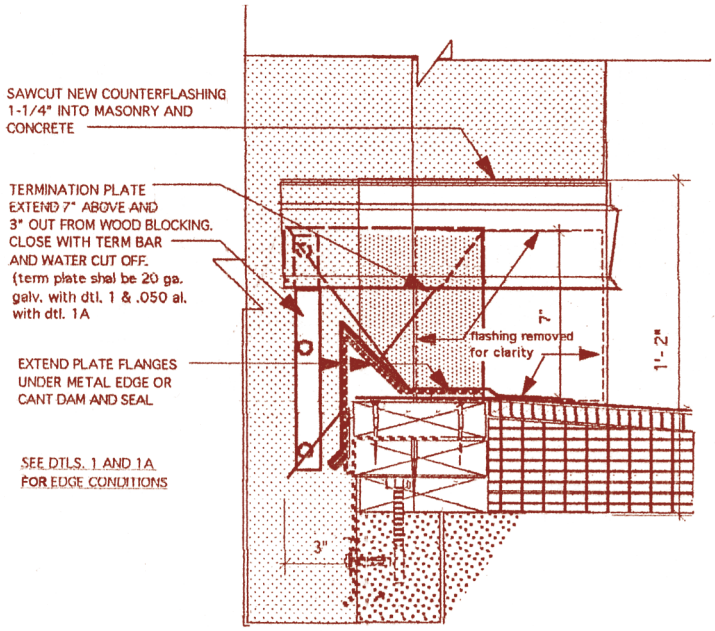

Illustration 4: Consultant detail 6, showing Edge Termination Detail 1 with elevation of edge transition to rising wall. Details that incorporate multiple conditions from manufacturers' standards must be prepared by the consultant. Some conditions are best shown in isometric.

ufacturers' standard details. The same applies to details published in professional or trade magazines. They may work well for a specific condition but are not an accepted standard.

Augmenting Manufacturer Details with Consultants' Details

A more concise method of incorporating standard details into a project is to identify the specific manufacturer's details that will be used. Another is to identify specific NRCA, SMACNA, or other non-manufacturing details that will be used. Identifying these details simply as "manufacturers' standards" or "as published by NRCA" is too vague, open to wide interpretation and can contribute to jobsite confusion. Referencing standard manufacturer or NRCA details should be identified by a specific number or design.

While a manufacturer's roofing detail may be considered standard, other items are not included as part of the manufacturer's standard details. Referring back to earlier illustrations in this paper, *Illustration 1* shows a manufacturer's edge detail; *Illustration 2* shows the NRCA detail BUR-3, and *Illustration 3* shows the consultant's edge detail (Detail-1). The building is a nine-story structure facing the Atlantic Ocean. You will note that consultant's Detail-1 has very little to do with describing roofing materials and a lot to do with other construction items, mainly securement to the structure. Detail-1 doesn't even mention the roof membrane. Like the manufacturer's detail, it makes reference to NRCA details.

Quality and Content of Details

Early in my architectural practice, we often looked at the way details were drawn. We used to refer to details as "a good-looking detail," refer to how the materials were graphically identified and which elements were incorporated in elevation behind the section where the detail was "cut." Conventional wisdom was that a good-looking detail was buildable. *Illustration 4* (consultant's Detail-6) is similar to consultant's Detail-1 except that it shows the termination of the metal edge against a rising wall. The flashing at the wall is shown in elevation. It is large so the information is legible. It is important because it shows a transition between two conditions. Although the detail may incor-

ILLUSTRATIONS 5 – 7 SHOW MANUFACTURERS' CONTINUITY OVER THE YEARS AS MINOR CHANGES DEVELOP.

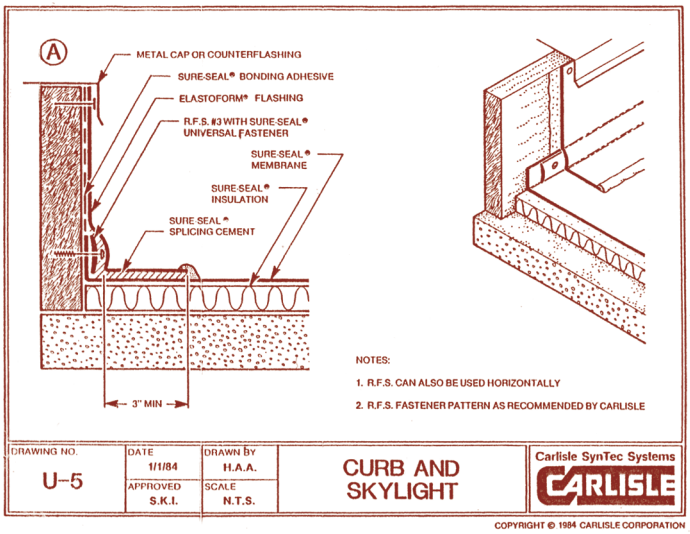

Illustration 5: 1984 detail with isometric, which is an ideal way to illustrate a transition and assembly of components – especially if the method is a recent development.

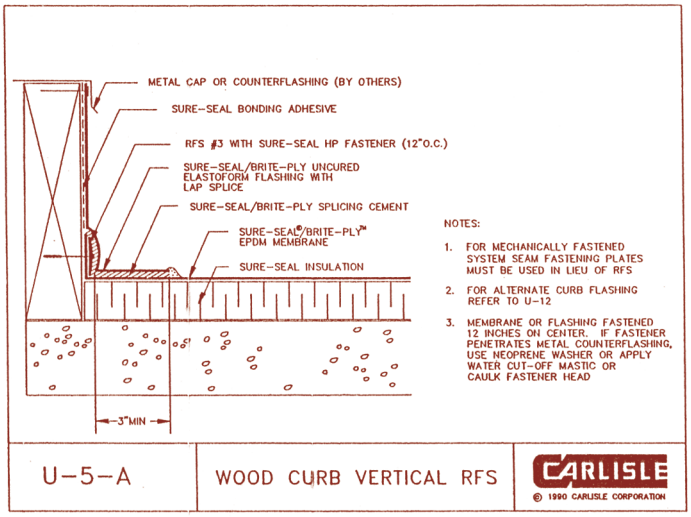

Illustration 6: 1990 detail revised without isometric but with more descriptive instructions in note form. Also note representation of curb material as wood.

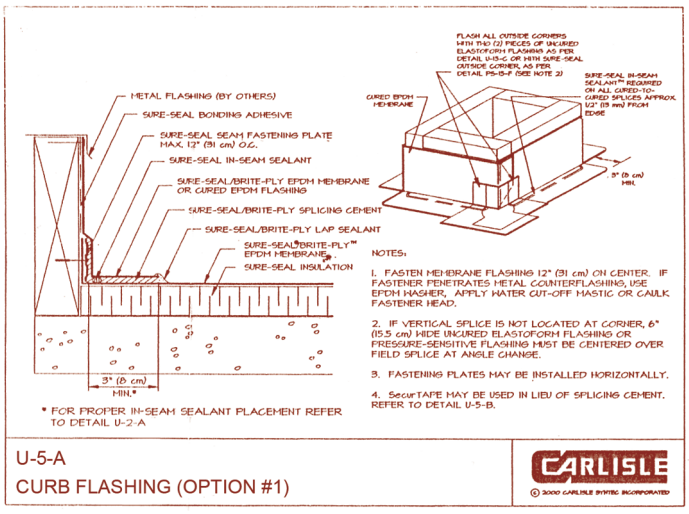

Illustration 7: 2000 detail revised showing a different assembly than that shown in 1984. It includes an isometric describing the assembly condition. Note that all three details fail to show how the curb is attached to the structural deck.

porate several standard details, it shows more specific information, both in section and elevation. An isometric of this condition, or more complicated conditions, is another way of getting the information into the field.

It is quite true that not all "good-looking details" are buildable, but it is also quite true that where details are cut and what is shown beyond the cut line, in elevation, are very important. Manufacturers' standard details, by their global nature, tend to be diagrams and do not reference other building materials or construction conditions related to the roofing system. Some manufacturers' standard details are so diagrammatic that the roofing materials appear to be placed in space.

The consultant's job is to focus on what needs to be shown that is not part of the manufacturers' standard and with the confidence that a contractor accepts manufacturer details as common knowledge and practice. One does not need to repeat what is already accepted knowledge. We should be able to rely on the fact that manufacturers and their contractors reinforce industry standards. If they do not, they should be made to do so!

Recover Roofing and Accepted Standards

Recover and reroofing projects may involve upgrading code items or replacing building components such as wood blocking drains, mechanical equipment, and structural decking or framing. Most manufacturers' details are prepared for new construction or roof replacement; there is little reference on manufacturers or details regarding preparation to recover an existing roof. This is where the consultant's specification for selective demolition and preparation for new roofing is most important. This is also where details beyond the standard manufacturer's details can be so critical.

Some architects and consultants prepare separate details for existing conditions and demolition and a second set of separate details for the new construction. This provides more detailed information for the contractor to plan for changes and upgrades in the building's construction. It certainly places more responsibility on the architect or consultant. Incorrect information on those details can be just as bad as or worse than no information.

Relying on Manufacturers' Standard Details

It is logical to assume that manufacturers' details reinforce the theory of common

knowledge and that they should be considered as accepted standards for the following reasons:

- Many of these details were established early in the roof system development and have been consistent over a long period.
- There is common information between manufacturer details for similar roofing systems.
- Non-manufacturing entities have duplicated and expanded upon manufacturer details.

Publishing Details

Details have a life of their own. They convey information that is both specific and generalized. It is this author's experience that manufacturers' details provide generalized information, that contractors do work at that generalized level, and that the consultant must provide additional documentation for specific information. Therefore, unlike manufacturers and contractors, the consultant works at multiple levels. The more complex the building design and technology, the less likely manufacturers' standard details will provide sufficient information. Therefore, it is important that a roof consultant provide details that go beyond manufacturers' standards and include all the other building envelope materials that work in conjunction with a roofing system. Consultants should develop their own resource library of manufacturers' materials and standards well beyond roofing. Consultants should retain specific information that can be incorporated into details that focus on the complete building envelope. These include:

- A reference library of "look alike" roofing details from other material

BECOME AN RCI APPROVED INSTRUCTOR

RCI Director of Educational Services Jerry Teitsma and GAF's CARE program director, Chris Mooney, will conduct a "Train the Trainer" session Friday afternoon, April 1, from 3:30 to 5:30 at the RCI International Convention in Miami Beach, FL. The session will include adult education methodology as well as an insight into the RCI Approved Instructor program. The meeting is open to all who are interested in teaching RCI courses. The general criteria for being an RCI Approved Instructor is to be a Registered Roof Consultant (RRC).

ILLUSTRATIONS 8 – 10 SHOW CONTINUITY BETWEEN MANUFACTURERS FOR A COMMON ROOF CONDITION. SIMILARITIES INCLUDE PLENTY OF NOTES ON EACH DETAIL AND NO REFERENCE TO DECK ATTACHMENT.

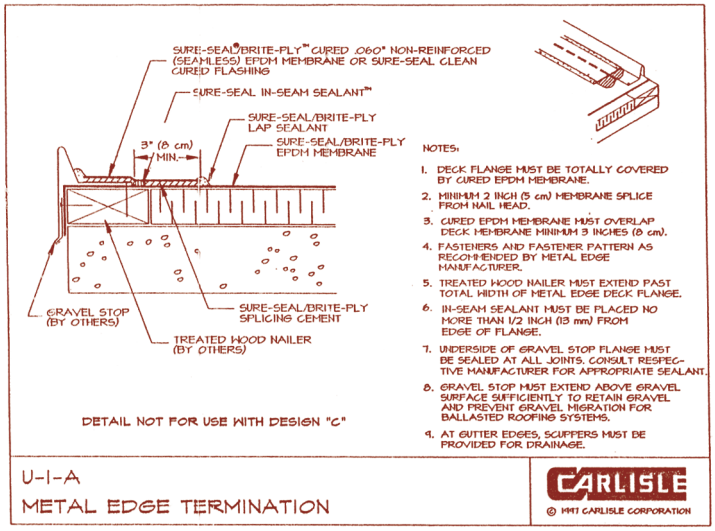

Illustration 8: 1997 Carlisle detail.

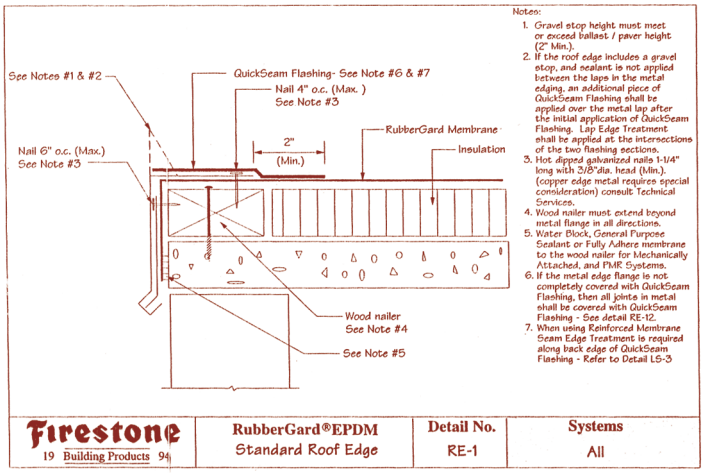

Illustration 9: 1994 Firestone detail.

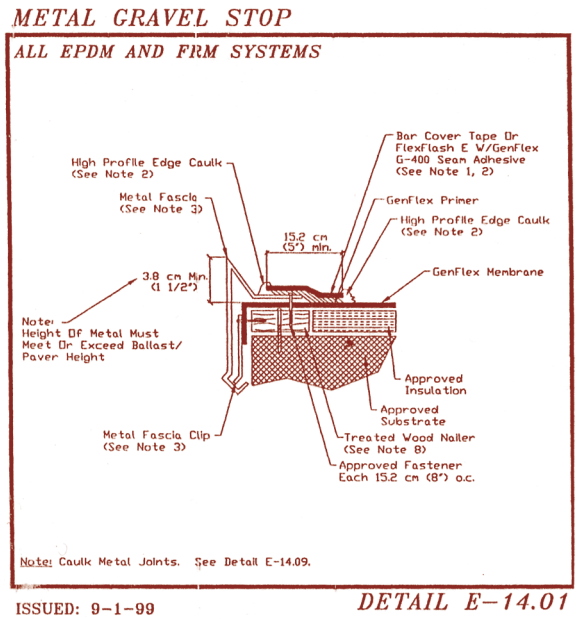

Illustration 10: 1999 Gen-flex detail.

manufacturers (brick and concrete block, EIFS, and metal panel manufacturers, to name a few) to see how they construct their materials relative to roofing.

- Publications on wind uplift, snow loads, and other structural design guides. ASCE-7 is the penultimate example.
- Full knowledge of applicable codes.
- A reference library of NRCA, ARMA, SPRI, and SMACNA publications.
- A reference library of FM and UL publications (FM fastening guidelines).
- A reference library of copper (*Copper and Common Sense*), stainless steel, and others that are instrumental in roofing products.
- A reference library of fastener manufacturers who provide a wealth of design performance criteria.

I am confident that many consultants can significantly add to this list.

Whether publishing details in a Project Manual or not, it is wise to require that the roofing contractor indicates precisely which manufacturers' standard details will be used in the roofing project. This includes not only roofing, but also all prefabricated components such as sheet metal. By this procedure, the consultant, the manufacturer, and the contractor are on the same page. The consultant and the roofing foreman in the field should get along very well as the work progresses. If the materials are not installed per the manufacturer's standards, they will be after it's been ripped out and done over. After all, what are standards for?

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John J. Serke, AIA, RRC

John J. Serke, AIA, RRC, is an experienced contractor and roof consultant. Mr. Serke traded as a commercial roofing contractor in the Philadelphia area under the name of Sernat Roofing Co. After fifteen years, he returned to the architectural world as a specialist providing roofing and building envelope services for commercial clients and other architects and engineers. He is owner of JDS Design Associates in Ardmore, PA. With his practical knowledge, Mr. Serke provides claim, litigation, and asset inventory support to major insurance companies, trial attorneys, and management firms across the United States.