Hoffmann Architects Journal

second issue 89

Why Roofs Fail

An examination of specific roofing problems, ranging from blistering to a lack of designer education

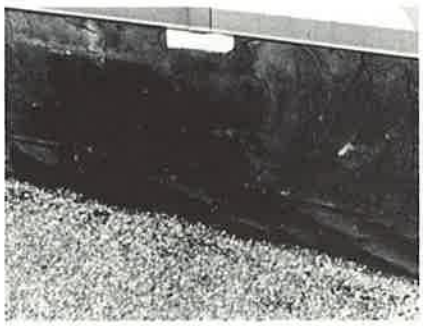
By Scott Melnick

A few years ago on a visit to Manhattan, I stopped in to see an architect who was involved in roof specification for one of the nation's largest building owners. We chatted for a while, and then he looked me in the eye, and said: "Scott, what's all this I've been hearing lately about white roofs?" Not for the last time, I realized that there is a great need for the dissemination of roofing information beyond that provided by manufacturer's literature. What follows is based on an interview with Karen L. Warseck, president of Building Diagnostics Associates, Hollywood, Florida.

Complaints about roofing rank number one on most building owners' lists, according to several studies. But why do roofs fail? In part, there's a lack of information about roofing throughout all phases of the design and construction industry.

A common lament from experienced architects and building owners is that recent graduates from architectural schools are up to date in the latest design trends, but not the basic systems that make a building work. "Fundamental theory is not taught well," Warseck says. "In some schools, materials and methods classes are given to fill accreditation requirements, not because they actually teach anything."

The problem continues during the first few years after graduation. Young architects are encouraged to change jobs frequently, either by lay-offs or to advance their careers. This movement discourages firms from investing time in teaching young architects about roofing since they will probably soon be leaving.



structural movement caused flashing failure

Fee-shopping

"Clients 'fee shop' looking for the cheapest design fees without understanding the consequences," Warseck says. When there are less fees, less work is performed. As a result, clients often receive bare bones drawings - just enough to get a permit, but not enough to ensure a good roof. And tight fees don't allow any extra money for consultants, materials research, or in-house or formal training programs.

Roofing is not a high priority in most design firms, so it usually is left to a younger draftsperson. "What happens is that standard details get copied from reference books without any clue as to whether or not they are relevant."

Another problem is that developers often know even less about roofs than do designers. And this translates into buying warranties, rather than a quali-

ty roof. What owners need to realize is that if they get a good roof, the warranty is redundant. *(If only the Board of Directors at my condominium realized this four years ago. They hired an inexpensive contractor, complete with warranty. But then when the roof failed, the legal costs of pursuing the guarantee exceeded the value of the warranty - sm.)* All too often, the roof is the first item to have its budget cut when a developer is looking to trim costs. This is especially problematical with speculative developers who quickly sell the property - and the roof becomes someone else's problem.

And, like almost everyone else, architects fall prey to the "If it's not broken, don't fix it" syndrome. "Most architects get used to using one particular material that has worked for them in the past. They then never change, even when something else may be more appropriate." This is a particular problem in the roofing industry, where systems change so rapidly it's almost a full time job keeping up with the changes.

poorly installed metal edge

These problems are exacerbated by the lack of high quality manufacturer literature that allows comparison from one system to another. "Sales literature rarely contains enough information to make informed choices." Warseck says. "If any details at all are shown in the literature, only the most basic are there with no explanation that actual conditions very rarely coincide with 'standard' details."

In addition, the various manufacturers cannot agree on which tests to use, with each claiming that their test is best - at least for their product. The tests that are used simulate aging since many of the products are too new to have actual installed data available.

Architects are particularly vulnerable to the lack of clear and concise data on roofing because very few have actual hands-on knowledge, according to Warseck. "They're unfamiliar with constraints of materials' installation requirements."

Lack of training causes many problems

The emphasis on low price especially hurts when it comes to hiring a contractor. "Lack of sufficient money precludes many of a contractor's work force from being able to participate in Roofing Industry Educational Institute (RIEI) or National Roofing Contractor Association (NRCA) sponsored programs or for the contractor to afford in-house training programs." Warseck says. And while not a guarantee of quality, professional affiliation is a step in the right direction.

poorly designed expansion joint termination

Roofing is an unglamorous, dangerous, uncomfortable profession and pay scales are lower than for other construction trades. Turnover is high, so too often the actual installation is performed by poorly trained work crews.

Once the roof is installed, owners often cause problems due to neglect. Maintenance should include semi-annual inspections, small repairs done on an as-needed basis and done correctly, and removal of debris from drains. □■□□

Scott Melnick is Editor-in-Chief of COMMERCIAL RENOVATION magazine.

The above article was excerpted from the December 1988 issue of COMMERCIAL RENOVATION, copyright 1988 by Qualified Remodeler, Inc., and used with permission. Karen L. Warseck was formerly Director of the Southeast Region office of Hoffmann Architects.

Hoffmann Architects

Roof Maintenance Inspection Checklist

Building _____ **Date** _____

Roof Designation _____

Address _____ **Inspected by** _____

The first step is to prepare a roof plan, showing the location of all penetrations, mechanical equipment and other roof top accessories. Figure 1 shows a sample of the types of things that are commonly found on roofs and what they are called. Figure 2 shows the roof shown in Figure 1 translated into a roof plan.

The interior of the building should then be inspected for signs of moisture and locations noted should be marked on the roof plan for later comparison on the roof. Next, inspect the exterior for signs of water damage, structural movement or deterioration that may transmit to the roof or explain moisture damage on the interior.

After these inspections are complete, inspect the roof membrane and flashings for deterioration or damage, especially noting locations marked from your previous inspections of the interior walls and ceilings and exterior walls. The checklist gives an outline of the items you should inspect.

Once your inspection is complete, the condition of the roof should be evaluated for repairs or replacement. If only a few minor repairs are required, you may want to simply call the roofing contractor to have them done. If major work is required, or if you are unsure at all about what is needed, consult with a qualified roof consulting firm (ours) to analyze the condition and provide professional guidance in solving your roofing problems.

figure 1

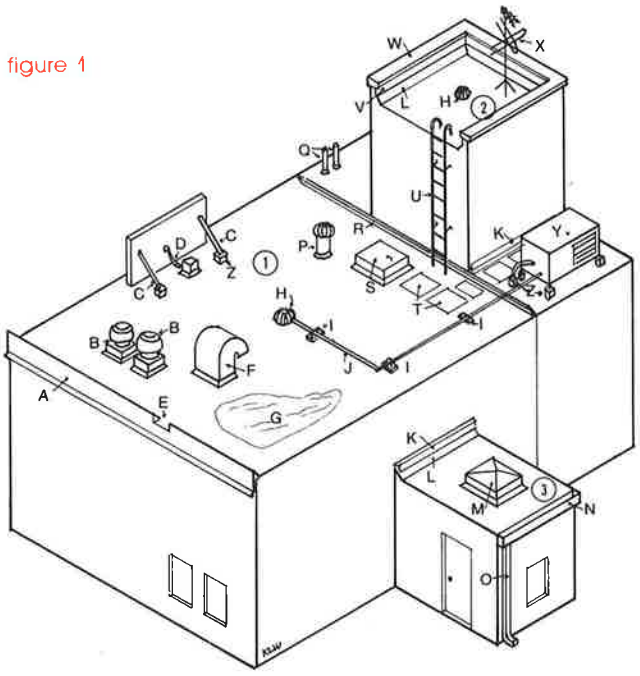
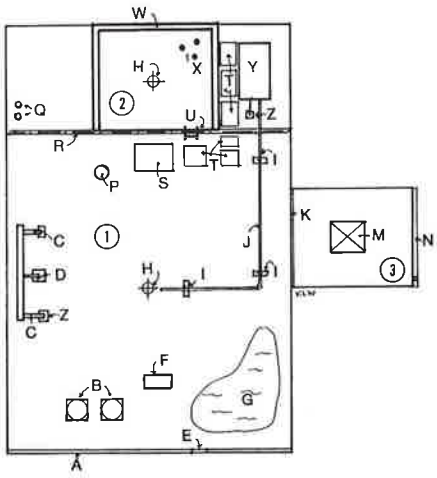


figure 2



A = GRAVEL STOP & FASCIA
B = FAN UNIT
C = SIGN SUPPORT
D = ELECTRICAL CONDUIT
E = SCUPPER
F = FAN HOOD
G = PONDED WATER
H = DRAIN
I = PIPE SUPPORT
J = PIPE
K = COUNTERFLASHING
L = BASE FLASHING
M = SKYLIGHT
N = GUTTER
O = DOWNSPOUT
P = VENT
Q = VENT PIPES
R = EXPANSION JOINT
S = ROOF HATCH
T = WALKWAY
U = LADDER
V = PARAPET WALL
W = COPING
X = ANTENNA
Y = AIR CONDITIONING UNIT
Z = PITCH POCKET

	PROBLEMS				
	major	minor	none	Locations	Comments
I. Structure					
A. Exterior and Interior Walls					
Condition of Joints					
Settlement Cracks					
Deterioration					
Water Stains/Efflorescence					
Physical Damage					
Spalling					
Other					
B. Exterior and Interior Roof Deck					
Deflection					
Securement to Supports					
Expansion/Contraction					
Structural Deterioration/ Rusting					
Water Stains					
Physical Damage					
Attachment of Felts/ Insulation					
New Equipment/Alterations					
Other					
II. Roof Condition					
A. General Appearance					
General Condition					
Evidence of Ponding					
Physical Damage					
New Equipment/Alterations					
Debris					
Other					
B. Condition of Surfacing					
Bare Spots in Gravel or Coating					
Alligatoring/Cracking					
Slippage					
Coating Peeling					
Other					
C. Membrane Condition					
Blisters					
Splits					
Ridges/Cigars					
Fishmouths					
Non-Adhered/Open Laps					
Punctures					
Securement to Substrate					
Fasteners					
Membrane Slippage					
Other					
III. Perimeter					
A. Base Flashings					
Puncture or Tears					
Deterioration					
Blisters					
Open Laps					
Attachment					
Wrinkles or Ridges					
Other					
B. Counter Flashing					
Open Laps					
Punctures					
Attachment					
Rusting					
Fasteners					
Sealants/Caulking					
Other					
C. Coping					
Cracks, Fractures					
Punctures					

	PROBLEMS major	minor	none	Locations	Comments
Attachment					
Rusting					
Drainage					
Fasteners					
Sealants/Caulking					
Other					
D. Gravel Stops & Fascia					
Securement					
Rusting					
Fasteners					
Punctures					
Open Laps					
Splits in Stripping at Metal					
Deterioration of Stripping					
Bare Spots in Stripping					
Other					
E. Parapet Wall					
General Condition					
Condition of Joints					
Other					

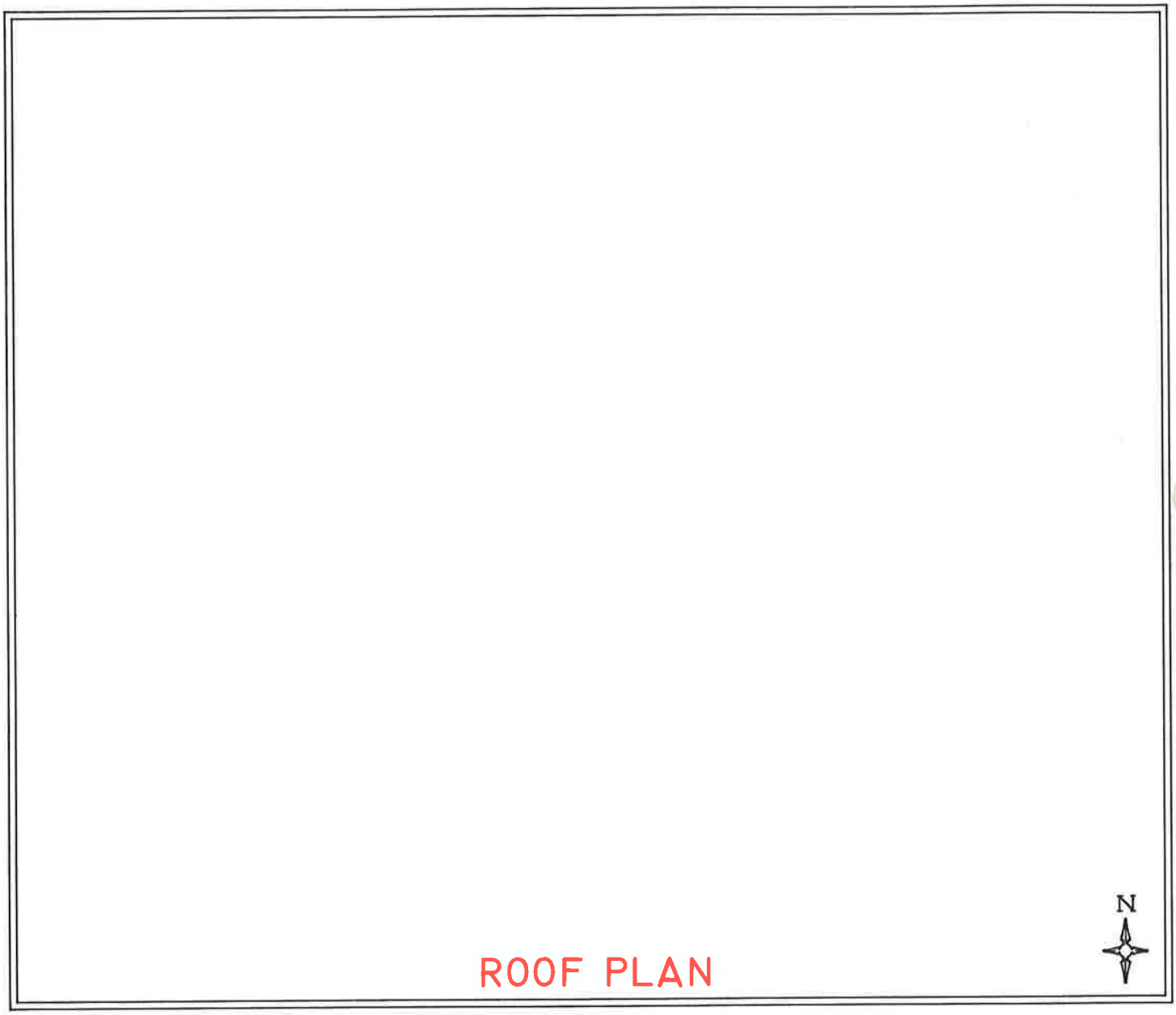
IV. Penetrations

A. Equipment, Skylight, Roof Hatch, or Smoke Vent Flashing					
Punctures or Tears					
Deterioration					
Blisters					
Open Laps					
Attachment					
Wrinkles or Ridges					
Counterflashing					
Physical Damage					
Sealants/Caulking					
Drainage					
Other					
B. Equipment					
Equipment Covers					
Discharge of Contaminants					
Heavy Foot Traffic					
Other					
C. Vents, Pipes, Supports, Antennas, Ladder, etc.					
Flashing					
Attachment					
Other					
D. Pitch Pans					
Condition of Sealer					
Attachment					
Other					

V. Roof Accessories

A. Expansion Joint Covers					
Open Joints					
Deteriorated Bellows					
Punctures/Splits					
Rusting					
Fasteners					
Attachment					
Other					
B. Drains, Scuppers, Gutters and Downspouts					
Debris					
Drainage					
Open Laps					
Attachment					
Rusting					
Flashing Condition					
Other					

	PROBLEMS major	minor	none	Locations	Comments
C. Pipe/Conduit Supports					
Condition					
Attachment					
Other					
D. Walkways					
Attachment					
Deterioration					
Location					
Other					



ROOF PLAN

KEY:

Roof Inspection Checklist is published by Hoffmann Architects, specialists in the analysis and solution of problems with existing buildings. Our office is located at 3074 Whitney Avenue, Hamden, Connecticut 06518. Phone (203) 281-4440.

Representative Projects

Hoffmann Architects specializes in the analysis and solution of problems with roofing, exterior wall and structural systems. Of the many services offered by the firm, a representative few are included below.

Roofing

For **Nabisco Brands, Inc.,** Hoffmann Architects is surveying several roofs at the Chun King Plant in Cambridge, Maryland.

Hoffmann Architects has prepared plans and specifications for reroofing a **New York Telephone Company** building in Greenwich, Connecticut. A modified bitumen membrane will be used for the roofing. Construction is scheduled for this spring.

The firm is preparing construction documents for reroofing the West Building of **General Electric Company's** headquarters in Fairfield, Connecticut.

NYNEX Building, White Plains, NY

Ford Foundation, New York, NY

Facade

For **NYNEX Properties Company,** the firm is investigating the condition of the exterior surfaces of a building in White Plains, New York. Upon completion of the survey, Hoffmann Architects will prepare construction documents and assist **NYNEX** in the bidding process.

The firm investigated the causes and recommended solutions for water infiltration problems along the front wall and planting beds at a **Stop and Shop Supermarket Company** facility in Groton, Connecticut.

Hoffmann Architects conducted a waterproofing survey of the roof, granite curtain wall, plaza and foundation walls of the **Ford Foundation** building in New York City.

Journal is a publication of Hoffmann Architects, specialists in investigative and rehabilitative architecture/ engineering, including the analysis and solution of roofing, exterior wall, glazing and structural problems. Our office is located at 3074 Whitney Avenue, Hamden, Connecticut 06518, Phone (203) 281-4440.

We welcome contributions to HA/J from our clients and friends. Please send news and technical information to Ann M. Prokop, Hoffmann Architects/Journal, 3074 Whitney Avenue, Hamden, Connecticut. Address changes or requests for free subscriptions for others not receiving the publication should be sent to the Hamden, Connecticut address.

staff news

Hoffmann Architects
3074 Whitney Avenue
Hamden, Connecticut 06518

Built-Up Roofing Alert

It is common knowledge in the roofing industry that the viscosity of asphalt at the point of installation is an important factor in the construction of a built-up roof. If the asphalt is cold, its fluid characteristics are thick, like syrup, and too much asphalt will be installed. If the asphalt is too hot, it is too runny and the mopping will be too thin. In 1977, as a guideline for the best temperature for asphalt installation, the National Roofing Contractors Association (NRCA) established the concept of equiviscous temperature, or EVT.

At that time, the recommendation was for EVT to be defined as the temperature at which the viscosity of roofing asphalt is 125 centistokes, plus or minus 25 degrees F. Research by NRCA and the Trumbull Asphalt Division of Owens Corning Fiberglas has shown that the viscosity earlier recommended was too high for optimum performance on the roof. Lower viscosity asphalt was shown to be fundamental in assuring even moppings with fewer voids. As a result, in a revised bulletin published in September 1988, NRCA recommended a change in the definition of EVT. The new EVT is the temperature where 75 centipoise is attained, plus or minus 25 degrees F.

What this means is that, to reach the new EVT, the temperature of the asphalt needs to be higher at the point of application than it was for the earlier definition. Because of this, the asphalt must be heated almost to the flash point to keep it hot enough. The NRCA recommends that the asphalt be heated to no more than 25°F below the flash point to avoid fires and other dangers associated with overheating the material.

Staff News

Hoffmann Architects is pleased to introduce the newest member of our firm, **Frank S. Staron.** Frank, who has joined Hoffmann Architects as Project Manager, received his architectural degree from the University of Detroit and has 14 years of experience with architectural firms in New York and Michigan.

Allan H. Gold, PE, AIA, has been appointed to the Standards Committee of the American Society of Civil Engineers (ASCE), a committee to develop standards for design loads on construction related structures.

Walter E. Damuck, AIA, CSI is the author of an article entitled "Man and Nature Contribute to Building Decay". The article appeared in the 1989 Annual Magazine published by the Building Owners and Managers Association (BOMA) of New York.