American Roofing©

ROOFING *in* *America*©

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Mark Kelly

Chemical Publishing Company

AMERICAN ROOFING© ROOFING IN *America*©

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The journey was all for you….

Dedicated with love to my children,
Joshua, Jared, Jessica and Jordan

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FOREWARD

Mankind is dependent upon our ability to form our environment to provide specialized work and living spaces to create a great society. Roofing is the key protective skin of our buildings forming our environment.

THE USA is considered the absolute best society of man. It needs to improve with time, but in the USA all men & woman are created equal and have a chance to make it. ROOFS SERVE THIS GOAL!

Since all of life is integrated; food, water and shelter all overlap as the most significant need when you pick the most important need of mankind from Maslow's list.

The best and biggest building roofs and tallest building roofs all are examples of great desire by our society to go where no man has gone before. State houses are an example of how we have perceived roofs in function and architecture across this great land over the past two hundred plus years.

Weather is so many things today - temperature, humidity, precipitation, static and dynamic forces, ultraviolet rays, ultrasonic rays, noise, and air quality as well. These are both engineering and architectural challenges in protecting man from a changing nature. The advances in roofing are now of space-age technology and economically precise. The industry is getting more and more sensitive to energy, environmental challenges and knowhow.

Mark Kelly was there at a time when these roofs were changing with the changing society. He has written his journey across the states. He has catalogued the language of roofing, the challenges and the stories of where products come from, how they are made and how they are installed across these great United States.

PREFACE

I WOULD LIKE TO THANK GOD & MY FAMILY for giving me the strength and courage to face the challenges of a great roofing professional career. The weather in the United States, the laws of nature, and the political and technical tasks that are necessary to do a good job every day. The occupations of Americans are a story of life. The roofers and roofing professionals have evolved and served. I honor their story here in our book together.

Many thanks to my parents, Andrew and Rita, my siblings Nancy, Paul and Rick and my children Joshua, Jared, Jessica and Jordan, who have been with me on this journey to Roofing in America and AMERICAN ROOFING.

There have been so many mentors and industry professionals who have been there for me that I cannot even begin to thank them all. Something I have tried to do in my career, is pass on the knowledge for future generations.

Those that helped me will forever be in my thoughts and prayers.

The Best Roofs in the World

A ***good roof*** starts with a good design, continues with a good manufactured product and ends with a good installer; this quality team is needed to produce a good roof anywhere on earth. Roofs in America are often described as the best in the world, and the roofing professionals here in the United States are the models for roofing trends and quality.

There are literally hundreds of millions of roofs in the United States, built to the highest standards in building codes and occupied by the greatest civilization in history. The best roofs in the world are, in fact, here. The growth of the world economy itself going into the 21st century is based on America's superior standard of roofing technology and this is why.

Roofs are a major part of any successful society. In the chain of survival for the human race, it can be argued that after food and water, shelter is the third most important necessity of humankind. Furthermore, the key to every good structure or shelter is a quality roof. This first step in the growth of humankind is a shelter's ability to protect humankind from the weather and animals, provide security from neighbors and provide a place for business to grow.

For instance, food is stored in silos, warehouses, giant coolers and freezers, home refrigerators and cupboards. Food distributors with coolers and freezers have special vapor and thermal protection barriers in order to protect the foods and keep it at its optimum shelf life. Bananas are stored at specific temperatures and humidity levels. Computers are made in clean rooms. Computer chips as well as cures to the common cold are made in climate-controlled rooms. The concept of a shopping mall versus the old society village street market would only be a dream without quality roofing. None of this would be possible if it were not for specialized and perfected quality roofs.

Here in the United States, we have worldwide economic success and a healthy population because of the wide spread existence of quality roofs. It is certain that without quality roofs there are no quality hospitals. Imagine widespread mold or bacteria, snow or rain in surgery or in intensive care. While Abe Lincoln read and learned by candlelight; our grade schools and universities would not bring us to the moon and beyond without good roofs. We cannot go backwards – quality roofing is here to stay.

In some emerging countries, roof systems are made out of basic materials such as banana leaves, wheaten straw and sea grass. In fact, in some countries, caves are still used as family homes to this day. Here in the United States, even in the less affluent areas, roofs are primarily made out of aluminum sheeting, pre-cast concrete, ceramic tiles, laminated glass, composite shingles, wood shakes and quarried slate. Built up roofing and single ply roofing systems are the flat-sloped roof materials of choice in America. Whatever your roof is made of, it was not put in place until your home or facility was built. The construction of a roof can only be determined after it is established what the purpose of the building is, how the building will support the roof and at what pitch the roof will be to solve the dead and live roof loads or architectural desires.

Think of architecture in Ancient Egypt, China, Rome or Greece. Stonehenge has horizontal beams with vertical columns on top. This is a basic design used in prehistoric times to construct structures. These are called stone lintels. In addition, throughout the centuries, there have been stone arches, iron beams, reinforced concrete beams and wood timber that have been, and continue to be, used to support roofs today.

I have been connected with billions of square feet of roofing projects throughout the United States in the past 30 years in; studies, design, construction or forensic study. The weather variations for these roofs in America range from 140 degrees above zero Fahrenheit to 50 degrees below zero Fahrenheit and experiencing wind speeds in excess of 150 mph. These are the most extreme weather climates on the planet. We have roofs for all buildings and all climates here in America.

My individual project sizes as a science expert, designer and contractor ranged from million square foot warehouse type re-roofing projects, to giant skyscrapers, all the way down to small border stations; from elegant mansions to quaint small homes. Together with my associates, we have handled half a million square foot refrigerator / freezer buildings in Maine, Ivy League research buildings for growing record size insects, facilities where they were splitting the first atom, universities studying mankind, athletic complexes and arenas for recreation, government buildings where research for guidance systems for missiles were conducted, and even various types of power plants.

We are active in the green roof and cool roof revolution, as well as the communication antennas placed on rooftops countrywide. We have worked on homes directly or indirectly for families all over our great nation and the world, and were part of a greater society effort in securing great American roofs. We are part of the physics, the chemistry, the industrial engineering and management of building and maintaining great roofs.

There are some great American architects, engineers and contractors that have built American roofs in the 20th and 21st century. We like to think we have contributed here with this great historic team of roofing professionals. Our extensive knowledge in the forensic failures in roofing and building envelopes is where we have marked our greatest contribution.

In all things, it is where we look at our mistakes that we find the greatest long term good and the most improvement as individuals and as a society. The causes of roofing system failures can be from excessive forces of nature; wind, rain, snow, lightening, ultraviolet rays, heat aging, thermal shock, or in manmade failures from bad design, manufacturer defects and/or in a contractor's bad installation. Ultimately though, because we eliminated the past mistakes, 99 percent of all current roof leaks in America are due to poor flashings with the architecture and building functions. The mistakes are now often found in the details. Let's not make new ones in the future.

In this book, we will look at the different economic and weather regions throughout the United States of America that affect roofing. We look also to the variety of roofs contained within at different; longitudes, latitudes and time zones, as well as the building codes that will affect and serve you into the centuries ahead.

The United States is broken up into four major economic and weather geographic regions:

Northeast:

New England: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut

Middle Atlantic: New York, Pennsylvania, New Jersey

Midwest

East North Central: Wisconsin, Michigan, Illinois, Indiana, Ohio

West North Central: North Dakota, South Dakota, Nebraska, Kansas, Minnesota, Iowa, Missouri

South

South Atlantic:	Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida
East South Central:	Kentucky, Tennessee, Mississippi, Alabama
West South Central:	Oklahoma, Texas, Arkansas, Louisiana

West

Mountain:	Idaho, Montana, Wyoming, Nevada, Utah, Colorado, Arizona, New Mexico
Pacific:	Alaska, Washington, Oregon, California, Hawaii

The weather throughout the United States is as varied as the landscape; this has changed the forms of regional; agriculture, manufacturing, tourism and ultimately the regional economics.

In the Northeast and parts of the Midwest and West there are significant snowfalls each winter. This greatly affects the integrity of a roof. The same is true of the significant rainfall seen in the Pacific states. In the South and parts of the West and Midwest, summers can be hot and humid. All weather conditions for any region must be taken into consideration before building a structure. There are other types of extreme periodic climate conditions to take into consideration, including tornados, hurricanes and earthquakes. The majority of structures in Florida are rarely built over two stories high due to the frequency of hurricanes. The roofs there must be constructed so that they can withstand hurricane force winds. In California, where earthquakes are prevalent, a roof must be built to withstand the shaking seismic force. In Kansas, where tornados occur, the roofs must be able to withstand the winds associated with tornados. Of course, nothing can withstand a direct hit of a tornado. In New York City the high rises are built to withstand wind forces and gusts associated with buildings that are anywhere from 2 to 100 stories tall.

There is a glossary in the appendix to define the current roofing terms in America and list of associations who have contributed to build our great American roofs, with which you may not be familiar. In addition, I will share some of my most memorable roofing stories, which are related to the people, the construction industry and the architecture of our great land.

So, if the United States of America has 350,000,000 people and 125,000,000 estimated homes with roofs, and equal number of businesses with roofs it is a lot of territory to cover. The 150,000 roofing companies and million to million and a half roofers are busy. The average roofs' life varies upon the region, climate and quality of system in place. It is our firm belief that there are:

- 2,000 sq. Ft. Homes x 125,000,000 houses = 250,000,000,000 sq. Ft. Or *250 Billion sq. Ft. of residential roofing here in the USA.*
- 6000 sq. Ft. Buildings x 125,000,000 business = 750,000,000,000 sq. Ft or *750 Billion sq. Ft. of commercial roofing in the USA.*

All in all, a trillion square feet of roofing represents a lot of acres of roofs in America. It is safe to say that each year in America, between $10 billion and $25 billion is spent on new roofing and between $18 billion and $27 billion is spent on re-roofing projects. In a down economy however, roof replacements are less frequent.

Right now, we estimate on averages, but someday soon, with the use of statistics and Google Earth, we will know how many houses and businesses exist in the U.S. We will also know how many square feet of roofing there are, which ones are sloped and which ones are flat sloped: Modern technology meets roofing master planning on a global scale.

I'm glad I hooked my wagon up to the roofing wagon train in my early adult life. There are many self made millionaires and millionaire families in America that got their start in the roofing business. The amount of human energy, insurance premiums and payroll taxes paid in this industry is simply staggering. It is truly a mixture of "art & science" with "warrior" skills that builds great "Roofing in America©"

Welcome to "Roofing in America©"! Thanks for taking the journey.

Northeast

Maine, New Hampshire, Vermont, Massachusetts, New York, Connecticut, Rhode Island, Pennsylvania, New Jersey

Maine

Maine, the northern most state on the east coast, is rife with variety. From dense forests to its rocky coastline, you will find beauty beyond description. The major industries are lumber, paper, Portland cement, agriculture, tourism, skiing, beaches and boating. There is a military base and government research and development facility as well.

Maine's most popular lobster eatery is Chauncey Creek in Kittery Point, Maine. They start their dockside restaurant off each year with a cannon shot on Memorial Day and close each year on Columbus Day. The wood dock has a great water view. You pick out your own lobster and they bring it to you cooked. You bring your own beer or wine. There is no mistaking this restaurant as their distinct red roof is seen well down the road.

The architecture of Maine is conservative, historic and unique. The roofs are both flat and steep sloped. The flat roofs are often snow shoveled or snow blown clear all winter due to massive snow storms and constant cold weather.

Population: 1,321,505

Economy:

Paper-manufacturing forests water

Famous Residences:

Stephen King (author)
E. B. White (author)
Leon Leonwood (L.L.) Bean
Dan Fogelberg (singer)
Hannibal Hamlin (VP for Lincoln)
Dorothea Dix (civil rights reformer)
Milton Bradley (board game inventor)
David E. Kelly (producer)

Famous Buildings:

The ***Heckscher House*** was built by Edward Larabee Barnes in 1975. It is located in Mt. Desert Island, Maine.

Both the ***Sarah Jane Jewett House*** in South Berwick and the ***James Smith Homestead*** in Kennebunk were built in the Georgian style. They feature hipped and gambrel roofs.

The ***Ruggles House*** of Columbia Falls is an enduring example of a Federal style home. While taller than Colonial and Georgian style structures, the Federal style structure features a low pitch roof.

The Italianate style features a low-pitched roof with wide overhanging eaves. One example is the ***Harrison B. Brown*** House in Portland. Another example is the ***Pierce-Giddings House*** in Bangor.

The Queen Anne style features an elegant, yet complicated, roof, by using a variety of shapes, textures, towers, turrets, gables, and patterned shingles. The style is prominently featured in the ***Holman Day House*** in Auburn.

Bangor Auditorium has a V shaped roof. It was opened in October 1, 1955. The planning for this building began in 1947; however, the voters did not approve it until 1951. The architect was Eaton Tarbell. The V shape design is better for high winds. The roof shape would save 235,000 cubic feet that would have otherwise had to have been heated.

Largest Square Foot Roof:

The ***Pratt & Whitney*** building has the largest roof in Maine. Located in North Berwick, it is 875,000 square feet.

Tallest Roof:

Franklin Towers in Portland stands 53.34 meters high, with 16 floors. 14,000 lbs. of concrete were poured during the construction of this building.

Oldest Roof:

The ***Hunnewell House*** in Scarborough (c. 1673) and the ***McIntire Garrison House*** in York (c. 1707) are two of the oldest structures in Maine. Built in a colonial style, they feature a steep pitched roof with a center chimney.

State Capital: Augusta

Capitol Building:

Maine's capitol building, located in Augusta, is called ***The State House***. The State House was built in 1832. Charles Bulfinch (of Boston) designed this building to be built out of granite, mined from the Hallowell quarries, in a Greek Revival style. The original structure was 150' long; however, following a major remodel in 1909-1910, the structure was enlarged to 300' long. G. Henri Desmond designed the remodel of The State House using a neoclassical style. This remodel required all but the front and rear walls to be demolished.

The dome that tops this austere building is a 185' tall dome. This dome replaced the original cupola designed by Bulfinch. A statue of a draped female figure of wisdom, in turn, surmounts the dome. This statue is made of copper and overlaid in gold.

The State House has been plagued with roof leaks since the original construction and continued after the major renovation in 1909-10. In 1987, the dome went dark as wiring issues resulted in being unable to light the dome at night. Then in 1988 the dome, which had long since become pockmarked and peeling, was stripped and repainted. The mid-1990's found the dome rewired and once again alit. When they restored the dome, it became visible to viewers from inside The State House.

Thanks for taking the journey…

American Roofing has been on a journey to excellence, with the entire civilization reaping huge benefits. It is the unsung hero in our lifestyle and our culture. The grand governance buildings in each state, our Statehouses, represent this commitment to the pursuit of quality and excellence. Roofs have always been the challenge in the design and construction of buildings. The challenge is in the framing and waterproofing. The roofs of the statehouses, the United States Capital building and the White House are a theme to our insistence in buildings that work in their art form and science.

The roofs across our great land are the best in the world and being the best is no easy task. There are mines, manufacturing plants, constructions sites, insurance board rooms, court rooms and families that dedicate their lives to quality roofs. They all have a hand in this Gold Medal of World Building Olympics. We have the Decathlon in roofing. ROOFING IN AMERICA is indeed the athletic best among a great world of buildings.

Remember, the Roofing and Waterproofing Industry in the United States has come a long way in the 20th Century from the world of earth mined and drilled bitumen's to the world of synthetic elastomeric and

thermoplastics. This is true from the solvent based to water based coatings, those of air cure, ultraviolet cure and those of heat cure or water cure.

The United States has a society based upon very specific building types and purposes to suit society and humankinds needs. The great architects, engineers, building envelope consultants and contractors deserve credit for the dedication and talent they have shown in making life so wonderful here in AMERICA. The roofs are one of those parts of society that are indispensible and without which we go back 500 years in culture and standards. We cannot, however, sit still and be satisfied. The planet changes and so must we.

In the 21st Century we are into a new world of roofing and waterproofing where we must be technically sound and constantly improving the manufacture and construction for the betterment of the environment while providing the maximum safety of the workers and of the general public.

The new green roof and sustainable roofing is really about rooftop gardens and providing roofs that live at a cooler temperature, absorbing less solar heat gain. The green roof is made of recycled materials where possible, from materials made with less chemical by-products for air and water quality potential environment problems. The green roof will act to provide a total drop in inner-city air temperatures in the future and lower pollution globally.

Society is under tremendous economic pressure in this growing world economy and the new products cost more to make. Energy and labor are constantly getting more expensive. This combination makes a difficult formula to produce quality roofing and waterproofing solutions at reasonable cost. A true expert must be on your side to protect both new and existing buildings from moisture.

Research and development can no longer be the ugly stepsister to sales teams. All departments must work together to manufacture the best products on earth and to serve humankind. In the USA, we do this with dedication, pride and talent. Quality is the end result to keep our future generations advancing as a people and as a society.

The new products entering the market to meet these environmental changes as mandated by the EPA, or where raw material shortages have evolved, have resulted in new product failures. Research and development must be part of the A team in manufacturing again. Some clients have the unfortunate experience of a mis-manufactured roof or waterproofing system. Research and development cannot keep up with the EPA or reengineering changes. Because of this, some failures are occurring during the reengineering and environmental revolution in roofing and waterproofing.

Short cuts must be eliminated in the pursuit of roofing and waterproofing here in America and in the world at large.

We recommend the following to our clients:

1. Hire a building envelope consultant
2. Hire a competent building envelope contractor
3. Examine all walls every two years
4. Examine all roofs annually when new and semi-annually when older.
5. Examine all plazas and parking garages in a continuous basis - rotating the areas of maintenance as needed.
6. Budgets a replacement analysis for building envelopes based upon the current Status and age and its known failure timeframe
7. When something goes wrong engage a building envelope consultant to perform forensic to provide a solution from the defect source.

In the world of construction, and more specifically, where roofs and walls are involved, there is human risk. Begin with OSHA training for the safety of workers and supervisors and continue with equipment and management meetings and analysis to keep workers safe and job sites safe. The manufacturers, manufacturers' representatives and distributors have been highly criticized on product failures in the past 30 years. The reality is they have a very high batting average with 99.9% of all products hitting home runs for the American roof owner. I think we all should thank them for the excellent overall results in a market and world that is constantly changing.

We should be very proud of all facets of America and today we salute the American Roofing and the Roofing in America teams.

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[i] http://thinkexist.com/quotes/vince_lombardi/
[ii] http://www.sips.org/content/technical/index.cfm?pageId=161

Glossary of Roofing Terms

Glossary of Roofing Terms

Absorption: The act or process of retaining foreign particles such as gas or liquid without transmission of these particles.

Acid Etch: (1) The use of a strong acid to remove the surface of concrete thereby exposing the aggregate. (2) The use of a strong acid to etch the surface of material such as metal in order for that material to accept a primer or Spray Polyurethane Foam.

Acrylic Coating: A coating system with an acrylic resin base.

Acrylic Resin: Polymers of acrylic or methacrylic monomers often used as a latex base for coating systems.

Active: Will corrode in the presence of moisture or a "noble" metal.

Aggregate: A surfacing or ballast for a roof system. Aggregate can be rock, stone, crushed stone or slag, water-worn gravel, crushed lava rock or marble chips.

Air Blown Asphalt: Asphalt produced by blowing air through molten asphalt held at an elevated temperature. This procedure is used to modify properties of the asphalt.

Alligatoring: The cracking of the surfacing bitumen on a built-up roof, producing a pattern of cracks that resemble an alligator's hide.

Aluminized Steel: Sheet steel with a thin aluminum coating on the surface to enhance the steel's ability to withstand weathering.

Aluminum: A non-rusting metal used in roofing for metal roofing and the fabrication of gutter and flashings.

Anodic: When two metals are connected in an electrolyte, they will form a galvanic cell, with the higher metal in the galvanic series being the anode. The anodic will oxidize and produce an electrical current which protects the cathode from corrosion.

Apron Flashing: A flashing located at the low end of a curb or penetration.

Architectural Panel: A metal roof panel that usually requires solid decking underneath.

Architectural Shingle: Shingle that provides a dimensional appearance. See also Dimensional Shingle.

Area Divider: A flashed assembly usually extending above the surface of the roof that is anchored to the roof deck. It is used to relieve thermal stresses in a roof system where an expansion joint is not required, or to separate large roof areas.

ARMA: Asphalt Roofing Manufacturers Association

Asbestos: An incombustible fibrous mineral form of magnesium silicate formerly used for fireproofing and sometimes used for the reinforcement of roofing materials.

Asphalt: A substance left as a residue after evaporating or otherwise processing crude oil or petroleum. Asphalt can be refined to conform to various roofing grade specifications:

- **Dead-Level Asphalt:** A roofing asphalt conforming to the requirements of ASTM Specification D 312, Type I. This asphalt is for use in roofs which do not exceed a ¼ in 12 slope (2%).
- **Flat Asphalt:** A roofing asphalt conforming to the requirements of ASTM Specification D 312, Type II. This asphalt is for use in roofs which do not exceed a ½ in 12 slope (4%).
- **Steep Asphalt:** A roofing asphalt conforming to the requirements of ASTM Specification D 312, Type III. This asphalt is for use in roofs which do not exceed a 3 in 12 slope (25%).
- **Special Steep Asphalt:** A roofing asphalt conforming to the requirements of ASTM Specification D 312, Type IV. This asphalt is for use in roofs which do not exceed a 6 in 12 slope (50%).

Asphalt Emulsion: A mixture of asphalt particles and an emulsifying agent such as bentonite clay and water.

Asphalt Felt: An asphalt-saturated and/or an asphalt-coated felt membrane.

Asphalt Roof Cement: The proper name for Plastic Cement and Flashing Cement. Asphalt roof cement consists of solvent-based bitumen, mineral stabilizers, and other fibers (sometimes asbestos). Asphalt roof cement is categorized by ASTM standard D 2822-91 (1997) or for non-asbestos, ASTM standard D 4586-93.

- Plastic Cement is for use on low-slope surfaces, conforms to ASTM Specification D 312, Type I; Specification D 449, Types I or II; or Specification D 946. Plastic Cement is self-sealing, adhesive and ductile and is classified by ASTM Standard D 2822-91 *Asphalt Roof Cement,* and D 4586-92 *Asphalt Roof Cement, Asbestos-Free, Types I and II*.

- Flashing Cement can be used on vertical surfaces and has a high softening point, low ductility and conforms to the requirement of ASTM Specification D 312, Types II or III; or Specification D 449, Type III.

Atactic Polypropylene: A group of high molecular weight polymers formed by the polymerization of propylene.

Attic: The open area above the ceiling and under the roof deck of a steep-sloped roof.

Back-Nailing: The method of fastening the back or upper side of a ply of roofing felt or other component in a roof system so that the fasteners are covered by the following ply.

Back-Surfacing: A fine mineral material on the back side of roofing materials such as roll roofing to keep them from sticking together while packaged.

Ballast: A material installed over the top of a roof membrane to help hold it in place. Ballasts are loose laid and can consist of aggregate or concrete pavers.

Barrel Roof: A roof configuration with a partial cylindrical shape to it.

Base Flashing: Plies of roof membrane material used to seal a roof at the vertical plane intersections, such as at a roof-wall and roof-curb junctures.

Base Ply: The primary ply of roofing material in a roof system.

Base Sheet: An asphalt-impregnated, or coated felt used as the first ply in some built-up and modified bitumen roof systems.

Batten: (1) A strip of wood usually fastened to the structural deck for use in attaching a primary roof system such as tile; (2) A plastic strip, wood strip, or metal bar which is used to fasten or hold the roof and/or base flashing in place, A.K.A. Termination Bar.

Bermuda Seam: A metal roof that has a step profile.

Bird Bath: A small amount of water on a rooftop that quickly evaporate.

Bird Screen: Wire mesh installed over openings in order to prevent birds from entering a building or roof cavity.

Bitumen: Any of various flammable mixtures of hydrocarbons and other substances, occurring naturally or obtained by distillation from coal or petroleum, that are a component of asphalt and tar and are used for surfacing roads and for waterproofing.

Bitumen-Stop: A continuous seal for preventing bitumen from leaking down into or off a building. Is constructed by extending the base sheet or other non-porous ply of felt beyond the edge of the field plies. It is then turned back onto the top of the system and adhered.

Bituminous Emulsion: Bituminous particles suspended in water or other solution. See also Asphalt Emulsion.

Bleeder Strip: A starter strip placed along rake edges for use in asphalt shingle roofing. See also Rake-Starter.

Blind-Nailing: The use of nails so that they are not exposed to the weather in the finished roofing system

Blister: A pocket of air trapped between layers of felt or membrane. Blisters are usually caused by water or other foreign substances.

Blocking: Pieces of wood built into a roof assembly used to stiffen the deck around an opening, support a curb, or for use as a nailer for attachment of membranes or flashing.

Blown Asphalt: See Air Blown Asphalt.

Blueberry: A small bubble found in the flood coat of an aggregate-surfaced built-up roof.

BOMA: Building Owners & Managers Association, International

Glossary of Roofing Terms

Boot: A piece of material preformed to protect roof penetrations from dirt, moisture and other foreign and/or damaging substances.

Brake: A piece of equipment used for forming metal.

Bridging: When membrane is unsupported at a juncture.

Brooming: Embedding a ply of roofing material into hot bitumen or adhesive by using a broom, squeegee, or other piece of equipment to eliminate voids and help ensure adhesion.

Buckle: A long, tented displacement of a roof membrane. Can occur over insulation and deck joints.

Built-Up Roof Membrane: A roof membrane consisting of layers of bitumen, which serves as the waterproofing component, with plies of reinforcement fabric installed between each layer. The reinforcement material can consist of bitumen-saturated felt, coated felt, polyester felt or other fabrics. A surfacing is generally applied and can be asphalt, aggregate, emulsion or a granule-surfaced cap sheet.

Bulb-Tee: A steel reinforcing member used when constructing pre-stressed, poured gypsum decks. When the gypsum is poured, it surrounds the Bult-Tee.

Bundle: An individual package of shingles or shakes.

BUR: An acronym for Built-Up Roof. See Built-Up Roof.

Butadiene: A colorless, highly flammable hydrocarbon, C_4H_6, obtained from petroleum and used in the manufacture of synthetic rubber.

Butt Joint: Where two separate, adjacent pieces of material abut.

Butyl: A hydrocarbon radical, C_4H_9. Butyl has a rubber-like consistency, is formed from the copolymerization of isobutylene and isoprene and is used primarily in sealants and adhesives.

Butyl Rubber: A butyl-based, synthetic elastomer.

Butyl Tape: A sealant tape used in numerous sealant applications such as sealing sheet metal joints.

Camber: A slight convex curve of a surface.

Canopy: An overhang, usually over entrances or driveways.

Cap Flashing: A material used to cover the top edge of base flashings or other flashings. (See also Coping.)

Cap Sheet: A granule-surfaced membrane often used as the top ply of BUR or modified roof systems.

Capacitance Meter: A device for locating moisture within a roof system by measuring the ratio of the change to the potential difference between two conducting elements that are separated by a non-conductor.

Caulk: A material with no elastomeric properties used for sealing joints.

Caulking: The act of sealing a joint or of material.

Cavitation: The vaporization of a liquid under the suction force of a pump which can create voids within the pump supply line. Cavitation will result in off-ratio foam in Sprayed Polyurethane Foam applications.

C-Channel: A structural framing member that, when viewed as a cross-section, has the shape of a "C".

Cellulose: A complex carbohydrate, (C6H10O5)n, that is composed of glucose units, forms the main constituent of the cell wall in most plants, and is used in the manufacturing of organic roofing materials.

Chalk Line: (1) A string on a reel in a container that can hold chalk; (2) A line made on by pulling taut a string coated with chalk and snapping it.

Channel Flashing: Flashing with a built-in channel for runoff; used where roof planes intersect other vertical planes.

Chemical Resistance: A materials ability to retain its properties when it comes into contact with certain chemicals.

Cladding: A material used to cover the exterior wall of a building.

Cleat: A continuous metal strip used to secure two or more metal roof components together. Commonly used along with coping or gravel stop on tall buildings.

Clerestory (Clearstory): A room that extends above an abutting roof section of a building.

Clipped Gable: A gable cut back at the ridge in a small hip configuration.

Closed-Cut Valley: A method of valley application in which shingles from one side of the valley extend across the valley while shingles from the other side are installed over the top of those and then trimmed back approximately 2 inches from the valley centerline.

Closure Strip: A material used to close openings created by joining metal panels or sheets and flashings.

Coal Tar Bitumen: A proprietary trade name for Type III coal tar used in dead-level or low-slope built-up roofs. It is not for use in roofs exceeding ¼" in 12" (2%) slope.

Coal Tar Pitch: A type of coal tar used in dead-level or low-slope built-up roofs. It is not for use in roofs exceeding ¼" in 12" (2%) slope.

Coal Tar Felt: A roofing membrane saturated with refined coal tar.

Coal Tar Roof Cement: A trowelable mixture of processed coal tar base, solvents, mineral fillers and/or fibers.

Coated Base Sheet: An asphalt-saturated base sheet membrane later coated with harder, more viscous asphalt, thereby increasing its impermeability to moisture.

Coated Felt: An asphalt-saturated ply sheet that has also been coated on both sides with harder, more viscous asphalt.

Coating: A layer of material that is spray, roller, or brush applied over a surface for protection or sometimes decoration.

Cohesion: Mutual attraction by which the elements or particles of a body or substance are held together.

Coil Coating: The application of a finish to a coil of metal or other material.

Cold Forming: The process of shaping metal into desired configurations at ambient room temperature.

Collector Head: A component used to direct water from a through-wall scupper to a downspout. Also known as a Conductor Head.

Column: A vertical structural member placed on a footing or foundation used to support horizontal above-ground building components.

Combing Ridge: A term used to describe an installation of finishing slate at the ridge of a roof whereby the slates on one side project beyond to the apex of the ridge.

Composition Shingle: A type of shingle used in steep-slope roofing and generally comprised of weathering-grade asphalt, a fiber glass reinforcing mat, an adhesive strip, and mineral granules.

Concealed-Nail Method: A method of installing asphalt roll roofing material in which all nails or fasteners are driven into the underlying roofing and covered by an overlapping course.

Condensate: The liquid resulting from condensation.

Condensation: The conversion of water vapor to liquid state when warm air comes in contact with a cold surface. (See also Dew Point.)

Conduction: The transmission or conveying of something through a medium or passage, especially the transmission of electric charge or heat through a conducting medium without perceptible motion of the medium itself.

Conductor Head: A component used to direct water from a through-wall scupper to a downspout. Also known as a Collector Head.

Construction Joint: A constructed joint where two successive installments of concrete come together.

Contact Cements: Adhesives used to adhere or bond roofing components.

Coping: The piece of material used to cover the top of a wall and protect it from the elements. It can be constructed from metal, masonry, or stone.

Glossary of Roofing Terms

Copper: A reddish-brown element that conducts heat and electricity very well. It is also used as a primary roof material as well as a flashing component. Copper turns a greenish color after being exposed to the weather for a length of time and appears in the middle of the Galvanic Series.

Cornice: A horizontal projecting part that crowns the wall of a building.

Counter Batten: Wood strips installed vertically on sloped roofs over which horizontal battens are secured.

Counterflashing: Formed metal sheeting secured to walls, curbs, or other surfaces, for use in protecting the top edge of base flashings from exposure to weather.

Course: (1) The term used for each row of roofing material that forms the roofing or flashing system; (2) One of multiple layers materials applied to a surface. For example, a three-course flashing consists of a layer of mesh or other reinforcing material sandwiched between two layers roofing cement.

Cove: In roofing, a heavy bead of sealant material installed at the point where vertical and horizontal planes meet. It is used to eliminate the 90° angle.

Cover Plate: A metal strip sometimes installed over the joint between formed metal pieces.

Crack: A separation or fracture occurring in a material.

Cream Time: Time in seconds at a given temperature when the isocyanate and resin components of SPF will begin to expand after being mixed.

Creep: Movement of roof membrane causing the roof system to be deformed

Cricket: A roof component used to divert water away from curbs, platforms, chimneys, walls, or other roof penetrations and projections. See also Saddle.

Cupola: A relatively small roofed structure set on the ridge of a main roof area. Also known as a Crow's Nest.

Curb: (1) A raised member used to support skylights, HVAC units, exhaust fans, hatches or other pieces of mechanical equipment above the level of the roof surface, should be a minimum of eight inches (8") in height; (2) A raised roof perimeter that is relatively low in height.

Cure: A process by which a material is forms permanent molecular linkages by exposure to chemicals, heat, pressure, and/or weathering.

Cure Time: The time necessary to effect curing.

Curing Agent: A material additive that alters chemical activity between the components resulting in a change in the rate of cure.

Curing Compound: A liquid that is applied to newly installed concrete which slows water loss while curing.

Cutback: Bitumen thinned by solvents that is used in cold-process roofing adhesives, roof cements, and roof coatings.

Cut-off: A detail designed to seal, preventing lateral water movement in an insulation system, and used to separate different sections of a roofing system.

Cutout: The open area between shingle tabs. Also known as a "throat".

Dampproofing: Treatment of a surface or structure to resist the passage of water in the absence of hydrostatic pressure.

Dead Level: Refers to a roof with no slope or pitch.

Dead-Level Asphalt: A roofing asphalt conforming to the requirements of ASTM Specification D 312, Type I. This asphalt is for use in roofs which do not exceed a ¼ in 12 slope (2%).

Dead Loads: Permanent, non-moving loads on a roof resulting from the weight of a building's components, equipment, and the roof system.

Deck: The structural component of the roof of a building which provides the substrate to which the roofing system is applied.

Deflection: The downward displacement of a structural member under load.

Degradation: A decline in the appearance, structure, or properties, of a material or substance.

Delamination: Separation of laminated layers of a material or system.

Diaphragm: A type of structural roof deck capable of resisting shear that is produced by lateral forces such as wind or seismic loads.

Diffusion: The movement of a substance such as water vapor from regions of high concentration to regions of lower concentration

Dimensional Shingle: A shingle that is textured, or laminated to produce a three-dimensional effect. Also known as Laminated and Architectural Shingles. Please be aware that there are also shingles being produced that can be classified as Dimensional but not as Laminated. These shingles are comprised of a single piece of material rather than two different materials laminated together.

Dimensional Stability: The ability of a material to retain its current properties and to resist a change in size resulting from exposure to temperature changes and moisture.

Dome: A roof with a partial-spherical shape.

Dormer: A framed projection through the sloping plane of a roof.

Double Coverage: Installing roofing so that twice the amount of material is used, resulting in a double layer of roofing.

Double Graveling: Installing one layer of gravel in a flood coat of hot bitumen, removing the excess gravel and then installing a second layer of gravel in another flood coat of hot bitumen.

Downspout: A conduit for carrying water from a gutter, scupper, drop outlet or other drainage unit from roof to ground level. Also known as a Leader Pipe.

Drain: a device used to carry water off of a roof.

Drip Edge: A steel flashing bent at a 90º angle that is placed along the outer perimeter of steep sloped buildings; used to help direct runoff water away from the building. Drip Edge resembles nosing except that it has an outwardly-angled bottom edge (preferably hemmed).

Dry Bulb Temperature: The temperature of air in degrees Fahrenheit measured by an ordinary thermometer.

Dry Film Thickness: The thickness in mils (thousandths of an inch), of a dried coating or mastic.

Dry-In: (1) The process of installing the underlayment in steep slope roofing; (2) Making a low-slope roof watertight. Does not always mean getting all of the required plies installed.

Dry Rot: Wood rot caused by certain fungi. Dry rot can result from condensation build-up, roof leaks that go untended, or from other problems. Dry rot will not remain localized. It can spread and damage any lumber touching the affected area.

Dual Level Drain: An item that will permit drainage at two different levels.

Dynamic Load: Any moving load on a roof such as people and equipment. Wind can also be considered a Dynamic Load.

Eave: A roof edge that extends out past the exterior wall line.

Edge Stripping: Roofing material used to seal perimeter edge metal and the roof itself.

Edge Venting: The installation of vent material along a roof edge (e.g., Starter Vent) as part of a ventilation system. Edge vent material should be used in conjunction with other venting material (e.g., ridge vent) as it not intended for use by itself.

Elastomer: A material which, after being stretched, will return to its original shape.

Elastomeric: Properties of a material that will permit it to return to its original shape after being stretched.

Elastomeric Coating: A coating that can be stretched to twice its dimensions and that will return to original when tension is released.

Elongation: The ability of a material to be stretched or lengthened.

Glossary of Roofing Terms

Embedment: In roofing, to uniformly press one material into another, such as aggregate into bitumen, roofing felt into bitumen, or granules into a coating.

End Lap: The extension of one component of material past the end of an adjacent piece of material.

Envelope: A continuous seal for preventing bitumen from leaking down into or off a building. Is constructed by extending the base sheet or other non-porous ply of felt beyond the edge of the field plies. It is then turned back onto the top of the system and adhered.

Epoxy: A type of synthetic, thermosetting resins that produce tough, hard, chemical-resistant coatings and adhesives.

Equipment Screen: A nonstructural wall or screen constructed around rooftop equipment such as HVAC units, curbs, etc. to hide the look of the equipment and make the structure more aesthetically pleasing.

Exhaust Vent: A device used to vent air from the roof cavity with vents that are installed on or near the higher portions of the roof such as the ridge.

Expansion Cleat: A cleat designed to handle thermal movement of the metal roof panels.

Expansion Joint: A built-in separation between building sections to allow for free movement between the sections without damaging the buildings structural components.

Exposed-Nail Method: A method of installing roll roofing materials to where all nails/fasteners are visible and exposed to the elements.

Exposure: The portion of the membrane that is not overlapped by the succeeding ply or course. Or, the portion of the roofing material exposed to the weather after being installed.

Extrusion: The process of manufacturing and/or shaping a material by forcing it through a die.

Eyebrow: A small, shed roof protruding from the main roof or located on the side of a building below the level of the main roof.

Factory Seam: A splice/seam made in the roofing material by the manufacturer. It is preferable during installation to cut these splices out of the membrane.

Fallback: A reduction in the softening point temperature of asphalt that occurs when asphalt is overheated for pro-longed periods of time.

Fascia: Vertical roof trim located along the perimeter of a building, usually below the roof level. Its use can be either decorative or for waterproofing.

Feathering Strips: Strips of wood that are placed along the butt ends of wood shingles to form a somewhat smooth surface so that the shingles can be roofed over without removal.

Felt: A roofing sheet made of interwoven fibers. The fibers can be wood or vegetable for Organic Felts, glass fibers for fiberglass felts, polyester, or asbestos.

Felt Machine: A machine that will install bitumen and felt at the same time.

Ferrule: A metal sleeve used as a spacer to keep gutter from being beat up when secured to fascia with spikes.

Fiberglass Insulation: Insulation composed of glass fibers used to insulate walls and roofs.

Field of the Roof: Refers to the central part of a roof away from the perimeter.

Field Seam: A non-factory material seam made by joining overlapping seams together with adhesives, heat welders, or other means.

Filler: An inert ingredient added to roofing materials in order to alter their physical characteristics.

Fillet: A sealant material installed at horizontal and vertical planes to remove 90° angles.

Film: A membrane or sheeting material with a nominal thickness of 10 mils or less.

Film Thickness: The thickness of a membrane or coating that is expressed in mils (thousandths of an inch).

Fin: A sharp protrusion in a roof deck that can damage roof components.

Fishmouth: An opening along the exposed edge of an installed ply of felt caused by shifting the ply during installation. Repair these by making a slice along their entire length and feathering two plies of felt over the fishmouth for a minimum coverage of one foot all the way around.

Flaking: Occurs when a coating loses its cohesion.

Flange: A projection edge of a roof component such as flashings, skylight frames, pre-manufactured curbs, etc. Usually refers to the part that sits on the roof surface.

Flash Point: The lowest temperature of a liquid material at which combustion will occur when air reaches its surface.

Flashing: Components used to seal the roof system at areas where the roof covering is interrupted or terminated. For example, pipes, curbs, walls, etc. all have special components that, when correctly installed, will help prevent moisture entry into the roof system or building.

Flashing Collar: A flashing component used to seal soil pipe vents, hot stacks or other roof penetrations.

Flat Lock: A type of interlocking two separate metal panels by folding one panel over on top itself and the folding the other down under itself and then hooking the panels together.

Fleece: Mats or felts used as a membrane backer and composed of fibers.

Flood Coat: The surfacing layer of bitumen into which aggregate is embedded on an aggregate-surfaced built-up roof. A flood coat is applied at an approximate rate of 45 to 60 pounds per square (100 square feet).

Flood Test: A water test performed to determine the effectiveness of a roof covering.

Fluid-Applied Elastomer: A liquid elastomeric material that cures to form a continuous waterproofing membrane.

Foam Stop: The edge metal used to terminate Sprayed Polyurethane Foam.

Framed Opening: A structurally-framed opening in a roof of a building for use in installing large items such as HVAC units, skylights, or ventilators.

Gable: A triangular-shaped portion of the endwall of a building directly under the sloping roof and above the Eave line..

Gable Roof: A roof configuration that has gable ends.

Gable-On-Hip Roof: A roof configuration with hips coming up from the eave corners and terminates into a gable roof.

Galvalume: Trade name for a protective coating composed of aluminum zinc.

Galvanize: To coat with zinc.

Galvanized Steel: Steel that is coated with zinc to aid in corrosion resistance. Galvanized steel for use in roofing should be Hot-Dipped Galvanized with a G-90 coating.

Gambrel: A roof that has two different pitches.

Gauge: A standard of measurement. For instance the thickness of sheet metal or the diameter of wire. The thicker the wire or metal, the lower the gauge.

Geodesic Dome: A geodesic dome uses a pattern of self-bracing triangles in a pattern that gives maximum structural advantage, thus theoretically using the least material possible. (A "geodesic" line on a sphere is the shortest distance between any two points.) The first contemporary geodesic dome on record was designed by Walter Bauersfeld.

Girt: A horizontal beam place between support columns that is used for attaching wall cladding.

Glass Felt: (1) In the manufacturing of roofing materials - a sheet comprised of bonded glass fibers prior to being saturated with bitumen; (2) short for asphalt or coal tar saturated fiberglass felt membrane.

Glaze Coat: (1) The uppermost layer of asphalt on a smooth-surfaced built-up roof membrane, usually a reflective surfacing is installed over it; (2) A thin coat of bitumen applied to help protect the roof membrane when application of additional felts or the flood coat and aggregate surfacing are delayed.

Grain: A unit of measure for the mass of moisture: a unit of weight equal to 0.002285 ounces or 0.036 dram.

Glossary of Roofing Terms

Granule:	A small aggregate, naturally or synthetically colored, used to surface cap sheets, shingles, and other granule-surfaced roof coverings.
Gravel:	Aggregate consisting of rock fragments or pebbles.
Gravel Stop:	A flanged, sheet metal edge flashing with an upward projection installed along the perimeter of a roof to stop the flow of bitumen over the edge.
Grout:	A thin mortar used to fill cracks in masonry and tile.
Grout (Non-Shrink):	A cementitious material used to partially fill penetration pockets (pitch pans). A pourable sealer is used afterward.
Gutter:	A channel (usually sheet metal) installed along the down slope perimeter of a roof to convey runoff water from the roof to the drain leaders or downspouts.
Hand-Tabbing:	Applying spots of adhesive to shingle tabs.
Hatch:	A unit used to provide access to a roof from the interior of a building.
Headlap:	The distance that the topmost ply of roofing felt overlaps the undermost ply or course.
Heat Transfer:	Thermal energy going from an area of higher temperature to an area of lower temperature by conduction, convection, or radiation.
Heat Welding:	Fusing the seams of separate sections of roofing material together through the use of hot air or an open flame and pressure. Also known as heat seaming.
Hem:	The edge created by folding metal back on itself. Metal is hemmed for safety and strength reasons.
Hip:	The angle formed by the intersection of two sloping roof planes.
Hip Roof:	A roof that rises by inclined planes on all sides of a building. The line where two adjacent sloping sides of a roof meet is called the Hip.
Hoist:	A mechanical lifting device. A hoist can be hand or electrically operated.
Holiday:	An area where a liquid-applied material is missing.
Honeycomb:	Small voids left in concrete because the mortar failed to fill the spaces around the aggregate.
Humidity:	The amount of water vapor in the air.
ICBO:	International Conference of Building Officials, responsible for The Uniform Building Code.
Ice Dam:	Ice formed at the transition from a warm surface to a cold surface, such as along the overhang of a house. The build-up of ice is the result of ice or snow melting on the roof area over the warmer, living area of a building and then refreezing when it runs down and reaches the overhang.
Ignition Temperature:	The minimum temperature at which a material will combust.
Impact Resistance:	A roof assembly's ability to withstand the impact from falling objects such as hail.
Impregnate:	To saturate; in roofing, asphalt impregnated fiber glass roofing felts are fiber glass mats that have been completely permeated with asphalt bitumen.
Infrared Thermography:	The use of an infrared camera to detect moisture in roof insulation.
Inorganic:	Involving neither organic life nor the products of organic life; relating to compounds not containing hydrocarbon groups.
Insulation:	Material used to help maintain a certain temperature in a building by reducing the flow of heat to and from that building.
Intake Ventilation:	The part of a ventilation system used to draw fresh air in. Usually vents installed in the soffit or along the eaves of a building.
Interlayment:	A waterproof material usually installed between adjacent rows of wood shakes to help with the roof's waterproofing characteristics.
Interlocking Shingles:	Shingles that lock together to provide wind resistance.

Internal Pressure: Atmospheric pressure inside a structure that correlates to the number and location of openings and air leaks.

Isocyanate: A highly reactive organic chemical containing one or more Isocyanate groups. A basic component in Sprayed Polyurethane Foam systems and some polyurethane coating systems.

Joint Tape: Tape used to seal joints between insulation boards.

Joist: Any of the parallel horizontal beams set from wall to wall to support the boards of a floor, ceiling or roof of a building.

Knee Cap: Sheet metal trim that fits over a panel rib after it has been cut and bent.

Laitance: An accumulation of fine, powdery aggregate particles on fresh cement caused by the upward movement of water; indicates that too much water was used in the mix resulting in poor surface adhesion for a waterproofing layer.

Lap: The part of the roofing material that overlaps a section of adjacent material.

Lap Cement: Asphalt-based roof cement used to adhere overlapping plies of asphalt roll roofing.

Lap Seam: Where two material that overlap are sealed together.

Leader Head: A component used to direct water from a through-wall scupper to a downspout. Also known as a Collector Head.

Leader Pipe: A conduit for carrying water from a gutter, scupper, drop outlet or other drainage unit from roof to ground level. Also known as Downspout.

Lift: The rise in Sprayed Polyurethane Foam resulting from a pass.

Live Loads: Temporary items on a roof such as equipment, people, snow, etc. which the roof must be designed to support.

Mansard: (1) A steep-sloped roof located at the perimeter of a building and usually used for decorative purposes. (2) The upper story formed by the lower slope of a mansard roof.

Mansard Roof: A steeper roof that terminates into a lower sloped roof at its high point.

Mat: A thin layer of woven, non-woven, or knitted fiber used to reinforce a material.

Mechanical Damage: Damage to a roof by means of items puncturing or otherwise unnecessarily penetrating the roof system or any of its components. Screws or nails stuck in the roof and heel marks along base flashings are examples of mechanical damage.

Mechanical Fasteners: Devices such as screws, plates, battens, nails, or other materials that are used to secure roofing materials.

Membrane: The portion of the roofing system that serves as the waterproofing material. Can be composed of one material or several materials laminated together.

Metal Flashing: Roof components made from sheet metals that are used to terminate the roofing membrane or material along roof edges. Metal flashings are also used in the field of the roof around penetrations.

Model Codes: A group of codes and standards accepted by more than one of the Building Code regulatory agencies such as SBCCI, BOCA, and ICBO

Modified Bitumen: A bitumen modified by one or more polymers such as Atactic Polypropylene (APP), styrene butadiene styrene (SBS).

Moisture Relief Vent: A vent installed through the roofing membrane to relieve moisture vapor pressure that has been trapped within the roofing system.

Moisture Scan: A survey of a roof specifically to detect the amount of moisture present in the roof system. Devices used in moisture surveys can be capacitance meters, infrared cameras, and nuclear scanners. Infrared scans can be done from the air or on the surface of the roof. Capacitance and nuclear scans are done on the roof surface. It is argued that the most accurate scans are done from the surface of the roof with the most accurate of these being nuclear scans.

Glossary of Roofing Terms

Mole Run: A term used to describe a ridge in a roof membrane that is not the result of improper deck or insulation joints.

Monolithic: Used to describe something without seams; formed from a single material.

Monomer: A simple molecule that can combine with other to form a polymer.

Mop-and-Flop: A roofers' term where the back side of a roofing material is mopped, then the piece is turned over and set in place.

Mopping: To apply hot asphalt or coat tar using a hand mop or mechanical applicator.

Mud Cracking: Surface cracking of a material that looks similar to dried, cracked mud.

Nailer: A piece of lumber, preferably treated, that is secured to the deck, walls, or to premanufactured curbs. Nailers are used to receive fasteners for roof membranes. Generally, nailers are installed wherever it is necessary to secure base flashings and edge metal.

Nailing Pattern: Refers to a specific method or pattern at which nails are applied. For instance, a nailing pattern for base sheets on plywood roof decks can be "Nine and Eighteen". This means one row of nails on the outside edge of the sheet set at nine inches (9") on center, and two rows in the center of the sheet, each set at eighteen inches (18") on center.

Neoprene: A synthetic rubber produced by polymerization of Chloroprene for use in liquid-applied and sheet-applied elastomeric roofing.

Nesting: To overlay existing shingles with new shingles and butt the top edge of the new shingle up against the bottom edge of the existing shingles.

Net Free Vent Area: The area permitting unrestricted air flow.

Night Seal: To temporarily seal the edge of a roof membrane in order to protect it from moisture entry. A.K.A. Night Tie-Off and Water Cut-Off.

Noble: In reference to metal, inert or inactive.

Nosing: Metal flashing bent at a 90º angle and is installed around roof perimeters, curbs, platforms, etc. in order to protect the edge of the roofing system. Nosing should not be used in place of drip edge.

NRCA: National Roofing Contractors Association.

Open Time: The time after an adhesive has been applied and permitted to cure when the two surfaces can be bonded.

Open Valley: A valley where both sides of the roof are trimmed back from the centerline to expose the valley flashing material beneath.

Organic Felt: An asphalt roofing base material manufactured from cellulose fibers.

Organic Shingle: An asphalt shingle reinforced with organic material manufactured from cellulose fibers.

Overspray: The loss of spray particles (from coatings, SPF, etc.) in the air.

Pallet: A platform, generally from wood, used to hold materials.

Pan: (1) The concave piece of "Pan and Cover" tile whose rounded surface touches the top side of the roof substrate. (2) The flat part of a roofing panel located between the ribs.

Pan Flashing: A sheet metal flashing that covers an equipment platform and is designed to counter flash the base flashings surrounding the platform.

Parapet Wall: That part of a perimeter wall that extends above the surface of the roof.

Pass: The term used to describe the application of one layer of Spray Polyurethane Foam (SPF). The speed of a pass will determine foam thickness.

Pass Line: The distinct line formed between two passes of SPF. This line is the top skin of the bottom pass of the SPF.

Penetration: Any object that pierces the surface of the roof.

Percent Elongation: The maximum amount that a material can be lengthened or stretched before breaking; expressed as a percentage of the original length of material tested.

Perlite: A natural volcanic glass having distinctive concentric cracks and a relatively high water content. Perlite in a fluffy heat expanded form is used in lightweight insulating concrete, fire-resistant rigid insulation board (R = 2.78 per inch) and potting soil.

Perm: A unit of water vapor transmission, defined as one grain of water vapor per square foot per hour per inch of mercury (Hg) pressure difference (1 inch of mercury = 0.491 psi).

pH: A measure of the acidity or alkalinity of a solution, numerically equal to 7 for neutral solutions, increasing with increasing alkalinity and decreasing with increasing acidity. The pH scale commonly in use ranges from 0 to 14.

Phasing: Installing roof system components in separate time intervals. For instance, installing a base sheet, and then two plies of roofing one day, and coming back and installing the remaining two plies one or more days later. It is generally not considered Phasing if the surfacing is applied at a later date.

Picture Framing: Rectangular patterns seen in a roof that are created by buckles or ridges in the roof system or sumps in the substrate.

Pinhole: A small hole in a coating, foil, membrane, or other roofing material.

Pipe Boot: A prefabricated flashing piece used to flash around circular pipe penetrations.

Pitch: Term used to describe Roof Slope and also short for Coal Tar Pitch.

Pitch Pocket: A flanged piece of flashing material placed around irregularly shaped roof penetrations and filled with grout and a pourable sealer to seal around the penetration in order to seal it from against moisture entry. Pitch pockets are a good source of leaks and should be avoided if possible.

Plastic Cement: A term used to describe Type I asphalt roof cement. Plastic cement should not be used on vertical surfaces.

Plastic Film: A flexible sheet made by the extrusion of thermoplastic resins.

Plasticizers: Material incorporated into rubber and plastic in order to increase their flexibility and workability.

Plenum: A space or enclosure in which air or other gas is at a pressure greater than that of the outside atmosphere.

Ply: A layer of felt or other reinforcement material in a roof system.

Polyester: Any of numerous synthetic polymers produced chiefly by reaction of dibasic acids with dihydric alcohols and used primarily as light, strong, weather-resistant resins. In roofing, polyester is used to reinforce fabrics.

Polymer: Any of numerous natural and synthetic compounds of usually high molecular weight consisting of up to millions of repeated linked units, each a relatively light and simple molecule.

Polymerization: The combining of monomers to produce polymers.

Polypropylene: Any of various thermoplastic resins that are polymers of propylene. They are hard and tough, and are used to make molded articles and fibers.

Ponding: The accumulation of water at low-lying areas on a roof.

Pop Rivet: A small metal pin having a head on one end, inserted through aligned holes in pieces of light gauge metal to be joined and then the head is expanded to join the metal.

Positive Drainage: The drainage condition of a roof where all water is gone from the roof surface within forty-eight hours of precipitation during normal drying conditions.

Pot Life: The period of time during which a material with multiple ingredients can be applied or administered after being mixed together.

Pourable Sealer: A type of sealant that is initially in liquid form commonly used in conjunction with pitch pans to form a water-tight barrier around penetrations that are difficult to flash.

Glossary of Roofing Terms

Press Brake: A mechanical device used to form sheet metal into desired shapes and profiles.

Primer: A material that is applied to a surface in order to increase that surface's ability to adhere to or work in conjunction with a subsequently applied material.

Proportioner: A pumping unit comprised of two (2) positive displacement pumps that is designed to dispense two (2) components at a precise ratio. Used in SPF and plural component coating applications.

Psychrometer: An instrument that uses the difference in readings between two thermometers, one having a wet bulb and the other having a dry bulb, to measure the moisture content or relative humidity of air.

Purlin: Horizontal secondary structural member used to transfer loads from the primary structural members.

Radian Barrier: a reflective surface that intercepts the flow of radiant energy to or from a building component.

Raggle: A groove that is cut into the side of a vertical surface such as a wall or chimney that is used to insert a flashing element such as a reglet or counterflashing.

Rake: The sloped perimeter edge of a roof that runs from the eaves to the ridge. The rake is usually perpendicular to the eaves and ridge.

Rake-Starter: A starter strip placed along rake edges for use in asphalt shingle roofing.

Re-Cover (Overlay): The installation of a new roof system over an existing system without removing an existing system.

Reglet: A receiver, usually sheet metal, which counterflashings are attached to. Reglets can be surface-mounted, set in a raggle, or be part of the wall assembly.

Reinforced Membrane: A roofing membrane that has been strengthened by adding polyester scrims or mats, glass fibers or other material.

Relative Humidity: The amount of water vapor in the air compared to the amount of water vapor that the air can hold at a given temperature. For example, if the relative humidity is 50 percent, then the amount of water vapor in the air is half of what the air could actually hold at that temperature.

Reroofing: The procedure of installing a new roof system.

Resin: The "B" component in SPF that is mixed with the "A" component in order to form polyurethane. Resin contains a catalyst, fire retardants, a blowing agent, Polyol, and a surface active agent.

Ridge: The line where two planes of roof intersect, forming the highest point on the roof that runs the entire length of the roof.

Ridge Cap: Material applied over the ridge or hip of a roof.

Ridge Course: The final course of roofing applied that covers the area where two or more roof planes intersect.

Ridge Vent: An exhaust venting device located at the ridge of a roof that works in conjunction with a starter or under eave soffit vent and is used to ventilate attics. Ridge vents and their cooperative starter or soffit vents should be installed at a 1:1 ratio in order to function properly.

Ridging: The formation of a Buckle.

Roof Covering: The outermost reinforced layer of the roof assembly. In BUR it's the multiple-ply membrane, in Thermoplastic roof systems it's the thermoplastic sheet, etc.

Roof Curb: A frame used to structurally mount rooftop equipment such as HVAC units, exhaust fans, skylight, etc.; may be pre-constructed or constructed on site.

Roof Jack: (1) A steel bracket fastened to the roof that is used to support toe boards. (2) A term used to describe a Pipe Boot or Flashing Collar.

Roof Overhang: That portion of the roof that extends beyond the exterior wall line of the building.

Roof Seamer: (1) A mechanical device used to crimp metal roof panels and make the seams watertight. (2) A machine used to weld membrane laps of PVC (Thermoplastic) roofing material.

Roof Slope: The angle made by the roof surface plane with the horizontal plane and expressed as the amount of vertical rise for every twelve inch (12") horizontal run. For instance, a roof that rises four inches (4") for every twelve inch (12") horizontal run is expressed as having a "four in twelve" slope; often written

as "4:12." Expressed as a percentage, the slope would be 33%, which is equal to 4 divided by 12. Also known as the Pitch of a roof.

Roof System: Multiple roof components assembled to provide waterproofing (and sometimes insulating) capabilities for a structure.

Rosin: Non-asphaltic material used as slip sheets and sheathing paper in roof systems. Also referred to Rosin Paper and Rosin-Sized Sheathing Paper.

Run: The horizontal dimension of a slope.

Rust Blush: Early stage of rust indicated by an orange or reddish color.

Saddle: (1) A type of flashing usually used in conjunction with step, counter, and apron flashings on steep slope roof systems. (2) A small, somewhat pyramid-shaped figure constructed in between sump drains that is used to direct run-off water toward the sump drains.

Sag: Settling or drooping of base flashings that have not been properly secured to a surface.

Saturated Felt: Felt that has been saturated with bitumen.

Scarfed: Shaped by grinding.

Screeding: Bringing the surface of concrete to the final, desired look and finish by removing any excess or unwanted material.

Scrim: Woven or nonwoven material used to reinforce membranes; it is usually laminated or coated to produce the membrane.

Scuttle: A unit that provides access to the roof from the interior of the building.

Sealant: Generic term for a multitude of materials used to seal joints or junctures against moisture or weather.

Sealer: Coating designed to prevent bleedout or bleed-through.

Seam: A line, ridge, or groove formed from fitting, joining, or lapping two sections together.

Self-Sealing Shingle: Asphalt shingles with adhesive strips that will soften and stick to the following course of shingles when heated by the sun; used to help against wind uplift.

Self-Tapping Screws: Fasteners that make screw thread receivers when screwed into a hole.

Selvage Edge: That portion of a granule-surfaced membrane that is designed to be overlapped by the following membrane course; usually two, four, or nineteen inches in width.

Shark Fin: A curled corner or lap in a membrane.

Shed Roof: A roof with only one sloping plane. Also known as Half Gable.

Shelf Life: The length of time between the manufacture of a material and when the material is no longer suitable for use.

Shiner: Term used to describe an exposed nail; one that was not covered by the following course of roofing material.

Shingle: (1) A single piece of prepared roofing material, either asphalt or wood, for use in steep slope roof systems. (2) To install a wood or asphalt shingle roof system.

Shingle Fashion: Refers to the way courses of like materials are overlapped in order to have multiple layer coverage.

Shrinkage: The process of shrinking; depreciation in size.

Shrinkage Crack: A crack caused by material shrinkage. May be the result of thermal expansion/contraction, material failure, or cure.

Side Lap: The longitudinal overlap of neighboring materials.

Siding: Exterior wall finish materials applied to the outside of a structure.

Sill: The bottom framing member of a door or window opening.

Glossary of Roofing Terms

Sill Flashing: Flashing material(s) used to waterproof the bottom framing member of a door or window opening.

Single Coverage: One layer of roofing material.

Single-Ply Membranes: Roofing membranes that are applied in one layer. Thermoplastic and thermoset membranes are usually Single-Ply Membranes. Single-Ply membranes come in five basic types: (1) Ballasted, (2) Fully-Adhered, (3) Mechanically-Fastened, (4) Partially-Adhered, and (5) Self-Adhered. Seams of Single-Ply Membranes can be heat welded; solvent welded, and adhered using seam tape or other adhesives.

Single-Ply Roofing: Roofing systems where the principal component consists of a single-ply membrane.

Skylight: A transparent or translucent item that is designed to admit light and set over a curbed opening in the roof.

Slag: Residue from blast furnaces that is sometimes used for the surfacing on aggregate-surfaced built-up roof systems.

Slate: A fine-grained metamorphic rock that splits into thin, smooth-surfaced layers used in steep slope roofing applications.

Slating Hook: A hook-shaped device used to secure roofing slate.

Slip Sheet: Sheeting material placed between roofing components to prevent those components from adhering to one another or to prevent material damage due to component incompatibility. Slip Sheets may be polyethylene, rosin-sized sheathing paper, or other material.

Slit Sample: A cut made in SPF roofing to measure coating thickness. The cut should be about 1.5" long by ¾" deep by ½" wide.

Slope: The angle of incline of a roof expressed as a percent or as a ratio of rise to run.

Smooth Surface Texture: In SPF roofing, a relatively smooth surfaced texture that is considered ideal for receiving the base coating.

Smooth Surfaced Roof: A roof with no surfacing or with a smooth surfacing such as emulsion and/or a reflective coating.

Snow Guard: Devices secured to the roof to prevent snow and ice from sliding off of a roof.

Snow Load: A roof load resulting from snowfall. Snow load is a major structural consideration when roofs are designed in areas that receive heavy snow.

Soffit: The underside of a roof overhang.

Soffit Vent: An intake ventilation device located in the soffit. An exhaust vent should be installed on or near the ridge of the roof to work in conjunction with the soffit vent in order to properly ventilate the attic space. The ratio of intake vent area to exhaust vent area should be 1:1.

Softening Point: The temperature at which bitumen will begin to Flow.

Softening Point Drift: A change in the softening point of bitumen.

Soil Pipe: A pipe that penetrates a roof and is used to vent a building's plumbing.

Solder: Any of various fusible alloys, usually tin and lead, used to join metallic parts.

Solid Mopping: To continuously apply hot asphalt or coal tar leaving no areas without bitumen.

Solvent: (1) A liquid capable of dissolving other substances such as bitumen. (2) A liquid that is part of a substance and is used to make that substance easier to work with. Once applied, the solvent evaporates and leaves the working characteristics of the substance. Examples are solvent-based adhesives and solvent-based mastics.

Solvent Weld: To weld materials using a liquid solvent.

Spall: A chip, fragment, or flake from concrete or masonry.

Special Steep Asphalt: A roofing asphalt conforming to the requirements of ASTM Specification D 312, Type IV. This asphalt can be used on roofs with slopes up to 6 in 12 (50%).

Splash Guard: A fabricated metal pan or masonry block that is placed below a leader pipe or downspout and is used to help protect the roof membrane on a lower roof level or to prevent soil erosion when placed on the ground.

Splice: To join by overlapping along ends.

Splice Plate: A metal plate placed beneath the joint between two pieces of metal.

Splice Tape: A self-adhering (usually double-sided) tape used for splicing membrane materials.

Split: The separation of a material resulting from tensile forces.

Sprinkle Mopping: To scatter hot bitumen over a surface.

Spud: To remove the top surfacing of a roof by scraping it with special tools called spud bars or power spudders.

Spud Bar: A long-handle tool with a stiff flat blade on one end (usually 4" or 6" wide) that is used to scrape and remove the top surfacing of a roof down to the membrane.

Square: (1) 100 square feet of roof area (9.29 m^2) in the USA. (2) 10 square meters (107.639 $ft.^2$) of roof area using the metric system of weights and measures.

Stack Effect: The occurrence where air escapes through opening in the upper part of a building and is replaced with outside air which enters through an opening lower down. In roofing, the Stack Effect helps create proper air flow for attic or roof space ventilation. The Stack Effect will be affected by atmospheric conditions such as temperature and wind.

Stainless Steel: A highly corrosion resistant steel alloy containing either chromium, nickel, or copper.

Stair Step: The diagonal method of laying shingles.

Standing Seam: A type of metal roof system where the longitudinal seams on adjacent panels are turned up, overlapped and folded in various ways in order to prevent moisture entry and interlock the panels.

Starter Course: The primary course of roofing materials. The Starter course is installed along the down slope perimeter edge and usually covered by the first course of roofing.

Starter Plies: Felt or ply sheets that are cut into widths that are proportionate to the reciprocal of the number of plies being installed. For instance, with a three-ply built-up roof, the first starter ply would be one-third of the roll width, the second two-thirds of the roll width installed over it, and then a full ply over those.

Starter Strip: Strips of shingles (usually 3-Tab shingles with the tabs cut off) or roll roofing material that is laid along the eave line of the roof prior to the application of the first course of shingles. The starter strip is used to fill in the gaps created by shingle cutouts and joints.

Steep Asphalt: A roofing asphalt conforming to the requirements of ASTM Specification D 312, Type III. This asphalt can be used on roofs with slopes up to 3 in 12 (25%).

Steep-Slope Roof: A roof with a slope exceeding 3 in 12 (25%). Deemed appropriate to receive water-shedding type roofing materials such as asphalt shingles, wood shakes and shingles, concrete or clay tile, etc.

Steeple: A tall tower forming the superstructure of a building, such as a church or temple, and usually surmounted by a spire.

Step Flashing: Pieces of metal or other material that are used to flash roof projections such as chimneys, walls, curbs, etc. The pieces are installed between each course of roofing and generally have a vertical flange equal in length to that of the horizontal flange.

Strapping: Installing roofing felts so that they run parallel with the slope. Not a recommended installation method for slopes that are 1:12 or less.

Straw Nail: Long shanked nails used to fasten tile along hips and ridges.

Strip Flashing: Pieces of membrane material that are used to flash metal flashing flanges such as gravel stop. Also referred to as Stripping.

Strip Mopping: Hot bitumen applied in parallel bands.

Glossary of Roofing Terms

Strip Shingles: Asphalt shingles that are manufactured in strips.

Substrate: The surface that the roof is installed upon.

Sump: A depression around roof drains and scuppers to help promote roof drainage.

Surface Erosion: The effect on a surface after being worn away from abrasion or weathering.

Surfacing: The top-most layer of the roof system designed to protect the system from damage.

Surfactant: Short for "surface active agent." A soluble compound that reduces the surface tension of liquids, or reduces interfacial tension between two liquids or a liquid and a solid having cationic (positive charge), anionic (negative charge), or non-ionic (no charge) nature. The ingredient in SPF that controls the cell size.

Tab: The portion of an asphalt shingle that is outlined by the cutouts.

Tapered Edge Strip: Tapered insulation strip used to ease transitions from one substrate elevation to another and to provide slope along roof perimeters.

Tar: A brown or black bituminous material, liquid or semi-solid in consistency, in which the predominating constituents are bitumens obtained as condensates in the processing of coal, petroleum, oil-shale, wood, or other organic materials.

Tar Boil: A small bubble found in the flood coat of an aggregate-surfaced built-up roof; usually the result of trapped moisture vapor. Tar Boils are also known as blueberries or blackberries.

Tear-Off: To remove a roof system down to the structural substrate.

Tear Resistance: A material's ability to withstand tearing. The test is performed by placing stress on an area of the material where a flaw is located. Tear Resistance is expressed in psi per inch width or kilonewton per meter width.

Tear Strength: The strength necessary to tear a material.

Tensile Strength: The amount of longitudinal pulling stress that a material can withstand before being pulled apart.

Termination: The sealed edges of a roof membrane.

Termination Bar: A bar, usually metal or vinyl, used to seal and anchor the free edges of a roof membrane.

Terne: Sheet iron or steel plated with an alloy of three or four parts of lead to one part of tin, used as a roofing material.

Terra Cotta: A semi-fired ceramic clay used in building construction.

Thatch Roof: A roof covering made with straw, palms, reeds or other natural growths that are bound together in order to shed water.

Thermal Barrier: Material used in conjunction with polyurethane foam that is designed to inhibit the rise in temperature of the foam during a fire in order to delay the foam's involvement in the fire. Time ratings for thermal barriers should exceed 15 minutes.

Thermal Insulation: A material used to reduce heat flow.

Thermal Movement: Movement of a material resulting from temperature changes.

Thermal Shock: The damage to a roof resulting from expansion and contraction which are the result of sudden extreme temperature changes. Thermal Shock often occurs when a cold rain shower suddenly cools a roof during a hot day.

Thermal Stress: Stress to a roof system or component caused by expansion and / or contraction from temperature change.

Thermoplastic: (1) *adjective* Becoming soft when heated and hard when cooled. (2) *noun* A thermoplastic resin, such as polystyrene or polyethylene.

Thermoset: A material that cannot be reshaped or formed by heating. EPDM and Butyl are thermosets.

Thinners: Liquids that are used to reduce a material's viscosity when mixed but that evaporates during cure.

Thixotropy: Property of certain materials which liquefy when they are subjected to vibratory forces such as simple stirring or shaking and then solidify when left standing.

Throat: (1) The cutout of a shingle. (2) The narrowing passage located between a fireplace and smoke chamber or flue.

Through-Wall Flashing: A material that extends through a wall and is used to direct water entering a wall cavity to the exterior of the structure.

Tie-In: The joining of two different roof systems.

Tie-Off: A watertight seal used to terminate roof membranes at system adjuncts, terminations, flashings, or substrates. Can be temporary or permanent.

Toggle Bolt: A bolt with a separate toggle end that can be flattened to fit through a pre-drilled hole and that springs outward to provide a secure hold when the bolt is tightened.

Tongue and Groove: Pre-manufactured materials with a convex "tongue" on one side and a concave "groove" on the other so that pieces of material can be joined together by placing the tongue of one piece into the groove of an adjacent piece so that the pieces fit more securely together.

Torque: Force applied to an object, particularly, to screw a mechanical fastener into a roof deck or substrate.

Traffic: Any rooftop activity that can potentially damage the roof surface.

Transverse Seam: The joint between the top of one metal roof panel and the bottom of the next panel, which runs perpendicular to the roof slope.

Tuck Pointing: To remove old and deteriorated mortar from between masonry blocks and replace it with new mortar.

U-Value: The overall coefficient of heat transfer of an assembly measured in BTUs per square foot, per degrees Fahrenheit difference in temperature per hour.

UL Label: A label that has been stamped on certain materials by authority of Underwriters Laboratories, Inc. indicating that the material has met certain performance criteria.

Underlayment: A material installed over the roof deck prior to the application of the primary roof covering. Usually consists of fifteen (15#) or thirty (30#) pound organic felt but can also be self-adhering such as an ice and water protection membrane.

Valley: The internal intersection of two sloping roof planes that runs from the eaves to the ridge. This intersection collects the most water run-off.

Vapor Migration: The natural movement of water vapor from regions of higher vapor pressure to regions of lower vapor pressure.

Vapor Retarder: A material used to restrict the passage of water vapor through a roof assembly.

Veneer: Any of the thin layers of wood glued together to make plywood.

Vermiculite: One off a group of micaceous hydrated silicate minerals related to the chlorites and used in lightweight insulating concrete.

Void: An open space or a break in continuity; a gap.

Volatile: That which readily vaporizes; evaporates quickly.

Vulcanize: To improve the strength, resiliency, and freedom from stickiness and odor of rubber, for example, by combining with sulfur or other additives in the presence of heat and pressure.

Water Absorption: The increase in weight of a test specimen expressed as a percentage of its dry weight after being immersed in water for a specified time at a given temperature.

Water Cure: To control the rate of cure of materials such as concrete by spraying a fine mist of water on the surface.

Water Guard: A turned up edge on valley metal or continuous wall flashing; used to prevent water migration under the roof system.

Water Stop: Material placed over a joint and used to prevent water entry.

Glossary of Roofing Terms

Waterproofing: The treatment of a surface or structure in order to prevent the passage of water under hydrostatic pressure.

Water Trough: The area in a valley where water runs. Usually referred to with open valley configurations.

Weather: To undergo degradation in quality and appearance which is caused by exposure to the sun, wind, rain, etc.

Weep Holes: Small holes used to permit moisture to drain that has gathered inside a building component.

Weld: To join multiple metal or PVC components together by heat fusion.

Wet Film Thickness: The thickness of an uncured material such as a coating.

Wick: To convey liquid by capillary action.

Wind Clip: A clip that slips over the ends of tile, slate and other steep slope roofing materials in order to help prevent wind uplift damage.

Wind Load: The force that wind puts on structures.

Wind Uplift: (1) The upward displacement of a section of a roof system or component caused by movement of air from a location of higher air pressure, such as inside a building, to an area of lower air pressure, such as the surface of a roof during a windy day. Strong wind across the surface of a roof, especially at corners and along perimeters, creates low air pressure above the surface of the roof. Nature will automatically try to compensate for this by moving air from an area of higher pressure such as inside a building. If all penetrations and perimeters are not properly sealed, then "blow-off" can occur. (2) Displacement or blow-off of shingles or other roofing caused by the wind.

Wire Tie: A system for attaching heavy steep slope roofing materials such as slate r tile by using wire fasteners in addition to or in place of nails.

Z Bar or Z Section: A piece of steel formed in the shape of a "Z."