

Roofing 101



A BASIC DISCUSSION OF ROOFING AND ROOF MANAGEMENT



TWO BASIC CATEGORIES

STEEP SLOPE ROOFS

LOW SLOPE ROOFS

STEEP SLOPE ROOFS

- GREATER THAN
1 1/2" : 12" PITCH
(SLOPE)

WATER SHEDDING
SYSTEMS



Steep Slope Assemblies

Asphalt Shingle Types

- Strip
- Laminated
- Individual

Shingle Reinforcement

- Organic
- Glass-fiber
- Polyester/Synthetic

Roof Tile Types

- Barrel, Pan & Cover
- S-Tile
- W- Tile Channeled
- Simulated Slate
- Flat Plain

Roof Tile Composition

- Clay
- Concrete
- Lightweight Concrete

Slate Material Types

- Natural Materials
- Cementitious
- Composite Materials

Slate Roof Systems

- Standard
- Graduated
- Textural

Wood Shake Types

- Handsplit & Resawn
- Taper-sawn
- Taper-split
- Straight-split

Shake Composition

- Cedar
- Cedar Shingles
- Pressure Treated
- Composite Material

Non-Ferrous Metals

- Aluminum
- Copper
- Lead Coated Copper
- Lead
- Stainless Steel
- Terne-coated Stainless
- Zinc

Ferrous Metal Types

- Aluminized Steel
- Galvalume
- Galvanized Steel
- Terne Metal

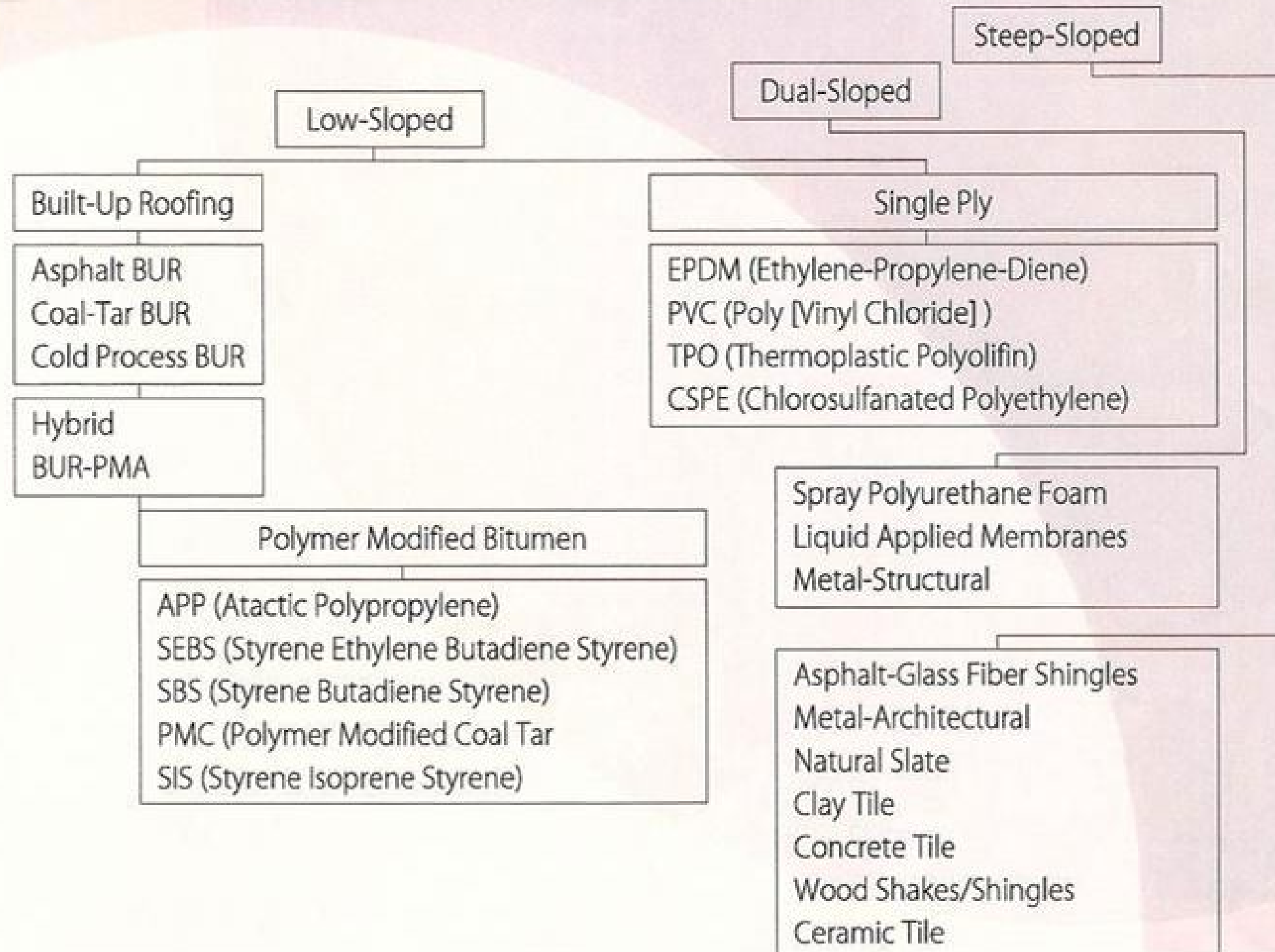
LOW SLOPE ROOFING

- UNDER 1 1/2": 12"
PITCH
- WATER-PROOFING
SYSTEM





Roofing Systems Classification Chart



METAL ROOF SYSTEMS

- LOW SLOPE OR STEEP SLOPE



S.P.U.F.

- Sprayed Polyurethane Foam

Low and mid slope applications



LIQUID APPLIED SYSTEMS

- LOW OR MID SLOPE



ELEMENTS OF A LOW SLOPED ROOF

ROOF ASSEMBLY

1. ROOF DECK
2. INSULATION
3. ROOF MEMBRANE AND OR MATERIALS

ROOF SYSTEM

1. INSULATION
2. ROOF MEMBRANE AND OR MATERIALS

DRAINAGE

- PERIPHERAL



- INTERNAL



ROOF DECK

- EAST COAST STEEL

- WEST COAST WOOD



ALTERNATE DECKS

- STRUCTURAL CONCRETE
- LIGHTWEIGHT CONCRETE(PAN OR FORMBOARD)
- PRE-CAST CONCRETE
- POURED/SPRAYED GYPSUM
- GYPSUM PLANK
- TECTUM

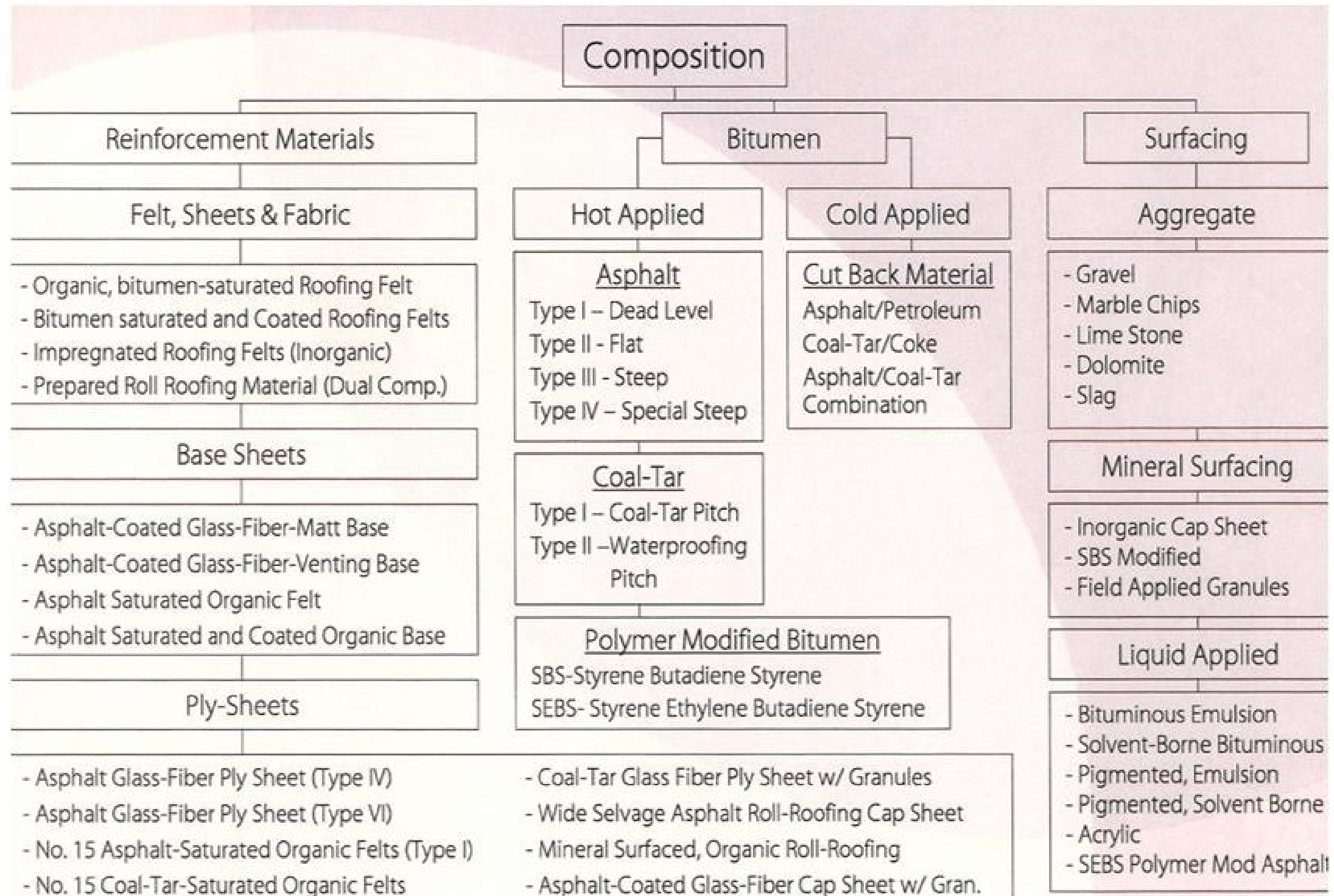
INSULATION

- PROVIDES A SURFACE (SUBSTRATE) FOR THE MEMBRANE OR MATERIALS
- PROVIDES THERMAL RESISTANCE



BUILT-UP ROOFING

- USE ASPHALT, COAL TAR PITCH OR COLD APPLIED LIQUIDS/CEMENTS
- USE BASE AND/OR PLY SHEETS
- REQUIRE A SURFACING MATERIAL
- ASPHALT, PITCH OR COLD CEMENTS ARE THE WATERPROOFING AGENT
- BASE SHEETS SEPARATE THE DECK OR INSULATION FROM THE PLY SYSTEM
- PLY SHEETS ACT AS A BINDER
- SURFACING MATERIALS PROTECT THE ROOF SYSTEM FROM THE ELEMENTS





Build-Up Roofing Inter-Play Felt Shingle Configuration

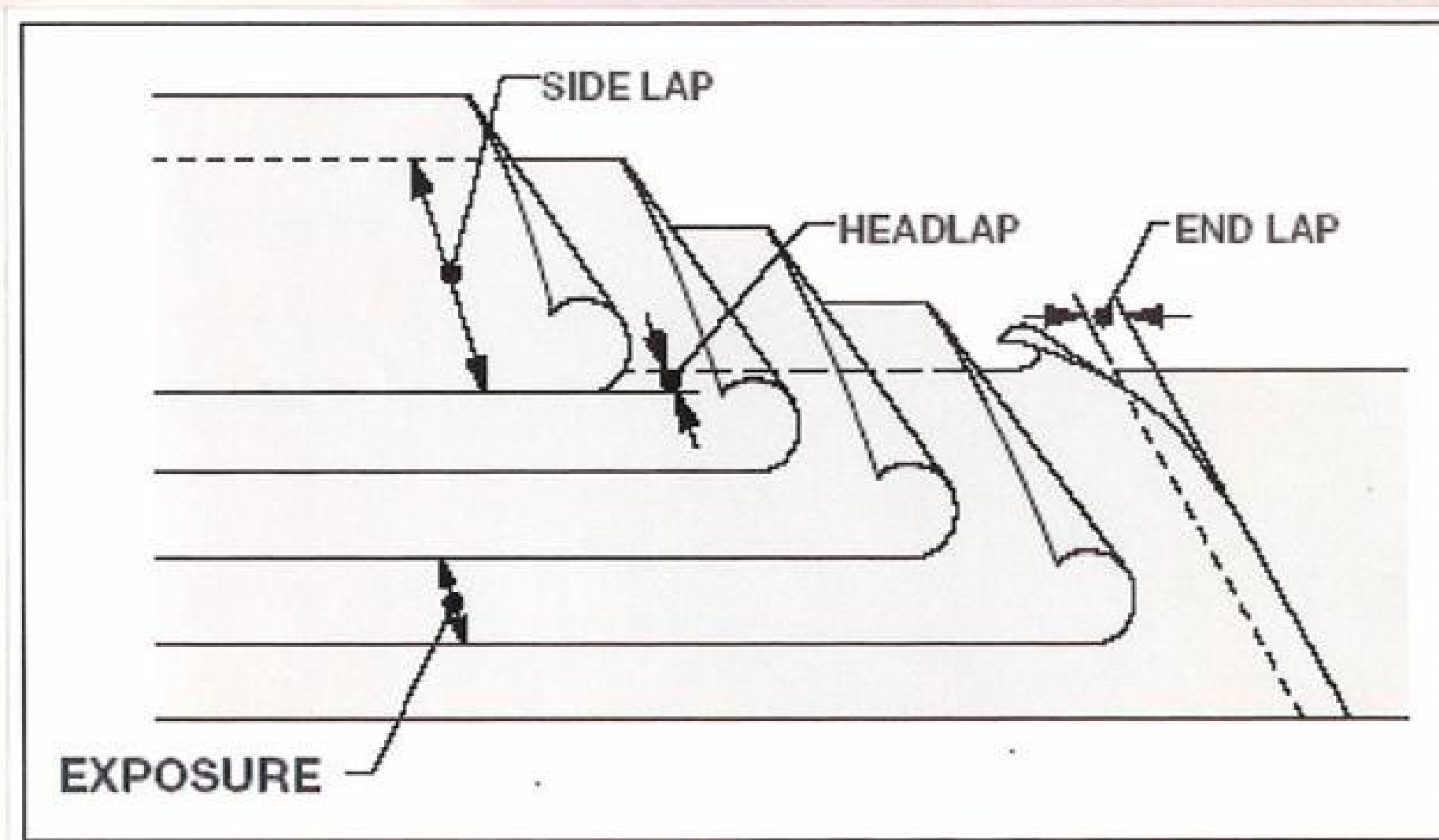
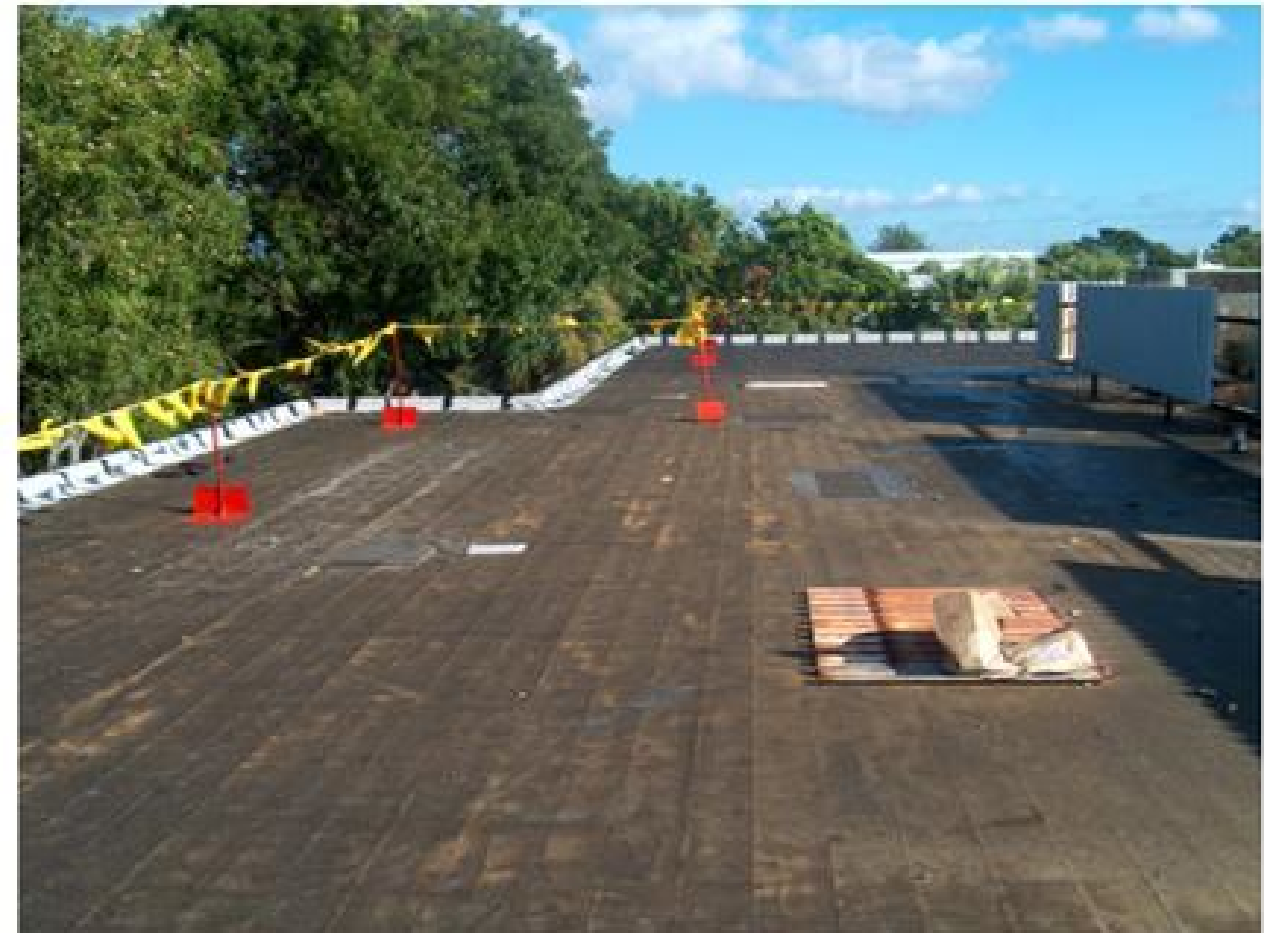


Figure 1: Courtesy of the NRCA Roofing and Waterproofing Manual Fifth Edition

- Exposures: = 36" roll width less 2" = 34" divisible by the number of total system plies = the felt exposure. Manufacture ply lines should not be utilized for interply configurations.

BITUMEN & PLY

- FORM THE WATERPROOFING COMPONENTS OF THE ROOF SYSTEM



SURFACINGS

- GRAVEL SURFACED

Flood coat applied



- CAP SHEET SURFACED

Torch or mop applied



ALTERNATE SURFACINGS

- COATED



- ASPHALT APPLIED
SINGLE PLY



FLOOD COAT AND GRAVEL

- IT'S A SURFACING, NOT A BALLAST
- DURABILITY
- LOW SPOTS
- DRAINAGE



SINGLE-PLY ROOFS

- USE INSULATION
- ONE LAYER OF A WATERPROOF (O.K., ALMOST WATERPROOF) SYNTHETIC MEMBRANE

SINGLE-PLY SYSTEMS

- SYNTHETIC MATERIALS
- THERMOSET MEMBRANES
- THERMOPLASTIC MEMBRANES
- SEAMS



THERMOSET MEMBRANE

- EPDM
- PIB

ADHESIVE SET
SEAMS



Thermoset Material

Ethylene Propylene Diene Monomer (EPDM)

EPDM Seam Installation

- Chemically Primed & Taped
- Chemically Bonded Seams

Chlorosulfonated Polyethylene (CSPE)

CSPE Seam Installation

- Hot Air Welded
- Chemically Bonded Seams
- Liquid (CSPE) @ all cut seams

Polyisobutylene PIB

PIB Seam Installation

- Self Adhesive
- Chemically Primed Seams
- Liquid (PIB) @ "T" Laps

Method of Installation

- Aggregate Ballasted
- Paver Block Ballasted
- Mechanically Fastened
- Fully Adhered
- Asphalt (PIB)

Note: (PIB) Refers to Polyisobutylene membrane only.

Related Flashing

- Resin Coated Metal
- Clad Metal
- Non-reinforced Material
- Factory Fabricated Boots
- Factory Corners

Separator Sheets

- Heavy Polyester
- Glass-fiber Fabric
- Reinforced Kraft Paper
- Polyethylene Sheeting
- Factory Applied Fleece (PIB)

Note: (PIB) Refers to Polyisobutylene membrane only.

Adhesives and Sealants

- Water Base Adhesive
- Solvent Based Adhesive
- One-part Urethane
- Two-part Urethane
- Proprietary Sealants

THERMOPLASTIC MEMBRANES

- TPO
- PVC

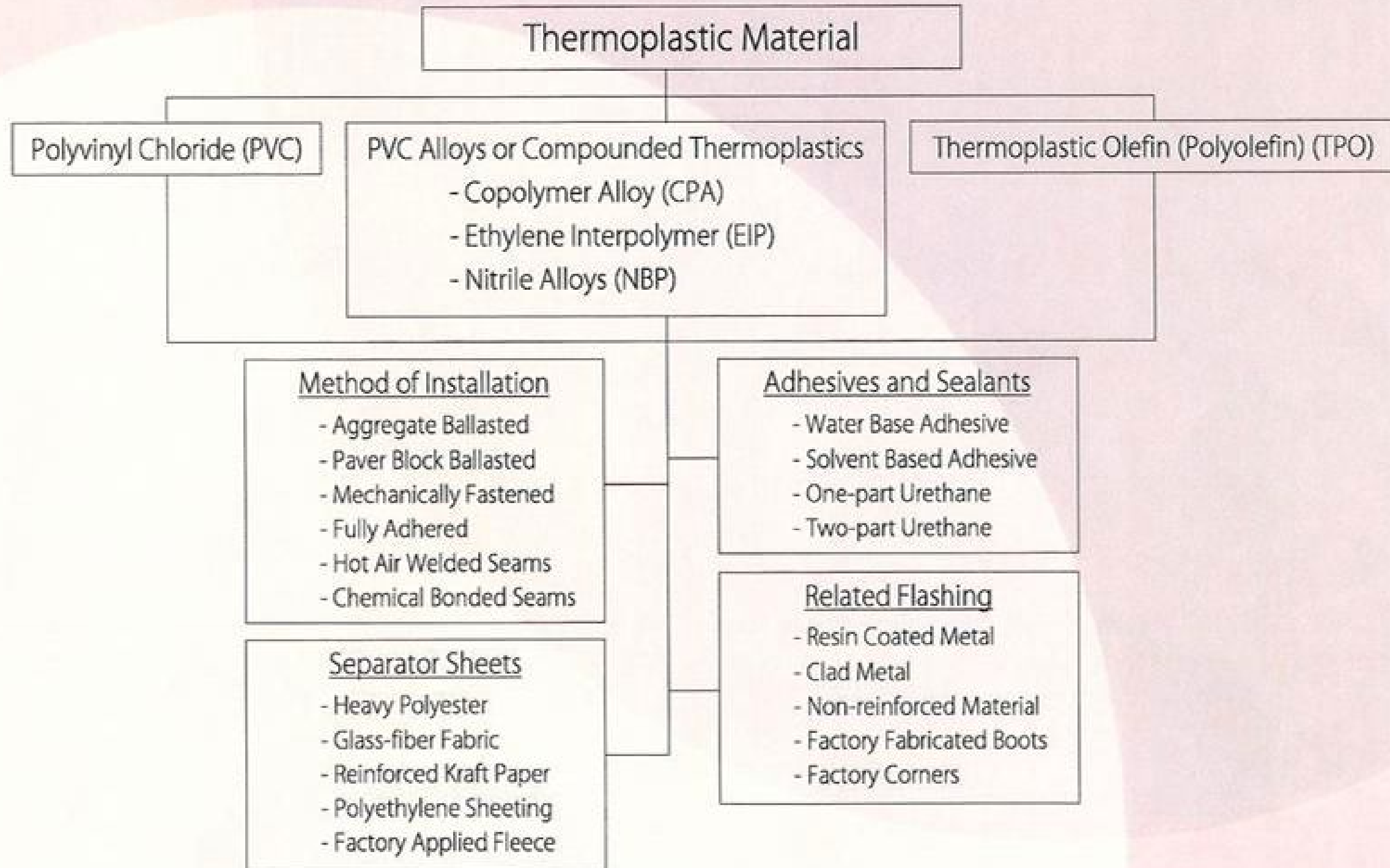
HEAT WELDED
SEAMS



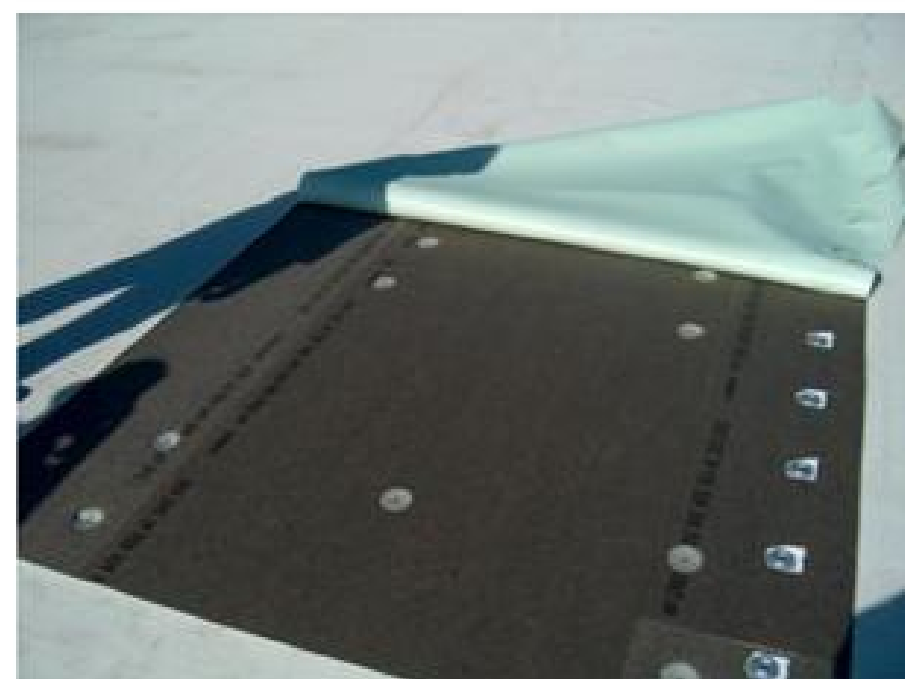
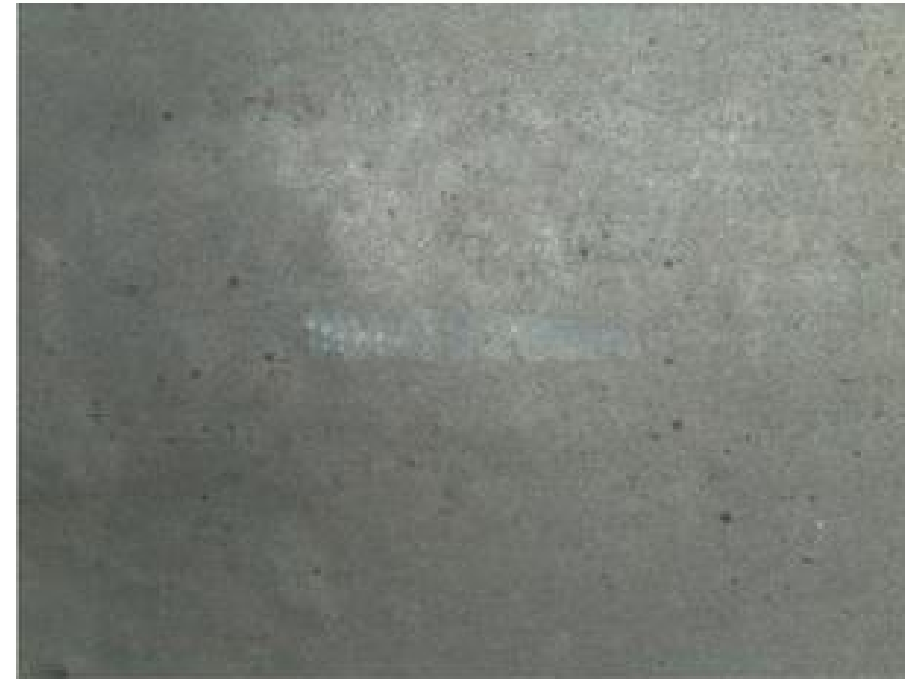


Low Slope Roofing Overview

Thermoplastic Roof Membranes



ATTACHMENT



TERMINATIONS

- The treatment or method of anchoring the free edges of the membrane in a roofing system.



PENETRATIONS

- PROTRUSIONS
EXTENDING
THROUGH THE
ROOF SYSTEM



DETAILS, DETAILS, DETAILS

- Major cause of roof leaks is in the details.



DESIGN CONSIDERATIONS

Different roof systems
for different building
designs and uses.

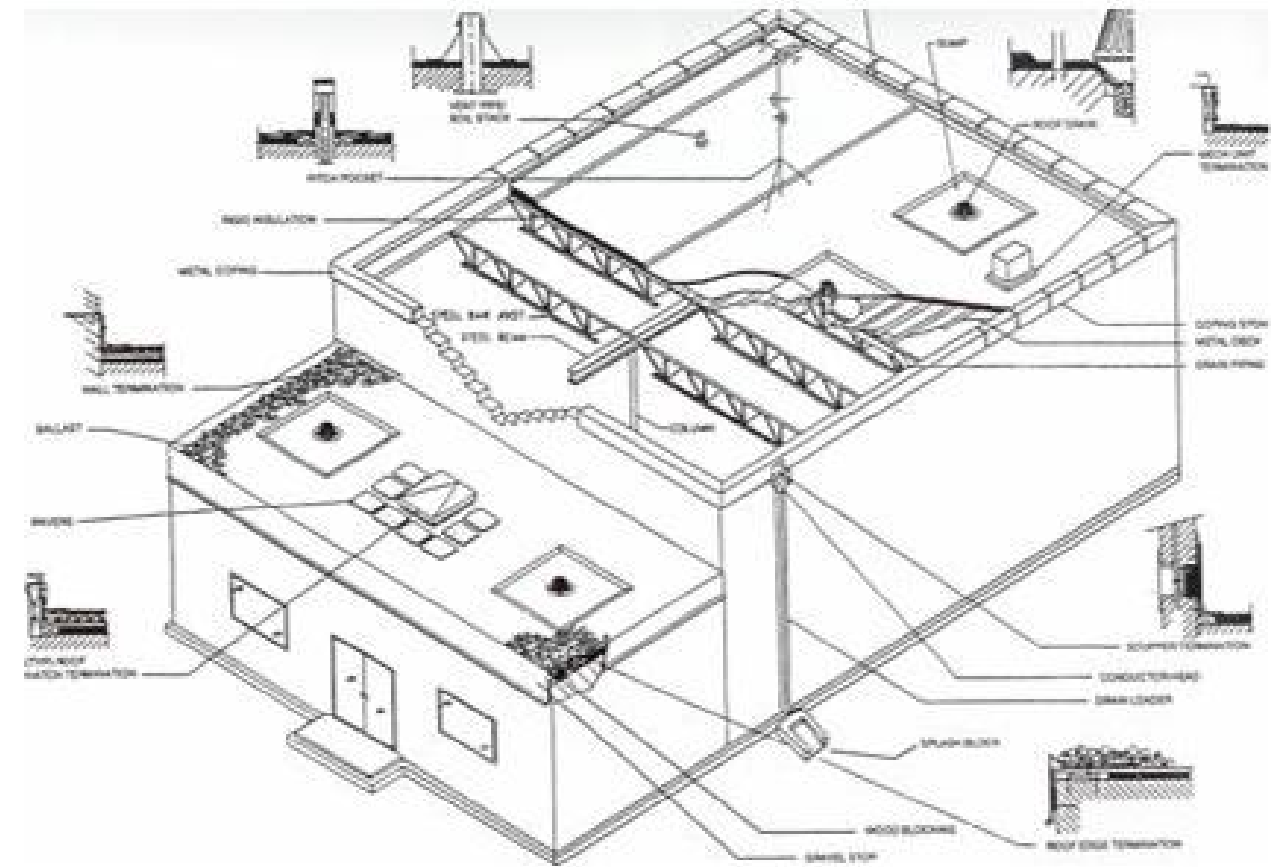
No panacea.

Like in Kind



PRE DESIGN PHASE

- ARCHITECT AND ENGINEER ARE CONSIDERING ROOF TYPE WITH INITIAL BUILDING DESIGN





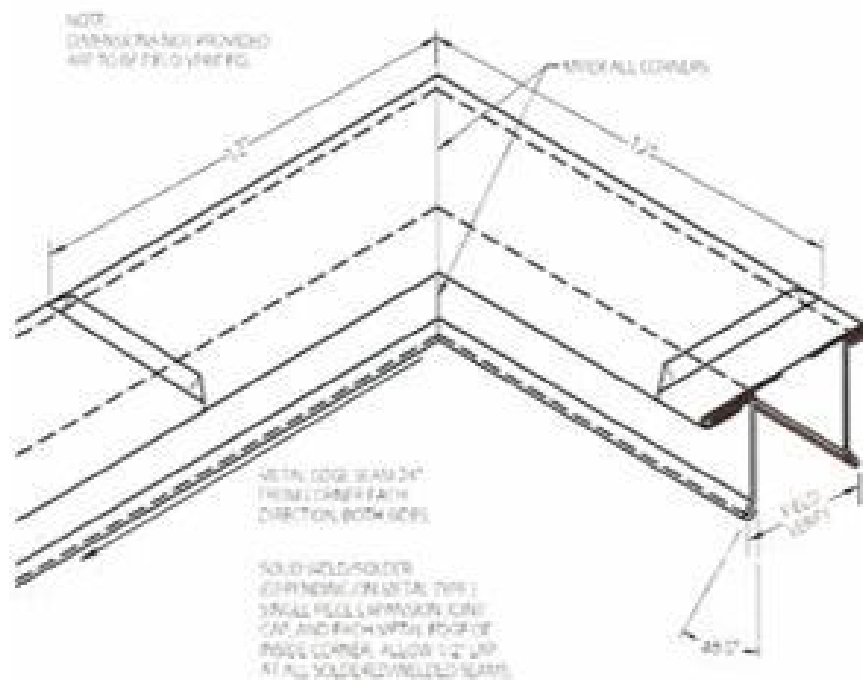
Proper Roofing Design Should Include:

1. An assessment of architectural components and elevations or in the event of reroofing the existing conditions, environmental and/or logistical concerns.
2. The clients current budget and future ability to maintain the roofing system and related components.
3. Roofing system general track history, geographical performance criteria, maintenance and life cycle costing for comparable assemblies.
4. Concise detailing of transitions, terminations and through roof penetrations.
5. A system including a secondary line of defense against moisture infiltration at roof area field, flashing, counterflashings and through roof penetrations.

Roofing Detailing Should Include:



Riley Expansion Joint Cover Outside Corner
SCALE: N.T.S.

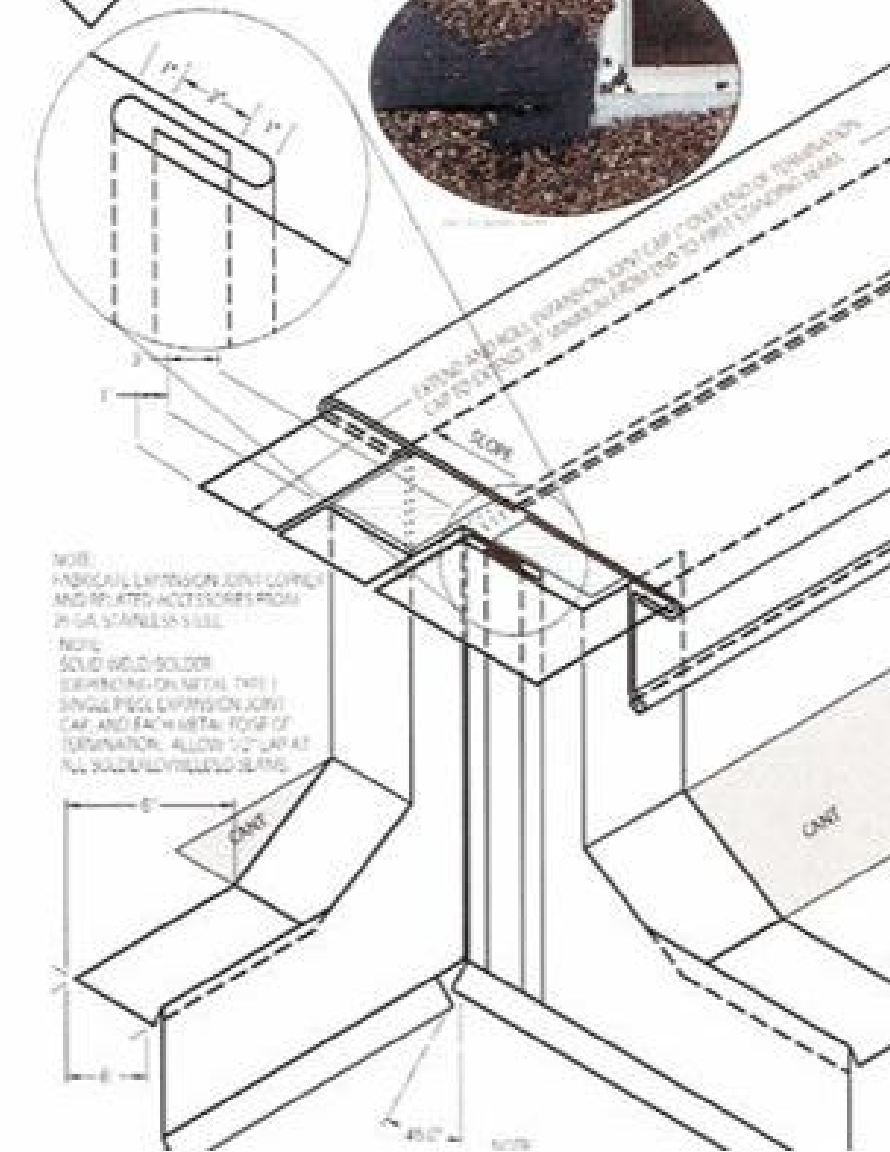
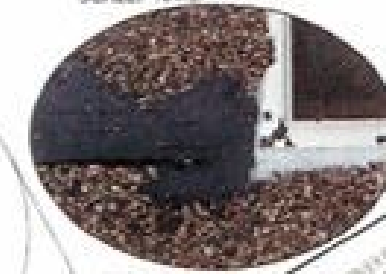


NOTE: FABRICATE EXPANSION JOINT COVER

NOTE: REVERSE ROLL SEAMS TO MATCH



Riley Expansion Joint End Cap @Co
SCALE: N.T.S.



NOTE: FABRICATE EXPANSION JOINT COVER AND RELATED ACCESSORIES FROM 316L STAINLESS STEEL

NOTE: SOLID WELD SOLDER (SMPRO-10) ON METAL TYPE 1 SINGLE PLY EXPANSION JOINT CAP AND EACH METAL ROOF OF TERMINATION. ALLOW 1/2" LAP AT ALL SOLID WELDED JOINTS.

CONVERSIONS

- STRUCTURAL CONSIDERATIONS
- DRAINAGE CONSIDERATIONS
- PERFORMANCE CONSIDERATIONS
- CODE CONSIDERATIONS





Know when to walk away....know when to..... R U N!

Some materials may seem compatible



But they're not

ROOF MANAGEMENT

- INSPECTIONS
- MAINTENANCE
- REPAIRS
- RE-ROOFING
- RECOVERS
- TEAR-OFFS

LIFE CYCLE COSTING

- TOTAL ROOF COST DIVIDED BY THE LIFE OF THE ROOF=LIFE CYCLE COST
- / BY THE AREA FOR PSF LIFE CYCLE COST
- INITIAL OR RE-ROOF COST
- INSPECTION, MAINTENANCE AND REPAIR COSTS
- WARRANTY COSTS
- INSURANCE COSTS



Low Slope Roofing Overview System Comparison Survey

Membrane Type	Percent surviving after (in years)					Life cycle cost \$/yr
	9	15	21	27	33	
Asphalt-glass fiber BUR	99.9	69.9	9.5	0.1	0.0	0.31
SBS polymer modified asphalt	98.3	61.0	5.7	1.0	0.0	0.34
(PVC) Poly [vinyl chloride]	93.7	35.2	1.2	0.0	0.0	0.36
EPDM rubber	95.6	36.7	1.1	0.0	0.0	0.33
Asphalt-organic felt BUR	96.4	46.4	2.3	0.0	0.0	0.33
Spray polyurethane foam	83.7	17.9	0.2	0.0	0.0	0.47
Thermoplastic polyolifin	90.0	21.2	0.2	0.0	0.0	0.37
APP polymer modified asphalt	9.5	32.3	0.5	0.0	0.0	0.34

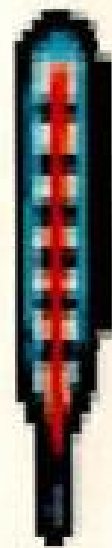
Source: *Roofing Failures*, by Carl G. Cash, Published 2003

DON'T LET IT LEAK !!

WHEN DOES A ROOF LEAK?



It is good to remember...



The higher the climate temperatures

The  the service life of membrane.

FOR THE FUTURE

- SAFETY
- CONVENIENCE
- LIFE CYCLE COST
- ENVIRONMENTAL



SAVE THE SUBSTRATE

- USE IT ONCE OR USE IT TWICE



SPECIFICATIONS

- A concise statement of requirements to be satisfied by a product, material or a process.
- **DESCRIPTIVE**
- **PERFORMANCE**
- **REFERENCE STANDARD**
- **PROPRIETARY (CLOSED OR OPEN)**



LIBERTY
PROPERTY TRUST

Specification for Reroofing 2400 Lake Orange Drive • Orlando, Florida

Project Consultant:



allied roofing consultants, inc.
Roofing and Waterproofing Consultants

4861 South Orange Avenue, Suite 8 • Orlando, Florida 32839
Phone: 407.298.1112 • Fax: 407.297.2281

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CONTRACTS

- AIA FORMS
- CONTRACTOR CONTRACTS

RIGHTS DUTIES & RESPONSIBILITIES

- OWNER
- ARCHITECT/ENGINEER/CONSULTANT
- CONTRACTOR

CODES COVENANTS & RESTRICTIONS

- BUILDING CODES
- PROPERTY COVENANTS
- ENVIRONMENTAL RESTRICTIONS

SPECIFIERS

- CONTRACTOR
- MANUFACTURER
- PROPERTY MGR
- 3RD PARTY
EMPLOYED BY THE
OWNER

LIBERTY
PROPERTY TRUST

SECTION 07530
BALLASTED EPDM ROOFING SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. EPDM roofing membrane, ballasted conventional application.
- B. Replacement of wet or damaged insulation, flat and tapered.
- C. Flashings and counterflashings.
- D. Roofing accessories, area dividers and stack boots.

1.02 RELATED SECTIONS

- A. Section 02200 – Site Preparation
- B. Section 05310 – Steel Deck
- C. Section 06114 – Wood Blocking and Curbing
- D. Section 07620 – Sheet Metal Flashing and Trim: Gutters and Downspouts
- E. Section 09960 – High-Performance Coatings

1.03 REFERENCES

- A. ASTM C 1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2002.
- B. ASTM D 412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension; 1998a (Reapproved 2002).
- C. ASTM D 449 - Standard Classification for Class of Adhesives for Sheet and Block Construction

WARRANTY

- CONTRACTORS
- MANUFACTURERS



Roofing Material Warranties



Roofing Material Manufacturer Warranties

- Are material warranties written to protect the interest of the manufacturer or the building owner?
- Is it possible to provide a better means of protection for the building owner and designer?
- Would a planned maintenance budget be a better use of the clients dollars as apposed to paying manufacturer warranty fees?

"What do warranties and snow have in common, They both turn to water." by Carl G. Carr

FM GLOBAL INSURANCE CO.

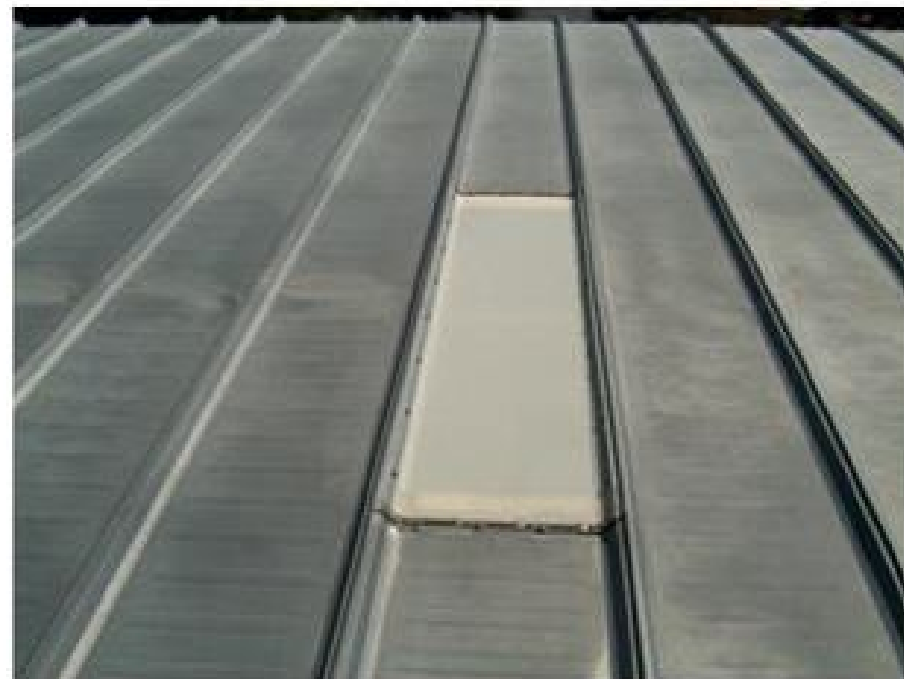
- ONE OF THE WORLDS LARGEST COMMERCIAL AND INDUSTRIAL PROPERTY INSURANCE AND RISK MANAGEMENT ORGANIZATIONS SPECIALIZING IN PROPERTY PROTECTION.

FM RESEARCH

- LOSS CONTROL FOCUSES ON
 - PROTECTION RESEARCH
 - MATERIALS RESEARCH
 - STRUCTURES RESEARCH
 - RISK AND RELIABILITY
- FM GLOBAL RESEARCH CAMPUS
- 78 MILLION \$ RESEARCH FACILITY ON 1600 ACRES IN GLOCESTER R.I.

SAFETY

- LADDERS
- ROOF EDGES
- PENETRATIONS
- SKYLIGHTS



Liberty Orlando

- 2400 Lake Orange Drive



Liberty Orlando

- 1090 Gills Drive



Liberty Orlando

- 10003 Satellite



Liberty Orlando

- 6989 Lee Vista



Thank You!!!!

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