

GARLAND INDUSTRIES, INC.

AIA PRESENTATION



CHOOSING THE RIGHT ROOF SYSTEM

Program # 0619 CRS



LEARNING OBJECTIVES

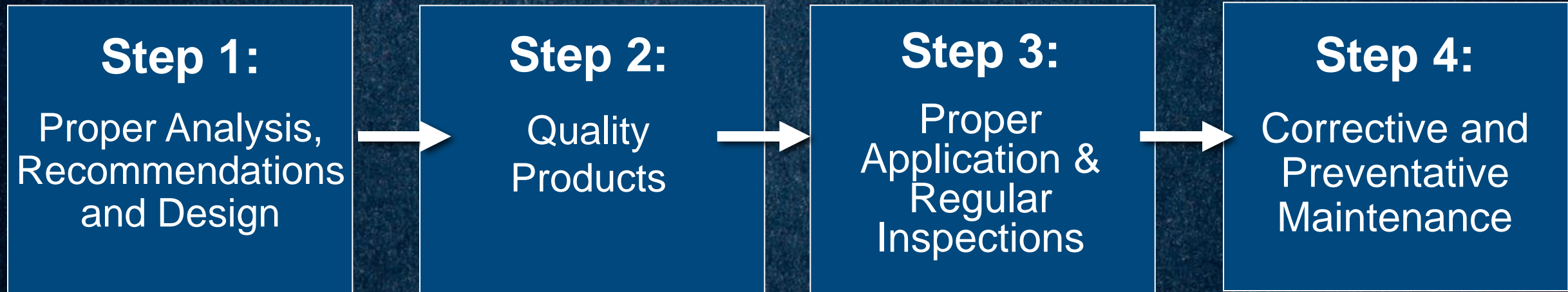
- Understand the Advantages and Disadvantages of the Three Most Common Commercial Low Slope Roofing Systems
- Learn About Various Application Options Available For Those Systems
- Receive an Overview of Various ASTM Testing Methods Used to Define the Performance of Each System

THE ROOFTOP CHALLENGE

- **More Than Half** of Building Owners Report The Roof as Their **#1 Construction Problem**
- **Almost Half** of All Designer Related Legal Claims Involve The Roof
- 15% of New Roofs **Fail Within First 6 Years**
- Roofs, On Average, **Last Only About Half** of Their Designated Lifetime
- While Roofs Only Make up About 2% of Construction Costs, Water Intrusion Accounts for More Than **70% of Construction Litigation**



FOUR STEPS TO SUCCESS

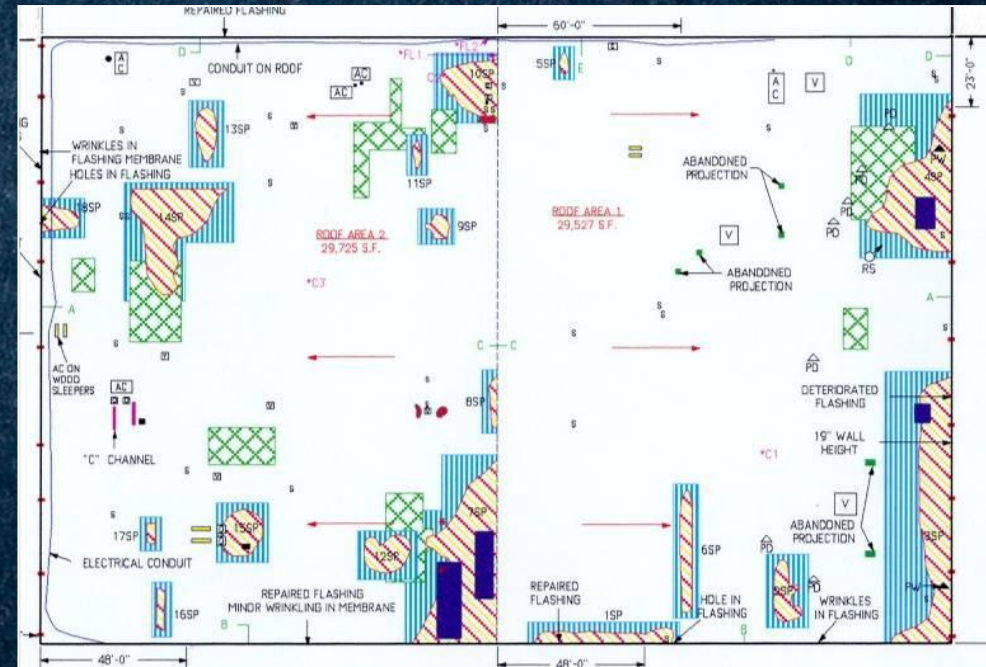
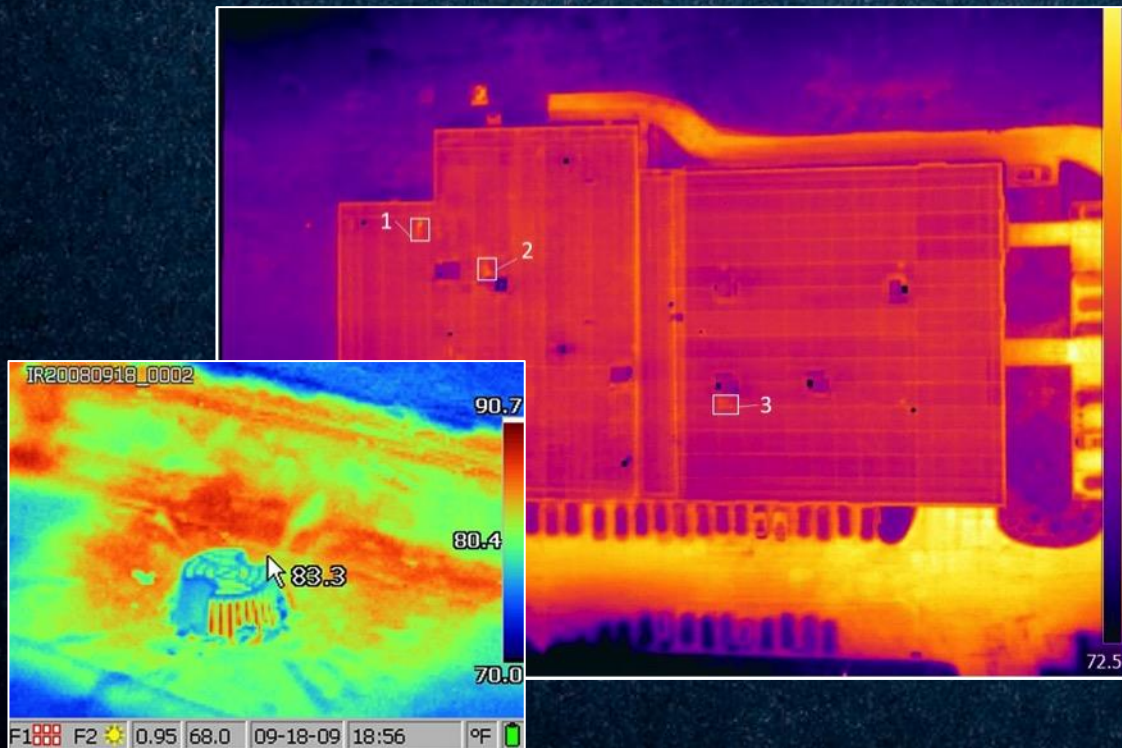


PROPER ANALYSIS & EVALUATION

- **Analysis Includes:**
 - Customer Needs, Wants and Expectations
 - Physical, Rooftop Assessment
- **Evaluation Includes:**
 - Visual Inspections
 - Moisture Detection
 - Core Cuts With Lab Analysis
 - Infrared (if needed)
 - Create Recommendations, Deficiency Findings and Budget Report

NONDESTRUCTIVE TESTING

- Comprehensive Inspections and Reports Give you Better Control of Roof Repair Schedules and Budgets



CORE ANALYSIS

- Core Analysis Can Confirm Thermal Scan Results



TYPES OF COMMERCIAL ROOFS

- Almost All Low Slope Commercial Roofs Fall Into One of Three Types of Systems
- **Built-Up Roof (BUR)**
 - Asphalt
 - Coal Tar
- **Single-Ply**
 - Thermoplastic
 - Thermoset
- **Modified Bitumen**
 - SBS & APP Polymers
 - Fiberglass & Polyester Reinforced

BUILT-UP ROOF SYSTEMS

BUR

- 100+ Year History of Success
- Alternating Plies of Asphalt or Coal Tar Pitch and Felts With Gravel
- Common and Acceptable Roofing System
- Many 20, 30, 40-Year Old BUR's Still Sound

BUR ADVANTAGES

- Multi-Ply Protection
- Easy to Repair & Maintain
- User Friendly
- Chemical Resistance (Coal Tar)
- Resist Ponding Water (Coal Tar)
- Exceptional Weathering Capabilities
- Excellent Internal Cohesion and Adhesion
- Thermoplasticity (Solid to Liquid)

BUR



BUR DISADVANTAGES

- Difficult to Inspect (Gravel)
- Cannot Resist the High Movement of Modern Buildings
- Decreasing Quality of Products
- Old Antiquated Technology
- Labor Intensive



SINGLE-PLY SYSTEMS

SINGLE-PLY CLASSIFICATION

- **Thermoplastic** – Materials Whose Chemical and Physical Characteristics Allow Them to Soften When Heated and Harden When Cooled
- **Thermoset** – Materials Whose Polymers are Chemically Cross-Linked and Cannot Change Once the Sheet is Produced
- **Chlorosulfinated Polyethylene (CSPE)** – Starts as Thermoplastic and Cross Links Into a Thermoset

SINGLE-PLY – THERMOPLASTICS

- **PVC** – Polyvinyl Chloride
- **TPO** – Thermoplastic Polyolefin
- **KEE** – Dupont Elvaloy Ketone Ethylene Ester

SINGLE-PLY - THERMOSETS

- **EPDM** – Ethylene Propylene Diene Monomer
- **Hypalon*** – Chlorosulfonated Polyethylene (CSPE)

*Dupont Trade Name

SINGLE-PLY ADVANTAGES

- Low Initial Cost
- Clean/Fast Application
- Lightweight (Except for Ballasted System)
- Excellent Elongation
- Easy to Inspect and Monitor (Unless Ballasted)
- Strong Heat Welded Seams (Thermoplastics)
- Tough Flexible Compound (KEE)
- No Plasticizer Migration (KEE)

SINGLE-PLY APPLICATION



SINGLE-PLY INSTALLATION



SINGLE-PLY DISADVANTAGES

- 39-90 Mils of Protection (1 Ply Only)
- Contractor Sensitive to Apply
- Difficult to Repair
- Easy to Puncture
- Shrinks as it Ages
- High Life-Cycle Cost
- Limited Foot Traffic
- Vulnerable to Chemical Attacks
- White Membranes Tend to Discolor

SINGLE-PLY FAILURES



SINGLE-PLY FAILURES



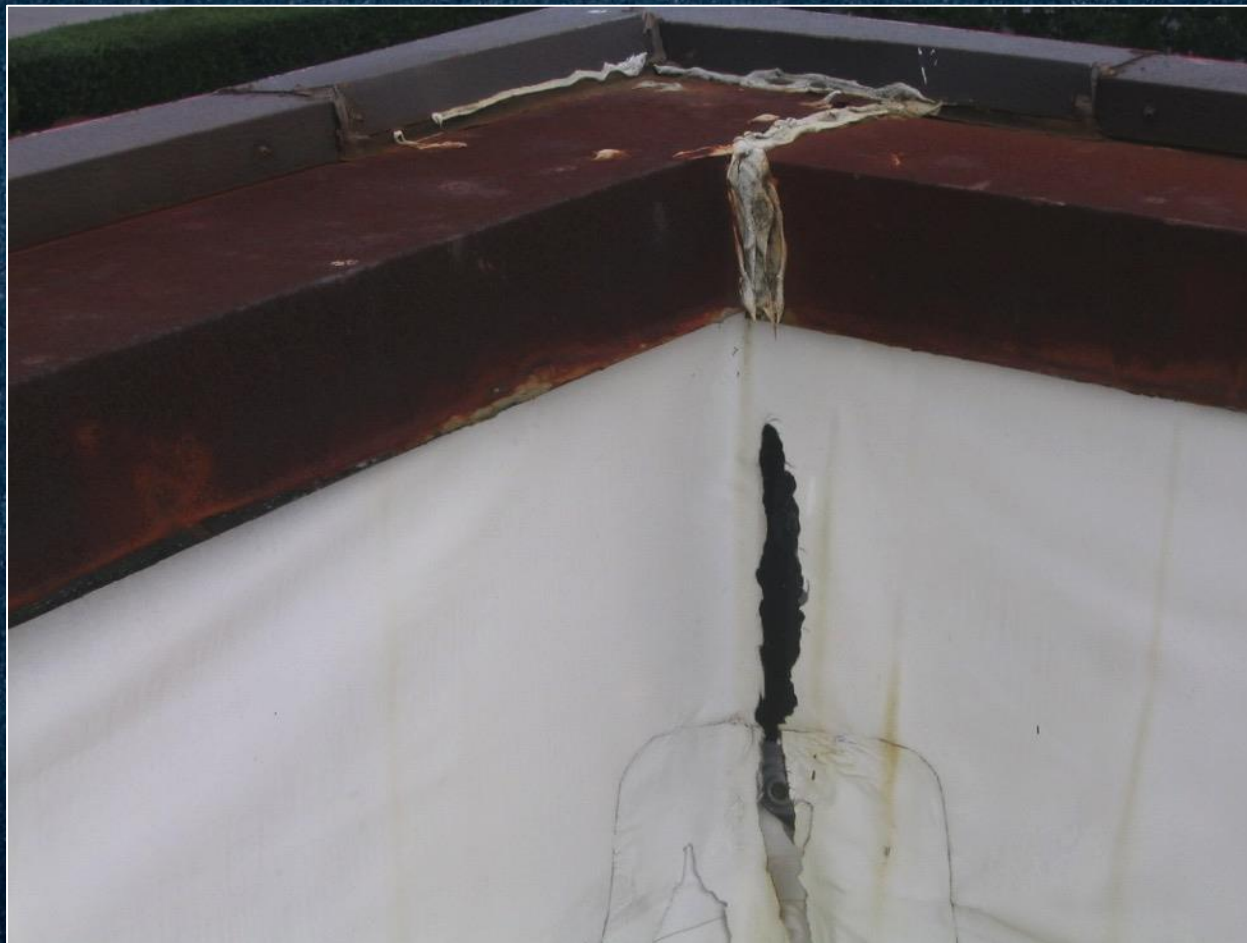
SINGLE-PLY FAILURES



SINGLE-PLY FAILURES



SINGLE-PLY FAILURES



SINGLE-PLY FAILURES



SINGLE-PLY FAILURES



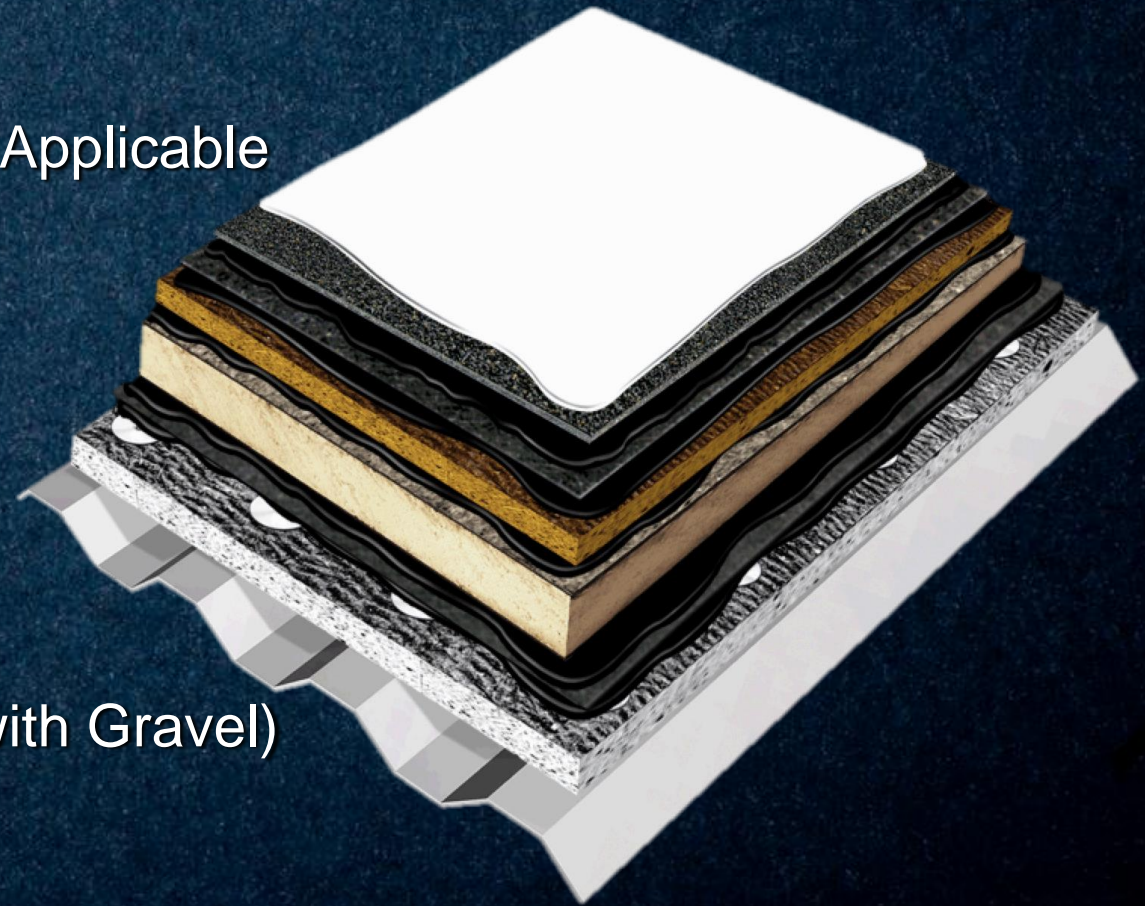
SINGLE-PLY HYBRID



MODIFIED BITUMEN SYSTEMS

TRADITIONAL MODIFIED BITUMEN ROOF LAYERS

- Deck
- Barrier Board (When Applicable)
- Vapor Barrier (When Applicable)
- Insulation With Fasteners or Adhered When Applicable
- Asphalt/Adhesive
- Recovery Board
- Asphalt/Coal Tar/Adhesive
- Felt/Base Sheet
- Asphalt/Coal Tar/Adhesive
- Felt/Base Sheet
- Asphalt/Coal Tar/Adhesive
- Cap Sheet (Mineral, Coated or Flood Coat with Gravel)



MODIFIED BITUMEN SYSTEMS

- **2-Ply Modified**
 - Modified Base Sheet
 - Modified Bitumen Cap Sheet
- **2 Plies and a Cap (Hybrid)**
 - 2 Plies of Type IV Felt (or Type II Base Sheets)
 - Modified Bitumen Cap Sheet

MODIFIED BITUMEN



COVERBOARDS

- **Types**
 - Woodfiber – High Density
 - Perlite
 - DensDeck/DensDeck Prime
 - Securock
- **Adhesives**
 - Hot Asphalt
 - Foam Adhesives



COLD-APPLIED



HOT-APPLIED



TORCH-APPLIED



SELF-ADHERED



MODIFIED ADVANTAGES

- Improves on Existing Technology
- High Tensile Strength
- Excellent Fatigue/Puncture Resistance
- Excellent Low Temperature Flex
- Multi-Ply Protection
- Easy to Repair
- Many Application Methods

MODIFIED BITUMEN QUALITY

There is a Difference

- Modifieds
 - % of Rubber
 - Polymer Dispersion
 - Low Temperature Flexibility
 - Compound Stability
 - Tensile and Tear Strength
 - Surfacing Considerations

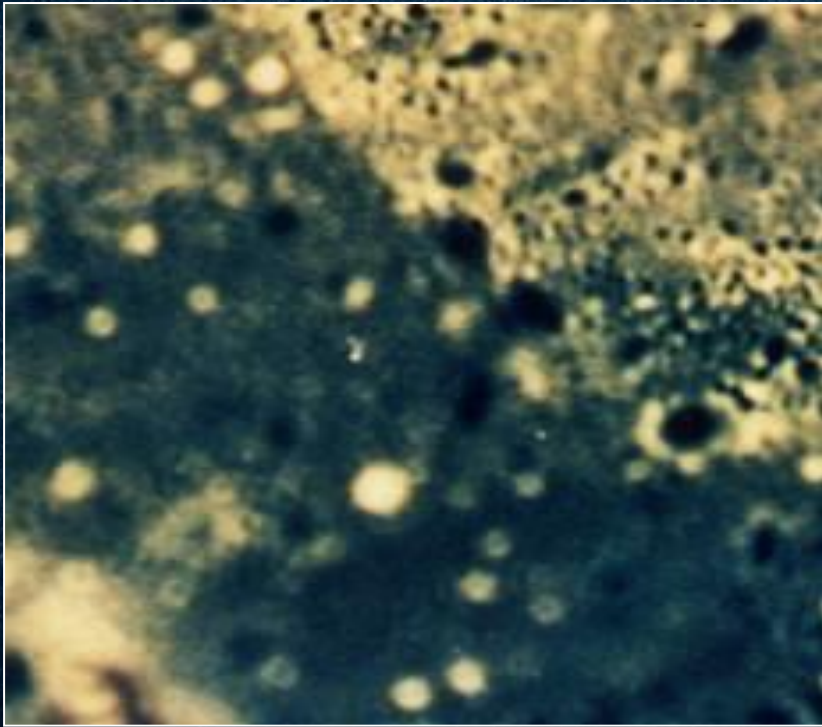
SBS, SEBS, SIS POLYMERS

Characteristics

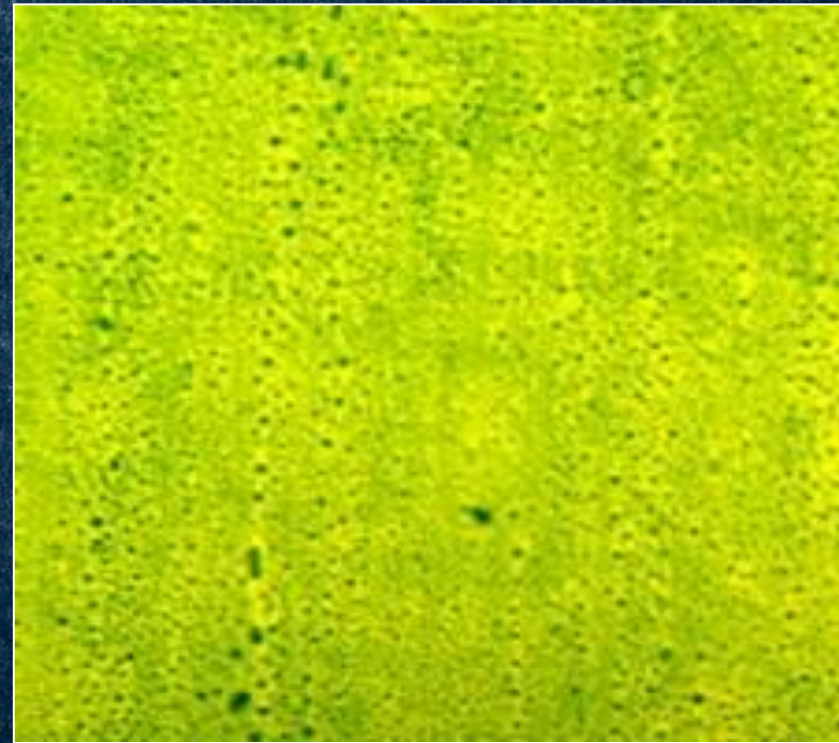
- Low Temperature Flexibility
- UV Resistance
- Heat Resistance
- Elongation
- Elastic v. Plastic
- Flexible Application
- Pliable
- Improved Weathering
- Better Softening Point
- Fatigue Resistance
- Thermal Shock Resistance

POLYMER DISPERSION

There is a Difference



**Improper
Polymer Dispersion**



**Proper
Polymer Dispersion**

POOR POLYMER DISPERSION



POLYESTER, FIBERGLASS & COMPOSITE REINFORCEMENTS

- Tensile Strength
- Tear Strength
- Flexural Strength
- Tensile Fatigue Strength
- Shear Strength
- Notch Tensile Strength
- Creep
- Tear Resistance
- Pliability
- Permeability
- Moisture Expansion
- Flexure Fatigue Strength

ASTM D 5147

- Test Method That Explains How Modified Bitumen Sheet Should Be Tested
- Provides Only Test Methods But No Recommended Test Values
- Key Tests Include:
 - Compound Stability
 - Dimensional Stability
 - Thickness
 - Water Content
 - Tensile
 - Tear
 - Accelerated Aging
 - Granule Adhesion
 - Low Temperature Flexibility
 - Heat Exposure

KEY MB DIFFERENTIATORS

- **Tensile Strength**
 - National Bureau of Standards Building Science Series #55 States There Are 20 Key Characteristics That Lead to Long Lasting Roofs (see article in notes)
 - 7 of These 20 Characteristics Involve Strength
- **Low Temperature Flexibility**
 - Good Low Flex
 - Amount of Polymer in the Sheet
 - Compatibility of the Asphalt and Polymer
 - Manufacturing and Blending of the Base Raw Materials

MODIFIED BITUMEN



MB ASTM – MINIMUM TEST VALUES

- **D 6162:** SBS Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements
- **D 6163:** SBS Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements
- **D 6164:** SBS Modified Bituminous Sheet Materials Using Polyester Reinforcements
- **D 6222:** APP Modified Bituminous Sheet Materials Using Polyester Reinforcements
- **D 6223:** APP Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements

ASTM D 6163

Property	Type I	Type II	Type III
Max Load @ 0°F	70	150	180
Max Load @ 77°F	30	80	150
Elongation @ 0°F	1	2	2
Elongation @ 77°F	2	4	3
Tear @ 77°F	35	110	210
Low Temp Flex	0	0	5
Elongation at 5% Max Load	3	40	2

APPROVALS

- There Are Numerous Approval and Testing Agencies:
 - Factory Mutual (FM)
 - Underwriter's Laboratory (UL)
 - Miami-Dade County
 - International Code Council (ICC)
 - Texas Department of Insurance (TDI)
 - Intertek/Warnock-Hersey
 - ...and many more.

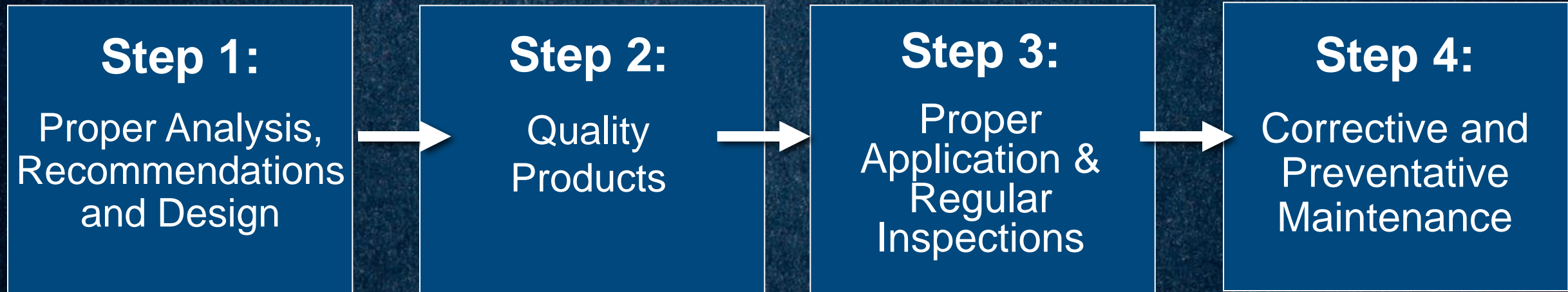


MODIFIED SURFACING TYPES

- Aggregate (Flood Coat and Gravel)
- Mineral Cap Sheet
- Smooth with a Liquid-Applied Coating



FOUR STEPS TO SUCCESS



WHO IS GARLAND?

FULL-SERVICE SOLUTIONS PROVIDER

- Leading Manufacturer of Building Envelope Products With Over 120 Years in Business
- ISO Certified
- 200+ Building Envelope Experts Strategically Located Across U.S., Canada and United Kingdom
- Manufacturing Facilities in OH, GA, AL, AR, NC, & CA
- Financially Stable - 5A1 Credit Rating

HIGH-PERFORMANCE PRODUCTS

- **High-Performance Products Include:**
 - Modified Bitumen Roof Systems
 - Architectural and Structural Standing Seam Metal Roof Systems
 - Metal Edge Systems and Accessories
 - Rooftop Maintenance and Restoration Products
 - Fluid-Applied Urethane and Acrylic Systems
 - KEE Hybrid Roof Systems
 - Air Barriers, Plaza Decks & Underlayments
 - Sustainable Roofing Solutions
 - Flooring Repair and Restoration Solutions
 - Sealants and Accessories

VALUE-ADDED SERVICES

- **Comprehensive Services**

- Inspections, Analysis, Recommendations, Solution Options
- Specification and Detail Assistance
- Pre-Bid, Pre-Construction Meetings
- Job Inspections & Reports
- Post-Project Evaluation
- Preventive Maintenance Programs
- Online Asset Management Tools

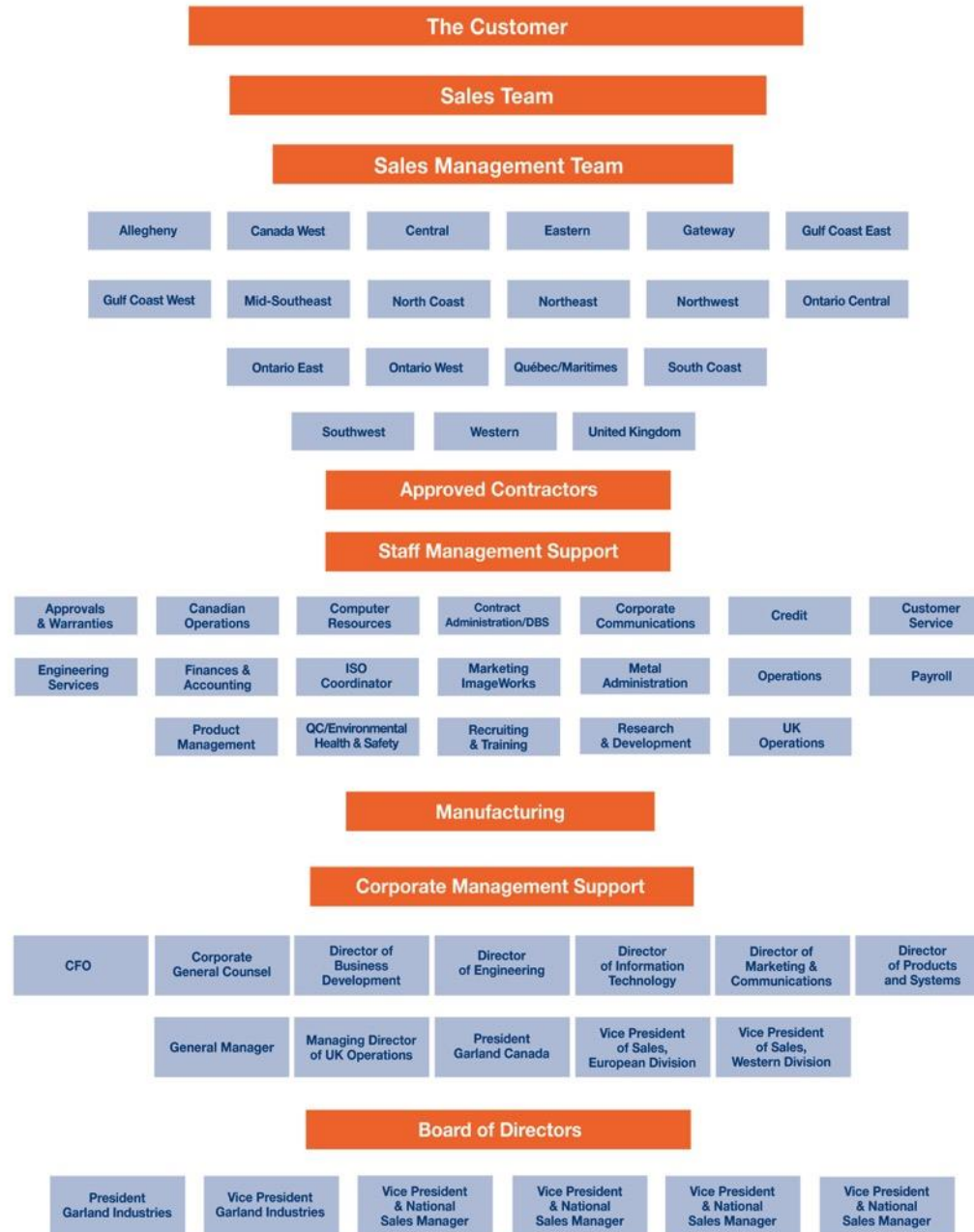
- **Typical Garland Customers**

- Schools; Hospitals; Local, State, Federal Agencies; Manufacturing; Prisons; Airports; etc.

Garland Reps in U.S., Canada and UK



Organizational Chart







THANK YOU

