



# Cool & Green Roofs

IRCC Meeting  
January 23, 2007

# Copyright Materials

This presentation is protected by US and International copyright laws. Reproduction, distribution, display and use of the presentation without written permission of the speaker is prohibited.

Allana Buick & Bers, Inc. 2020



**ALLANA BUICK & BERS**

Making Buildings Perform Better

# Best Practice

Allana Buick & Bers, Inc. (ABBAE) is a Registered Provider with the American Institute of Architects Continuing Education Systems. Credit earned on completion of this program will be reported to CES Records for AIA members. Certificates of completion for non-AIA members are available on request.

This program is registered with the AIA/CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product. Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.



# Karim P. Allana, PE, RRC, RWC

- **Education:** B.S., Civil Engineering, Santa Clara University
- **Registration:** P.E., Civil Engineering, California, Washington, Nevada, and Hawaii
- **Certification:** Registered Roof Consultant (RRC), Roof Consultants Institute, and Registered Waterproofing Consultant (RWC)

- **Overview:**

- CEO and Senior Principal at Allana Buick & Bers.
- Former Turner Construction Employee (Project Engineering and Superintendent)
- Over 37 years experience providing superior technical standards in all aspects of building technology and energy efficiency.
- Principal consultant in forensic investigations of building assemblies, failure analysis, evaluation and design of building infrastructure and building envelope evaluation and design.
- Expert in all aspects of building envelope technology.
- Completed numerous new construction, addition, rehabilitation, remodel and modernization projects for public and private sector clients.
- Specialization in siding, roofing, cement plaster, wood, water intrusion damage, window assemblies, storefronts, below grade waterproofing, energy efficiency, solar engineering and complex building envelope and mechanical assemblies.



# ABBAE Firm Overview

- Allana Buick & Bers (ABBAE) is an Architectural Engineering firm specializing in Building Envelope Systems
- ABBAE is one of the 5 largest building envelope consultants in the country
- ABBAE has over 33 years of experience & over 12,500 projects
- ABBAE is also a leading Forensic Defect firm with hundreds of forensic projects (litigation)
- Locations – 16 offices across California, Nevada, North Carolina, Oklahoma, Oregon, Texas, Virginia, Washington, Colorado and Hawaii



# Staff & In-House Expertise

- Licensed Professional Engineers – Civil, Structural, and Mechanical
- Registered Architects
- Building Enclosure Commissioning Process Providers (BECxPs)
- Registered Building Envelope Consultant (RBEC)
- Registered Roofing Consultants (RRCs)
- Registered Waterproofing Consultants (RWCs)
- Registered Exterior Wall Consultant (REWCs)
- Registered Roof Observers (RROs)
- Certified Exterior Insulation and Finish System (EIFS) inspectors
- Curtain Wall Specialists
- ICC Certified Building Inspectors
- Quality Assurance Monitors
- Water Testing Experts
- Leak Investigation and Diagnosis Experts
- Infrared Imaging and Nuclear Moisture Scanning Experts

# ABBAE Building Expertise

- Building Envelope Systems

- Roofing Systems
  - High-Slope/Low-Slope Roofs
  - Green/Garden Roofs
  - Drainage Systems
  - Pedestrian Plazas
- Exterior Wall Systems
  - Wall Cladding/Siding/GFRC/pre-cast
  - EIFS/cement plaster/stucco
  - Sheet Metal Flashings
- Windows and Glazing Systems
  - Punched Windows
  - Curtain Wall/Window Wall Systems
  - Sliding Glass Doors
  - Skylights

- Building Envelope Systems (cont'd)

- Roofing & Waterproofing Systems
  - Deck/Balcony/Lanai Waterproofing
  - Podium Waterproofing
  - Pool/Spa Deck Waterproofing
  - Above-Grade/Below-Grade Waterproofing
  - All types of low and steep sloped roofing
- Commissioning BECx
  - OPR/BOD/Commissioning Plan
- Mechanical/HVAC Systems
  - HVAC design
  - Plumbing systems
  - Commissioning and testing

# ABBAE Core Services

- Consulting and third-party peer review services
- Engineer of record for building envelope systems
- Contract administration services
- Inspection services (usually direct with owner)
- Air and water performance testing
- Mock-up design, observation, and testing
- Building assessments and forensic investigations
- Litigation support and expert witness services
- Educational seminars with AIA credits





# OVERVIEW

- What is a *Green* Building?
- Why do we want *Green* Buildings?
- LEED
- Green Roofs
- Cool Roofs
- Garden Roofs
- Q&A

# WHAT ARE *GREEN* BUILDINGS?

- “Buildings that are environmentally responsible, profitable and healthy places to live and work.”

~US Green Building Council

# BUILDINGS USE RESOURCES

- 36% of total energy use/65% of electricity consumption
- 30% of greenhouse gas emissions
- 30% of raw materials use
- 30% of waste output/136 million tons annually
- 12% of potable water consumption

~US Green Building Council

# LEED

- Leadership in Energy and Environmental Design

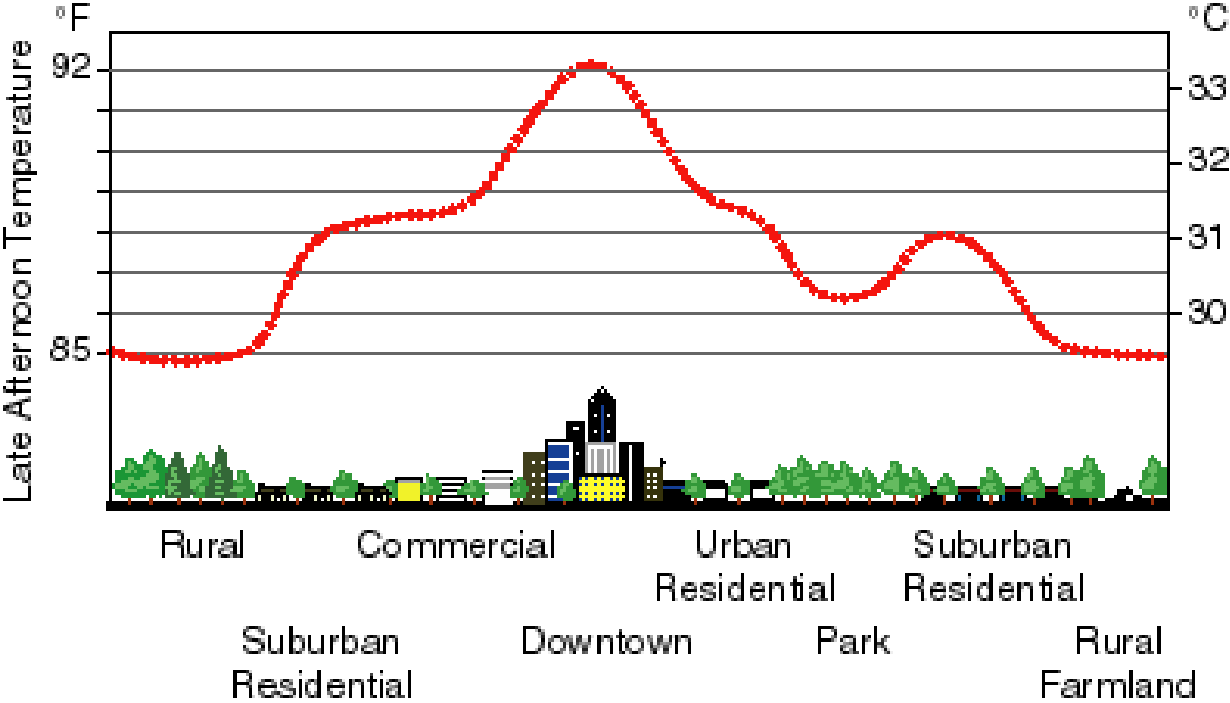
- *Define* "green building" by establishing a common standard of measurement
- *Promote* integrated, whole-building design practices
- *Recognize* environmental leadership in the building industry
- *Stimulate* green competition
- *Raise awareness* of green building benefits
- *Transform* the building market

# WHAT IS A GREEN ROOF?

- Environmentally Responsible
  - Efficient use of resources
  - Manufacturing is benign
  - Long service life
- Profitable
  - Economically efficient
- Healthy Place to Live and Work
  - Discourages urban heat islands
  - Reduces greenhouse gas production

# Urban Heat Islands

## Sketch of an Urban Heat-Island Profile



# Urban Heat Islands: Causes

- Buildings and pavement made of dark materials absorb the sun's rays instead of reflecting them away, causing the temperature of the surfaces and the air around them to rise.
- There are fewer trees, shrubs, and other plants to shade buildings, intercept solar radiation, and cool the air by “evapotranspiration.”

# Urban Heat Islands: Solutions

- Cool Roofs

- White Roofs
- Highly Reflective

- Garden Roofs

- Chlorophyll!
- Sunlight + H<sub>2</sub>O + CO<sup>2</sup> =  
Sugar/Cellulose (e.g. more plants)



# COOL ROOFS: Theory

- Radiant Heat (Think Sun)
  - Long wave electromagnetic radiation
  - When it strikes matter... it shakes atoms and makes them HOTTERR
- Latent Heat (Think Hot Potato)
  - Heat stuck in material and water vapor
  - As the atoms slow down... they radiate heat.

# COOL ROOFS: Practice

- White Roof Membranes
  - Titanium dioxide in membrane surface
  - Permanent reflective coating
- White Roof Coatings
  - Titanium dioxide in coating
  - Must be renewed 4 to 7 year cycle

# COOL ROOFS: Metal Issue

- Metal based sheet and films or coating reflect radiant heat out of building... but they also reflect interior heat back into the building.
- So... not as cool as you would think... white membranes and coatings are better.

# COOL ROOF: Membranes

- PVC (thermoplastic)
  - Sarnafil
  - Manville
- PVC Alloy (thermoplastic)
  - Duro-Last
  - FiberTite
- TPO (thermoplastic)
  - Carlisle Sure-Weld
  - Firestone Ultra-Ply

# COOL ROOF MEMBRANES



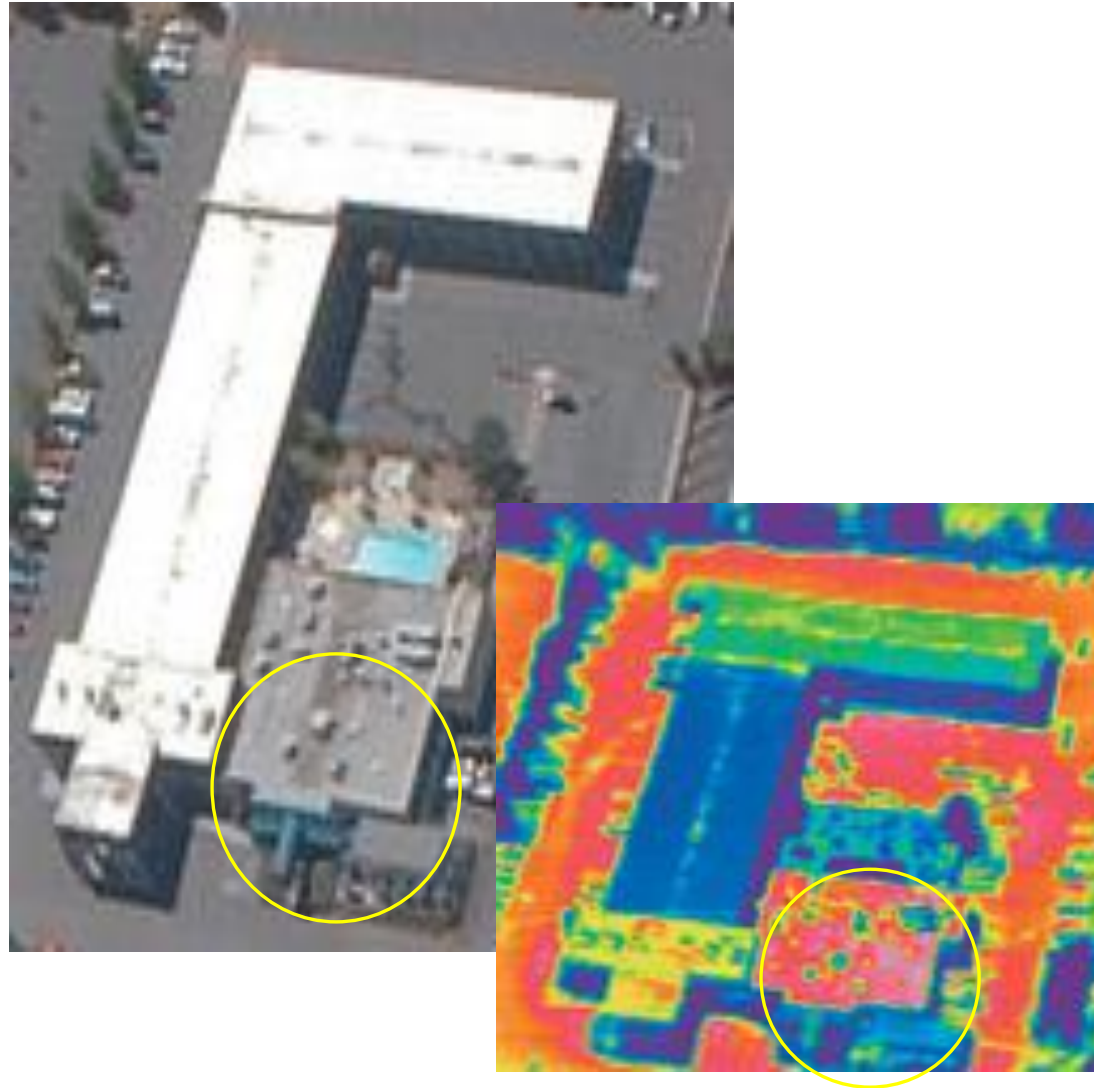
# COOL ROOF MEMBRANES



# COOL ROOF MEMBRANES



# COOL ROOF MEMBRANES





# COOL ROOF COATINGS

- **Acrylic**
  - Waterborne polymer
  - Good longevity (best value-longevity)
- **Latex**
  - Waterborne polymer
  - Poor longevity (do not use)
- **Urethane**
  - Catalyst or water cure
  - Excellent longevity (expensive)
- **Silicone**
  - Water cure silicone based rubber
  - Excellent longevity (expensive)

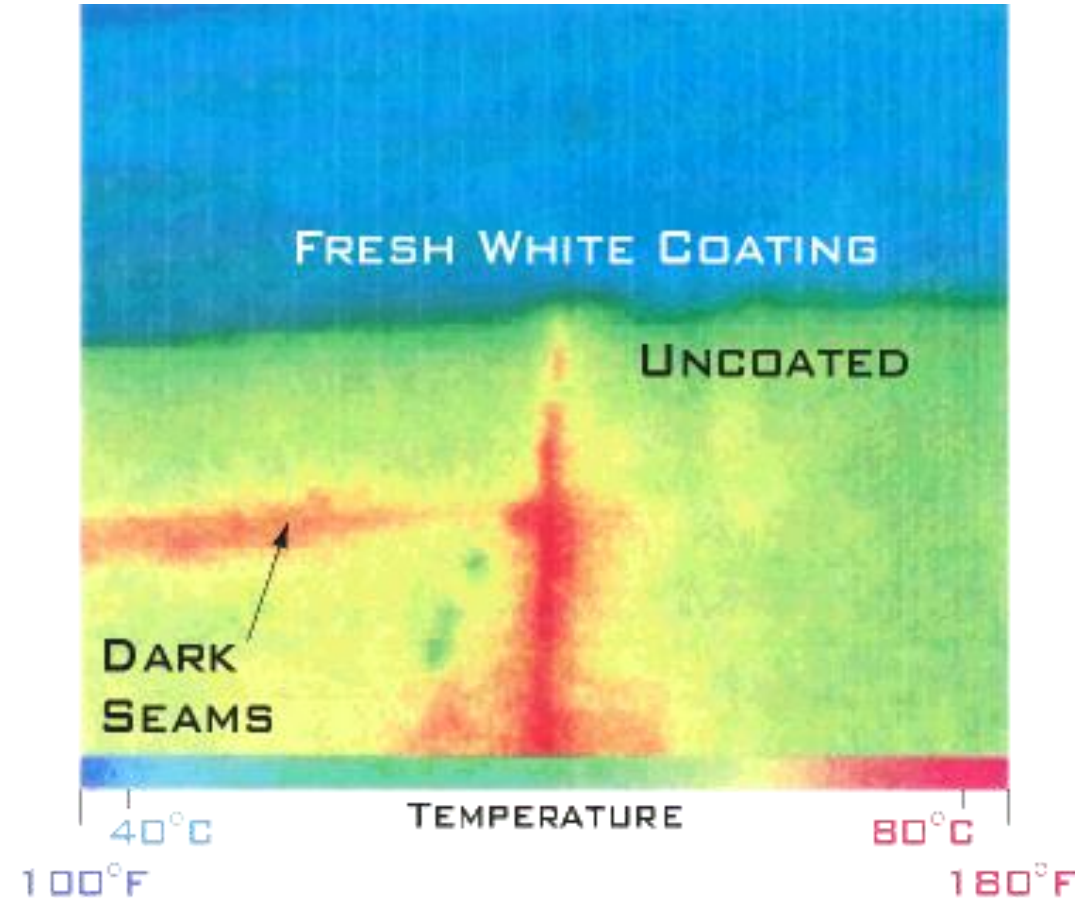
# COOL ROOF COATINGS



# COOL ROOF COATINGS



# COOL ROOF COATINGS



# GARDEN ROOFS

- Not to be confused with a Green Roofs
- Living environment on your roof
  - Soil
  - Water
  - Plants
  - Birds
  - Termites
- Two Types
  - Extensive
  - Intensive

# GARDEN ROOFS: Extensive

- Thin soil layers
- Light weight (as little as 15 psf)
- Low density vegetation
- Horticulturally intense
  - Special soil fabrication
  - Plant selection very site specific
  - Watering very tricky

# GARDEN ROOFS: Extensive



**Los Angeles**



**Philadelphia**

# GARDEN ROOFS: Intensive

- Huge planter box
- Heavy! 30 to 100+ lbs/sf
- Multiple plant types and root system
- Horticulturally mainstream
  - Soil is less critical
  - Plant just about whatever you want
  - Watering is necessary in the West



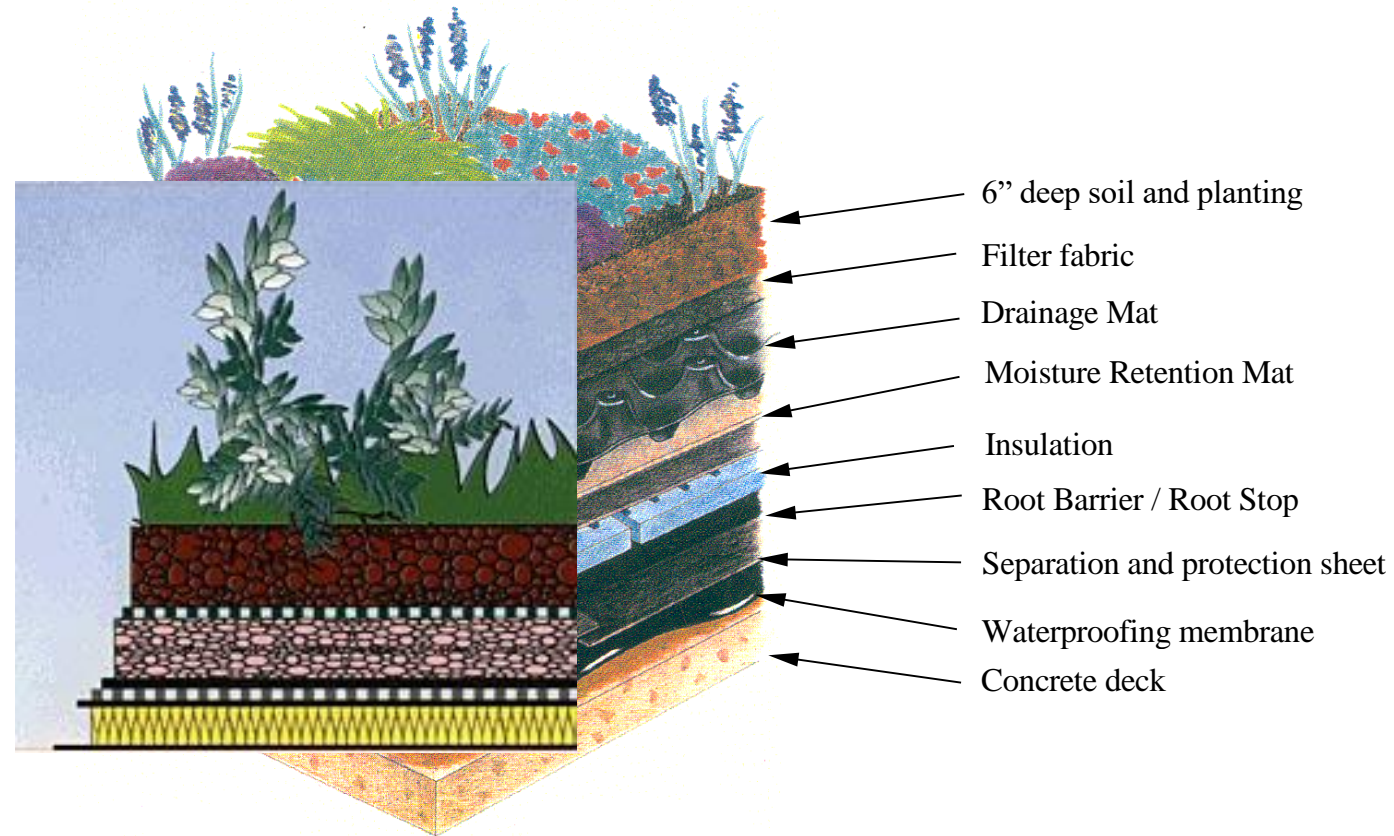
# GARDEN ROOFS: Intensive



# GARDEN ROOF: Typical Pieces

Roof structure  
Waterproofing/Roof membrane  
Protection layer  
Root barrier  
Drainage layer  
Moisture retention system  
Engineered soil system  
Irrigation system  
Plantings  
Landscaping elements

# GARDEN ROOF: Typical Pieces



Typical cross section of Green Roof

# GARDEN ROOF: Lessons Learned

## Be Committed!

- Think of a garden roof as pet
- People will come to look
- Bring your wallet

## Use ONLY Proven Waterproofing

- Use systems with 30 year track record
- Run from “newest, improved, etc.”

## Use ONLY Proven Roof Garden/Meadow System

- Use landscape/garden roof consultant with a track record
- Stay away from newly created systems... do not be a guinea pig

## Require Close Observation/Inspection

- You only get one chance
- Many trades at once

## Flood Test

- Put 3-inches of water and hold for 72 hours
- If in doubt... dye the water first

# GARDEN ROOF: Installation



# GARDEN ROOF: Installation



# GARDEN ROOF: Installation



# GARDEN ROOF: Installation





# GARDEN ROOF: Installation



# GARDEN ROOF: Installation



# GARDEN ROOF: Installation



# GARDEN ROOF: Installation



# Sustainable Silicon Valley

- Reduced CO2
- Reduce the impact of greenhouse gases on climate change in California and Silicon Valley
- What can organizations do to reduce CO2 emissions?
- For Buildings:
  - When replacing roofs, install “cool” roofs
  - Install “garden roofs”
  - Follow LEED
  - Landscape to shade sunny sides of buildings
  - Install solar electric systems where cost-effective

# Silicon Valley Manufacturing Group

- These firms set a goal of reducing CO2 by 20% in six years:
  - Hewlett-Packard
  - Oracle
  - Calpine
  - Lockheed
  - ALZA
  - LifeScan
  - PG&E
- These organizations support that effort:
  - City of San Jose
  - NASA Ames Research Center
  - Santa Clara Valley Water District



Questions?