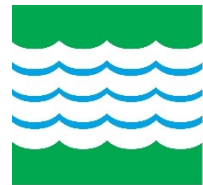


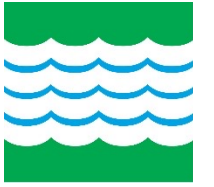
Cool Roof Feasibility Study

PROJECT OVERVIEW

1/22/2025



SOUTH BAY CITIES
COUNCIL OF GOVERNMENTS



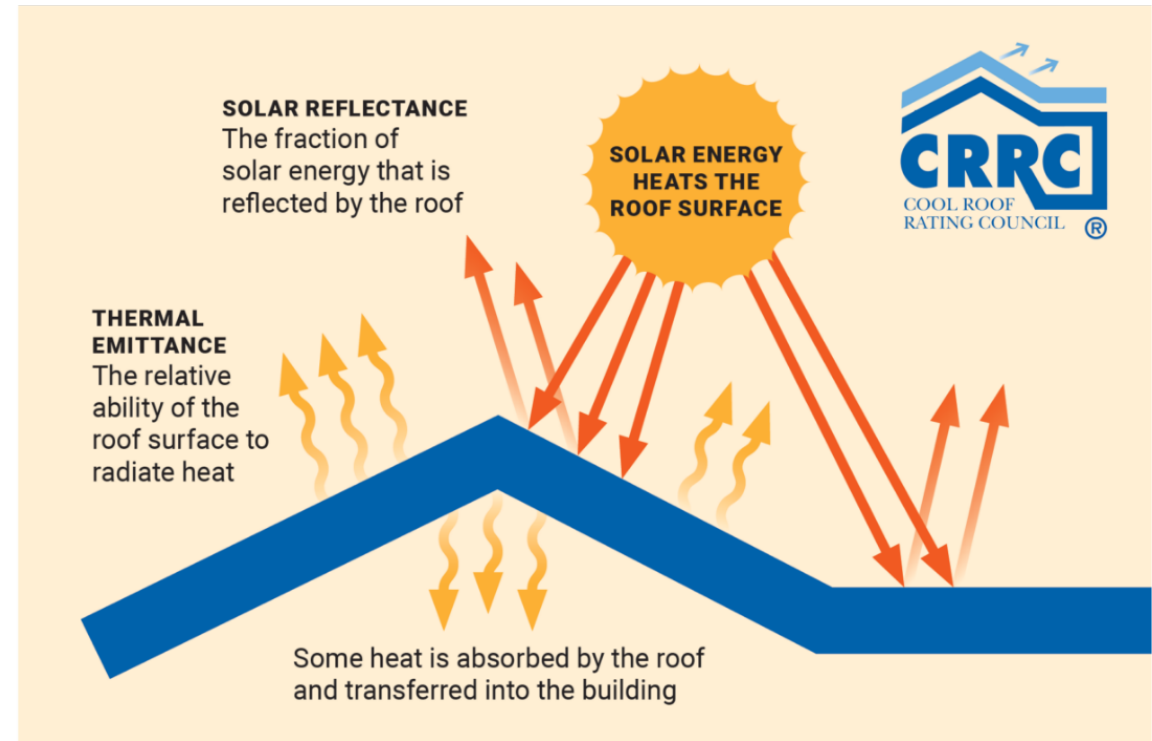
Project Goals and Objectives

- Provide details of cool roof technology
 - What is a cool roof?
 - What are the benefits of cool roofs?
 - What criteria make cool roofs suitable?
- Provide a report on existing research and literature
- Develop a list of SBCCOG buildings most feasible for cool roofs
- Create Site Plans for most suitable sites in a Final Cool Roof Feasibility Report



What is a Cool Roof?

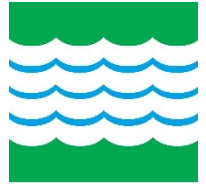
- A roof designed to lower rooftop temperatures
- Defined by two key properties
 - Solar Reflectance (SR): Ability to reflect sunlight (Scale 0-1)
 - Thermal Emittance (TE): Ability to radiate absorbed heat (scale 0-1)
- Solar Reflectance Index (SRI): Combines SR and TE into a single metric (typically 0-100)
- 0 = standard black material, 100 = standard white material



This illustration describes the flow of radiant energy as heat between the sun, roof surface, building interior, and surroundings. The higher the solar reflectance, the more solar energy is reflected away from the roof surface. Some of the solar energy is absorbed by the roof as heat. The higher the thermal emittance, the more of this absorbed heat is radiated away from the roof surface. IMAGE CREDIT: COOL ROOF RATING COUNCIL.

Source: CRRC website

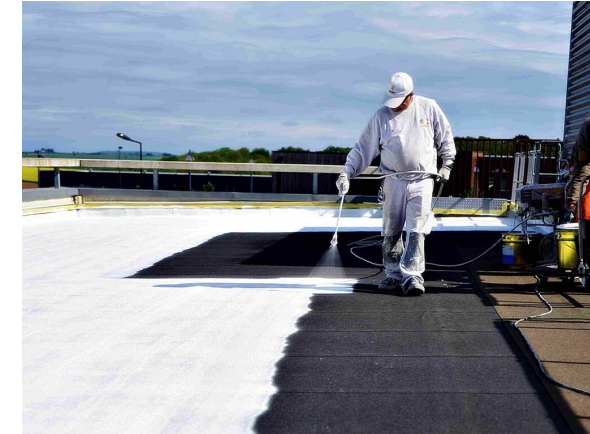
Cool Roof Product Options for Different Roof Types



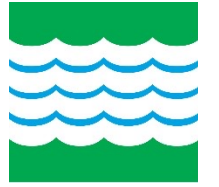
Roof Type	Roof Slope	Conventional Roof		Cool Roof			EUL** (yrs)
		Roof Option	SR	Roof Option	SR	Material Cost*	
Asphalt Shingle	Steep	Black/dark brown with conventional pigments	0.05 – 0.15	Light gray Medium gray/brown with cool pigments	0.20 – 0.30 0.20 – 0.30	\$	15 - 30
Concrete Tile	Steep	Dark color with conventional pigments	0.05 – 0.35	Color with cool pigments White	0.40 – 0.60 0.70	\$ - \$\$\$	50+
Clay Tile	Steep	Terracotta (unglazed red tile)	0.40 – 0.50	Color with cool pigments White	0.40 – 0.60 0.70	\$\$ - \$\$\$	50+
Wood Shake	Steep	Painted dark color with conventional pigments	0.05 – 0.35	Bare	0.40 – 0.55	\$	15 - 30
Metal Roof	Steep or Low	Unpainted, corrugated Dark painted, corrugated	0.30 – 0.50 0.05 – 0.10	Color with cool pigments White painted	0.40 – 0.70 0.60 – 0.70	\$\$	20 - 50+
Liquid Applied Coating	Steep or Low	Smooth black	0.05	Smooth white	0.60 – 0.90	\$	10
Built-Up Roof	Low	With dark gravel With aluminum coating	0.05 – 0.15 0.10 – 0.15	With white gravel Smooth with white roof coating	0.30 – 0.50 0.75 – 0.85	\$ - \$\$	10 - 30
Modified Bitumen	Low	With mineral surface capsheet (SBS, APP)	0.10 – 0.20	White coating over mineral surface	0.60 – 0.75	\$	10 – 30
Single-Ply Membrane	Low	Black (PVC or EDPM)	0.05	White (PVC or TPO) Color with cool pigments	0.70 – 0.85 0.40 – 0.60	\$	10 – 20

*Material Cost: \$ = \$0 - \$2 / ft2, \$\$ = \$2 - \$4 / ft2, \$\$\$ = \$4 - \$6 / ft2.

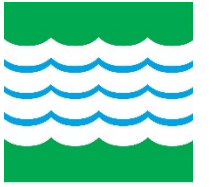
**EUL: Expected Useful Life



Evaluation Criteria for Site Cool Roof Suitability

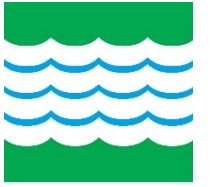


Evaluation Criteria	Description
Roof Condition	<ul style="list-style-type: none"> •Several sites were observed to have aging roofs with faded colors and visibly poor aesthetics. •For these locations, if roof replacement is already planned or necessary, installing a cool roof is considered a smart and beneficial choice—regardless of the building’s energy usage, size, or presence of air conditioning
Energy Usage	<ul style="list-style-type: none"> •Sites with annual electricity usage < 75,000 kWh = “low-usage”. •Sites consuming between 75,000 kWh and 250,000 kWh annually = “medium-usage”, •Sites using > 250,000 kWh annually = “high-usage”. •Medium- and high-usage sites were considered for cool roof suitability since they offer greater potential for energy savings.
HVAC System Presence	<ul style="list-style-type: none"> •Sites that are fully conditioned were identified as strong candidates for cool roof installation
Roof Type and Color	<ul style="list-style-type: none"> •Low-slope or flat roofs with darker colors (e.g., brown, grey or tan) were considered suitable for cool roof retrofits
Roof Size and Orientation	<ul style="list-style-type: none"> •Larger, flatter roofs with maximum solar exposure were prioritized for evaluation due to their higher potential for energy savings
Climate Zone	<ul style="list-style-type: none"> •Sites in Climate Zone-CZ08 experience higher heat exposure, with 938 hours above 80°F annually, compared to 352 hours in CZ06.
Building Type	<ul style="list-style-type: none"> •Facilities that serve critical community functions such as libraries and community centers, particularly those that remain operational during extreme heat events, power outages, or other climate-related emergencies were prioritized.



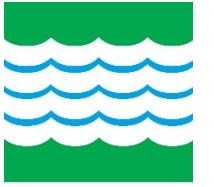
Site Identification Approach

- All sites were categorized as “Yes,” “Maybe,” or “Not Needed” based on evaluation criteria for cool roof suitability
- Sites meeting most or all criteria were marked “Yes” for cool roof suitability
- Sites were considered “Not needed” if they had:
 - Low electricity usage
 - No HVAC systems
 - White roofs
 - Roofs covered by solar panels
 - Over 50% roof shading from trees or nearby buildings
- Several sites were marked “Maybe” requiring further review and agency consultation to confirm cool roof suitability.



Selected Sites Suitable for Cool Roof

- Carson Veterans Park
- Gardena Police Department
- Gardena Rush Gym & HR
- Inglewood Civic Center Police Department
- Inglewood Darby Park
- Inglewood Crenshaw Imperial Library
- Inglewood Rogers Park & Community Center
- Lomita City Hall
- Redondo Beach City Hall
- Redondo Beach Civic Center Police Department
- Redondo Beach Civic Center Library
- Torrance City Hall
- Torrance Cultural Center Rec Building
- Torrance Police Department HQ



Cool Roof Retrofit Recommendations

- Basis for recommendations
 - Developed from on-site field observations and input from facility personnel
 - Each site evaluated for most appropriate implementation strategy
- Core strategy - Based on roof condition
 - Cool roof coating on existing roof: Recommended if existing roof has sufficient remaining useful life; cost effective option
 - New roof installation with cool roof coating: Recommended if roof has exceeded its useful life
- Cost analysis approach
 - Cool roof coating on existing roof: Total cool roof coating cost used for financial analysis
 - New roof installation with cool roof coating: Analysis based on incremental cost (price difference between conventional roofing and cool roofing system)



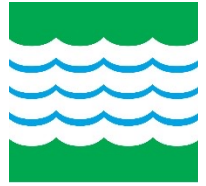


Example Site Plan

- Building: Inglewood Darby Park Sports Building
- Existing condition
 - HVAC System: RTUs and HPs
 - Roof Age/Area: ~68 yrs / 17,092 ft²
 - Roof Composition: Built-up w/ Gravel + Asphalt Shingle
- Recommendation: Roof Replacement + Cool Roof Coating
 - Estimated 20 day timeline
- Project calculations
 - Potential Savings: 7,037 kWh / \$3,802
 - Project Cost/Incremental Cost - \$298,159/\$94,050
 - Payback Period: 24.74 years
- Potential for Rooftop Solar PV Installation - Yes

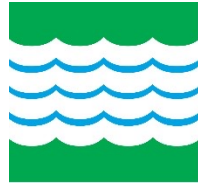


Aerial View (Top Picture) and Rooftop Solar PV (Bottom Picture)



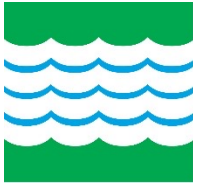
Summary Table- All Sites

Order	Site Name	Address	Building Area (sq.ft.)	Conditioned Roof Area (Sq.ft)	Age of Existing Roof (years)	Remaining Useful Life of Existing Roof (Years)	Existing Roof Description	Proposed Cool Roof Solution	Estimated Annual Electricity Savings (kWh)	Estimated Annual Electricity Cost Savings (\$)	Estimated Cool Roof Coating OR New Cool Roof Cost (\$)	Incremental Cost (\$)	Simple Payback (years)	Estimated Implementation Timeline (days)	GHG Emission Reduction (Metric Tons of CO2)	Effective Useful Life of Cool Roof (years)
1	Torrance - Police Department	3300 Torrance Blvd, Torrance, CA 90503	74,183	31,000	45	0	Asphalt Membrane	Remove Existing Roof and Install New Roof with Cool Roof Coating	18,011	\$9,731	\$302,250	\$139,500	14.3	26	3.50	20
2	Redondo Beach -Civic Center Police Department	401 Diamond St, Redondo Beach, CA 90277	13,650	13,650	34	0	Built-Up Roof (BUR) with gravels on the top	Remove Existing Roof and Install New Roof with Cool Roof Coating	7,800	\$4,214	\$259,350	\$61,425	14.6	19	1.51	20
3	Gardena- Police Department	1718 W 162nd St, Gardena, CA 90247	23,147 (does not include trailer)	16,239	65	0	Flat, Modified Bitumen Gray	Remove Existing Roof and Install New Roof with Cool Roof Coating	8,369	\$4,850	\$166,450	\$73,076	15.1	17	1.63	20
4	Redondo Beach- City Hall	415 Diamond St, Redondo Beach, CA 90277	42,000	34,701	63	0	Two types of roof- 1. Tar/Asphalt Roof (appx 92%) 2. Built-Up Roof (BUR) with gravels on the top (appx 8%)	Remove Existing Roof and Install New Roof with Cool Roof Coating	17,387	\$9,394	\$349,259	\$156,155	16.6	30	3.38	20
5	Torrance-Cultural Recreation Center	3330 Civic Center Dr N, Torrance, CA 90503	11,500	11,500	35	0	Built-Up Roof (BUR) with gravels on the top	Remove Existing Roof and Install New Roof with Cool Roof Coating	5,474	\$2,958	\$218,500	\$51,750	17.5	17	1.06	20
6	Redondo Beach- Civic Center Library	303 N Pacific Coast Hwy, Redondo Beach, CA 90277	36,000	34,316	55	15	Two Types- 1. Grey colored Metal sloped roof and 2. Flat Tar/asphalt grey roof	Apply silicone white coating on existing roofs	21,156	\$11,430	\$224,054	NA	19.6	10	4.11	20



Summary Table- All Sites

Order	Site Name	Address	Building Area (sq.ft.)	Conditioned Roof Area (Sq.ft)	Age of Existing Roof (years)	Remaining Useful Life of Existing Roof (Years)	Existing Roof Description	Proposed Cool Roof Solution	Estimated Annual Electricity Savings (kWh)	Estimated Annual Electricity Cost Savings (\$)	Estimated Cool Roof Coating OR New Cool Roof Cost (\$)	Incremental Cost (\$)	Simple Payback (years)	Estimated Implementation Timeline (days)	GHG Emission Reduction (Metric Tons of CO2)	Effective Useful Life of Cool Roof (years)
7	Inglewood-Darby Park	3400 W Arbor Vitae St, Inglewood, CA, 90305	20,900	17,092	68	0	Two types of roof- 1. Built-Up Roof (BUR) with gravels on the top 2. Asphalt Shingles	Remove Existing Roof and Install New Roof with Cool Roof Coating	7,037	\$3,802	\$298,159	\$94,050	24.7	20	1.37	20
8	Gardena- Rush Gymnasium and Human Services	1651 W 162nd St, Gardena, CA 90247	20,559	20,559	46	29	Concrete with gravel on the top	Apply silicone white coating on existing roof	14,184	\$7,653	\$201,450	NA	26.3	18	2.75	20
9	Torrance City Hall	3031 Torrance Blvd, Torrance, CA 90503	53,822	13,372	52	0	Asphalt Membrane	Remove Existing Roof and Install New Roof with Cool Roof Coating	4,087	\$2,208	\$130,377	\$60,174	27.3	17	0.79	20
10	Inglewood- Civic Center Police Department (PD)	1 W Manchester Blvd, Inglewood, CA 90301	35,240	26,759	49	0	Built-Up Roof (BUR) with gravel on the top	Remove Existing Roof and Install New Roof with Cool Roof Coating	7,646	\$4,131	\$508,421	\$120,416	29.2	23	1.48	20
11	Lomita - City Hall	24300 Narbonne Ave, Lomita, CA, 90717	20,000	12,533	18	12	Built-Up Roof (BUR) with gravels on the top	Apply silicone white coating on existing roof	6,725	\$3,633	\$123,197	NA	33.9	17	1.31	20
12	Inglewood-Rogers Park Community Center	400 W Beach Ave, Inglewood, CA, 90302	33,978	33,978	15	15	Built-Up Roof (BUR) with gravels on the top	Apply silicone white coating on existing roof	16,775	\$9,063	\$342,819	NA	37.8	20	3.26	20
13	Inglewood-Library	11141 Crenshaw Blvd, Inglewood, CA, 90303	8,284	8,284	4	26	Built-Up Roof (BUR) with gravels on the top	Apply silicone white coating on existing roof	3,497	\$1,890	\$87,853	NA	46.5	15	0.68	20
14	Carson-Veterans Sports Complex	22400 Moneta Ave, Carson, CA 90745	32,983	20,980	35	20	Steep Slope Green Metal Roof	Apply silicone white coating on existing roof	5,973	\$3,227	\$215,390	NA	66.7	8	1.16	20



Summary of Findings

- Estimated annual savings average 10,000 kWh with buildings saving \$2,000 to \$11,000 on electricity bills annually
- Costs range from \$87,000 to \$150,000
 - Simple payback periods are generally long, ranging from 16 years to 66 years
 - Financial justification relies on non-energy benefits such as:
 - Extended roof life: Cool roof coating protect roof membrane from UV damage and thermal cycling
 - Lower maintenance costs: Reduced wear on roofing materials and HVAC systems means fewer repairs over time
 - Deferred HVAC upgrades: Lower cooling leads extend the life of existing HVAC system and postpone upgrades
 - Improved indoor comfort and better performance during heat waves
 - Environmental impact: Reduced energy use lowers GHG emission, supporting city sustainability goals



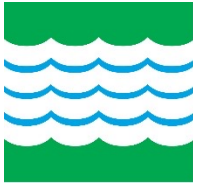
Potential Funding Sources

Incentive and Financing Program	Description
California Energy Commission's Energy Conservation Assistance Act	1% interest loans up to \$3 million, loan term up to smaller of 20 years or Effective Useful Life (EUL) of Project. For details, visit: https://www.energy.ca.gov/programs-and-topics/programs/energy-conservation-assistance-act/low-interest-loans
Southern California Regional Energy Network (SoCalREN): Public Agency Program	<ul style="list-style-type: none">• Metered Savings Program - Incentive based on normalized energy savings measured at the meter and requires a minimum threshold of 10% savings to qualify.• Rate-payer funded program that offers full program benefits such as on-site assessments, installation of energy-saving equipment, financial support, and more. For details, visit: https://socalren.org/agencies/services/streamlined-savings
Southern California Edison (SCE) Measured Savings Program	Incentive based on normalized energy savings measured at the meter and requires a minimum threshold of 10% savings to qualify. For details, visit: https://aesc-inc.com/measured-savings-program/
SCE On-Bill Financing	0% interest loan to be repaid by bill savings, loan term up to smaller of 10 years or EUL For details, visit: https://www.sce.com/business/rates-financing/energy-efficiency-financing/on-bill-financing

Solar System Considerations

- Solar can complement cool roof coating
 - Provides additional shading across large roof areas reducing heat gain
 - Energy generated helps offset electricity from utility
- Cool roofs have limited financing. Solar is eligible for:
 - 30% Federal Investment Tax Credit (ITC)
 - 10% Incentive (project site location dependent in “Energy Community”)
 - Tax-exempt agencies using domestically sourced materials receive an additional 10% incentive.





Next Steps

Cities

- **Planning:**
 - Adopt cool roofs during routine roof upgrades/replacements
 - Use incremental cost and payback for prioritization
 - Align with future solar PV plans for added value
 - ❖ Solar PV offsets electricity use from the utility grid
 - ❖ Multiple solar incentives available to reduce upfront installation cost

Cities

- **Funding**
 - Use incentive and financing programs
 - Explore low-interest loans, on-bill financing
 - Leverage SCE and SoCalREN programs.

SBCCOG

- **Regional Funding**
 - Secure sub-regional funding to reduce city costs
 - Consider launching pilot projects to demonstrate benefits and gather data

Thank you!

Questions?