How to Build
or Remodel
Energy Efficient Homes
and Businesses

VOLUNTARY GREEN BUILDING MANUAL

This Voluntary Code was produced by the collaborative effort of **Southern California Edison, Coachella Valley Association of Governments, Terra Nova Planning & Research and Interactive Design Corporation**

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INTRODUCTION

This Manual has been prepared to help anyone who wants to build or remodel their home or business to be more energy efficient. It is designed to help residents, homeowners, building owners, designers, architects, contractors, developers and building officials determine how they can design their building or remodeling project to include 'green building' techniques and products.

Green building is a strategy that takes a comprehensive approach to achieving efficiency through design, construction, renovation, and operation by creating structures that are resource efficient and environmentally sound.

The central objective of green buildings is to use resources, including building materials, electricity, and water, efficiently. Green buildings also tend to have better indoor air quality, thereby improving the health of people who live or work in them relative to traditional buildings. Another benefit is that the cost of operating and maintaining green buildings is less compared to their traditional counterparts. Green building strategies save money, improve the profit margin for local businesses, and free up dollars which would otherwise have been spent on utilities. Finally, green buildings enhance the local environment and quality of life, and increase the livability of the community.

voluntary green building manual

BACKGROUND

Buildings and structures use energy, water and raw materials and generate waste in the form of wastewater, refuse (solid waste), and demolition materials. The production and use of materials and energy as well as the disposal of waste results in the emission of air pollutants and greenhouse gases. Minimizing the use of these resources through green building principles -- such as using materials that are recycled and energy sources that are renewable-- helps to reduce impacts to our environment and promotes sustainability.

There are a number of methods to achieve energy efficiency in buildings and structures, including passive solar design, heating, ventilation, air-conditioning systems that are very efficient and are tuned/controlled by sophisticated thermostats, and selection of building and landscaping materials.

While green buildings or sustainable buildings can be described in a number of ways, the following are fundamental principles that are considered when designing a green building or retrofitting an existing building:

- Site Integration (location and building orientation)
- Efficient use of resources (water, natural gas, electricity)
- Material selection, building products, and appliances
- Indoor air quality and ventilation
- Efficient operation and maintenance

WHO CAN TAKE ADVANTAGE OF THIS MANUAL?

If you are building or remodeling a home or a commercial property, the techniques and products in this Manual are meant to help you build a more energy efficient, environmentally friendly structure. This Manual is intended to be used by:

- Homeowners
- Building owners
- Renters, Lessees, and Tenants
- Developers
- Architects and designers
- Builders, contractors and building trades
- Planners, practitioners and city officials

The goal of this Manual is to provide a one-stop shop for those who choose to participate in green building by making information readily available and easy to understand.

PURPOSE OF THIS MANUAL

This Manual is intended to provide guidance to those wishing to increase the energy efficiency of their home or workplace. This manual goes beyond energy efficiency to address other aspects of the built environment such as indoor air quality. In addition, green building concepts strive to maximize the beneficial use of naturally occurring processes such as the path of the sun through appropriate placement of awning or solar water heating, or water flow drainage and retention by minimizing impermeable surfaces and designing catchment basin to promote infiltration. This manual introduces users to green building concepts, provides a point system to estimate the level of energy efficiency achieved, described incentives and resources available locally and through the utilities, and explains the permitting process.

A WORD (or two) ABOUT CODES (Chapter Two)

Whether your project is a new building or a remodel of an existing structure, you will need a building permit, AND California building energy efficiency standards will apply. We know that understanding the process, let alone the principles, can be difficult, but the goal is simple – reduce energy consumption.

The Voluntary Green Building Program and the checklist of design strategies in Chapter Three of this Manual do NOT take the place of the Energy Efficiency and Green Building Sections of the California Building Code (CBC).

"Title 24" is the term commonly used to describe energy regulations for buildings in California. Since 1978 design professionals, contractors and building owners have had to comply with the energy efficiency measures contained in Part 6 of Title 24. The requirements to comply have been revised numerous times during the past thirty years, and they will continue to be revised to reach the ultimate goal of "net zero."

Of course, a building constructed today is much more efficient than one constructed twenty years ago. The minimum goal of the Voluntary Green Building Program is to exceed TODAY'S mandated energy performance by15% (per part 6, Title 24 calculations.)

Historically, to demonstrate that a building meets California energy efficiency standards, a design professional or energy consultant would use software to compare the energy efficiency of a proposed building with a theoretical "baseline energy budget." The design professional would select the various elements within a building (glazing, insulation, roofing, HVAC equipment, etc.) and the software spits out the annual energy usage in the specific climate zone (mountain, desert, coast.) If the projected energy usage is less than the "baseline," the building would "comply."

In 2010, Title 24 was amended to include "green building" requirements. These requirements are contained in Part 11 of Title 24, and are called "CALGreen." Part 11 views the entire process of design and construction from a broader perspective and includes issues dealing with construction waste, recycled materials, and water usage. Virtually any new construction, remodel, alteration or addition to an existing structure must comply with both Part 6 (energy calculations) and Part 11 (Green Building) of Title 24. This Manual supplements those requirements, but does not replace them.

HOW TO USE THIS MANUAL
This Manual is organized into the following Chapters:

Chapter 1: The Practical Approach, "What Should I Do?"
Chapter 2: The Informative Approach, Green Principles Illustrated
Chapter 3: The Technical Approach, Understanding Green Building Codes and Credit Checklist
Chapter 4: Financial Analysis
Chapter 5: Financial Incentives and Permit Processing

The first task in using this Manual is to identify the building type to which green building concepts will be applied. Each chapter contains information specific to residential and commercial buildings (for ease of use, all non-residential buildings are termed commercial).

Information for residential buildings is subdivided into single family and multi family structures. The residential and commercial sections are further broken out into existing buildings (upgrade) and new buildings. Once you've identified your building type you can go directly to the appropriate section in each Chapter.

The next step is to browse through the menu of green building options (mostly Chapters 1 and 2) and become familiar with green building concepts. This will allow you to select improvements that will be most beneficial to your needs. You should also talk to your designer, architect or contractor about these options, and work with them to develop a list of the items you want to include. In order to reach the first level – 15% over Title 24 part 6, you will need to incorporate the improvements shown in green in Chapter 3. Your designer or contractor can help you select the items you need to reach that level.

The additional improvements listed will help you reach higher energy efficiency levels, which are described below.

OVERVIEW OF CHAPTERS

Chapter One: The Practical Approach, provides information on how to use this Green Building Manual and explains who can use it, what it can be used for and how to implement it. This chapter provides a quick overview of practical steps to improve energy-efficiency and save money. Chapter One asks "What should I do?" and provides basic answers for each of the building types addressed.

If you are new to green building principles, Chapter Two: The Informative Approach, introduces concepts such as solar orientation, building envelope, and passive energy conservation. Green building principles include a number of common and more specialized concepts. Chapter Two provides a glossary of terms for easy reference and graphic images that explain green building concepts. It introduces the green building categories that are used to evaluate the level of energy savings achieved. This Chapter enables the homeowner, tenant, designer, builder or developer to become familiar with various aspects of green building. Each concept is tied to specific green building techniques in Chapter Three.

Chapter Three: The Technical Approach, provides the technical guidance and parameters to consider when using green building principles. This chapter provides the detailed menu of sustainable design options and the credit attributed to each measure. The menu items are organized by the following categories: Site, Envelope, Equipment, Passive Energy Conservation, and Materials. Each category contains several green building measures that correlate to the point system. All the measures that have a green background are specific to increasing your energy efficiency by 15% over Title 24. The rest are optional measures that will help you reach either the Energy Leader or Super-Efficiency Leader levels.

POINT SYSTEM

The point system gives you a total for two categories, depending on which measure or product you choose to use. The first category is "**Total Energy Efficiency Measures**." This total applies to the measures selected that will reduce electricity and natural gas use in your building. The second category is "**Total Sustainable Measures**." This category applies to the measures you choose that will lower the impact of the building on the environment. A total of 20 in Total Energy Efficiency Measures means that your building will be 15% more efficient than a traditional building. A total of 30 in Total Sustainable Measures means that your building will reach Energy Leader level; a total of 40 in Total Sustainable Measures means that your building will reach Super-Efficiency Leader level.

Chapter 4 offers a cost benefit analysis to help determine the most appropriate measures to apply for specific budgets. You can use this tool to determine the cost of the measures you have chosen, and how long it will take for these measures to pay for themselves.

Rebates, discounts, and financial incentives as they relate to green building are described in Chapter 5: Financial Incentives and Permit Processing. Since incentives change regularly, depending on the offers being made by the State and federal governments, and individual utilities, this chapter gives you links to government and utility web sites to check on the latest programs available.

As part of this program, the City/Tribe has committed to making it easier for those participating in the program to process their plans and receive permit approval. In the case of remodeling and retrofitting plans, only building permits will be required. When a new residential or commercial project is proposed, that new project will be subject to standard environmental review. However, projects that show a commitment to Green Building and achieve targeted savings will benefit from fast tracking and reduced permitting costs for building permits.

Online Version
If viewing electronically, direct links to each building type and subcategory are provided. Simply click on the desired chapter to be routed to the appropriate discussion.

INSPECTIONS

This Program is self-reporting (except for the Title-24 credits which are required). It is based upon an honor system: you say you are going to do something to improve the energy efficiency of your building, and we assume you will. However, there is great value to have third party verification of the actual installation of various measures.

Now, why do we say we will trust you, but not the contractor? Simply because the complexities and idiosyncrasies of every construction project present challenges to contractors. Sometimes they miss something, overlook something or simply make a mistake. It is in your interest to confirm that what the plans and specifications state, and what you pay for, are actually well-executed.

Therefore both the State Energy Code and this Manual place high value on third party verification of four major elements: insulation, duct and whole house leakage, HVAC equipment. The first three require careful attention to details and connections, and not infrequently do not perform as designed. By inspecting them before they are closed up (so errors can be corrected), the overall performance of the building is greatly enhanced.

Every process of manufacturing and fabrication requires quality control; you can think of third-party verification as construction quality control.

WHERE ELSE TO LOOK FOR INFORMATION

Energy conservation is on everyone's mind, but it isn't always easy to find your way around all the programs and websites.

Below are links to some of these organizations – ones we think are especially relevant to our Desert Climate. By no means is the list complete, but it will get you started looking for more information – or the same information presented differently.

CODE REFERENCE:
These links provide additional information on the source codes used in Chapter 3. You can learn about the principles to make your building "green" and how to apply the principles. Use these links to find efficiency standards and regulations for residential and non-residential buildings.

California State Energy Code (CG)
http://www.bsc.ca.gov/Home/CALGreen.aspx

Build It Green (GPR)
http://www.builditgreen.org/greenpoint-rated/

United States Green Building Council (LEED)
http://www.usgbc.org

The California Energy Commission
http://www.energy.ca.gov/title24/
http://www.energy.ca.gov/HERS/index.html

"ENERGY EFFICIENT" BENEFITS:
Learn about the benefits of energy upgrades. Search for rebate information, find a contractor and read about specific news in your town.

Southern California Edison
http://www.sce.com

Department of Energy
http://energy.gov/

California Energy Upgrade
https://energyupgradeca.org/

U.S. Environmental Protection Agency
http://www.epa.gov/greeningepa/index.htm

ENERGY-SAVING TIPS:
These links provide tips on saving energy and recommend products to use for a remodel or new construction. You can also verify if your "green" upgrades meet today's standards.

Energy Star
http://www.energystar.gov/

American Society of Heating, Refrigerating & Air-Conditioning Engineers
http://ashrae.org/

Cool Roof Rating Council
http://coolroofs.org/index.html

Lawrence Berkeley National Laboratory
http://www.lbl.gov/

National Fenestration Rating Council
http://nfrc.org/

CHAPTER ONE

What should I do?

CHAPTER ONE provides a quick overview of practical steps to improve energy-efficiency and save money. CHAPTER ONE asks "What should I do?" and provides basic answers for each of the building types addressed in the Voluntary Green Building Manual:

Single family homes
Multi-family apartments
Commerical buildings

CHAPTER ONE also includes a simple glossary of terms commonly used in energy-efficiency literature and the green building design and construction industry.

Some low- or no-cost steps one can take right now.

NO COST OR LOW COST IMPROVEMENTS

These measures to reduce energy use are either low cost or no cost options that everyone should consider.

1. Seal Leaks: eliminating air leaks in buildings by checking window and door seals helps to regulate the temperature differential between indoors and outdoors.
2. Replace light bulbs: the use of compact fluorescent light bulbs reduces energy costs while proving the same level of illumination.
3. Turn off lights and appliances and shut off power source: turning off lights and appliances when not in use is a quick and easy way to save energy. The use of power strips can further reduce energy use by avoiding the ghost effect caused by unused electronics. Some mechanisms, such as cable TV boxes, utilize almost as much power when in the off position as when the TV is on.
4. Automate the thermostat, lights and vending machines: Programmable systems allow for automation so that energy is conserved during non-business hours or during low use.
5. Maximize heat and light from the sun: Natural daylight can be sufficient to provide adequate light for certain activities. Open curtains and blinds in south and west facing windows for heat and light, or close them to keep cooler.

CHAPTER TWO

GREEN PRINCIPLES ILLUSTRATED

CHAPTER TWO is the informational part of this Green Building Manual. In this Chapter the principles of energy efficiency and resource management are illustrated and explained in everyday language. This Chapter is geared toward property owners and interested citizens more than to professionals.

The principles are organized from the outside – in. Issues related to the site and existing conditions are addressed first, then the envelope of the building, then equipment and systems, and finally passive strategies. Each page illustrates two or three related principles. While the graphics and text are intended to present a basic understanding of an issue, at the bottom of the page are noted the reference numbers for specific technical items listed in Chapter 3. In addition, the Appendix contains source references for more information.

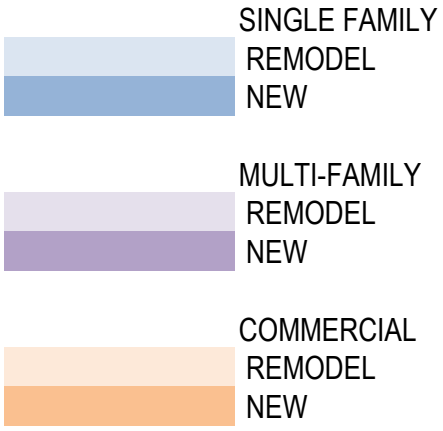
Principles of energy efficiency are illustrated for both remodel and new construction and for all three building types (single family residences, multi-family buildings and commercial buildings), and are coded by color with a lighter shade for remodel, and darker for new.

At the beginning of each building type is a sheet titled "What Can I Do Now?" which presents simple steps to consider for remodel projects but are also relevant to new projects. The ideas are organized from low cost to higher cost, and are steps to take to reduce the cooling load before upgrading the equipment.

"A word about Codes"

Many of the steps to improve energy efficiency in a building will require a building permit including compliance with the State energy efficiency standards. "Title 24" is the catch-all phrase commonly used when referring to the energy efficiency requirements in the building code. The introductions to this Manual and Chapter Three explain the intricacies of "energy codes."

BUILDING TYPES



the informative approach

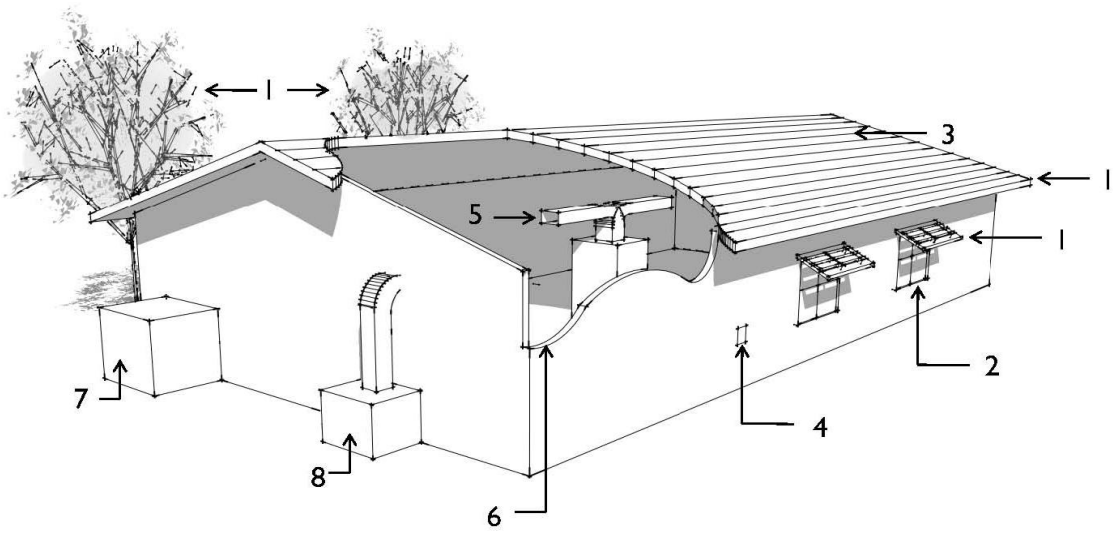
GLOSSARY

What should I do?

COOL ROOFING requires high solar reflectance and emissivity.	ROOFING
Reflectance measures how much of sunlight (visible, infrared and ultraviolet) is reflected; > 0.70	Solar Reflectance
Emissivity measures how easily heat is radiated by a material.	Emissivity
INSULATION slows the transfer of heat. The thermal resistance of a material is measured in "R value"; higher is better. In our desert climate R-38 is good in the attic and R-19 in the walls.	INSULATION R-Values
WINDOW thermal performance is measured in three ways: controlling sunlight (SHGC), conductance and infiltration.	WINDOWS
Solar Heat Gain Coefficient (SHGC) measures how much sunlight heats up the interior; lower is better. < 0.30	SHGC
U-value measures the conductance of the entire window assembly (glazing and frame). Performance is expressed as "U-factor";	U-Factor
VENTILATION is necessary for a healthy interior, but buildings are increasingly "tight." They don't leak much, so fresh air has to be brought into the house when the AC is running. The amount of fresh air is measured in Air Changes per Hour (ACH) and is verified by blower door test.	VENTILATION Tight Buildings Air Changes/Hour
SEER / EER measures air conditioning efficiency. Higher is better; 13 SEER and 11.5 EER are minimums	AC EQUIPMENT SEER & EER
PASSIVE strategies and methods do not rely upon equipment or electricity.	PASSIVE SYSTEMS Thermal Chimney
Thermal chimney: opening windows in high spaces and near the floor allows hot air to escape and be replaced by cooler air.	Thermal Mass
Thermal mass: using the sun to heat up a tile floor is passive.	

WHAT CAN I DO NOW
FOR MY HOME?

SINGLE FAMILY NEW & REMODEL



1 SHADE

Add trellis, awnings, trees, lattice/vines; mostly on west and south

2 AIR SEAL

Seal gaps and cracks with foam and sealants

3 COOL ROOF

Add coating on existing roofing or install a "cool roof" system

4 WINDOWS

Add film to existing single pane windows or replace with high-performance windows

5 DUCT SEAL

Tape existing pipes and ducts to seal leaks

6 ENVELOPE INSULATION

Add insulation in the attic and a radiant barrier

7 HVAC ≥ SEER 13

Replace AC unit with higher efficiency rating

8 EVAPORATIVE COOLER

Add cooler to existing or new for energy efficient ventilation

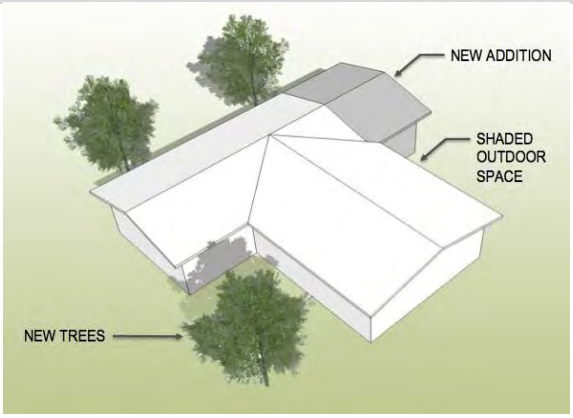
residential

site & existing condition

SITE CONSIDERATIONS

START FROM THE OUTSIDE

AROUND THE HOME

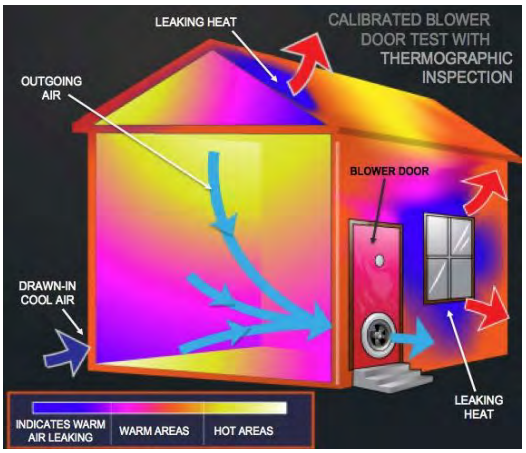


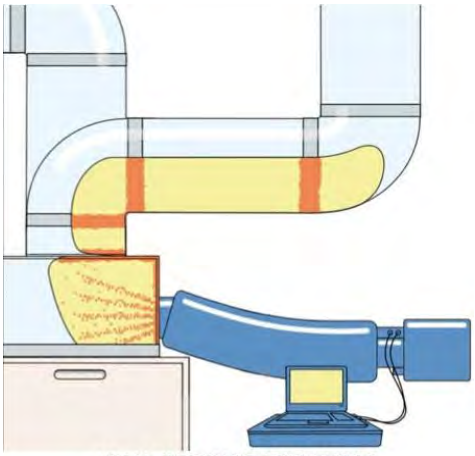
START OUTSIDE
When considering how to add to your home, use the new addition to enhance the quality of outdoor areas with new shade. Consider where new trees would be valuable for shade, how the addition itself can shade currently exposed areas, and how the orientation of the addition will limit windows and long walls facing west.

Consider removing hardscape that is not necessary.

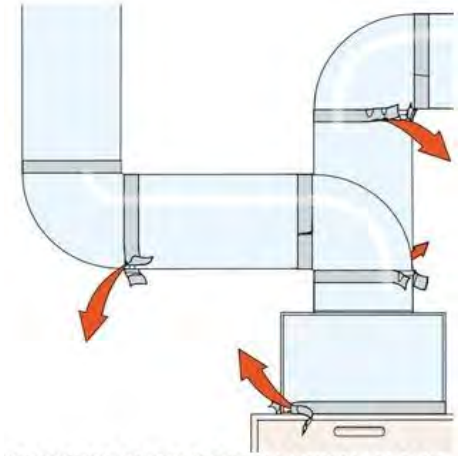
FIX WHAT'S BROKEN

As part of preparing to remodel and/or expand, find out how the home is already working – test the ducts to see how badly they leak, perhaps do a "blower door" test to see how much air leaks into (or out of) the house through cracks, electrical outlets, windows and doors. While the workers are doing the main remodel, some remedial work such as duct and "air sealing" may be warranted and cost effective.





SEAL INTERIOR WITH VINYL ACETATE ADHESIVE PARTICLES



CONNECT DUCTS MECHANICALLY AND SEAL WITH MASTIC

KEEP UNWANTED HEAT OUTSIDE

Ref: Chapter 3 credits

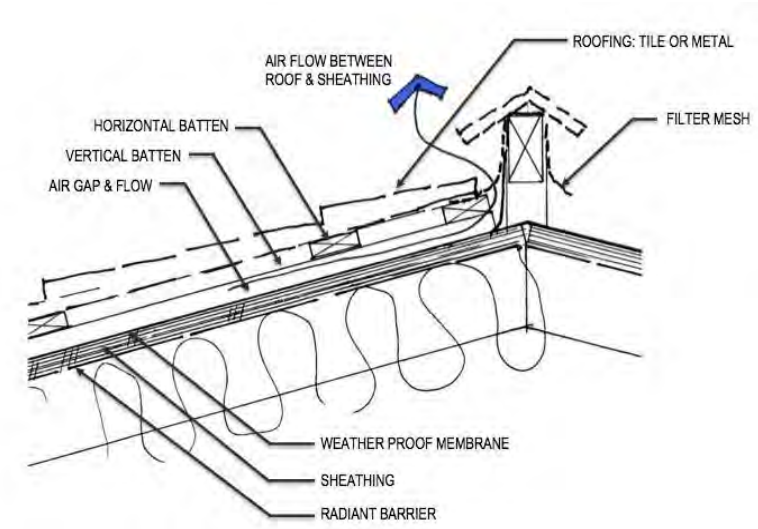
the envelope

ROOF & ATTIC

ROOF ASSEMBLY

ROOF

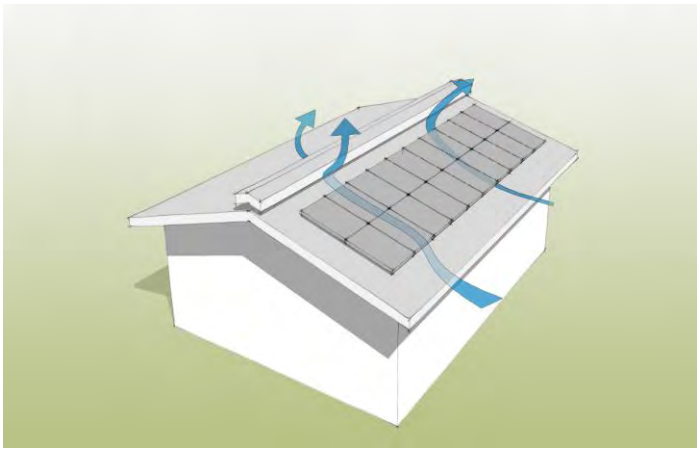
Heat gain through the roof is the largest single load the HVAC system has to counteract. Because the roof is exposed to the sun all day long the whole assembly quickly gets saturated with heat, and even during the night it continues to transfer heat inside.



Re-roofing should accomplish two objectives: reflect solar radiant heat and resist heat transfer. "Cool roof" systems and radiant barriers reflect heat from radiation. Insulation increases the resistance to heat transfer, and rigid insulation on top of the existing sheathing keeps heat from penetrating the roof structure or attic insulation.

A "ventilated" roof system accomplishes all of these objectives.

ATTIC COOLING



ATTIC

Most older homes often have minimal insulation installed in the attic. Adding more insulation is a good investment, but should be combined with improving airflow through the attic and installation of a radiant barrier where possible.

The temperature in closed attics can reach 150 degrees. Ventilation requires inlets and outlets, relief vents must be added low and high to take advantage of convection ventilation. Adding a solar powered exhaust fan without adding intake vents will not work. If the home has an evaporative cooler, adding relief vents in the ceiling will exhaust the cooled air up through the attic and out attic vents. The ceiling vents must be insulated.

At the same time you add insulation, seal around all recessed lights and ceiling junction boxes.

DESIGN THE ROOF TO REDUCE HEAT

the envelope

WINDOWS & WALLS

KEEP THE SUN OUT

WINDOW ASSEMBLY

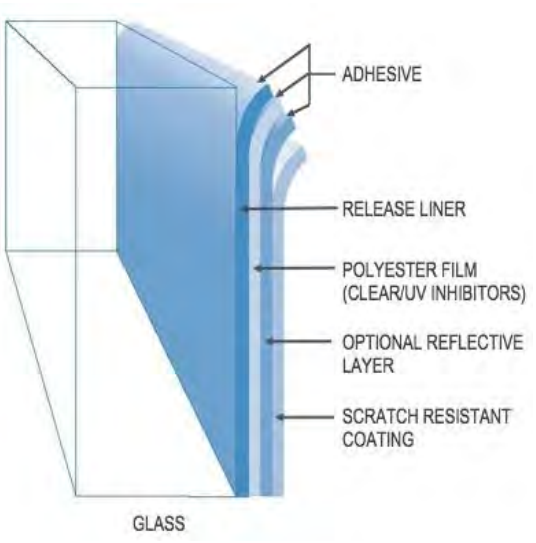
WINDOWS

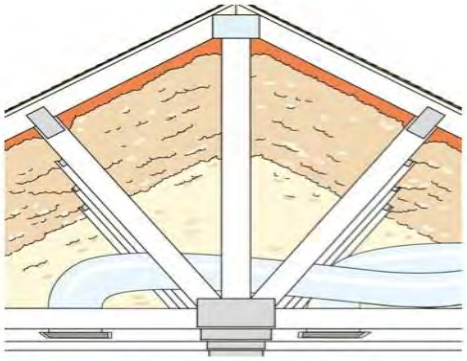
In homes built before 1978, windows are energy sieves -- not only are the frames highly conductive (aluminum or steel), the glazing is probably single pane, the glass is clear (no Low-e coating), the weatherstripping has deteriorated, and even the connection to the surrounding wall material may have cracks.

Replacing windows is relatively simple and not disruptive (the new frames fit within and are attached to the existing frames), but it can be costly. A full-house replacement program should be tailored so that windows facing east, south or west have better SHGC than north-facing windows. Replacement windows may require tempered glass based upon current codes requirements.

An interim approach is to add film to the inside of the glass on windows that get direct sun. The film will reflect a considerable amount of solar heat gain, but heat will still come through cracks and the hot glass. Therefore, all cracks should be sealed.

Shade windows with trees or awnings.





INSULATED ROOF

INSULATED WALLS

INSULATION

WALLS

In most homes built before 1978 the walls are not well insulated. All efforts to increase the insulation values to existing walls are costly and disruptive.

Planting shade trees, creating trellises or living walls and painting the walls a light color cost little and will reduce the heat build-up from solar radiation.

A ventilated wall system for a blank west-facing wall may be an aesthetic as well as energy efficient approach.

If you are considering a large remodel project that will better the architectual style, adding rigid insulation on the outside and/or adding batt insulation between studs will reduce heat transfer.

DAYLIGHTING STRATEGIES

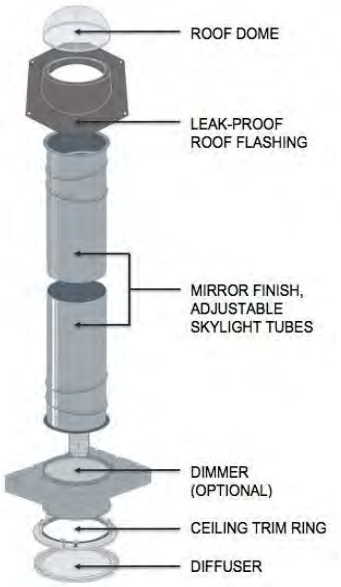
CONTROL HOW DAYLIGHT ENTERS THE BUILDING…

BALANCE DAYLIGHT

DAYLIGHTING & VENTILATION

Self-flashed tubular skylights make it relatively easy to bring daylight into dark interior rooms or into large rooms where glare is a problem because of large expanses of glass on only one wall. Skylights can balance the distribution of natural light and reduce artificial light during the day.

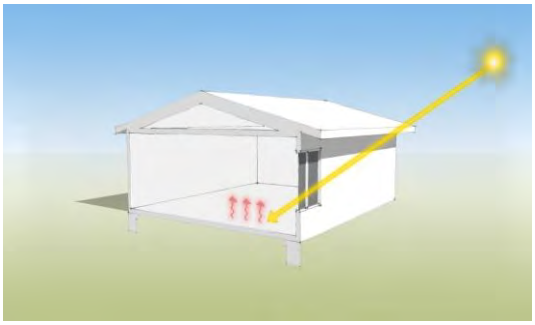
In some cases operable skylights can provide daylight and a way to naturally ventilate high volume spaces using natural flow of hot air upward. Opening the skylights at night can provide "night purging" in areas without cross ventilation.

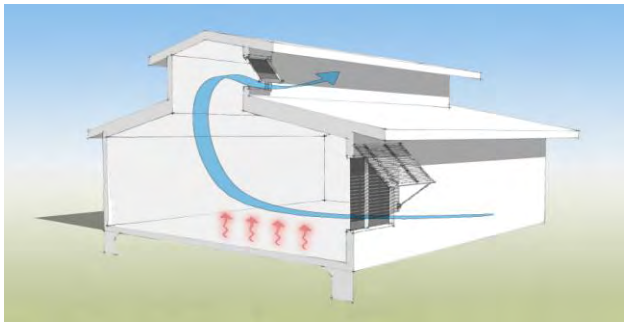


VENTILATION AND THERMAL MASS

For eight months a year, natural ventilation is an essential part of indoor comfort and reducing energy use. Cross ventilation through windows is the easiest path, but the thermal chimney effect works for homes that may not have adequate or appropriate window placement. By replacing existing fixed windows with operable windows and adding house fans in the attic to pull the air up, natural ventilation for greater comfort is achieved.

Thermal mass is the ability to absorb heat and release it over time. Concrete and/or tile floors remain cold because they are in contact with the earth. Still, during the day they absorb heat. At night as fresh, cooler air blows across, the floor releases its heat. This is night purging.





USE DESIGN TO CONTROL DAYLIGHT

the equipment

EQUIPMENT

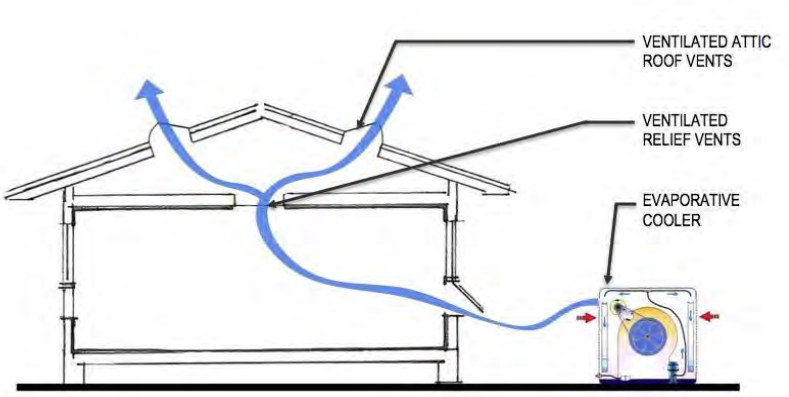
AIR CONDITIONING & EVAPORATIVE COOLING

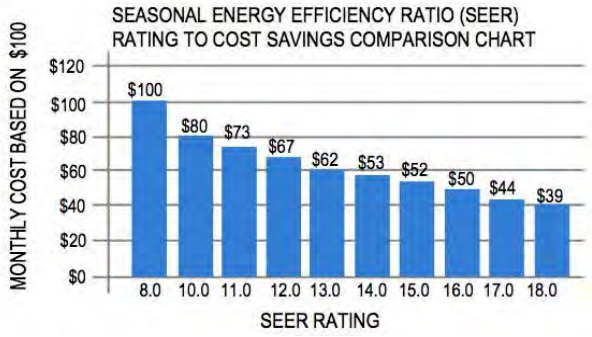
EQUIPMENT

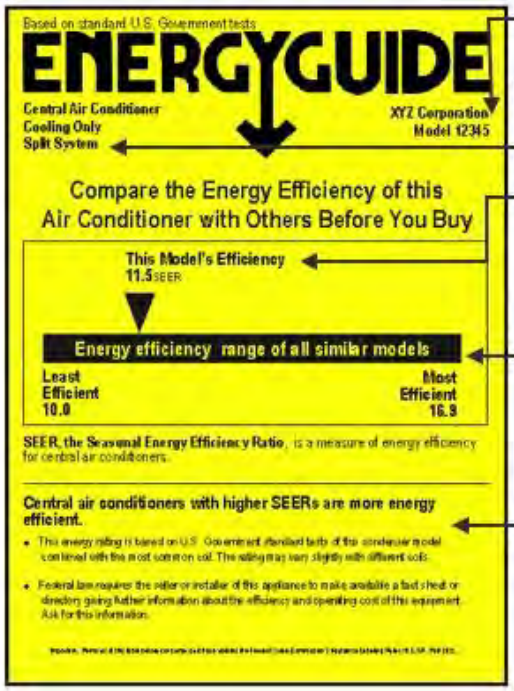
Upgrading the existing home's thermal performance (shade trees, roof, attic, walls and windows) will significantly reduce the cooling load. Doing a careful room-by-room cooling load calculation may mean a smaller HVAC system is needed (e.g. 3-ton vs. 4-ton.) This is called "right sizing."

Installing an evaporative cooler will shorten the time when the HVAC system is needed. For many desert residents, an evaporative cooler provides comfortable temperature well into June and as early as mid-September.

With insulated ceiling relief vents, the evaporatively cooled air can exhaust through the attic, significantly reducing the air temperature.







MANUFACTURER & MODEL NUMBER

INFORMATION ABOUT FEATURES, CAPACITY & SIZE HELPS YOU COMPARE BRANDS.

THE ENERGY EFFICIENCY RATING FOR THE PRODUCT. THE HIGHER THE NUMBER, THE MORE ENERGY-EFFICIENT THEPRODUCT AND THE LESS IT COSTS TO RUN.

THE RANGE OF RATINGS FOR SIMILAR MODELS, FROM LESS EFFICIENT TO MORE EFFICIENT. THIS SCALE SHOWS HOW A PARTICULAR MODEL MEASURES UP TO THE COMPETITION.

IMPORTANT INFORMATION ON ENERGY USE & OPERATING COSTS IS PUBLISHED IN FACT SHEETS & PRODUCT DIRECTORIES. INSTALLERS & CONTRACTORS ARE REQUIRED BY LAW TO PROVIDE THESE TO YOU.

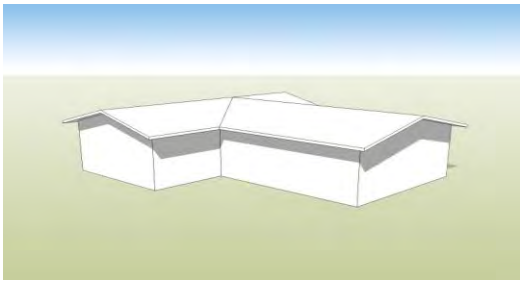
USE THE "RIGHT SIZE" EQUIPMENT

site & building form

SITE CONSIDERATIONS

START FROM THE OUTSIDE

How the home sits on the lot is the first crucial decision.



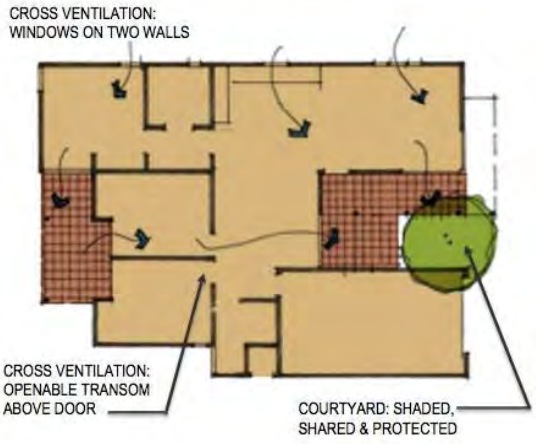
ORIENTATION: The western exposure may have the best view, but it is also the most severe exposure for solar radiation (heat from sunlight.) Limiting western exposure by careful placement and sizing of windows, and orienting the home so long walls face north and south are decisions that can be made at the outset, and do not cost money.

VIEWS: In our Desert the best views are often to the south and west, but large, unprotected expanses of glass are brutal heat gainers. Consider patio cover with drop-doors shade cloth.

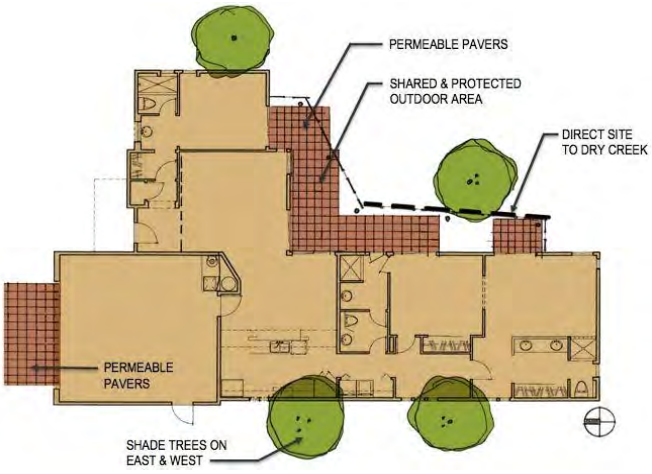
THE PLAN

DESERT RESPONSIVE BUILDING FORM

Two competing principles must be balanced: on the one hand compact floor plans keep the exterior walls to a minimum, but for good cross ventilation and daylighting, "L" shaped and courtyard homes that are essentially one -room deep are best. These shapes also create shared, shaded outdoor spaces.



AROUND THE HOME



MODIFY MICRO-CLIMATE: Add trees to shade the building and the outdoors.

LIMIT HARDSCAPE: This will reduce the "heat island" effect. Also separate exterior paving from the house slab.

USE PERMEABLE PAVERS: Water can seep between the pavers to reduce runoff.

DIRECT RAIN WATER: Direct roof and site water to "dry creek" landscape areas.

USE DESIGN TO REDUCE HEAT LOADS

Ref: Chapter 3 credits 2.7, 3.1, 4.4, 4.5, 6.2, 6.6, 8.3, 8.5

the envelope

ROOF & ATTIC

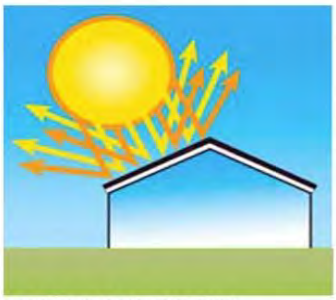
ROOF ASSEMBLY

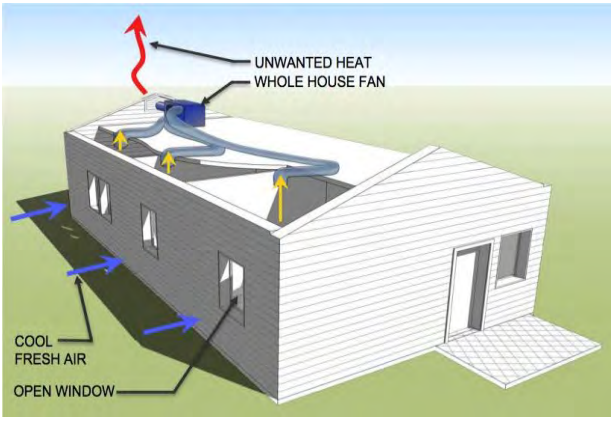
THE ROOF
Insulation is the principal means of resisting heat transfer, and generally more is better. The location is also important. If the insulation is on top of the roof sheathing it helps more than the value from batt insulation between rafters – but both together is the best.

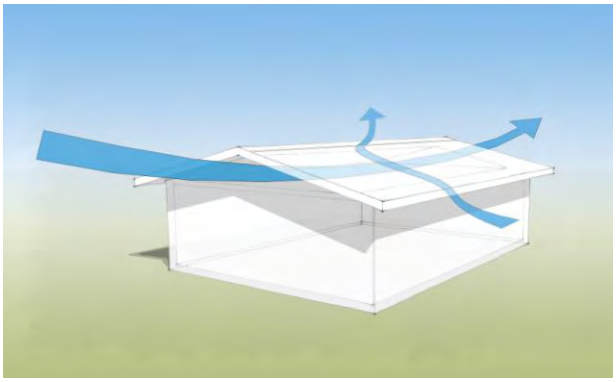
A reflective, "cool roof" system intercepts radiant heat buildup. There are "cool roof" rated tiles, shingles and metal roof systems for sloped roofs. Single-ply "cool roof" systems for flat roofs are very effective, and cumulatively, over the entire city, the heat island effect is reduced by "cool roof" systems. A "cool roof" system also prolongs the life of the roof membrane itself.

A ventilated roof system shades the actual weathertight envelope thus prolonging its life, and circulates air over the membrane which also keeps it about the same temperature as the ambient air. Installing a roof-mounted solar system essentially creates a ventilated roof system.


ROOF WITH CONVENTIONAL PAINT


ROOF WITH COOL ROOF PAINT





ATTIC COOLING

ATTIC
Attic temperatures can reach 150 degrees, and the insulation at the ceiling joists becomes completely saturated with heat. All through the night the ceiling radiates heat into the rooms below.

Airflow through the attic space is critical in reducing heat buildup. Ventilation requires inlet and outlet vents. Solar powered exhaust fans with inlet vents at the eave, a ridge vent combined with eave vents, and dormer vents near the ridge and eave vents are all valid approaches, but the size and number of vents must be calculated.

If attic insulation is placed under the roof sheathing, the attic is part of the conditioned space and AC ducts are more efficient. But all cracks at the roof-to-wall joints must be sealed.

If the home has an evaporative cooler, the outlet can be through relief vents in the ceiling which will drive the cooled air through the attic, substantially cooling the attic air.

DESIGN THE ROOF TO REDUCE HEAT

the envelope

WINDOWS & WALLS

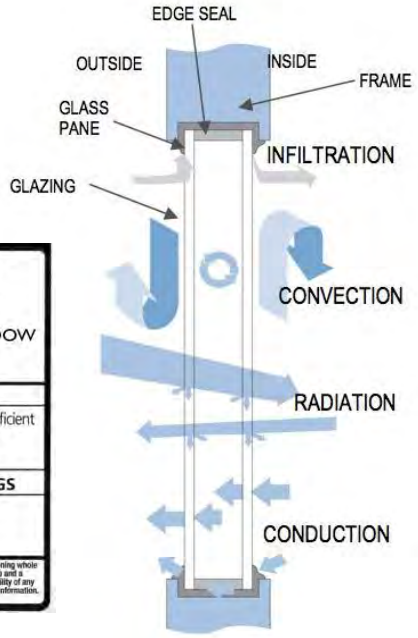
WINDOW ASSEMBLY

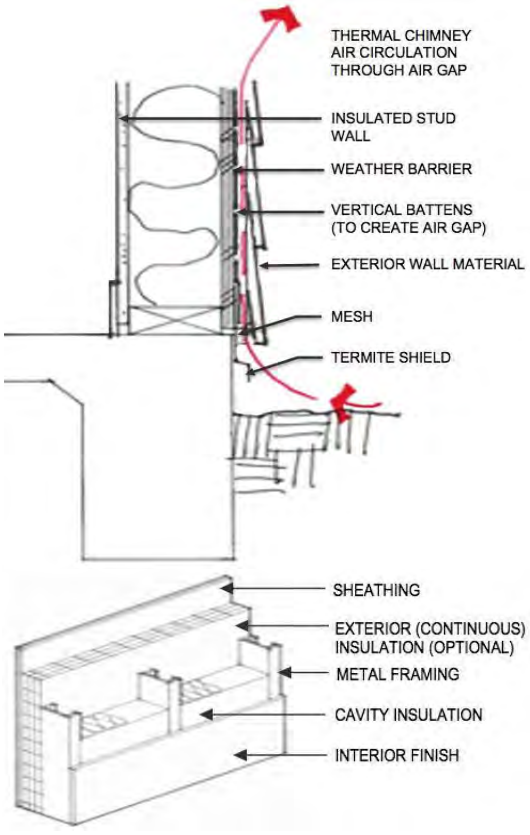
KEEP THE SUN OUT

Windows: Direct sunlight heats up the inside of a building the same way it makes a steering wheel too hot to touch. The best way to prevent radiant heat buildup is to shade the window. Additionally, the glass itself should be coated with a low emissivity (Low-e) substance.

This type of coating reflects much of the radiant energy and is measured by Solar Heat Gain Coefficient (SHGC.) The lower the number, the better (0.23 is much better than 0.50.) However, the lower values are really only useful on windows that get direct sunlight. North-facing windows can have a higher SHGC.

U-Factor is the efficiency of the entire window to resist heat transfer. A lower U-factor is better.





WALL INSULATION

WALLS

Resisting heat transfer through walls generally is accomplished by insulation. More is better. Where it is also matters: if rigid insulation is placed on the outside of the framing, there is no "thermal bridging" through the studs, and the batt insulation between studs doesn't get as saturated with heat.

Walls also heat up from direct sunlight; in addition to ambient air temperature of 115, direct sunlight can add another 15 degrees to the heat trying to get inside. So shade on walls as well as windows is good.

Even without shade, a ventilated wall system can cut the heat load. The first surface that the sun hits is separated from the wall itself and air circulates between the "skin" and the weather barrier and wall structure. This means the insulation in the wall only has to deal with the ambient air temperature (and a little radiant heat from the skin.)

DESIGN WINDOWS TO REDUCE SOLAR

passive strategies

DAYLIGHTING STRATEGIES

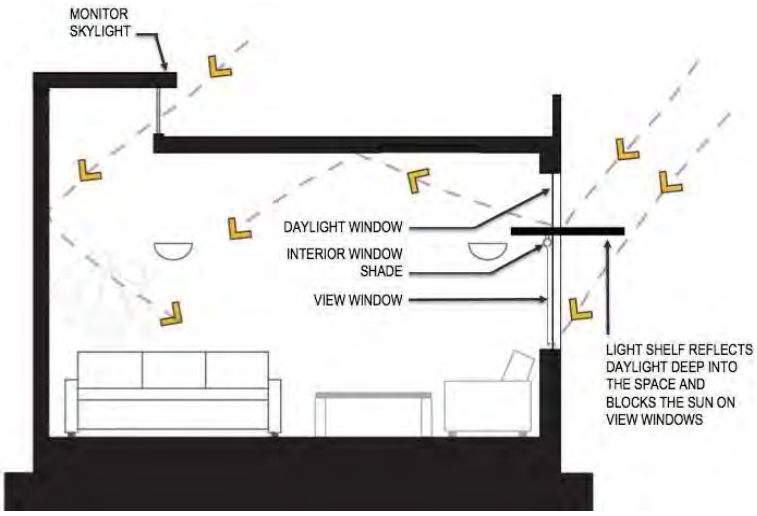
CONTROL HOW DAYLIGHT ENTERS THE BUILDING

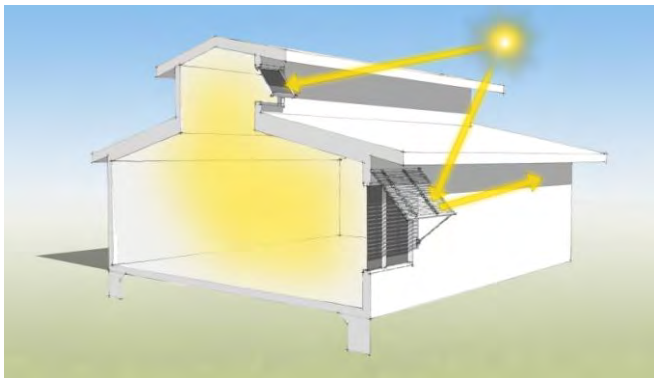
BALANCE DAYLIGHT

Natural daylight is uplifting and creates a feeling of connectedness to nature. It is difficult to bring daylight into all the rooms in most homes, and in larger rooms it may be difficult to balance the glare that comes from sliding glass doors when located on only one wall. Skylights and light monitors can balance light distribution within a room, bring light into dim areas, and can serve as relief vents for the "thermal chimney" effect.

LIGHT SHELF
A light shelf can be used in combination with high-reflecting ceilings to reflect natural daylight that enters the building.

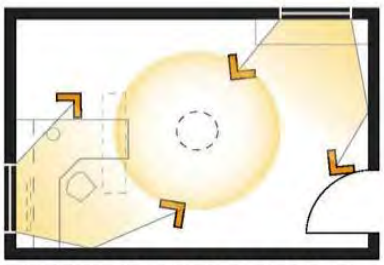
SKYLIGHT
Installing skylights will allow natural daylight to enter the building where windows may not exist. Skylights with splayed openings distribute the natural light deeper into the space. Walls immediately below skylights are sources of dynamic and indirect illumination.

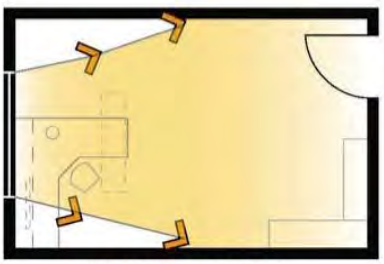




REDUCE GLARE

BILATERAL LIGHTING
Light distribution is improved by admitting daylight from more than one point in the space; the daylight entering the space can be reflected off multiple sidewalls. Additionaly, the glare from a vertical window next to a sidewall is less severe than that from a horizontal window in the middle of a room.


BILATERAL LIGHTING WITH SKYLIGHT


UNILATERAL LIGHTING

USE DESIGN TO CONTROL DAYLIGHT

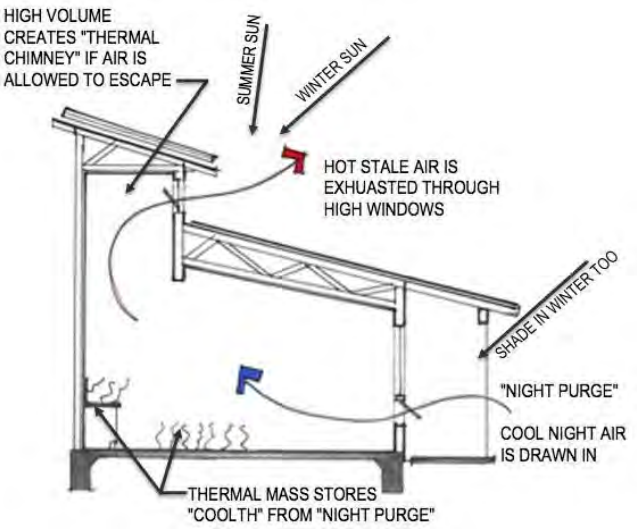
passive strategies

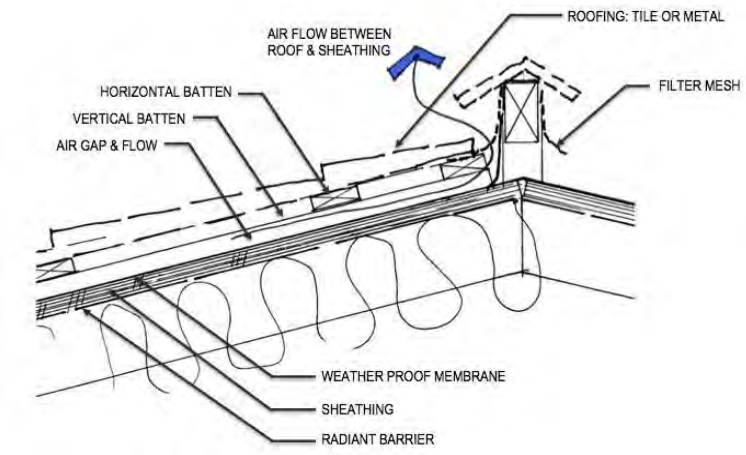
PASSIVE ENERGY

AIR MOVEMENT

For eight months a year, natural ventilation is an essential part of indoor comfort and reducing energy use. Cross ventilation through windows is the easiest path, but the thermal chimney effect works for homes and condos that may not have adequate or appropriate window placement. High bay spaces or tower elements use the thermal chimney effect to draw air up and out, and also provide natural light to interior spaces.

"Night purging" is the process by which cool night air is drawn through the house to replace stale and warmer air. When combined with surfaces that have high thermal mass (tile or concrete floors, stone counter tops, even tile walls) these materials hold their "cool temperature" and delay the need for air conditioning during the day. They give up their heat when cool night air passes over them.





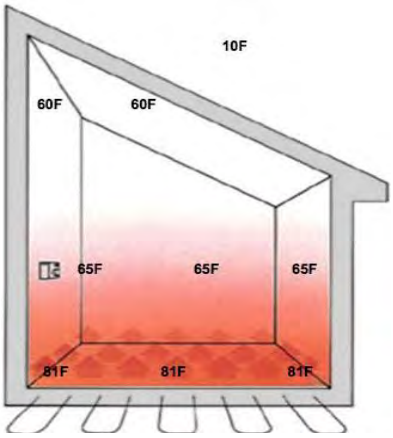
VENTILATED ROOF SYSTEM

Ventilated roof systems use double battens to create an air space between the roof sheathing and the roofing system (generally tile or metal.) The air is drawn by convection from the eave up to the ridge, and the separation between the roofing material and the sheathing prevents direct heat transfer (conduction.) Place mesh at eave and ridge to help keep birds, bugs and rodents out.

RADIANT HEATING

Radiant temperature control relies upon the exchange of heat between a person's body and the surrounding surfaces. In a "radiant" system the temperature of the surrounding surfaces is what matters, not the actual air temperature.

Radiant floor heating systems are generally understood – warm liquid circulates in tubes through the floor slab; the floor feels warm to the touch, and it radiates warmth to the rest of our bodies. A solar thermal system can provide hot water as can a gas-fired water heater. In such a system the energy use is limited to the pump moving the warm liquid, there are no fans.



MOVE AIR TO REDUCE TEMPERATURES

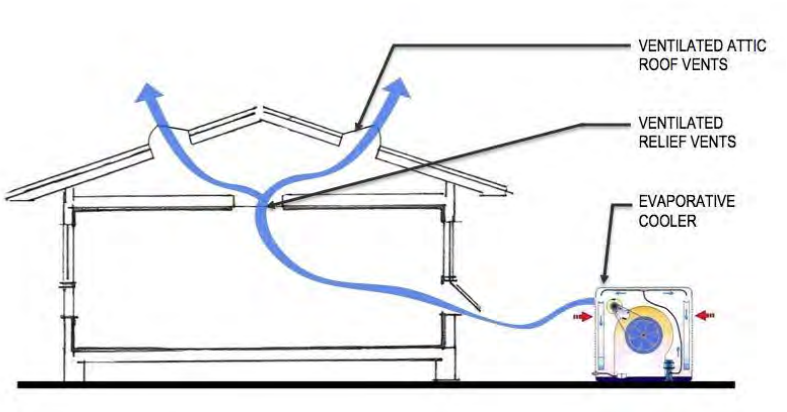
the equipment

EQUIPMENT

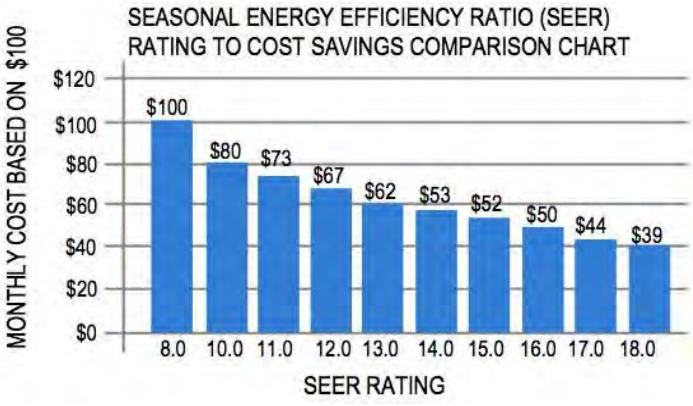
EVAPORATIVE COOLING

Many people prefer the fresh air from evaporative coolers to recirculated air conditioned air. But during the late summer they do not provide adequate comfort; the house still needs air conditioning. But an evaporative cooling system can provide a comfortable and fresh indoor environment through the shoulder seasons and even well into the summer.

The evaporative cooler can also lower the temperature of the attic if relief vents exhaust through the attic.



AIR CONDITIONING



The biggest energy draw is air conditioning (HVAC), so designing the building for energy efficiency (shade, lots of insulation, daylighting, Energy Star appliances) will minimize the heat gains that the HVAC unit has to overcome. The HVAC can be "right-sized" so the smallest possible HVAC unit will do the job.

HVAC units with the highest efficiency (defined as SEER) have two-stage compressor motors. Only during the hottest days will the second, more energy-consuming, stage be called upon.

Annual and Life Cycle Costs and Savings for 1 Central Air Conditioner(s)

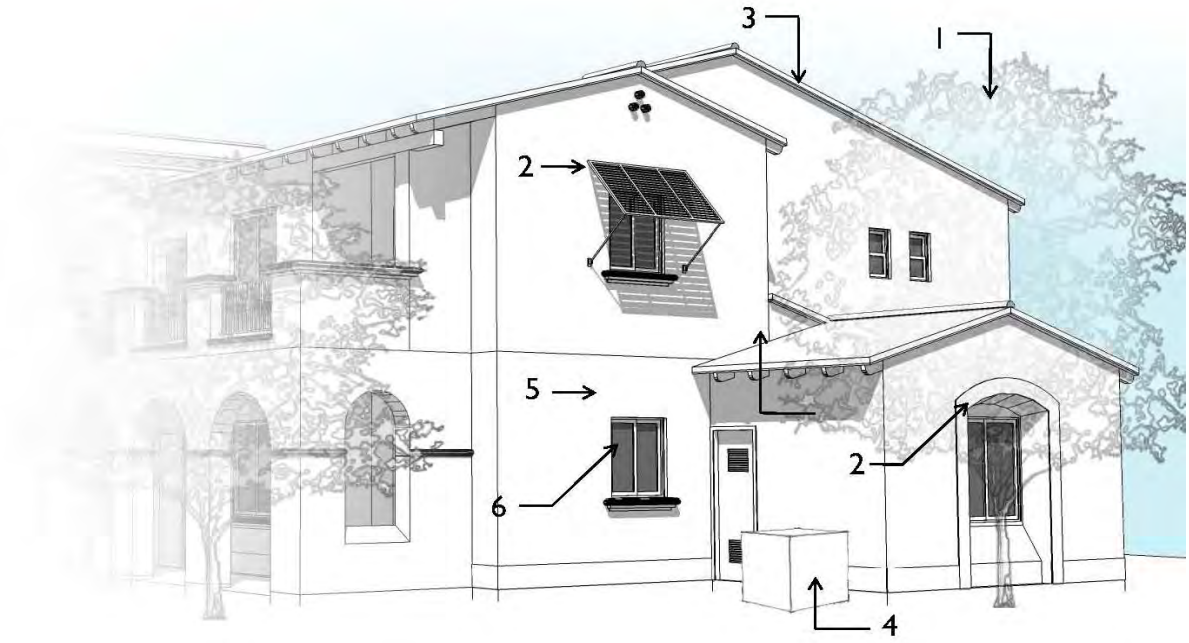
	1 ENERGY STAR Qualified Units	1 Conventional Units	Savings with ENERGY STAR
Annual Operating Costs*			
Energy cost	$383	$631	$248
Energy consumption (kWh)	*3,515*	*5,793*	*2,279*
Maintenance cost	$0	$0	$0
Total	**$383**	**$631**	**$248**
Life Cycle Costs*			
Operating costs (energy and maintenance)	$4,043	$6,664	$2,621
Energy costs	$4,043	$6,664	$2,621
Energy consumption (kWh)	*49,204*	*81,105*	*31,901*
Maintenance costs	$0	$0	$0
Purchase price for 1 unit(s)	$3,413	$2,857	-$556
Total	**$7,456**	**$9,521**	**$2,065**
		Simple payback of initial additional cost (years)†	**2.2**

USE DESIGN TO COOL THE HOUSE

WHAT CAN I DO NOW

FOR MY APARTMENT BUILDING?

MULTI-FAMILY NEW & REMODEL



1 SHADE

Add trellis and awnings; plant trees and vines on lattices.

2 WINDOWS (E, S & W)

Add film to existing single pane windows. Better would be to replace windows

3 COOL ROOF

Add coating on existing roofing, or install a "cool roof" system

4 HVAC ≥ SEER 13

Replace AC units with higher efficiency rating

5 LIGHT COLORS

Paint exterior surfaces light colors to reflect the sun and heat

6 Duct Test/Seal

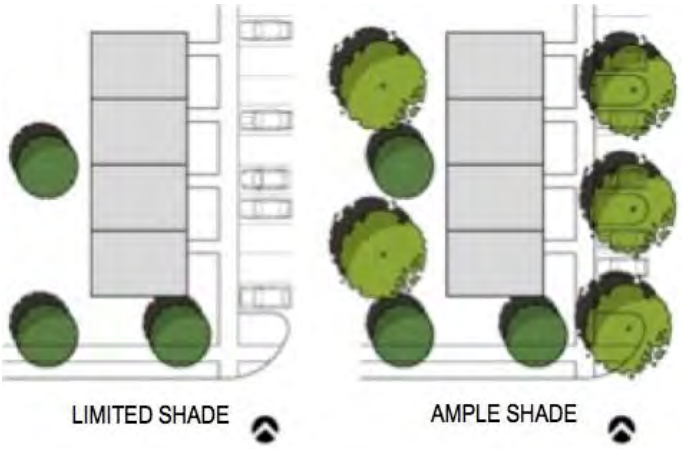
Perfom a "duct leakage" test to find leaks in existing ducts. Seal all joints and cracks

multi-family

site & existing conditions

SITE CONSIDERATIONS

START FROM THE OUTSIDE



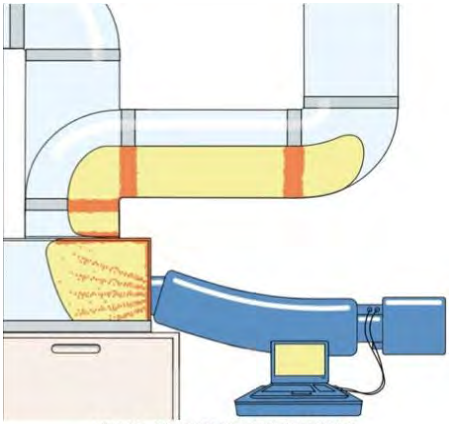
Trees that shade roofs, walls, and even walkways will modify the micro-climate and reduce heat gain.

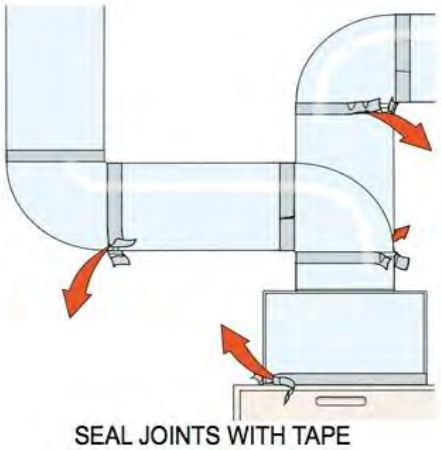
Do a parking usage study to determine if the project is over-parked; the study should be taken at three times during the day, and over a week during three seasons - spring, winter and summer. If evidence shows more than 10% empty parking spaces, approach the Planning Department for a reduction.

Tree cover, recreational use or on-site retention can be improved by removing paving and cement. In addition, the "heat island" effect can be reduced that way.

TEST FIRST

HOW IS IT FUNCTIONING NOW
As part of preparing to remodel and/or upgrade find out how the apartment units are working – test the ducts to see how badly they leak, perhaps do a "blower door" test to see how much air leaks into (or out of) the unit through cracks, electrical outlets, windows and doors. Testing just 15% of the units will give a good sense of major defects.





USE DESIGN TO REDUCE ENERGY LOADS

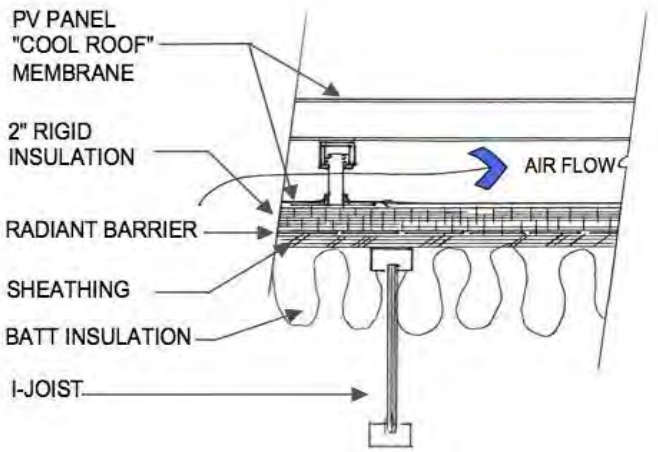
Ref: Chapter 3 credits

the envelope

ATTIC & ROOF

THE ENVELOPE

INTEGRATED ROOF SYSTEM



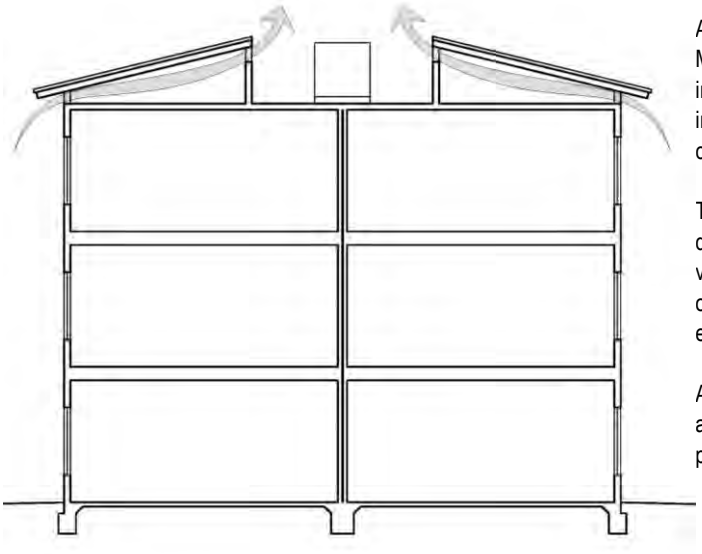
ROOF

Heat gain through the roof is the largest single load the HVAC system has to counteract. Because the roof is exposed to the sun all day long the whole assembly quickly gets saturated with heat, and even during the night it continues to transfer heat inside.

Re-roofing should accomplish two objectives: reflect solar radiant heat and resist heat transfer. "Cool roof" systems and radiant barriers reflect heat. Insulation increases the resistance to heat transfer, and rigid insulation on top of the existing sheathing keeps heat from penetrating the roof structure or attic insulation. A "ventilated" roof system accomplishes all of these objectives.

In general, the lighter a roof is - in color and weight - the more effective it is in keeping the building cool.

AIR MOVEMENT



ATTIC

Most older apartment buildings have only nominal insulation installed on the ceiling joists. Adding more insulation is a good investment, but should be combined with improving airflow through the attic.

The temperature in closed attics can reach 150 degrees. Ventilation requires inlets and outlets, relief vents must be added low and high to take advantage of convection ventilation, and adding a solar powered exhaust fan without adding intake vents will not work.

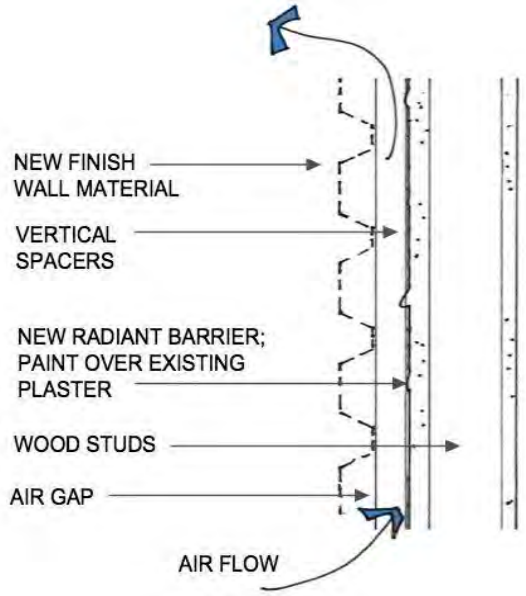
Adding insulation, a radiant barrier AND sealing gaps and cracks around ceiling light fixtures is the best practice.

DESIGN TO PROVIDE CONSISTENT AIR FLOW

the envelope

WINDOWS & WALLS

WALLS



In most apartment buildings constructed before 1978, the walls are not insulated, but all efforts to increase the insulation values to existing walls are costly and disruptive.

Planting shade trees, creating trellises or living walls and painting the walls a light color cost little and will reduce the heat build-up.

For walls with severe western exposure that can't be shaded, a ventilated wall system can reduce solar radiant heat gain.

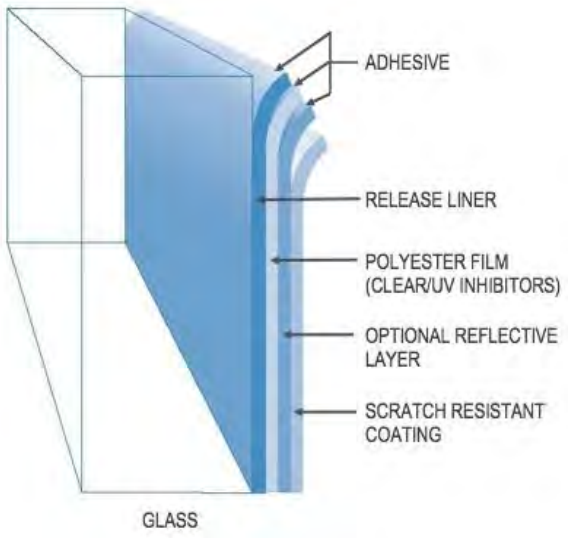
WINDOWS

In buildings constructed before 1978, windows are energy sieves -- not only are the frames highly conductive (aluminum or steel), the glazing is single pane, the glass is clear (no Low-e coating), the weatherstripping has deteriorated, and even the connection to the surrounding wall material may have cracks.

Replacing windows is relatively simple and not disruptive (the new frames fit within and are attached to the existing frames), but it can be costly. A full-building replacement program should be tailored so that windows facing east, south or west have better SHGC than north-facing windows. Replacement windows may require tempered glass based upon current code requirements.

An interim approach is to add film to the inside of the glass on windows that get direct sun. The film will reflect a considerable amount of solar heat gain, but heat will still come through cracks and the hot glass.

Shade windows with trees or awnings.



DESIGN WINDOWS & WALLS TO REDUCE SOLAR HEAT

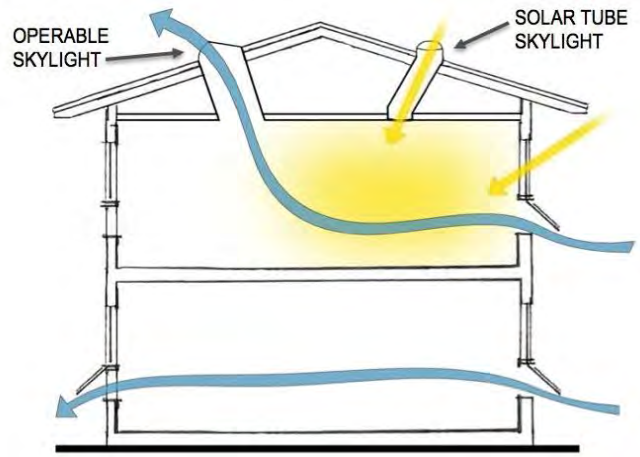
passive strategies

DAYLIGHTING & VENTILATION

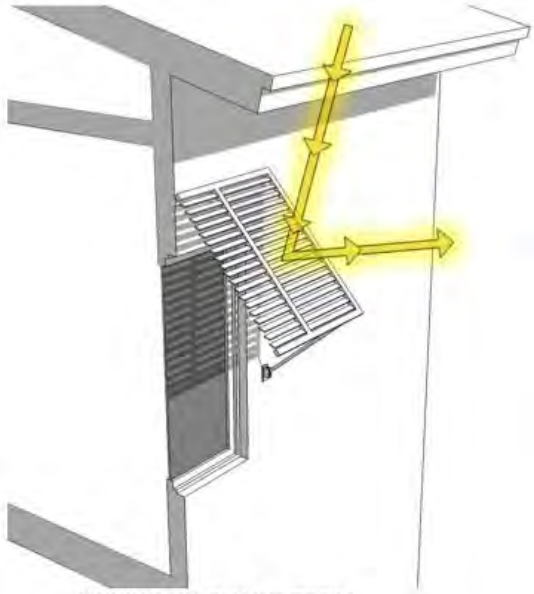
SOLAR TUBE SKYLIGHTS

DAYLIGHTING & VENTILATION

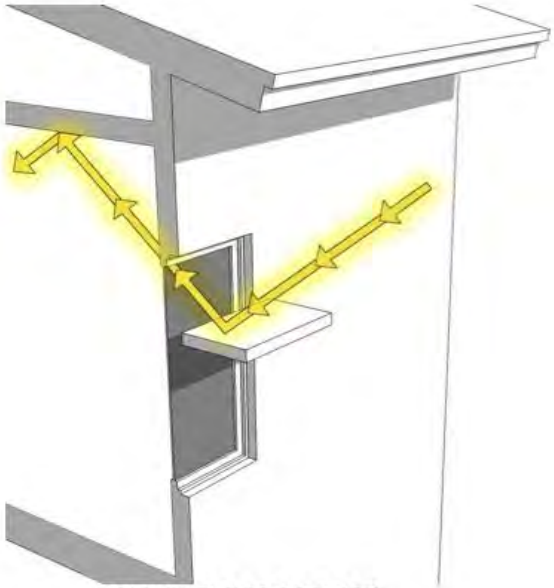
Self-flashed tubular skylights make it relatively easy to bring daylight into dark interior rooms or into large rooms where glare is a problem because of large expanses of glass on only one wall. Skylights can balance the distribution of natural light and reduce artificial light during the day.



In some cases operable skylights can provide daylight and a way to naturally ventilate high volume spaces using natural flow of hot air upward. Opening the skylights at night can provide "night purging" in areas without cross ventilation.



AWNING TO SHADE FROM DIRECT SUNLIGHT



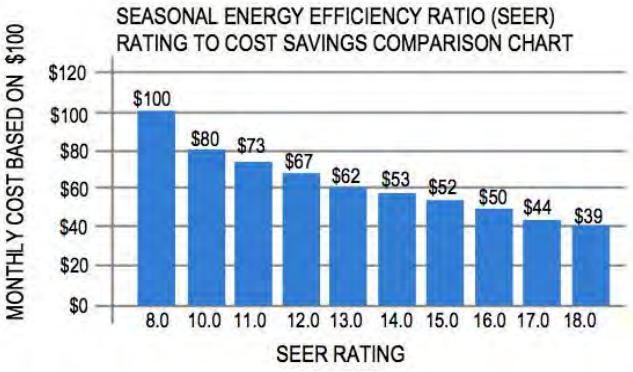
LIGHT SHELF TO REFLECT SUNLIGHT DEEP INTO SPACE

DESIGN WITH NATURAL LIGHT & NATURAL VENTILATION

the equipment

EQUIPMENT

AIR CONDITIONING



EQUIPMENT

Upgrading the envelope (roof, attic, walls and windows) will significantly reduce the cooling load. Doing a careful room-by-room cooling load calculation may mean a smaller HVAC system will suffice (e.g. 2-ton vs. 3-ton.) In addition, new HVAC systems are much more energy efficient (measured by the SEER rating). Units with 14 SEER or higher have two-stage compressors, so only during the hottest days will the second stage compressor be required; the rest of the year the compressor runs with lower energy usage.

Annual and Life Cycle Costs and Savings for 1 Central Air Conditioner(s)

	1 ENERGY STAR Qualified Units	1 Conventional Units	Savings with ENERGY STAR
Annual Operating Costs*			
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Total	**$7,456**	**$9,521**	**$2,065**
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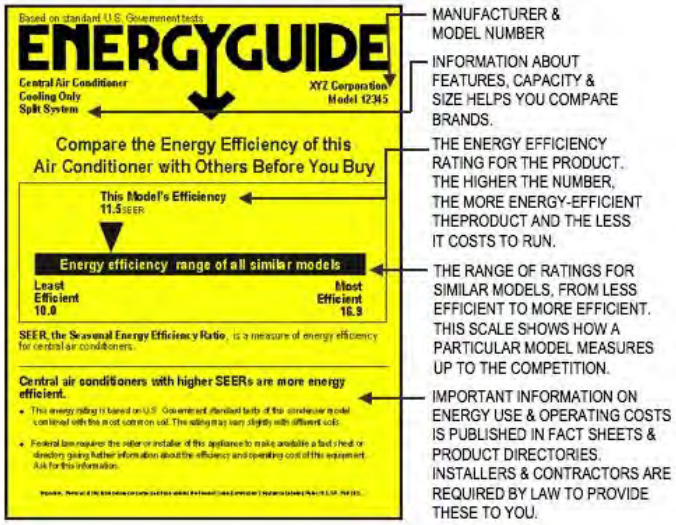


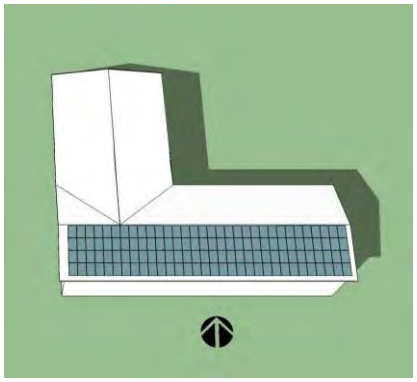
"RIGHT SIZE" YOUR EQUIPMENT

site

SITE CONSIDERATIONS

START FROM THE OUTSIDE

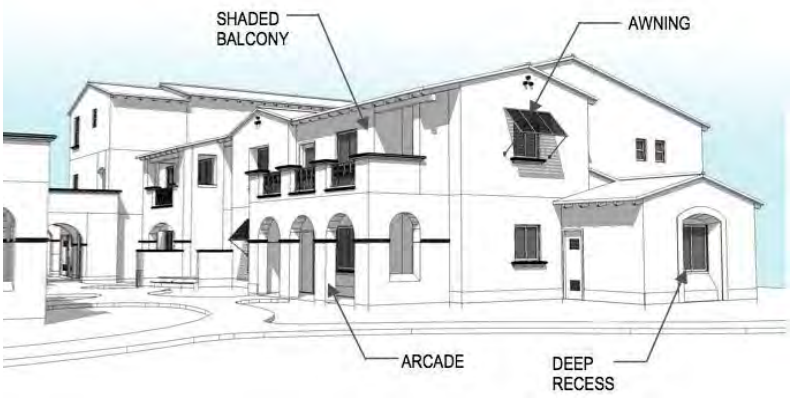
The building shape and how it is oriented on the lot are the first crucial steps.



ORIENTATION
It is common knowledge that walls facing west get a lot of heat during the summer, so generally buildings should be designed as rectangles and sited with the long axis running east-west. This orientation also allows optimal south-facing roof for solar panels.

BUILDING FORM
Multi-family site planning rarely allows simple east-west rectangle layouts. Courtyard buildings, however, can be oriented in either direction, and compensate for bad exposures. Each wing of the building can shade the other.

Building elements can also provide shade.



Additionally, because most cities require private outdoor space, deep shade can be created by balconies that project out or are carved into the building.

USE DESIGN TO REDUCE ENERGY LOADS

Ref: Chapter 3 credits

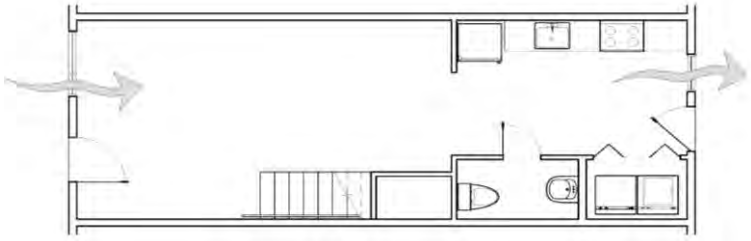
the building plan

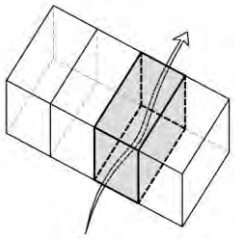
PLAN

THROUGH UNIT

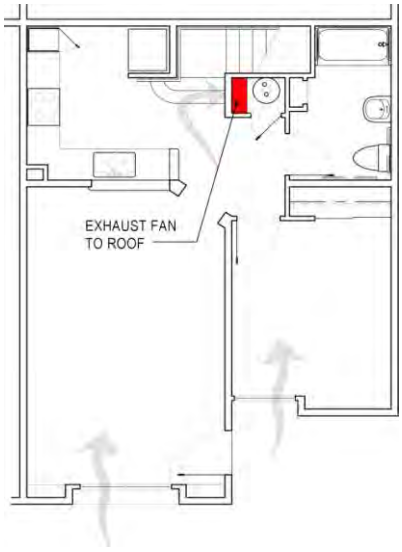
BUILDING PLAN
There are three basic unit types – through units (front to back), inside units (exterior walls facing one direction only) and corner units.

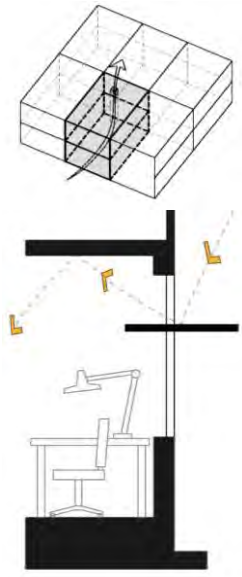
Through units have the advantage of cross-ventilation through the entire unit. Rooms may only have windows on one wall, which creates glare and does not allow cross-ventilation within a single room. Light shelves are valuable to bounce light deep into rooms.





INSIDE UNIT



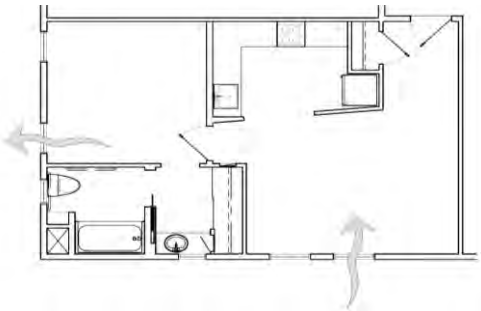


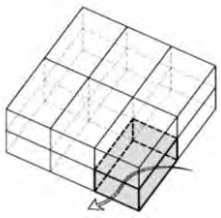
Inside units are the most difficult in terms of cross-ventilation and daylighting, but they are also the most energy efficient because they have the least exterior exposure.

Inside units on the top floor can benefit from light monitors and the "thermal chimney" effect for ventilation. Ground floor units need a roof-mounted exhaust fan to adequately ventilate the unit. The exhaust fan must be wired with an interlock to prevent the HVAC and fan from running at the same time.

Light shelves are important to distribute daylight.

CORNER UNIT





Corner units allow some rooms to have windows on two walls, and they have the ability to provide through-unit ventilation.

USE DESIGN TO PROVIDE CONSISTENT AIR FLOW

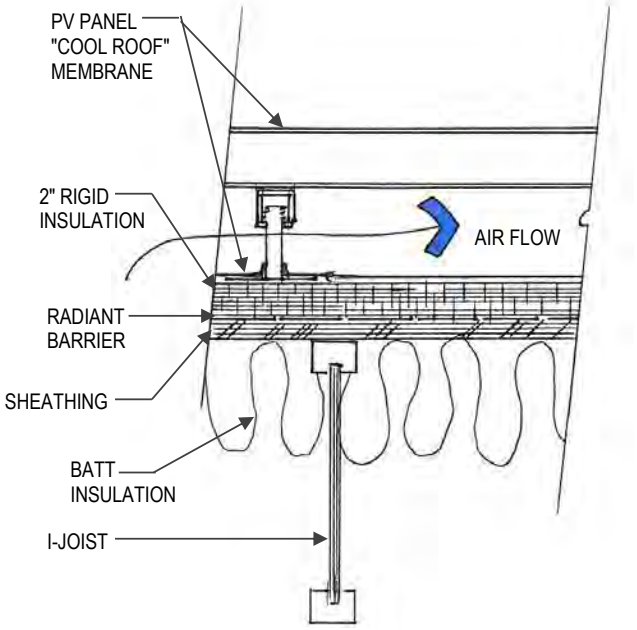
Ref: Chapter 3 credits

the envelope

ATTIC & ROOF

THE ENVELOPE

INTEGRATED ROOF SYSTEM



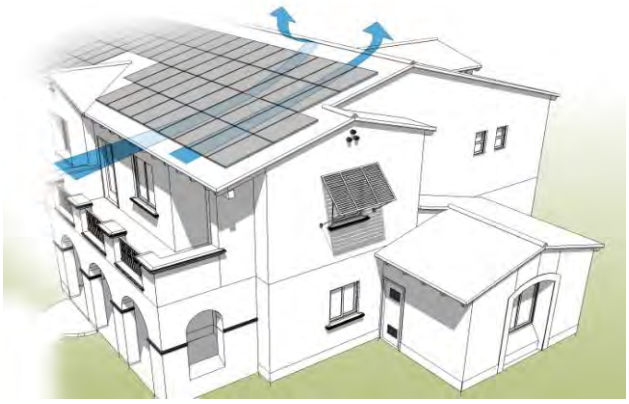
INTEGRATED ROOF SYSTEM

Insulation is the principal means of resisting heat transfer, and generally more is better. But the location is also important. If the insulation is on top of the roof sheathing it helps the roof sheathing and rafters as well as batt insulation from getting saturated with heat. Both types - rigid and batt- together is the best.

A reflective, "cool roof" system intercepts the solar radiant heat buildup. There are "cool roof" rated tiles, shingles and metal roof systems for sloped roofs. Single-ply "cool roof" systems for flat roofs are very effective, and cumulatively, over the entire city, the heat island effect is reduced by "cool roof" systems. A "cool roof" system also prolongs the life of the roof membrane itself.

A ventilated roof system shades the actual weathertight roofing thus prolonging its life, and circulates air over the membrane which also keeps it about the same temperature as the ambient air. Installing a roof-mounted solar system essentially creates a ventilated roof system.

AIR MOVEMENT



ATTIC

Attic temperatures can reach 150 degrees, and the insulation at the ceiling joists becomes completely saturated with heat. All through the night the ceiling radiates heat into the rooms.

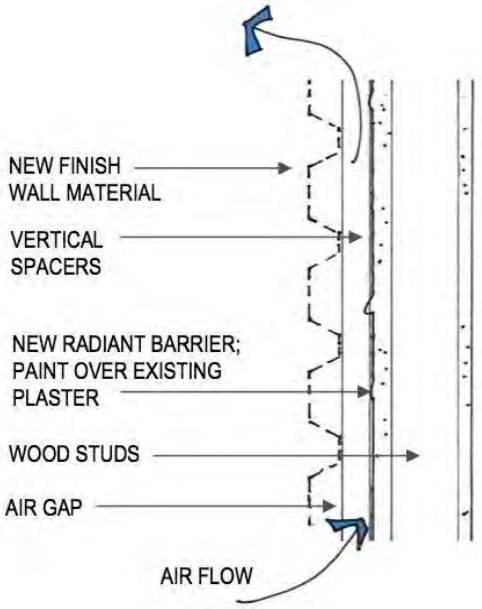
Airflow through the attic space is critical in reducing heat build up. Ventilation requires inlet and outlet vents. In multifamily buildings the attic is divided by draft stops or fire resistive walls, therefore each attic cavity must be ventilated separately. Solar powered exhaust fans with inlet vents at the eave may be an effective design strategy.

USE DESIGN TO PROVIDE CONSISTENT AIR FLOW

the envelope

WINDOWS & WALLS

WALLS

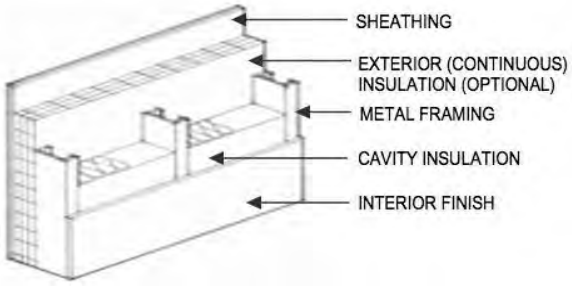


WALLS

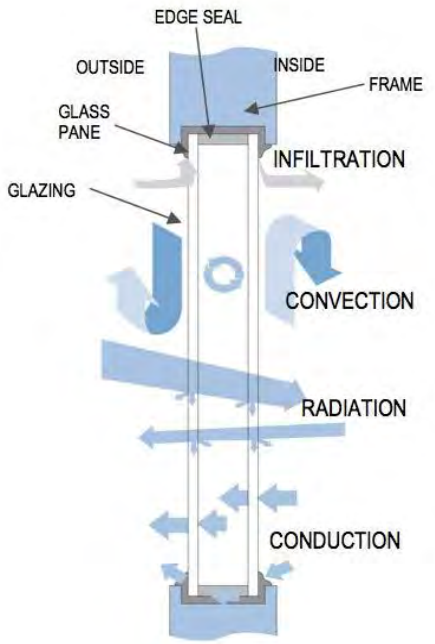
Resisting heat transfer through exterior walls generally is accomplished by adding insulation. More is better. Where it is located also matters: if rigid insulation is placed on the outside of the framing, there is no "thermal bridging" through the studs, and the batt insulation between studs doesn't get as saturated with heat.

Walls also heat up from direct sun; in addition to ambient air temperature of 115, direct sunlight can add another 15 degrees to the heat load. So shading walls with trees and roof overhangs is good.

In some cases a west-facing wall may utilize a "ventilated wall" system to shade the wall weather barrier and circulate air between the outer "skin" and the weather barrier. Place mesh at the base to help keep bugs and rodents out.



WINDOWS



KEEP HEAT FROM THE SUN OUT

Windows: Direct sunlight heats up the inside of a building the same way a car's steering wheel gets too hot to touch.

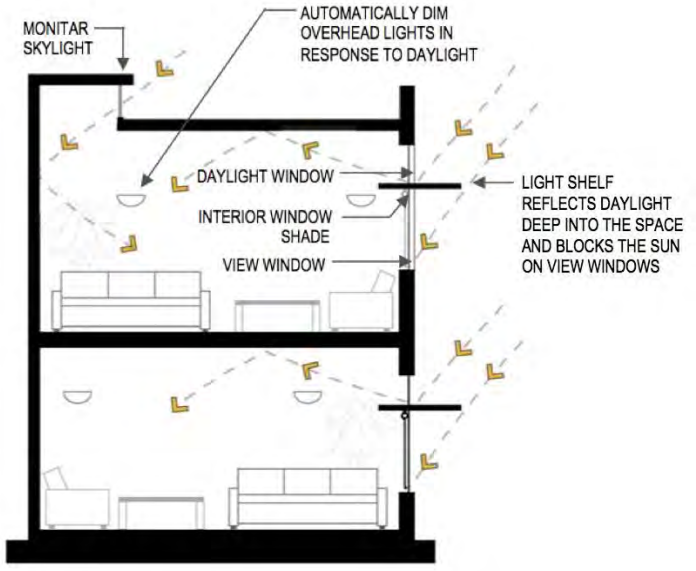
The best way to prevent radiant heat buildup is to shade the window. Additionally, the glass itself should be coated with a low emissivity (Low-e) substance. This type of coating reflects much of the radiant energy and is measured by Solar Heat Gain Coefficient (SHGC.) The lower the number, the better (0.23 is much better than 0.50.) However, the lower values are really only useful on windows that get direct sunlight. North-facing windows can have a higher SHGC.

DESIGN WINDOWS & WALLS TO REDUCE SOLAR HEAT

passive strategies

DAYLIGHTING & VENTILATION

NATURAL LIGHT



DAYLIGHTING

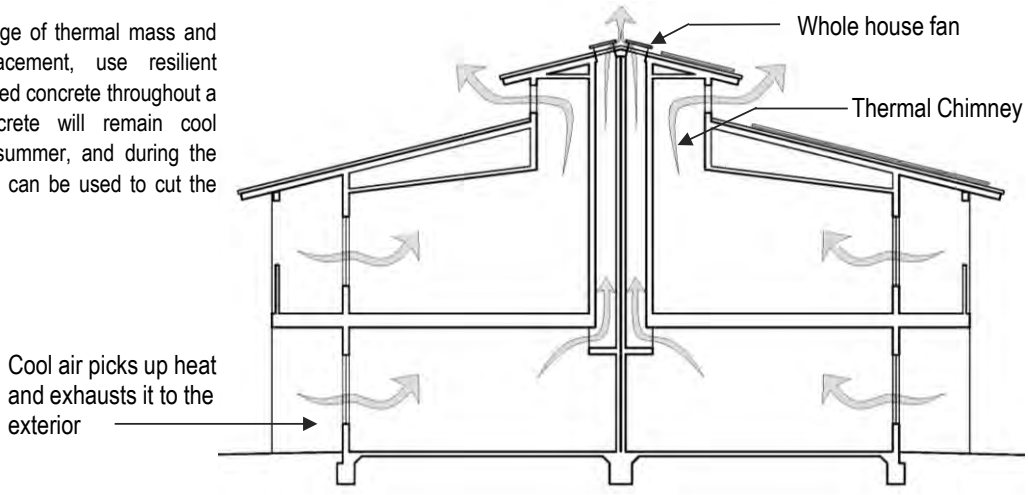
Apartments often have windows on only one wall which results in harsh light distribution – glare near the window and dimness near the back wall. On upper floors, tubular skylights can bring natural light into interior rooms and dark corners. On lower floors, windows can be designed with light shelves to bounce light deep into rooms. This is especially desirable when the kitchen is on the interior wall.

VENTILATION AND THERMAL MASS

Apartments on the top floor can take advantage of the thermal chimney effect to draw hot air out, and light monitors to bring daylight in. Both effectively lower energy consumption.

In multi-unit buildings, ground floor and inside units may have no effective cross ventilation. To draw cool night air through the unit, install a roof-mounted whole-house fan with interlock controls to prevent the fan and HVAC working at the same time.

To take advantage of thermal mass and infrequent replacement, use resilient flooring or exposed concrete throughout a unit. The concrete will remain cool throughout the summer, and during the winter area rugs can be used to cut the chill.

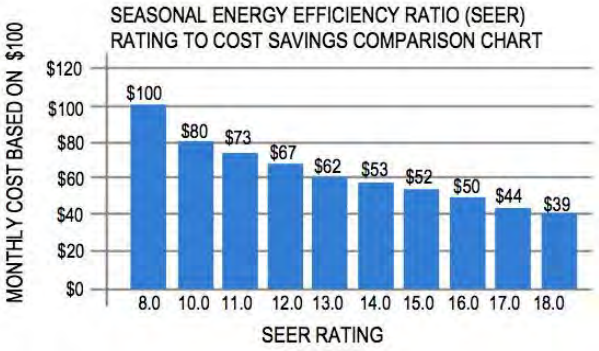


DESIGN WITH NATURAL VENTILATION & NATURAL LIGHT

the equipment

EQUIPMENT

AIR CONDITIONING



HVAC

The biggest energy draw is air conditioning, so designing the building for energy efficiency (shade, lots of insulation, daylighting, Energy Star appliances) will minimize the heat gains that the HVAC unit has to overcome. The HVAC can be "right-sized" so the smallest possible HVAC unit will do the job.

HVAC units with the highest efficiency (defined as SEER) have two-stage compressor motors. Only during the hottest days will the second, more energy-consuming stage be called upon.

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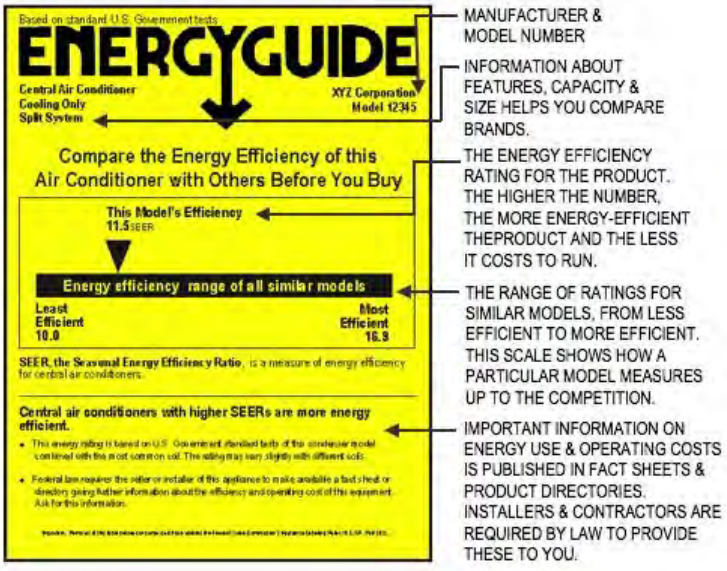
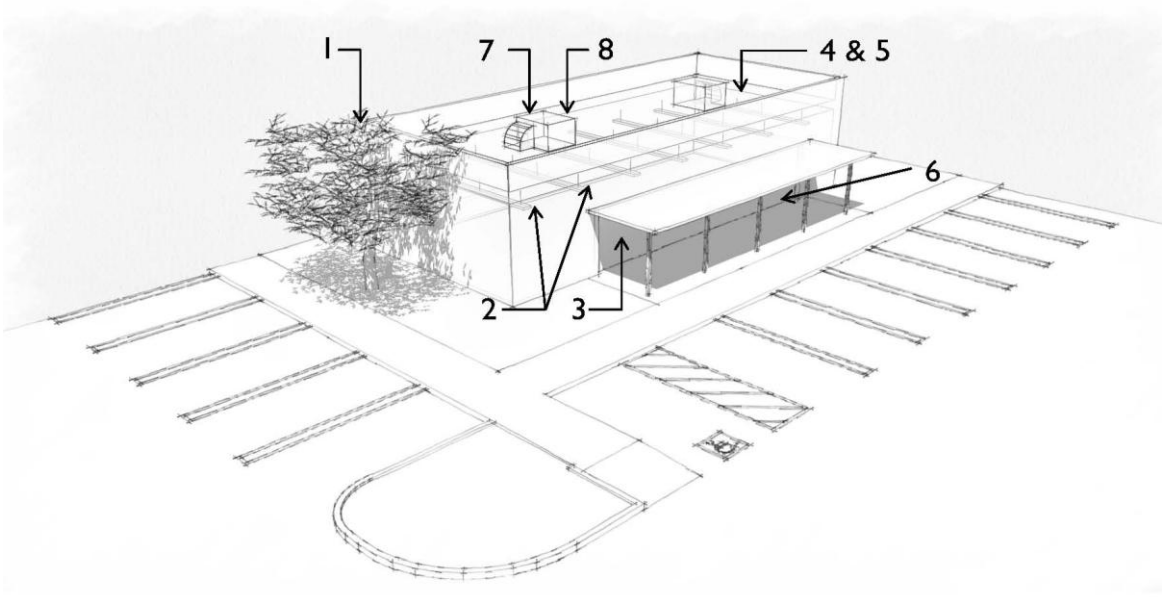


DESIGN THE "RIGHT SIZE" EQUIPMENT

WHAT CAN I DO NOW

FOR MY BUSINESS?

COMMERCIAL NEW & REMODEL



1 PLANT TREES ON WEST SIDE

2 UPDATE LIGHTING

Install compact fluorescent bulbs, electronic ballasts and photo sensitive controls

3 SHADE WINDOWS

Add trellis, awnings, trees, or canopies

4 COOL ROOF

Add "cool roof" coating on existing roofing or use "cool roof" re-roofing system

5 ADD INSULATION

Add spray or rigid foam on top of the roof

6 ADD FILM

Install film with a low SHGC to single-glazed windows

7 DUCT TEST/SEAL

Perfom a "duct leakage" test to find leaks in existing ducts. Seal all joints and cracks

8 HVAC ≥ SEER 13

Replace AC with higher efficiency units, economizer cycle, and "right size" the unit after upgrading the insulation and windows.

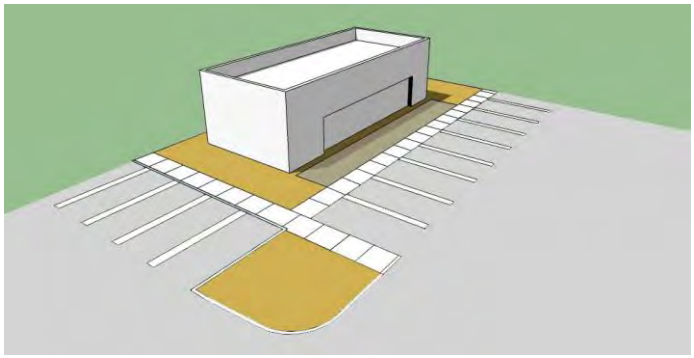
commercial

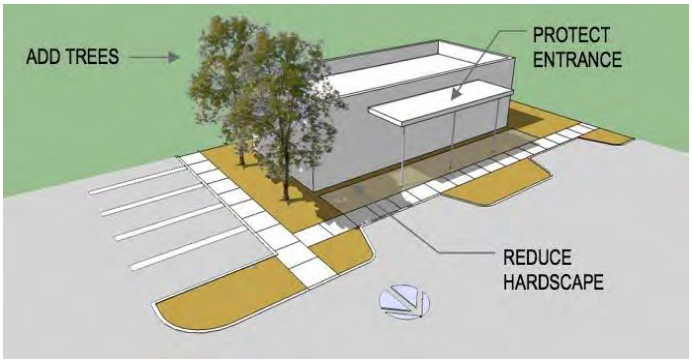
site & building

SITE CONSIDERATIONS

START FROM THE OUTSIDE

ANALYZE WHAT EXISTS





Most existing commercial buildings are assaulted from every angle by a harsh environment: they are surrounded by parking, there are no trees, the glass has no solar heat gain reflectivity, and there is little shade.

START OUTSIDE
The first steps to improving the building may be to make the surroundings more hospitable.

SHADE
Trees that shade roofs, AC units, walls and even walkways will modify the micro-climate and reduce heat gain.

REDUCE HARDSCAPE
Do a parking usage study to determine if the development is over-parked; the study should be taken at three times during the day, and over a week during three seasons - shoulder, winter and summer.

If evidence shows more than 10% empty parking spaces, approach the Planning Department for a reduction.

Tree cover and on-site retention can be improved by removing paving and cement. In addition, the "heat island" effect will be reduced.

PROTECT THE ENTRANCE
An awning, canopy or arcade will not only reduce the solar heat gain, it will improve the customer's experience and perception of the building.

INVOLVE THE TENANT
Some of these improvements can be done with little disruption to the existing tenants, and a savings-sharing agreement can be executed so both the tenant and the landlord gain from upgrades done now.

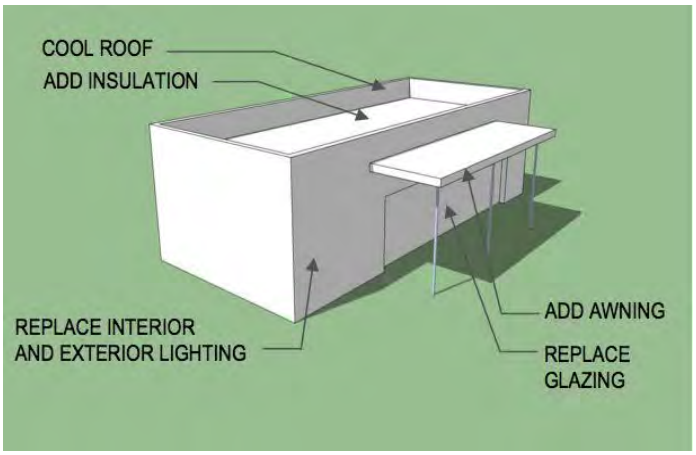
USE DESIGN TO REDUCE ENERGY LOADS

Ref: Chapter 3 credits, 2.1, 3.3, 3.5, 3.6

THE ENVELOPE

IMPROVE THE ENVELOPE AND LIGHTING

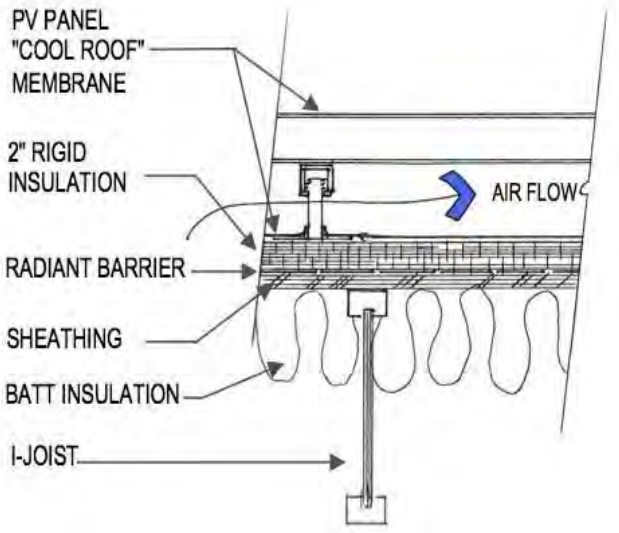
Once you get to the building itself, upgrades that improve the thermal performance – better insulation, better windows, sealing ducts, and better lighting – ideally should be done before changing out the HVAC system. By improving the thermal performance, the HVAC system may be downsized. It is important to "right size" the HVAC system.



These changes can be phased: when the building needs a new roof, add rigid insulation on top of the sheathing; install a "cool roof" system; when a tenant moves out, add batt insulation to the underside of the roof structure; do a duct test on existing HVAC ducts to reveal leaks – and fix them; replace T-12 fluorescent fixtures with T-8 or T-5 direct-indirect fixtures with dimmable electronic ballasts; install spectrally selective film on east- south- and west-facing windows.

Each of these steps will have an effect on the energy usage of the building, and will be more competitive in the market, but new leases need to be written so the owner recoups the capital costs to make these improvements.

ROOF & ATTIC



ROOF & ATTIC

Adding insulation and a "cool roof" will have an immediate impact on the cooling load for any building, and can be done without disruption to tenants.

MAKE YOUR OWN

Rooftop solar systems can make sense, but only after you have upgraded the other elements of energy efficiency. The solar system can be part of an integrated roof system wherein the panels shade the roof membrane and also create an air gap that can foster air movement between the panels and the roofing.

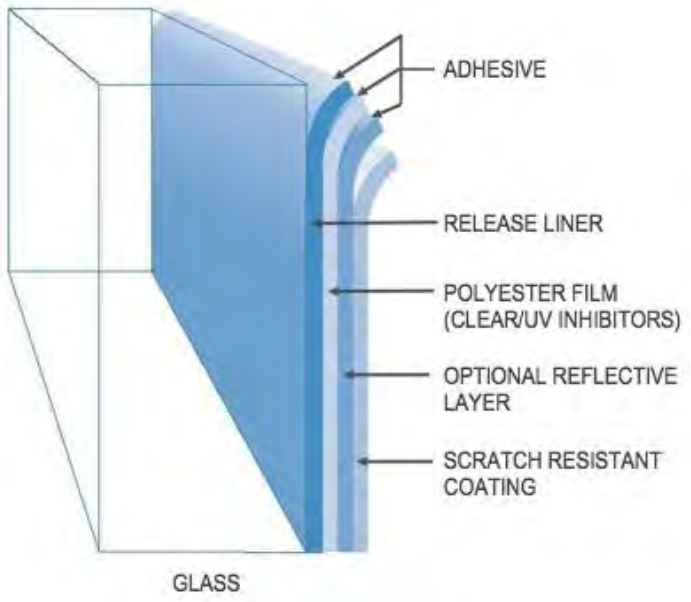
DESIGN TO REDUCE HEAT GAIN

WINDOWS

ASSEMBLY

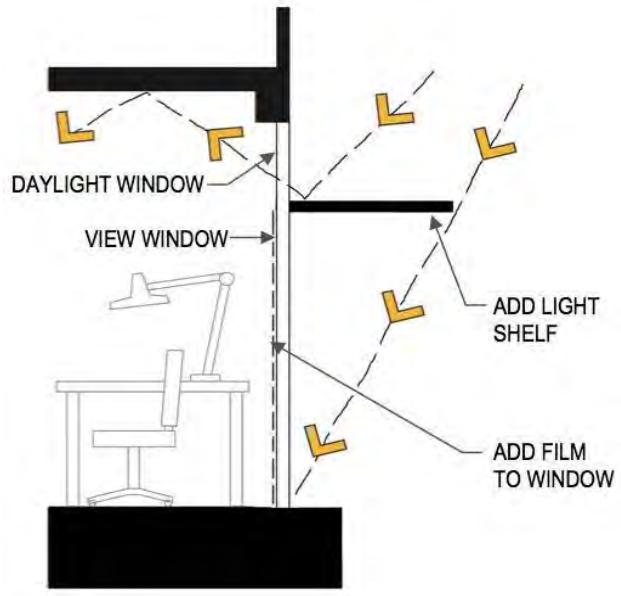
In many older commercial buildings (offices and retail) full height single-glazed storefront systems span the full width of the front wall even though they do not serve a "display" function. A full replacement with dual glazed storefront system may be too costly, but improvements can still be made.

Shade for windows facing east, south and west is critical and can be done with awnings, light shelves, arcades, and even trees. For windows that cannot be shaded and get sun during the day, film that reflects heat can be mounted to the inside surface. A lower SHGC rating reflects more heat.



SHADE

Shade and better daylighting can be achieved with light shelves. The design and proportions of an existing storefront system can be improved aesthetically and thermally by adding light shelves to the existing storefront. Internal films of different qualities can be added also. The film quality should be selected based on the function and orientation of the window. For example, windows facing north in an office setting can have higher levels of light passing through them, and a standard solar heat gain coefficient compared to windows facing east or west.



DESIGN WINDOWS TO REDUCE SOLAR HEAT LOAD

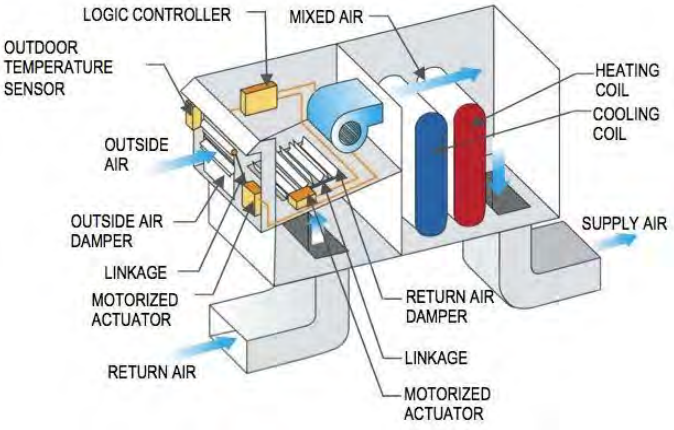
the equipment

EQUIPMENT

AIR BALANCE

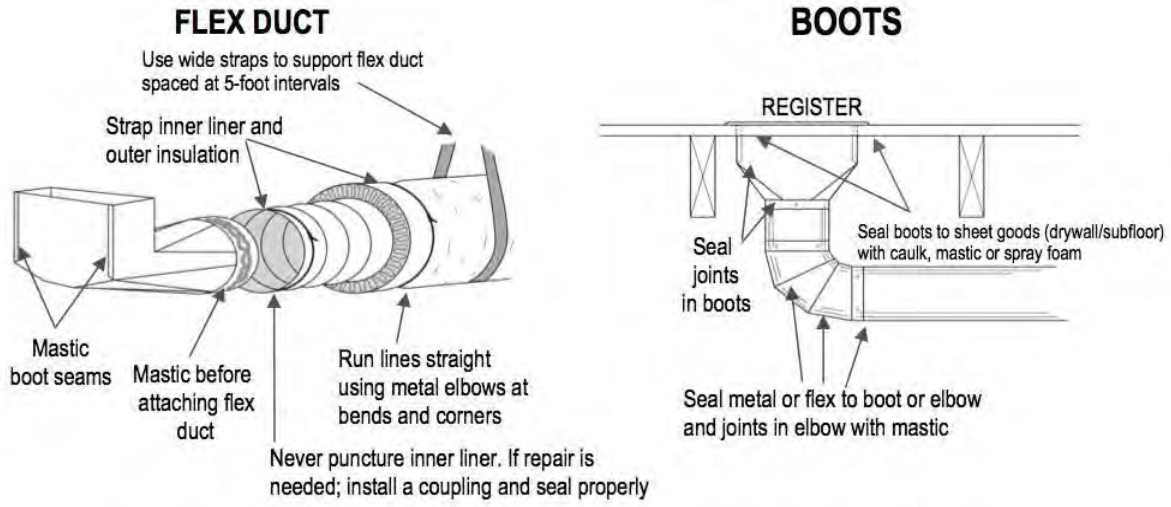
GET THE RIGHT EQUIPMENT

Ideally the improvement of the thermal performance of the building is done prior to replacing the HVAC units so they are "right sized." Equipment that is oversized suffers due to on-off cycling and higher energy usage. New HVAC units should be "right sized" and have two-stage compressor motors and variable speed air handlers. This allows the system to accurately respond to the demand for cooling. The higher compressor function is required only during the hottest times of the year. Adding an economizer cycle also allows a building to be "night purged" when evening temperatures fall below 68 deg.



SEAL DUCTS

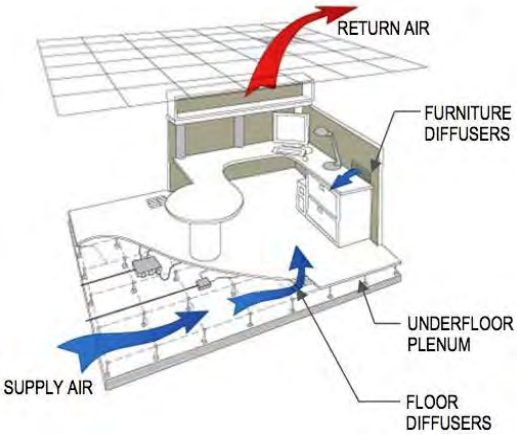
As part of preparing to remodel and/or expand, find out how the building is already working – test the ducts to see how badly they leak, perhaps do a "blower door" test to see how much air leaks into (or out of) the building through cracks, electrical outlets, windows and doors. While the workers are doing the main remodel, some remedial work such as duct and "air sealing" may be warranted and cost effective.



► Mastic is a gooey adhesive that is applied wet. It fills gaps and dries to a soft solid. Mastics may or may not contain reinforcing fibers, and they may be used with reinforcing mesh tape.

HEATING AND COOLING

AIR DISTRIBUTION



INNOVATIVE
UNDERFLOOR AIR DISTRIBUTION

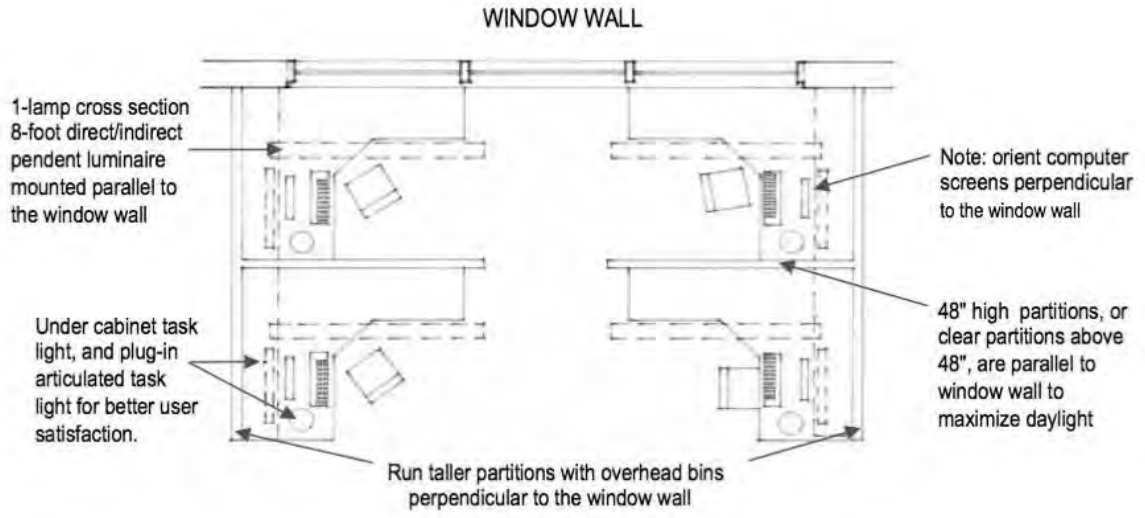
For large office tenants, a raised floor with air distribution coming up through floor registers offers a number of benefits. Under floor distribution relies upon the natural flow of cool air introduced at occupied level and rising as it picks up heat from people, computers, and lights. As it rises to return registers near the ceiling, it also collects contaminants and odors and exhausts them above head level. This results in better indoor air quality.

The "displacement" system (cool air displaces hot air as it rises) saves energy because the air is not as cold as an overhead distribution (full mix) system, the velocity of the air is lower, and the heat from equipment and lights never mixes with the air people breathe.

An under floor distribution system may also include an "access floor" through which cable, telecommunication and electrical conduits run. For commercial spaces that are remodeled frequently, the flexibility of

LIGHTING

Windows provide free lighting, but the can also create glare. Light shelves, the glass itself and interior shades help control light getting into the building. Once inside, light from windows needs to be balanced with photo-sensor controlled lights and other technologies.



CONSIDER DIFFERENT METHODS OF AIR DISTRIBUTION

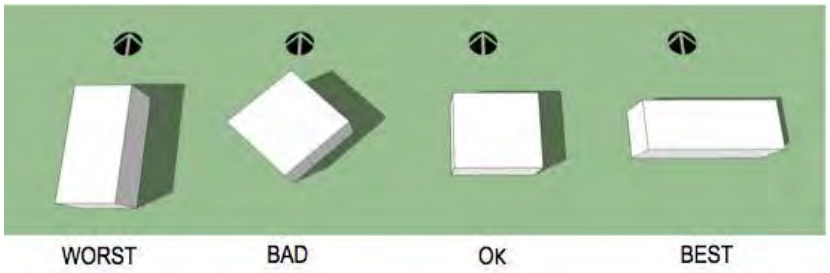
the equipment

site & building

SITE CONSIDERATIONS

START FROM THE OUTSIDE

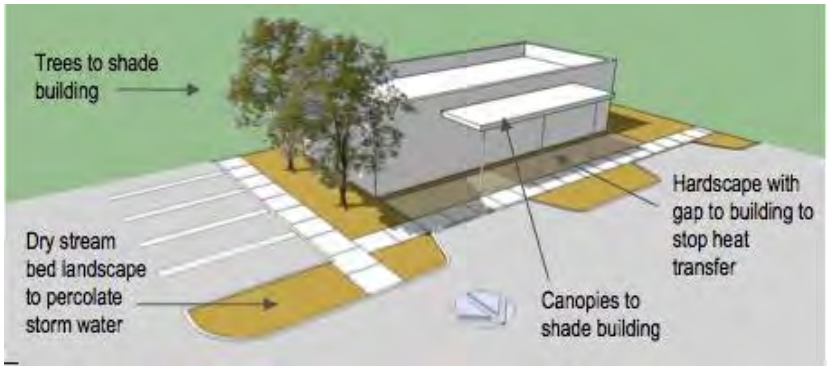
The building shape and how it is oriented on the lot are the first crucial



ORIENTATION
Wherever possible, limiting exposure to the east and west is desirable from an energy efficiency point of view.

How the immediate surroundings support and protect the building is next.

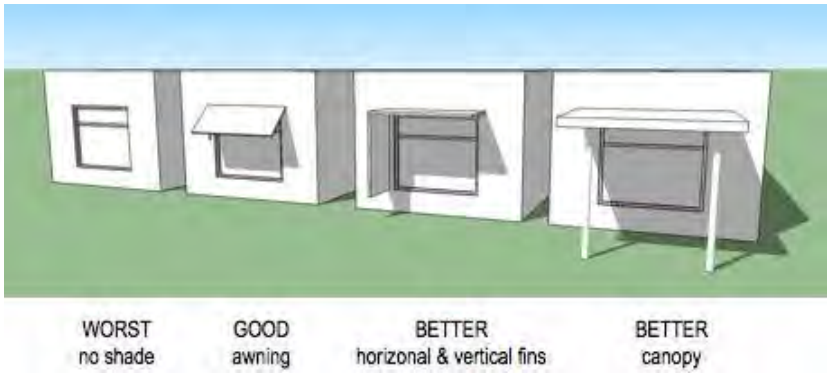
MODIFY THE MICRO-CLIMATE
Shade is a simple and effective means to reduce the heat load on a building. Big trees can shade the building; when placed strategically, they can make the building seem welcoming (who doesn't want to be in shade in July); and when they shade the hardscape, the "heat island effect" is reduced.



Reflected and radiant heat from hardscape can also be reduced by material selection; generally permeable pavers have less thermal mass (radiant heat) and scatter the sunlight more than concrete.

Permeable pavers also play a role in reducing stormwater run-off - water can seep between the pavers directly into the soil.

Building elements can also provide shade.



Roof overhangs, canopies, arcades and awnings are all part of the architectural vocabulary that has aesthetic value and can reduce heat loads by shading both windows and walls. Canopies and arcades also reach out from the building to welcome customers.

USE DESIGN TO REDUCE ENERGY LOADS

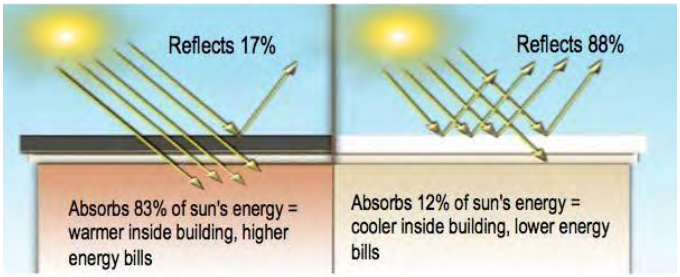
Ref: Chapter 3 credits, 2.1, 3.3, 3.5, 3.6

the envelope

ROOF & WALLS

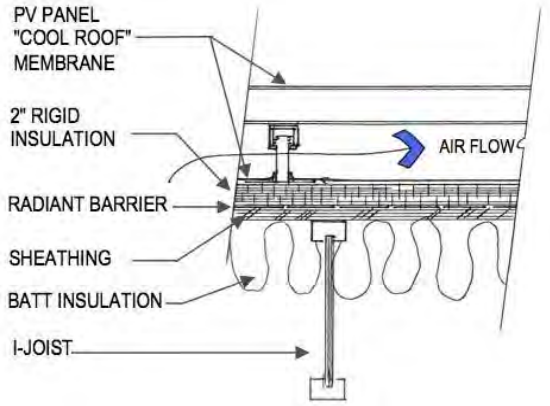
THE ENVELOPE

REFLECT, SHADE & INSULATE



ROOF

For commercial buildings, a "cool roof" is a must. It reduces solar heat transfer into the building, it prolongs the life of the roof membrane itself, and it reduces the "heat island" effect for the whole city. Combining a radiant barrier, rigid insulation above the sheathing and batt insulation at the underside of the roof structure is the best envelope. Another advantage is that the HVAC ducts are within the insulated envelope.



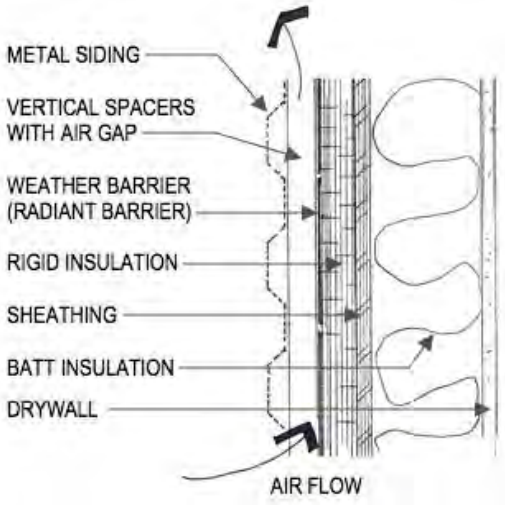
INTEGRATED ROOF DESIGN

Shade, air movement, reflectance, and insulation all play a role in keeping heat out. An integrated roof design might include solar panels shading the membrane and creating a "ventilated roof" (air movement between the panels and the roof membrane), a reflective membrane ("cool roof"), rigid insulation on top of the sheathing, a radiant barrier on the sheathing, and batt insulation between the roof rafters.

WALL ASSEMBLY

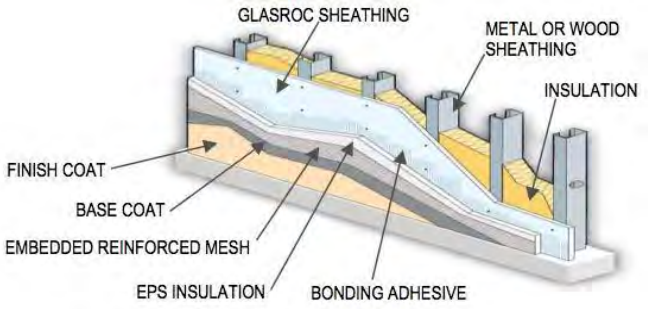
WALLS

Rigid insulation on the exterior of walls (called EIFS - exterior insulation finish system) prevents thermal bridging and allows additional batt insulation with the cavity so the overall resistance of the wall is greatly improved. On CMU walls, placing rigid insulation on the exterior also takes advantage of the thermal mass of the block. For blank west-facing walls with no shade, a ventilated wall system with radiant barrier will greatly reduce the heat transfer from the intense solar exposure.



VENTILATED WALL

For west- and south- facing walls a "ventilated" or "second skin" wall system can greatly reduce heat transfer by blocking the solar radiation component and allowing air to circulate between the outer skin and the wall or window itself.

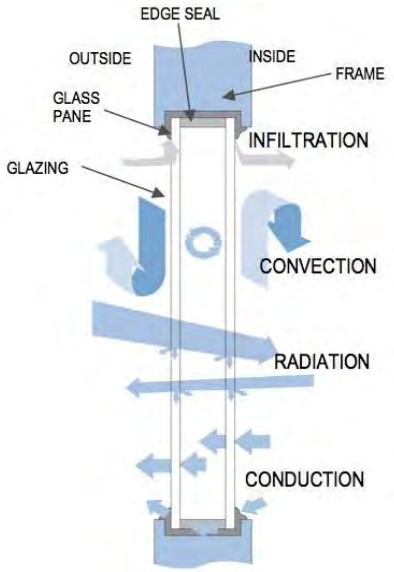


USE DESIGN TO REDUCE ENERGY LOADS

the envelope

WINDOWS

ASSEMBLY



WINDOWS

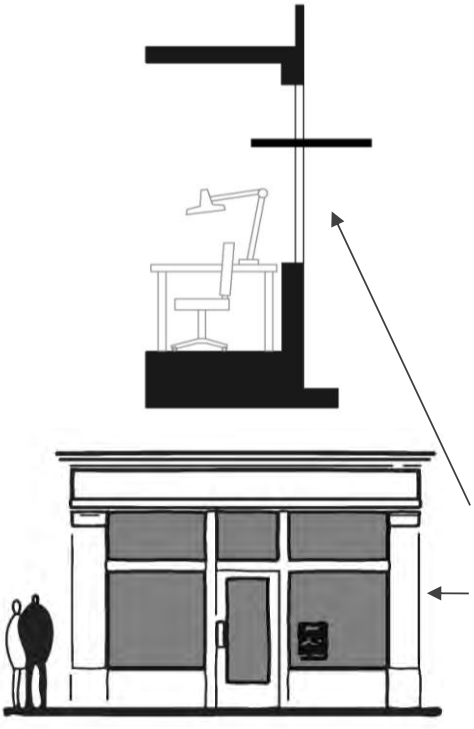
Carefully choose the location and orientation of the windows. Windows are openings for natural light, views and displays, but are also openings for unwanted heat during the summer and unwanted cold during the winter.

Choose glass with
- Low-e coating; it lowers the amount of heat that enters the space.
- Low Solar Heat Gain Coefficient (SHGC) ≤ 0.30 since this is the amount of solar radiation admitted which is important in hot climates.
- Low U-Value since this helps to keep the conductive heat out
- Good window frame material with good weatherstripping
- Gas between the glass (argon or krypton)

The combination of these properties and good flashing around the openings will reduce air leakage.

Another approach is to add film to the inside of the glass on existing single pane windows that get direct sun. The film will reflect a considerable amount of solar heat gain.

SOLAR HEAT GAIN



GLAZING IN STOREFRONT & WINDOWS

Windows in commercial buildings may warrant several different kinds of glazing to balance heat gain and visibility: display windows must be crystal clear, but for office windows the important qualities are controlling heat gain and glare, and storefront systems that are not display windows require a different balance of SHGC and visibility. Identifying the specific characteristics for each window will both optimize the performance of the window and will save energy.

U-FACTOR, SHGC & VISIBILE TRANSMITTANCE

In a desert climate, the three key performance indicators in windows are the ability to reflect solar radiation (SHGC – lower number is better), the ability to resist the heat from air temperature (U-Factor – lower is better), and visible transmittance (how clear is the glass – 100% is crystal clear.) Within a building, different windows may require unique characteristics to perform optimally.

Office window facing east, south or west
U-factor @ 0.35, SHGC @ 0.23, VT @ 0.51

Display facing east, south or west
U-factor @ 0.65, SHGC @ 0.32, VT @ 0.87

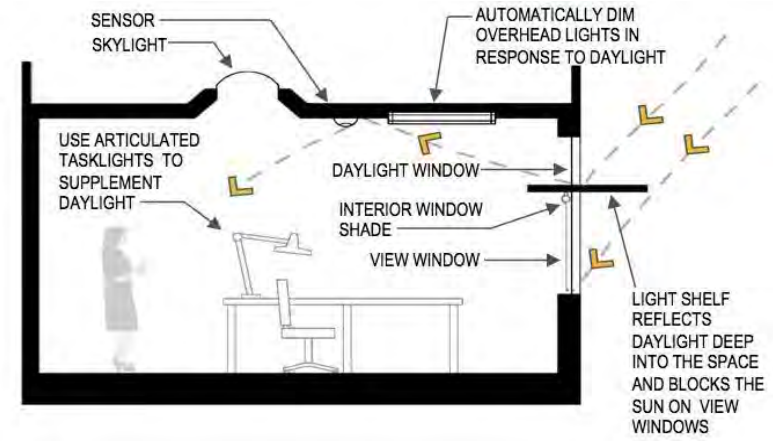
DESIGN WINDOWS TO REDUCE SOLAR HEAT

passive strategies

DAYLIGHTING STRATEGIES

CONTROL HOW DAYLIGHT ENTERS THE BUILDING

BALANCE DAYLIGHT



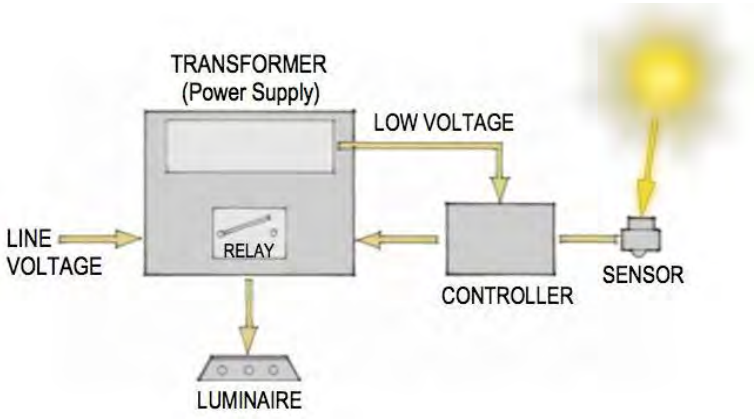
NATURAL LIGHT IS ALWAYS CHANGING

Within minutes the amount and quality of light that comes through windows and skylights can change dramatically; that is part of what brings life to a building. A building needs a variety of ways to respond to the dynamic nature of daylight. There are individual responses (pull down the shade or turn on a light), there are automatic controls (photosentive dimmers for general lighting), and there are fixed building elements (light shelves.) All should be considered in a daylighting strategy.

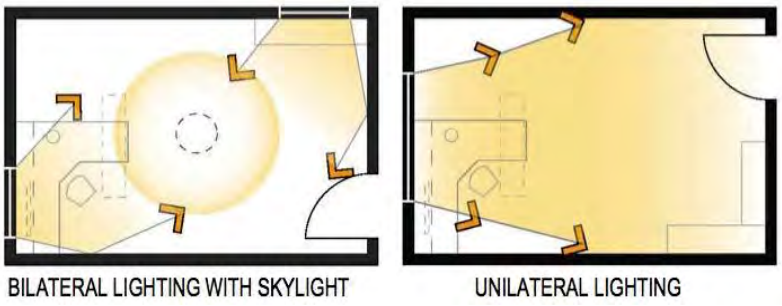
CONTROLS

LIGHTING CONTROLS

Without lighting controls, daylighting will not save any energy. Automatic controls that sense daylight are essential because they ensure that electric lighting will be reduced when enough daylight is available and also adjust on cloudy days.



REDUCE GLARE



BILATERAL LIGHTING

Light distribution is improved by admitting daylight from more than one point in the space; the daylight entering the space can be reflected off multiple sidewalls. Additionaly, the glare from a vertical window next to a sidewall is less severe than that from a horizontal window in the middle of a room.

USE DESIGN TO CONTROL DAYLIGHT

Ref: Chapter 3 credit

the equipment

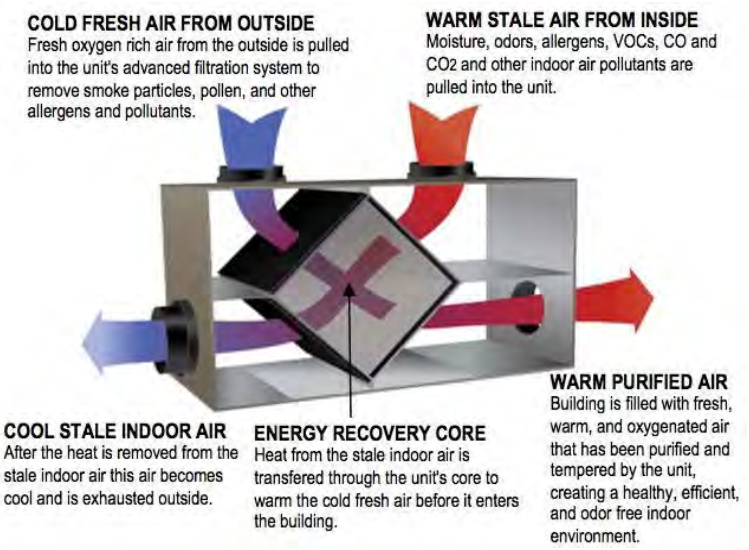
EQUIPMENT

AIR BALANCE

BALANCING INSIDE AND OUTSIDE AIR

The interaction between a building and its climate should be dynamic; the building should be able to respond in a variety of ways to changing conditions. For example, in the desert a well-balanced building can take advantage of natural ventilation during seven months of a year using operable windows and filtered outside air circulated through the HVAC system.

In the past, HVAC systems were designed as closed systems – recycling the same conditioned air – and rarely were windows operable. This saved money, but it also created indoor air quality problems. Current systems have requirements to draw outside air into the building. Balancing the requirements for fresh air and interior comfort is complicated. There are several strategies to lessen the energy demand to condition the outside air.



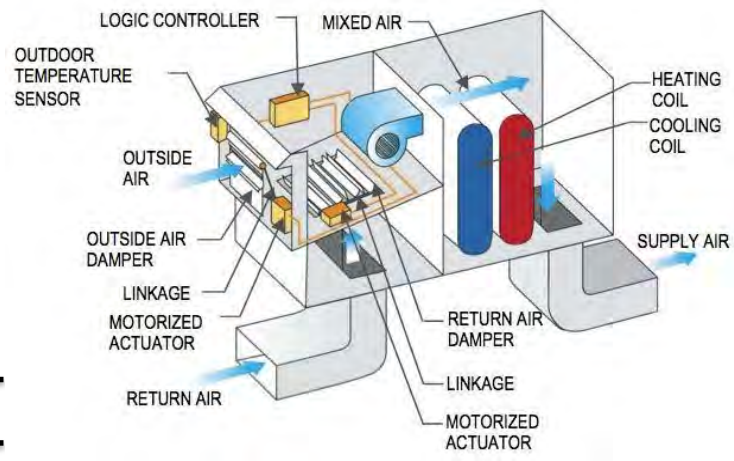
ENERGY RECOVERY

When fresh air comes into the building at 120 degrees it can be slightly cooled if the air being exhausted (at about 80 deg) can blow across (air-to-air heat exchanger) the fresh air. The incoming air might lose 10 degrees of heat.

PRE-COOLER

Some HVAC systems include an air-to-air evaporatively cooled pre-cooler. In this case, hot fresh air is drawn through an air-to-air heat exchanger where the fresh air passes over the tubes of the pre-cooler and some of the heat is transferred to the pre-cooled air. The different streams of air do not mix.

ECONOMIZER CYCLE



ECONOMIZER CYCLE

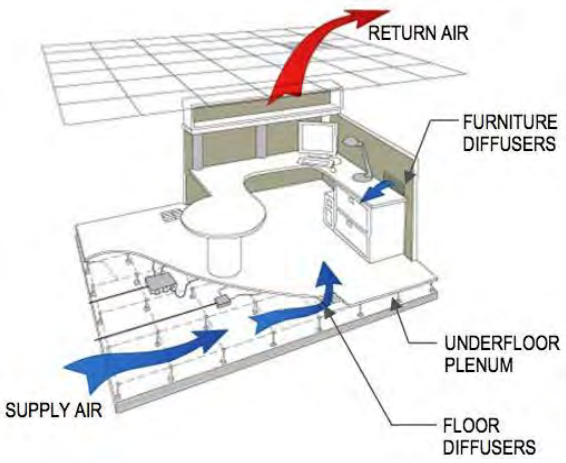
During the work day in a commercial building, heat is being added from many different sources – the people in the building, the lights, the computers and printers, and the outside temperature. The "internal" loads are often enough to require cooling even when the outside temperature is pleasantly cool. If the HVAC system has an economizer cycle it can draw 100% fresh filtered air through the building when the outside air is below say 65 deg. This is natural ventilation, but controlled and distributed by the HVAC system.

USE OUSTIDE AIR WHEN COOL OUTSIDE

the equipment

HEATING AND COOLING

AIR DISTRIBUTION

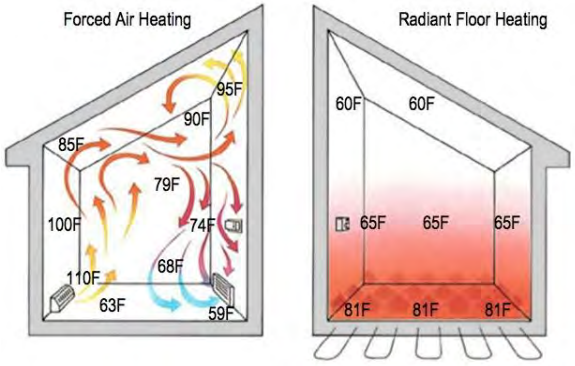


INNOVATIVE
UNDERFLOOR AIR DISTRIBUTION
For large office tenants, a raised floor with air distribution coming up through floor registers offers a number of benefits. Under-floor distribution relies upon the natural flow of cool air introduced at occupied level and rising as it picks up heat from people, computers, and lights. As it rises to return registers near the ceiling, it also collects contaminants and odors and exhausts them above head level. This results in better indoor air quality.

The "displacement" system (cool air displaces hot air as it rises) saves energy because the air is not as cold as an overhead distribution (full mix) system, the velocity of the air is lower, and the heat from equipment and lights never mixes with the air people breathe.

An under floor distribution system may also include an "access floor" through which cable, telecommunication and electrical conduits run. For commercial spaces that are remodeled frequently, the flexibility of relocating registers and outlets in the floor may have significant long term savings.

RADIANT HEATING



RADIANT HEATING & COOLING
Radiant temperature control relies upon the exchange of heat between a person's body and the surrounding surfaces. In a "radiant" system the temperature of the surrounding surfaces is what matters, not the actual air temperature.

Radiant floor heating systems are generally understood – warm water circulates in tubes through the floor slab; the floor feels warm to the touch, and it radiates warmth to the rest of our bodies. A solar thermal system can provide hot water as can a gas-fired water heater. With a radiant heating system there is no "instant hot;" it takes a while to heat the floor.

Radiant cooling uses the same principle as radiant heating, but in radiant cooling the body radiates its heat to cooler surrounding surfaces. An underground parking structure often feels cool even on hot days because the concrete surface temperature is below the temperature of our skin.

Radiant cooling relies on water circulating through the floor, walls and or ceiling to cool those surfaces. The advantages are improved comfort (no hot-cold cycling or cold air blasts), reduced fan motor size, and no compressor motors. Overall there are savings from lower energy usage. But the systems are unconventional and require an experienced team to design the system properly.

CONSIDER DIFFERENT METHODS OF COOLING AND HEATING

CHAPTER THREE

UNDERSTANDING GREEN BUILDING CODES

CHAPTER THREE is the technical part of the Green For Life (GFL) Voluntary Green Building Program. Like the previous chapter, it is organized by building type and whether a new building or a remodel project. The Checklist that makes up Chapter Three also organizes the items from outside to inside – starting with site considerations and then dealing with the envelope, equipment and passive design strategies.

The Chapter Three checklist includes a broad range of design options, equipment and systems that help reduce energy usage. Each such item in the checklist is assigned a point value (credit) which is recorded electronically in the "score card" for your project. As you select the items you want to include in your project, the points (credits) are totaled. Each choice brings you closer to the minimum goal of the GFL Program which is to exceed the mandatory building energy efficiency standards in what is generally referred to as "Title 24 Energy Code."

This CODE, that CODE, I'll take A LA MODE

> Energy efficiency and green building measures are already part of the permitting process for virtually every project, whether it is new construction or remodel, addition or alteration of an existing structure. The requirements, commonly referred to as "Title 24," cover a broad range of subjects, and exist under a formal legislative document, Title 24 of the California Code of Regulations.
>
> Part 6 of Title 24 contains the energy efficiency standards for residential and non-residential buildings, and is best known for the energy usage calculations. In almost all cases a design or energy consultant will be necessary to run the calculations that estimate the energy usage of a building by using approved (by the State) software. Your project must "comply" or perform equally well as the "baseline" energy usage of a project similar to your own. In other words, when the variables relating to insulation, windows, equipment, etc. are entered in the software program, the output will indicate whether your proposed building project will consume less, the same or more energy than the "baseline."
>
> The Green for Life Voluntary Green Building Program can guide you to make choices that will use at least 15% LESS energy than the baseline. This is called a "Reach Code."

That's the goal of the Program – reduce energy usage in buildings by 15% over and above the State mandated energy efficiency standards. But you can do even better without great effort. The California Energy Commission also recognizes this, and introduced in 2010 Part 11 of Title 24 (California Green Building Standards Code – "CALGreen.")

CALGreen (Title 24, Part 11), broadens the approach to energy efficiency to include green building practices, some of which are mandatory, and some are voluntary. Part 11 does not include energy calculations.

The VGBP includes elements of both Parts 6 and 11, but not in their entirety. It also includes measures that are not part of Title 24 at all, but are good practices. The VGBP does NOT exempt you from the requirements in Title 24

NOW BACK TO THE CHECKLIST

The checklist includes green building measures from many well-established "energy" and "green building" programs. Those that are included in Title 24 are highlighted in green (of course) and in working with your energy consultant your project may meet the 15% threshold simply by "upping" the value of these items. Those that are already mandatory are identified in with an "M" in the points column.

As you proceed through the checklist and "check" items that are relevant to your project, the "points" keep adding up. The on-line Program will alert you to each threshold you meet. While the 15% threshold is the easiest to meet, and uses a quantitative measure, the Green For Life Program recognizes that sustainability is much more than energy efficiency, therefore "points" are also awarded for material selections, waste management, water conservation and other "sustainable" measures. This "systems" approach to green building is the full purpose of the green For Life Voluntary Green Building Program.

Rating Systems

The following rating systems are referenced to develop the GFL Voluntary Manual:

California State Energy Code (http://www.bsc.ca.gov/Home/CALGreen.aspx) Uses Title 24 as basis of calculations; is revised every three years.	CALGreen(CG)
United States Green Building Council (http://www.usgbc.org) Non-Profit organization providing a sustainable future through cost-efficient and energy-saving green buildings.	LEED (LD)
Build It Green (http://www.builditgreen.org/greenpoint-rated/) Non-Profit organization with a mission to promote healthy, energy- and resource-efficient homes in California.	Green Point Rated (GPR)
Scottsdale, AZ (http://www.scottsdaleaz.gov/greenbuilding) Some cities have developed their own Green Building Code. Scottsdale, AZ standards are included because its climate is similar to the Coachella Valley.	Scottsdale (AZ(Scott))
Advanced Energy Design Guide (http://www.ashrae.org/) Guides that offer designers and contractors the tools needed for achieving energy savings.	AEDG

CHAPTER THREE

TECHNICAL BUILDING MEASURES & POINT SYSTEM

HOW THE SCORING SYSTEM WORKS

CHECK BOX
"CHECK" THIS IF YOU COMMIT TO THIS ITEM

BUILDING TYPE
(NEW OR REMODEL)

SPECIFIC CATEGORY & BRIEF DESCRIPTION
OF UNDRLYING PRINCIPLE

INDIVIDUAL CREDIT
IDENTIFYING NUMBER & DESCRIPTION
OF CREDIT

COLORS
PURPLE: SPECIFIC CATEGORY

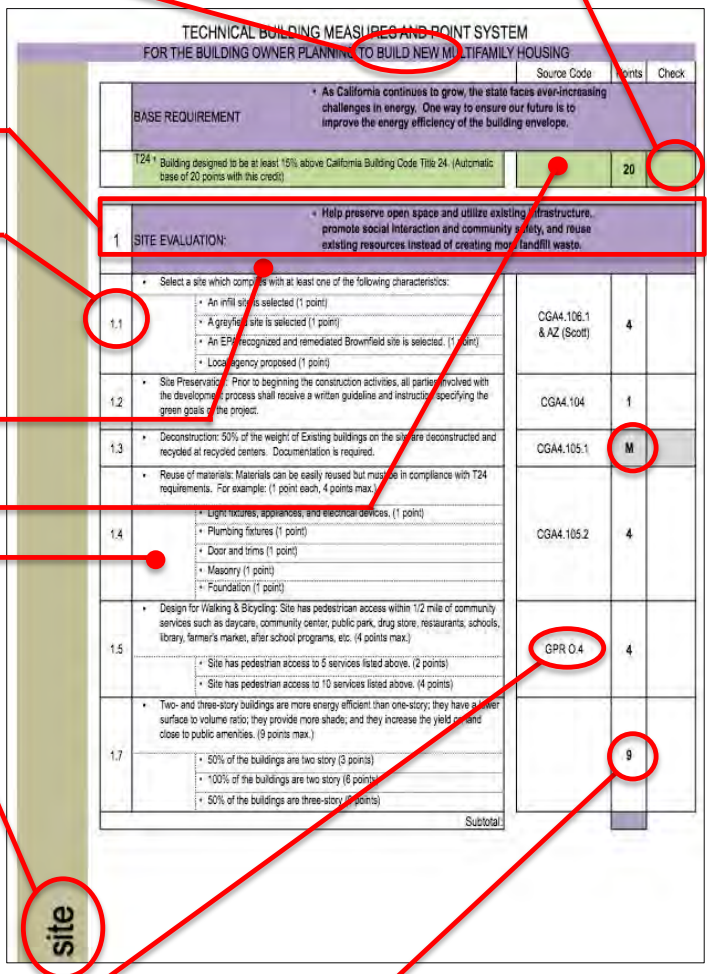
GREEN: THIS ITEM RELATES TO ITEM USED
IN T-24 CALCULATIONS

WHITE: ITEM IS NOT PART OF T-24

GENERAL TOPIC
- SITE
- ENVELOPE
- STRUCTURE
- EQUIPMENT
- PASSIVE ENERGY
- COMFORT & HEALTH

CROSS REFERENCE TO OTHER RATING
SYSTEMS
- CG (CALGreen)
- LEED (USGBC)
- GPR (Build it Green)
- AZ (Scottsdale, AZ)

POINT VALUE OF CREDIT FOR THIS CODE
- M= MANDATORY


TECHNICAL BUILDING MEASURES AND POINT SYSTEM
FOR THE BUILDING OWNER PLANNING TO BUILD NEW MULTIFAMILY HOUSING

		Source Code	Points	Check
	BASE REQUIREMENT — As California continues to grow, the state faces ever-increasing challenges in energy. One way to ensure our future is to improve the energy efficiency of the building envelope.			
T24	Building designed to be at least 15% above California Building Code Title 24. (Automatic base of 20 points with this credit)		20	
1	SITE EVALUATION: — Help preserve open space and utilize existing infrastructure, promote social interaction and community safety, and reuse existing resources instead of creating more landfill waste.			
1.1	Select a site which complies with at least one of the following characteristics: • An infill site is selected (1 point) • A greyfield site is selected (1 point) • An EPA recognized and remediated Brownfield site is selected. (1 point) • Local agency proposed (1 point)	CGA4.106.1 & AZ (Scott)	4	
1.2	Site Preservation: Prior to beginning the construction activities, all parties involved with the development process shall receive a written guideline and instruction specifying the green goals of the project.	CGA4.104	1	
1.3	Deconstruction: 50% of the weight of Existing buildings on the site are deconstructed and recycled at recycled centers. Documentation is required.	CGA4.105.1	M	
1.4	Reuse of materials: Materials can be easily reused but must be in compliance with T24 requirements. For example: (1 point each, 4 points max.) • Light fixtures, appliances, and electrical devices. (1 point) • Plumbing fixtures (1 point) • Door and trims (1 point) • Masonry (1 point) • Foundation (1 point)	CGA4.105.2	4	
1.5	Design for Walking & Bicycling: Site has pedestrian access within 1/2 mile of community services such as daycare, community center, public park, drug store, resaurants, schools, library, farmer's market, after school programs, etc. (4 points max.) • Site has pedestrian access to 5 services listed above. (2 points) • Site has pedestrian access to 10 services listed above. (4 points)	GPR O.4	4	
1.7	Two- and three-story buildings are more energy efficient than one-story; they have a lower surface to volume ratio; they provide more shade; and they increase the yield per land close to public amenities. (9 points max.) • 50% of the buildings are two story (3 points) • 100% of the buildings are two story (6 points) • 50% of the buildings are three-story (9 points)		9	
	Subtotal			

site

TECHNICAL BUILDING MEASURES AND POINT SYSTEM

FOR THE HOMEOWNER PLANNING TO UPGRADE, REMODEL AND/OR ADD TO AN EXISTING HOME

site

		Source Code	Points	Check
M	BASE REQUIREMENT • **As California continues to grow, the state faces ever-increasing challenges in energy. One way to ensure our future is to improve the energy efficiency of the building envelope.**			
	T24 • Building designed to be at least 15% above California Building Code Title 24. (Automatic base of 20 points with this credit.)	CG	**20**	
1	EXISTING CONDITION EVALUATION: • **Reuse existing resources instead creating more landfill waste.**			
1.1	• Deconstruction: 50% of the weight of Existing buildings on the site are deconstructed and recycled at recycled centers. Documentation is required.	CGA4.105.1	**M**	
1.2	• Reuse of materials: Materials can be easily reused but must be in compliance with T24 requirements. For example: (4 points max.)	CGA4.105.2	**4**	
	• Light fixtures, appliances, and electrical devices. (1 point)			
	• Plumbing fixtures (1 point)			
	• Door and trims (1 point)			
	• Masonry (1 point)			
	• Foundation (1 point)			
1.3	• Home Reuse: maintain existing Walls, floors and roof. Maintain the existing building structure (including structural floor and roof decking) and envelope (the building framing, excluding window assemblies and non-structural roofing material). The minimum percentage building reuse for each point threshold is as follows: (4 points max.)	CGA4.105.2	**4**	
	• 50% (2 points)			
	• 75% (3 points)			
	• 95% (4 points)			
	Subtotal:			
2	SOLAR ORIENTATION: • **Protect east-, south- and west-facing windows from the sun; see also "window"**			
2.1	T24 • Configure new additionto minimize west-facing walls and windows. The long axis should be within 30 deg. of south.	CGA4.106.1 & AZ (Scott)		
3	SHADE: • **Shade your home (roof, walls, windows) with trees, overhangs, shutters or awnings**			
3.1	T24 • Use several strategies to provide appropriate shade for east- and west-facing windows during the summer, and south-facing windows in the winter.	CG A4.205.2		
3.2	T24• Awnings and overhangs need to be close to top of windows to effectively shade the glass. A good rule of thumb is to cover half the surface of glass at the summer solstice. (e.g. A 30" overhang at the header will cover the top half of a 4' tall window; 4'-6" would cover the top half of a 6'8" slding glass door.)	CG A4.205.2, A4.407.7, GPR D.7		
3.3	T24 • Install window screens with a shading coefficient of .45 or lower to reduce heat radiation	AZ (Scott)		
3.4	• Trees on the west and east can be evergreen, but consider using deciduous trees on the south because during the winter, after dropping their leaves, the branches will filter the sun and provide desirable partial passive heating. Trees may shade roof surfaces where solar panels may be installed and decrease efficiency. Coordinate location of trees and solar panels.	LEED SS 2, GPR C.5, & AZ (Scott)	**2**	
	• Use trees to shade the west side of the building. Minimum of 2 new trees.			
	Subtotal:			

site

		Source Code	Points	Check
4	WATER - DRAINAGE: • **A drainage system will increase the durability of the home's foundation by draining water away from the structure.**			
4.1	• For new building additions, the site shall be developed to manage surface water (rain, irrigation, or nuisance water) away from buildings. Consider foundation and landscape drains as part of the drainage system.	CG A4.106.3 & A4.407.6	**M**	
4.2	• Soil analysis and protection: The soil at the building site are analyzed and protected as follows: • Perform soil analysis by licensed professional and use for structural design. • Develop a plan to manage storm water drainage and implement during construction. • Site access is accomplished by minimizing the amount of cut and fill needed to install access roads and driveways. • Underground construction activities are coordinated to utilize the same trench, minimize the amount of time the disturbed soil is exposed and the soil is replaced using accepted compaction methods.	CG 4.106.2 & LEED SS 4.1	**2**	
4.3	• Design a site with balanced Cut/Fill	AZ (Scott)	**1**	
	Subtotal:			

		Source Code	Points	Check
5	WATER - RAIN: • **Keep storm water on your lot with french drains, cisterns, retention basins. Keep water (rain and irrigation) away from the house**			
5.1	• Design addition with roof overhangs to shed water away from the walls and doors. Install gutter and downspout systems to route water at least 3 feet away from the foundation or connect to landscape drains which discharge to a dry well, sump, bioswale, rainwater capture system or other approved on-site location.	CG A4.407.2 & A4.407.7	**2**	
5.2	• Door protection. Exterior doors to the dwelling are covered to prevent water intrusion by one or more of the following: • An awning at least 3 feet in depth is installed • The door is protected by a roof overhang at least 3 feet in depth • The door is recessed at least 3 feet • Other methods which provide equivalent protection	CG A4.407.6	**2**	
5.3	• Use weather-based automatic irrigation controllers/timers to adjust function due to rain. (SEE WATER - USAGE)		**M**	
5.4	• Adhere to landscape material (drought-tolerant) guidelines adopted by Jurisdiction. (SEE WATER - USAGE)		**M**	
5.5	• Flashing details. Provide flashing details on building plans which comply with accepted industry standards or manufacturer's instructions. Details are shown on house plans at all of the following locations: • Around windows and doors • Roof valleys • Deck connections to the structure • Roof to wall instersections • Chimneys to roof intersections • Drip caps above windows and doors with architectural projections.	CG A4.106.4 & GPR P.A.1	**3**	

site

		Source Code	Points	Check
5	WATER - RAIN: (cont.)			
5.6	• Use permeable pavers for patios, walkways and driveways/parking	AZ (Scott), CG A4.106.4 & GPR P.A.1		
	• Min. 80% of exposed paving is light colored (at least 30% light reflectance value)		**2**	
	• No less than 20% of total on-site hardscape (2 points) OR			
	• No less than 30% of total on-site hardscape (3 points)		**3**	
5.7	• Use deep irrigation and solar power controllers	LEED WE 2.1	**2**	
	Subtotal:			

6	WATER - USAGE: **• Use weather controlled automatic irrigation system controllers, use drip irrigation, use water efficient fixtures**			
6.1	• Adhere to (Coachella Valley) landscape material (drought-tolerant) guidelines adoped by Jurisdiction.	CG A4.106.3, LEED SS 2-4	**M**	
6.2	• Adhere to (Coachella Valley and CVAG Water Efficiency Water Ordinance) landscape irrigation guidelines.	CG A4.106.3, Local Zoning & LEED WE 2., CG A4.304.1 & AZ (Scott)	**M**	
	• A water budget shall be developed for irrigation which meets and does not exceed CVWD requirements.		**1**	
	• Install a low-water consumption irrigation system which minimizes the use of spray-type heads. For example, use non-sprinkler or drip, zoned irrigation system with multiple valves to accommodate specific water needs to different types of plants.		**2**	
	• Use weather-based automatic irrigation controllers/timers to save water usage when raining.		**1**	
6.3	• Rainwater channeling methods using gutters, scuppers, downspouts and grading to direct runoff to landscaped areas.	AZ (Scott)	**2**	
6.4	• Use turf ONLY where it is actively used, and strictly limit the area. (4 points max.)	CG A4.106.3, LEED SS 2.3 & GPR C.3		
	• 10% of landscape area (2 points)		**4**	
	• 0% of landscape (4 points)			
6.5	• Graywater recovery: Graywater systems use wastewater from washing machine, showers, tubs, and lavatories.	CG 4.305 AZ (Scott)		
	• Install a two-pipe drain system for future system		**2**	
	• Install a complete graywater system with/without filtration/storage tank for landscape irrigation and/or toilet flushing.		**3**	
6.6	• Consider reducing the usage of indoor water by selecting plumbing fixtures with flow restrictors or aerators beyond code requirements	CG 4.303.1 - 3 AZ (Scott)		
	• Kitchen faucets and dishwashers with Max flow rate at sink faucet not greater than 1.5 gpm at 60 psi		**1**	
	• All bathroom faucets and showerheads are high efficiency (2.0 or less GPM)		**3**	
	• Toilets with high efficiency (1.3 or less gal/flush) and/or dual flush operated (average flush of 1.2 gal or less)		**3**	
	• Dishwashers shall be Energy Star and not use more than 5.8 gallons per cycle.		**1**	
	• Waterless toilets are installed.		**1**	
	• Indoor water use shall be reduced by at least 20 percent by either water saving fixtures/flow restrictors or 20 percent reduction in baseline water use as defined in California Building Code.		**6**	
	Subtotal:			

TECHNICAL BUILDING MEASURES AND POINT SYSTEM

FOR THE HOMEOWNER PLANNING TO UPGRADE, REMODEL AND/OR ADD TO AN EXISTING HOME

site

		Source Code	Points	Check
7	HEAT ISLAND: • **Reduce heat island effect* and reduce rain runoff with pavers; reduce overall paving areas.**			
7.1	• Use shade trees and trellises to shade hardscape and patios. (SEE SHADE)	GPR P.A.1		
7.2	• Separate hardscape from the building to reduce heat transfer from outside to inside or use cooldeck or similar for large concrete patios near house.	IDC	**1**	
7.3	• Use alternative paving (pavers, decomposed granite, etc.) that have less thermal mass than concrete. (SEE SHADE)	CG A4.106.4		
7.4	• Reduce glare (sunlight reflecting off the ground surface) by using drought-tolerant ground cover or material that scatters the sunlight (gravel). (SEE SHADE)	IDC		
7.5	• Consider use radiant barrier in overhangs over outdoor living areas as well as insulating the overhang. Low -8-9 ft high uninsulated patio covers, carport roofs radiate heat into the ground and adjacent house walls especially metal deck shade structures. (SEE SHADE)	IDC		
	Subtotal:			

TECHNICAL BUILDING MEASURES AND POINT SYSTEM

FOR THE HOMEOWNER PLANNING TO UPGRADE, REMODEL AND/OR ADD TO AN EXISTING HOME

envelope

		Source Code	Points	Check
8	ROOF: • **Use "cool roof" coating or materials**			
8.1	T24 • Rigid insulation on top of roof sheathing.			
8.2	T24 • Install "cool roof" system for new roofs.	CG A4.106.5, AZ (Scott) & GPR P.E.1		
8.3	T24 • Install a radiant barrier at the roof level.	CG A4.205.1		
8.4	T24 • Consider "cool roof" coating when working with existing roofing.	CG A4.106.5 & AZ (Scott)		
8.5	T24 • In a vented attic design, install continuous ridge vent and eave vents for effective thermally-driven ventilation.			
8.6	T24 • Use solar powered attic exhaust fan.			
8.7	• If metal roof system is being considered, design metal roof with stand-off battens to allow free flow thermally-driven air between roof sheathing and metal roofing.		**2**	
8.8	• Avoid petroleum-based roof system.		**2**	
8.9	• Use roof with a high durability/low maintenance material such as concrete, slate, clay or fiber cement.	AZ (Scott)	**2**	
8.10	• Use non-sawn lumber when reframing the roof structure (at least 75%). Non sawn lumber uses less lumber. (SEE FRAMING CONSIDERATION)	AZ (Scott)	**M**	
8.11	• Energy heels on roof trusses (75% of attic insulation height at outside edge of exterior wall) for reframing.	GPR D.6	**2**	
	Subtotal:			

9	ATTIC: • **Add insulation in the attic; Ventilate the attic; With evaporative coolers, discharge upducts through roof or the exterior.**			
9.1	T24 • Perform third party blower door test to verify building envelope tightness.	CG A4.206		
9.2	T24 • Exceed code minimum attic insulation values.	GPR J.2.a & .i		
9.3	T24 • Use extended-heel trusses to ensure full depth insualtion at eaves			

10	WALLS: • **Maximize wall insulation – outside and/or within the walls; use durable materials outside like plaster and/or fiber cement board.**			
10.1	T24 • Use blown-in spray foam wall insulation to create air-tight walls. Continuous exhaust fans in bathrooms may be necessary.			
10.2	T24 • Exceed Code-mandated insulation values.	GPR F.1 & F.2		
10.3	T24 • Carefully seal gaps and joints between framing members and sheathing.	CG 4.406.1		
10.4	T24 • Exterior insulation systems prevent thermal bridging and is most effective at reducing heat flow into the conditioned space.			
10.5	T24 • Configure and place windows to limit solar exposure on west and south walls.	AZ (Scott)		
10.6	T24 • Third party inspection of insulation, at least HERS grade II	LEED EA 2.1		
10.7	• Use durable and pre-finished exterior finish material (integrally colored plaster, fiber-cement siding and panels)	CG A4.405.1 & GPR E.3	**2**	
10.8	• Consider a "second-skin" wall system that shades west and south-facing walls. "Living walls", louvers and simple shades reduce the radiant heat build up from solar exposure.	AZ (Scott)	**4**	
10.9	• Insulated headers	GPR D.4	**1**	
	Subtotal:			

envelope

		Source Code	Points	Check
11	WINDOWS: • **Select windows for their frame material (vinyl or fiberglass), dual-glazing, and coatings (low-e) in relation to their orientation. Verify coatings are appropriate to the desert climate. (SHGC < 0.30)**			
11.1	T24 • Meet or Exceed Energy Star rated for windows	LEED EA 4.1, 4.2, & GPR J.2.j		
11.2	T24 • Use spectrally selective glazing (SHGC of <0.28) on east-, south- and west-facing windows.			
11.3	T24 • Use argon gas-filled insulated glass units.			

structure

		Source Code	Points	Check
12	FRAMING CONSIDERATIONS: • **Place Joists, Rafters & Studs @ 24" O.C. It saves material.**			
12.1	• Building dimensions and layouts are designed to minimize waste.	CG A4.404.1-3 & AZ (Scott)		
	• Design stud spacing greater than 16" o.c.		**2**	
	• Design addition on modular grid such as 24" or 48" to match dimensions of standard material		**3**	
	• Design beams, headers and trimmers at the minimum size to adequately support the load.		**1**	
12.2	• Use premanufactured building systems to eliminate solid sawn lumber whenever possible. One of the following systems:	CG A4.404.3, GPR D.2.a, D.6 & AZ (Scott)		
	• Composite floor joist or premanufactured floor truss framing (Min. of 75%) of floor area.		**2**	
	• Composite roof rafter or premanufactured roof truss framing (Min. of 75%) of floor area.		**2**	
	• Composite framing for interior framing. (Min. of 75%) of wall area.		**2**	
	• Panelized wall framing systems (SIPS, ICF, or similar)		**2**	
	• Other methods approved by the enforcing agency		**2**	
12.3	• Material lists are included in the plans which specify material quality and provide direction for on-site cuts for all of the following:		**2**	
	• Floor framing			
	• Wall framing			
	• Ceiling and roof framing			
	• Structural panels and roof sheathing			
12.4	• Use advanced framing technologies for walls and roof framing.	LEED MR 1.2 AZ (Scott)	**3**	
	Subtotal:			

13	MATERIAL EFFICIENCY: • **Consider using panelized or already assembled systems**			
13.1	• Select exterior finishes derived from regional sources within 500 miles of job site. This includes stone or culture stone veneers that are regionally quarried or processed. (1 point for each material over $2500, 5 points max.)	GPR D.6 AZ (Scott)	**5**	
13.2	• Reduction in cement use: Products such as fly ash, slag, silica fume and rice hull ash used to replace cement in concrete mix design. (2 points max.)	CG A4.403 & AZ (Scott)	**2**	
	• No less than 20% substituted volume of cement. (1 point)			
	• No less than 25% substituted volume of cement. (2 points)			
13.3	• Use engineered lumber (Beams, headers, lumber for floors and rafters; oriented strand board for subfloor, walls and roof sheathing) (SEE FRAMING CONSIDERATIONS)		**M**	
13.4	• Use building materials that do not require additional resources for finishing (One or more of exterior trim, windows, siding or exterior wall coverings) (1 point each, 4 points max.)		**4**	
13.5	• Floors that do not require additional coverings for finish.		**2**	
	Subtotal:			

equipment

		Source Code	Points	Check
14	AIR CONDITIONING: • **Use high efficiency equipment (higher SEER & EER rating means higher efficiency – lower electrical usage, lower monthly bill). Efficiency is increased by dual-stage compressor and better controls. NOTE: the more choices you make that reduce the overall heat load on your home (more insulation, better windows, more shade) may reduce the size of the condensing unit (e.g. 3-ton vs. 4-ton).**			
14.1	• "Right-size" HVAC equipment. Carefully consider the energy efficiency measures selected in this Code that will influence the actual heat load on the air conditioning system. The size of the system (measured in "tons") may be reduced by as much as 30% through careful design and upgraded energy efficient measures.	CG A4.407, LEED EA 6.1, 6.2, 6.3 & GPR H.5	**M**	
14.2	T24 • Perform duct leakage testing to verify a total leakage rate of less than 6 percent of the total fan flow.	CG A4.207.8 & LEED EA 5.1		
14.3	T24 • General HVAC equipment verification and correction.	CG A4.207 & GPR H.1		
14.4	T24 • Use condensing units with two-stage compressors (generally on units with SEER 16 or higher.) Use units with a minimum of EER 11.5.	CG A4.207.6, GPR J.2.f AZ (Scott)		
14.5	T24 • Design and install a whole-house fan system if the remodel scale allows it.	AZ (Scott)		
14.6	T24 • Design and install an evaporative cooling system if the remodel scale allows it.	AZ (Scott)		
14.7	T24 • Install ductwork within the conditioned envelope of building, in an underfloor crawl space, with an R-6 or higher insulation value or buried in the ceiling insulation.	CG A4.207.7		
14.8	• Design the HVAC system to be zoned such that no more than two enclosed rooms are controlled by one thermostat (does not include bathroom, kitchens, closets, pantries, and laundry rooms).	AZ (Scott)	**4**	
14.9	• Design the furnace as a sealed - combustion unit.	AZ (Scott)	**1**	
14.10	• Configure and place windows to facilitate cross-ventilation.	AZ (Scott)	**2**	
14.11	• Install multi-speed Energy Star rated ceiling fans (Min of one per room). (One per bedroom, one per living room.)	AZ (Scott)	**2**	
14.12	• HVAC system to incorporate a whole house filtration system with a MERV rating of at least 8. Pressure drop across the filter shall not exceed .1 inches water column and filter rack area should be sized at 300 fpm maximum face velocity for fan energy savings.	CG A4.506.1 AZ (Scott)	**2**	
14.13	• Water heaters, fireplaces and furnaces are sealed combustion units. Direct-vent heating and cooling equipment is utilized if the equipment will be located in the conditioned space or isntall the space heating and water heating equipment in an isolated mechanical room.	CG A4.506.2 AZ (Scott)	**1**	
	Subtotal:			

equipment

		Source Code	Points	Check
15	WATER HEATING: • **Tankless (on-demand) gas water heaters use less gas, but may require larger gas line.**			
15.1	T24 • With a storage water heater, the energy factor (EF) for a gas-fired storage water heater is higher than 0.60 and the energy factor (EF) for a gas-fired tankless water heater is .80 or higher.	CG A4.208.1 & 2, LEED EA 7.3 & AZ (Scott)		
15.2	T24 • Insulate (R-4) hot water pipes full distance from heater to fixture and consider insulating cold water piping if pipes run in attic or in unisulated exterior wall.	AZ (Scott)		
15.3	T24 • Consider integrating a solar thermal water heating system when the demand for hot water is equivalent.	CG A4.211.2		
15.4	• Design a water heater with sealed combustion unit. The water heater draws combustion air from the oudoors eliminating any chance of back drafting.	AZ (Scott)	**1**	
15.5	• Where the hot water source is more than 10 feet from a fixture, the potable water distribution system shall convey hot water using a method designed to minimize wait time for hot water to arrive at the fixture such as a circulation pump system or solar thermal water heating system.	GPR G.1.c, CG A4.208.3 & A4.211.2	**2**	
	Subtotal:			

16	EVAPORATIVE COOLING: • **Evaporative coolers use a fraction of the energy air conditions does, brings in filetered fresh air, and ar effective except for about six weeks in late summer.**			
16.1	T24 • Design an evaportative cooler system to be used for the majority of the year and save on electrical load and can assist in night structure cooling if designed with night purge exhaust fan. Any areas with large diurnal temperature swings will benefit from structure cooling. (SEE WHOLE HOUSE FAN)	LEED EA 7.3 & AZ (Scott)		

17	EXHAUST FANS: • **Use Energy Star fans, exhaust outdoors. Humidistat, occupancy sensor, timer.**			
17.1	• Exhaust fans which terminate outside the building are provided in every bathroom.	CG 4.506.1	**1**	
17.2	• Local exhaust time/automatic controls for bathroom exhaust fans are installed.	LEED IED 5.2	**1**	
17.3	• Install Energy Star bathroom fans on timer or humidistat.	GPR H.8	**1**	
	Subtotal:			

18	WHOLE HOUSE FAN: • **When the outside temperature is between 55 - 70 deg. a whole house fan can draw air through the house at night. Called "night purging," the flow of air cools the inside of the house (especially heavy materials like stone counter tops and tile floors.) Then as the temperature rises during the day, the need for air conditioning is delayed.**			
18.1	• Openings. Whole house exhaust fans shall have insulated louvers or covers which close when the fan is off. Covers or louvers shall have a minimum insulation value of R-4.2.	CG A4.407	**M**	
18.2	• Design and install whole building ventilation system according to ASHRAE. The system shall operate automatically or continuously with manual override as part of energy recovery ventilator.	AZ (Scott)	**2**	
18.3	• HVAC: Mechanical ventilation system for cooling installed such as an economizer to use cool air from the ambient to cool the building.	GPR H.9.b AZ (Scott)	**1**	
	Subtotal:			

equipment

		Source Code	Points	Check
19	POOL PUMP: • **New pool pumps use a variable-speed drive and more sensitive internal controls so the speed, and therefore the energy, more precisely matches the demand. This saves a lot of energy (money.)**			
19.1	• Replace existing pool pump with a two speed pump system	CG A4.210.1	**2**	
	Subtotal:			

		Source Code	Points	Check
20	APPLIANCES: • **Use Energy Star appliances.**			
20.1	• Energy star rated appliances including refrigerator, freezer, dishwasher and clothes washer. (1 point per appliance, 3 points max.)	CG A4.210.1, AZ (Scott), GPR M.1 & LEED EA 9.1	**3**	
	Subtotal:			

passive energy - comfort & health

		Source Code	Points	Check
21	THERMAL MASS: • **Heavy materials like stone, tile, masonry and concrete can absorb a lot of heat. When combined with whole house fan can delay the use of air conditioning. However, they are also cool during the winter.**			
21.1	T24 • In desert climate, hard surface flooring reduces the cooling load during the summer, but during the winter the floor may be uncomfortably cool.			
22	THERMAL CHIMNEY: • **"Hot air rises" the building can move air passively - indoors and outdoors**			
22.1	• Operable skylights at the peak of the roof or a tower element with operable windows will draw hot air up and will facilitate natural ventilation.		**2**	
	Subtotal:			
23	DAYLIGHTING: • **Bringing daylight into a room can reduce the need for lights, which has a direct economic benefit. Balancing the light within a room is equally important for comfort and beauty. The light should be balanced by right-sizing windows, locating them on two or more walls, using skylights or "solar tubes" and using shading devices to reduce direct penetration of sunlight for long periods of time.**			
23.1	• Natural light reduces the demand for electric lights during the day, however, glare and solar heat gain must be controlled. • Interior floor covering to be light in color with min. light reflectance value (LRV) of 25%,		**1**	
23.2	• Use external light shelves to control direct sunlight.		**2**	
23.3	• Configure and place windows so daylight enters from two sides in each room.	AZ (Scott)	**2**	
23.4	• Provide skylights for daylight in interior spaces and to balance light from large windows on one wall only. (1 point per room, 5 points max.)		**5**	
	Subtotal:			
24	LIGHTING: • **Use fixtures with greater illumination with lower electrical demand to lower the overall electrical load of the house.**			
24.1	T24 • Consider lighting fixtures that have high efficacy lighting. These include compact or tubular fluorescent and light emitting diodes (LED).	AZ (Scott)		
24.2	T24 • Max interior lighting wattage does not exceed .5 watts per sq ft as determined by aggregate wattage not including plug loads.	AZ (Scott)		
24.3	• Building lighting consists of at least 90 percent ENERGY STAR qualified hard-wired fixtures.	CG A4.209.1	**2**	
24.4	• Design recessed lights so they do not penetrate the thermal barrier.	AZ (Scott)	**2**	
24.5	• Smart wiring system to be installed for controlling lighting and telecommunications.	AZ (Scott)	**2**	
24.6	• Use occupancy sensors for closets, pantries, bathrooms, etc.	AZ (Scott)	**1**	
	Subtotal:			

passive energy - comfort & health

		Source Code	Points	Check
25	INDOOR AIR QUALITY: • **Off-gassing is the process by which materials release chemicals used to fabricate or hold them together. Carpet, adhesives, medium density fiberboard (a substitute for plywood in cabinets) and paints are sources for harmful off-gassing. Select materials that have a SCAQMD (South Cost Air Quality Management) compliance. After your home is painted and all cabinets and carpet are installed, flush out the off-gassed air. Run the whole house fan full time for up to a week, or as long as you smell the odors.**			
25.1	• Joints and openings. Openings in the building envelope separating conditioned space from unconditioned space needed to accommodate gas, plumbing, electrical lines and other necessary penetrations must be sealed in compliance with the California Energy Code.	CG A4.406	**M**	
25.2	• Fire place: Any installed gas fireplace shall be a direct-vent sealed-combustion type.	CG A4.503	**M**	
25.3	• For Cabinetry or interior trims: Meet the formaldehyde limits or use composite wood products with California Air Resources Board	CG A4.504.1. 5 & GPR K.7-8	**3**	
25.4	• Select all interior materials that are low-emitting (VOC): eg. Adhesives, resilient flooring, carpet, paints, and sealer. Documentation which includes manufacturer's product specification and field verfication of on-site product containers.	CG 4.504.2.1-3 & GPR F.2 & K.2 - 3	**M**	
25.5	• Resilient flooring systems. Where resilient flooring is installed, at least 50 percent of floor area receiving resilient flooring shall comply with the VOC emission limits defined in the Collaborative for High Performance Schools (CHPS) Low-emitting Materials List or certified under the Resilient Floor Covering Institute (RFCI) FloorScore program.	CG 4.504.4	**M**	
	• A minimum of 80% of the total area of resilient flooring installed shall comply (2 points) OR		**3**	
	• A minimum of 90% of the total area of resilient flooring installed shall comply (3 points)			
25.6	• Composite wood products. Hardwood plywood, particleboard and medium density fiberboard composite wood products used on the interior or exterior of the building shall meet the requirements for formaldehyde as specified in ARB's Air Toxics Control Measure for Composite Wood. Documentation of verfication is required.	CG 4.504.5	**M**	
25.7	• Covering of duct openings and protection of mechanical equipment during construction. At the time of rough installation or during storage on the construction site and until final startup of the heating and cooling equipment, all duct and other related air distribution component openings shall be covered with tape, plastic, sheetmetal or other methods acceptable to the enforcing agency to reduce the amount of dust or debris which may collect in the system.	CG A4.504	**M**	
25.8	• Concrete slab foundations required to have a vapor retarder by Capillary break. A capillary break shall be installed in compliance with a 4-inch (101.6 mm) thick base of 1/2 inch or larger clean aggregate shall be provided with a vapor barrier in direct contact with concrete and a concrete mix design, which will address bleeding, shrinkage, and curling, shall be used. For additional information, see American Concrete Institute, ACI 302.2R-06 or other designs by a licensed design professional.	CG 4.505	**M**	
25.9	• Bathroom exhaust fans. Mechanical exhaust fans which exhaust directly from bathrooms shall comply with the following:	CG A4.506	**M**	
	• Fans shall be ENERGY STAR compliant and be ducted to terminate outside the building.			
	• Unless functioning as a component of a whole house ventilation system, fans must be controlled by a humidistat which shall be readily accessible			

		Source Code	Points	Check
25	INDOOR AIR QUALITY: (cont.)			
25.10	• Flush the addition or the renovation area continuously for 1 week with windows open after renovation is completed.	LEED IEQ 8.3 & GPR K.9	1	
25.11	• Reduce pollution entering the home from the garage (garage exhaust fan or detached garage)	GPR D.9	2	
25.12	• Use timer/automatic controls for bathroom exhaust fans.	LEED IEQ 5.2	2	
25.13	• Insulate addition or renovation with formaldehyde-free insulation. Documentation must be provided that verifies the materials are certified to meet this the pollutant emission limits in this section.	CG 4.504.4 & AZ (Scott)		
	• Install thermal insulation in compliance with the VOC emission limits defined in CHPS Low emitting Material List.		2	
	• Install thermal insulation which oontains No-Added Formalehyde and is in compliance with the VOC emission limits defined in CHPS Low emitting Material List.		3	
	Subtotal:			

conservation of materials

		Source Code	Points	Check
26	RECYCLED/RAPIDLY RENEWABLE: • **Look into the cool new materials that manufacturers make from recycled or rapidly renewable materials. There are new ones every week.**			
26.1	• Use Recycled Content Aggregate (Min. 25%)	CG A4.405.3		
	• Walkway and driveway base		**1**	
	• Roadway Base		**1**	
26.2	• Recycled content roof material reduces new resources: (4 points max.)	CG A4.405.3		
	• A min. of 25% of roof area uses recyled or recycled content roof material. (2 points)		**4**	
	• A min. of 50% of roof area uses recyled or recycled content roof material. (4 points)			
26.3	• Replace portland cement in concrete with recycled flyash or slag: Min 20% flyash and/or slag content	GPR B.1.a & b	**2**	
26.4	• Install insulation with 30% post-consumer recycled content and no added formaldehyde.	GPR F.1	**1**	
26.5	• Use recycled content paint	GPR K.5	**1**	
26.6	• Flooring: Environmentally preferable flooring: FSC certified wood, reclaimed or refinished, rapidly renewable, recycled content, exposed concrete or locally sourced stone or tile.	GPR K.6 & L.1	**2**	
26.7	• Innovations: Structural frame and building envelope, use FSC certified engineered lumber for headers, I-joists, trusses, and rafters.	GPR P.D.3	**3**	
26.8	• Select fascia, soffit and trim elements made of recycled-content materials (including metals) or engineered wood products such as finger jointed trim, fiberboard, laminated starnd lumber or OSB.	AZ (Scott)	**1**	
26.9	• Select countertops manufactured from min. of 20% recycled content material.	AZ (Scott)	**1**	
26.10	• Recycled content. Use materials, equivalent in performance to virgin materials, with postconsumer or preconsumer recyled content. Documentation to be provided as to the respective values. (4 points max.)	CG A4.405.3		
	• No less than 10% recycled content value of the total value, based on estiamted cost of materials of the project. (2 points)		**4**	
	• No less than 15% recycled content value of the total value, based on estiamted cost of materials of the project. (4 points)			
26.11	• Use of building materials from renewable sources. Use one or more of the following materials manufactured from rapidly renewable sources or agricultural by-products is used (products typically harvested within a 10 year or shorter cycle): (5 points max.)	CG A4.405.4, LEED MR 2.1 -2, & GPR C.9		
	• Insulation (1 point)		**5**	
	• Bamboo or cork (1 point)			
	• Engineered wood products (1 point)			
	• Agricultural based products (1 point)			
	• Solid wood products (1 point)			
	• Other products acceptable by the enforcing agency. (1 point)			
	Subtotal:			

conservation of materials

		Source Code	Points	Check
27	RECYCLE CONSTRUCTION WASTE during DEMOLITION: • **Education and site setup are important during construction. If the set up is done well from the beginning, everyone working on the site will follow. For example, provide separate recyle bins during construction for recycling of everyday objects (plastic bottles and aluminum cans) but also for construction waste: drywall, glass, metals, concrete/plaster.**			
27.1	• Construction waste reduction: A minimum of 50% of the construction waste generated at the site is diverted to recycle or salvage.	CG 4.408	**M**	
27.2	• Construction waste management plan. Where a local jurisdiction does not have a construction and demolition waste management ordinance, a construction waste management plan shall be submitted for approval to the enforcing agency.	CG 4.408.2, LEED MR 3.2, & GPR A.2	**M**	
27.3	• Construction waste reduction: Enhanced construction waste generated at the site is diverted to recycle or salvage. Documentation shall be provided to the enforcing agency which demostrates compliance. (3 points max.) • A minimum of 65% of the construction waste generated at the site is diverted to recycle or salvage. (2 points) • A minimum of 75% of the construction waste generated at the site is diverted to recycle or salvage. (3 points)	CG 4.408.1, LEED MR 3.2, & GPR A.2	**3**	
	Subtotal:			

28	RECYCLE - WASTE DESIGN: • **When recycling facilities are available, recycling becomes second nature.**			
28.1	• Install built-in recycling and/or composting in site design if site renovation is part of the work.	GPR M.4	**1**	
28.2	• Install pull-out kitchen base cabinet with separate recycle/trash bins if kitchens are part of the renovation.	AZ (Scott)	**1**	
28.3	• Building operation and maintenance manual. At the time of final inspection, a manual, compact disc, web-based reference or other media acceptable to the enforcing agency which includes all of the following shall be placed in the building.	CG 4.410	**M**	
	Subtotal:			

on-site generation

		Source Code	Points	Check
29	SOLAR - PHOTO VOLTAIC: • **Reduce the peak power demand through the use of on-site renewable energy systems or contracting with off-site energy companies.**			
29.1	• Install a solar photovoltaic (PV) system in compliance with California Energy Commission New Solar Homes Partnership (NSHP). 2 points for each 10% of annual electrical load (KWh) met by system. Check with a structural engineer on the possible additional load to the roof structure. (10 points max.)	CG A4.211.1 & 4	**10**	
29.2	• Provide a min. one-inch conduit from the electrical service equipment for the future installation of a (PV) system with A minimum of 300 square feet of unobstructed roof area facing within 30° of south is provided for future solar collector or photovoltaic panels. Check with a structural engineer on the possible additional load to the roof structure.	AZ (Scott), CG A4.211.1 & 4	**2**	
29.3	• If the remodel includes site lighting renovation, use solar powered lighting for exterior site lighting, attic fan, and irrigation controller. At least 50% of the exterior site lighting.	AZ (Scott)	**1**	
	Subtotal:			

30	SOLAR - THERMAL: • **Even though solar thermal water heating is very efficient, for very low demand, it may not be practical**			
30.1	• Install a solar water heating system when the demand of hot water is equivalent to the production of hot water or provide space on the roof surface (200 SF south-facing), penetrations (stand-offs) through the roof surface, and one-inch conduit for future solar installation. Consult with a structural engineer for additional load requirements to the existing roof structure.	CG A4.211.2 & 3	**2**	
	Subtotal:			

Total	

TECHNICAL BUILDING MEASURES AND POINT SYSTEM

FOR THE HOMEOWNER PLANNING TO BUILD A NEW HOME

site

		Source Code	Points	Check
M	BASE REQUIREMENT: • **As California continues to grow, the state faces ever-increasing challenges in energy. One way to ensure our future is to improve the energy efficiency of the building envelope.**			
	T24 • Building designed to be at least 15% above California Building Code Title 24. (Automatic base of 20 points with this credit)	CG	**20**	

1	SITE EVALUATION: • **Help preserve open space and utilize existing infrastructure, promote social interaction and community safety, and reuse existing resources instead of creating more landfill waste.**			
1.1	• Select an infill site.	CGA4.106.1 & AZ (Scott)	**2**	
1.2	• Site Preservation: Prior to beginning the construction activities, all parties involved with the development process shall develop or adopt a written guideline and instruction specifying the green goals of the project.	CGA4.104	**2**	
1.3	• Deconstruction: 50% of the weight of Existing buildings on the site are deconstructed and recycled at recycled centers. Documentation is required.	CGA4.105.1	**M**	
1.4	• Reuse of materials: Materials can be easily reused but must be in compliance with T24 requirements. For example: (4 points max.) • Light fixtures, appliances, and electrical devices. (1 point) • Plumbing fixtures (1 point) • Door and trims (1 point) • Masonry (1 point) • Foundation (1 point)	CGA4.105.2	**4**	
1.5	• Design for Walking & Bicycling: Site has pedestrian access within 1/2 mile of community services such as daycare, community center, public park, drug store, restaurants, schools, library, farmer's market, after school programs, etc. (4 points max.) • Site has pedestrian access to 5 services listed above. (2 points) • Site has pedestrian access to 10 services listed above. (4 points)	GPR O.4	**4**	
	Subtotal:			

2	HOUSE DESIGN: • **The new status symbol is not how you display it but how you do it responsibly. The best way to be a responsible environmental citizen is to stay in a smaller house or go to a small house because you are automatically consuming less.**			
2.1	• Dwelling under 1600 SF of total conditioned space including guesthouse but not including ancilliary structures: 2 point for every 100 SF under 1600 SF. (Starting at 10 points for 1600 SF)		**20**	
2.2	• Dwelling under 3000 SF of total conditioned space including guesthouse but not including ancilliary structures: 1 point for every 100 SF under 3000 SF.		**5**	
2.3	• Dwelling over 3500 SF of total conditioned space including guesthouse but not including ancilliary structures: Minus 1 point for every 250 SF above 3000 SF.		**(-)**	
2.4	• Home Front Entrances have views from the inside to outside callers	GPR O.5	**1**	
2.5	• Home Front Entrances can be seen from the street or from other front doors	GPR O.5	**1**	
2.6	• Orient porches (min. 100 SF) to streets and public spaces.	GPR O.5	**1**	
2.7	• House configuration creates shaded usable outdoor "rooms"; indoors and outdoors are integrated. Provide L-shape or courtyard of configuration. (SEE SOLAR ORIENTATION)		**M**	
	Subtotal:			

site

		Source Code	Points	Check
3	SOLAR ORIENTATION: • **Protect east-, south- and west-facing windows from the sun; see also "window"**			
3.1	T24 • Configure new home to minimize west-facing walls and windows. The long axis should be within 30 deg. of south.	CGA4.106.1 & AZ (Scott)		
4	SHADE: • **Shade your home (roof, walls, windows) with trees, overhangs, shutters or awnings**			
4.1	T24 • Use several strategies to provide appropriate shade for east- and west-facing windows during the summer, and south-facing windows in the winter.	CG A4.205.2		
4.2	T24 • Awnings and overhangs need to be close to top of windows to effectively shade the glass. A good rule of thumb is to cover half the surface of glass at the summer solstice. (e.g. A 30" overhang at the header will cover the top half of a 4' tall window; 4'-6" would cover the top half of a 6'8" slding glass door.)	CG A4.205.2, A4.407.7, GPR D.7 & AZ (Scott)		
4.3	T24 • Install window screens with a shading coefficient of .45 or lower to reduce heat radiation	AZ (Scott)		
4.4	• Trees on the west and east can be evergreen, but consider using deciduous trees on the south because during the winter, after dropping their leaves, the branches will filter the sun and provide desirable partial passive heating. Trees may shade roof surfaces where solar panels may be installed and decrease efficiency. Coordinate location of trees and solar panels. (2 points) • Use trees to shade the west side of the building. Minimum of 2 trees.	LEED SS 2, GPR C.5, & AZ (Scott)	**2**	
4.5	• Dwelling is designed with shaded outdoor living on north, south and/or east sides. • Provide total area of shaded outdoor living equal to at least 25% of total liveable floor area served.	AZ (Scott)	**2**	
	Subtotal:			
5	WATER - DRAINAGE: • **A drainage system will increase the durability of the home's foundation by draining water away from the structure.**			
5.1	• The site shall be developed to manage surface water (rain, irrigation, or nuisance water) away from buildings. Consider foundation and landscape drains as part of the drainage system.	CG A4.106.3 & A4.407.6	**M**	
5.2	• Soil analysis and protection: The soil at the building site are analyzed and protected as follows: (6 points max.) • Perform soil analysis by licensed professional and use for structural design. (2 points) • Site access is accomplished by minimizing the amount of cut and fill needed to install access roads and driveways. (2 points) • Underground construction activities are coordinated to utilize the same trench, minimize the amount of time the disturbed soil is exposed and the soil is replaced using accepted compaction methods. (2 points)	CG 4.106.2 & LEED SS 4.1	**6**	
5.3	• Design a site with balanced Cut/Fill	AZ (Scott)	**2**	
5.4	• Topsoil shall be protected or saved for reuse as specified in this section. (2 points max.) • Displaced topsoil shall be stockpiled for reuse in a designated area and covered or protected from erosion. (1 point) • The construction area shall be identified and delineated by fencing or flagging to limit construction activity to the construction area. (1 point)	CG 4.106.3 & LEED SS 4.1	**2**	
5.5	• Soil analysis shall be used to select plants and trees that will thrive in on-site soil conditions.		**1**	
	Subtotal:			

site

		Source Code	Points	Check
6	**WATER - RAIN:** • **Keep storm water on your lot with french drains, cisterns, retention basins. Keep water (rain and irrigation) away from the house**			
6.1	• Design building with roof overhangs to shed water away from the walls and doors. Install gutter and downspout systems to route water at least 5 feet away from the foundation or connect to landscape drains which discharge to a dry well, sump, bioswale, rainwater capture system or other approved on-site location.	CG A4.407.2 & A4.407.7	**2**	
6.2	• Door protection. Exterior doors to the dwelling are covered to prevent water intrusion by one or more of the following: (4 points max.) • An awning at least 3 feet in depth is installed (1 point) • The door is protected by a roof overhang at least 3 feet in depth (1 point) • The door is recesed at least 4 feet (1 point) • Other methods which provide equivalent protection (1 point)	CG A4.407.6	**4**	
6.3	• Use weather-based automatic irrigation controllers/timers to adjust function due to rain. (SEE WATER - USAGE)		**M**	
6.4	• Adhere to landscape material (drought-tolerant) guidelines adopted by Jurisdiction. (SEE WATER - USAGE)		**M**	
6.5	• Flashing details. Provide flashing details on building plans which comply with accepted industry standards or manufacturer's instructions. Details are shown on house plans at all of the following locations: • Around windows and doors • Roof valleys • Deck connections to the structure • Roof to wall instersections • Chimneys to roof intersections • Drip caps above windows and doors with architectural projections.	CG A4.106.4 & GPR P.A.1	**3**	
6.6	• Use permeable pavers for patios, walkways and driveways/parking • Min. 80% of exposed paving is light colored (at least 30% light reflectance value) • No less than 20% of total on-site hardscape. (1 point) OR • No less than 30% of total on-site hardscape (2 points)	AZ (Scott), CG A4.106.4 & GPR P.A.1	**1** **2**	
6.7	• Use deep irrigation and solar power controllers	LEED WE 2.1	**1**	
	Subtotal:			

7	**WATER - USAGE:** • **Use weather controlled automatic irrigation system controllers, use drip irrigation, use water efficient fixtures**			
7.1	• Adhere to (Coachella Valley) landscape material (drought-tolerant) guidelines adoped by Jurisdiction.	CG A4.106.3, Local Zoning, LEED SS 2.2-4	**M**	
7.2	• Adhere to (Coachella Valley and CVAG Water Efficiency Water Ordinance) landscape irrigation guidelines. • A water budget shall be developed for irrigation which meets and does not exceed CVWD requirements. • Install a low-water consumption irrigation system which minimizes the use of spray-type heads. For example, use non-sprinkler or drip, zoned irrigation system with multiple valves to accommodate specific water needs to different types of plants. • Use weather-based automatic irrigation controllers/timers to save water usage when raining.	CG A4.106.3, Local Zoning & LEED WE 2., CG A4.304.1 & AZ (Scott)	**M** **1** **2** **1**	

site

		Source Code	Points	Check
7	**WATER - USAGE: (cont.)**			
7.3	• Rainwater channeling methods using gutters, scuppers, downspouts and grading to direct runoff to landscaped areas.	AZ (Scott)	1	
7.4	• Use turf ONLY where it is actively used, and strictly limit the area. (4 points max.) • 10% of landscape area (2 points) • 0% of landscape (4 points)	CG A4.106.3, LEED SS 2.3 & GPR C.3	4	
7.5	• Graywater recovery: Graywater systems use wastewater from washing machine, showers, tubs, and lavatories. • Install a two-pipe drain system for future system • Install a complete graywater system with/without filtration/storage tank for landscape irrigation and/or toilet flushing.	CG 4.305 AZ (Scott)	1 2	
7.6	• Consider reducing the usage of indoor water by selecting plumbing fixtures with flow restrictors or aerators beyond code requirements. • Kitchen faucets and dishwashers with Max flow rate at sink faucet not greater than 1.5 gpm at 60 psi • All bathroom faucets and showerheads are high efficiency (2.0 or less GPM) • Toilets with high efficiency (1.3 or less gal/flush) and/or dual flush operated (average flush of 1.2 gal or less) • Dishwashers shall be Energy Star and not use more than 5.8 gallons per cycle. • Waterless toilets are installed. • Indoor water use shall be reduced by at least 20 percent by either water saving fixtures/flow restrictors or 20 percent reduction in baseline water use as defined in California Building Code.	CG 4.303.1 - 3 AZ (Scott)	1 3 3 1 1 6	
	Subtotal:			

		Source Code	Points	Check
8	**HEAT ISLAND:** • **Reduce heat island effect* and reduce rain runoff with pavers; reduce overall paving areas.**			
8.1	• Use shade trees and trellises to shade hardscape and patios. (SEE SHADE)	GPR P.A.1	M	
8.2	• Separate hardscape from the building to reduce heat transfer from outside to inside or use of cooldeck or similar coating for large concrete patios near house.	IDC	1	
8.3	• Use alternative paving (pavers, decomposed granite, etc.) that have less thermal mass than concrete. (SEE SHADE)	CG A4.106.4	M	
8.4	• Reduce glare (sunlight reflecting off the ground surface) by using drought-tolerant ground cover or material that scatters the sunlight (gravel). (SEE SHADE)	IDC	M	
8.5	• Consider the use of radiant barrier in overhangs over outdoor living areas as well as insulating the overhangs. Low -8-9 ft high uninsulated patio covers, carport roofs radiate heat into the ground and adjacent house wall especially metal deck shade structures. (SEE SHADE)	IDC	M	
	Subtotal:			

envelope

		Source Code	Points	Check
9	ROOF: • **Use "cool roof" coating or materials.**			
9.1	T24 ‹ Rigid insulation on top of roof sheathing.			
9.2	T24 ‹ Install "cool roof" system.	CG A4.106.5, AZ (Scott) & GPR P.E.1		
9.3	T24 ‹ Install a radiant barrier at the roof level.	CG A4.205.1		
9.4	T24 ‹ Consider "cool roof" coating for roofing	CG A4.106.5 & AZ (Scott)		
9.5	T24 ‹ In a vented attic design, install continuous ridge vent and eave vents for effective thermally-driven ventilation.			
9.6	T24 ‹ Use solar powered attic exhaust fan.			
9.7	• If metal roof system is being considered, design metal roof with stand-off battens to allow free flow thermally-driven air between roof sheathing and metal roofing.		**2**	
9.8	• Avoid petroleum-based roof system.		**2**	
9.9	• Use roof with a high durability/low maintenance material such as concrete, slate, clay or fiber cement.	AZ (Scott)	**2**	
9.10	• In a vented attic design, install continuous ridge vent and eave vents for effective thermally-driven ventilation.	AZ (Scott)	**2**	
9.11	• Use non-sawn lumber to frame the roof structure (at least 75%). Non sawn lumber uses less lumber. (SEE FRAMING CONSIDERATION)	AZ (Scott)	**M**	
9.12	• Energy heels on roof trusses (75% of attic insulation height at outside edge of exterior wall)	GPR D.6	**2**	
	Subtotal:			

10	ATTIC: • **Add insulation in the attic; Ventilate the attic; With evaporative coolers, discharge upducts through roof or the exterior.**			
10.1	T24 ‹ Perform third party blower door test to verify building envelope tightness.	CG A4.206		
10.2	T24 ‹ Exceed code minimum attic insulation values.	GPR J.2.a & J.2.i		
10.3	T24 ‹ Use extended-heel trusses to ensure full depth insualtion at eaves			

envelope

		Source Code	Points	Check
11	WALLS: • **Maximize wall insulation – outside and/or within the walls; use durable materials outside like plaster and/or fiber cement board.**			
11.1	T24 ‹ Use blown-in spray foam wall insulation to create air-tight walls. Continuous exhaust fans in bathrooms may be necessary.	CG 4.506		
11.2	T24 ‹ Exceed Code-mandated insulation values.	GPR F.1 & F.2		
11.3	T24 ‹ Carefully seal gaps and joints between framing members and sheathing	CG 4.406.1		
11.4	T24 ‹ Exterior insulation systems prevent thermal bridging and is most effective at reducing heat flow into the conditioned space.			
11.5	T24 ‹ Configure and place windows to limit solar exposure on west and south walls.	AZ (Scott)		
11.6	T24 ‹ Third party inspection of insulation, at least HERS grade II	LEED EA 2.1 & 2		
11.7	• The building wall system provides and integral air and water infiltration barrier or the house is wrapped with breathable exterior air and water infiltration barrier that allows water vapor to escape.	AZ (Scott)	**1**	
11.8	• Use durable and pre-finished exterior finish material (integrally colored plaster, fiber-cement siding and panels)	CG A4.405.1 & GPR E.3	**2**	
11.9	• Consider a "second-skin" wall system that shades west and south-facing walls. "Living walls", louvers and simple shades reduce the radiant heat build up from solar exposure.	AZ (Scott)	**4**	
11.10	• Use insulated headers at exterior doors and windows.	GPR D.4	**1**	
	Subtotal:			

12	WINDOWS: • **Select windows for their frame material (vinyl or fiberglass), dual-glazing, and coatings (low-e) in relation to their orientation. Verify coatings are appropriate to the desert climate. (SHGC < 0.30)**			
12.1	T24 ‹ Meet or Exceed Energy Star rated for windows	LEED EA 4.1, 4.2, & GPR J.2.j		
12.2	T24 ‹ Use spectrally selective glazing (SHGC of <0.28) on east-, south- and west-facing windows			
12.3	T24 ‹ Use argon gas-filled insulated glass units.			

structure

		Source Code	Points	Check
13	FRAMING CONSIDERATIONS: • **Place Joists, Rafters & Studs @ 24" O.C. It saves material.**			
13.1	• Building dimensions and layouts are designed to minimize waste.	CG A4.404.1-3 & AZ (Scott)		
	• Design stud spacing greater than 16" o.c.		**2**	
	• Design home on modular grid such as 24" or 48" to match dimensions of standard material		**2**	
	• Design beams, headers and trimmers at the minimum size to adequately support the load.		**1**	
13.2	• Use premanufactured building systems to eliminate solid sawn lumber whenever possible.	CG A4.404.3, GPR D.2.a, D.6 & AZ (Scott)		
	• Composite floor joist or premanufactured floor truss framing (Min. of 75%) of floor area.		**2**	
	• Composite roof rafter or premanufactured roof truss framing (Min. of 75%) of floor area.		**2**	
	• Composite framing for interior framing. (Min. of 75%) of wall area.		**2**	
	• Panelized wall framing systems (SIPS, ICF, or similar)		**2**	
	• Other methods approved by the enforcing agency		**2**	
13.3	• Material lists are included in the plans which specify material quality and provide direction for on-site cuts for all of the following:		**2**	
	• Floor framing			
	• Wall framing			
	• Ceiling and roof framing			
	• Structural panels and roof sheathing			
13.4	• Advanced framing technologies for walls and roof framing.	LEED MR 1.2, AZ (Scott)	**3**	
	Subtotal:			

14	MATERIAL EFFICIENCY: • **Consider using panelized or already assembled systems**			
14.1	• Select exterior finishes derived from regional sources within 500 miles of job site. This includes stone or culture stone veneers that are regionally quarried or processed. (1 point for each material over $2500, 5 points max)	GPR D.6 AZ (Scott)	**5**	
14.2	• Reduction in cement use: Products such as fly ash, slag, silica fume and rice hull ash used to replace cement in concrete mix design. (2 points max.)	CG A4.403 & AZ (Scott)	**2**	
	• No less than 20% substituted volume of cement. (1 point)			
	• No less than 25% substituted volume of cement. (2 points)			
14.3	• Use engineered lumber (Beams, headers, lumber for floors and rafters; oriented strand board for subfloor, walls and roof sheathing) (SEE FRAMING CONSIDERATIONS)		**M**	
14.4	• Use building materials that do not require additional resources for finishing (One or more of exterior trim, windows, siding or exterior wall coverings) (1 point each, 4 points max.)	CG A4.405.1	**4**	
14.5	• Floors that do not require additional coverings for finish.	CG A4.405.2	**2**	
	Subtotal:			

equipment

		Source Code	Points	Check
15	AIR CONDITIONING: • **Use high efficiency equipment (higher SEER and EER rating means higher efficiency – lower electrical usage, lower monthly bill). Efficiency is increased by dual-stage compressor and better controls. NOTE: the more choices you make that reduce the overall heat load on your home (more insulation, better windows, more shade) may reduce the size of the condensing unit (e.g. 3-ton vs. 4-ton).**			
15.1	• "Right-size" HVAC equipment. Carefully consider the energy efficiency measures selected in this Code that will influence the actual heat load on the air conditioning system. The size of the system (measured in "tons") may be reduced by as much as 30% through careful design and upgraded energy efficient measures.	CG A4.407, LEED EA 6.1, 6.2, 6.3 & GPR H.5	**M**	
15.2	T24 • Perform duct leakage testing to verify a total leakage rate of less than 6 percent of the total fan flow.	CG A4.207.8 & LEED EA 5.1		
15.3	T24 • General HVAC equipment verification and correction	CG A4.207 & GPR H.1		
15.4	T24 • Use condensing units with two-stage compressors (generally on units with SEER 16 or higher.) Use units with a minimum of EER 11.5.	CG A4.207.6, GPR J.2.f & AZ (Scott)		
15.5	T24 • Design and install a whole-house fan system.	AZ (Scott)		
15.6	T24 • Design and install an evaporative cooling system.	AZ (Scott)		
15.7	T24 • Install ductwork within the conditioned envelope of building, in an underfloor crawl space, with an R-6 or higher insulation value or buried in the ceiling insulation.	CG A4.207.7		
15.8	• Design the HVAC system to be zoned such that no more than two enclosed rooms are controlled by one thermostat (does not include bathroom, kitchens, closets, pantries, and laundry rooms).	AZ (Scott)	**2**	
15.9	• Design the furnace as a sealed - combustion unit.	AZ (Scott)	**1**	
15.10	• Configure and place windows to facilitate cross-ventilation.	AZ (Scott)	**2**	
15.11	• Install multi-speed Energy Star rated ceiling fans (One per bedroom and one per living room).	AZ (Scott)	**2**	
15.12	• HVAC system to incorporate a whole house filtration system with a MERV rating of at least 8. Pressure drop across the filter shall not exceed .1 inches water column and filter rack area should be sized at 300 fpm maximum face velocity for fan energy savings.	CG A4.506.1 AZ (Scott)	**2**	
15.13	• Indoor and/or outdoor living area utilizes a passive cooling method such as a cool tower or misting system.	AZ (Scott)	**1**	
15.14	• Water heaters, fireplaces and furnaces are sealed combustion units. Direct-vent heating and cooling equipment is utilized if the equipment will be located in the conditioned space or isntall the space heating and water heating equipment in an isolated mechanical room.	CG A4.506.2 AZ (Scott)	**1**	
	Subtotal:			

equipment

		Source Code	Points	Check
16	WATER HEATING: • **Tankless (on-demand) gas water heaters use less gas, but may require larger gas line.**			
16.1	T24 • With a storage water heater, the energy factor (EF) for a gas-fired storage water heater is higher than 0.60 and the energy factor (EF) for a gas-fired tankless water heater is .80 or higher.	CG A4.208.1 & 2, LEED EA 7.3 & AZ (Scott)		
16.2	T24 • Insulate (R-4) hot water pipes full distance from heater to fixture. Also consider insulating cold water piping if the pipes are located in attic or uninsulated exterior walls such as garages.	AZ (Scott)		
16.3	T24 • Consider integrating a solar thermal water heating system when the demand for hot water is equivalent.	CG A4.211.2		
16.44	• Design a water heater with sealed combustion unit. The water heater draws combustion air from the oudoors eliminating any chance of back drafting.	AZ (Scott)	**1**	
16.5	• Where the hot water source is more than 10 feet from a fixture, the potable water distribution system shall convey hot water using a method designed to minimize wait time for hot water to arrive at the fixture such as circulation pump system or solar thermal water heating system.	GPR G.1.c, AZ (Scott), CG A4.208.3 & CG A4.211.2	**2**	
	Subtotal:			

17	EVAPORATIVE COOLING: • **Evaporative coolers use a fraction of the energy air conditions does, brings in filetered fresh air, and ar effective except for about six weeks in late summer.**			
17.1	T24 • Design an evaporative cooler system to be used for the majority of the year and save on electrical load and can assist in night structure cooling if designed with night purge exhaust fan. Any areas with large diurnal temperature swings will benefit from structure cooling. (SEE WHOLE HOUSE FAN)	LEED EA 7.3 & AZ (Scott)		

18	EXHAUST FANS: • **Use Energy Star fans, exhaust outdoors. Humidistat, occupancy sensor, timer.**			
18.1	• Exhaust fans which terminate outside the building are provided in every bathroom.	CG 4.506.1	**1**	
18.2	• Local exhaust time/automatic controls for bathroom exhaust fans are installed.	LEED IED 5.2	**1**	
18.3	• Install Energy Star bathroom fans on timer or humidistat.	GPR H.8	**1**	
	Subtotal:			

19	WHOLE HOUSE FAN: • **When the outside temperature is between 55 - 70 deg. a whole house fan can draw air through the house at night. Called "night purging," the flow of air cools the inside of the house (especially heavy materials like stone counter tops and tile floors.) Then as the temperature rises during the day, the need for air conditioning is delayed.**			
19.1	• Openings. Whole house exhaust fans shall have insulated louvers or covers which close when the fan is off. Covers or louvers shall have a minimum insulation value of R-4.2.	CG A4.407	**M**	
19.2	• HVAC: Mechanical ventilation system for cooling installed such as an economizer to use cool air from the ambient to cool the building.	GPR H.9.b AZ (Scott)	**1**	
	Subtotal:			

equipment

		Source Code	Points	Check
20	POOL PUMP: • **New pool pumps use a variable-speed drive and more sensitive internal controls so the speed, and therefore the energy, more precisely matches the demand. This saves a lot of energy (money.)**			
20.1	• Install a two speed pump system	CG A4.210.1	**2**	
	Subtotal:			

21	APPLIANCES: • **Use Energy Star appliances.**			
21.1	• Energy star rated appliances including refrigerator, freezer, dishwasher and clothes washer. (1 point per appliance, 3 points max.)	CG A4.210.1, AZ (Scott), GPR M.1 & LEED EA 9.1	**3**	
	Subtotal:			

passive energy - comfort & health

			Source Code	Points	Check
22	THERMAL MASS:	• **Heavy materials like stone, tile, masonry and concrete can absorb a lot of heat. When combined with whole house fan can delay the use of air conditioning. However, they are also cool during the winter.**			
22.1	T24 • In desert climate, hard surface flooring reduces the cooling load during the summer, but during the winter the floor may be uncomfortably cool.				
23	THERMAL CHIMNEY:	• **"Hot air rises" the building can move air passively - indoors and outdoors.**			
23.1	• Operable skylights at the peak of the roof or a tower element with operable windows will draw hot air up and will facilitate natural ventilation.			**2**	
	Subtotal:				
24	DAYLIGHTING:	• **Bringing daylight into a room can reduce the need for lights, which has a direct economic benefit. Balancing the light within a room is equally important for comfort and beauty. The light should be balanced by right-sizing windows, locating them on two or more walls, using skylights or "solar tubes" and using shading devices to reduce direct penetration of sunlight for long periods of time.**			
24.1	• Natural light reduces the demand for electric lights during the day, however, glare and solar heat gain must be controlled. • Interior floor covering to be light in color with min. light reflectance value (LRV) of 25%,			**1**	
24.2	• Use external light shelves to control direct sunlight.			**2**	
24.3	• Configure and place windows so daylight enters from two sides in each room.		AZ (Scott)	**2**	
24.4	• Provide skylights for daylight in interior spaces and to balance light from large windows on one wall only.			**1**	
	Subtotal:				
25	LIGHTING:	• **Use fixtures with greater illumination with lower electrical demand to lower the overall electrical load of the house.**			
25.1	T24 • Consider lighting fixtures that have high efficacy lighting. These include compact or tubular fluorescent and light emitting diodes (LED)		AZ (Scott)		
25.2	T24 • Max interior lighting wattage does not exceed .5 watts per sq ft as determined by aggregate wattage not including plug loads.		AZ (Scott)		
25.3	• Building lighting consists of at least 90 percent ENERGY STAR qualified hard-wired fixtures.		CG A4.209.1	**2**	
25.4	• Design recessed lights so they do not penetrate the thermal barrier.		AZ (Scott)	**2**	
25.5	• Smart wiring system to be installed for controlling lighting and telecommunications.		AZ (Scott)	**2**	
25.6	• Use occupancy sensors for closets, pantries, bathrooms, etc.		AZ (Scott)	**1**	
	Subtotal:				
26	NIGHT PURGING:	• **See "whole house fans".**			

passive energy - comfort & health

		Source Code	Points	Check
27	INDOOR AIR QUALITY: • **Off-gassing is the process by which materials release chemicals used to fabricate or hold them together. Carpet, adhesives, medium density fiberboard (a substitute for plywood in cabinets) and paints are sources for harmful off-gassing. Select materials that have a SCAQMD (South Cost Air Quality Management) compliance. After your home is painted and all cabinets and carpet are installed, flush out the off-gassed air. Run the whole house fan full time for up to a week, or as long as you smell the odors.**			
27.1	• Joints and openings. Openings in the building envelope separating conditioned space from unconditioned space needed to accommodate gas, plumbing, electrical lines and other necessary penetrations must be sealed in compliance with the California Energy Code.	CG A4.406	**M**	
27.2	• Fire place: Any installed gas fireplace shall be a direct-vent sealed-combustion type.	CG A4.503	**M**	
27.3	• For Cabinetry or interior trims: Meet the formaldehyde limits or use composite wood products with California Air Resources Board.	CG A4.504.1. 5 & GPR K.7-8	**3**	
27.4	• Select all interior materials that are low-emitting (VOC): eg. Adhesives, resileient flooring, carpet, paints, and sealer. Documentation which includes manufacturer's product specification and field verfication of on-site product containers.	CG 4.504.2.1-3 & GPR F.2 & K.2 - 3	**M**	
27.5	• Resilient flooring systems. Where resilient flooring is installed, at least 50 percent of floor area receiving resilient flooring shall comply with the VOC emission limits defined in the Collaborative for High Performance Schools (CHPS) Low-emitting Materials List or certified under the Resilient Floor Covering Institute (RFCI) FloorScore program.	CG 4.504.4	**M**	
	• A minimum of 80% of the total area of resilient flooring installed shall comply (2 points) OR		**3**	
	• A minimum of 90% of the total area of resilient flooring installed shall comply (3 points)			
27.6	• Composite wood products. Hardwood plywood, particleboard and medium density fiberboard composite wood products used on the interior or exterior of the building shall meet the requirements for formaldehyde as specified in ARB's Air Toxics Control Measure for Composite Wood. Documentation of verfication is required.	CG 4.504.5	**M**	
27.7	• Covering of duct openings and protection of mechanical equipment during construction. At the time of rough installation or during storage on the construction site and until final startup of the heating and cooling equipment, all duct and other related air distribution component openings shall be covered with tape, plastic, sheetmetal or other methods acceptable to the enforcing agency to reduce the amount of dust or debris which may collect in the system.	CG A4.504	**M**	
27.8	• Concrete slab foundations required to have a vapor retarder by Capillary break. A capillary break shall be installed in compliance with a 4-inch (101.6 mm) thick base of 1/2 inch or larger clean aggregate shall be provided with a vapor barrier in direct contact with concrete and a concrete mix design, which will address bleeding, shrinkage, and curling, shall be used. For additional information, see American Concrete Institute, ACI 302.2R-06 or other designs by a licensed design professional.	CG 4.505	**M**	
27.9	• Bathroom exhaust fans. Mechanical exhaust fans which exhaust directly from bathrooms shall comply with the following:	CG A4.506	**M**	
	• Fans shall be ENERGY STAR compliant and be ducted to terminate outside the building.			
	• Unless functioning as a component of a whole house ventilation system, fans must be controlled by a humidistat which shall be readily accessible			
27.10	• Flush home continuously for 1 week with windows open after renovation is completed.	LEED IEQ 8.3 & GPR K.9	**1**	

			Source Code	Points	Check
27	INDOOR AIR QUALITY: (cont.)				
27.11	• Reduce pollution entering the home from the garage (garage exhaust fan or detached garage)		GPR D.9	**2**	
27.12	• Use timer/automatic controls for bathroom exhaust fans.		LEED IEQ 5.2	**2**	
27.13	• Insulate dwelling with formaldehyde-free insulation. Documentation must be provided that verifies the materials are certified to meet this the pollutant emission limits in this section.		CG 4.504.4 & AZ (Scott)		
		• Install thermal insulation in compliance with the VOC emission limits defined in CHPS Low emitting Material List.		**2**	
		• Install thermal insulation which contains No-Added Formaldehyde and is in compliance with the VOC emission limits defined in CHPS Low emitting Material List.		**3**	
		Subtotal:			

conservation of materials

		Source Code	Points	Check
28	RECYCLED/RAPIDLY RENEWABLE: • **Look into the cool new materials that manufacturers make from recycled or rapidly renewable materials. There are new ones every week.**			
28.1	• Use Recycled Content Aggregate (Min. 25%) • Walkway and driveway base • Roadway Base	CG A4.405.3	**1** **1**	
28.2	• Recycled content roof material reduces new resources: (4 points max.) • A min. of 25% of roof area uses recyled or recycled content roof material. (2 points) • A min. of 50% of roof area uses recyled or recycled content roof material. (4 points)	CG A4.405.3	**4**	
28.3	• Replace portland cement in concrete with recycled flyash or slag: Min 20% flyash and/or slag content. Check with street engineer.	GPR B.1.a & b	**2**	
28.4	• Install insulation with 30% post-consumer recycled content and no added formaldehyde.	GPR F.1	**1**	
28.5	• Use recycled content paint.	GPR K.5	**1**	
28.6	• Flooring: Environmentally preferable flooring: FSC certified wood, reclaimed or refinished, rapidly renewable, recycled content, exposed concrete or locally sourced stone or tile.	GPR K.6 & L.1	**2**	
28.7	• Innovations: Structural frame and building envelope, use FSC certified engineered lumber for headers, I-joists, trusses, and rafters.	GPR P.D.3	**3**	
28.8	• Select fascia, soffit and trim elements made of recycled-content materials (including metals) or engineered wood products such as finger jointed trim, fiberboard, laminated starnd lumber or OSB.	AZ (Scott)	**1**	
28.9	• Select countertops manufactured from min. of 20% recycled content material.	AZ (Scott)	**1**	
28.10	• Recycled content. Use materials, equivalent in performance to virgin materials, with postconsumer or preconsumer recyled content. Documentation to be provided as to the respective values. (4 points max.) • No less than 10% recycled content value of the total value, based on estiamted cost of materials of the project. (2 points) • No less than 15% recycled content value of the total value, based on estiamted cost of materials of the project. (4 points)	CG A4.405.3	**4**	
28.11	• Use of building materials from renewable sources. Use one or more of the following materials manufactured from rapidly renewable sources or agricultural by-products is used (products typically harvested within a 10 year or shorter cycle): (5 points max.) • Insulation (1 point) • Bamboo or cork (1 point) • Engineered wood products (1 point) • Agricultural based products (1 point) • Other products acceptable by the enforcing agency. (1 point)	CG A4.405.4, LEED MR 2.1-2 & GPR C 9	**5**	
	Subtotal:			

conservation of materials

		Source Code	Points	Check
29	RECYCLE CONSTRUCTION WASTE during DEMOLITION: • **Education and site setup are important during construction. If the set up is done well from the beginning, everyone working on the site will follow. For example, provide separate recyle bins during construction for recycling of everyday objects (plastic bottles and aluminum cans) but also for construction waste: drywall, glass, metals, concrete/plaster.**			
29.1	• Construction waste reduction: A minimum of 50% of the construction waste generated at the site is diverted to recycle or salvage.	CG 4.408	**M**	
29.2	• Construction waste management plan. Where a local jurisdiction does not have a construction and demolition waste management ordinance, a construction waste management plan shall be submitted for approval to the enforcing agency.	CG 4.408.2, LEED MR 3.2, & GPR A.2	**M**	
29.3	• Construction waste reduction: Enhanced construction waste generated at the site is diverted to recycle or salvage. Documentation shall be provided to the enforcing agency which demostrates compliance. (3 points max.) • A minimum of 65% of the construction waste generated at the site is diverted to recycle or salvage. (2 points) • A minimum of 75% of the construction waste generated at the site is diverted to recycle or salvage. (3 points)	CG 4.408.1, LEED MR 3.2, & GPR A.2	**3**	
	Subtotal:			

30	RECYCLE - WASTE DESIGN: • **When recycling facilities are available, recycling becomes second nature.**			
30.1	• Install built-in recycling and/or composting in site design	GPR M.4	**1**	
30.2	• Install pull-out kitchen base cabinet with separate recycle/trash bins.	AZ (Scott)	**1**	
30.3	• Building operation and maintenance manual. At the time of final inspection, a manual, compact disc, web-based reference or other media acceptable to the enforcing agency which includes all of the following shall be placed in the building.	CG 4.410	**M**	
	Subtotal:			

on-site generation

		Source Code	Points	Check
31	SOLAR - PHOTO VOLTAIC: • **Reduce the peak power demand through the use of on-site renewable energy systems or contracting with off-site energy companies.**			
31.1	• Install a solar photovoltaic (PV) system in compliance with California Energy Commission New Solar Homes Partnership (NSHP). 2 points for each 10% of annual electrical load (KWh) met by system. (10 points max.)	CG A4.211.1 & 4	**10**	
31.2	• Provide a min. one-inch conduit from the electrical service equipment for the future installation of a (PV) system with A minimum of 300 square feet of unobstructed roof area facing within 30° of south is provided for future solar collector or photovoltaic panels.		**2**	
31.3	• Use solar powered lighting for exterior site lighting, attic fan, and irrigation controller. At least 50% of the exterior site lighting.	AZ (Scott)	**1**	
	Subtotal:			
32	SOLAR - THERMAL: • **Even though solar thermal water heating is very efficient, for very low demand, it may not be practical.**			
32.1	• Install a solar water heating system when the demand of hot water is equivalent to the production of hot water or provide space on the roof surface (200 SF south-facing), penetrations (stand-offs) through the roof surface, and one-inch conduit for future solar installation. Consult with a structural engineer for additional load requirements to the roof structure.	CG A4.211.2 & 3	**2**	
	Subtotal:			
33	FUEL CELL: • **For very large homes a fuel cell system may make economic sense to level out the electrical demands. The fuel cell uses natural gas to generate electricity; the process also generates heat that can provide domestic hot water and partially heat a swimming pool (during the winter).**			
33.1	• Design and install a fuel cell using hydrogen generated by natural gas if the demand for hot water justifies the use. 2 points for each 10% of annual electrical load (KWh) met by system with max. of 8 points.	AZ (Scott)	**8**	
	Subtotal:			
	Total			

TECHNICAL BUILDING MEASURES AND POINT SYSTEM

FOR THE BUILDING OWNER PLANNING TO REMODEL MULTIFAMILY HOUSING

site

			Source Code	Points	Check
M	BASE REQUIREMENT	• **As California continues to grow, the state faces ever-increasing challenges in energy. One way to ensure our future is to improve the energy efficiency of the building envelope.**			
	T24 • Building designed to be at least 15% above California Building Code Title 24		CG	**20**	

			Source Code	Points	Check
1	EVALUATION OF EXISTING CONDITIONS:	• **Help preserve open space and utilize existing infrastructure, promote social interaction and community safety, and reuse existing resources instead of creating more landfill waste.**			
1.1	• Site Preservation: Prior to beginning the construction activities, all parties involved with the development process shall receive a written guideline and instruction specifying the green goals of the project.		CGA4.104	**1**	
1.2	• Deconstruction: 50% of the weight of Existing buildings on the site are deconstructed and recycled at recycled centers. Documentation is required.		CGA4.105.1	**M**	
1.3	• Reuse of materials: Materials can be easily reused but must be in compliance with T24 requirements. For example: (1 point each, 4 points max.)		CGA4.105.2	**4**	
		• Light fixtures, appliances, and electrical devices.			
		• Plumbing fixtures			
		• Door and trims			
		• Masonry			
		• Foundation			
1.4	• Apartment Reuse: maintain existing walls, floors and roof. Maintain the existing building structure (including structural floor and roof decking) and envelope (the building framing, excluding window assemblies and non-structural roofing material). The minimum percentage per building reuse for each point threshold is as follows: (4 points max.)		CGA4.105.2	**4**	
		• 50% (2 points)			
		• 75% (3 points)			
		• 95% (4 points)			
		Subtotal:			

			Source Code	Points	Check
2	SOLAR ORIENTATION:	• **Minimize east- and west-facing walls and windows; maximize north-facing windows.**			
2.1	T24 • By carefully configuring the buildings and windows, glazing exposed to the east and west can be minimized. No more than 25% of total glazing faces east or west. (SEE WINDOWS)		LEED ID 1.5		

TECHNICAL BUILDING MEASURES AND POINT SYSTEM

FOR THE BUILDING OWNER PLANNING TO REMODEL MULTIFAMILY HOUSING

site

		Source Code	Points	Check
3	SHADE: • **Provide shade for walks, walls and windows.**			
3.1	T24 • Use several strategies to provide appropriate shade for east- and west-facing windows during the summer, and south-facing windows in the winter using combination of vertical and horizontal shading devices.	CG A4.205.2		
3.2	T24 • Provide shading with a projection ratio of 0.5 on south facing windows. (Overhang projects half the height of the window.)	GPR AA.7.b CG A4.407.7		
3.3	T24 • Install window screens with a shading coefficient of .45 or lower to reduce heat radiation	AZ (Scott)		
3.4	• Trees on the west and east can be evergreen, but consider using deciduous trees on the south because during the winter, after dropping their leaves, the branches will filter the sun and provide desirable partial passive heating. Trees may shade roof surfaces where solar panels may be installed and decrease efficiency. Coordinate location of trees and solar panels. • Provide trees to shade the west side of the building. Minimum of 2 trees per side.	LEED SS 2, GPR C.5, & AZ (Scott)	**2**	
3.5	• Provide shade for sidewalks, parking areas and patios. Minimum 50% of all hardscape within 3 years.	LEED SS 3.1 GPR A.5	**1**	
3.6	• Reduce roof heat island effects for Mid-rise: Install roof with high albedo materials on 75% roof area or install vegetated roof for at least 50% roof area. (SEE ROOF)	LEED SS 3.2	**1**	
	Subtotal:			

4	WATER - RAIN: • **Keep storm water on your lot with french drains, cisterns, retention basins. Keep water (rain and irrigation) away from buildings.**			
4.1	• Door protection. Exterior doors to the dwelling are covered to prevent water intrusion by one or more of the following: (1 point each, 2 points max.) • An awning at least 3 feet in depth is installed. • The door is protected by a roof overhang at least 3 feet in depth. • The door is recessed at least 3 feet. • Other methods which provide equivalent protection.	CG A4.407.6	**2**	
4.2	• Use weather-based automatic irrigation controllers/timers to adjust function due to rain. (SEE WATER - USAGE)		**M**	
4.3	• Adhere to landscape material (drought-tolerant) guidelines adopted by Jurisdiction. (SEE WATER - USAGE)		**M**	
4.4	• Flashing details. Provide flashing details on building plans which comply with accepted industry standards or manufacturer's instructions. Details are shown on house plans at all of the following locations: • Around windows and doors • Roof valleys • Deck connections to the structure • Roof to wall intersections • Drip caps above windows and doors with architectural projections.	CG A4.106.4 & GPR P.A.1	**3**	
4.5	• Use permeable pavers for patios, walkways and driveways/parking to improve on-site percolation, reduce glare and heat island effect. Min. 50% of hardscape. • Min. 80% of exposed paving is light colored (at least 30% light reflectance value) • No less than 20% of total on-site hardscape (2 points) OR • No less than 30% of total on-site hardscape (4 points)	AZ (Scott), CG A4.106.4 & GPR P.A.1	**2** **4**	
4.6	• Use deep irrigation and solar power controllers (SEE SOLAR)		**M**	
4.7	• The civil engineer and landscape architect collaborate on the drainage and grading to utilize rainwater as part of the irrigation of landscape material.	CG A4.304.2	**2**	
	Subtotal:			

		Source Code	Points	Check
5	WATER - USAGE: • **Use weather controlled automatic irrigation system controllers, use drip irrigation, use water efficient fixtures**			
5.1	• Adhere to (Coachella Valley) landscape material (drought-tolerant) guidelines adopted by Jurisdiction.	CG A4.106.3, Local Zoning, LEED SS 2.2-4	**M**	
5.2	• Adhere to (Coachella Valley and CVAG Water Efficiency Water Ordinance) landscape irrigation guidelines.	CG A4.106.3, Local Zoning & LEED WE 2., CG A4.304.1 & AZ (Scott)	**M**	
	• A water budget shall be developed for irrigation which meets and does not exceed CVWD requirements.		**1**	
	• Install a low-water consumption irrigation system which minimizes the use of spray-type heads. For example, use non-sprinkler or drip, zoned irrigation system with multiple valves to accommodate specific water needs to different types of plants.		**2**	
	• Use weather-based automatic irrigation controllers/timers to save water usage when raining.		**1**	
5.3	• Rainwater channeling methods using gutters, scuppers, downspouts and grading to direct runoff to landscaped areas.	AZ (Scott)	**2**	
5.4	• Use turf ONLY where it is actively used, and strictly limit the area. (2 points max.)	CG A4.106.3, LEED SS 2.3 & GPR C.3	**2**	
	• 10% of landscape area (1 point)			
	• 0% of landscape (2 points)			
5.6	• Consider reducing the usage of indoor water by selecting plumbing fixtures with flow restrictors or aerators beyond code requirements	CG 4.303.1 - 3 AZ (Scott)		
	• Kitchen faucets and dishwashers with Max flow rate at sink faucet not greater than 1.5 gpm at 60 psi		**1**	
	• All bathroom faucets and showerheads are high efficiency (2.0 or less GPM)		**3**	
	• Toilets with high efficiency (1.3 or less gal/flush) and/or dual flush operated (average flush of 1.2 gal or less)		**3**	
	• Dishwashers shall be Energy Star and not use more than 5.8 gallons per cycle.		**1**	
	• Nonwater supplied urinals, waterless toilets, or pint urinals are installed in public facilities.		**1**	
	OR			
	• Indoor water use shall be reduced by at least 20 percent by either water saving fixtures/flow restrictors or 20 percent reduction in baseline water use. (Choose any of the credits above OR this credit, but not both.)		**6**	
	Subtotal:			

site

		Source Code	Points	Check
6	HEAT ISLAND: • **Hardscape throughout the site increases the heat island effect.**			
6.1	• Use shade trees and trellises to shade hardscape and patios. (SEE SHADE)	GPR P.A.1	**M**	
6.2	• Separate hardscape from the building to reduce heat transfer from outside to inside or use of cool deck or similar for large concrete patios near buildings.	IDC	**1**	
6.3	• Use alternative paving (pavers, decomposed granite, etc.) that have less thermal mass than concrete. (SEE WATER - RAIN)	CG A4.106.4	**M**	
6.4	• Reduce glare (sunlight reflecting off the ground surface) by using drought-tolerant ground cover or material that scatters the sunlight (gravel). (SEE WATER - RAIN)	IDC	**M**	
6.5	• Reduce roof heat island effects for Mid-rise: Install roof with high albedo materials on 75% roof area or install vegetated roof for at least 50% roof area. Consider using radiant barrier in overhangs over outdoor living areas as well as insulating the overhang. Low -8-9 ft high uninsulated patio covers, carport roofs radiate heat into the ground and adjacent building walls such as metal deck shade structures. (SEE SHADE)	LEED SS 3.2	**M**	
	Subtotal:			

7	PARKING REQUIREMENTS: • **Provide preferred stalls for electric or hybrid vehicles. Consider on-street and joint-use parking to reduce on-site parking**				
7.1	• Provide preferential parking for low-emitting, fuel efficient vehicles, for motorcycles and scooters, for bicycles and for golf-carts. Negotiate with planning department to include such vehicles in parking count.		LEED SS 7.3.a		
		• 5% of total capacity is preferred parking spots for low-emitting vehicles.	LEED SS 7.3.b	**1**	
		• Alternative-fuel refueling stations for 3% of total vehicle capacity.	LEED SS 7.3.c	**1**	
	Subtotal:				

site

TECHNICAL BUILDING MEASURES AND POINT SYSTEM

FOR THE BUILDING OWNER PLANNING TO REMODEL MULTIFAMILY HOUSING

envelope

		Source Code	Points	Check
8	ROOF: • **Use "cool roof" coating or materials; install rigid or spray-applied foam on roofs.**			
8.1	T24 • Rigid insulation on top of roof sheathing.			
8.2	T24 • Install "cool roof" system.	CG A4.106.5, AZ (Scott) & GPR P.E.1		
8.3	T24 • Consider "cool roof" coating for roofing	CG A4.106.5 & AZ (Scott)		
8.4	T24 • In a vented attic design, install continuous ridge vent and eave vents for effective thermally-driven ventilation.	AZ (Scott)		
8.5	T24 • Use solar powered attic exhaust fan. (SEE SOLAR - PHOTOVOLTAIC)			
8.6	• Install a radiant barrier at the roof level.	IDC	**2**	
8.7	• If metal roof system is being considered, consider the design of metal roof with stand-off battens to allow free flow thermally-driven air between roof sheathing and metal roofing.	IDC	**2**	
8.8	• Avoid petroleum-based roof system.	GPR	**2**	
8.9	• All roofing has 3-yr subcontractor warranty and 20-yr manufacturer warranty.	GPR E.2.a	**2**	
8.10	• Use durable and fire resistant roofing materials or assembly.	GPR E.2.b	**1**	
8.11	• Use rigid insulation on top of roof sheathing.	GPR	**1**	
8.12	• Use roof with a high durability/low maintenance material such as concrete, slate, clay or fiber cement. Consult with structural engineer on the load carrying capacity of the existing roof framing.	AZ (Scott)	**2**	
8.13	• In a vented attic design, install continuous ridge vent and eave vents for effective thermally-driven ventilation.	AZ (Scott)	**2**	
	Subtotal:			

9	ATTIC: • **Maximize insulation in the attic**			
9.1	T24 • Perform third party blower door test to verify building envelope tightness.	CG A4.206		
9.2	T24 • Exceed code minimum attic insulation values.	GPR J.2.a & J.2.i		
9.3	T24 • Use extended-heel trusses to ensure full depth insulation at eaves.	GPR		

10	WALLS: • **Maximize wall insulation – outside and/or within the walls; use durable materials outside like plaster and/or fiber cement board.**			
10.1	T24 • Use blown-in spray foam wall insulation to create air-tight walls. Continuous exhaust fans in bathrooms may be necessary.	IDC		
10.2	T24 • Exceed Code-mandated insulation values.	GPR F.1 & F.2		
10.3	T24 • Carefully seal gaps and joints between framing members and sheathing.	CG 4.406.1		
10.4	T24 • Exterior insulation systems prevent thermal bridging and is most effective at reducing heat flow into the conditioned space.	IDC		
10.5	T24 • Configure and place windows to limit solar exposure on west and south walls.	AZ (Scott)		
10.6	T24 • Third party inspection of insulation, at least HERS grade II.	LEED EA 2.1 & 2		
10.7	• Use durable and pre-finished exterior finish material (integrally colored plaster, fiber-cement siding and panels)	CG A4.405.1 & GPR E.3	**2**	
10.8	• Consider a "second-skin" wall system that shades west and south-facing walls. "Living walls", louvers and simple shade reduces the radiant heat build up from solar exposure.	AZ (Scott)	**4**	
	Subtotal:			

envelope

		Source Code	Points	Check
11	WINDOWS: • **Specify coatings to reduce solar heat gain. For east- south-, and west-facing windows, use glazing with SHGC <0.28. For north-facing windows, the SHGC need not be as low. Select windows with fiberglass, vinyl or thermally broken frames.**			
11.1	T24 • Meet or Exceed Energy Star rated for windows.	LEED EA 4.1, 4.2, & GPR J.2.j		
11.2	T24 • Use spectrally selective glazing (SHGC of <0.28) on east-, south- and west-facing windows.			
11.3	T24 • Use argon gas-filled insulated glass units.			
11.4	T24 • By carefully configuring replacement windows, glazing exposed to the east and west can be minimized. No more than 25% of total glazing faces east or west.	LEED ID 1.5		

		Source Code	Points	Check
12	MATERIAL EFFICIENCY: • **Consider using panelized or already assembled systems**			
12.1	• Select exterior finishes derived from regional sources within 500 miles of job site. This includes stone or culture stone veneers that are regionally quarried or processed.	GPR D.6 AZ (Scott)	**1**	
12.2	• Use building materials that do not require additional resources for finishing (One or more of exterior trim, windows, siding or exterior wall coverings)	CG A4.405.1	**2**	
12.3	• Floors that do not require addition coverings for finish.	CG A4.405.2	**2**	
	Subtotal:			

structure

equipment

		Source Code	Points	Check
13	AIR CONDITIONING: • **For a multi-tenant building, roof-mounted package HVAC units are the most common solution, and higher efficiency units use less energy. Careful design will take into consideration energy efficiency upgrades, and room-by-room loads therefore a smaller unit may suffice.**			
13.1	• "Right-size" HVAC equipment. Carefully consider the energy efficiency measures selected in this Code that will influence the actual heat load on the air conditioning system. The size of the system (measured in "tons") may be reduced by as much as 30% through careful design and upgraded energy efficient measures.	CG A4.407, LEED EA 6.1, 6.2, 6.3 & GPR H.5	**M**	
13.2	T24 • Perform duct leakage testing to verify a total leakage rate of less than 6 percent of the total fan flow.	CG A4.207.8 & LEED EA 5.1		
13.3	T24 • General HVAC equipment verification and correction	CG A4.207 & GPR H.1		
13.4	T24 • Use condensing units with two-stage compressors and multi-speed or two speed air handling fan (generally on units with SEER 13 or higher.) Use units with a minimum of EER 11.5.	CG A4.207.6, GPR J.2.f AZ (Scott)		
13.5	T24 • Design and install an evaporative cooling system to Public or Support Facilities.	AZ (Scott)		
13.6	• Install multi-speed Energy Star rated ceiling fans (Min of three). SEE APPLIANCES.	AZ (Scott)	**M**	
13.7	• Adding an economizer cycle to the HVAC unit will allow "night purging" when the days are hot, but the night temperature drops below 68 degrees to Public or Support Facilities.	LEED EQ 4	**2**	
13.8	• Specify filtration of MERV 8 or higher to improve the indoor air quality, cut down on allergens and increase comfort.	CG A4.506.1 LEED EQ 7, AZ (Scott)	**2**	
	Subtotal:			

14	WATER HEATING: • **Tankless (on-demand) gas water heaters use less gas than standard storage tank water heaters.**			
14.1	T24 • With a storage water heater, the energy factor (EF) for a gas-fired storage water heater is higher than 0.60 and the energy factor (EF) for a gas-fired tankless water heater is .80 or higher. Consider a solar thermal system for to provide central domestic hot water heating for each apartment building. Consider a solar thermal system for individual apartments that have 2 or more bathrooms or 3 or more bedrooms. Consult with a structural engineering on the load capacity of the existing roof structure.	CG A4.208.1 & 2, LEED EA 7.3 & AZ (Scott)		
14.2	T24 • Insulate (R-4) hot water pipes full distance from heater to fixture. Insulate all hot water piping. Also, consider insulating cold water piping if run in attic or in uninsulated exterior walls.	AZ (Scott)		
14.3	T24 • Consider integrating a solar thermal water heating system when the demand for hot water is equivalent. (SEE SOLAR - THERMAL and Credit 17.1)	CG A4.211.2		
14.4	• Design a water heater with sealed combustion unit. The water heater draws combustion air from the outdoors eliminating any chance of back drafting.	AZ (Scott)	**1**	
14.5	• Where the hot water source is more than 10 feet from a fixture, the potable water distribution system shall convey hot water using demand controlled pumping system method. The systems could be recirc systems, temperature based recirc systems, timer and temperature based recirc systems, and demand based non-recirc systems. These four strategies minimize the wait time for hot water, but only the demand based non-recirc system uses no energy except when hot water is called for.	GPR G.1.c, AZ (Scott), CG A4.208.3 & CG A4.211.2	**2**	
	Subtotal:			

		Source Code	Points	Check
15	EVAPORATIVE COOLING: • **Two-stage evaporative coolers that use air-to-air heat exchangers may be very effective in back of house areas and can assist in night structure cooling if designed with night purge exhaust fan. Any areas with large diurnal temperature swings will benefit from structure cooling.**			
15.1	T24 • Dwelling units and/or enclosed common areas are provided with an evaporated cooling system with independent air distribution system.	LEED EA 7.3 & AZ (Scott)		
16	EXHAUST FANS: • **Use Energy Star fans, exhaust to the outdoors, occupancy sensor, and timer.**			
16.1	• Verify that the exhaust ventilation system meets Title 24 requirements.	CG A4.207.2 & LEED IEQ 5.1	**M**	
16.2	• Exhaust fans which terminate outside the building are provided in every bathroom at shared facilities. (SEE INDOOR AIR QUALITY)	CG A4.506.1	**1**	
16.3	• Local exhaust time/automatic controls for bathroom exhaust fans	LEED IED 5.2	**1**	
	Subtotal:			
17	POOL PUMP: • **New pool pumps use a variable-speed drive and more sensitive internal controls so the speed, and therefore the energy, more precisely matches the demand. This saves a lot of energy (money.)**			
17.1	• Consider a two speed pump system for shared pool facility.	CG A4.210.1	**2**	
	Subtotal:			
18	APPLIANCES: • **Use Energy Star appliances.**			
18.1	• Energy star rated appliances including refrigerator, freezer, dishwasher and clothes washer. (1 point per appliance, 3 points max.)	CG A4.210.1, AZ (Scott), GPR M.1 & LEED EA 9.1	**3**	
18.2	• Energy Star ceiling fans and light kits in living areas and bedrooms. (SEE AIR CONDITIONING)	GPR H.3.b.i	**1**	
18.3	• Energy Star bathroom fans on timer or humidistat. (SEE AIR CONDITIONING)	GPR H.4.d	**1**	
	Subtotal:			

equipment

passive energy - comfort & health

		Source Code	Points	Check
19	THERMAL MASS: • **Heavy materials like stone, tile, masonry and concrete can absorb a lot of heat. When combined with an economizer cycle and "night purging" the cool surfaces absorb heat and can delay the use of air conditioning.**			
19.1	T24 • In desert climate, hard surface flooring reduces the cooling load during the summer, but during the winter the floor may be uncomfortably cool.	IDC		
20	DAYLIGHTING: • **Bringing daylight into a building can reduce the need for lights, which has a direct economic benefit. However, the greater benefit is the uplifting nature that natural light brings. Morale, productivity, even sales are increased in spaces illuminated by natural daylight. Balancing the light within a space is also important to reduce glare and "hot spots." Exterior shading devices, light shelves, orientation of windows, skylights and "solar tubes" are all part of the design strategies for balanced natural daylighting. The type of glazing is important to reduce both solar heat gain and UV penetration.**			
20.1	• Natural light reduces the demand for electric lights during the day, however, glare and solar heat gain must be controlled. • Interior floor covering to be light in color with min. light reflectance value (LRV) of 25%	IDC	1	
20.2	• Use external light shelves to control direct sunlight. (SEE SHADE)	IDC	M	
20.3	• Configure and place windows so daylight enters from two sides in each room. (Min. of 2 rooms)	AZ (Scott)	2	
20.4	• Provide skylights for daylight in interior spaces and to balance light from large windows on one wall only on top floor units, public or support facilities.	IDC	1	
20.5	• Design a balanced daylighting scheme for the common area and administrative facilities. Include photo sensors and dimmable ballasts for areas served by windows and skylights. (Min. of 2 rooms)	AZ (Scott)	2	
	Subtotal:			
21	LIGHTING: • **Use fixtures with greater illumination with lower electrical demand to lower the overall electrical load of the apartment units.**			
21.1	T24 • Consider lighting fixtures that have high efficacy lighting. These include compact or tubular fluorescent and light emitting diodes (LED)	AZ (Scott)		
21.2	T24 • Max interior lighting wattage does not exceed .5 watts per sq ft as determined by aggregate wattage not including plug loads.	AZ (Scott)		
21.3	• Building lighting consists of at least 90 percent ENERGY STAR qualified hard-wired fixtures.	CG A4.209.1	2	
21.4	• Design Recessed lights so they do not penetrate the thermal barrier. (SEE ATTIC)	AZ (Scott)	M	
21.5	• Smart wiring system to be installed for controlling lighting and telecommunications for public or support facilities.	AZ (Scott)	2	
21.6	• Use occupancy sensors for closets, pantries, bathrooms, etc.	AZ (Scott)	1	
	Subtotal:			

passive energy - comfort & health

		Source Code	Points	Check
22	INDOOR AIR QUALITY: • **Off-gassing is the process by which materials release chemicals used to fabricate or hold them together. Carpet, adhesives, medium density fiberboard (a substitute for plywood in cabinets) and paints are sources for harmful off-gassing. Select materials that meet the VOC limits of the Air Resources Board. After the interiors are painted and all cabinets and carpet are installed, flush out the off-gassed air. Run the economizer cycle on the HVAC unit or the whole house fan to continuously replace inside air with fresh outside air.**			
22.1	• Joints and openings. Openings in the building envelope separating conditioned space from unconditioned space needed to accommodate gas, plumbing, electrical lines and other necessary penetrations must be sealed in compliance with the California Energy Code.	CG A4.406	**M**	
22.2	• For Cabinetry or interior trims: Meet the formaldehyde limits or use composite wood products with California Air Resources Board.	CG A4.504.1. 5 & GPR K.7-8	**3**	
22.3	• Select all interior materials that are low-emitting (VOC): eg. Adhesives, resilient flooring, carpet, paints, and sealer. Documentation which includes manufacturer's product specification and field verification of on-site product containers.	CG 4.504.2.1-3 & GPR F.2 & K.2 - 3	**M**	
22.4	• Resilient flooring systems. Where resilient flooring is installed, at least 50 percent of floor area receiving resilient flooring shall comply with the VOC emission limits defined in the Collaborative for High Performance Schools (CHPS) Low-emitting Materials List or certified under the Resilient Floor Covering Institute (RFCI) Floor Score program. (3 points max.)	CG 4.504.4	**M**	
	• A minimum of 80% of the total area of resilient flooring installed shall comply (2 points)		**3**	
	• A minimum of 90% of the total area of resilient flooring installed shall comply (3 points)			
22.5	• Composite wood products. Hardwood plywood, particleboard and medium density fiberboard composite wood products used on the interior or exterior of the building shall meet the requirements for formaldehyde as specified in ARB's Air Toxics Control Measure for Composite Wood. Documentation of verification is required.	CG 4.504.5	**M**	
22.6	• Covering of duct openings and protection of mechanical equipment during construction. At the time of rough installation or during storage on the construction site and until final startup of the heating and cooling equipment, all duct and other related air distribution component openings shall be covered with tape, plastic, sheet metal or other methods acceptable to the enforcing agency to reduce the amount of dust or debris which may collect in the system.	CG A4.504	**M**	
22.7	• Bathroom exhaust fans. Mechanical exhaust fans which exhaust directly from bathrooms shall comply with the following: (SEE EXHAUST FANS)	CG A4.506	**M**	
	• Fans shall be ENERGY STAR compliant and be ducted to terminate outside the building.			
	• Unless functioning as a component of a whole house ventilation system, fans must be controlled by a humidistat which shall be readily accessible.			
22.8	• Flush apartments continuously for 1 week with windows open after renovation is completed.	LEED IEQ 8.3 & GPR K.9	**1**	
22.9	• Reduce pollution entering units from garages. If unit is attached to a garage, install an exhaust fan.	GPR D.9	**2**	
22.10	• Use timer/automatic controls for bathroom exhaust fans.	LEED IEQ 5.2	**2**	

			Source Code	Points	Check
22	INDOOR AIR QUALITY: (cont.)				
22.11	• Insulate dwelling unit with formaldehyde-free insulation. Documentation must be provided that verifies the materials are certified to meet this the pollutant emission limits in this section.				
		• Install thermal insulation in compliance with the VOC emission limits defined in CHPS Low emitting Material List.	CG 4.504.4	**2**	
		• Install thermal insulation which contains No-Added Formaldehyde and is in compliance with the VOC emission limits defined in CHPS Low emitting Material List.		**3**	
		Subtotal:			

conservation of materials

		Source Code	Points	Check
23	RECYCLED/RAPIDLY RENEWABLE: • **Look into the cool new materials that manufacturers make from recycled or rapidly renewable materials. There are new ones every week.**			
23.1	• Recycled content roof material reduces new resources: (4 points max.) • A min. of 25% of roof area uses recycled or recycled content roof material. (2 points) • A min. of 50% of roof area uses recycled or recycled content roof material. (4 points)	CG A4.405.3	**4**	
23.2	• Renewable source building products to be used on the project	CG A4.405.4, LEED MR 2.1 -2, & GPR C.9	**1**	
23.3	• Install insulation with 30% post-consumer recycled content and no added formaldehyde.	GPR F.1	**1**	
23.4	• Use recycled content paint	GPR K.5	**1**	
23.5	• Flooring: Environmentally preferable flooring: FSC certified wood, reclaimed or refinished, rapidly renewable, recycled content, exposed concrete or locally sourced stone or tile.	GPR K.6 & L.1	**2**	
23.6	• Select fascia, soffit and trim elements made of recycled-content materials (including metals) or engineered wood products such as finger jointed trim, fiberboard, laminated strand lumber or OSB.	AZ (Scott)	**1**	
23.7	• Select countertops manufactured from min. of 20% recycled content material.	AZ (Scott)	**1**	
23.8	• Recycled content. Use materials, equivalent in performance to virgin materials, with postconsumer or preconsumer recycled content. Documentation to be provided as to the respective values. (4 points max.) • No less than 10% recycled content value of the total value, based on estimated cost of materials of the project. (2 points) • No less than 15% recycled content value of the total value, based on estimated cost of materials of the project. (4 points)	CG A4.405.3	**4**	
23.9	• Use of building materials from renewable sources. Use one or more of the following materials manufactured from rapidly renewable sources or agricultural by-products (products typically harvested within a 10 year or shorter cycle): (5 points max.) • Insulation (1 point) • Bamboo or cork (1 point) • Engineered wood products (1 point) • Agricultural based products (1 point) • Solid wood products (1 point) • Other products acceptable by the enforcing agency. (1 point)	CG A4.405.4	**5**	
	Subtotal:			

conservation of materials

		Source Code	Points	Check
24	RECYCLE CONSTRUCTION WASTE during DEMOLITION: • **Education and site setup are important during construction. If the set up is done well from the beginning, everyone else working on the site will follow. For example, provide separate recycle bins during construction for recycling of everyday objects (plastic bottles and aluminum cans) but also for construction waste: drywall, glass, metals, concrete/plaster.**			
24.1	• Construction waste reduction: A minimum of 50% of the construction waste generated at the site is diverted to recycle or salvage.	CG 4.408	**M**	
24.2	• Construction waste management plan. Where a local jurisdiction does not have a construction and demolition waste management ordinance, a construction waste management plan shall be submitted for approval to the enforcing agency.	CG 4.408.2, LEED MR 3.2, & GPR A.2	**M**	
24.3	• Construction waste reduction: Enhanced construction waste generated at the site is diverted to recycle or salvage. Documentation shall be provided to the enforcing agency which demonstrates compliance. (3 points max.) • A minimum of 65% of the construction waste generated at the site is diverted to recycle or salvage of total waste weight. (2 points) • A minimum of 75% of the construction waste generated at the site is diverted to recycle or salvage of total waste weight.. (3 points)	CG 4.408.1, LEED MR 3.2, & GPR A.2	**3**	
	Subtotal:			

25	RECYCLE - WASTE DESIGN: • **When recycling facilities are available, recycling becomes second nature.**			
25.1	• Install pull-out kitchen base cabinet with separate recycle/trash bins.	AZ (Scott)	**1**	
25.2	• Building operation and maintenance manual. At the time of final inspection, a manual, compact disc, web-based reference or other media acceptable to the enforcing agency which includes all of the following shall be placed in the building.	CG 4.410	**M**	
	Subtotal:			

on-site generation

		Source Code	Points	Check
26	SOLAR - PHOTO VOLTAIC: • **Reduce the peak power demand through the use of on-site renewable energy systems or contracting with off-site energy companies.**			
26.1	• Install a solar photovoltaic (PV) system in compliance with California Energy Commission New Solar Homes Partnership (NSHP). 2 points for each 10% of annual electrical load (KWh) met by system. Consult with a structural engineer on the load carrying capacity of the existing roof structure. (10 points max.)	CG A4.211.1/4	**10**	
26.2	• Use solar powered lighting for exterior site lighting, attic fan, and irrigation controller. At least 50% of the exterior site lighting.	AZ (Scott)	**1**	
	Subtotal:			
27	SOLAR - THERMAL: • **Even though solar thermal water heating is very efficient, for very low demand, it may not be practical.**			
27.1	• Install a solar water heating system when the demand of hot water is equivalent to the production of hot water or provide space on the roof surface (200 SF south-facing), penetrations (stand-offs) through the roof surface, and one-inch conduit for future solar installation. Consult with a structural engineer for additional load requirements to the existing roof structure.	CG A4.211.2 & 3	**2**	
	Subtotal:			
28	FUEL CELL: • **Fuel cells may be effective for large single-users or in a project that has master / sub-metering. But for typical apartment projects, they are not practical.**			
28.1	• Design and install a fuel cell using hydrogen generated by natural gas if the demand for hot water justifies the use. 2 points for each 10% of annual electrical load (KWh) met by system. The demand needs to justify the use of gas resources to generate electricity. (8 points max.)	AZ (Scott)	**8**	
	Subtotal:			
	Total:			

TECHNICAL BUILDING MEASURES AND POINT SYSTEM

FOR THE BUILDING OWNER PLANNING TO BUILD NEW MULTIFAMILY HOUSING

site

		Source Code	Points	Check
	BASE REQUIREMENT • **As California continues to grow, the state faces ever-increasing challenges in energy. One way to ensure our future is to improve the energy efficiency of the building envelope.**			
	T24 • Building designed to be at least 15% above California Building Code Title 24. (Automatic base of 20 points with this credit)		**20**	
1	SITE EVALUATION: • **Help preserve open space and utilize existing infrastructure, promote social interaction and community safety, and reuse existing resources instead of creating more landfill waste.**			
1.1	• Select a site which complies with at least one of the following characteristics: • An infill site is selected (1 point) • A greyfield site is selected (1 point) • An EPA recognized and remediated Brownfield site is selected. (1 point) • Local agency proposed (1 point)	CGA4.106.1 & AZ (Scott)	**4**	
1.2	• Site Preservation: Prior to beginning the construction activities, all parties involved with the development process shall receive a written guideline and instruction specifying the green goals of the project.	CGA4.104	**1**	
1.3	• Deconstruction: 50% of the weight of Existing buildings on the site are deconstructed and recycled at recycled centers. Documentation is required.	CGA4.105.1	**M**	
1.4	• Reuse of materials: Materials can be easily reused but must be in compliance with T24 requirements. For example: (1 point each, 4 points max.) • Light fixtures, appliances, and electrical devices. (1 point) • Plumbing fixtures (1 point) • Door and trims (1 point) • Masonry (1 point) • Foundation (1 point)	CGA4.105.2	**4**	
1.5	• Design for Walking & Bicycling: Site has pedestrican access within 1/2 mile of community services such as daycare, community center, public park, drug store, restaurants, schools, library, farmer's market, after school programs, etc. (4 points max.) • Site has pedestrian access to 5 services listed above. (2 points) • Site has pedestrian access to 10 services listed above. (4 points)	GPR O.4	**4**	
1.7	• Two- and three-story buildings are more energy efficient than one-story; they have a lower surface to volume ratio; they provide more shade; and they increase the yield on land close to public amenities. (9 points max.) • 50% of the buildings are two story (3 points) • 100% of the buildings are two story (6 points) • 50% of the buildings are three-story (9 points)		**9**	
	Subtotal:			

site

		Source Code	Points	Check
2	**UNIT DESIGN** • **The bigger the units the larger the consumption of natural resources. Average unit sizes have increased without consideration of negative impacts.**			
2.1	• Unit Sizes: Determine the number of bedrooms and the number of units for the corresponding points (10 points max): • 1 BED aparments under 900 SF of total conditioned space. Add 1 point for every 40 SF under 900 SF. Subtract 1 point for every 40 SF over 900 SF (Max 10 points). • 2 BED aparments under 1400 SF of total conditioned space. Add 1 point for every 50 SF under 1400 SF. Subtract 1 point for every 50 SF over 900 SF (Max 10 points). • 3 BED aparments under 1900 SF of total conditioned space. Add 1 point for every 70 SF under 1900 SF. Subtract 1 point for every 70 SF over 900 SF (Max 10 points). • 4 BED aparments under 2600 SF of total conditioned space. Add 1 point for every 100 SF under 1900 SF. Subtract 1 point for every 100 SF over 900 SF (Max 10 points).	LEED Home	**(+)** **(-)**	
2.2	• Unit Front Entrances have views from the inside to outside callers for 50% of the units.	GPR O.5	**1**	
2.3	• Unit Front Entrances can be seen from the street or from other front doors for 50% of the units.	GPR O.5	**1**	
2.4	• Orient porches to streets and public spaces for 50% of the units.	GPR O.5	**1**	
	Subtotal:			

3	**SOLAR ORIENTATION:** • **Minimize east- and west-facing walls and windows; maximize north-facing windows**			
3.1	T24 • Configure buildings to minimize west-facing walls and windows. The long axis should be within 30 deg. of south.	CGA4.106.1, GPR AA.7.a & AZ (Scott)		
3.2	T24 • By carefully configuring the buildings and windows, glazing exposed to the east and west can be minimized. No more than 25% of total glazing faces east or west. (SEE WINDOWS)	LEED ID 1.5		

4	**SHADE:** • **Provide shade for walks, walls and windows.**			
4.1	T24 • Use several strategies to provide appropriate shade for east- and west-facing windows during the summer, and south-facing windows in the winter using combination of vertical and horizontal shading devices.	CG A4.205.2		
4.2	T24 • Provide shading with a projection ratio of 0.5 on south facing windows. (Overhang projects half the height of the window.)	GPR AA.7.b CG A4.407.7		
4.3	T24 • Install window screens with a shading coefficient of .45 or lower to reduce heat radiation	AZ (Scott)		
4.4	• Trees on the west and east can be evergreen, but consider using deciduous trees on the south because during the winter, after dropping their leaves, the branches will filter the sun and provide desirable partial passive heating. Trees may shade roof surfaces where solar panels may be installed and decrease efficiency. Coordinate location of trees and solar panels. • Provide trees to shade the west side of the building. Minimum of 2 trees per side.	LEED SS 2, GPR C.5, & AZ (Scott)	**2**	

site

		Source Code	Points	Check
4	SHADE: (cont.)			
4.5	• Provide shade for sidewalks, parking areas and patios. Minimum 50% of all hardscape within 3 years.	LEED SS 3.1 GPR A.5	1	
4.6	• Reduce roof heat island effects for Mid-rise: Install roof with high albedo materials on 75% roof area or install vegetated roof for at least 50% roof area. (SEE ROOF)	LEED SS 3.2	1	
	Subtotal:			

			Source Code	Points	Check
5	WATER - DRAINAGE:	**• A drainage system will increase the durability of the apartments's foundation by draining water away from the structure.**			
5.1	• The site shall be developed to manage surface water (rain, irrigation, or nuisance water) away from buildings. Consider foundation and landscape drains as part of the drainage system.		CG A4.106.3 & A4.407.6	M	
5.2	• Develop a plan to manage storm water drainage and implement during construction.		CG 4.106.2 & LEED SS 4.1	M	
		• Design "dry creek bed" areas to capture concentrate flow from roof run-off and storm water.	GPR P.A.1.b	1	
		• Stormwater control: Prescriptive path, Route downspout through permeable landscape	GPR P.A.1.c	1	
		• Stormwater control: Perform a soil percolation test and capture and treat 85% of total annual runoff	GPR P.A.2	1	
5.3	• Soil analysis and protection: The soil at the building site are analyzed and protected as follows:		CG 4.106.2 & LEED SS 4.1	2	
		• Soil analysis is performed by a licensed design professional and the findings utilized in the structural design of the building.			
		• Develop a plan to manage storm water drainage and implement during co			
		• Site access is accomplished by minimizing the amount of cut and fill needed to install access roads and driveways.			
		• Underground construction activities are coordinated to utilize the same trench, minimize the amount of time the dixturbed soil is exposed and the soil is replaced using accpeted compaction methods.			
5.4	• Design a site with balanced Cut/Fill		AZ (Scott)	1	
5.5	• Topsoil shall be protected or saved for reuse as specified in this section.		CG 4.106.3 & LEED SS 4.1	1	
		• Displaced topsoil shall be stockpiled for reuse in a designated area and covered or protected from erosion.			
		• The construction area shall be identified and delineated by fencing or flagging to limit construction activity to the construction area.			
5.6	• Reduce the overall site area devoted to parking and hardscape. (-4 points min, 0 max)			-4	
		• More than 24' wide driveway (-2 points)			
		• Continuous concrete patio full length of house (-2 points)			
5.7	• A plan is developed and implemented to manage storm water drainage during construction.		CG 4.106.2	1	
	Subtotal:				

		Source Code	Points	Check
6	WATER - RAIN: • **Keep storm water on your lot with french drains, cisterns, retention basins. Keep water (rain and irrigation) away from buildings.**			
6.1	• Design building with roof overhangs to shed water away from the walls and doors. Install gutter and downspout systems to route water at least 5 feet away from the foundation or connect to landscape drains which discharge to a dry well, sump, bioswale, rainwater capture system or other approved on-site location.	CG A4.407.2 & A4.407.7	**2**	
6.2	• Door protection. Exterior doors to the dwelling are covered to prevent water intrusion by one or more of the following: • An awning at least 4 feet in depth is installed • The door is protected by a roof overhang at least 4 feet in depth • The door is recessed at least 4 feet • Other methods which provide equivalent protection	CG A4.407.6	**2**	
6.3	• Use weather-based automatic irrigation controllers/timers to adjust function due to rain. (SEE WATER - USAGE)		**M**	
6.4	• Adhere to landscape material (drought-tolerant) guidelines adopted by Jurisdiction. (SEE WATER - USAGE)		**M**	
6.5	• Flashing details. Provide flashing details on building plans which comply with accepted industry standards or manufacturer's instructions. Details are shown on house plans at all of the following locations: • Around windows and doors • Roof valleys • Deck connections to the structure • Roof to wall instersections • Chimneys to roof intersections • Drip caps above windows and doors with architectural projections.	CG A4.106.4 & GPR P.A.1	**3**	
6.6	• Use permeable pavers for patios, walkways and driveways/parking to improve on-site percolation, reduce glare and heat island effect. Min. 50% of hardscape. • Min. 80% of exposed paving is light colored (at least 30% light reflectance value) • No less than 20% of total on-site hardscape (2 points) OR • No less than 30% of total on-site hardscape (4 points)	AZ (Scott), CG A4.106.4 & GPR P.A.1	**2** **4**	
6.7	• Use deep irrigation and solar power controllers (SEE SOLAR)	LEED WE 2.1	**2**	
6.8	• The civil engineer and landscape architect collaborate on the drainage and grading to utilize rainwater as part of the irrigation of landscape material.	CG A4.304.2	**2**	
	Subtotal:			

site

		Source Code	Points	Check
7	WATER - USAGE: •			
7.1	• Adhere to (Coachella Valley) landscape material (drought-tolerant) guidelines adoped by Jurisdiction.	CG A4.106.3, Local Zoning, LEED SS 2.2-4	**M**	
7.2	• Adhere to (Coachella Valley and CVAG Water Efficiency Water Ordinance) landscape irrigation guidelines.	CG A4.106.3, Local Zoning & LEED WE 2., CG A4.304.1 & AZ (Scott)	**M**	
	• A water budget shall be developed for irrigation which meets and does not exceed CVWD requirements.		**1**	
	• Install a low-water consumption irrigation system which minimizes the use of spray-type heads. For example, use non-sprinkler or drip, zoned irrigation system with multiple valves to accommodate specific water needs to different types of plants.		**2**	
	• Use weather-based automatic irrigation controllers/timers to save water usage when raining.		**1**	
7.3	• Rainwater channeling methods using gutters, scuppers, downspouts and grading to direct runoff to landscaped areas.	AZ (Scott)	**2**	
7.4	• Use turf ONLY where it is actively used, and strictly limit the area. (4 points max)	CG A4.106.3, LEED SS 2.3 & GPR C.3	**4**	
	• 10% of landscape area (2 points)			
	• 0% of landscape (4 points)			
7.5	• Graywater recovery: Graywater systems use wastewater from washing machine, showers, tubs, and lavatories.	CG 4.305 AZ (Scott)		
	• Install a two-pipe drain system for future system		**2**	
	• Install a complete graywater system with/without filtration/storage tank for landscape irrigation and/or toilet flushing.		**3**	
7.6	• Consider reducing the usage of indoor water by selecting plumbing fixtures with flow restrictors or aerators beyond code requirements	CG 4.303.1 - 3 AZ (Scott)		
	• Kitchen faucets and dishwashers with Max flow rate at sink faucet not greater than 1.5 gpm at 60 psi		**1**	
	• All bathroom faucets and showerheads are high efficiency (2.0 or less GPM)		**3**	
	• Toilets with high efficiency (1.3 or less gal/flush) and/or dual flush operated (average flush of 1.2 gal or less)		**3**	
	• Dishwashers shall be Energy Star and not use more than 5.8 gallons per cycle.		**1**	
	• Nonwater supplied urinals or waterless toilets are installed.		**1**	
	• OR Indoor water use shall be reduced by at least 20 percent by either water saving fixtures/flow restrictors or 20 percent reduction in baseline water use. (ONLY use this credit if none of the above are used)		**6**	
	Subtotal:			

site

		Source Code	Points	Check
8	HEAT ISLAND: • **Hardscape throughout the site increases the heat island effect.**			
8.1	• Use shade trees and trellises to shade hardscape and patios. (SEE SHADE.)	GPR P.A.1	**M**	
8.2	• Separate hardscape from the building to reduce heat transfer from outside to inside.	IDC	**1**	
8.3	• Use alternative paving (pavers, decomposed granite, etc.) that have less thermal mass than concrete. (SEE WATER - RAIN.)	CG A4.106.4	**M**	
8.4	• Reduce glare (sunlight reflecting off the ground surface) by using drought-tolerant ground cover or material that scatters the sunlight (gravel). (SEE WATER - RAIN.)	IDC	**M**	
8.5	• Reduce roof heat island effects for Mid-rise: Install roof with high albedo materials on 75% roof area or install vegetated roof for at least 50% roof area. (SEE SHADE.)	LEED SS 3.2	**M**	
	Subtotal:			

9	PARKING REQUIREMENTS: • **Provide preferred stalls for electric or hybrid vehicles. Consider on-street and joint-use parking to reduce on-site parking**				
9.1	• Provide preferrential parking for low-emitting, fuel efficient vehicles, for motorcycles and scooters, for bicycles and for golf-carts. Negotiate with planning department to include such vehicles in parking count.		LEED SS 7.3.a		
		• 5% of total capacity is preferred parking spots for low-emitting vehicles.	LEED SS 7.3.b	**1**	
		• Alternative-fuel refueling stations for 3% of total vehicle capacity.	LEED SS 7.3.c	**1**	
		• Size parking to not exceed min zoning req'ts and provide infrastructure to facilitate shared vehicle usage.	LEED SS 7.3.d	**1**	
9.2	• Negotiate with the planning department that parking requirements will be based upon parking analysis of similar projects in the jurisdiction.		LEED SS 7.3.e	**1**	
	Subtotal:				

site

envelope

		Source Code	Points	Check
10	ROOF: • **Use "cool roof" coating or materials; install rigid or spray-applied foam on roofs.**			
10.1	T24 • Rigid insulation on top of roof sheathing.			
10.2	T24 • Install "cool roof" system.	CG A4.106.5, AZ (Scott) & GPR P.E.1		
10.3	T24 • Install a radiant barrier at the roof level.	CG A4.205.1		
10.4	T24 • Consider "cool roof" coating for roofing	CG A4.106.5 & AZ (Scott)		
10.5	T24 • In a vented attic design, install continuous ridge vent and eave vents for effective thermally-driven ventilation.	AZ (Scott)		
10.6	T24 • Use solar powered attic exhaust fan. (SEE SOLAR - PHOTOVOLTAIC)			
10.7	• If metal roof system is being considered, consider the design of metal roof with stand-off battens to allow free flow thermally-driven air between roof sheathing and metal roofing.	IDC	**2**	
10.8	• Avoid petroleum-based roof system.	GPR	**2**	
10.9	• All roofing has 3-yr subcontractor warranty and 20-yr manufacturer warranty.	GPR E.2.a	**2**	
10.10	• Use durable and fire resistamt roofing materials or assembly.	GPR E.2.b	**1**	
10.11	• Use rigid insulation on top of roof sheathing.	GPR	**1**	
10.12	• Use roof with a high durability/low maintenance material such as concrete, slate, clay or fiber cement.	AZ (Scott)	**2**	
10.13	• In a vented attic design, install continuous ridge vent and eave vents for effective thermally-driven ventilation.	AZ (Scott)	**2**	
10.14	• Use non-sawn lumber to frame the roof structure (at least 75%). Non sawn lumber uses less lumber. (SEE FRAMING CONSIDERATION)	AZ (Scott)	**M**	
10.15	• Energy heels on roof trusses (75% of attic insulation height at outside edge of exterior wall). (SEE ATTIC)	GPR D.6	**M**	
	Subtotal:			

11	ATTIC: • **Maximize insulation in the attic. Add insulation in the attic; Ventilate the attic; With evaporative coolers, discharge upducts through roof or the exterior.**			
11.1	T24 • Perform third party blower door test to verify building envelope tightness.	CG A4.206		
11.2	T24 • Exceed code minimum attic insulation values.	GPR J.2.a & J.2.i		
11.3	T24 • Use extended-heel trusses to ensure full depth insualtion at eaves	GPR		
11.4	• Energy heels on roof trusses (75% of attic insulation height at outside edge of exterior wall)	GPR D.6	**2**	
	Subtotal:			

envelope

		Source Code	Points	Check
12	WALLS: • **Maximize wall insulation – outside and/or within the walls; use durable materials outside like plaster and/or fiber cement board.**			
12.1	T24 • Use blown-in spray foam wall insulation to create air-tight walls. Continuous exhaust fans in bathrooms may be necessary.	IDC		
12.2	T24 • Exceed Code-mandated insulation values.	GPR F.1 & F.2		
12.3	T24 • Carefully seal gaps and joints between framing members and sheathing	CG 4.406.1		
12.4	T24 • Exterior insulation systems prevent thermal bridging and is most effective at reducing heat flow into the conditioned space.	IDC		
12.5	T24 • Configure and place windows to limit solar exposure on west and south walls.	AZ (Scott)		
12.6	T24 • Third party inspection of insulation, at least HERS grade II	LEED EA 2.1 & 2		
12.7	• The building wall system provides and integral air and water infiltration barrier or the house is wrapped with breathable exterior air and water infiltration barrier that allows water vapor to escape.	AZ (Scott)	**1**	
12.8	• Use durable and pre-finished exterior finish material (integrally colored plaster, fiber-cement siding and panels)	CG A4.405.1 & GPR E.3	**2**	
12.9	• Consider a "second-skin" wall system that shades west and south-facing walls. "Living walls", louvers and simple shade reduces the radiant heat build up from solar exposure.	AZ (Scott)	**4**	
12.10	• Use Insulated headers on exterior windows and doors.	GPR D.4	**1**	
	Subtotal:			

		Source Code	Points	Check
13	WINDOWS: • **Specifiy coatings to reduce solar heat gain. For east- south-, and west-facing windows, use glazing with SHGC <0.28. For north-facing windows, the SHGC need not be as low. Select windows with fiberglass, vinyl or thermally broken frames.**			
13.1	T24 • Meet or Exceed Energy Star rated for windows	LEED EA 4.1, 4.2, & GPR J.2.j		
13.2	T24 • Use spectrally selective glazing (SHGC of <0.28) on east-, south- and west-facing windows			
13.3	T24 • Use argon gas-filled insulated glass units.			
13.4	T24 • By carefully configuring the buildings and windows, glazing exposed to the east and west can be minimized. No more than 25% of total glazing faces east or west.	LEED ID 1.5		
13.5	• Dwelling unit windows are configured to allow for stack and/or cross ventilation to take advantage of seasonal cooling. Cross ventilation paths shall not exceed 40ft. • Augment natural ventilation by designing units with thermal chimneys or light monitors with operable windows.	AZ (Scott) GPR H.3.a	**2**	
	Subtotal:			

structure

		Source Code	Points	Check
14	FRAMING CONSIDERATIONS: • **Place Joists, Rafters & Studs @ 24" O.C. It saves material.**			
14.1	• Building dimensions and layouts are designed to minimize waste.	CG A4.404.1-3 & AZ (Scott)		
	• Design stud spacing greater than 16" o.c.		**2**	
	• Design home on modular grid such as 24" or 48" to match dimensions of standard material		**3**	
	• Design Beams and headers and trimmers are the minimum size to adequately support the load.		**1**	
14.2	• Use premanufactured building systems to eliminate solid sawn lumber whenever possible. One of the following systems:	CG A4.404.3, GPR D.2.a, D.6 & AZ (Scott)		
	• Composite floor joist or premanufactured floor truss framing (Min. of 75%) of floor area.		**2**	
	• Composite roof rafter or premanufactured roof truss framing (Min. of 75%) of floor area.		**2**	
	• Composite framing for interior framing. (Min. of 75%) of wall area.		**2**	
	• Panelized wall framing systems (SIPS, ICF, or similar)		**2**	
	• Other methods approved by the enforcing agency		**2**	
14.3	• Material lists are included in the plans which specify material quality and provide direction for on-site cuts.	CG A4.404.4	**2**	
	• Floor framing			
	• Wall framing			
	• Ceiling and roof framing			
	• Structural panels and roof sheathing			
14.4	• Use advanced framing technologies for floor and roof framing.	LEED MR 1.2 AZ (Scott)	**3**	
14.5	• Optimal value engineering: Place rafters and studs at 24 inches on center framing, size door and window headers for load, use only jack and cripple studs required for load.	GPR D.1 AZ (Scott)	**2**	
	Subtotal:			

15	MATERIAL EFFICIENCY: • **Consider using panelized or already assembled systems**			
15.1	• Select exterior finishes derived from regional sources within 500 miles of job site. This includes stone or culture stone veneers that are regionally quarried or processed.	GPR D.6 AZ (Scott)	**1**	
15.2	• Reduction in cement use: Products such as fly ash, slag, silica fume and rice hull ash used to replace cement in concrete mix design. (2 points max.)	CG A4.403 & AZ (Scott)	**2**	
	• No less than 20% substituted volume of cement. (1 point)			
	• No less than 25% substituted volume of cement. (2 points)			
15.3	• Use engineered lumber (Beams, headers, lumber for floors and rafters; oriented strand board for subfloor, walls and roof sheathing) (SEE FRAMING CONSIDERATIONS)		**M**	
15.4	• Use building materials that do not require additional resources for finishing (One or more of exterior trim, windows, siding or exterior wall coverings)	CG A4.405.1	**2**	
15.5	• Floors that do not require addition coverings for finish.	CG A4.405.2	**2**	
	Subtotal:			

equipment

		Source Code	Points	Check
16	AIR CONDITIONING: • **Careful design will take into consideration energy efficiency upgrades, and room-by-room loads therefore a smaller unit may suffice.**			
16.1	• "Right-size" HVAC equipment. Carefully consider the energy efficiency measures selected in this Code that will influence the actual heat load on the air conditioning system. The size of the system (measured in "tons") may be reduced by as much as 30% through careful design and upgraded energy efficient measures.	CG A4.407, LEED EA 6.1, 6.2, 6.3 & GPR H.5	**M**	
16.2	T24 • Perform duct leakage testing to verify a total leakage rate of less than 6 percent of the total fan flow.	CG A4.207.8 & LEED EA 5.1		
16.3	T24 • General HVAC equipment verification and correction	CG A4.207 & GPR H.1		
16.4	T24 • Use condensing units with two-stage compressors and variable speed air handling fan (generally on units with SEER 13 or higher.) Use units with a minimum of EER 11.5.	CG A4.207.6, GPR J.2.f, AZ (Scott)		
16.5	T24 • Design and install a whole-house fan system.	AZ (Scott)		
16.6	T24 • Design and install an evaporative cooling system.	AZ (Scott)		
16.7	T24 • Install ductwork within the conditioned envelope of building, in an underfloor crawl space, with an R-6 or higher insulation value or buried in the ceiling insulation.	CG A4.207.7		
16.8	T24 • A central plant is provided for heating and cooling and/or HVAC system utilized water source heat pumps, ground source heat pumps, indirect evaporative cooling or thermal storage (ice or water) AND/OR dwelling units are heated and /or cooled by a hydronic/radiant system in ceiling, wall and/or floor. Stackable floors - building design to be considered for this system.	AZ (Scott)		
16.9	• Design the HVAC system to be zoned such that no more than two enclosed rooms are controlled by one thermostat (does not include bathroom, kitchens, closets, pantries, and laundry rooms).	AZ (Scott)	**4**	
16.10	• Perform room-by-room load calculations for different orientations of the buildings. (West facing walls will have a higher load than north-facing; first floor units will have no heat load from above.)	LEED EQ 6.1	**1**	
16.11	• Use registers that allow directional and volume adjustments to air flow.	IDC	**1**	
16.12	• Design the furnace as a sealed - combustion unit.	AZ (Scott)	**1**	
16.13	• Configure and place windows to facilitate cross-ventilation. SEE WINDOWS.	AZ (Scott)	**2**	
16.14	• Install multi-speed Energy Star rated ceiling fans (Min of three). SEE APPLIANCES.	AZ (Scott)	**M**	
16.15	• Adding an economizer cycle to the HVAC unit will allow "night purging" when the days are hot, but the night temperature drops below 68 degrees.	LEED EQ 4	**2**	
16.16	• Specifiy filtration of MERV 8 or higher to improve the indoor air quality, cut down on allergens and increase comfort.	CG A4.506.1 LEED EQ 7 AZ (Scott)	**2**	
16.17	• Indoor and/or outdoor living area utilizes a passive cooling method such as a cool tower or misting system.	AZ (Scott)	**1**	
16.18	• Water heaters, fireplaces and furnaces are sealed combustion units. Direct-vent heating and cooling equipment is utilized if the equipment will be located in the conditioned space or isntall the space heating and water heating equipment in an isolated mechanical room.	CG A4.506.2 AZ (Scott)	**1**	
	Subtotal:			

equipment

		Source Code	Points	Check
17	WATER HEATING: • **Tankless (on-demand) gas water heaters use less gas than standard storage tank water heaters.**			
17.1	T24 • With a storage water heater, the energy factor (EF) for a gas-fired storage water heater is higher than 0.60 and the energy factor (EF) for a gas-fired tankless water heater is .80 or higher.	CG A4.208.1 & 2, LEED EA 7.3 & AZ (Scott)		
17.2	T24 • Insulate (R-4) hot water pipes full distance from heater to fixture.	AZ (Scott)		
17.3	T24 • Consider integrating a solar thermal water heating system when the demand for hot water is equivalent. (SEE SOLAR - THERMAL)	CG A4.211.2		
17.4	• Design a water heater with sealed combustion unit. The water heater draws combustion air from the oudoors eliminating any chance of back drafting.	AZ (Scott)	**1**	
17.5	• Where the hot water source is more than 10 feet from a fixture, the potable water distribution system shall convey hot water using a method designed to minimize wait time for hot water to arrive at the fixture such as circulation pump system or solar thermal water heating system.	GPR G.1.C, AZ (Scott), CG A4.208.3 & CG A4.211.2	**2**	
	Subtotal:			

18	EVAPORATIVE COOLING: • **Two-stage evaporative coolers that use air-to-air heat exchangers may be very effective in back of house areas.**			
18.1	T24 • Dwelling units and/or enclosed common areas are provided with an evaporated cooling system with independent air distribution system OR a dual moisture sensor controlled system on a shared air distribution system.	LEED EA 7.3 & AZ (Scott)		

19	EXHAUST FANS: • **Use Energy Star fans, exhaust outdoors. Humidistat, occupancy sensor, timer.**			
19.1	• Verify that the exhaust ventilation system meets Title 24 requirements.	CG A4.207.2 & LEED IEQ 5.1	**M**	
19.2	• Add exhaust fans which terminate outside the building are provided in every bathroom. (SEE INDOOR AIR QUALITY)	CG A4.506.1	**M**	
19.3	• Add local exhaust time/automatic controls for bathroom exhaust fans.	LEED IED 5.2	**1**	
	Subtotal:			

20	WHOLE HOUSE FAN: • **When the outside temperature is between 55 - 70 deg. a whole house fan can draw air through the house at night. Called "night purging," the flow of air cools the inside of the house (especially heavy materials like stone counter tops and tile floors.) Then as the temperature rises during the day, the need for air conditioning is delayed.**			
20.1	• Openings. Whole house exhaust fans shall have insulated louvers or covers which close when the fan is off. Covers or louvers shall have a minimum insulation value of R-4.2.	CG A4.407	**M**	
20.2	• Design and install whole building ventilation system according to ASHRAE. The system shall operate automatically or continuously with manual override as part of energy recovery ventilator.	AZ (Scott)	**2**	
20.3	• Whole house exhaust fans shall have insulated louvers or covers which close when the fan is off. Covers orlouvers shall have min R-4.	CG 4.207.9 & CG 4.507.1	**1**	
20.4	• HVAC: Mechanical ventilation system for cooling installed such as an economizer to use cool air from the ambient to cool the building.	GPR H.9.b AZ (Scott)	**2**	
	Subtotal:			

		Source Code	Points	Check
21	POOL PUMP: • **For common areas such as pools, new pool pumps use a variable-speed drive and more sensitive internal controls so the speed, and therefore the energy, more precisely matches the demand. This saves a lot of energy (money.)**			
21.1	• Consider a variable pump system	CG A4.210.1	**2**	
	Subtotal:			

22	APPLIANCES: • **Use Energy Star appliances.**			
22.1	• Energy star rated appliances including refrigerator, freezer, dishwasher and clothes washer. (1 point per appliance, 3 points max.)	CG A4.210.1, AZ (Scott), GPR M.1 & LEED EA 9.1	**3**	
22.2	• Energy Star ceiling fans and light kits in living areas and bedrooms. (SEE AIR CONDITIONING) (One per bedroom and one per living room)	GPR H.3.b.i	**1**	
22.3	• Energy Star bathroom fans on timer or humidistat. (SEE AIR CONDITIONING)	GPR H.4.d	**1**	
22.4	• Energy Star Appliances (Dishwasher, clothes washer, refrigerator) (1 point per appliance, 4 points max.)	GPR M.1, CG A4.210.1 & AZ (Scott)	**4**	
	Subtotal:			

equipment

passive energy - comfort & health

		Source Code	Points	Check
23	THERMAL MASS: • **Heavy materials like stone, tile, masonry and concrete can absorb a lot of heat. When combined with an economizer cycle and "night purging" the cool surfaces absorb heat and can delay the use of air conditioning.**			
23.1	T24 • In desert climate, hard surface flooring reduces the cooling load during the summer, but during the winter the floor may be uncomfortably cool.	IDC		
24	THERMAL CHIMNEY: • **"Hot air rises" the building can move air passively - indoors and outdoors.**			
24.1	• Operable skylights at the peak of the roof or a tower element with operable windows will draw hot air up and will facilitate natural ventilation. (SEE WINDOWS)		**M**	
	Subtotal:			
25	DAYLIGHTING: • **Bringing daylight into a building can reduce the need for lights, which has a direct economic benefit. However, the greater benefit is the uplifting nature that natural light brings. Morale, productivity, even sales are increased in spaces illuminated by natural daylight. Balancing the light within a space is also important to reduce glare and "hot spots." Exterior shading devices, light shelves, orientation of windows, skylights and "solar tubes" are all part of the design strategies for balanced natural daylighting. The type of glazing is important to reduce both solar heat gain and UV penetration.**			
25.1	• Natural light reduces the demand for electric lights during the day, however, glare and solar heat gain must be controlled. • Interior floor covering to be light in color with min. light reflectance value (LRV) of 25%	IDC	**1**	
25.2	• Use external light shelves to control direct sunlight. (SEE SHADE)	IDC	**M**	
25.3	• Configure and place windows so daylight enters from two sides in each room.	AZ (Scott)	**2**	
25.4	• Provide skylights for daylight in interior spaces and to balance light from large windows on one wall only.	IDC	**1**	
25.5	• Design a balanced daylighting scheme for the common area and administrative facilities. Include photosensors and dimmable ballasts for areas served by windows and skylights.	AZ (Scott)	**2**	
	Subtotal:			
26	LIGHTING: • **Use fixtures with greater illumination with lower electrical demand to lower the overall electrical load of the apartment.**			
26.1	T24 • Consider lighting fixtures that have high efficacy lighting. These include compact or tubular fluorescent and light emitting diodes (LED)	AZ (Scott)		
26.2	T24 • Max interior lighting wattage does not exceed .5 watts per sq ft as determined by aggregate wattage not including plug loads.	AZ (Scott)		
26.3	• Building lighting consists of at least 90 percent ENERGY STAR qualified hard-wired fixtures.	CG A4.209.1	**2**	
26.4	• Design Recesed lights so they do not penetrate the thermal barrier. (SEE ATTIC)	AZ (Scott)	**M**	
26.5	• Smart wiring system to be installed for controlling lighting and telecommunications.	AZ (Scott)	**2**	
26.6	• Use occupancy sensors for closets, pantries, bathrooms, etc.	AZ (Scott)	**1**	
	Subtotal:			

passive energy - comfort & health

		Source Code	Points	Check
27	INDOOR AIR QUALITY: • **Off-gassing is the process by which materials release chemicals used to fabricate or hold them together. Carpet, adhesives, medium density fiberboard (a substitute for plywood in cabinets) and paints are sources for harmful off-gassing. Select materials that meet the VOC limits of the Air Resources Board. After the remodeled space is painted and all cabinets and carpet are installed, flush out the off-gassed air. Run the economizer cycle on the HVAC unit or the whole house fan to continuously replace inside air with fresh outside air.**			
27.1	• Joints and openings. Openings in the building envelope separating conditioned space from unconditioned space needed to accommodate gas, plumbing, electrical lines and other necessary penetrations must be sealed in compliance with the California Energy Code.	CG A4.406	**M**	
27.2	• Fire place: Any installed gas fireplace shall be a direct-vent sealed-combustion type..	CG A4.503	**M**	
27.3	• For Cabinetry or interior trims: Meet the formaldehyde limits or use composite wood products with California Air Resources Board	CG A4.504.1. 5 & GPR K.7-8	**3**	
27.4	• Select all interior materials that are low-emitting (VOC): eg. Adhesives, resileient floorping, carpet, paints, and sealer. Documentation which includes manufacturer's product specification and field verfication of on-site product containers.	CG 4.504.2.1-3 & GPR F.2 & K.2 - 3	**M**	
27.5	• Resilient flooring systems. Where resilient flooring is installed, at least 50 percent of floor area receiving resilient flooring shall comply with the VOC emission limits defined in the Collaborative for High Performance Schools (CHPS) Low-emitting Materials List or certified under the Resilient Floor Covering Institute (RFCI) FloorScore program. (3 points max.)	CG 4.504.4	**M**	
	• A minimum of 80% of the total area of resilient flooring installed shall comply (2 points)			
	• A minimum of 90% of the total area of resilient flooring installed shall comply (3 points)		**3**	
27.6	• Composite wood products. Hardwood plywood, particleboard and medium density fiberboard composite wood products used on the interior or exterior of the building shall meet the requirements for formaldehyde as specified in ARB's Air Toxics Control Measure for Composite Wood. Documentation of verfication is required.	CG 4.504.5	**M**	
27.7	• Covering of duct openings and protection of mechanical equipment during construction. At the time of rough installation or during storage on the construction site and until final startup of the heating and cooling equipment, all duct and other related air distribution component openings shall be covered with tape, plastic, sheetmetal or other methods acceptable to the enforcing agency to reduce the amount of dust or debris which may collect in the system.	CG A4.504	**M**	
27.8	• Concrete slab foundations required to have a vapor retarder by Capillary break. A capillary break shall be installed in compliance with a 4-inch (101.6 mm) thick base of 1/2 inch or larger clean aggregate shall be provided with a vapor barrier in direct contact with concrete and a concrete mix design, which will address bleeding, shrinkage, and curling, shall be used. For additional information, see American Concrete Institute, ACI 302.2R-06 or other designs by a licensed design professional.	CG 4.505	**M**	
27.9	• Bathroom exhaust fans. Mechanical exhaust fans which exhaust directly from bathrooms shall comply with the following: (SEE EXHAUST FANS)	CG A4.506	**M**	
	• Fans shall be ENERGY STAR compliant and be ducted to terminate outside the building.			
	• Unless functioning as a component of a whole house ventilation system, fans must be controlled by a humidistat which shall be readily accessible.			

		Source Code	Points	Check
27	INDOOR AIR QUALITY: (cont.)			
27.10	• Flush apartments continuously for 1 week with windows open after renovation is completed.	LEED IEQ 8.3 & GPR K.9	1	
27.11	• Reduce pollution entering units from garages (garage exhaust fan or detached garage)	GPR D.9	2	
27.12	• Use timer/automatic controls for bathroom exhaust fans.	LEED IEQ 5.2	2	
27.13	• Insulate dwelling with formaldehyde-free insulation. Documentation must be provided that verifies the materials are certified to meet this the pollutant emission limits in this section.	CG 4.504.4		
	• Install thermal insulation in compliance with the VOC emission limits defined in CHPS Low emitting Material List.		2	
	• Install thermal insulation which contains No-Added Formalehyde and is in compliance with the VOC emission limits defined in CHPS Low emitting Material List.		3	
	Subtotal:			

conservation of materials

		Source Code	Points	Check
28	RECYCLED/RAPIDLY RENEWABLE: • **Look into the cool new materials that manufacturers make from recycled or rapidly renewable materials. There are new ones every week.**			

28.1	• Use Recycled Content Aggregate (Min. 25%) (2 points max.)
	  • Walkway and driveway base (1 point)
	  • Roadway Base (1 point)
		CG A4.405.3	**2**	

28.2	• Recycled content roof material reduces new resources: (4 points max.)
	  • A min. of 25% of roof area uses recyled or recycled content roof material. (2 points)
	  • A min. of 50% of roof area uses recyled or recycled content roof material. (4 points)
		CG A4.405.3	**4**	

28.3	• Renewable source building products to be used on the project	CG A4.405.4, LEED MR 2.1 -2, & GPR C.9	**1**	
28.4	• Replace portland cement in concrete with recycled flyash or slag: Min 20% flyash and/or slag content	GPR B.1.a & b	**2**	
28.5	• Install insulation with 30% post-consumer recycled content and no added formaldehyde.	GPR F.1	**1**	
28.6	• Use recycled content paint	GPR K.5	**1**	
28.7	• Flooring: Environmentally preferable flooring: FSC certified wood, reclaimed or refinished, rapidly renewable, recycled content, exposed concrete or locally sourced stone or tile.	GPR K.6 & L.1	**2**	
28.8	• Innovations: Structural frame and building envelope, use FSC certified engineered lumber for headers, I-joists, trusses, and rafters.	GPR P.D.3	**3**	
28.9	• Select fascia, soffit and trim elements made of recycled-content materials (including metals) or engineered wood products such as finger jointed trim, fiberboard, laminated starnd lumber or OSB.	AZ (Scott)	**1**	
28.10	• Select countertops manufactured from min. of 20% recycled content material.	AZ (Scott)	**1**	

28.11	• Recycled content. Use materials, equivalent in performance to virgin materials, with postconsumer or preconsumer recyled content. Documentation to be provided as to the respective values. (4 points max.)
	  • No less than 10% recycled content value of the total value, based on estiamted cost of materials of the project. (2 points)
	  • No less than 15% recycled content value of the total value, based on estiamted cost of materials of the project. (4 points)
		CG A4.405.3	**4**	

28.12	• Use of building materials from renewable sources. Use one or more of the following materials manufactured from rapidly renewable sources or agricultural by-products is used (products typically harvested within a 10 year or shorter cycle): (5 points max.)
	  • Insulation (1 point)
	  • Bamboo or cork (1 point)
	  • Engineered wood products (1 point)
	  • Agricultural based products (1 point)
	  • Solid wood products (1 point)
	  • Other products acceptable by the enforcing agency. (1 point)
		CG A4.405.4	**5**	

	Subtotal:			

conservation of materials

		Source Code	Points	Check
29	RECYCLE CONSTRUCTION WASTE during DEMOLITION: • **Education and site setup are important during construction. If the set up is done well from the beginning, everyone else working on the site will follow. For example, provide separate recyle bins during construction for recycling of everyday objects (plastic bottles and aluminum cans) but also for construction waste: drywall, glass, metals, concrete/plaster.**			
29.1	• Construction waste reduction: A minimum of 50% of the construction waste generated at the site is diverted to recycle or salvage.	CG 4.408	**M**	
29.2	• Construction waste management plan. Where a local jurisdiction does not have a construction and demolition waste management ordinance, a construction waste management plan shall be submitted for approval to the enforcing agency.	CG 4.408.2, LEED MR 3.2, & GPR A.2	**M**	
29.3	• Construction waste reduction: Enhanced construction waste generated at the site is diverted to recycle or salvage. Documentation shall be provided to the enforcing agency which demostrates compliance. (3 points max.) • A minimum of 65% of the construction waste generated at the site is diverted to recycle or salvage of total waste weight. (2 points) • A minimum of 75% of the construction waste generated at the site is diverted to recycle or salvage of total waste weight. (3 points)	CG 4.408.1, LEED MR 3.2, & GPR A.2	**3**	
	Subtotal:			

30	RECYCLE - WASTE DESIGN: • **When recycling facilities are available, recycling becomes second nature.**			
30.1	• Install built-in recycling and/or composting in site design	GPR M.4	**1**	
30.2	• Install pull-out kitchen base cabinet with separate recycle/trash bins.	AZ (Scott)	**1**	
30.3	• Building operation and maintenance manual. At the time of final inspection, a manual, compact disc, web-based reference or other media acceptable to the enforcing agency which includes all of the following shall be placed in the building.	CG 4.410	**M**	
	Subtotal:			

TECHNICAL BUILDING MEASURES AND POINT SYSTEM

FOR THE BUILDING OWNER PLANNING TO BUILD NEW MULTIFAMILY HOUSING

on-site generation

		Source Code	Points	Check
32	SOLAR - PHOTO VOLTAIC: • **Reduce the peak power demand through the use of on-site renewable energy systems or contracting with off-site energy companies.**			
32.1	• Install a solar photovoltaic (PV) system in compliance with California Energy Commission New Solar Homes Partnership (NSHP). 2 points for each 10% of annual electrical load (KWh) met by system. (10 points max.)	CG A4.211.1/4	**10**	
32.2	• Provide a min. one-inch conduit from the electrical service equipment for the future installation of a (PV) system with A minimum of 300 square feet of unobstructed roof area facing within 30° of south is provided for future solar collector or photovoltaic panels.	AZ (Scott), CG A4.211.1/4	**2**	
32.3	• Use solar powered lighting for exterior site lighting, attic fan, and irrigation controller. At least 50% of the exterior site lighting.	AZ (Scott)	**1**	
	Subtotal:			
33	SOLAR - THERMAL: • **Even though solar thermal water heating is very efficient, for very low demand, it may not be practical**			
33.1	• Install a solar water heating system when the demand of hot water is equivalent to the production of hot water or provide space on the roof surface (200 SF south-facing), penetrations (stand-offs) through the roof surface, and one-inch conduit for future solar installation. Consult with a structural engineer for additional load requirements to the existing roof structure.	CG A4.211.2 & 3	**2**	
	Subtotal:			
34	FUEL CELL: • **Fuel cells may be effective for large single-users or in a project that has master / sub-metering. But for typical apratment projects, they are not practical.**			
34.1	• Design and install a fuel cell using hydrogen generated by natural gas if the demand for hot water justifies the use. 2 points for each 10% of annual electrical load (KWh) met by system. (8 points max.)	AZ (Scott)	**8**	
	Subtotal:			
	Total:			

TECHNICAL BUILDING MEASURES AND POINT SYSTEM

FOR THE BUILDING OWNER PLANNING TO REMODEL COMMERCIAL BUILDING

site

		Source Code	Points	Check
M	BASE REQUIREMENT • **The goal is for California to become more energy efficient so much so that by 2020 the state hopes for new projects to benefit from net zero energy consumption. It cannot be done all at once but incremental changes such as designing buildings 15% above Title 24 NOW is going to get us there.**			
	T24 • Building designed to be at least 15% above California Building Code Title 24: Utilize energy efficiency measures that cumulatively improve the performance of the building, reduce the size of the HVAC system and add comfort for occupants.	CG A5.203 CG 5.201 L EA P1, 2 & Cr 1	**20**	
1	SHADE: • **Provide shades (roof, walls, windows) with trees, overhangs, shutters or awnings.**			
1.1	T24 • Use several strategies to provide appropriate shade for east- and west-facing windows during the summer, and south-facing windows in the winter.	CG A5.106.7		
1.2	T24 • Awnings and overhangs need to be close to top of windows to effectively shade the glass. A good rule of thumb is to cover half the surface of glass at the summer solstice. (e.g. A 30" overhang at the header will cover the to half of a 4' tall window; 4'-6" would cover the top half of a 6'8" sliding glass door.)	CG A5.106.9 AZ (Scott)		
1.3	T24 • Install window screens with a shading coefficient of .45 or lower to reduce heat radiation	AZ (Scott)		
1.4	• Trees on the west and east can be evergreen, but consider using deciduous trees on the south because during the winter, after dropping their leaves, the branches will filter the sun and provide desirable partial passive heating. Trees may shade roof surfaces where solar panels may be installed and decrease efficiency. Coordinate location of trees and solar panels. • Use trees to shade the west side of the building. Minimum of 1 tree per 20 liner feet of building length.	LEED SS CG A5.106.7	**2**	
1.5	• Use trellises, shade structures to extend the comfort of the building out into the harsh environment of the parking lot. Create moderate-climate in-between zone as entry to several adjacent uses. Min. 5% of building area.	IDC	**2**	
1.6	• Shade pavement to reduce heat island effect. Carports do a better job than trees. Use trees in larger planting areas to create a visual impact, create a microclimate that is supportive of the trees themselves, and may also improve the shoppers' experience. Shade 50% of parking with min. of two of following requirements: • When using trees, they must mature within 5 years of occupancy. • Use open-grid pavement system. • Use light colored/high -albedo materials	CG A5.106.11	**2**	
	Subtotal:			
2	WATER - RAIN: • **Keep water (rain and irrigation) away from buildings.**			
2.1	• Use weather-based automatic irrigation controllers/timers to adjust function due to rain. (SEE WATER - USAGE)	CVAG	**M**	
2.2	• Adhere to landscape material (drought-tolerant) guidelines adopted by Jurisdiction. (SEE WATER - USAGE)	CVAG	**M**	
2.3	• Use deep irrigation and solar power controllers. (SEE SOLAR - PHOTOVOLTAIC)	LEED WE 2.1	**2**	
2.4	• Do not use petroleum-based pavement material.	AZ (Scott) 1.33	**2**	

TECHNICAL BUILDING MEASURES AND POINT SYSTEM

FOR THE BUILDING OWNER PLANNING TO REMODEL COMMERCIAL BUILDING

site

		Source Code	Points	Check
2	WATER - RAIN: (cont.)			
2.5	• Moisture control. Employ moisture control measures by the following methods; • Sprinklers. Prevent irrigation spray on structures. • Entries and openings. Design hardscape and landscape to prevent water intrusion into buildings.	CG 5.731.7.1 & 5.713.7.2	**M**	
2.6	• Flashing details for new additions: Provide flashing details on building plans which comply with accepted industry standards or manufacturer's instructions. Details are shown on plans at all of the following locations: • Around windows and doors • Deck connections to the structure • Roof to wall intersections • Drip caps above windows and doors with architectural projections.	CG A4.106.4 & GPR P.A.1	**3**	
2.7	• Weather protection. Provide a weather-resistant exterior wall and foundation envelope as required by California Building Code Section 1403.2 (Weather Protection) and California Energy Code Section 150, (Mandatory Features and Devices), manufacturer's installation instructions, or local ordinance, whichever is more stringent. Mandatory for Remodel areas greater than 2000 SF and $500,000 in construction cost.	CG 5.713.7.1	**M**	
2.8	• Storm water pollution prevention. Additions that disturb soil of less than one acre shall prevent the pollution of stormwater runoff from the construction activities through one or more of the following measures: Erosion Control of Local Ordinance, Best management practices, and Good Housekeeping Best Management Practice to manage construction equipment, materials, waste, etc.	CG 5.710.6	**M**	
2.9	• Grading and Paving. Construction plans shall indicate how site grading or a drainage system will manage all surface water flows to keep water from entering buildings. Examples of methods to manage surface water include, but are not limited to, the following: • 1. Swales • 2. Water collection and disposal systems • 3. French drains • 4. Water retention gardens • 5. Other water measures which keep surface water away from buildings and aid in groundwater recharge.	CG 5.710.10	**M**	
	Subtotal:			

3	WATER - USAGE: • **Water needs to be pumped to reach millions of destinations. Electricity powers the pumps. Reduction of water usage equals reduction of water delivery. Use combination of aerators & low flow fixtures.**			
3.1	• Adhere to (Coachella Valley) landscape material (drought-tolerant) guidelines adopted by Jurisdiction.	CG 5.712.4.1 Local Zoning, LEED SS	**M**	
3.2	• Adhere to (Coachella Valley and CVAG Water Efficiency Water Ordinance) landscape irrigation guidelines.	CG 5.712.4.1 Local Zoning LEED WE	**M**	
	• Install a low-water consumption irrigation system which minimizes the use of spray-type heads. For example, use non-sprinkler or drip, zoned irrigation system with multiple valves to accommodate specific water needs to different types of plants.		**2**	
	• Use weather-based automatic irrigation controllers/timers to save water usage when raining.		**1**	

TECHNICAL BUILDING MEASURES AND POINT SYSTEM

FOR THE BUILDING OWNER PLANNING TO REMODEL COMMERCIAL BUILDING

		Source Code	Points	Check
3	WATER - USAGE: (cont.)			
3.3	• Use turf ONLY where it is actively used, and strictly limit the area. (4 points max) • 10% of landscape area (2 points) • 0% of landscape (4 points)	IDC	**4**	
3.4	• Plumbing fixtures and fittings. Plumbing fixtures (water closets and urinals) and fittings (faucets and showerheads) shall meet the standards referenced in Table 5.503.6 of CBC.	CG 5.712.3.2	**M**	
3.5	• Consider reducing the usage of indoor water by selecting plumbing fixtures with flow restrictors or aerators beyond code requirements.	CG 5.713.3.5 L WE Cr 2 & 3		
	• Kitchen faucets and dishwashers with Max flow rate at sink faucet not greater than 1.5 gpm at 60 psi		**1**	
	• Dishwashers shall be Energy Star and not use more than 5.8 gallons per cycle.		**1**	
	• Nonwater supplied urinals or waterless toilets are installed.		**1**	
3.6	• Consider reducing water consumption as a whole house approach.			
	• Indoor water use shall be reduced by at least 20 percent by either water saving fixtures/flow restrictors or 20 percent reduction in baseline water use stated in the California Building Code.		**M**	
	• 30 percent savings. A schedule of plumbing fixtures and fixture fittings that will reduce the overall use of potable water within the building by 30 percent shall be provided. (8 points) OR	CG A5.303.3 L WE Cr 2 & 3	**12**	
	• 35 percent savings. A schedule of plumbing fixtures and fixture fittings that will reduce the overall use of potable water within the building by 35 percent shall be provided. (10 points) OR			
	• 40 percent savings. A schedule of plumbing fixtures and fixture fittings that will reduce the overall use of potable water within the building by 40 percent shall be provided. (12 points)			
3.7	• Additions to existing buildings in excess of 50,000 square feet. Separate submeters shall be installed for each individual leased, rented, or other tenant space within the building projected to consume more than 100 gal/day (380 L/day), including, but not limited to, spaces used for laundry or cleaners, restaurant or food service, medical or dental office, laboratory, or beauty salon or barber shop.	CG 5.712.3.1	**M**	
3.8	• Dual plumbing: New buildings and facilities shall be dual plumbed for potable and recycled water systems for toilet flushing when recycled water is available as determined by the enforcement authority.	CG A5.303.5	**2**	
	Subtotal:			

site

TECHNICAL BUILDING MEASURES AND POINT SYSTEM

FOR THE BUILDING OWNER PLANNING TO REMODEL COMMERCIAL BUILDING

site

		Source Code	Points	Check
4	HEAT ISLAND: • **Reduce heat island effect - the more the area surrounding the building is heated, the more the building needs to cool down during the summer.**			
4.1	• Use shade trees and trellises to shade hardscape to reduce heat radiation. (SEE SHADE)		**M**	
4.2	• Separate hardscape from the building to reduce heat transfer from outside to inside.	IDC	**1**	
4.3	• Re-design areas around building entrances to improve the appeal and micro-climate: add shade from awnings, overhangs, and plant material.	IDC	**1**	
4.4	• Use alternative paving (pavers, decomposed granite, etc.) that have less thermal mass than concrete. (SEE WATER RAIN)		**M**	
4.5	• Reduce glare (sunlight reflecting off the ground surface) by using drought-tolerant ground cover or material that scatters the sunlight (gravel). (SEE SHADE)		**M**	
	Subtotal:			

5	PARKING REQUIREMENTS: • **Provide preferred stalls for electric or hybrid vehicles. Consider on-street and joint-use parking to reduce on-site parking**			
5.1	• When restriping, provide preferential parking to 8% for low-emitting, fuel efficient vehicles, for motorcycles and scooters, for bicycles and for golf-carts. Negotiate with planning department to include such vehicles in parking count.	CG A5.105.5 & 106.5 L SS Cr 4.3 & 4	**M**	
	• 10% of total capacity is preferred parking spots for low-emitting vehicles. (1 point) OR		**2**	
	• 12% of total capacity is preferred parking spots for low-emitting vehicles. (2 points)		**1**	
	• Alternative-fuel refueling stations for 1% of total vehicle capacity.		**1**	
	• Size parking to not exceed min zoning req'ts and provide infrastructure to facilitate shared vehicle usage.			
5.2	• Provide preferred bicycle storage for building occupants. For buildings with over 10 tenant occupants, provide changing/shower facilities for tenant-occupants only in accordance with Table A5.106.4.3 of CBC or document arrangements with nearby changing/shower facilities.	CG A5.106.4.3	**1**	
5.3	• Provide solar powered lighting for at least 50% of site lighting. (SEE SOLAR - PHOTOVOLTAIC)	AZ (Scott) 1.42	**M**	
	Subtotal:			

6	PROTECT EXISTING BUILDING: • **Save materials and save resources**			
6.1	• Existing building structure. Maintain at least 75 percent of existing building structure (including structural floor and roof decking) and envelope (exterior skin and framing) based on surface area.	A5.105.1.1	**2**	
6.2	• Existing nonstructural elements. Reuse existing interior nonstructural elements (interior walls, doors, floor coverings and ceiling systems) in at least 50 percent of the area of the completed building (including additions).	A5.105.1.2	**2**	
6.3	• Salvage. Salvage additional items in good condition such as light fixtures, plumbing fixtures and doors as follows. Document the weight or number of the items salvaged. Salvage for reuse on the project items that conform to other provisions of Title 24 in an onsite storage area.	A5.105.1.3	**2**	
	Subtotal:			

TECHNICAL BUILDING MEASURES AND POINT SYSTEM

FOR THE BUILDING OWNER PLANNING TO REMODEL COMMERCIAL BUILDING

envelope

		Source Code	Points	Check
7	ROOF: • **Use "cool roof" coating or materials and save on annual electricity bills by reducing summer air conditioning costs.**			
7.1	T24 • Rigid insulation on top of roof sheathing. Add insulation on top of roof sheathing: rigid or spray-applied foam.	AEDG Small (Chap 3) 30%		
7.2	T24 • Re-roof with Cool Roof: highly reflective outer surface that reduces the amount of heat conducted through the roof: this may reduce size of air conditioning; extend roof life, and reduce heat island effect.	CG A5.106.11.2 L SS Cr 7.2 SCE p. 16 15%		
7.3	T24 • Consider "cool roof" coating over existing roofing.	CG A5.106.11 SCE p. 16		
7.4	• If metal roof system is being considered, the design of metal roof should include stand-off battens to allow free flow thermally-driven air between roof sheathing and metal roofing.	IDC	**2**	
7.5	• Avoid petroleum-based roof system.	AZ (Scott)	**2**	
7.6	• Install a radiant barrier at the roof level..	IDC	**2**	
7.7	• Use non-sawn lumber to frame new roof structure for new additions (at least 75%). Non sawn lumber uses less lumber. (SEE FRAMING CONSIDERATION)		**M**	
	Subtotal:			

8	CEILING SPACE: • **Insulation is simply a method for slowing the movement of heat. Insulating materials work in the same way that goose down works-by trapping air in tiny pockets that restrict it from moving. Heat transfer that would normally be accomplished through natural air movement is slowed down because the air can't move as freely.**			
8.1	T24 • Perform third party blower door test to verify building envelope tightness.	CG A4.206		
8.2	T24 • Exceed code minimum attic insulation values.: Insulate attic and other areas with R-38. In ventilated attic spaces install insulation at the ceiling line. In unventilated attic spaces install insulation between roof framing at the underside of roof deck. When suspended ceilings with removable ceiling tiles are used, install insulation at underside of roof deck.	AEG Small Office Blg (Chap 3) 30%		
8.3	T24 • R-10 duct insulation w/ ducts on roof, HERS verified duct leakage for 10,580 SF, 1 Story, & W//W ratio 37.1%	SCE (pg. 16) 15% T24		
8.4	T24 • R-8 duct insulation w/ ducts in the ceiling space, HERS verified duct leakage for 10,580 SF, 1 Story, & W//W ratio 37.1% when ceiling space is part of the remodel.	IDC		

TECHNICAL BUILDING MEASURES AND POINT SYSTEM

FOR THE BUILDING OWNER PLANNING TO REMODEL COMMERCIAL BUILDING

envelope

		Source Code	Points	Check
9	WALLS: • **Maximize wall insulation – outside and/or within the walls; use durable materials outside like plaster and/or fiber cement board.**			
9.1	T24 • Use blown-in spray foam wall insulation to create air-tight walls.	IDC		
9.2	T24 • Exceed Code-mandated insulation values.	GPR F.1 & F.2		
9.3	T24 • Exterior insulation systems prevent thermal bridging and is most effective at reducing heat flow into the conditioned space.	IDC		
9.4	T24 • If new windows are replaced or added, limit solar exposure on west and south walls. (SEE SHADE)	AZ (Scott)		
9.5	T24 • Third party inspection of insulation	IDC		
9.6	• Use durable and pre-finished exterior finish material (integrally colored plaster, fiber-cement siding and panels) for exterior remodels.	AZ (Scott)	**2**	
9.7	• Consider a "second-skin" wall system that shades west and south-facing walls. "Living walls", louvers and simple shade reduces the radiant heat build up from solar exposure. (SEE SHADE)	CG A5.106.7	**2**	
9.8	• Provide insulated headers in new additions.	IDC	**1**	
9.9	• Wall colors have a light reflectance value of 35% or less for reduced desert glare.	AZ (Scott)	**1**	
	Subtotal:			

10	WINDOWS: • **Specify spectrally selective glazing to reduce heat gain, but allow optimal visible transmittance (VT) especially for retail display windows. Select windows with thermally broken frames.**			
10.1	T24 • Meet or Exceed Energy Star rated for windows			
10.2	T24 • Use spectrally selective glazing (SHGC of <0.28) on east-, south- and west-facing windows. Use north-facing windows with SHGC < 0.46.			
10.3	T24 • Replace existing single-glazed windows with dual-glazed units using spectrally selective glass and thermally broken frames.			
10.4	T24 • Use argon gas-filled insulated glass units.			
10.5	• Provide shade on east-, south, and west-facing windows using overhangs, awnings, colonnades, trees, etc. Design projections to shade at least 50% of glazing (projection factor of 0.5) for new additions. (SEE SHADE)		**M**	
10.6	• Include operable windows for natural ventilation during the six month "season." (SEE EXHAUST)		**M**	
10.7	• Add window films to reduce heat gain from solar radiation and provide low cost cooling load reduction. Install film on the inside surface.		**1**	
10.8	• Add Interior shades to all windows to improve comfort, reduce solar heat gain and glare.		**1**	
	Subtotal:			

11	SKYLIGHTS: • **Skylights can be a great advantage to daylight schemes and the overall quality of the indoor environment. However they are thermally transparent. Integrate skylights into an overall daylighting scheme including photosensitive sensors & dimmable fixtures.**			
11.1	• Balance the placement and size of skylights for optimal indoor light quality, but limit the maximum percent of roof area to <6%.	AEDG Small (Chap 3) 30%	**1**	
11.2	• Use skylights with a thermal transmittance value of U-6.9, solar Heat Gain Coefficient of 0.19, and thermal break.	AEDG Small (Chap 3) 30%	**1**	
	Subtotal:			

TECHNICAL BUILDING MEASURES AND POINT SYSTEM

FOR THE BUILDING OWNER PLANNING TO REMODEL COMMERCIAL BUILDING

structure

		Source Code	Points	Check
12	FRAMING CONSIDERATIONS: • **For new additions such as new facades, place Joists, Rafters & Studs @ 24" O.C. It saves material.**			
12.1	• For light wood framing additions, dimensions and layouts are designed to minimize waste.	CG A5.404.1 AZ (Scott)		
	• Design stud spacing greater than 16" o.c.		**2**	
	• Design building on modular grid such as 24" or 48" to match dimensions of standard material		**3**	
	• Design Beams and headers and trimmers are the minimum size to adequately support the load.		**1**	
12.2	• Use premanufactured building systems to eliminate solid sawn lumber whenever possible. One of the following systems:	AZ (Scott)		
	• Composite floor joist or premanufactured floor truss framing (Min. of 75%)		**2**	
	• Composite roof rafter or premanufactured roof truss framing (Min. of 75%)		**2**	
	• Composite framing for interior framing. (Min. of 75%)		**2**	
	• Panelized wall framing systems (SIPS, ICF, or similar)		**2**	
	• Other methods approved by the enforcing agency.		**2**	
12.3	• Material lists are included in the plans which specify material quality and provide direction for on-site cuts.		**2**	
	• Floor framing			
	• Wall framing			
	• Ceiling and roof framing			
	• Structural panels and roof sheathing			
12.4	• Use advanced framing technologies	AZ (Scott)	**3**	
12.5	• Steel framing. Design for and employ techniques to avoid thermal bridging.	CG A5.213.1	**1**	
	Subtotal:			

13	MATERIAL EFFICIENCY: • **Consider using panelized or already assembled systems**			
13.1	• Select exterior finishes derived from regional sources within 500 miles of job site. This includes stone or culture stone veneers that are regionally quarried or processed. (10% of material cost min.)	CG A5.405.1 L MR Cr 5	**1**	
13.2	• Reduction in cement use for new additions: Products such as fly ash, slag, silica fume and rice hull ash used to replace cement in concrete mix design (2 points max.)	CG A5.405.5 AZ (Scott)	**2**	
	• No less than 20% substituted volume of cement. (1 point)			
	• No less than 25% substituted volume of cement. (2 point)			
13.3	• Use engineered lumber (Beams, headers, lumber for floors and rafters; oriented strand board for subfloor, walls and roof sheathing)	IDC	**2**	
13.4	• Use building materials that do not require additional resources for finishing (One or more of exterior trim, windows, siding or exterior wall coverings)	CG A5.406	**2**	
13.5	• Floors that do not require additional coverings for finish.	CG A5.406	**2**	
13.6	• Service life: Select materials for longevity and minimal deterioration under conditions of use. Use materials, equivalent in performance to virgin materials, with post-consumer or pre-consumer recycled content value (RVC) for a minimum of 10 percent of the total value, based on estimated cost of materials on the project. Provide documentation as to the respective values.	CG A5.406.1	**2**	

			Source Code	Points	Check
13	MATERIAL EFFICIENCY cont:				
13.7	• Bio-based materials. Select bio-based building materials and products made from solid wood, engineered wood, bamboo, wool, cotton, cork, straw, natural fibers, products made from crops (soy-based, corn-based) and other bio-based materials with at least 50% bio-based content.		CG A5.405.2	**4**	
		• Certified wood. Certified wood is an important component of green building strategies and the California Building Standards Commission will continue to develop a standard through the next code cycle. (2 points)			
		• Rapidly renewable materials. Use materials made from plants harvested within a ten-year cycle for at least 2.5% of total materials value, based on estimated cost. (2 points)			
13.8	• Reused materials. Use salvaged, refurbished, refinished, or reused materials for a minimum of 5% of the total value, based on estimated cost of materials on the project. Provide documentation as to the respective values.		CG A5.405.3	**2**	
13.9	• Recycled content. Use materials, equivalent in performance to virgin materials with a total (combined) recycled content value (RCV) of:			**4**	
		• The RCV shall not be less than 10 percent of the total material cost of the project. (2 points) OR			
		• The RCV shall not be less than 15 percent of the total material cost of the project. (4 points)			
		Subtotal:			

structure

TECHNICAL BUILDING MEASURES AND POINT SYSTEM

FOR THE BUILDING OWNER PLANNING TO REMODEL COMMERCIAL BUILDING

equipment

		Source Code	Points	Check
14	AIR CONDITIONING: • **For a business owner in a multi-tenant building, roof-mounted package HVAC units are the most common solution; higher efficiency units use less energy. Careful design will take into consideration energy efficiency measures used throughout the design, and will identify zones within the building so the air distribution is balanced. An economizer cycle can greatly reduce off-hour heat build-up.**			
14.1	• Carefully design the HVAC system taking into account all the energy efficiency and sustainable design strategies used throughout the building (e.g. "cool roof", higher insulation values, better-performing windows, daylighting, thermal mass, shade on walls and windows, reduction of heat island surrounding the building, etc.)	L IEQ P1 & Cr 7.1	**M**	
14.2	T24 • Perform duct leakage testing to verify a total leakage rate of less than 6 percent of the total fan flow.			
14.3	T24 • Use condensing units with two-stage compressors and variable speed air handling fan (generally on units with SEER 16 or higher.) Use units with a minimum of EER 11.5.	AZ (Scott)		
14.4	T24 • Install ductwork within the conditioned envelope of building, in an under floor crawl space, with an R-6 or higher insulation value or buried in the ceiling insulation.			
14.5	T24 • Install an energy management system with humidity and temperature sensors, and demand controlled ventilation (DCV) which matches outside air intake to the number of people in a space.	CG 5.506.1 L EA Cr 4		
14.6	T24 • Design HVAC system with economizer cycle.	IDC		
14.7	• Configure window functions to facilitate cross-ventilation for open floorplan layout. (SEE WINDOWS)	AZ (Scott)	**2**	
14.8	• Install multi-speed Energy Star rated ceiling fans (Min of 3 per 1500 SF of commercial space). For high bay areas, consider high volume and low speed (HVLS) fans.	AZ (Scott)	**2**	
14.9	• Filters. In mechanically ventilated buildings, provide regularly occupied areas of the building with air filtration media for outside and return air prior to occupancy that provides at least a MERV of 8.	CG 5.504.5.3	**M**	
14.10	• Filters. In mechanically ventilated buildings, provide regularly occupied areas of the building with air filtration media for outside and return air prior to occupancy that provides at least a MERV of 11.	CG 5.504.5.3 LEED EA	**2**	
14.11	• Salvage components of system if effectively reusable.		**1**	
14.12	• If re-using ducts, seal ends to protect form construction dust. Prior to re-start, clean and seal ducts to reduce leakage.		**1**	
14.13	• Reduce outside air intake with demand controlled ventilation (DCV) which matches outside air intake to the number of people in a space.		**1**	
	Subtotal:			

15	WATER HEATING: • **Depending upon the demand for hot water, solar water heating, tankless (on-demand) gas water heaters, even fuel cells may be appropriate.**			
15.1	T24 • With a storage water heater, the energy factor (EF) for a gas-fired storage water heater is higher than 0.60 and the energy factor (EF) for a gas-fired tankless water heater is .80 or higher.	LEED EA 7.3 AZ (Scott)		
15.2	T24 • Insulate (R-4) hot water pipes full distance from heater to fixture.	AZ (Scott)		
15.3	• Commercial users with high hot water demands (restaurants, medical clinics, Laundromat, etc.) may also consider fuel cell systems that generate electricity and can provide heat for hot water. (SEE FUEL CELL)		**M**	

		Source Code	Points	Check
16	EVAPORATIVE COOLING: • **Design an evaporative cooler system to be used for the majority of the year and save on electrical load.**			
16.1	• Use a two-stage direct/indirect evaporative cooler that uses air-to-air heat exchangers may be effective in back of house areas. This provides the most efficiency for year round operation for public or support facilities.	IDC	**2**	
16.2	• Use a direct 2 speed (air to water) evaporative cooler as a more cost effective system. Limited use for hot and dry weather only.	IDC	**2**	
	Subtotal:			

17	EXHAUST FANS: • **Use Energy Star fans, exhaust outdoors. Humidistat, occupancy sensor, timer.**			
17.1	• Install Energy Star bathroom fans on timer or occupancy for individual toilet rooms. Use a central exhaust fan system when more than 6 individual toilet rooms.	IDC	**1**	
	Subtotal:			

18	DUCTS • **Duct leakage and heat transfer the length of ducts greatly reduces the HVAC efficiency.**			
18.1	• Place ducts below roof insulation or insulate with a minimum R-6. (SEE ROOF)		**M**	
18.2	• Perform duct leakage testing prior to installation of ceiling. (SEE ROOF AND ATTIC)		**M**	
18.3	• Seal ducts during construction to prevent dust from entering system. (SEE AIR QUALITY CONTROL)		**M**	
18.4	• Flush building after construction to improve indoor air quality. (SEE AIR QUALITY CONTROL)		**M**	

passive energy - comfort & health

		Source Code	Points	Check
19	THERMAL MASS: • **Heavy materials like stone, tile, masonry and concrete can absorb a lot of heat. When combined with whole building fan can reduce the use of air conditioning if used with night structure cooling. However, they are also cool during the winter.**			
19.1	• In desert climate, hard surface flooring reduces the cooling load during the summer, but during the winter the floor may be uncomfortably cool.		**2**	
	Subtotal:			

20	THERMAL CHIMNEY: • **"Hot air rises" the building can move air passively - indoors and outdoors.**			
20.1	• Add operable skylights at existing high bays, peak of the roof or a tower element with operable windows. This will allow the hot air to escape if proper air intakes are provided at windows below. This will facilitate natural ventilation.	IDC	**2**	
20.2	• Add small exhaust fans at the peak of the existing roof or a tower element to assist this thermal effect. Simple differential temperature controls can perform the sequence automatically. (SEE THERMAL MASS)	IDC	**2**	
	Subtotal:			

21	DAYLIGHTING: • **Daylighting reduces energy usage in two ways: it reduces daytime need for artificial light, and reduces heat gain from light fixtures. However, windows and skylights must be also be thermally efficient to limit solar heat gain. Daylight schemes must moderate direct sunlight, balance light distribution to reduce glare, and be integrated with artificial lighting controls. Occupant-controlled solar control (blinds, adjustable louvers, etc.) are important components.**			
21.1	• Natural light reduces the demand for electric lights during the day, however, glare and solar heat gain must be controlled. Provide day lit spaces as required for top lighting and side lighting. In constructing a design, consider the one of the following (min.):	CG A5.507.2 L IEQ CR 8.1		
	• Use of light shelves and reflective room surfaces to maximize daylight penetrating the rooms		**1**	
	• Means to eliminate glare and direct sun light with skylights 20' from windows.		**1**	
	• Use of photo sensors to turn off electric lighting when daylight is sufficient		**1**	
	• Not using diffuse day lighting glazing where views are desired		**1**	
21.2	• Views. Achieve direct line of sight to the outdoor environment via vision glazing between 2'6" and 7'6" above finish floor for building occupants in 90 percent of all regularly occupied areas.	CG A5.507.3 L IEQ CR 8.2	**2**	
21.3	• Interior office spaces: Entire areas of interior office spaces may be included in the calculation if at least 75 percent of each area has direct line of sight to perimeter vision glazing. For multi-occupant spaces, include in the calculation the square footage with direct line of sight to perimeter vision glazing for views.	CG A5.507.3 L IEQ CR 8.1	**2**	
21.4	• Interior surface reflectivity is an essential part of daylighting. Use 80% reflectance for ceilings and 70% for walls.	IDC	**2**	
21.5	• Locate all work stations occupied for critical visual tasks within 25 feet of windows.	AZ (Scott) 5.43	**1**	
	Subtotal:			

TECHNICAL BUILDING MEASURES AND POINT SYSTEM

FOR THE BUILDING OWNER PLANNING TO REMODEL COMMERCIAL BUILDING

		Source Code	Points	Check
22	EFFICIENT FIXTURES & CONTROLS: • **Lighting efficiency has several components: the fixtures, the controls and interior surfaces.**			
22.1	T24 • Max interior lighting wattage does not exceed minimum requirements of watts per sq ft as stated in the California Building Code.			
22.2	T24 • Use highly efficient fluorescent fixtures with programmable electronic ballasts.			
22.3	T24 • Use LED fixtures where the highest efficacy are required.			
22.4	T24 • Use occupancy sensors, photo-sensitive sensors and programmable lighting controls.			
22.5	T24 • Specifically zone areas adjacent to windows and skylights for photosensitive controls.			
22.6	• Program lighting for "cleaning crew" separate from normal operations.	IDC	**1**	
22.7	• Lighting and thermal comfort controls. Provide controls in the workplace for single-occupant spaces.	CG A5.507.1.1 IEQ Cr 6.1 & 2		
	• Provide individual task lighting and/or daylighting controls for at least 90 percent of the building occupants.		**2**	
	• Thermal comfort. Provide individual thermal comfort controls for at least 50 percent of the building occupants.		**2**	
22.8	• Multi-occupant spaces. Provide lighting and thermal comfort system controls for all shared multi-occupant spaces.	CG A5.507.1.2	**2**	
22.9	• Light Pollution Reduction: design interior and exterior lighting such that zero direct - beam illumination leaves the building site. Meet or exceed exterior light levels and uniforminity ratios for lighting zones using the following strategies.	CG 5.106.8 L SS Cr 8	**M**	
	• Shield all exterior luminaries or use cutoff luminaries.			
	• Contain interior lighting within each source.			
22.10	• Energy monitoring. Provide submetering or equivalent combinations of sensor measurements and thermodynamic calculations, if appropriate, to record energy use data for each major energy system in the building.	CG A5.204.2	**M**	
	• Data storage. The data management system must be capable of electronically storing energy data and creating user reports showing hourly, daily, monthly and annual energy consumption for each major energy system.		**3**	
	• Data access. Hourly energy use data shall be accessible through a central data management system and must be available daily.		**3**	
22.11	• Demand response. HVAC systems with Direct Digital Control Systems and centralized lighting systems shall include preprogrammed demand response strategies that are automated with either a Demand Response Automation Internet Software Client or dry contact relays.	CG A5.204.3	**M**	
	• HVAC. The preprogrammed demand response strategies should be capable of reducing the peak HVAC demand by cooling temperature set point adjustment.		**2**	
	• Lighting. The preprogrammed demand response strategies should be capable of reducing the total lighting load by a minimum 30 percent through dimming control or bi-level switching.		**2**	
	• Software clients. The software clients will be capable of communicating with a DR Automation Server.		**2**	
	Subtotal:			

passive energy - comfort & health

			Source Code	Points	Check
23	APPLIANCES: • **Use Energy Star appliances: energy star appliances save energy, save money, and help reduce emissions of greenhouse gases and air pollutants at the source.**				
23.1	• Energy star rated appliances including range, refrigerator, and/or dishwasher for office buildings.		CG A5.204.1 & A5.303.3	**2**	
		• Clothes washers shall have a maximum Water Factor (WF) that will reduce the use of water for buildings like laundry rooms.		**1**	
		• Ice makers shall be air cooled.			
		• Food steamers shall be connectionless or boilerless.			
		Subtotal:			

24	INDOOR AIR QUALITY & COMFORT: • **Off-gassing is the process by which materials release chemicals used to fabricate or hold them together. These chemicals adversely affect the indoor air quality.**			
24.1	• Outside air delivery. For mechanically or naturally ventilated spaces in buildings, meet the minimum requirements of Section 121 of the California Energy Code, CCR, Title 24, Part 6 and Chapter 4 of CCR, Title 8 or the applicable local code, whichever is more stringent. Mandatory for Remodel areas greater than 2000 SF and $500,000 in construction cost.	CG 5.714.7.1 CG 5.714.7.2	**M**	
24.2	• For new additions, concrete slab foundations required to have a vapor retarder shall be installed in compliance with a 4-inch (101.6 mm) thick base of 1/2 inch or larger clean aggregate shall be provided with a vapor barrier in direct contact with concrete and a concrete mix design, which will address bleeding, shrinkage, and curling, shall be used. For additional information, see American Concrete Institute, ACI 302.2R-06 or other designs by a licensed design professional. (SEE WATER - RAIN)	CG A5.407.1	**M**	
24.3	• For new additions, openings in the building envelope separating conditioned space from unconditioned space needed to accommodate gas, plumbing, electrical lines and other necessary penetrations must be sealed in compliance with the California Energy Code.	IDC	**M**	
24.4	• Prevent irrigation heads from spraying building walls - another source of mold in walls. (SEE WATER - RAIN)		**M**	
24.5	• Carbon dioxide (CO_2) monitoring. For buildings equipped with demand control ventilation, CO_2 sensors and ventilation controls shall be specified and installed in accordance with the requirements of the latest edition of the California Energy Code, CCR, Title 24, Part 6, Section 121(c).	CG 5.506.2 CG 5.714.7.3 L IEQ Cr 1 & 2	**M**	

passive energy - comfort & health

		Source Code	Points	Check
24	INDOOR AIR QUALITY & COMFORT: (cont.)			
24.6	• Covering of duct openings and protection of mechanical equipment during construction. At the time of rough installation or during storage on the construction site and until final startup of the heating and cooling equipment, all duct and other related air distribution component openings shall be covered with tape, plastic, sheet metal or other methods acceptable to the enforcing agency to reduce the amount of dust or debris which may collect in the system.			
	• Temporary ventilation. The permanent HVAC system shall only be used during construction if necessary to condition the building within the required temperature range for material and equipment installation. If the HVAC system is used during construction, use return air filters with a Minimum Efficiency Reporting Value (MERV) of 8, based on ASHRAE 52.2 1999, or an average efficiency of 30% based on ASHRAE 52.1 1992. Replace all filters immediately prior to occupancy. Mandatory for Remodel areas greater than 2000 SF and $500,000 in construction cost.	CG 5.714.7.1 CG 5.714.7.3	**M**	
	• Filters. In mechanically ventilated buildings, provide regularly occupied areas of the building with air filtration media for outside and return air that provides at least a Minimum Efficiency Reporting Value (MERV) of 8. MERV 8 filters shall be installed prior to occupancy, and recommendations for maintenance with filters of the same value shall be included in the operation and maintenance manual. Mandatory for Remodel areas greater than 2000 SF and $500,000 in construction cost.			
	• Upgrade Filters. In mechanically ventilated buildings, provide regularly occupied areas of the building with air filtration media for outside and return air that provides at least a Minimum Efficiency Reporting Value (MERV) of 11. MERV 11 filters shall be installed prior to occupancy, and recommendations for maintenance with filters of the same value shall be included in the operation and maintenance manual. (1 point)		**1**	
24.7	• Ozone depletion and global warming reductions. Installations of HVAC, refrigeration and fire suppression equipment shall comply with the following:			
	• Install HVAC and refrigeration equipment that does not contain CFCs.	CG 5.714.8	**M**	
	• Install fire suppression equipment that does not contain Halons.			
24.8	• Prohibit smoking in the building or Restrict areas for smoking outside of 25 ft of entries, outdoor air intakes, & operable windows. Mandatory for Remodel areas greater than 2000 SF and $500,000 in construction cost.	CG A5.714.4.7 L IEQ P2	**M**	
24.9	• Develop and implement an indoor air quality management plan for the pre-occupancy phase of the building and temporary ventilation during construction.	CG A5.504.1 L IEQ Cr 3.1 & 2	**3**	
24.10	• After construction ends and prior to occupancy, conduct a one-week building flush out with new efficiency reporting value (MERV) 13 filtration media at 100% outside air. Replace filters after flushout.	CG A5.504.2 LEED IEQ	**1**	
24.11	• Hazardous particulates and chemical pollutants. Minimize and control pollutant entry into buildings and cross-contamination of regularly occupied areas.			
	• Install permanent entryway systems measuring at min. six feet in the main direction of travel to capture dirt and particulates at entryways directly connected to the outdoors on site renovation	CG A5.504.5 IEQ Cr 5	**2**	
	• Isolation of pollutant sources. In rooms where activities produce hazardous fumes or chemicals, exhaust them and isolate them from their adjacent rooms.		**2**	

passive energy - comfort & health

		Source Code	Points	Check
24	INDOOR AIR QUALITY & COMFORT: (cont.)			
24.12	• Hydro chlorofluorocarbons (HCFCs). Install HVAC and refrigeration equipment that does not contain HCFCs.	CG A5.508.3	3	
24.13	• Hydro fluorocarbons (HFCs). Install HVAC complying with either: • Install HVAC, refrigeration and fire suppression equipment that do not contain HFCs or that do not contain HFCs with a global warming potential greater than 150, OR • Install HVAC and refrigeration equipment that limit the use of HFC refrigerant through the use of a secondary heat transfer fluid with a global warming potential no greater than 1.	CG A5.508.4 L EA P3 & Cr 4	3	
24.14	• Composite wood products. Hardwood plywood, particleboard and medium density fiberboard composite wood products used on the interior or exterior of the building shall meet the requirements for formaldehyde as specified in ARB's Air Toxics Control Measure for Composite Wood. Documentation of verification is required.	CG 5.504.4 CG 5.714.4.4 IEQ Cr 4.4	M	
24.15	• Select all interior materials that are low-emitting (VOC): eg. Adhesives, resilient flooring, carpet, paints, and sealer. Documentation which includes manufacturer's product specification and field verification of on-site product containers.	CG 5.504.4 CG 5.714.4.4 IEQ Cr 4.1 & 2	M	
24.16	• Resilient flooring systems. Where resilient flooring is installed, at least 50 percent of floor area receiving resilient flooring shall comply with the VOC emission limits defined in the Collaborative for High Performance Schools (CHPS) Low-emitting Materials List or certified under the Resilient Floor Covering Institute (RFCI) Floor Score program. (2 points max.) • A minimum of 80% of the total area of resilient flooring installed shall comply. (1 point) • A minimum of 90% of the total area of resilient flooring installed shall comply. (2 points)	CG 5.504.4.6 CG 5.714.4.4 IEQ Cr 4.3	M 2	
24.17	• Consider exposed concrete or tile flooring to eliminate off-gassing and dust mites (assoc. with carpet). Concrete also provides a great "heat sink" for thermal mass calculations.	IDC	2	
24.18	• For Cabinetry or interior trims: Meet the formaldehyde limits or use composite wood products with California Air Resources Board.	CG 5.504.4 CG 5.714.4.4	2	
24.19	• Use materials throughout 50% of building which require no application of finish materials (stains, paints).	AZ (Scott)	2	
24.20	• Acoustical ceilings and wall panels. Comply with Chapter 8 in Title 24, Part 2 and with the VOC-emission limits defined in the 2009 CHPS criteria and listed on its Low-emitting Materials List (or Product Registry). Documentation shall be provided verifying that acoustical finish materials meet the pollutant emission limits.	CG A5.504.4.9	2	
24.21	• Insulate formaldehyde-free insulation. Documentation must be provided that verifies the materials are certified to meet this the pollutant emission limits in this section. • Install thermal insulation in compliance with the VOC emission limits defined in CHPS Low emitting Material List. • Install thermal insulation which contains No-Added Formaldehyde and is in compliance with the VOC emission limits defined in CHPS Low emitting Material List.	CG A5.504.4.8 CG 5.714.4.4 AZ (Scott)	2 3	
24.22	• Acoustical control. Employ building assemblies and components with STC values. Mandatory for Remodel areas greater than 2000 SF and $500,000 in construction cost.	CG 5.517.7.4.1	M	
	Subtotal:			

conservation of materials

		Source Code	Points	Check
25	RECYCLED/RAPIDLY RENEWABLE: • **Look into the cool new materials that manufacturers make from recycled or rapidly renewable materials. There are new ones every week.**			
25.1	• Use Recycled Content Aggregate (Min. 25%) • Walkway base if new sidewalks are placed.	CG A5.409	1	
25.2	• Reused materials. Use salvaged, refurbished, refinished or reused materials for at least 5 percent of the total value, based on estimated cost of materials on the project. (SEE SITE EVALUATION)		M	
25.3	• Use recycled content paint	GPR K.5	1	
25.4	• Flooring: Environmentally preferable flooring: FSC certified wood, reclaimed or refinished, rapidly renewable, recycled content, exposed concrete or locally sourced stone or tile.	CG A5.405.2.1 MR Cr 7	2	
25.5	• Innovations: Structural frame and building envelope, use FSC certified engineered lumber for headers, I-joists, trusses, and rafters.	MR Cr 7	3	
25.6	• Select fascia, soffit and trim elements made of recycled-content materials (including metals) or engineered wood products such as finger jointed trim, fiberboard, laminated strand lumber or OSB.	AZ (Scott)	1	
25.7	• Select countertops manufactured from min. of 20% recycled content material.	AZ (Scott)	1	

25.8	• Recycled content. Use materials, equivalent in performance to virgin materials, with postconsumer or preconsumer recycled content. Documentation to be provided as to the respective values. (4 points max.)
	  • No less than 10% recycled content value of the total value, based on estimated cost of materials of the project. (2 points)
	  • No less than 15% recycled content value of the total value, based on estimated cost of materials of the project. (4 points)
		CG A5.405.4
		L Mr Cr 4
			4	

25.9	• Use of building materials from renewable sources. Use one or more of the following materials manufactured from rapidly renewable sources or agricultural by-products is used (products typically harvested within a 10 year or shorter cycle) at least 2.5% of total material value, based on estimated cost.	CG A5.405.2.2 L MR Cr 6		
	• Insulation		2	
	• Bamboo or cork		2	
	• Engineered wood products		2	
	• Agricultural based products		2	
	• Solid wood products		2	
	• Other products acceptable by the enforcing agency.		2	
	Subtotal:			

conservation of materials

		Source Code	Points	Check
26	RECYCLE CONSTRUCTION WASTE: • **Education and site setup are important during construction. If the set up is done well from the beginning, everyone working on the site will follow. For example, provide separate recycle bins during construction for recycling of everyday objects (plastic bottles and aluminum cans) but also for construction waste: drywall, glass, metals, concrete/plaster.**			
26.1	• Construction waste reduction: A minimum of 50% of the construction waste generated at the site is diverted to recycle or salvage.	CG 5.713.8.1	**M**	
26.2	• Construction waste management plan. Where a local jurisdiction does not have a construction and demolition waste management ordinance, a construction waste management plan shall be submitted for approval to the enforcing agency.	CG A5.408.1-3, 3.1 L MR Cr 2	**M**	
26.3	• Excavated soil and land clearing debris. 100 percent of trees, stumps, rocks and associated vegetation and soils resulting primarily from land clearing shall be reused or recycled for new additions.	CG A5.713.8.3	**M**	
26.4	• Deconstruction: Maintain min. of 75% of existing building structure and reuse existing nonstructural elements in at least 50% of the area of completed building including additions. • A minimum of 85% of the construction waste generated at the site is diverted to recycle or salvage.	CG A5.105.1 L MR Cr 2	**2**	
	Subtotal:			

27	RECYCLE - WASTE DESIGN: • **It takes less energy to process recycled materials than to process virgin materials. For example, it takes a lot less energy to recycle paper than to create new paper from trees. The energy from transporting virgin materials from the source is also saved. Saving energy also has its own benefits like decreasing pollution. This creates less stress on own health and our economy.**			
27.1	• Recycling by occupants. Provide readily accessible areas that serve the entire building and are identified for the depositing, storage and collection of nonhazardous materials for recycling.	CG 5.713.10 L MR P1	**M**	

conservation of materials

		Source Code	Points	Check
28	BUILDING MAINTENANCE AND OPERATION: • **Building maintenance is disregarded, resulting in terrible air quality or unsafe areas within the place of work. Additionally, the wrong colors, furnishings setup, or noise level can depressingly impact the temperament and fortitude of those working within such conditions.**			
28.1	• Testing and adjusting. Testing and adjusting of systems shall be required for remodeled buildings less than 10,000 SF. • Systems. Develop a written plan of procedures for testing and adjusting systems. Systems to be included for testing and adjusting shall include, as applicable to the project, the systems listed in Section 5.410.3.2 of the 2010 California Building Code. • Procedures. Perform testing and adjusting procedures in accordance with industry best practices and applicable national standards on each • Reporting. After completion of testing, adjusting and balancing, provide a final report of testing signed by the individual responsible for performing these services. • Operation and maintenance manual. Provide the building owner with detailed operating and maintenance instructions and copies of guaranties/warranties for each system prior to final inspection.	CG 5.713.10.4 L EA Cr 3	**M**	
28.2	• Provide on-going accountability of building energy performance and maintenance after remodel.	L EA Cr 5	**2**	
28.3	• Energy Monitoring: Provide sub-metering or equivalent combinations of sensor measurements and thermodynamic calculations, if appropriate, to record energy use data for each major energy system in the building, including chillers, heat pumps, packaged AC systems, fans, pumps, cooling towers, boilers and other heating systems, lighting systems, and process loads. This energy use data, once collected, shall be stored within a data management system. (4 points max) • Data storage. The data management system must be capable of electronically storing energy data and creating user reports showing hourly, daily, monthly and annual energy consumption for each major energy system. Hourly data shall be retained a minimum of 30 days, daily data shall be retained a minimum of 6 months and monthly data shall be retained a minimum of 2 years. (2 points) • Data access. Hourly energy use data shall be accessible through a central data management system and must be available daily. (2 points)	CG A5.204.2	**4**	
28.4	• Demand response. HVAC systems with Direct Digital Control Systems and centralized lighting systems shall include pre-programmed demand response strategies that are automated with either a Demand Response Automation Internet Software Client or dry contact relays. (6 points max) • HVAC. The pre-programmed demand response strategies shall be capable of reducing the peak HVAC demand by cooling temperature set point adjustment. (2 points) • Lighting. The pre-programmed demand response strategies shall be capable of reducing the total lighting load by a minimum 30% through dimming control or bi-level switching. (2 points) • Software clients. The software clients shall be capable of communicating with a DR Automation Server. (2 points)	CG A5.204.3	**6**	
	Subtotal:			

on-site generation

		Source Code	Points	Check
28	SOLAR - PHOTO VOLTAIC: • **Reduce the peak power demand through the use of on-site renewable energy systems or contracting with off-site energy companies.**			
28.1	• On-site renewable energy. Use on-site renewable energy for at least 1 percent of the electrical service over current protection device rating calculated in accordance with the 2007 California Electrical Code or 1KW, whichever is greater, in addition to the electrical demand required to meet 1 percent of natural gas and propane use calculated in accordance with the 2007 California Plumbing Code.	CG A5.211.4 L EA Cr 2	**3**	
	• Documentation. Calculate renewable on-site system to meet the requirements. Factor in net-metering, if offered by local utility, on an annual basis.			
28.2	• Use solar powered lighting for exterior site lighting, attic fan, and irrigation controller. At least 50% of the exterior site lighting.	AZ (Scott)	**1**	
	Subtotal:			
29	SOLAR - THERMAL: • **Even though solar thermal water heating is very efficient, for very low demand, it may not be practical**			
29.1	• Install a solar water heating system when the demand of hot water is equivalent to the production of hot water. Consult with a structural engineer for additional load requirements to the existing roof structure and consult with a plumbing engineer if the demand justifies the supply of heated water through the thermal system.	CG A5.211.4	**3**	
	Subtotal:			
	TOTAL			

TECHNICAL BUILDING MEASURES AND POINT SYSTEM

FOR THE BUILDING OWNER PLANNING TO BUILD NEW COMMERCIAL BUILDING

site

		Source Code	Points	Check
	BASE REQUIREMENT • **The goal is for California to become more energy efficient so much so that by 2020 the state hopes for new projects to benefit from net zero energy consumption. It cannot be done all at once but incremental changes such as designing buildings 15% above Title 24 NOW is going to get us there.**			
	T24 • Building designed to be at least 15% above California Building Code Title 24: Utilize energy efficiency measures that cumulatively improve the performance of the building, reduce the size of the HVAC system and add comfort for occupants.	CG 5.201 CG A5.203 L EA P1, 2 & Cr 1	**20**	
1	SITE EVALUATION: • **Select sites within already developed areas and avoid development on inappropriate sites. Make connections with adjacent developed sites.**			
1.1	• Select a site which complies with at least one of the following characteristics: (2 points max.) • An infill site is selected (1 point) • Local agency proposed (1 point)	CG A5.103.2 L SS Cr 1-3	**2**	
1.2	• Site Preservation: Prior to beginning the construction activities, all parties involved with the development process shall receive a written guideline and instruction specifying the green goals of the project.		**2**	
1.3	• Deconstruction: 50% of the weight of Existing Buildings on the site are deconstructed and recycled at recycled centers. Documentation is required. (SEE RECYCLE CONSTRUCTION)	CG 5.408	**M**	
1.4	• Reuse of materials: Materials can be easily reused but must be in compliance with T24 requirements such as: • light fixtures, appliances, and electrical devices. • plumbing fixtures • door and trims • masonry • foundation	CG A5.105.1 CG A5.409 L MR Cr 3	**4**	
1.5	• Design for Walking & Bicycling: Site has pedestrian access within 1/2 mile of community services such as daycare, community center, public park, drug store, restaurants, schools, library, after school programs, etc. (4 points max.) • Site has pedestrian access to 5 services listed above (2 points) • Site has pedestrian access to 10 services listed above. (4 points)	CG A5.103.1 L SS Cr 2	**4**	
1.6	• Provide Bicycle parking and changing rooms (1 per 10 occupants) per 2010 California Building Code.	CG 5.106.4 L SS Cr 4.2	**M**	
1.7	• Begin site design by optimizing connections with existing and future surrounding uses. Min. of 2 connections.	IDC	**1**	
1.8	• Configure and place buildings so as to create shaded and pleasant outdoor places. Min. of 1 place per 2000 SF.	IDC	**1**	
1.9	• Seek reciprocal easements to connect parking areas of similar adjacent uses to pool parking and facilitate circulation. (1 point per connection, 4 points max.)	IDC	**4**	
1.10	• Organize site and cluster buildings to facilitate connections between different uses on same site; seek to eliminate pattern of driving from one use to another within the same development. (1 point per connection, 4 points max.)	IDC	**4**	
	Subtotal:			

TECHNICAL BUILDING MEASURES AND POINT SYSTEM

FOR THE BUILDING OWNER PLANNING TO BUILD NEW COMMERCIAL BUILDING

site

		Source Code	Points	Check
2	PROTECT EXISTING SITE • **When dirt is moved in or out of site, large equipment such as trucks are necessary thus more pollution. Limit disturbance to within 20ft of building footprint, 5ft beyond curbs and walkways, and use 50% of site for impervious surfaces with native vegetation.**			
2.1	• Rehabilitate damaged sites where development is complicated by real or perceived environmental contamination, reducing pressure on undeveloped land.	AZ (Scott)	**2**	
2.2	• Reduce development footprint to exceed the zoning open space requirement for the site by 25%.	CG A5.104.1.1 SS Cr 5.2	**2**	
2.3	• Protect/preserve in place natural desert features within development footprint (boulders, vegetation)	AZ (Scott)	**1**	
2.4	• Restoration of areas disturbed by construction. Restore all areas disturbed during construction by planting with local native and/or noninvasive vegetation. (SEE WATER - USAGE)	CG A5.304.6 SS Cr 5.1	**M**	
2.5	• Previously developed sites. On previously developed or graded sites, restore or protect at least 50 percent of the site area with native and/or noninvasive vegetation.	CG A5.304.7	**1**	
	Subtotal:			

3	SOLAR ORIENTATION: • **Protect east-, south- and west-facing windows from the sun; see also "window."**			
3.1	T24 • Configure building layout to minimize west-facing walls and windows. The long axis should be within 30 deg. of south.	CGA5.106.9 & AZ (Scott)		

4	SHADE: • **Provide shades (roof, walls, windows) with trees, overhangs, shutters or awnings.**			
4.1	T24 • Use several strategies to provide appropriate shade for east- and west-facing windows during the summer, and south-facing windows in the winter.	CG A5.106.7		
4.2	T24 • Awnings and overhangs need to be close to top of windows to effectively shade the glass. A good rule of thumb is to cover half the surface of glass at the summer solstice. (e.g. A 30" overhang at the header will cover the to half of a 4' tall window; 4'-6" would cover the top half of a 6'8" sliding glass door.)	CG A5.106.9 AZ (Scott)		
4.3	T24 • Install window screens with a shading coefficient of .45 or lower to reduce heat radiation	AZ (Scott)		
4.4	• Trees on the west and east can be evergreen, but consider using deciduous trees on the south because during the winter, after dropping their leaves, the branches will filter the sun and provide desirable partial passive heating. Trees may shade roof surfaces where solar panels may be installed and decrease efficiency. Coordinate location of trees and solar panels. • Use trees to shade the west side of the building. Minimum of 1 tree per 20 liner feet of building length.	LEED SS CG A5.106.7	**2**	
4.5	• Use trellises, shade structures to extend the comfort of the building out into the harsh environment of the parking lot. Create moderate-climate in-between zone as entry to several adjacent uses. Min. 5% of building area.	IDC	**2**	
4.6	• Shade pavement to reduce heat island effect. Carports do a better job than trees. Use trees in larger planting areas to create a visual impact, create a microclimate that is supportive of the trees themselves, and may also improve the shoppers' experience. Shade 50% of parking with min. of two of following requirements: • When using trees, they must mature within 5 years of occupancy. • Use open-grid pavement system. • Use light colored/high-albedo materials	CG A5.106.11	**2**	
	Subtotal:			

site

		Source Code	Points	Check
5	WATER - DRAINAGE: • **Good drainage benefits your landscape immensely and solves many common water issues which are caused by flooding, excessive rainfall, poor drainage and soil erosion.**			
5.1	• Grading and paving. The site shall be planned and developed to keep surface water away from buildings. Construction plans shall indicate how site grading or a drainage system will manage all surface water flows.	CG 5.106.10 LEED SS 6.1	**M**	
5.2	• Soil analysis and protection: The soil at the building site are analyzed and protected as follows: • Soil analysis is performed by a licensed design professional and the findings utilized in the structural design of the building. • Develop a plan to manage storm water drainage and implement during construction. • Site access is accomplished by minimizing the amount of cut and fill needed to install access roads and driveways. • Underground construction activities are coordinated to utilize the same trench, minimize the amount of time the disturbed soil is exposed and the soil is replaced using accepted compaction methods.	CG A5.106.2 LEED SS P1 & SS 6	**2**	
	Subtotal:			

		Source Code	Points	Check
6	WATER - RAIN: • **Keep storm water on your lot with french drains, cisterns, retention basins. Keep water (rain and irrigation) away from buildings.**			
6.1	• The site shall be developed to manage surface water (rain, irrigation, or nuisance water) away from buildings. Reduce peak runoff. Employ the following methods or other best management practices to allow rainwater to soak into the ground, evaporate into the air or collect in storage receptacles for irrigation or other beneficial uses. Strategies include, but are not limited to: • Permeable and porous paving; • Vegetative swales and filter strips; tree preservation;	CG 5.106.10 A5.106.3 LEED SS 6.2	**M**	
6.2	• Use weather-based automatic irrigation controllers/timers to adjust function due to rain. (SEE WATER - USAGE)	CVAG	**M**	
6.3	• Adhere to landscape material (drought-tolerant) guidelines adopted by Jurisdiction. (SEE WATER - USAGE)	CVAG	**M**	
6.4	• Use deep irrigation and solar power controllers. (SEE SOLAR - PHOTOVOLTAIC)	LEED WE 2.1	**2**	
6.5	• Use "dry stream bed" retention basins within parking areas to capture storm water.	IDC	**2**	
6.6	• Do not use petroleum-based pavement material.	AZ (Scott) 1.33	**2**	
6.7	• Use permeable pavers for patios, walkways and driveways/parking. • Min. 50% of exposed paving is light colored (at least 30% light reflectance value) (2 points) • No less than 20% of total on-site hardscape (2 points) OR • No less than 30% of total on-site hardscape (4 points)	AZ (Scott), CG A5.106.11 & GPR P.A.1	**2** **4**	
6.8	• Moisture control. Employ moisture control measures by the following methods; • Sprinklers. Prevent irrigation spray on structures. • Entries and openings. Design exterior entries and openings to prevent water intrusion into buildings.	CG 5.407.2 A5.505.1	**M**	

site

		Source Code	Points	Check
6	WATER - RAIN: (cont.)			
6.9	• Weather protection. Provide a weather-resistant exterior wall and foundation envelope as required by California Building Code Section 1403.2 and California Energy Code Section 150, manufacturer's installation instructions or local ordinance, whichever is more stringent.	CG 5.407.1	**M**	
6.10	• Flashing details. Provide flashing details on building plans which comply with accepted industry standards or manufacturer's instructions. Details are shown on plans at all of the following locations: • Around windows and doors • Roof valleys • Deck connections to the structure • Roof to wall intersections • Chimneys to roof intersections • Drip caps above windows and doors with architectural projections.	CG A4.106.4 & GPR P.A.1	**2**	
	Subtotal:			

		Source Code	Points	Check
7	WATER - USAGE: • **Water needs to be pumped to reach millions of destinations. Electricity powers the pumps. Reduction of water usage equals reduction of water delivery. Use combination of aerators & low flow fixtures.**			
7.1	• Meters. Separate meters shall be installed for the following uses: • Buildings in excess of 50,000 square feet. Separate submeters shall be installed for each individual leased, rented or other tenant space within the building projected to consume more than 100 gal/day. • Buildings in excess of 50,000 square feet. Separate submeters shall be installed for spaces used for laundry or cleaners, restaurant or food service, medical or dental office, laboratory or beauty salon or barber shop projected to consume more than 100 gal/day.	CG 5.303.1	**M**	
7.2	• Outdoor potable water use. For new water service, separate meters or submeters shall be installed for indoor and outdoor potable water use for landscaped areas between 1,000 square feet and 5,000 square feet.	CG 5.304.2	**M**	
7.3	• Limit or eliminate use of potable water by 50% for landscape irrigation. For example: Graywater systems use wastewater from washing machine, and lavatories.	CG A5.304.5/8 L WE Cr 1	**4**	
7.4	• Adhere to (Coachella Valley) landscape material (drought-tolerant) guidelines adopted by Jurisdiction.	CG 5.304.16 Local Zoning, LEED SS	**M**	
7.5	• Adhere to (Coachella Valley and CVAG Water Efficiency Water Ordinance) landscape irrigation guidelines. • A water budget shall be developed for irrigation which meets and does not exceed CVWD requirements. • Install a low-water consumption irrigation system which minimizes the use of spray-type heads. For example, use non-sprinkler or drip, zoned irrigation system with multiple valves to accommodate specific water needs to different types of plants. • Use weather-based automatic irrigation controllers/timers to save water usage when raining.	CG 5.304.3-4 Local Zoning LEED WE	**M** **M** **2** **1**	
7.6	• Rainwater channeling methods using gutters, scuppers, and downspouts to direct runoff to landscaped areas.	AZ (Scott)	**2**	

TECHNICAL BUILDING MEASURES AND POINT SYSTEM

FOR THE BUILDING OWNER PLANNING TO BUILD NEW COMMERCIAL BUILDING

site

		Source Code	Points	Check
7	WATER - USAGE: (cont.)			
7.7	• Use turf ONLY where it is actively used, and strictly limit the area. (4 points max.) • 10% of landscape area. (2 points) • 0% of landscape. (4 points)	IDC	**4**	
7.8	• Wastewater reduction. Each building shall reduce the generation of wastewater by one of the following methods: (2 points max) • The installation of water-conserving fixtures (1 point) • Utilizing nonpotable water systems (1 point)	CG A5.303.4 L WE P 1	**2**	
7.9	• Dual plumbing: New buildings and facilities shall be dual plumbed for potable and recycled water systems for toilet flushing when recycled water is available as determined by the enforcement authority.	CG A5.303.5	**2**	
7.10	• Plumbing fixtures and fittings. Plumbing fixtures (water closets and urinals) and fittings (faucets and showerheads) shall meet the standards referenced in Table 5.503.6 of CBC.	CG A5.303.2	**2**	
7.11	• Consider reducing the usage of indoor water by selecting plumbing fixtures with flow restrictors or aerators beyond code requirements. • Kitchen faucets and dishwashers with Max flow rate at sink faucet not greater than 1.5 gpm at 60 psi. • Dishwashers shall be Energy Star and not use more than 5.8 gallons per cycle. • Nonwater supplied urinals or waterless toilets are installed.	CG A5.303.2 L WE Cr 2 & 3	**1** **1** **1**	
7.12	• Consider reducing water consumption as a whole house approach. • Indoor water use shall be reduced by at least 20 percent by either water saving fixtures/flow restrictors or 20 percent reduction in baseline water use stated in the California Building Code. • 30 percent savings. A schedule of plumbing fixtures and fixture fittings that will reduce the overall use of potable water within the building by 30 percent shall be provided. (8 points) OR • 35 percent savings. A schedule of plumbing fixtures and fixture fittings that will reduce the overall use of potable water within the building by 35 percent shall be provided. (10 points) OR • 40 percent savings. A schedule of plumbing fixtures and fixture fittings that will reduce the overall use of potable water within the building by 40 percent shall be provided. (12 points)	CG A5.303.3 L WE Cr 2 & 3	**6** **12**	
	Subtotal:			

		Source Code	Points	Check
8	HEAT ISLAND: • **Reduce heat island effect* and reduce rain runoff with pavers; reduce overall paving areas.**			
8.1	• Use shade trees and trellises to shade hardscape to reduce heat radiation. (SEE SHADE)		**M**	
8.2	• Separate hardscape from the building to reduce heat transfer from outside to inside.	IDC	**1**	
8.3	• Use alternative paving (pavers, decomposed granite, etc.) that have less thermal mass than concrete. (SEE WATER RAIN)		**M**	
8.4	• Reduce glare (sunlight reflecting off the ground surface) by using drought-tolerant ground cover or material that scatters the sunlight (gravel). (SEE SHADE)		**M**	
	Subtotal:			

TECHNICAL BUILDING MEASURES AND POINT SYSTEM

FOR THE BUILDING OWNER PLANNING TO BUILD NEW COMMERCIAL BUILDING

site

		Source Code	Points	Check
9	PARKING REQUIREMENTS: • **Provide preferred stalls for electric or hybrid vehicles. Consider on-street and joint-use parking to reduce on-site parking**			
	• Provide preferential parking for low-emitting, fuel efficient vehicles, for motorcycles and scooters, for bicycles and for golf-carts (1 per 10 spaces). Negotiate with planning department to include such vehicles in parking count.	CG 5.106.5.2	**M**	
9.1	• 10% of total capacity is preferred parking spots for low-emitting vehicles. (1 point) OR	CG 5.105.5, A5.106.5, A5.106.4, A5.106.6 L SS Cr 4.3 & 4	**2**	
	• 12% of total capacity is preferred parking spots for low-emitting vehicles. (2 points)			
	• Alternative-fuel refueling stations for 1% of total vehicle capacity.		**1**	
	• Size parking to not exceed min zoning req'ts and provide infrastructure to facilitate shared vehicle usage.		**1**	
9.2	• Negotiate with the planning department that parking requirements will be based upon parking analysis of similar projects in the jurisdiction and thus reduce parking total count.	IDC	**1**	
9.3	• Do not exceed Zoning Ordinance parking standards. Seek cooperative parking arrangements between adjacent uses to reduce overall parking requirements, thus overall hardscape. This can reduce heat island effect and stormwater run off.	CG A5.106.6 L SS Cr 4.4	**2**	
9.4	• Provide preferred bicycle storage for building occupants. (SEE SITE EVALUATION)	CG A4.106.4	**M**	
9.5	• Provide solar powered lighting for at least 50% of site lighting. (SEE SOLAR - PHOTOVOLTAIC)	AZ (Scott) 1.42	**M**	
9.6	• Electric vehicle charging. Provide facilities meeting Section 406.7 (Electric Vehicle) of the California Building Code. For each space required in Table A5.106.5.3.1 of CBC, provide panel capacity and dedicated conduit for one 208/240 amp circuit terminating within 5 feet of the midline of each parking space	CG A5.106.5.3	**2**	
	Subtotal:			

TECHNICAL BUILDING MEASURES AND POINT SYSTEM

FOR THE BUILDING OWNER PLANNING TO BUILD NEW COMMERCIAL BUILDING

envelope

		Source Code	Points	Check
10	ROOF: • **Use "cool roof" coating or materials and save on annual electricity bills by reducing summer air conditioning costs.**			
10.1	T24 • Rigid insulation on top of roof sheathing.	AEDG Small Office Blg (Chap 3) 30%		
10.2	T24 • Install "cool roof" system.	CG A5.106.11 L SS Cr 7.2 SCE p. 16		
10.3	• If metal roof system is being considered, consider the design of metal roof with stand-off battens to allow free flow thermally-driven air between roof sheathing and metal roofing.	IDC	**2**	
10.4	• Avoid petroleum-based roof system.	AZ (Scott)	**2**	
10.5	• Use roof with a high durability / low maintenance material such as concrete, slate, clay or fiber cement.	AZ (Scott)	**2**	
10.6	• Install a radiant barrier at the roof level..	IDC	**2**	
10.7	• Use non-sawn lumber to frame the roof structure (at least 75%). Non sawn lumber uses less lumber. (SEE FRAMING CONSIDERATION)		**M**	
	Subtotal:			

11	CEILING SPACE: • **Insulation is simply a method for slowing the movement of heat. Insulating materials work in the same way that goose down works-by trapping air in tiny pockets that restrict it from moving. Heat transfer that would normally be accomplished through natural air movement is slowed down because the air can't move as freely.**			
11.1	T24 • Perform third party blower door test to verify building envelope tightness.	CG A4.206		
11.2	T24 • Exceed code minimum attic insulation values.: Insulate attic and other areas with R-38. In ventilated attic spaces install insulation at the ceiling line. In unventilated attic spaces install insulation between roof framing at the underside of roof deck. When suspended ceilings with removable ceiling tiles are used, install insulation at underside of roof deck.	AEG Small Office Blg (Chap 3) 30%		
11.3	T24 • R-10 duct insulation w/ ducts on roof, HERS verified duct leakage for 10,580 SF, 1 Story, & W//W ratio 37.1%	SCE (pg. 16) 15% T24		
11.4	T24 • R-8 duct insulation w/ ducts in the ceiling space, HERS verified duct leakage for 10,580 SF, 1 Story, & W//W ratio 37.1%	IDC		

12	WALLS: • **Maximize wall insulation – outside and/or within the walls; use durable materials outside like plaster and/or fiber cement board.**			
12.1	T24 • Use blown-in spray foam wall insulation to create air-tight walls.	IDC		
12.2	T24 • Exceed Code-mandated insulation values.	GPR F.1 & F.2		
12.3	T24 • Exterior insulation systems prevent thermal bridging and is most effective at reducing heat flow into the conditioned space.	IDC		
12.4	T24 • Configure and place windows to limit solar exposure on west and south walls. (SEE SHADE)	AZ (Scott)		
12.5	T24 • Third party inspection of insulation	IDC		
12.6	• Carefully seal gaps and joints between framing members and sheathing	CG 4.406.1	**1**	
12.7	• In CMU walls (large mass) place insulation on exterior side to gain benefit of thermal mass to modulate temperature swings during day.	AEDG Small Office Blg (Chap 3) 30%	**1**	
12.8	• Use durable and pre-finished exterior finish material (integrally colored plaster, fiber-cement siding and panels)	AZ (Scott)	**2**	

envelope

		Source Code	Points	Check
12	WALLS: (cont.)			
12.9	• Consider a "second-skin" wall system that shades west and south-facing walls. "Living walls", louvers and simple shade reduces the radiant heat build up from solar exposure. (SEE SHADE)	CG A5.106.7	**2**	
12.10	• Provide insulated headers	IDC	**1**	
12.11	• Wall colors have a light reflectance value of 35% or less for reduced desert glare.	AZ (Scott)	**1**	
	Subtotal:			

13	WINDOWS: • **Specify spectrally selective glazing to reduce heat gain, but allow optimal visible transmittance (VT) especially for retail display windows. Select windows with thermally broken frames.**			
13.1	T24 • Meet or Exceed Energy Star rated for windows			
13.2	T24 • Use spectrally selective glazing (SHGC of <0.28) on east-, south- and west-facing windows. Use north-facing windows with SHGC < 0.46.			
13.3	T24 • Use argon gas-filled insulated glass units.			
13.4	• Provide shade on east-, south, and west-facing windows using overhangs, awnings, colonnades, trees, etc. Design projections to shade at least 50% of glazing (projection factor of 0.5). (SEE SHADE)		**M**	
13.5	• Carefully configure, place and size windows to optimize daylighting. Because windows are thermally transparent, carefully balance the window-to-wall ratio. Consider 40% the maximum. (SEE DAYLIGHTING)		**M**	
13.6	• Include operable windows for natural ventilation during the six month "season." (SEE EXHAUST)		**M**	

14	SKYLIGHTS: • **Skylights can be a great advantage to daylight schemes and the overall quality of the indoor environment. However they are thermally transparent. Integrate skylights into an overall daylighting scheme including photosensitive sensors & dimmable fixtures.**			
14.1	• Balance the placement and size of skylights for optimal indoor light quality, but limit the maximum percent of roof area to <6%.	AEDG Small Office Blg (Chap 3) 30%	**1**	
14.2	• Use skylights with a thermal transmittance value of U-6.9, solar Heat Gain Coefficient of 0.19, and thermal break.	AEDG Small Office Blg (Chap 3) 30%	**1**	
	Subtotal:			

structure

		Source Code	Points	Check
15	FRAMING CONSIDERATIONS: • **Place Joists, Rafters & Studs @ 24" O.C. It saves material.**			
15.1	• For light wood framing buildings, dimensions and layouts are designed to minimize waste.	CG A5.404.1 AZ (Scott)		
	• Design stud spacing greater than 16" o.c.		**2**	
	• Design building on modular grid such as 24" or 48" to match dimensions of standard material		**3**	
	• Design Beams and headers and trimmers are the minimum size to adequately support the load.		**1**	
15.2	• Use premanufactured building systems to eliminate solid sawn lumber whenever possible. One of the following systems:	AZ (Scott)		
	• Composite floor joist or premanufactured floor truss framing (Min. of 75%)		**2**	
	• Composite roof rafter or premanufactured roof truss framing (Min. of 75%)		**2**	
	• Composite framing for interior framing. (Min. of 75%)		**2**	
	• Panelized wall framing systems (SIPS, ICF, or similar)		**2**	
	• Other methods approved by the enforcing agency		**2**	
15.3	• Material lists are included in the plans which specify material quality and provide direction for on-site cuts.			
	• Floor framing		**2**	
	• Wall framing			
	• Ceiling and roof framing			
	• Structural panels and roof sheathing			
15.4	• Use advanced framing technologies.	AZ (Scott)	**3**	
15.5	• Steel framing. Design for and employ techniques to avoid thermal bridging.	CG A5.213.1	**1**	
	Subtotal:			

16	MATERIAL EFFICIENCY: • **Consider using panelized or already assembled systems.**			
16.1	• Select exterior finishes derived from regional sources within 500 miles of job site. This includes stone or culture stone veneers that are regionally quarried or processed. (10% of material cost min.)	CG A5.405.1 L MR Cr 5	**1**	
16.2	• Reduction in cement use: Products such as fly ash, slag, silica fume and rice hull ash used to replace cement in concrete mix design (2 points max.)	CG A5.405.5 AZ (Scott)	**2**	
	• No less than 20% substituted volume of cement. (1 point)			
	• No less than 25% substituted volume of cement. (2 points)			
16.3	• Use engineered lumber (Beams, headers, lumber for floors and rafters; oriented strand board for subfloor, walls and roof sheathing).	IDC	**2**	
16.4	• Use building materials that do not require additional resources for finishing (One or more of exterior trim, windows, siding or exterior wall coverings).	CG A5.406	**2**	
16.5	• Floors that do not require additional coverings for finish.	CG A5.406	**2**	

		Source Code	Points	Check
16	MATERIAL EFFICIENCY cont.			
16.6	• Service life: Select materials for longevity and minimal deterioration under conditions of use. Use materials, equivalent in performance to virgin materials, with post-consumer or pre-consumer recycled content value (RVC) for a minimum of 10 percent of the total value, based on estimated cost of materials on the project. Provide documentation as to the respective values.	CG A5.406.1	**2**	
16.7	• Bio-based materials. Select bio-based building materials and products made from solid wood, engineered wood, bamboo, wool, cotton, cork, straw, natural fibers, products made from crops (soy-based, corn-based) and other bio-based materials with at least 50% bio-based content. • Certified wood. Certified wood is an important component of green building strategies and the California Building Standards Commission will continue to develop a standard through the next code cycle. (2 points) • Rapidly renewable materials. Use materials made from plants harvested within a ten-year cycle for at least 2.5% of total materials value, based on estimated cost. (2 points)	CG A5.405.2	**4**	
16.8	• Reused materials. Use salvaged, refurbished, refinished, or reused materials for a minimum of 5% of the total value, based on estimated cost of materials on the project. Provide documentation as to the respective values.	CG A5.405.3	**2**	
16.9	• Recycled content. Use materials, equivalent in performance to virgin materials with a total (combined) recycled content value (RCV) of: • The RCV shall not be less than 10 percent of the total material cost of the project. (2 points) • The RCV shall not be less than 15 percent of the total material cost of the project. (2 points)		**4**	
	Subtotal:			

structure

equipment

		Source Code	Points	Check
17	AIR CONDITIONING: • **For a business owner in a multi-tenant building, roof-mounted package HVAC units are the most common solution; higher efficiency units use less energy. Careful design will take into consideration energy efficiency measures used throughout the design, and will identify zones within the building so the air distribution is balanced. An economizer cycle can greatly reduce off-hour heat build-up.**			
17.1	• Carefully design the HVAC system taking into account all the energy efficiency and sustainable design strategies used throughout the building (e.g. "cool roof", higher insulation values, better-performing windows, daylighting, thermal mass, shade on walls and windows, reduction of heat island surrounding the building, etc.)	L IEQ P1 & Cr 7.1	**M**	
17.2	T24 • Perform duct leakage testing to verify a total leakage rate of less than 6 percent of the total fan flow.			
17.3	T24 • Use condensing units with two-stage compressors and variable speed air handling fan (generally on units with SEER 16 or higher.) Use units with a minimum of EER 11.5.	AZ (Scott)		
17.4	T24 • Install ductwork within the conditioned envelope of building, in an under floor crawl space, with an R-6 or higher insulation value or buried in the ceiling insulation.			
17.5	T24 • Install an energy management system with humidity and temperature sensors, and demand controlled ventilation (DCV) which matches outside air intake to the number of people in a space.	CG 5.506.1 L EA Cr 4		
17.6	T24 • Design HVAC system with economizer cycle.	IDC		
17.7	• Configure and place windows to facilitate cross-ventilation for open floorplan layout. (SEE WINDOWS)	AZ (Scott)	**2**	
17.8	• Install multi-speed Energy Star rated ceiling fans (Min of 3 per 1500 SF of commercial space). For high bay areas, consider high volume and low speed (HVLS) fans.	AZ (Scott)	**2**	
17.9	• Filters. In mechanically ventilated buildings, provide regularly occupied areas of the building with air filtration media for outside and return air prior to occupancy that provides at least a MERV of 8.	CG 5.504.5.3	**M**	
17.10	• Filters. In mechanically ventilated buildings, provide regularly occupied areas of the building with air filtration media for outside and return air prior to occupancy that provides at least a MERV of 11.	CG 5.504.5.3 LEED EA	**2**	
	Subtotal:			

18	WATER HEATING: • **Depending upon the demand for hot water, solar water heating, tankless (on-demand) gas water heaters, even fuel cells may be appropriate.**			
18.1	T24 • With a storage water heater, the energy factor (EF) for a gas-fired storage water heater is higher than 0.60 and the energy factor (EF) for a gas-fired tankless water heater is .80 or higher.	LEED EA 7.3 AZ (Scott)		
18.2	T24 • Insulate (R-4) hot water pipes full distance from heater to fixture.	AZ (Scott)		
18.3	• Commercial users with high hot water demands (restaurants, medical clinics, Laundromat, etc.) may also consider fuel cell systems that generate electricity and can provide heat for hot water. (SEE FUEL CELL)		**M**	

		Source Code	Points	Check
19	EVAPORATIVE COOLING: • **Design an evaporative cooler system to be used for the majority of the year and save on electrical load.**			
19.1	• Use a two-stage direct/indirect evaporative cooler that uses air-to-air heat exchangers may be effective in back of house areas. This provides the most efficiency for year round operation.	IDC	**3**	
19.2	• Use a direct 2 speed (air to water) evaporative cooler as a more cost effective system. Limited use for hot and dry weather only.	IDC	**3**	
	Subtotal:			

20	ELEVATORS • **Minimize total energy consumption by selecting eco-efficient elevators which sets the devices to sleep mode during inactive periods.**			
20.1	• Elevators and escalators. In buildings with more than one elevator or two escalators, provide controls to reduce the energy demand of elevators and reduce the speed of escalators. Document the controls in the project specifications and commissioning plan.	CG A5.212.1	**3**	
	Subtotal:			

21	EXHAUST FANS: • **Use Energy Star fans, exhaust outdoors. Humidistat, occupancy sensor, timer.**			
21.1	• Install Energy Star bathroom fans on timer or occupancy for individual toilet rooms. Use a central exhaust fan system when more than 6 individual toilet rooms.	IDC	**1**	
	Subtotal:			

22	DUCTS • **Duct leakage and heat transfer the length of ducts greatly reduces the HVAC efficiency**			
22.1	• Place ducts below roof insulation or insulate with a minimum R-6. (SEE CEILING SPACE)		**M**	
22.2	• Perform duct leakage testing prior to installation of ceiling. (SEE ROOF AND ATTIC)	IDC	**1**	
22.3	• Seal ducts during construction to prevent dust from entering system. (SEE AIR QUALITY CONTROL)	CG 5.504.3	**M**	
22.4	• Flush building after construction to improve indoor air quality. (SEE AIR QUALITY CONTROL)		**M**	
	Subtotal:			

equipment

passive energy - comfort & health

		Source Code	Points	Check
23	THERMAL MASS: • **Heavy materials like stone, tile, masonry and concrete can absorb a lot of heat. When combined with whole building fan can reduce the use of air conditioning if used with night structure cooling. However, they are also cool during the winter.**			
23.1	• In desert climate, hard surface flooring reduces the cooling load during the summer, but during the winter the floor may be uncomfortably cool.		**2**	
	Subtotal:			

24	THERMAL CHIMNEY: • **"Hot air rises" the building can move air passively - indoors and outdoors**			
24.1	• Operable skylights at the peak of the roof or a tower element with operable windows will allow the hot air to escape if proper air intakes are provided at windows below. This will facilitate natural ventilation.	IDC	**2**	
24.2	• Add small exhaust fans at the peak of the roof or a tower element to assist this thermal effect. Simple differential temperature controls can perform the sequence automatically. (SEE THERMAL MASS)	IDC	**2**	
	Subtotal:			

25	DAYLIGHTING: • **Daylighting reduces energy usage in two ways: it reduces daytime need for artificial light, and reduces heat gain from light fixtures. However, windows and skylights must be also be thermally efficient to limit solar heat gain. Daylight schemes must moderate direct sunlight, balance light distribution to reduce glare, and be integrated with artificial lighting controls. Occupant-controlled solar control (blinds, adjustable louvers, etc.) are important components.**			
25.1	• Natural light reduces the demand for electric lights during the day, however, glare and solar heat gain must be controlled. Provide day lit spaces as required for top lighting and side lighting. In constructing a design, consider the one of the following (min.):	CG A5.507.2 L IEQ CR 8.1		
	• Use of light shelves and reflective room surfaces to maximize daylight penetrating the rooms		**1**	
	• Means to eliminate glare and direct sun light with skylights 20' from windows.		**1**	
	• Use of photo sensors to turn off electric lighting when daylight is sufficient		**1**	
	• Not using diffuse day lighting glazing where views are desired		**1**	
25.2	• Views. Achieve direct line of sight to the outdoor environment via vision glazing between 2'6" and 7'6" above finish floor for building occupants in 90 percent of all regularly occupied areas.	CG A5.507.3 L IEQ CR 8.2	**2**	
25.3	• Interior office spaces: Entire areas of interior office spaces may be included in the calculation if at least 75 percent of each area has direct line of sight to perimeter vision glazing. For multi-occupant spaces, include in the calculation the square footage with direct line of sight to perimeter vision glazing for views.	CG A5.507.3 L IEQ CR 8.1	**2**	
25.4	• Interior surface reflectivity is an essential part of daylighting. Use 80% reflectance for ceilings and 70% for walls.	IDC	**2**	
25.5	• Locate all work stations occupied for critical visual tasks within 25 feet of windows.	AZ (Scott) 5.43	**1**	
	Subtotal:			

passive energy - comfort & health

			Source Code	Points	Check
26	EFFICIENT FIXTURES & CONTROLS:	• **Lighting efficiency has several components: the fixtures, the controls and interior surfaces.**			
26.1	T24 • Max interior lighting wattage does not exceed minimum requirements of watts per sq ft as stated in the California Building Code.				
26.2	T24 • Use highly efficient fluorescent fixtures with programmable electronic ballasts.				
26.3	T24 • Use LED fixtures where the highest efficacy are required.				
26.4	T24 • Use occupancy sensors, photo-sensitive sensors and programmable lighting controls.				
26.5	T24 • Specifically zone areas adjacent to windows and skylights for photosensitive controls.				
26.6	• Program lighting for "cleaning crew" separate from normal operations.		IDC	**1**	
26.7	• Lighting and thermal comfort controls. Provide controls in the workplace for single-occupant spaces.		CG A5.507.1.1 IEQ Cr 6.1 & 2	**2**	
		• Provide individual task lighting and/or daylighting controls for at least 90 percent of the building occupants.			
		• Thermal comfort. Provide individual thermal comfort controls for at least 50 percent of the building occupants.		**2**	
26.8	• Multi-occupant spaces. Provide lighting and thermal comfort system controls for all shared multi-occupant spaces.		CG A5.507.1.2	**2**	
26.9	• Light Pollution Reduction: design interior and exterior lighting such that zero direct - beam illumination leaves the building site. Meet or exceed exterior light levels and uniforminity ratios for lighting zones using the following strategies.		Local Ordinance CG 5.106.8 L SS Cr 8	**M**	
		• Shield all exterior luminaries or use cutoff luminaries.			
		• Contain interior lighting within each source. (1 point)	IDC	**1**	
26.10	• Energy monitoring. Provide submetering or equivalent combinations of sensor measurements and thermodynamic calculations, if appropriate, to record energy use data for each major energy system in the building.		CG A5.204.2		
		• Data storage. The data management system must be capable of electronically storing energy data and creating user reports showing hourly, daily, monthly and annual energy consumption for each major energy system.		**3**	
		• Data access. Hourly energy use data shall be accessible through a central data management system and must be available daily.		**3**	
26.11	• Demand response. HVAC systems with Direct Digital Control Systems and centralized lighting systems shall include preprogrammed demand response strategies that are automated with either a Demand Response Automation Internet Software Client or dry contact relays.		CG A5.204.3		
		• HVAC. The preprogrammed demand response strategies should be capable of reducing the peak HVAC demand by cooling temperature set point adjustment.		**2**	
		• Lighting. The preprogrammed demand response strategies should be capable of reducing the total lighting load by a minimum 30 percent through dimming control or bi-level switching.		**2**	
		• Software clients. The software clients will be capable of communicating with a DR Automation Server.		**2**	
		Subtotal:			

passive energy - comfort & health

		Source Code	Points	Check
27	APPLIANCES: • **Use Energy Star appliances: energy star appliances save energy, save money, and help reduce emissions of greenhouse gases and air pollutants at the source.**			
27.1	• Energy star rated appliances including range, refrigerator, and/or dishwasher for office buildings. • Clothes washers shall have a maximum Water Factor (WF) that will reduce the use of water for buildings like laundry rooms below California Energy Commission WF. • Ice makers shall be air cooled. • Food steamers shall be connectionless or boilerless.	CG A5.204.1 & A5.303.3	**2**	
	Subtotal:			

28	INDOOR AIR QUALITY & COMFORT: • **Off-gassing is the process by which materials release chemicals used to fabricate or hold them together. These chemicals adversely affect the indoor air quality.**			
28.1	• Outside air delivery. For mechanically or naturally ventilated spaces in buildings, meet the minimum requirements of Section 121 of the California Energy Code, CCR, Title 24, Part 6 and Chapter 4 of CCR, Title 8 or the applicable local code, whichever is more stringent.	CG 5.506.1	**M**	
28.2	• Filters: In mechanically ventilated buildings, provide regularly occupied areas of the building with air filtration media for outside and return air prior to occupancy that provides at least a Minimum Efficiency Reporting Value (MERV) of 8. • Update to MERV 11 (2 points)	CG 5.504.5.3	**M** **2**	
28.3	• Concrete slab foundations required to have a vapor retarder shall be installed in compliance with a 4-inch (101.6 mm) thick base of 1/2 inch or larger clean aggregate shall be provided with a vapor barrier in direct contact with concrete and a concrete mix design, which will address bleeding, shrinkage, and curling, shall be used. For additional information, see American Concrete Institute, ACI 302.2R-06 or other designs by a licensed design professional. (SEE WATER - RAIN)	CG 5.407.1	**M**	
28.4	• Joints and openings. Openings in the building envelope separating conditioned space from unconditioned space needed to accommodate gas, plumbing, electrical lines and other necessary penetrations must be sealed in compliance with the California Energy Code.	IDC	**M**	
28.5	• Prevent irrigation heads from spraying building walls - another source of mold in walls. (SEE WATER - RAIN)		**M**	
28.6	• Carbon dioxide (CO2) monitoring. For buildings equipped with demand control ventilation, CO2 sensors and ventilation controls shall be specified and installed in accordance with the requirements of the latest edition of the California Energy Code, CCR, Title 24, Part 6, Section 121(c).	CG 5.506.2 L IEQ Cr 1 & 2	**M**	
28.7	• Temporary ventilation. The permanent HVAC system shall only be used during construction if necessary to condition the building within the required temperature range for material and equipment installation. If the HVAC system is used during construction, use return air filters with a Minimum Efficiency Reporting Value (MERV) of 8, based on ASHRAE 52.2 1999, or an average efficiency of 30% based on ASHRAE 52.1 1992. Replace all filters immediately prior to occupancy.	CG 5.504.1.3	**M**	
28.8	• Covering of duct openings and protection of mechanical equipment during construction. At the time of rough installation or during storage on the construction site and until final startup of the heating and cooling equipment, all duct and other related air distribution component openings shall be covered with tape, plastic, sheet metal or other methods acceptable to the enforcing agency to reduce the amount of dust or debris which may collect in the system.	CG 5.504.3	**M**	

passive energy - comfort & health

		Source Code	Points	Check
28	**INDOOR AIR QUALITY & COMFORT: (cont.)**			
28.9	• Ozone depletion and global warming reductions. Installations of HVAC, refrigeration and fire suppression equipment shall comply with the following: • Install HVAC and refrigeration equipment that does not contain CFCs. • Halons. Install fire suppression equipment that does not contain Halons.	CG 5.508.1	**M**	
28.10	• Prohibit smoking in the building or Restrict areas for smoking outside of 25 ft of entries, outdoor air intakes, & operable windows.	CG A5.504.7 L IEQ P2	**1**	
28.11	• Develop and implement an indoor air quality management plan for the pre-occupancy phase of the building and temporary ventilation during construction.	CG A5.504.1 L IEQ Cr 3.1 & 2	**3**	
28.12	• After construction ends and prior to occupancy, conduct a one-week building flush out with new efficiency reporting value (MERV) 13 filtration media at 100% outside air. Replace filters after flushout.	CG A5.504.2 LEED IEQ	**1**	
28.13	• Hazardous particulates and chemical pollutants. Minimize and control pollutant entry into buildings and cross-contamination of regularly occupied areas. • Install permanent entryway systems measuring at least six feet in the primary direction of travel to capture dirt and particulates at entryways directly connected to the outdoors • Isolation of pollutant sources. In rooms where activities produce hazardous fumes or chemicals, exhaust them and isolate them from their adjacent rooms	CG A5.504.5 IEQ Cr 5	**2** **2**	
28.14	• Hydrochlorofluorocarbons (HCFCs). Install HVAC and refrigeration equipment that does not contain HCFCs.	CG A5.508.1 CG A5.508.2	**3**	
28.15	• Hydrofluorocarbons (HFCs). Install HVAC complying with either: • Install HVAC, refrigeration and fire suppression equipment that do not contain HFCs or that do not contain HFCs with a global warming potential greater than 150 • Install HVAC and refrigeration equipment that limit the use of HFC refrigerant through the use of a secondary heat transfer fluid with a global warming potential no greater than 1.	CG A5.508.4 L EA P3 & Cr 4	**3**	
28.16	• Composite wood products. Hardwood plywood, particleboard and medium density fiberboard composite wood products used on the interior or exterior of the building shall meet the requirements for formaldehyde as specified in ARB's Air Toxics Control Measure for Composite Wood. Documentation of verification is required.	CG 5.504.4 IEQ Cr 4.4	**M**	
28.17	• Select all interior materials that are low-emitting (VOC): eg. Adhesives, resilient flooring, carpet, paints, and sealer. Documentation which includes manufacturer's product specification and field verification of on-site product containers.	CG 5.504.4 IEQ Cr 4.1 & 2	**M**	
28.18	• Resilient flooring systems. Where resilient flooring is installed, at least 50 percent of floor area receiving resilient flooring shall comply with the VOC emission limits defined in the Collaborative for High Performance Schools (CHPS) Low-emitting Materials List or certified under the Resilient Floor Covering Institute (RFCI) Floor Score program. (3 points max.) • A minimum of 80% of the total area of resilient flooring installed shall comply (2 points) • A minimum of 90% of the total area of resilient flooring installed shall comply (3 points)	CG 5.504.4.6 CG 5.504.4.7 IEQ Cr 4.3	**M** **3**	

		Source Code	Points	Check
28	INDOOR AIR QUALITY & COMFORT: (cont.)			
28.19	• Consider exposed concrete or tile flooring to eliminate off-gassing and dust mites (assoc. with carpet). Concrete also provides a great "heat sink" for thermal mass calculations.	IDC	**2**	
28.20	• For Cabinetry or interior trims: Meet the formaldehyde limits or use composite wood products with California Air Resources Board.	CG 5.504.4	**2**	
28.21	• Use materials throughout 50% of building which require no application of finish materials (stains, paints).	AZ (Scott)	**2**	
28.22	• Acoustical ceilings and wall panels. Comply with Chapter 8 in Title 24, Part 2 and with the VOC-emission limits defined in the 2009 CHPS criteria and listed on its Low-emitting Materials List (or Product Registry). Documentation shall be provided verifying that acoustical finish materials meet the pollutant emission limits.	CG A5.504.4.9	**2**	
28.23	• Insulate formaldehyde-free insulation. Documentation must be provided that verifies the materials are certified to meet this the pollutant emission limits in this section.	CG A5.504.4.8 AZ (Scott)		
	• Install thermal insulation in compliance with the VOC emission limits defined in CHPS Low emitting Material List.		**2**	
	• Install thermal insulation which contains No-Added Formaldehyde and is in compliance with the VOC emission limits defined in CHPS Low emitting Material List.		**3**	
28.24	• Acoustical control. Employ building assemblies and components with the following STC values. (SEE CALIFORNIA GREEN BUILDING CODE FOR EXCEPTIONS)	CG 5.507.4	**2**	
	• Exterior noise transmission. Wall and floor-ceiling assemblies making up the building envelope shall have an STC of at least 50 and exterior windows shall have a minimum STC of 30.			
	Subtotal:			

conservation of materials

		Source Code	Points	Check
29	RECYCLED/RAPIDLY RENEWABLE: • **Look into the cool new materials that manufacturers make from recycled or rapidly renewable materials. There are new ones every week.**			
29.1	• Use Recycled Content Aggregate (Min. 25%)	CG A5.409 A5.405.5		
	• Walkway and driveway base		**1**	
	• Roadway Base		**1**	
29.2	• Reused materials. Use salvaged, refurbished, refinished or reused materials for at least 5 percent of the total value, based on estimated cost of materials on the project.	CG A5.405.3	**1**	
29.3	• Use recycled content paint	GPR K.5	**1**	
29.4	• Flooring: Environmentally preferable flooring: FSC certified wood, reclaimed or refinished, rapidly renewable, recycled content, exposed concrete or locally sourced stone or tile.	CG A5.405.2.1 MR Cr 7	**2**	
29.5	• Innovations: Structural frame and building envelope, use FSC certified engineered lumber for headers, I-joists, trusses, and rafters.	MR Cr 7	**3**	
29.6	• Select fascia, soffit and trim elements made of recycled-content materials (including metals) or engineered wood products such as finger jointed trim, fiberboard, laminated strand lumber or OSB.	AZ (Scott)	**1**	
29.7	• Select countertops manufactured from min. of 20% recycled content material.	AZ (Scott)	**1**	
29.8	• Recycled content. Use materials, equivalent in performance to virgin materials, with postconsumer or preconsumer recycled content. Documentation to be provided as to the respective values. (4 points max.)	CG A5.405.4 L Mr Cr 4	**4**	
	• No less than 10% recycled content value of the total value, based on estimated cost of materials of the project. (2 points)			
	• No less than 15% recycled content value of the total value, based on estimated cost of materials of the project. (4 points)			
29.9	• Use of building materials from renewable sources. Use one or more of the following materials manufactured from rapidly renewable sources or agricultural by-products is used (products typically harvested within a 10 year or shorter cycle) at least 2.5% of total material value, based on estimated cost.	CG A5.405.2.2 L MR Cr 6		
	• Insulation		**2**	
	• Bamboo or cork		**2**	
	• Engineered wood products		**2**	
	• Agricultural based products		**2**	
	• Solid wood products		**2**	
	• Other products acceptable by the enforcing agency.		**2**	
	Subtotal:			

conservation of materials

		Source Code	Points	Check
30	RECYCLE CONSTRUCTION WASTE: • **Education and site setup are important during construction. If the set up is done well from the beginning, everyone working on the site will follow. For example, provide separate recycle bins during construction for recycling of everyday objects (plastic bottles and aluminum cans) but also for construction waste: drywall, glass, metals, concrete/plaster.**			
30.1	• Construction waste reduction: A minimum of 50% of the construction waste generated at the site is diverted to recycle or salvage.	CG 5.408.3	**M**	
30.2	• Construction waste management plan. Where a local jurisdiction does not have a construction and demolition waste management ordinance, a construction waste management plan shall be submitted for approval to the enforcing agency.	CG 5.408.1-3, 3.1 L MR Cr 2	**M**	
30.3	• Excavated soil and land clearing debris. 100 percent of trees, stumps, rocks and associated vegetation and soils resulting primarily from land clearing shall be reused or recycled.	CG 5.408.3	**M**	
30.4	• Construction waste reduction: Enhanced construction waste generated at the site is diverted to recycle or salvage. Documentation shall be provided to the enforcing agency which demonstrates compliance. (2 points max) • A minimum of 60% of the construction waste generated at the site is diverted to recycle or salvage. (1 point) • A minimum of 80% of the construction waste generated at the site is diverted to recycle or salvage. (2 points)	CG A5.408.3.1 L MR Cr 2	**2**	
	Subtotal:			

31	RECYCLE - WASTE DESIGN: • **It takes less energy to process recycled materials than to process virgin materials. For example, it takes a lot less energy to recycle paper than to create new paper from trees. The energy from transporting virgin materials from the source is also saved. Saving energy also has its own benefits like decreasing pollution. This creates less stress on own health and our economy.**			
31.1	• Recycling by occupants. Provide readily accessible areas that serve the entire building and are identified for the depositing, storage and collection of nonhazardous materials for recycling.	CG 5.410.1 L MR P1	**M**	

conservation of materials

		Source Code	Points	Check
32	BUILDING MAINTENANCE AND OPERATION: • **Building maintenance is disregarded, resulting in terrible air quality or unsafe areas within the place of work. Additionally, the wrong colors, furnishings setup, or noise level can depressingly impact the temperament and fortitude of those working within such conditions.**			
32.1	• Commissioning. For new buildings 10,000 square feet and over, building commissioning for all building systems covered by T24, Part 6, process systems and renewable energy systems shall be included in the design and construction processes of the building project. Commissioning requirements shall include items listed in Section 5.410.2 of the 2010 California Building Code	CG 5.410.2&3 L EA P1	**M**	
32.2	• Testing and adjusting. Testing and adjusting of systems shall be required for buildings less than 10,000 SF. • Systems. Develop a written plan of procedures for testing and adjusting systems. Systems to be included for testing and adjusting shall include, as applicable to the project, the systems listed in Section 5.410.4.2 of the 2010 California Building Code. • Procedures. Perform testing and adjusting procedures in accordance with industry best practices and applicable national standards on each system as determind by enforcing agent. • Reporting. After completion of testing, adjusting and balancing, provide a final report of testing signed by the individual responsible for performing these services. • Operation and maintenance manual. Provide the building owner with detailed operating and maintenance instructions and copies of guaranties/warranties for each system prior to final inspection.	CG 5.410.4-6 L EA Cr 3	**M**	
32.3	• Energy monitoring: Provide sub-metering or equivalent combinations of sensor measurements and thermodynamic calculations, if appropriate, to record energy use data for each major energy system in the building, including chillers, heat pumps, packaged AC systems, fans, pumps, cooling towers, boilers and other heating systems, lighting systems, and process loads. This energy use data, once collected, shall be stored within a data management system.	CG A5.204.2	**1**	
32.4	• Demand response. HVAC systems with Direct Digital Control Systems and centralized lighting systems shall include pre-programmed demand response strategies that are automated with either a Demand Response Automation Internet Software Client or dry contact relays.	CG A5.204.3	**1**	
32.5	• Provide on-going accountability of building energy performance and maintenance after construction.	L EA Cr 5	**2**	
	Subtotal:			

on-site generation

		Source Code	Points	Check
33	SOLAR - PHOTOVOLTAIC: • **Reduce the peak power demand through the use of on-site renewable energy systems or contracting with off-site energy companies.**			
33.1	• On-site renewable energy. Use on-site renewable energy for at least 1 percent of the electrical service over current protection device rating calculated in accordance with the 2007 California Electrical Code or 1KW, whichever is greater, in addition to the electrical demand required to meet 1 percent of natural gas and propane use calculated in accordance with the 2007 California Plumbing Code. • Documentation. Calculate renewable on-site system to meet the requirements. Factor in net-metering, if offered by local utility, on an annual basis.	CG A5.211.4 L EA Cr 2	**3**	
33.2	• Provide a min. one-inch conduit from the electrical service equipment for the future installation of a (PV) system with A minimum of 300 square feet of unobstructed roof area facing within 30° of south is provided for future solar collector or photovoltaic panels. Consult with PV contractor.	IDC CG A5.211.4	**1**	
33.3	• Use solar powered lighting for exterior site lighting, attic fan, and irrigation controller. At least 50% of the exterior site lighting.	AZ (Scott)	**1**	
	Subtotal:			

34	SOLAR - THERMAL: • **Even though solar thermal water heating is very efficient, for very low demand, it may not be practical.**			
34.1	• Install a solar water heating system when the demand of hot water is equivalent to the production of hot water. Consult with a structural engineer for additional load requirements to the existing roof structure and consult with a plumbing engineer if the demand justifies the supply of heated water through the thermal system.	IDC CG A5.211.4	**3**	
34.2	• Provide space on the roof surface (200 SF south-facing), penetrations (stand-offs) through the roof surface, and one-inch conduit for future solar installation. Consult with a structural engineer for additional load requirements to the existing roof structure.	IDC CG A5.211.4	**1**	
	Subtotal:			

35	FUEL CELL: • **For some commercial projects with high hot water demand & year-round occupancy, a fuel cell system may make economic sense to level out the electrical demands. The fuel cell uses natural gas to generate electricity; the process also generates heat that can provide domestic hot water.**			
35.1	• Design and install a fuel cell using hydrogen generated by natural gas if the demand for hot water justifies the use. 2 points for each 10% of annual electrical load (KWh) met by system. (8 points max.)	AZ (Scott)	**8**	
	Subtotal:			

TOTAL		

CHAPTER FOUR

FINANCIAL ANALYSIS

financial analysis

CA Statewide Codes and Standards Program
Title 24 Local Energy Efficiency Ordinances

Title:
Climate Zone 15
Energy Cost-Effectiveness Study

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Last Modified: February 25, 2010

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1.0 Executive Summary

Public Resources Code Section 25402.1(h)2 and Section 10-106 of the Building Energy Efficiency Standards (Standards) establish a process which allows local adoption of energy standards that are more stringent than the statewide Standards. This process allows local governments to adopt and enforce energy standards before the statewide Standards effective date, require additional energy conservation measures, and/or set more stringent energy budgets. Because these energy standards "reach" beyond the minimum requirements of Title 24, Part 6 of the California Building Code, they are commonly referred to as Reach Codes when adopted as a collective set by a local jurisdiction.

The process for adopting a Reach Code requires that local governments apply to the California Energy Commission (CEC) for approval. The applicant jurisdiction must document the supporting analysis for determining that the proposed Reach Code Standards will save more energy than the current statewide Standards. The applicant jurisdiction must also prepare a **Cost Effectiveness Study** that provides the basis of the local government's determination that the proposed Reach Code Standards are cost-effective. Once the CEC staff has verified that the local Reach Code Standards will require buildings to use no more energy than the current statewide Standards and that the documentation requirements in Section 10-106 are met, the application is brought before the full California Energy Commission for approval.

This Cost Effectiveness Study was prepared for Climate Zone 15 which encompasses over 100 cities and towns within Imperial, San Diego, Riverside and San Bernardino counties (see Appendix "A" for list of local jurisdictions). The 2008 Building Energy Efficiency Standards, effective January 1, 2010, have been used as the baseline used in calculating the energy performance of efficiency measures summarized in this study.

2.0 Methodology and Assumptions

The energy performance impacts of exceeding the performance requirements of the 2008 Title 24 Building Energy Efficiency Standards (2008 Standards) have been evaluated in Climate Zone 15 using the following residential and nonresidential prototypical building types:

Small Single Family House 2-story 2,025 sf	**Large Single Family House** 2-story 4,500 sf
Low-rise Multi-family Apartments 8 dwelling units/2-story 8,442 sf	**High-rise Multi-family Apartments** 40 dwelling units/4-story 36,800 sf
Low-rise Office Building 1-story 10,580 sf	**High-rise Office Building** 5-story 52,900 sf

Methodology

The methodology used in the case studies is based on a design process for each of the proposed prototypical building types that first meets the minimum requirements and then exceeds the 2008 Standards by 15%. The process includes the following major stages:

Stage 1: Minimum Compliance with 2008 Standards:

Each prototype building design is tested for minimum compliance with the 2008 Standards, and the mix of energy measures are adjusted using common construction options so the building first just meets the Standards. The set of energy measures chosen represent a reasonable combination which reflects how designers, builders and developers are likely to achieve a specified level of performance using a relatively low first incremental (additional) cost

Stage 2: Incremental Cost for Exceeding 2008 Standards by 15%:

Starting with that set of measures which is minimally compliant with the 2008 Standards, various energy measures are upgraded so that the building just exceeds the 2008 Standards by 15%. The design choices by the consultant authoring this study are based on many years of experience with architects, builders, mechanical engineers; and general knowledge of the relative acceptance and preferences of many measures, as well as their incremental costs. This approach tends to reflect how building energy performance is typically evaluated for code compliance and how it's used to select design energy efficiency measures. Note that lowest simple payback with respect to building site energy is not the primary focus of selecting measures; but rather the requisite reduction of Title 24 Time Dependent Valuation(TDV) energy at a reasonable

incremental cost consistent with other non-monetary but important design considerations. A minimum and maximum range of incremental costs of added energy efficiency measures is established by a variety of research means. A construction cost estimator, Building Advisory LLC, was contracted to conduct research to obtain current measure cost information for several energy measures; and Gabel Associates performed its own additional research to establish first cost data.

Stage 3 Cost Effectiveness Determination:

Energy savings in kWh and therms is calculated from the Title 24 simulation results to establish the annual energy cost savings and CO2-equivalent reductions in greenhouse gases. A simple payback analysis in years is calculated by dividing the incremental cost for exceeding the 2008 Standards by the estimated annual energy cost savings.

Assumptions

Annual Energy Cost Savings

1. Annual site electricity (kWh) and natural gas (therms) saved for low-rise residential buildings are calculated using the state-approved energy compliance software for the 2008 Building Energy Efficiency Standards, Micropas 8; and for high-rise residential and nonresidential buildings using the state-approved 2008 energy compliance software EnergyPro v5.0.

2. Average residential utility rates of $0.159/kWh for electricity and $0.94/therm for natural gas in current constant dollars; nonresidential rates are time-of-use rate schedules modeled explicitly in the DOE-2.1E computer simulation: Southern California Edison GS-1 schedule for electricity and Southern California Gas GN-10 schedule for natural gas.

3. No change (i.e., no inflation or deflation) of utility rates in constant dollars

4. No increase in summer temperatures from global climate change

Simple Payback Analysis

1. No external cost of global climate change -- and corresponding value of additional investment in energy efficiency and CO_2 reduction – is included

2. The cost of money (e.g., opportunity cost) invested in the incremental cost of energy efficiency measures is not included.

3.0 Minimum Compliance with 2008 Standards

The following energy design descriptions of the following building prototypes just meet the 2008 Standards in Climate Zone 15.

Small Single Family House

- 2,025 square feet
- 2-story
- 20.2% glazing/floor area ratio

Energy Efficiency Measures
R-30 Roof w/ Radiant Barrier
R-15 Walls
R-19 Raised Floor over Garage/Open at 2nd Floor
R-0 Slab on Grade
Quality Insulation Installation (HERS)
Super Low E Vinyl Windows, U=0.36, SHGC=0.23
Furnace: 80% AFUE
Air Conditioner: 13 SEER, 11 EER (HERS)
Air Conditioner: Refrigerant Charge (HERS)
R-8 Attic Ducts
Reduced Duct Leakage/Testing (HERS)
50 Gallon Gas Water Heater: EF=0.62

Large Single Family House

- 4,500 square feet
- 2-story
- 22.0% glazing/floor area ratio

Energy Efficiency Measures
R-38 Roof w/ Radiant Barrier
R-21 Walls
R-30 Raised Floor
Quality Insulation Installation (HERS)
Super Low E Vinyl Windows, U=0.36, SHGC=0.23
(2) Furnaces: 80% AFUE
(2) Air Conditioners: 13 SEER, 11 EER (HERS)
(2) Air Conditioners: Refrigerant Charge (HERS)
R-6 Attic Ducts
Reduced Duct Leakage/Testing (HERS)
(2) 50 Gallon Gas Water Heaters: EF=0.62

Low-rise Multi-family Apartments

- 8,442 square feet
- 8 units/2-story
- 12.5% glazing/floor area ratio

R-38 Roof w/ Radiant Barrier
R-19 Walls R-0 Slab on Grade Quality Insulation Installation (HERS) Super Low E Vinyl Windows, U=0.36, SHGC=0.23 (8) Furnaces: 80% AFUE (8) Air Conditioners: 13 SEER, 11 EER (HERS) R-8 Attic Ducts Reduced Duct Leakage/Testing (HERS) (8) 40 Gallon Gas Water Heaters: EF=0.63

High-rise Multifamily Apartments

- 36,800 sf,
- 40 units
- 4-story
- Window to Wall Ratio = 35.2%

Energy Efficiency Measures to Meet Title 24
R-19 Metal Roof w/ R-10 (2") rigid insulation; cool roof Reflectance = 0.55 Emittance = 0.75
R-19 in Metal Frame Walls
R-4 (1.25" K-13 spray-on) Raised Slab over parking garage
Dual Metal Windows: default U-factor=0.70, SHGC=0.79
4-pipe fan coil, 80% AFUE boiler, 100-ton scroll air cooled chiller 0.79 KW/ton
Central DHW boiler: 80% AFUE and recirculating system w/ timer-temperature controls

Low-rise Office Building

- Single Story
- 10,580 sf,
- Window to Wall Ratio = 37.1%

Energy Efficiency Measures to Meet Title 24
R-19 under Metal Deck + R-10 (2" rigid); with Cool Roof Reflectance = 0.55, Emittance = 0.75
R-19 in Metal Frame Walls
R-0 (un-insulated) slab-on-grade 1st floor
Metal windows: Default glazing U=0.71, COG SHGC=0.54
Lighting = 0.858 w/sf: Open Office Areas: (60) 2-lamp T8 fixtures @58w each; (24) 18w recessed CFLs no lighting controls. Small Offices: (48) 2-lamp T8 fixtures; (40) 18w recessed CFLs, on/off lighting controls. Support Areas: (32) 18w recessed CFLs; (48) 13w CFL wall sconces; no controls.
(4) 10-ton DX units EER=11.0; 80% AFUE furnaces; standard efficiency fan motors; fixed temp. integrated air economizers
R-10 duct insulation w/ ducts on roof, HERS verified duct leakage
(1) Tank Gas Water Heaters EF=0.58

High-rise Office Building

- 5-story
- 52,900 sf,
- Window to Wall Ratio = 39.4%

Energy Efficiency Measures to Meet Title 24
R-30 under Metal/Conc. Deck, cool roof Reflectance=0.55, Emittance = 0.75
R-19 in Metal Frame Walls
R-0 (un-insulated) slab-on-grade 1st floor
Metal windows: COG u=0.30, COG SHGC=0.54
Lighting = 0.858 w/sf: Open Office Areas: (300) 2-lamp T8 fixtures @58w each; no lighting controls; (120) 18w recessed CFLs no lighting controls. Small Offices: (280) 2-lamp T8 58w fixtures on/off lighting controls; (200) 18w recessed CFLs no lighting on/off lighting controls. Support Areas: (160) 18w recessed CFLs no lighting controls; (240) 13w CFL wall sconces; no lighting controls.
(1) Built Up VAV system with (1) 200 ton recipricating chiller 1.2 kW/ton and 82% AFUE boiler, standard efficiency variable speed fan motors; 30% VAV boxes, reheat on perimeter zones with hot water using 82% AFUE boiler
R-8 duct insulation w/ ducts in conditioned
82% AFUE boiler for domestic hot water use

3.0 Incremental Cost to Exceed 2008 Standards by 15%

The following tables list the energy features and/or equipment included in the 2008 Standards base design, the efficient measure options, and an estimate of the incremental cost for each measure included **to improve the building performance to use 15% less TDV energy than the corresponding Title 24 base case design**.

Small Single Family House

- 2,025 square feet
- 2-story
- 20.2% glazing/floor area ratio

Incremental Cost Estimate to Exceed Title 24 by 15%
Single Family Prototype: 2,025 SF, Option 1 **2025 sf** **Climate Zone 15**

Energy Efficiency Measures	Change Type	Incremental Cost Estimate		
		Min	Max	Avg
R-30 Roof w/ Radiant Barrier	-	$ -	$ -	$ -
R-21 Walls (from R-15): 2,550 sf @ $0.45 to $0.70/sf	Upgrade	$ 1,148	$ 1,785	$ 1,467
R-19 Raised Floor over Garage/Open at 2nd Floor	-	$ -	$ -	$ -
R-0 Slab on Grade	-	$ -	$ -	$ -
Quality Insulation Installation (HERS)	-	$ -	$ -	$ -
Super Low E Vinyl Windows, U=0.36, SHGC=0.23	-	$ -	$ -	$ -
Furnace: 80% AFUE	-	$ -	$ -	$ -
Air Conditioner: 15 SEER, 12 EER (HERS) (from 13 SEER, 11 EER (HERS))	Upgrade	$ 500	$ 1,500	$ 1,000
Air Conditioner: Refrig. Charge (HERS)	-	$ -	$ -	$ -
R-8 Attic Ducts	-	$ -	$ -	$ -
Reduced Duct Leakage/Testing (HERS)	-	$ -	$ -	$ -
50 Gallon Gas Water Heater: EF=0.62	-	$ -	$ -	$ -
Total Incremental Cost of Energy Efficiency Measures:		**$ 1,648**	**$ 3,285**	**$ 2,467**
Total Incremental Cost per Square Foot:		**$ 0.81**	**$ 1.62**	**$ 1.22**

Incremental Cost Estimate to Exceed Title 24 by 15%

Single Family Prototype: 2,025 SF, Option 2 **2025 sf** **Climate Zone 15**

Energy Efficiency Measures	Change Type	Incremental Cost Estimate		
		Min	Max	Avg
R-38 Roof w/ Radiant Barrier (from R-30 w/Radiant Barrier): 1,443 sf @ 0.15 to 0.20/sf	Upgrade	$ 216	$ 289	$ 253
R-19 Walls (from R-15): 2,550 sf @ $0.35 to $0.55/sf	Upgrade	$ 893	$ 1,403	$ 1,148
R-30 Raised Floor over Garage/Open at 2nd Floor (from R-19): 448 sf @ $0.25 to $0.35	Upgrade	$ 112	$ 157	$ 134
R-0 Slab on Grade	-	$ -	$ -	$ -
Quality Insulation Installation (HERS)	-	$ -	$ -	$ -
Super Low E Vinyl Windows, U=0.36, SHGC=0.23	-	$ -	$ -	$ -
Furnace: 80% AFUE	-	$ -	$ -	$ -
Air Conditioner: 15 SEER, 12 EER (HERS) (from 13 SEER, 11 EER (HERS))	Upgrade	$ 500	$ 1,500	$ 1,000
Air Conditioner: Refrig. Charge (HERS)	-	$ -	$ -	$ -
R-8 Attic Ducts	-	$ -	$ -	$ -
Reduced Duct Leakage/Testing (HERS)	-	$ -	$ -	$ -
50 Gallon Gas Water Heater: EF=0.63 (from EF=0.62)	Upgrade	$ -	$ 50	$ 25
Total Incremental Cost of Energy Efficiency Measures:		**$ 1,721**	**$ 3,398**	**$ 2,560**
Total Incremental Cost per Square Foot:		**$ 0.85**	**$ 1.68**	**$ 1.26**

Incremental Cost Estimate to Exceed Title 24 by 15%

Single Family Prototype: 2,025 SF, Option 3 **2025 sf** **Climate Zone 15**

Energy Efficiency Measures	Change Type	Incremental Cost Estimate		
		Min	Max	Avg
R-38 Roof w/ Radiant Barrier (from R-30 w/Radiant Barrier): 1,443 sf @ 0.15 to 0.20/sf	Upgrade	$ 216	$ 289	$ 253
R-21 Walls (from R-15): 2,550 sf @ $0.45 to $0.70/sf	Upgrade	$ 1,148	$ 1,785	$ 1,467
R-19 Raised Floor over Garage/Open at 2nd Floor	-	$ -	$ -	$ -
R-0 Slab on Grade	-	$ -	$ -	$ -
Quality Insulation Installation (HERS)	-	$ -	$ -	$ -
Steep Sloped Cool Roof, Refl=0.30, Em=0.85 (from Refl=0.08, Em=0.85): 1,443 sf @ 0.35 to 0.50/sf	Upgrade	$ 505	$ 722	$ 613
Super Low E Vinyl Windows, U=0.36, SHGC=0.23	-	$ -	$ -	$ -
Furnace: 80% AFUE	-	$ -	$ -	$ -
Air Conditioner: 13 SEER, 11 EER (HERS)	-	$ -	$ -	$ -
Air Conditioner: Refrig. Charge (HERS)	-	$ -	$ -	$ -
R-8 Attic Ducts	-	$ -	$ -	$ -
Reduced Duct Leakage/Testing (HERS)	-	$ -	$ -	$ -
Instantaneous Gas Water Heater: RE=0.80 (from 50 Gal Gas: EF=0.62)	Upgrade	$ 900	$ 1,500	$ 1,200
Total Incremental Cost of Energy Efficiency Measures:		**$ 2,770**	**$ 4,295**	**$ 3,532**
Total Incremental Cost per Square Foot:		**$ 1.37**	**$ 2.12**	**$ 1.74**

Large Single Family House

- 4,500 square feet
- 2-story
- 22.0% glazing/floor area ratio

Incremental Cost Estimate to Exceed Title 24 by 15%

Single Family Prototype: 4,500 SF, Option 1 **4500 sf** **Climate Zone 15**

Energy Efficiency Measures	Change Type	Incremental Cost Estimate		
		Min	Max	Avg
R-49 Roof w/ Radiant Barrier (from R-38 w/ Radiant Barrier): 2,700 sf @ $0.30 to 0.45/sf	Upgrade	$ 810	$ 1,215	$ 1,013
R-21 Walls	-	$ -	$ -	$ -
R-38 Raised Floor (from R-30): 2,700 sf @ $0.10 to $0.15	Upgrade	$ 270	$ 405	$ 338
Quality Insulation Installation (HERS)	-	$ -	$ -	$ -
Steep Sloped Cool Roof, Refl=0.30, Em=0.85 (from Refl=0.08, Em=0.85): 2,700 sf @ 0.35 to 0.50/sf	Upgrade	$ 945	$ 1,350	$ 1,148
Housewrap: 2,518 sf @ $0.50 to $0.75/sf	Upgrade	$ 1,259	$ 1,889	$ 1,574
Super Low E Vinyl Windows, U=0.36, SHGC=0.23	-	$ -	$ -	$ -
(2) Furnaces: 80% AFUE	-	$ -	$ -	$ -
(2) Air Conditioners: 15 SEER, 12 EER (HERS) (from 13 SEER, 11 EER)	Upgrade	$ 1,000	$ 3,000	$ 2,000
(2) Air Conditioners: Refrig. Charge (HERS)	-	$ -	$ -	$ -
R-8 Attic Ducts (from R-6)	Upgrade	$ 450	$ 650	$ 550
Reduced Duct Leakage/Testing (HERS)	-	$ -	$ -	$ -
(2) 50 Gallon Gas Water Heaters: EF=0.63 (from EF=0.62)	Upgrade	$ -	$ 100	$ 50
Total Incremental Cost of Energy Efficiency Measures:		**$ 4,734**	**$ 8,609**	**$ 6,671**
Total Incremental Cost per Square Foot:		**$ 1.05**	**$ 1.91**	**$ 1.48**

Incremental Cost Estimate to Exceed Title 24 by 15%
Single Family Prototype: 4,500 SF, Option 2 **4500 sf** **Climate Zone 15**

Energy Efficiency Measures	Change Type	Incremental Cost Estimate		
		Min	Max	Avg
R-49 Roof w/ Radiant Barrier (from R-38 w/ Radiant Barrier): 2,700 sf @ $0.30 to 0.45/sf	Upgrade	$ 810	$ 1,215	$ 1,013
R-21 Walls	-	$ -	$ -	$ -
R-38 Raised Floor (from R-30): 2,700 sf @ $0.10 to $0.15	Upgrade	$ 270	$ 405	$ 338
Quality Insulation Installation (HERS)	-	$ -	$ -	$ -
Super Low E Vinyl Windows, U=0.36, SHGC=0.23	-	$ -	$ -	$ -
(2) Furnaces: 80% AFUE	-	$ -	$ -	$ -
(2) Air Conditioners: 15 SEER, 12 EER (HERS) (from 13 SEER, 11 EER)	Upgrade	$ 1,000	$ 3,000	$ 2,000
(2) Air Conditioners: Refrig. Charge (HERS)	-	$ -	$ -	$ -
R-8 Attic Ducts (from R-6)	Upgrade	$ 450	$ 650	$ 550
Reduced Duct Leakage/Testing (HERS)	-	$ -	$ -	$ -
(2) Instantaneous Gas Water Heater: RE=0.80 (from 50 Gal Gas: EF=0.62)	Upgrade	$ 1,800	$ 3,000	$ 2,400
Pipe Insulation	Upgrade	$ 300	$ 400	$ 350
Total Incremental Cost of Energy Efficiency Measures:		**$ 4,630**	**$ 8,670**	**$ 6,650**
Total Incremental Cost per Square Foot:		**$ 1.03**	**$ 1.93**	**$ 1.48**

Incremental Cost Estimate to Exceed Title 24 by 15%
Single Family Prototype: 4,500 SF, Option 3 **4500 sf** **Climate Zone 15**

Energy Efficiency Measures	Change	Incremental Cost Estimate		
R-38 Roof w/ Radiant Barrier	-	$ -	$ -	$ -
R-21 Walls	-	$ -	$ -	$ -
R-38 Raised Floor (from R-30): 2,700 sf @ $0.10 to $0.15	Upgrade	$ 270	$ 405	$ 338
Quality Insulation Installation (HERS)	-	$ -	$ -	$ -
Steep Sloped Cool Roof, Refl=0.30, Em=0.85 (from Refl=0.08, Em=0.85): 2,700 sf @ 0.35 to 0.50/sf	Upgrade	$ 945	$ 1,350	$ 1,148
Super Low E Vinyl Windows, U=0.36, SHGC=0.23	-	$ -	$ -	$ -
(2) Furnaces: 80% AFUE	-	$ -	$ -	$ -
(2) Air Conditioners: 15 SEER, 12 EER (HERS) (from 13 SEER, 11 EER)	Upgrade	$ 1,000	$ 3,000	$ 2,000
(2) Air Conditioners: Refrig. Charge (HERS)	-	$ -	$ -	$ -
R-6 Attic Ducts	-	$ -	$ -	$ -
Reduced Duct Leakage/Testing (HERS)	-	$ -	$ -	$ -
(2) Instantaneous Gas Water Heater: RE=0.80 (from 50 Gal Gas: EF=0.62)	Upgrade	$ 1,800	$ 3,000	$ 2,400
Pipe Insulation	Upgrade	$ 300	$ 400	$ 350
Total Incremental Cost of Energy Efficiency Measures:		**$ 4,315**	**$ 8,155**	**$ 6,235**
Total Incremental Cost per Square Foot:		**$ 0.96**	**$ 1.81**	**$ 1.39**

Low-rise Multi-family Apartments

- 8,442 square feet
- 8 units/2-story
- 12.5% glazing/floor area ratio

Incremental Cost Estimate to Exceed Title 24 by 15%
Multi-Family Prototype: 8,442 SF, Option 1 **8442 sf** **Climate Zone 15**

Energy Efficiency Measures	Change Type	Incremental Cost Estimate		
		Min	Max	Avg
R-38 Roof w/ Radiant Barrier	-	$ -	$ -	$ -
R-21 Walls (from R-19): 10,146 sf @ $0.14 to $0.16/sf	Upgrade	$ 1,420	$ 1,623	$ 1,522
R-0 Slab on Grade	-	$ -	$ -	$ -
Quality Insulation Installation (HERS)	-	$ -	$ -	$ -
Steep Sloped Cool Roof, Refl=0.30, Em=0.85 (from Refl=0.08, Em=0.85): 4,221 sf @ 0.35 to 0.50/sf	Upgrade	$ 1,477	$ 2,111	$ 1,794
Super Low E Vinyl, U=0.36, SHGC=0.23	-	$ -	$ -	$ -
(8) Furnaces: 80% AFUE	-	$ -	$ -	$ -
(8) Air Conditioners: 15 SEER, 12 EER (HERS) (from 13 SEER, 11 EER)	Upgrade	$ 4,000	$ 12,000	$ 8,000
(8) Air Conditioners: Refrig. Charge (HERS)	Upgrade	$ 1,200	$ 1,600	$ 1,400
R-8 Attic Ducts	-	$ -	$ -	$ -
Reduced Duct Leakage/Testing (HERS)	-	$ -	$ -	$ -
(8) 40 Gallon Gas Water Heaters: EF=0.63	-	$ -	$ -	$ -
Total Incremental Cost of Energy Efficiency Measures:		**$ 8,098**	**$ 17,334**	**$ 12,716**
Total Incremental Cost per Square Foot:		**$ 0.96**	**$ 2.05**	**$ 1.51**

Incremental Cost Estimate to Exceed Title 24 by 15%
Multi-Family Prototype: 8,442 SF, Option 2 **8442 sf** **Climate Zone 15**

Energy Efficiency Measures	Change Type	Incremental Cost Estimate		
		Min	Max	Avg
R-30 Roof w/ Radiant Barrier (from R-38 w/Radiant Barrier): 4,221 sf @ 0.15 to 0.20/sf	Downgrade	$ (844)	$ (633)	$ (739)
R-21 Walls (from R-19): 10,146 sf @ $0.14 to $0.16/sf	Upgrade	$ 1,420	$ 1,623	$ 1,522
R-0 Slab on Grade	-	$ -	$ -	$ -
Quality Insulation Installation (HERS)	-	$ -	$ -	$ -
Steep Sloped Cool Roof, Refl=0.30, Em=0.85 (from Refl=0.08, Em=0.85): 4,221 sf @ 0.35 to 0.50/sf	Upgrade	$ 1,477	$ 2,111	$ 1,794
Super Low E Vinyl, U=0.36, SHGC=0.23	-	$ -	$ -	$ -
(8) Furnaces: 80% AFUE	-	$ -	$ -	$ -
(8) Air Conditioners: 13 SEER, 11 EER (HERS)	-	$ -	$ -	$ -
(8) Air Conditioners: Refrig. Charge (HERS)	Upgrade	$ 1,200	$ 1,600	$ 1,400
R-8 Attic Ducts	-	$ -	$ -	$ -
Reduced Duct Leakage/Testing (HERS)	-	$ -	$ -	$ -
(8) Instantaneous Gas Water Heater: RE=0.80 (from 40 Gal Gas: EF=0.63)	Upgrade	$ 7,200	$ 11,600	$ 9,400
Total Incremental Cost of Energy Efficiency Measures:		**$ 10,454**	**$ 16,301**	**$ 13,377**
Total Incremental Cost per Square Foot:		**$ 1.24**	**$ 1.93**	**$ 1.58**

Incremental Cost Estimate to Exceed Title 24 by 15%
Multi-Family Prototype: 8,442 SF, Option 3 **8442 sf** **Climate Zone 15**

Energy Efficiency Measures	Change Type	Incremental Cost Estimate		
		Min	Max	Avg
R-38 Roof w/ Radiant Barrier	-	$ -	$ -	$ -
R-21 Walls (from R-19): 10,146 sf @ $0.14 to $0.16/sf	Upgrade	$ 1,420	$ 1,623	$ 1,522
R-0 Slab on Grade	-	$ -	$ -	$ -
Quality Insulation Installation (HERS)	-	$ -	$ -	$ -
Low E2 Vinyl Windows, U=0.36, SHGC=0.30 (from Super Low E Vinyl, U=0.36, SHGC=0.23): 1055 sf @ $1.40 - $1.75 / sf	Downgrade	$ (1,846)	$ (1,477)	$ (1,662)
(8) Furnaces: 80% AFUE	-	$ -	$ -	$ -
(8) Air Conditioners: 16.5 SEER, 13 EER (HERS) (from 13 SEER, 11 EER)	Upgrade	$ 6,000	$ 16,000	$ 11,000
(8) Air Conditioners: Refrig. Charge (HERS)	Upgrade	$ 1,200	$ 1,600	$ 1,400
R-6 Attic Ducts (from R-8)	Downgrade	$ (1,500)	$ (1,000)	$ (1,250)
Reduced Duct Leakage/Testing (HERS)	-	$ -	$ -	$ -
(8) 40 Gallon Gas Water Heaters: EF=0.63	-	$ -	$ -	$ -
Total Incremental Cost of Energy Efficiency Measures:		**$ 5,274**	**$ 16,746**	**$ 11,010**
Total Incremental Cost per Square Foot:		**$ 0.62**	**$ 1.98**	**$ 1.30**

High-rise Multifamily Apartments

- 36,800 sf,
- 40 units/4-story
- Window to Wall Ratio = 35.2%

Incremental Cost Estimate to Exceed Title 24 by 15%
High-rise Residential Prototype: 36,800 SF, Option 1 **Climate Zone 15**

Energy Efficiency Measures to Exceed Title 24 by 15%	Change Type	Incremental Cost Estimate		
		Min	Max	Avg
R-19 Metal Roof w/ R-10 (2") rigid insulation; cool roof Reflectance = 0.55 Emittance = 0.75	-			
R-19 in Metal Frame Walls	-			
R-4 (1.25" K-13 spray-on) Raised Slab over parking garage	-			
Dual Metal Windows: **COG U-factor=0.3, COG SHGC=0.38** 6,240 sf @ $2.00 to $3.50/sf	Upgrade	$ 15,600	$ 24,960	$ 20,280
4-pipe fan coil, **92% AFUE** boiler, 100-ton scroll air cooled chiller 0.79 KW/ton	Upgrade	$ 1,500	$ 3,000	$ 2,250
Central DHW boiler: **92% AFUE** and recirculating system w/ timer-temperature controls	Upgrade	$ 1,500	$ 3,000	$ 2,250
Total Incremental Cost of Energy Efficiency Measures:		**$ 18,600**	**$ 30,960**	**$ 24,780**
Total Incremental Cost per Square Foot:		**$ 0.51**	**$ 0.84**	**$ 0.67**

Incremental Cost Estimate to Exceed Title 24 by 15%
High-rise Residential Prototype: 36,800 SF, Option 2 **Climate Zone 15**

Energy Efficiency Measures to Exceed Title 24 by 15%	Change Type	Incremental Cost Estimate		
		Min	Max	Avg
R-19 Metal Roof w/ R-10 (2") rigid insulation; cool roof Reflectance = 0.55 Emittance = 0.75	-			
R-19 in Metal Frame Walls	-			
R-4 (1.25" K-13 spray-on) Raised Slab over parking garage	-			
Dual Non-Metal Windows: COG U-factor=0.3, COG SHGC=0.38, 6,240 sf @ $3.50 to $5.00/sf	Upgrade	$ 21,840	$ 31,200	$ 26,520
4-pipe fan coil, 80% AFUE boiler, 100-ton scroll air cooled chiller 0.79 KW/ton	-			
Central DHW boiler: 80% AFUE and recirculating system w/ timer-temperature controls	-			
Total Incremental Cost of Energy Efficiency Measures:		**$ 21,840**	**$ 31,200**	**$ 26,520**
Total Incremental Cost per Square Foot:		**$ 0.59**	**$ 0.85**	**$ 0.72**

Incremental Cost Estimate to Exceed Title 24 by 15%
High-rise Residential Prototype: 36,800 SF, Option 3 **Climate Zone 15**

Energy Efficiency Measures to Exceed Title 24 by 15%	Change Type	Incremental Cost Estimate		
		Min	Max	Avg
R-19 Metal Roof w/ **R-15 (3") rigid insulation**; cool roof Reflectance = 0.55 Emittance = 0.75, 9,200 sf @ $1.10 - $1.50/sf	Upgrade	$ 10,120	$ 13,800	$ 11,960
R-19 in Metal Frame Walls	-			
R-4 (1.25" K-13 spray-on) Raised Slab over parking garage	-			
Dual Metal Windows: **COG U-factor=0.3, COG SHGC=0.38** 6,240 sf @ $2.00 to $3.50/sf	Upgrade	$ 15,600	$ 24,960	$ 20,280
4-pipe fan coil, 80% AFUE boiler, 100-ton scroll air cooled chiller 0.79 KW/ton	-			
Central DHW boiler: 80% AFUE and recirculating system w/ timer-temperature controls	-			
Total Incremental Cost of Energy Efficiency Measures:		**$ 25,720**	**$ 38,760**	**$ 32,240**
Total Incremental Cost per Square Foot:		**$ 0.70**	**$ 1.05**	**$ 0.88**

Incremental Cost Estimate to Exceed Title 24 by 15%

High-rise Residential Prototype: 36,800 SF, Option 4 **Climate Zone 15**

Energy Efficiency Measures to Exceed Title 24 by 15%	Change Type	Incremental Cost Estimate		
		Min	Max	Avg
R-19 Metal Roof w/ **R-20 (4") rigid insulation**; cool roof Reflectance = 0.55 Emittance = 0.75, 9,200 sf @ $2.20 - $3.00/sf	Upgrade	$ 20,240	$ 27,600	$ 23,920
R-19 in Metal Frame Walls	-			
R-4 (1.25" K-13 spray-on) Raised Slab over parking garage	-			
Dual Metal Windows: Default U-factor=0.79, **COG SHGC=0.54** 6,240 sf @ $1.50 to $2.50/sf	Upgrade	$ 9,360	$ 15,600	$ 12,480
4-pipe fan coil, **92% AFUE** boiler, 100-ton scroll air cooled chiller 0.79 KW/ton	Upgrade	$ 1,500	$ 3,000	$ 2,250
Central DHW boiler: **92% AFUE** and recirculating system w/ timer-temperature controls	Upgrade	$ 1,500	$ 3,000	$ 2,250
Total Incremental Cost of Energy Efficiency Measures:		**$ 32,600**	**$ 49,200**	**$ 40,900**
Total Incremental Cost per Square Foot:		**$ 0.89**	**$ 1.34**	**$ 1.11**

Low-rise Office Building

- Single Story
- 10,580 sf,
- Window to Wall Ratio = 37.1%

Incremental Cost Estimate to Exceed Title 24 by 15%
Nonresidential Prototype: 10,580 SF, Option 1 **Climate Zone 15**

Energy Efficiency Measures to Exceed Title 24 by 15%	Change Type	Incremental Cost Estimate Min	Max	Avg
R-19 under Metal Deck + R-10 (2" rigid); with Cool Roof Reflectance = 0.55, Emittance = 0.75	-	$ -	$ -	$ -
R-19 in Metal Frame Walls	-	$ -	$ -	$ -
R-0 (un-insulated) slab-on-grade 1st floor	-	$ -	$ -	$ -
Metal windows: **COG U=0.30,** COG SHGC=0.54 3,200 sf @ $1.50 to $2.50/sf	Upgrade	$ 4,800	$ 8,000	$ 6,400
Lighting = 0.678 w/sf: **Open Office Areas: (32) HO 2-lamp T8 fixtures @74w each;** no lighting controls; (24) 18w recessed CFLs. Small Offices: (56) 2-lamp T8 fixtures, **(28) multi-level ocupancy sensors on T8s @ $75 to $100 each;**; (40) 18w recessed CFLs **w/ multi-level occupancy sensors on CFLs @ $75 to $100 each.** Support Areas: (32) 18w recessed CFLs; (48) 13w CFL wall sconces; no controls. Net saving of $36 to $40 per new fixture in open offices because of a total reduction of 46% of T8 fixtures in these areas.	Upgrade	$ 948	$ 1,520	$ 1,234
(4) 10-ton DX units EER=11.0; 80% AFUE furnaces; standard efficiency fan motors; fixed temp. integrated air economizers	-	$ -	$ -	$ -
R-10 duct insulation w/ ducts on roof, HERS verified duct leakage	-	$ -	$ -	$ -
(1) **Tankless Gas Water Heater EF=0.84**	Upgrade	$ 1,800	$ 2,400	$ 2,100
Total Incremental Cost of Energy Efficiency Measures:		**$ 7,548**	**$ 11,920**	**$ 9,734**
Total Incremental Cost per Square Foot:		**$ 0.71**	**$ 1.13**	**$ 0.92**

Incremental Cost Estimate to Exceed Title 24 by 15%

Nonresidential Prototype: 10,580 SF, Option 2 **Climate Zone 15**

Energy Efficiency Measures to Exceed Title 24 by 15%	Change Type	Incremental Cost Estimate		
		Min	Max	Avg
R-19 under Metal Deck + **R-15 (3" rigid);** with Cool Roof Reflectance = 0.55, Emittance = 0.75	Upgrade	$ 11,638	$ 15,870	$ 13,754
R-19 in Metal Frame Walls	-			
R-0 (un-insulated) slab-on-grade 1st floor	-			
Metal windows: **COG U=0.30,** COG SHGC=0.54 3,200 sf @ $1.50 to $2.50/sf	Upgrade	$ 4,800	$ 8,000	$ 6,400
Lighting = 0.678 w/sf: **Open Office Areas: (32) HO 2-lamp T8 fixtures @74w each;** no lighting controls; (24) 18w recessed CFLs. Small Offices: (56) 2-lamp T8 fixtures, **(28) multi-level ocupancy sensors on T8s @ $75 to $100 each;**; (40) 18w recessed CFLs **w/ multi-level occupancy sensors on CFLs @ $75 to $100 each.** Support Areas: (32) 18w recessed CFLs; (48) 13w CFL wall sconces; no controls. Net saving of $36 to $40 per new fixture in open offices because of a total reduction of 46% of T8 fixtures in these areas.	Upgrade	$ 948	$ 1,520	$ 1,234
(3) 15-ton DX units EER=12.0; 92% AFUE furnaces; premium efficiency fan motors; fixed temp. integrated air economizers	Upgrade	$ 7,500	$ 9,500	$ 8,500
R-10 duct insulation w/ ducts on roof, HERS verified duct leakage	-	$ -	$ -	$ -
(1) Tank Gas Water Heaters EF=0.58	-	$ -	$ -	$ -
Total Incremental Cost of Energy Efficiency Measures:		**$ 24,886**	**$ 34,890**	**$ 29,888**
Total Incremental Cost per Square Foot:		**$ 2.35**	**$ 3.30**	**$ 2.82**

Incremental Cost Estimate to Exceed Title 24 by 15%

Nonresidential Prototype: 10,580 SF, Option 3 **Climate Zone 15**

Energy Efficiency Measures to Exceed Title 24 by 15%	Change Type	Incremental Cost Estimate		
		Min	Max	Avg
R-19 under Metal Deck + **R-20 (4" rigid)**; Cool Roof Reflectance =0.55, Emittance = 0.75; 10,580 sf @ $2.20 to $3.00/sf	Upgrade	$ 23,276	$ 31,740	$ 27,508
R-19 in Metal Frame Walls	-	$ -	$ -	$ -
R-0 (un-insulated) slab-on-grade 1st floor	-	$ -	$ -	$ -
Metal windows: **COG U=0.30,** COG SHGC=0.54 3,200 sf @ $1.50 to $2.50/sf	Upgrade	$ 4,800	$ 8,000	$ 6,400
Lighting = 0.783 w/sf: Open Office Areas: (60) 2-lamp T8 fixtures @58w each; no lighting controls; (24) 18w recessed CFLs. Small Offices: (56) 2-lamp T8 fixtures, **(28) multi-level ocupancy sensors on T8s @ $75 to $100 each;**; (40) 18w recessed CFLs Support Areas: (32) 18w recessed CFLs; (48) 13w CFL wall sconces; no controls.	Upgrade	$ 2,100	$ 2,800	$ 2,450
(3) 15-ton DX units EER=12.0; 92% AFUE furnaces; premium efficiency fan motors; fixed temp. integrated air economizers	Upgrade	$ 7,500	$ 9,500	$ 8,500
R-10 duct insulation w/ ducts on roof, HERS verified duct leakage	-			
(1) **Tankless Gas Water Heater EF=0.84**	Upgrade	$ 1,800	$ 2,400	$ 2,100
Total Incremental Cost of Energy Efficiency Measures:		**$ 39,476**	**$ 54,440**	**$ 46,958**
Total Incremental Cost per Square Foot:		**$ 3.73**	**$ 5.15**	**$ 4.44**

Incremental Cost Estimate to Exceed Title 24 by 15%

Nonresidential Prototype: 10,580 SF, Option 4 **Climate Zone 15**

Energy Efficiency Measures to Exceed Title 24 by 15%	Change Type	Incremental Cost Estimate		
		Min	Max	Avg
R-19 under Metal Deck + R-10 (2" rigid); with Cool Roof Reflectance = 0.55, Emittance = 0.75	-	$ -	$ -	$ -
R-19 in Metal Frame Walls	-	$ -	$ -	$ -
R-0 (un-insulated) slab-on-grade 1st floor	-	$ -	$ -	$ -
Metal windows: **COG U=0.30, COG SHGC=0.38** 3,200 sf @ $2.50 to $3.50/sf	Upgrade	$ 8,000	$ 11,200	$ 9,600
Lighting = 0.678 w/sf: **Open Office Areas: (32) HO 2-lamp T8 fixtures @74w each;** no lighting controls; (24) 18w recessed CFLs. Small Offices: (56) 2-lamp T8 fixtures, **(28) multi-level ocupancy sensors on T8s @ $75 to $100 each;**; (40) 18w recessed CFLs **w/ multi-level occupancy sensors on CFLs @ $75 to $100 each.** Support Areas: (32) 18w recessed CFLs; (48) 13w CFL wall sconces; no controls. Net saving of $36 to $40	Upgrade	$ 948	$ 1,520	$ 1,234
(3) 15-ton DX units EER=12.0; 92% AFUE furnaces; standard efficiency fan motors**;** fixed temp. integrated air economizers	Upgrade	$ 7,200	$ 9,050	$ 8,125
R-10 duct insulation w/ ducts on roof, HERS verified duct leakage	-			
(1) Tank Gas Water Heaters EF=0.58	-	$ -	$ -	$ -
Total Incremental Cost of Energy Efficiency Measures:		**$ 16,148**	**$ 21,770**	**$ 18,959**
Total Incremental Cost per Square Foot:		**$ 1.53**	**$ 2.06**	**$ 1.79**

High-rise Office Building

- 5-story
- 52,900 sf,
- Window to Wall Ratio = 39.4%

Incremental Cost Estimate to Exceed Title 24 by 15%
Nonresidential Prototype: 52,900 SF, Option 1 **Climate Zone 15**

Energy Efficiency Measures to Exceed Title 24 by 15%	Change Type	Incremental Cost Estimate		
		Min	Max	Avg
R-30 under Metal/Conc. Deck, cool roof Reflectance=0.55, Emittance = 0.75	-	$ -	$ -	$ -
R-19 in Metal Frame Walls	-	$ -	$ -	$ -
R-0 (un-insulated) slab-on-grade 1st floor	-	$ -	$ -	$ -
Metal windows: COG U=0.30, **COG SHGC=0.27**; 16,000 sf @ $2.50 to $3.50/sf	Upgrade	$ 40,000	$ 56,000	$ 48,000
Lighting = 0.678 w/sf: Open Office Areas: **(160) HO 2-lamp T8 fixtures @74w each**; no lighting controls; (120) 18w recessed CFLs no lighting controls. Small Offices: (140) 2-lamp T8 fixtures **multi-level occupancy sensors on T8s @ $75 to $100 each**; (200) 18w recessed CFLs on/off lighting controls. Support Areas: (160) 18w recessed CFLs no lighting controls; (240) 13w CFL wall sconces; no lighting controls. Net saving of $36 to $40 per new fixture in open offices because of a total reduction of 46% of T8 fixtures in these areas	Upgrade	$ 4,740	$ 7,600	$ 6,170
(1) Built Up VAV system with (1) 200 ton recipricating chiller 1.2 kW/ton and 82% AFUE boiler, standard efficiency variable speed fan motors; 20% VAV boxes, reheat on perimeter zones with hot water using 82% AFUE boiler	-	$ -	$ -	$ -
R-8 duct insulation w/ ducts in conditioned	-	$ -	$ -	$ -
82% AFUE boiler for domestic hot water use	-	$ -	$ -	$ -
Total Incremental Cost of Energy Efficiency Measures:		**$ 44,740**	**$ 63,600**	**$ 54,170**
Total Incremental Cost per Square Foot:		**$ 0.85**	**$ 1.20**	**$ 1.02**

Incremental Cost Estimate to Exceed Title 24 by 15%
Nonresidential Prototype: 52,900 SF, Option 2 **Climate Zone 15**

Energy Efficiency Measures to Exceed Title 24 by 15%	Change Type	Incremental Cost Estimate Min	Max	Avg
R-30 under Metal/Conc. Deck, **no cool roof** 10,580 sf @$0.35 to $0.50/sf	Downgrade	$ (3,703)	$ (5,290)	$ (4,497)
R-19 in Metal Frame Walls	-	$ -	$ -	$ -
R-0 (un-insulated) slab-on-grade 1st floor	-	$ -	$ -	$ -
Metal windows: COG U=0.30, **COG SHGC=0.38**; 16,000 sf @ $1.75 to $2.75/sf	Upgrade	$ 28,000	$ 44,000	$ 36,000
Lighting = 0.678 w/sf: Open Office Areas: **(160) HO 2-lamp T8 fixtures @74w each**; no lighting controls; (120) 18w recessed CFLs no lighting controls. Small Offices: (140) 2-lamp T8 fixtures **multi-level occupancy sensors on T8s @ $75 to $100 each**; (200) 18w recessed CFLs on/off lighting controls. Support Areas: (160) 18w recessed CFLs no lighting controls; (240) 13w CFL wall sconces; no lighting controls. Net saving of $36 to $40 per new fixture in open offices because of a total reduction of 46% of T8 fixtures in these areas	Upgrade	$ 4,740	$ 7,600	$ 6,170
(1) Built Up VAV system with (1) 200 ton recipricating chiller 1.2 kW/ton and 82% AFUE boiler, **standard efficiency** variable speed fan motors; **20% VAV boxes**, reheat on perimeter zones with hot water using 82% AFUE boiler $0.65 to $0.90/sf	Upgrade	$ 34,135	$ 47,110	$ 40,623
R-8 duct insulation w/ ducts in conditioned	-	$ -	$ -	$ -
82% AFUE boiler for domestic hot water use	-	$ -	$ -	$ -
Total Incremental Cost of Energy Efficiency Measures:		**$ 63,172**	**$ 93,420**	**$ 78,296**
Total Incremental Cost per Square Foot:		**$ 1.19**	**$ 1.77**	**$ 1.48**

Incremental Cost Estimate to Exceed Title 24 by 15%

Nonresidential Prototype: 52,900 SF, Option 3 **Climate Zone 15**

Energy Efficiency Measures to Exceed Title 24 by 15%	Change Type	Incremental Cost Estimate		
		Min	Max	Avg
R-30 under Metal/Conc. Deck, **no cool roof** 10,580 sf @$0.35 to $0.50/sf	Downgrade	$ (3,703)	$ (5,290)	$ (4,497)
R-19 in Metal Frame Walls	-	$ -	$ -	$ -
R-0 (un-insulated) slab-on-grade 1st floor	-	$ -	$ -	$ -
Metal windows: COG U=0.30, **COG SHGC=0.31**; 16,000 sf @ $2.00 to $3.00/sf	Upgrade	$ 32,000	$ 48,000	$ 40,000
Lighting = 0.753 w/sf: Open Office Areas: **(160) HO 2-lamp T8 fixtures @74w each**; no lighting controls; (120) 18w recessed CFLs no lighting controls. Small Offices: (140) 2-lamp T8 fixtures on/off occupancy sensors on T8s; (200) 18w recessed CFLs on/off lighting controls. Support Areas: (160) 18w recessed CFLs no lighting controls; (240) 13w CFL wall sconces; no lighting controls. Net saving of $148.50 to $294.00 per new fixture in open offices because of a total reduction of 46% of T8 fixtures in these areas, and no multi-level occupancy sensors	Upgrade	$ (47,050)	$ (23,760)	$ (35,405)
(1) Built Up VAV system with (1) 200 ton recipricating chiller 1.2 kW/ton and 82% AFUE boiler, standard efficiency variable speed fan motors; **20% VAV boxes**, reheat on perimeter zones with hot water using 82% AFUE boiler $0.50 to $0.75/sf	Upgrade	$ 34,135	$ 47,110	$ 40,623
R-8 duct insulation w/ ducts in conditioned	-	$ -	$ -	$ -
82% AFUE boiler for domestic hot water use	-	$ -	$ -	$ -
Total Incremental Cost of Energy Efficiency Measures:		**$ 15,382**	**$ 66,060**	**$ 40,721**
Total Incremental Cost per Square Foot:		**$ 0.29**	**$ 1.25**	**$ 0.77**

5.0 Cost Effectiveness Determination

Regardless of the building design, occupancy profile and number of stories, the incremental improvement in overall annual energy performance of buildings in exceeding the 2008 Standards is determined to be cost-effective. However, each building's overall design, occupancy type and specific design choices may allow for a large range of incremental costs for exceeding 2008 Standards, estimated annual energy cost savings, and subsequent payback period.

Small Single Family

Building Description	Total Annual KWh Saving	Total Annual Therms Saving	Incremental First Cost ($)	Annual Energy Cost Savings ($)	Simple Payback (Years)
2,025 sf (Option 1)	1299	16	$2,467	$222	11.1
2,025 sf (Option 2)	1272	21	$2,560	$222	11.5
2,025 sf (Option 3)	1003	65	$3,533	$221	16.0
Averages:	1191	34	$2,853	$221	12.9

Annual Reduction in CO2-equivalent: ***932 lb./building-year***
0.46 lb./sq.ft.-year

Large Single Family

Building Description	Total Annual KWh Saving	Total Annual Therms Saving	Incremental First Cost ($)	Annual Energy Cost Savings ($)	Simple Payback (Years)
4,500 sf (Option 1)	2216	24	$6,672	$375	17.8
4,500 sf (Option 2)	1631	117	$6,650	$369	18.0
4,500 sf (Option 3)	1689	108	$6,235	$370	16.8
Averages:	1660	113	$6,443	$370	17.4

Annual Reduction in CO2-equivalent: ***1,797 lb./building-year***
0.40 lb./sq.ft.-year

Low-rise Multi-family Apartments

Building Description	Total Annual KWh Saving	Total Annual Therms Saving	Incremental First Cost ($)	Annual Energy Cost Savings ($)	Simple Payback (Years)
8-Unit, 8,442 sf (Option 1)	5427	7	$12,716	$869	14.6
8-Unit, 8,442 sf (Option 2)	3052	384	$13,378	$846	15.8
8-Unit, 8,442 sf (Option 3)	5163	20	$11,010	$840	13.1
Averages:	4547	137	$12,368	$852	14.5

Annual Reduction in CO2-equivalent: ***3,641 lb./building-year***
0.43 lb./sq.ft.-year

High-rise Multi-family Apartments

Building Description	Total Annual KWh Saving	Total Annual Therms Saving	Incremental First Cost ($)	Annual Energy Cost Savings ($)	Simple Payback (Years)
36,800 sf (Option 1)	23577	-150	$24,780	$3,608	6.9
36,800 sf (Option 2)	23675	-140	$26,520	$3,633	7.3
36,800 sf (Option 3)	24893	-227	$32,240	$3,745	8.6
36,800 sf (Option 4)	18495	663	$40,900	$3,564	11.5
Averages:	22660	37	$31,110	$3,637	8.6

Annual Reduction in CO2-equivalent: ***10,622 lb./building-year***
0.29 lb./sq.ft.-year

Low-rise Office Building

Building Description	Total Annual KWh Saving	Total Annual Therms Saving	Incremental First Cost ($)	Annual Energy Cost Savings ($)	Simple Payback (Years)
10,580 sf (Option 1)	22133	139	$9,734	$5,085	1.9
10,580 sf (Option 2)	25509	14	$29,888	$5,877	5.1
10,580 sf (Option 3)	22685	175	$46,958	$5,374	8.7
10,580 sf (Option 4)	27214	5	$18,959	$6,235	3.0
Averages:	24385	83	$26,385	$5,643	4.7

Annual Reduction in CO2-equivalent: ***11,942 lb./building-year***
1.13 lb./sq.ft.-year

High-rise Office Building

Building Description	Total Annual KWh Saving	Total Annual Therms Saving	Incremental First Cost ($)	Annual Energy Cost Savings ($)	Simple Payback (Years)
52,900 sf Option 1	69474	-342	$54,170	$15,438	3.5
52,900 sf Option 2	128191	1948	$78,296	$29,631	2.6
52,900 sf Option 3	99272	2142	$40,721	$23,176	1.8
Averages:	98979	1249	$57,729	$22,748	2.6

Annual Reduction in CO2-equivalent: ***44,192 lb./building-year***
0.84 lb./sq.ft.-year

Appendix A:
Climate Zone 15 Cities

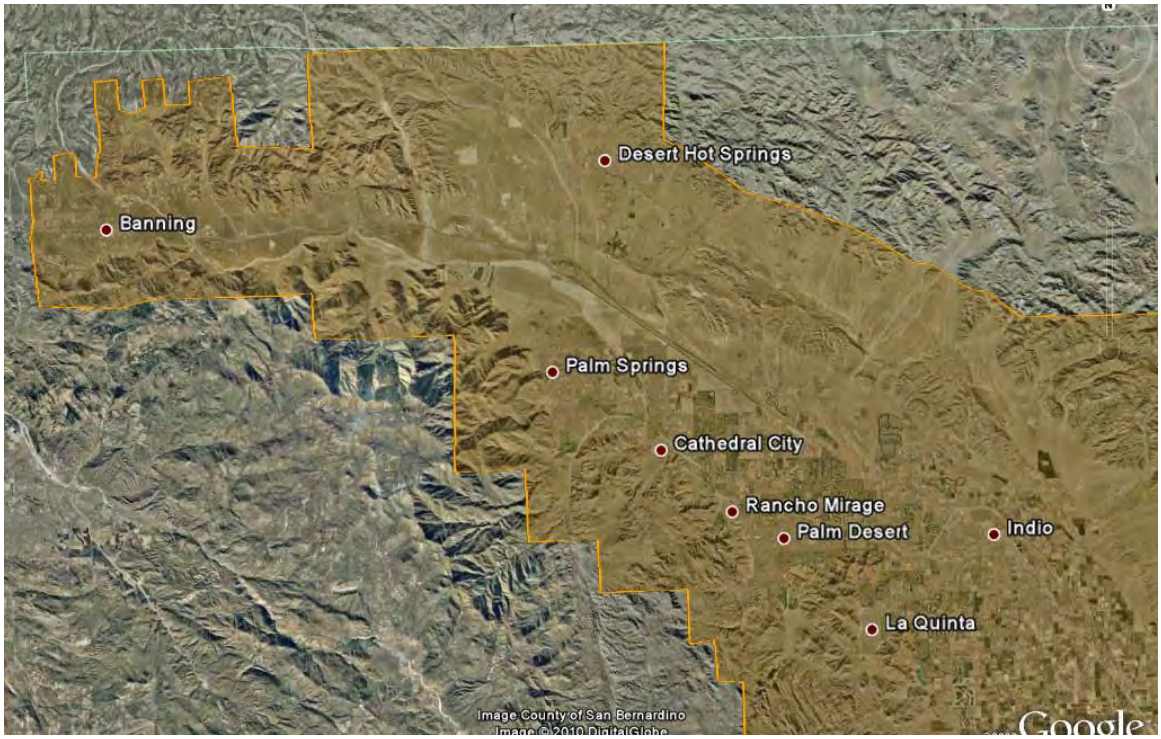
1 Acolita
2 Agua Caliente Springs
3 Aguanga
4 Alamo River
5 Amboy
6 Amos
7 Andrade
8 Araz Wash
9 Arroyo Salada
10 Bagdad
11 Banning
12 Bard
13 Big Maria Mountains
14 Black Meadow Landing
15 Blythe
16 Bombay Beach
17 Bonds Corner
18 Borrego
19 Borrego Springs
20 Box Canyon
21 Brawley
22 Bristol Lake
23 Cabazon
24 Cadiz
25 Cadiz Lake
26 Cadiz Valley
27 Calexico
28 Calipatria
29 Carrizo Wash
30 Cathedral City
31 Chambless
32 Chubbuck
33 Chuckwalla Valley
34 Clyde
35 Coachella
36 Coachella Valley
37 Colorado River
38 Coyote Wash
39 Cross Roads
40 Danby Lake
41 Deep Canyon
42 Desert Beach
43 Desert Center
44 Desert Hot Springs
45 Desert Shores
46 Dixieland
47 Dos Cabezas
48 Duguynos Canyon
49 Durmid
50 Earp
51 East Mesa
52 El Centro
53 Ferguson Lake
54 Ford Dry Lake
55 Frink
56 Glamis
57 Gold Rock Rch
58 Gordons Well
59 Grommet
60 Havasu Lake
61 Heber
62 Holtville
63 Imperial
64 Imperial Dam
65 Imperial Reservoir
66 Imperial Valley
67 Inca
68 Indian Wells
69 Indio
70 Iris

Climate Zone 15 Cities – con't

71	Jacumba Mountains
72	Java
73	La Quinta
74	Laguna Dam
75	Lake Havasu
76	Mammoth Wash
77	Martinez Canyon
78	McCoy Wash
79	Mecca
80	Mesaville
81	Midland
82	Milligan
83	Mount Signal
84	Mountain Spring
85	Needles
86	Nicholls Warm Springs
87	Niland
88	North Palm Springs
89	Oasis
90	Ocotillo
91	Ocotillo Wells
92	Ogilby
93	Orita
94	Palen Lake
95	Palen Mountains
96	Palm Canyon
97	Palm Desert
98	Palm Desert Country
99	Palm Springs
100	Palm Wash
101	Palo Verde
102	Palo Verde Valley
103	Parker Dam
104	Picacho
105	Picacho Wash
106	Pinkham Wash
107	Pinto Wash
108	Pinto Wash
109	Piute Wash
110	Plaster City
111	Quartz Peak
112	Rancho Mirage
113	Rice
114	Rice Valley
115	Ripley
116	Saltmarsh
117	Salton City
118	Salton Sea
119	Saltus
120	San Gorgonio Pass
121	San Gorgonio River
122	Superstition Mountain
123	Thermal
124	Thousand Palms
125	Tule Wash
126	U.S.N. Air Field El Centro
127	Unnamed Wash
128	Vidal
129	Vidal Junction
130	Vidal Valley
131	Vidal Wash
132	Vinagre Wash
133	West Mesa
134	Westmorland
135	Whipple Mountains
136	White Water
137	Wiest
138	Winterhaven
139	Wister
140	Yuha Desert

Only a portion located within Climate Zone 15


Riverside
15
San Diego
Google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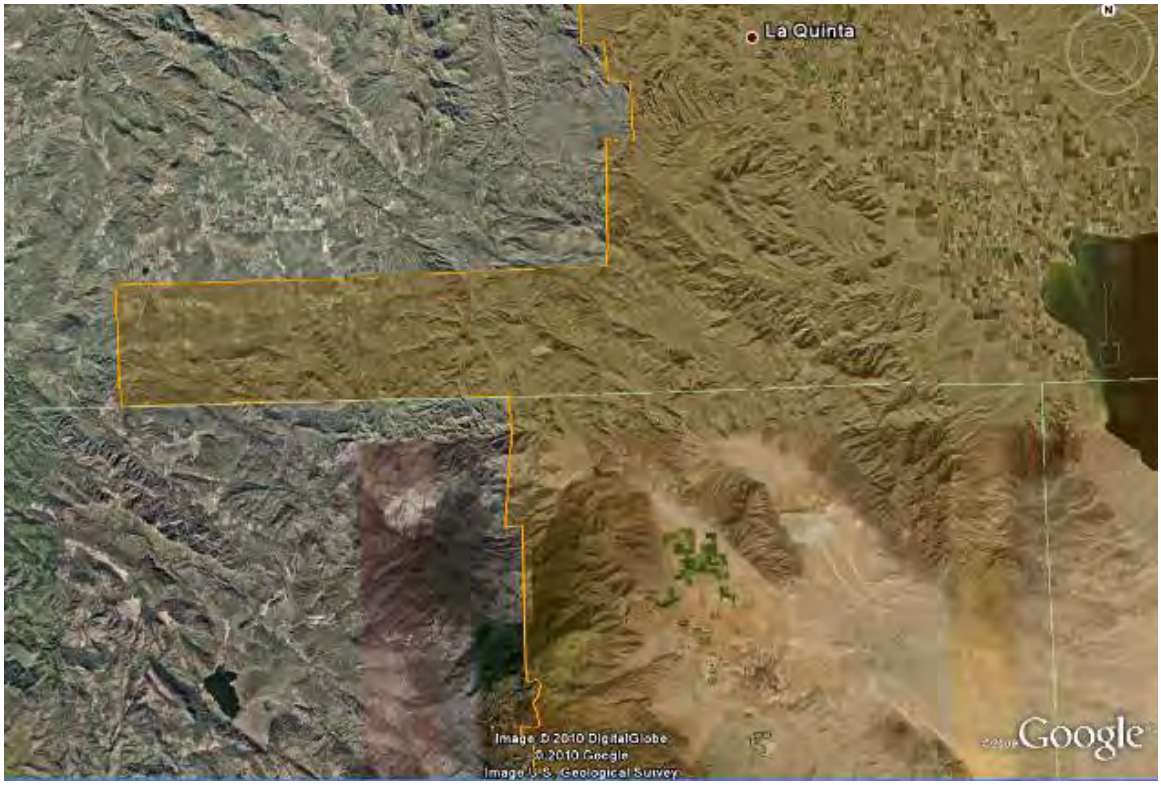
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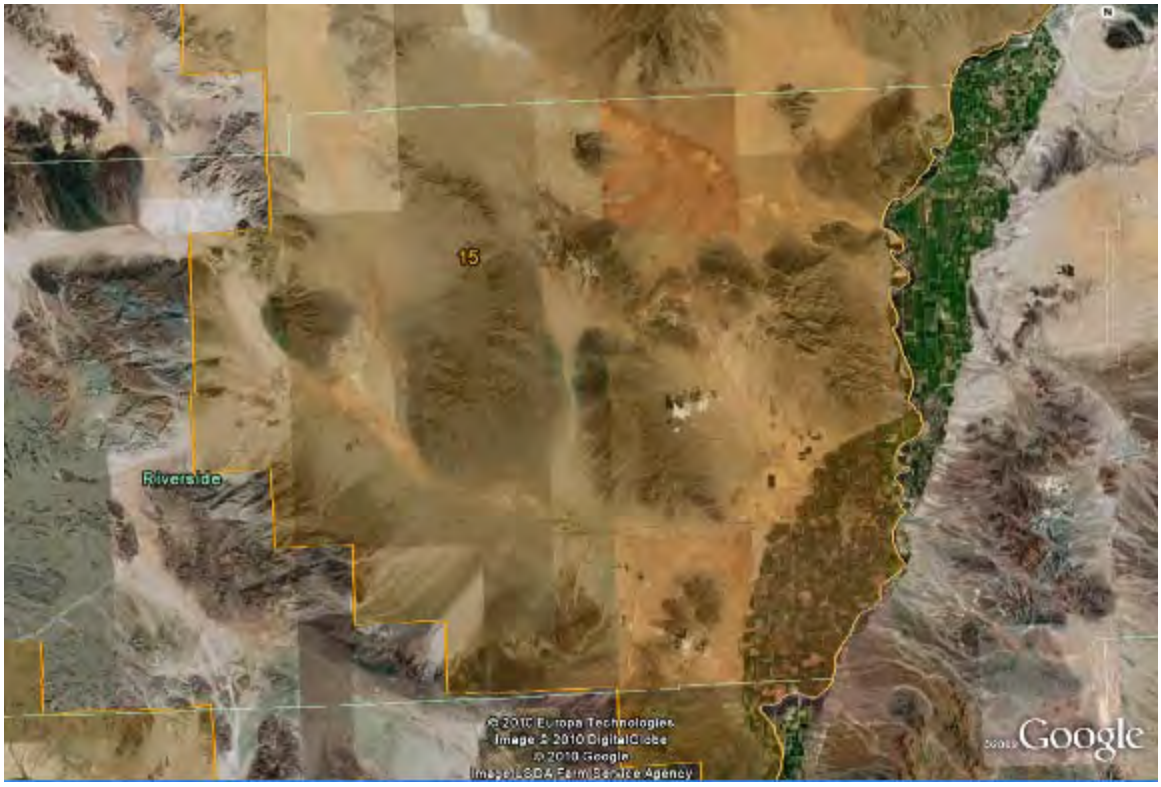
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CHAPTER FIVE
FINANCIAL INCENTIVES & PERMIT PROCESSING

financial incentives & permit processing

Financial Incentives

To encourage participation in this program, financial incentives are available to offset the costs of energy efficient upgrades. Incentives come in the form of private and public subsidies that support a variety of projects, including appliance upgrades and energy efficient building designs. The purpose of this section is to provide resources and information pertaining to current financial incentives for energy efficient upgrades.

Government and Utility Incentives

The following table provides links to incentive information. Note that programs and rates offered are subject to change based upon funding sources, budgetary limitations and political climate.

Southern California Edison (SCE)
Rebates and Savings – SCE's Rebate and Savings homepage.
Appliances – Find rebates for energy efficient appliances.
Lighting – Rebates for CFL's and other qualified lighting.
Heating and Cooling – Rebates for products, installation and maintenance.
Pool – Upgrade pool and spa products.
Multifamily Energy Efficiency Rebate Program – Offers property owners and managers incentives on a broad list of energy efficiency improvements.
ENERGY STAR
ENERGY STAR – ENERGY STAR's homepage.
Special Offers and Rebates – Check for special offers on qualified products.
Federal Tax Credits – Available Tax Credits (updated yearly)
DSIRE
DSIRE California – DSIRE is a comprehensive source of information on state, local, utility, and federal incentives and policies that promote energy efficiency.
Energy Upgrade California
Homeowners – Incentives offered to residential homeowners.
Contractors – Incentives offered to licensed contractors.
U.S. Department of Energy
California Appliance Rebates – An application based, mail-in rebate program
Tax Credits – Federal tax credits for purchasing energy-efficient products.

City/Tribe Incentives

TBD: Will be customized based on what each City wants to do.

Options: 50% reduction in plan check time
XX% reduction in plan check fees
RDA or similar financial incentives (affordable housing especially)
Individual SCE or SCG partnership funds

Education/Outreach

Hire/appoint staff position to manage, facilitate green building objectives. Support/require percentage of staff or certain positions to attend training/conferences related energy efficiency and green building.

Record Keeping/Tracking

Permit application should be automated, as feasible, when in conformance with agreed upon criteria. Electronic form filing. Status updates and schedules.

Permitting for Energy Efficiency Improvement

Mechanism to allow for group permitting based upon shared characteristic, such as era built, material composition, orientation, and other parameters. Permit would grant permission for installation of specific approved improvements (windows, solar, shading, insulation, and other Energy Efficient Retrofits).

Checklist should include at minimum: Stats on building performance before, proposed, and actual after built). Detail on solar design specs standard and custom.

Reach

Form Energy Efficient Task forces for districts that do not have defined HOA's.

Base groupings on housing characteristic similarities such as age and materials.

Through partnerships offer specific improvements to sectors that would achieve the greatest energy savings. (Must be able to identify those).