# IV

# Design Principles
# &
# Guidelines
# for
# Sustainable
# Development

# DESIGN PRINCIPLES & GUIDELINES FOR SUSTAINABLE DEVELOPMENT

## BACKGROUND

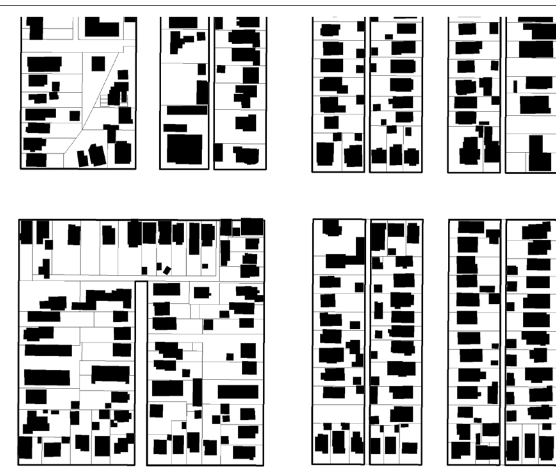
The older neighborhoods and historic districts in Salt Lake City are the foundation of the community's most sustainable form of development. They combine an urban residential density, character and walkability with a spectrum of small scale commercial enterprise, and proximity to the civic and commercial heart of the city. This is in stark contrast to the post-war patterns of suburban development.

This compact traditional form of development was encouraged by, and now helps to sustain, patterns of mobility that evolved without, and which rely much less on the use of the car. The development patterns, mature landscape, spectrum and diversity of residential scale, type, architectural form and expression, create the 'livability' which helps to attract residents and business alike. This livability encourages their consequent investments in the city and its more historic neighborhoods.

Effectively therefore, the unique character of each of these older neighborhoods embodies much of the essence of the economic sustainability, the cultural and social sustainability, as well as the environmental sustainability, of Salt Lake City.

**THESE DESIGN PRINCIPLES AND GUIDELINES ON SUSTAINABLE DEVELOPMENT PRACTICE ARE ADVISORY ONLY, AND WILL NOT BE USED IN DESIGN REVIEW.**





*A typical city settlement and street pattern, with its hierarchy of primary and secondary streets and shared alley access, creating an intricate, varied and concentrated layout of blocks, lots, access and buildings; a human scale pattern and character that is complex, rich, walkable and inherently sustainable.*

Historic preservation is effectively the wise use, the conservation of and the investment in our existing resources, including the spectrum of economic, social, cultural and environmental resources. It can also be thought of as the stewardship of the "record" of the many roles and activities of all who have come to Salt Lake City to invest in, and to build this culture and community over the last 170 or so years. This includes the many thousands of cultural and family networks, as well as all of the individual decisions which are manifest in the character of our older neighborhoods today.

Although the policies and goals of environmental sustainability are usually defined at the scale of the city, the region and beyond, they can only really be achieved at the micro level. Their realization will be through the many small decisions which have a cumulative positive effect on the conservation, wise use and generation of energy resources, and upon atmospheric quality. This community consciousness, at the point of individual choice and decision, really continues the traditions which are responsible for the City's attractive urban residential character today.

In a setting and a climate which bring their own distinct environmental issues and challenges, including temperature variation, air quality and water resources, it is essential that city and regional policy ensures that the stewardship of our historic architectural and cultural resources is a central part of policy goals and practice in environmental stewardship.

In turn, environmental stewardship depends upon our understanding of the environmental assets and advantages of traditional development patterns, neighborhoods and buildings. Equally, that we use this understanding to ensure that these assets are not lost to ill-considered, short-term expediency, and an unconsidered assumption that somehow "new" is always "better".

It is equally essential that new construction, whether a new building, a new addition or improvements to an existing building, make the most effective use of both traditional and contemporary wisdoms, technologies and best practices in reaching decisions on situation, construction, energy efficiency and its renewable generation.

A successful approach to ensuring a more sustainable and energy efficient form of development (including energy conservation and generation) in our existing older buildings and in new construction, will rely upon an understanding of four interrelated principles.

**Embodied energy and life cycle costs.**

This is the energy already invested in the construction of our current neighborhoods and buildings, and the costs associated with the construction or production of a building or component, its expected life span costs, including those costs associated with maintenance, repair and disposal.

**Passive energy and climate control characteristics and measures.**

These include building materials, thermal mass and insulation, room volumes, operable windows, natural ventilation, porchways, eaves and other forms of building shading .

**Active mechanical measures.**

Active measures include traditional ceiling fans, air conditioning and heating systems, heat exchangers and emerging smart technology to monitor and automatically calibrate use patterns, and to make adjustments for energy management and savings.

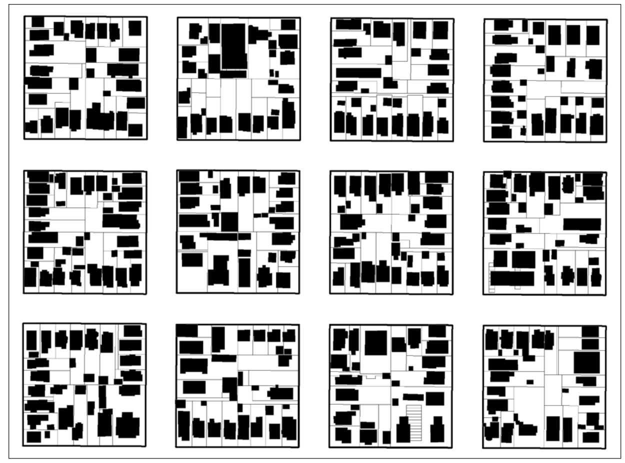
**Renewable sources of energy generation.**

These tap and harness the natural ressources we have, and include geothermal heat pumps, solar collector panels and cells, wind and water turbines, and arguably biomass heating.

Our recent focus on purchasing short-lived replacement building components which are marketed as 'energy efficient upgrades' has clouded or obscured our understanding of the inherent environmental advantages of our traditional buildings and their construction. Such knowledge was once much more universally understood and appreciated, and not just by designers and builders. A clear understanding of these characteristics and assets is however essential to achieving sensitive and sustainable solutions for both our existing buildings and new development.

## APPLICABILITY

**These design principles and guidelines on sustainable development practice are advisory only.** They provide guidance on the consideration of site works, the maintenance, repair and rehabilitation of our older buildings, and to the planning and development of a new addition or building, whether it be single or multifamily residential, mixed use, commercial or institutional.

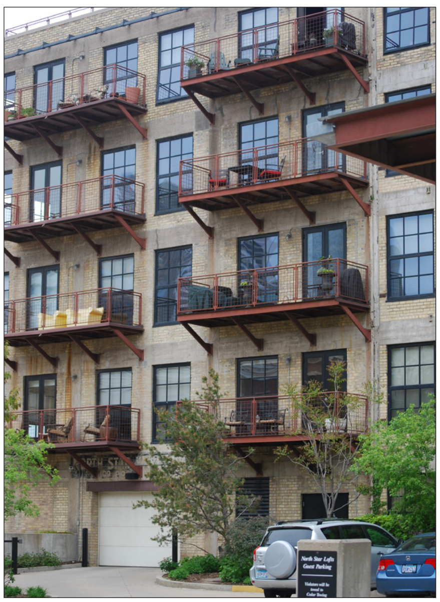


*The concentrated plan of small street blocks in the Avenues make it one of the most livable and desirable of city residential neighborhoods.*

*Mature tree cover and landscaping temper the urban temperature extremes with much needed shade, filter and renew air quality, while creating attractive street character.*

*The traditional characteristics of the thermal mass of solid materials, natural ventilation and the south-facing shade provided by a shared arrangement of balconies, combine to moderate the extremes of climate without mechanical means.*

*The past and current investment in a traditional neighborhood embodies many of the characteristics and principles of a sustainable form of development.*



*Adaptation of an early industrial building to new residential units reinvests in the original building, its history and the culture of the city.*

*Reused historic sandstone paving.*

## A DESIGN APPROACH IN SUSTAINABLE DEVELOPMENT

An approach to sustainable design for a building and for the community should:

- Evaluate the building and look at the neighborhood, its settlement and street pattern, its urban form, accessibility, walkability and livability.
- Understand the investment in the existing neighborhood, the site and building, economically, culturally, environmentally – in fact all definitions of energy investment.
- Understand the flexibility and adaptability of traditional building forms and fabric, and the advantages of their continuing use.
- Understand the structure, construction and materials, and the inherent climate control characteristics and dynamics of an older building.
- Gauge energy improvements and efficiency in the context of the original building, and not against the potential performance of a new building which would ignore the life cycle costs associated with demolition and new construction.

## EMBODIED ENERGY & LIFE CYCLE COSTS

Two principal measures of sustainable development, on which our existing historic development patterns and building stock score highly, are "embodied energy" and "life cycle costs".

### Embodied Energy

Embodied Energy can be defined as the sum total of the energy invested in the initial construction and subsequent investment in the building to date, and encompasses many facets. Embodied Energy Investment will include:

- The initial subdivision design and layout.
- The associated site grading and preparation.
- The sourcing, cutting, grading, moulding, firing and preparation or manufacture of the construction materials.
- Their transport to site.
- The construction of the building including the time, skills and labor involved.
- Subsequent building improvements and additions, and
- Periodic maintenance and/or repairs.

With the demolition of the building the embodied energy is lost.

### Life Cycle Cost

Life Cycle Cost and cost analysis in this context is an analytical measure of the initial and subsequent costs of acquiring and operating a building across its life span. Our more historic buildings score highly in various respects in such an analysis, largely due to characteristics such as:

- The quality and durability of initial construction, materials and craftsmanship,
- The fact that older buildings can be readily maintained and repaired at low cost,
- That they are not constructed from limited life-span component parts, which have to be replaced in their entirety at notable cost when they fail, and
- The inherent advantages of older building fabric, in terms of its adaptability and its energy efficiency, especially when these advantages are supplemented by informed upgrades.

Given their durability, longevity and low maintenance costs, the life cycle cost of traditional materials will be very low when set against the energy savings achieved by replacement components and materials, which in most cases have a built-in obsolescence factor and limited life span.

Cost would include the initial construction, its component elements and fitting out of the building, in terms of raw and finished materials, their associated waste products and pollution. The durability and longevity, the potential life span, of an older building, will be determined by the periodic attention and maintenance it receives, coupled with usually minor repairs assuming it has not been neglected. It will not be determined by the failure of various manufactured components, at much greater replacement cost. Maintenance costs will be very low if the building is monitored periodically.

Disposal of the building, or components of the building, with either full or partial demolition, also comes with significant costs. These include the negative impacts of demolition waste, land fill requirements and the associated and sometimes highly toxic pollution arising from various methods of disposal.

By contrast, an older building, of traditional and robust construction, does not have a life span determined by the designed operational life of its components, nor the inflexibility of its design and construction methods, but, alternatively, by the understanding and informed periodic minor care it receives, usually at minimal cost.

*Recent multifamily construction which includes a variety of sustainable characteristics as well as sensitive context design.*

*The architectural character of the building incorporates a variety of traditional design characteristics such as external porch, deep eaves, natural ventilation and solid masonry construction, ensuring efficient energy management and conservation.*

## ENERGY CONSERVATION & EFFICIENCY

Energy conservation and energy efficiency characteristics in an older building derive in major part from what can be described as the passive climate control advantages of traditional layout and construction. Plan layout, inherent insulation values of wall mass, interior volumes, natural ventilation, shade characteristics and materials are all components. At the basic level, buildings provide shelter from the extremes of heat, cold, rain and wind, and ideally beyond that, a comfortable working or living environment, including adequate insulation and ventilation.

Buildings also account for the majority of our energy consumption. Energy use and efficiency are consequently significant concerns, whether measured in day to day running costs, or the costs to the global environment. Life cycle cost becomes a major factor in this consideration.

Traditional construction, design and materials rely upon a time-honored understanding and techniques of interior and exterior shelter and climate management and control. Building shelter and shade are directly influenced by orientation, mature tree cover and landscape, and are also afforded by porches, stoops, eaves and window reveals. Roof forms and building massing also have a role to play.

Traditional contruction materials, such as masonry, have a thermal mass which absorbs heat and cold slowly, and have a regulating, moderating and 'capture' effect on temperature extremes. Unless allowed to deteriorate, masonry is also very effective at dealing with rain and frost, continually absorbing and allowing the evaporation of degrees of moisture in the form of rain, snow and ground water.

Traditional wood, whether used as a cladding material, building structure or for sections of a masonry building, e.g. porches, windows, doors, fascia and eaves, is usually from old growth trees and milled to appropriate dimensions. With its tighter grain, it is a denser, tougher and more resilient material than the recently harvested wood currently available.

Interior room volumes and operable windows jointly play a notable role in interior climate control, natural ventilation and comfort, as well as ensuring a healthy circulation of fresh air. Coupled with low key mechanical intervention, such as ceiling fans, these assets can be employed to their maximum.

Understanding how these characteristics and dynamics are designed to work will ensure that energy efficiency enhancement strategies are designed to be complementary, capitalizing on these advantages, while accentuating their attributes and efficiency.

*Historic wood windows, enhanced with a traditional design of external storm window, will generally outlast and outperfom a replacement window.*

## RENEWABLE ENERGY – PASSIVE & ACTIVE

Renewable energy generation is a component of sustainable development which does not deplete natural resources or cause pollution in generating energy. Renewable energy sources can be both passive and active. While they are harnessed to provide large scale industrial and community energy, they also have a role to play at the more intimate scale of the individual building and in the form of development.

### Passive Energy Management

Passive energy measures play a significant role in climate control, and can be as simple as heat absorbing materials, such as masonry, which absorb heat during a warmer day, releasing it through the cooler night. The effect works equally well providing a cooling effect in hot weather. The high density, temperature-capture and storage properties of masonry help to moderate extremes of heat and cold, and act as a passive energy source.

Window glass transfers both heat and cold, and can be a very effective source of interior solar heat gain in cold weather, reducing the burden on other mechanical systems. Operable windows also have passive energy generating and control characteristics in providing air circulation and ventilation. The double-hung sliding sash window in particular is designed to pull in cooler air below as it affords escape for warmer air above.

In a hot summer climate, shading a building to reduce solar gain will be critical. This can be achieved through situation, orientation, balconies or porches, fenestration and architectural shade elements. It can also be achieved using planting and tree cover, where mature deciduous trees in particular provide the benefit of effective summer shading with reduced shade to permit greater solar gain in the colder winter months.

## Active Renewable Energy Generation

Active renewable energy generation systems have been much studied, and have made significant technological strides in recent years.

**Geothermal** sources are perhaps the lower end of the technological spectrum. Circulating liquid at a specific depth below the ground surface can tap the constant temperature of the ground, both for residual heat and a residual cooling effect. Using heat exchangers, this type of system can notably reduce the burden on or need for heating and cooling systems.

The concept behind **biomass** energy is that heat is created by the combustion of a fuel source which can be continually grown, or produced as waste, and although requiring more attention, it is also more immediately deployable when required.

**Wind and water turbines** have a long-standing historical pedigree, providing a source of power at both a small and a large scale. Smaller turbine units have been developed to deliver greater efficiency than their historic counterparts, and at a scale which can be deployed for an individual building, site or narrow water channel.

**Solar collectors** are either thermal, where the sun directly heats water in a closed grid, or photovoltaic, where the energy from the sun is converted to electricity through a series of chemical cells. Solar collectors for urban building use are usually in the form of panels, although becoming increasingly available in the form of smaller units, solar laminates and roofing shingles.

*Small scale solar panels and their adaptability.*


*Solar collector panels are becoming increasingly affordable and are being developed in a variety of forms and scales, as with this installation on a traditional apartment buillding.*

## EXISTING BUILDINGS AND NEIGHBORHOODS

It is essential to understand your building and its situation, in terms of local and regional climate and micro-climate, and established urban settlement patterns. Knowing the dynamics of traditional construction and materials, their advantages and response to exposure and seasonal conditions, will ensure that the building will endure, and furnish shelter, comfort and a healthy living environment. Energy efficient aspects of the original building, its site and current setting should be retained and if necessary enhanced.

### URBAN FORM

The urban form of our historic and traditional neighborhoods is a critical component in the sustainable development of the city. The combination of a tighter urban grain (buildings and streets), complex hierarchy of the street and access patterns, concentration and proximity of residential and commercial buildings to each other and to the central core of the city (reduced energy and cost in travel), access to public transit and a choice of options for walking and cycling, mature tree cover and landscaping, combine to create an attractive, mature and durable form and character, encompassing most of the prerequisites for a sustainable form of development. The care taken with their layout, design and construction, coupled with the seasoned maturity of these neighborhoods, should help to ensure they continue as the most livable of city locations.

### Street Pattern and Settlement Pattern

**S.1 Maintain and design to compliment the current and historic street pattern and settlement pattern. These elements include:**

- Streets, lanes, alleys, squares.
- Sidewalks, footpaths, trails.
- Lot density, arrangement, size & configuration.
- Access points to streets, alleys, trails and open space.

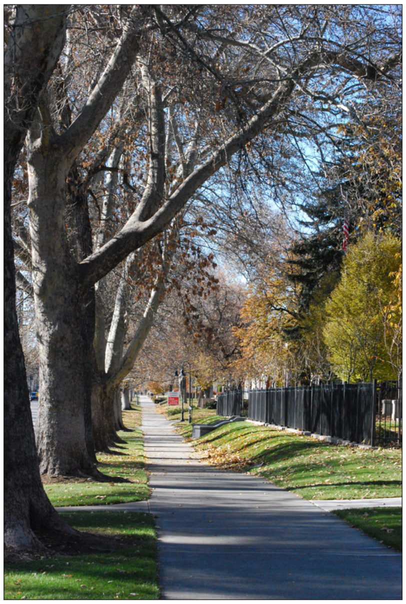
**S.2 Create or enhance access points wherever possible.**

### Building Orientation, Situation and Proximity

**Understand and plan to maximize energy efficiency in building orientation, situation and proximity in maintenance, repairs, alterations and additions, and in the siting and design of a new building. In the context of local topography consider the following:**

- Solar and wind exposure.
- Rain and frost exposure.
- Seasonal variations and extremes.
- Prevailing solar and wind exposure.

*Urban form here reflects proximity to the Downtown with a sequence of historic apartment buildings providing good urban density, livability and varied architectural interest and character.*



*The characteristics of mature deciduous tree cover help to moderate the extremes of the seasons, while enhancing atmospheric quality.*

*The city's historic parkways and park strips combine mature neighborhood landscape, open space and identity, with an attractive, walkable character.*


*The landscaping of this historic garden apartment development combines cultural and environmental, sustainable development characteristics with a unique residential atmosphere.*

## Landscape, Ground Cover and Trees

**S.3 Retain mature landscape, including ground cover planting and trees. Consider the following:**

- Aspect and shelter.
- Proximity to the structure.
- Seasonal variations - weather and micro-climate.
- Plan maintenance and new planting with an understanding of their seasonal role and performance in providing shelter, shade and solar access, as well as decorative impact.

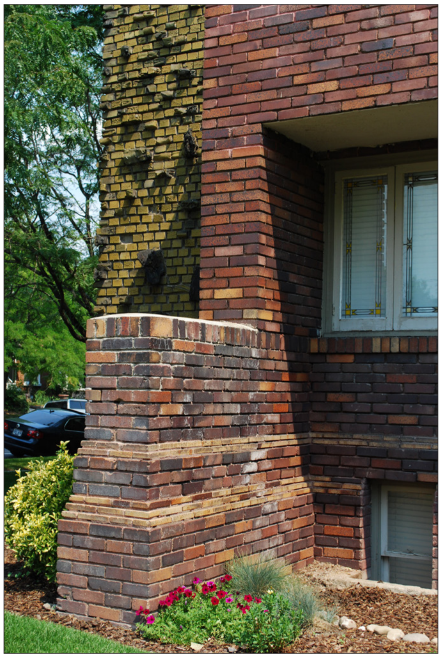
**S.4 Consider the design of new landscaping to manage, conserve and reuse water, and to recharge ground water. Consider the following:**

- Grading and landscaping to collect water and to disperse the flow.
- Collection of rainfall for irrigation use, using bio-swales, rain gardens, water barrels, etc.
- Select new native planting to conserve water and reduced irrigation requirements.
- Minimizing impermeable hard surfaces.
- There may be State regulations on the harvesting and use of rainwater.

## Site Planning

**S.5 Minimize site work that would adversely affect mature trees or disrupt mature layout and planting on this or adjacent sites.**

- Retain historic or early site features and accessory structures.
- Maintain shading and shelter of the building and parking areas.
- Plan improvements to enhance shade and/or shelter as appropriate to complement climate control.



## TRADITIONAL BUILDING FORM & CONSTRUCTION

Knowledge and appreciation of the characteristics and performance of original building materials, details and craftsmanship in building maintenance, repairs and alterations will simultaneously achieve preservation, conservation and sustainability objectives. Older buildings, designed and constructed with integral advantages in passive internal climate control, have distinct characteristics which are inherently sustainable. Understanding these characteristics and dynamics makes sound scientific sense and this understanding is a prerequisite of maximizing energy conservation and efficiency.

*Historic masonry and recessed windows here combine natural materials, thermal mass and shade with natural ventilation to enhance energy conservation, management and efficiency, while creating some of the best examples of the city's historic architectural character.*

*Solid masonry, projecting eaves and natural ventilation with original windows combine with other sustainable characteristics.*

*Projecting eaves provide protection from precipitation and solar exposure.*


*An exterior storm door revealing the detailing of the original behind.*

*A decorative choice and use of materials, detailing and textures combines thermal mass with low maintenance.*

A further point on historic character is that original and early materials have a patina of age and maturity which does not compromise their integrity or performance. It adds immensely to the historic character of an older building and neighborhood. It is a characteristic defining time, history and maturity that should be retained.

## Historic and Traditional Materials

**S.6 Retain historic and traditional materials for their durability, low maintenance requirements and character-defining properties.**

**S.7 Plan for a periodic maintenance review and attend to potential issues, including the following:**

- Identify and resolve any causes or issues of potential water damage.
- Caulk or fill any open joints and cracks.
- Repaint or repair woodwork rather than replace it.
- Repoint masonry with a compatible mortar to maintain the integrity of the component or the facade.

**S.8 Ensure any external materials are allowed to breath.**

- Avoid sealing in moisture by over-cladding with new materials.
- Do not paint masonry which has not been painted and avoid sealants in most circumstances.
- Consider paint removal from masonry if it can be achieved with the necessary care to avoid damaging the masonry.

**S.9 Retain the historic character and appearance of original materials and finishes, and repair or replace only where necessary.**

- Historic character includes a 'patina of age.'
- Mature historic materials do not need to look new.
- Most masonry cleaning is unnecessary, and can permanently damage historic materials if not handled with great expertise.

## Windows and Doors

Understand the energy efficient and sustainable characteristics and advantages of older windows and historic doors. They are inherently maintainable and repairable, while their capacity to outlast replacement windows and doors is echoed by their capacity to match them in energy management terms. With minimal maintenance, restoration or repair they can last as long as the building itself.

Inexpensive weatherization, such as caulking and weatherstripping, coupled with an interior or exterior storm window or door, should ensure that they approach or match replacements in energy and acoustic efficiency. Furthermore, they will not need to be replaced again when they fail, in total or in part. Where they no longer open as they were designed to do, they can be readily repaired at minimal cost to restore their role in providing natural ventilation and internal climate control. Refer to the Additional Information section at the end of this chapter for further data.

**MAINTAIN**

**S.10 Maintain and retain the materials, craftsmanship, glass and hardware of original or early windows.**

- Consider the orientation of windows and doors in relation to wind, shade or solar gain.
- South and west facades are the most exposed to solar ultra-violet light and prevailing winds and rain.
- Replace cracked or loose putty/glazing compound, and repaint before moisture gradually damages the framework.
- Retain and maintain opening windows and their hardware.

**REPAIR**

**S.11 Repair to restore the integrity of an original or early window frame.**

- Retain as much of the original frame as possible, since this is likely to be very durable material.
- Only replace materials or parts which are beyond repair, reducing associated cost at the same time.
- Repair where required to ensure the windows can assist with internal climate control and provide natural ventilation.

*External storm windows combined with the original windows can outperform replacements in acoustic and energy terms.*

UPGRADE

**S.12 Retain and upgrade the energy and acoustic perfomance of an early or original window using a related series of measures.**

- Weatherstrip to reduce air infiltration and eliminate drafts around the framework.
- Caulk also around the sub-frame jambs and trim to eliminate drafts.
- Consider the addition of storm windows or doors on the interior or exterior to enhance thermal and also acoustic performance.
- Consider the use of a solar film applied to window glass or storm window glass.
- Where original glass is missing, consider low-e replacement glass, which can often be achieved without a notable change in tint, color or reflection.

*Rehabilitation of the building here involved retaining, repairing and upgrading the original steel framed windows.*

**S.13 In most cases, avoid using sealed double-paned replacement glass in an original wood window frame.**

- The original frame and hardware will usually be unable to carry in excess of double the weight of the original glass, consequently damaging the framework.
- Evaluate slim profile double-pane units if the frame is sufficiently durable.
- A sealed double-pane glass unit has a life limited to the integrity of the seal, and will 'fog' with condensation when this fails.
- The inert gas between the two panes has a high embodied energy impact.
- Consider using an external or internal storm window, since this can match or exceed the energy and acoustic performance of a replacement, with no prelimited life span.

**S.14 Consider the internal shade and insulation advantages of curtains, blinds and shutters.**

- Prioritize importance in relation to the most exposed faces of the building.

## Elements of Shading - Porches, Stoops, Eaves, Window Reveals, Window and Door Canopies

**S.15 Retain shade elements, or repair or reinstate where appropriate.**

- Retain the original materials, craftsmanship and details.
- Review and consider their reinstatement where previously lost, prioritizing to address the facades with the greatest exposure.
- Consider the addition of external canopies to enhance window shading.

## ENERGY CONSERVATION

Most historic buildings have distinct energy efficient characteristics. Evaluate priorities for energy upgrades with these advantages informing the program of work. Similarly, work with the historic and architectural character of the building, site and setting when arriving at decisions on investing in renewable forms of energy generation.

### INSULATE

**S.16 Install or upgrade insulation.**

- The attic, basement and crawl space are the priorities to reduce loss of heat.

**S.17 Original or early windows and doors should be retained, maintained, and where necessary repaired.**

- Weatherstrip and insulate, using storm windows/doors, solar film, curtains and blinds.

**S.18 With mature landscaping, retain and maintain trees, shrubs, ground cover and enhance where appropriate.**

- In paved areas, maximize natural ground cover to absorb and retain water for subsequent use, and to avoid excess run off.

**S.19 Plan new landscaping to enhance mutually beneficial solar relationship, provide shelter from wind exposure, and capitalize on rainwater, snow management, and water reuse.**

## ENERGY GENERATION - RENEWABLE SOURCES

Similarly, work with the historic and architectural character of the building, site and setting when arriving at decisions on investing in renewable forms of energy generation.

**S.20 Avoid adverse impact on the historic character of the building, site or setting while choosing a site.**

**S.21 Consider the use of solar thermal panels.**

**S.22 Consider options and configurations of geothermal heat source in relation to ground conditions and site constraints.**

**S.23 Consider wind (and water) turbines, which increasingly are small enough to be both versatile and unobtrusive.**

**S.24 Consider the use of solar photovoltaic panelling.**

- These are now available as panels of differing sizes, solar laminates and shingles, and are adaptable to a variety of circumstances.
- With a roof mounted location choose a situation which will maximize energy generation without adverse visual impact upon architectural character.
- Consider solar panel location on accessory buildings or in free standing arrays where they would adversely affect the character of the building.
- Avoid a situation which would prompt the removal of mature tree cover or vegetation, with their environmental advantages.
- Consider the impact of reflection upon neighboring buildings and streets.
- Consider options and configurations of a geothermal heat source in relation to ground conditions and site constraints.

*Traditional methods of providing solar shading remain just as effective today.*

*Drive strips or wheel strips are a historic solution to the contemporary issue of reducing impervious surface and runoff.*


*A new house in the Avenues historic district designed to respect its historic setting and to be the first certified "passive house" in Salt Lake City.*

## NEW CONSTRUCTION

Existing residential neighborhoods and buildings in the city have distinct advantages in the forms of sustainable development they provide. Site planning and building design for new construction can learn much from these traditions and patterns of development. More recent research and practice in assembling a more thorough and integrated approach to sustainable development can build on these.

Salt Lake City also has a strong tradition of apartment living. Apartment buildings from the later nineteenth and earlier twentieth centuries provide some of the most characteristic and impressive historic architecture in the city.

Today, they provide a type of housing that immediately achieves a sustainable urban density. Plan form, structure, materials, balconies and operable windows are inherently sustainable characteristics of these buildings. Many of these advantages should inform what we build today if we are to continue this tradition in the interests of the economically and environmentally sustainable development of the city.

These design guidelines advise on a number of matters which should help to enhance an integrated consideration of best sustainable development practice in a historic setting.

## SETTLEMENT PATTERN AND SITUATION

**S.25 Reuse the existing building, or parts of it, wherever possible.**

- Retain and repurpose the original building and/or materials.
- Recycle materials, deconstructing the original as necessary.

**S.26 Plan for regional and local climate and associated weather patterns, to moderate and capitalize upon these characteristics.**

- Identify prevailing wind and solar impact, and design to maximize advantages, yet minimize extreme exposure.
- Orient and design to maximize shelter, shade, seasonal solar gain and sheltered external space (both common and private).

**S.27 Plan for easy access to public transit, walking and cycling.**

- Retain or create rear alley, lane or secondary street space, both public and private.
- Plan for direct access to streets and trails.
- Retain or create rear and side access points.

**S.28 Plan and design for a variety of private and common/public spaces.**

- Provide versatile and flexible arrangements for both shade and solar access.

## SITE PLANNING

**S.29 Retain and reuse historic or original site features and materials.**

**S.30 Deconstruct and repurpose these wherever possible, if they cannot be retained and reused.**

**S.31 Work closely with the existing topography, maximising landscaped open space across the site.**

## SITE LAYOUT AND ACCESS

**S.32 Design primarily for pedestrian and bicycle use and access.**

- Minimize hard impervious paving.
- Maximize landscaping and permeable paving.

**S.33 Minimize vehicular hard paved drive area and parking surface.**

- Grade for sheet flow and dispersal of water to adjacent landscaped spaces.
- Place parking underground and minimize open parking areas.
- Use water-permeable paving.

**S.34 Plan for a variety of public and private spaces which are landscaped, shaded and sheltered, and common gardening space where possible.**

**S.35 Plan and landscape for efficient water management and conservation.**

- Consider all surfaces across the site, including those of the building/s.

**S.36 Design and configure surface parking for shade and renewable energy generation. Where surface parking is unavoidable:**

- Design any surface parking as a shaded landscaped amenity for the residents and immediate context.
- Design solar arrays to provide shade for exposed surface parking bays.

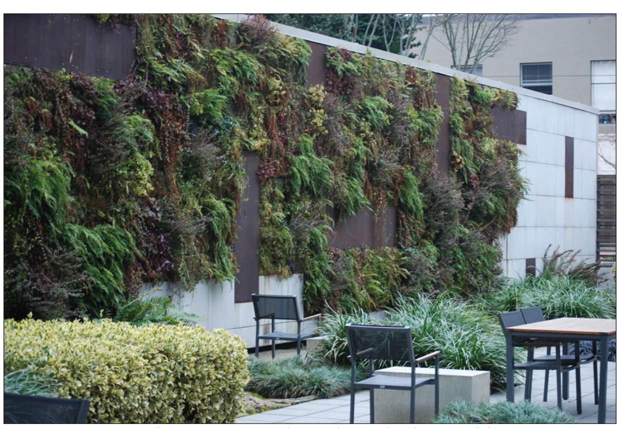
## LANDSCAPE AND PLANTING

**S.37 Retain mature landscape and trees, and configure building siting, layout, design and grading accordingly.**

**S.38 Plant new street trees in the public right of way where these are missing.**

**S.39 Plant new trees across the site.**

- Choose species and situate to maximize seasonal shade in hot weather and solar gain in cold weather.



*Greening an urban courtyard need not be limited by site area or to ground level landscaping.*

**S.40 Maximize landscaped areas while minimizing utility areas.**

- Where appropriate consider the roof areas of the building as part of the site landscaping, and energy and water management strategy.
- Design landscaping and planting with a view to tempering excess heat or cold.
- Design and choose plant varieties to allow for solar gain and ventilation.
- Design building footprint and landscaping to manage water in dispersed areas across the site, including swales and rain gardens.
- Choose indigenous plant species to maximize water conservation, and consider aspect and climatic extremes.
- Plan for communal/shared garden space/s.

## LIGHTING

**S.42 Minimize the need for external artificial lighting, while accounting for safety and a sense of security.**

- Avoid sources of light pollution.
- Design and site external lighting to avoid light spill and glare.
- Consider the use of solar powered lighting wherever possible.
- Use low energy light sources where possible.

## BUILDING DESIGN

**S.43 Design the building to maximize passive energy management. Consider the following:**

- Design the fenestration to take advantage of building aspect.
- Design to take advantage of the shading provided by aspect, window reveals, recessed entrances, canopies and awnings.

**S.44 Design windows to open for natural ventilation, interior atmosphere and a healthy living and working environment.**

- Avoid window construction with a high inherent obsolescence record in the extremes of the Utah climate.

**S.45 Design to provide the shade afforded by the articulation of building facades and the depth of the eaves.**

**S.46 Design for variable massing to create upper terrace outdoor spaces and landscaped areas.**

**S.47 Provide porch and stoop semi-public/private shaded spaces for their climatic moderating advantages.**

**S.48 Plan for external balcony space for each unit.**

**S.49 Wherever feasible provide green roof cover to enhance temperature and water management, and ecological diversity.**

- Investigate roof type and potential maximum loadings to check suitability.
- Design as part of a landscaped roofscape amenity.

**S.50 Design for adaptability and flexibility in future layout and use.**

- Learn from the adaptability of older buildings.
- Anticipate the future reuse of the building in the form and construction of the interior.

**S.51 Design to reduce indoor water use.**

- Make use of captured outdoor water where practicable.

**S.52 Consider color schemes with solar reflectivity as well as urban setting in mind.**

**S.53 Design with sustainable and durable materials.**

- Evaluate the energy management advantages of the thermal mass of denser more durable materials.
- Choose materials for their stability and low emissivity characteristics.
- Avoid experimental or synthetic materials which have no track record of durability.
- Avoid experimental or synthetic materials which produce pollution or toxic waste in their manufacture or disposal, or create environmental damage or disfiguration in their extraction.

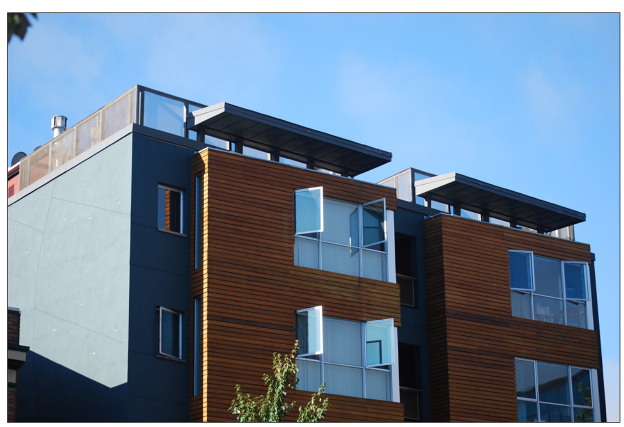
*Recent multifamily design composed with varied volumes and massing, private and communal open space, and constructed using solid, durable materials.*

*Durable materials frame and support the shade and shelter provided by both deep window reveals and fixed canopies for the sidewalk use and and street level retail.*

*Contemporary multifamily development affording shaded private balcony space and first floor level windows.*

**S.54 Plan and design for renewable energy generation, including solar, geothermal, wind/ water as appropriate for the building, the site and its setting.**

- Consider what options will best suit building and situation.
- Minimize visual impact from the street and from adjacent buildings.
- Consider siting on and off the building.
- Design as part of the roof layout and landscaping.
- Consider the use of solar shingles and solar laminates, as well as solar panels for different roof configurations.



*Recent apartment design creatively using traditional materials, resident open space and natural ventilation.*

## Additional Information

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