



# SUPPLEMENTAL

## Memorandum

**TO:** HONORABLE MAYOR  
AND CITY COUNCIL

**FROM:** Joseph Horwedel

**SUBJECT:** SEE BELOW

**DATE:** June 11, 2009

Approved

Date

6/12/09

**COUNCIL DISTRICT:** City-Wide  
**SNI AREA:** N/A

### S U P P L E M E N T A L M E M O

#### SUBJECT

**GREEN BUILDING ORDINANCE FOR NEW PRIVATE SECTOR CONSTRUCTION**

#### REASON FOR SUPPLEMENTAL

This memorandum accompanies an updated version of the Draft Green Building Ordinance for New Private Sector Construction and the final Energy Cost Effectiveness Study which were originally provided to the Transportation and Environment Committee at the meeting on June 1, 2009.

Staff considers the revisions to be minor, and the most substantive changes include:

Draft Green Building Ordinance:

- Added provisions for projects funded by the San Jose Housing Department to be exempted from payment of the refundable green building deposit for any square footage associated with affordable housing units and instead have compliance guaranteed by the Department of Housing;
- Removed the distinction between tract residential and custom residential development that have the same green building requirements; staff determined that any special circumstances required for custom developments can be better dealt with in implementation guidelines;
- Removed the establishment of the amount of the green building deposit rate, which has been instead included in a separate fee resolution encompassing all other fees charged by the Department of Planning, Building, and Code Enforcement; and

HONORABLE MAYOR AND CITY COUNCIL

June 11, 2009

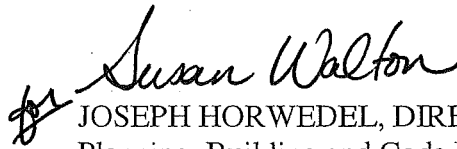
**Subject:** Green Building Ordinance for New Private Sector Construction

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- Created a section that authorizes the Director of Planning to promulgate implementation regulations and policies.

Energy Cost Effectiveness Study:

- Revised the energy efficiency criteria assumed to be equivalent to LEED certification from 10% to 15% better than the 2008 Title 24 California Efficiency Standards, which was done to align with direction from the California Energy Commission provided to another city which is also adopting green building standards.



JOSEPH HORWEDEL, DIRECTOR  
Planning, Building and Code Enforcement

For questions please contact Richard Buikema, Senior Planner, at 408-535-7835.

Attachments

ORDINANCE NO. \_\_\_\_\_

**ORDINANCE OF THE CITY COUNCIL OF THE CITY OF SAN JOSÉ AMENDING TITLE 17 OF THE SAN JOSÉ MUNICIPAL CODE TO ADD A NEW CHAPTER 17.84 TO ESTABLISH GREEN BUILDING REGULATIONS FOR PRIVATE DEVELOPMENT**

WHEREAS, in 2001, the City Council of the City of San José first adopted a Green Building Policy (Policy No. 8-13), and in March 2007, City Council amended the Green Building Policy to mandate that City and Agency facilities over 10,000 square feet attain a LEED Silver certification through the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) program, and to encourage green building in the private sector; and

WHEREAS, on October 30, 2007, City Council adopted San José's Green Vision, establishing 10 bold goals for the City that serve as a roadmap for reducing the carbon footprint of the City of San José by more than half. Green Vision Goal No. 4 specifically states that over the next 15 years, 50 million square feet of buildings built or retrofitted in the City shall be "green". The City estimates that approximately 2 million square feet of municipal buildings will be certified green buildings by 2022; and

WHEREAS, in April 2008, City Council adopted recommendations from the Santa Clara County Cities Association to recognize Build It Green's (BIG) GreenPoint Rated (GPR) and USGBC's LEED green building rating systems as reference standards for new residential and non-residential construction, and to incorporate the use of a green building checklist for planning applications. City Council adopted these recommendations in order to promote regional consistency, raise awareness of green building practices, and to make progress on Green Vision Goal No. 4; and

WHEREAS, the provisions of California Assembly Bill 32 (Global Warming Solutions Act) require actions on the part of State and local governments to significantly reduce greenhouse gas (GHG) emissions such that statewide GHG emissions in 2020 are lowered to 1990 levels; and

WHEREAS, in recent years, green building design, construction and operational techniques have become increasingly widespread. Many homeowners, businesses and building professionals have voluntarily sought to incorporate green building techniques into their projects. A number of local and national systems have been developed to serve as guides to green building practices. The U.S. Green Building Council, developer of the Leadership in Energy and Environmental Design (LEED™) Green Building Rating Systems and LEED™ Reference Guide, has become a leader in promoting and guiding green building. Also, the New Homes Green Points Calculator and the Multifamily Green Points Project Tool published by Build It Green are useful documents in evaluating residential green building projects; and

WHEREAS, on September 10, 2008, the Planning Commission held a duly noticed public hearing and heard testimony regarding a green building ordinance, and recommended adoption of the green building ordinance to the City Council; and

WHEREAS, on October 7, 2008, the City Council adopted Resolution No. 74624 establishing Council Policy No. 6-32, *Private Sector Green Building Policy*, and directed staff to draft an ordinance amending the San Jose Municipal Code to establish mandatory green building standards for private development; and

WHEREAS, on June 23, 2009, the City Council held a duly noticed public hearing and heard testimony regarding the proposed green building ordinance

WHEREAS, nothing in this ordinance is intended to duplicate, contradict, or enter a field which has been fully occupied by state law, including the California Building Standards Code; and

**NOW, THEREFORE, BE IT ORDAINED BY THE COUNCIL OF THE CITY OF SAN JOSÉ:**

A new Chapter 17.84 (Green Building Regulations for Private Development) of Title 17 (Building and Construction) of the San José Municipal Code is hereby added to read as follows:

**Chapter 17.84  
GREEN BUILDING REGULATIONS  
FOR PRIVATE DEVELOPMENT**

**Part 1  
Findings and Purpose**

**17.84.010 Purpose**

This Chapter is intended to enhance the public health, safety and welfare of San José residents, workers, and visitors by fostering practices in the design, construction, and maintenance of buildings that will minimize the use and waste of energy, water and other resources in the City of San Jose. The green building standards required by this Chapter are intended to advance greenhouse gas reduction and other sustainability strategies outlined in the City's Green Vision. Green building reduces per capita energy use, provides energy from renewable sources, diverts waste from landfills, uses less water and encourages the use of recycled wastewater. Green building also encourages buildings to be located close to public transportation and services and provide amenities that encourage walking and bicycling and therefore offer further potential to achieve a healthy, environmentally sustainable city.

### **17.84.020 Findings**

The City Council finds that:

- a. According to the U.S. Department of Energy's Center for Sustainable Development, buildings consume 40% of the world's total energy, 25% of its wood harvest and 16% of its water. The building industry is the nation's largest manufacturing activity, representing more than 50% of the nation's wealth and 13% of its Gross Domestic Product. Energy and material consumption in buildings can contribute significantly to global climate change.
- b. Green building design, construction, and operation can have a significant positive effect on energy and resource efficiency, waste and pollution generation, and the health of a building's occupants over the life of the building. Green building benefits are spread throughout the systems and features of the building. Green buildings may use recycled-content building materials, consume less energy and water, have better indoor air quality, and use less wood fiber than conventional buildings. Construction waste is often recycled and remanufactured into other building products.
- c. The City Environmental Services Department estimates that construction and demolition debris comprises up to 15% of materials from San José disposed in Santa Clara County landfills, and opportunities exist for reducing the generation of this waste.
- d. In recent years, green building design, construction and operational techniques have become increasingly widespread. Many homeowners, businesses, and building professionals have voluntarily sought to incorporate green building techniques into their projects. A number of local and national systems have been developed to serve as guides to green building practices. At the national level, the U.S. Green Building Council, developer of the Leadership in Energy and Environmental Design (LEED™) Commercial Green Building Rating System and LEED™ Reference Guide, has become a leader in promoting and guiding green building. Build It Green, developer of the GreenPoint Rated program, serves a similar function in California.
- e. Requiring certain commercial, residential and City-sponsored projects to incorporate LEED™ green building measures or meet GreenPoint Rating thresholds is necessary and appropriate to achieve the benefits of green building.
- f. California Health and Safety Code Sections 18938 and 17958 provide that the California Building Standards Code establish building standards for all occupancies throughout the state.
- g. California Health and Safety Code Section 18941.5 provide that the City may establish more restrictive building standards if they are reasonably necessary due to local climatic, geological or topographical conditions.

- h. Because the design, restoration, construction, and maintenance of buildings and structures within the City can have a significant impact on the City's environment, greenhouse gas emissions, resource usage, energy efficiency, waste management and the health and productivity of residents, workers and visitors over the life of the building, requiring commercial and residential projects to incorporate green building measures is necessary and appropriate to achieve the public health and welfare benefits of green building.
- i. The provisions of California Assembly Bill 32 (Global Warming Solutions Act) require actions on the part of State and local governments to significantly reduce greenhouse gas (GHG) emissions such that statewide GHG emissions are lowered to 1990 levels in 2020 and 80% below 1990 levels in 2050.
- j. Local government, by itself, cannot fully address all of the challenges posed by climate change and comply with the mandates of AB 32.
- k. Energy efficiency is a key component in reducing GHG emissions, and construction of more energy efficient buildings can help San Jose reduce its share of the GHG emissions that contribute to climate change.
- l. On October 7, 2008, the City Council adopted a policy establishing minimum green building standards for new construction in private residential and nonresidential development projects, Policy No. 6-32.
- m. In February 2009 the City hired Gabel Associates, LLC, an expert in the field of building analysis and Energy Code compliance, to assist the City in preparing a study and proposal for local amendments to the 2008 California Energy Code, and said study demonstrated the cost effectiveness of these local amendments.
- n. The study conducted by Gabel Associates, LLC has concluded that the energy efficiency measures contained in this Ordinance are cost-effective. The City Council hereby adopts the conclusions of the study and authorizes its inclusion in an application for consideration by the California Energy Commission in compliance with Public Resources Code 25402.1(h) (2).
- o. The City will include the Gabel Associates study in an application for consideration by the California Energy Commission in compliance with Public Resources Code 25402.1(h) (2).
- p. Reduction of total and peak energy use as a result of incremental energy efficiency measures required by this Ordinance will have local and regional benefits in the cost-effective reduction of energy costs for building owners, additional available system energy capacity, and a reduction in greenhouse gas emissions.

## **Part 2 Definitions**

### **17.84.100 Definitions**

The definitions set forth in this Part shall govern the application and interpretation of this Chapter.

### **17.84.101 Application**

Application means any application to the Planning Division of the City's Department of Planning, Building and Code Enforcement for a Development Permit.

### **17.84.102 Building**

Building means any structure used for support or shelter of any use or occupancy, as defined in the California Building Standards Code.

### **17.84.103 City**

City means the City of San José.

### **17.84.104 Commercial/Industrial Building**

Commercial/Industrial Building means all non-residential construction including construction of retail space, office space, and other commercial uses, regardless of the zoning scheme at the project's location.

### **17.84.105 Development Permit**

Development Permit has the same meaning as the definition in Section 20.200.270 of Title 20 of this Code.

### **17.84.106 Director**

Director means the Director of Planning or his or her designee.

### **17.84.107 GreenPoint Rated Rating System, GreenPoint Rated and GreenPoint Rated Checklist**

GreenPoint Rated Rating System, GreenPoint Rated and GreenPoint Rated Checklist refers to the third-party verification system for the green building measures established by the non-profit organization Build It Green that are referenced in their Green Building Guidelines.

**17.84.108 Gross Floor Area**

Gross Floor Area means the total enclosed area of all floors of a building measured to the inside face of the exterior walls including halls, stairways, elevator shafts at each floor level, service and mechanical equipment and mechanical equipment rooms and basement or attic areas having a height of more than seven feet, but excluding area used exclusively for vehicle parking or loading.

**17.84.109 High Rise Building**

High-Rise Building means a building that is a minimum of 75 feet in height.

**17.84.110 High Rise Residential Project**

High-Rise Residential Project means a High Rise building used primarily for residential purposes.

**17.84.111 Housing Department In-lieu Guarantee**

Housing Department In-Lieu Guarantee means a certificate issued by the Director of Housing guaranteeing that the Housing Department will pay the Green Building Deposit Fee on the square footage of the building constructed as affordable housing uses in the event the Project does not achieve the minimum Green Building Compliance Requirements

**17.84.112 Large Commercial/Industrial Building**

Large Commercial Building means a non-residential building having a gross floor area of twenty-five thousand (25,000) square feet or more and is not a high-rise building.

**17.84.113 Large Residential Project**

Large Residential Project means a residential project that has ten (10) or more single family or multi-family dwelling units and is not a high-rise building.

**17.84.114 LEED™ Rating System and LEED™ Checklist**

LEED™ and LEED™ Checklist mean the Leadership in Energy and Environment Design Rating Systems, certification methodology, and checklists of the United States Green Building Council (USGBC), the nationally accepted benchmark for the design, construction and operation of high performance green buildings.

**17.84.115 Mixed-Use Project**

Mixed-Use Project means a development that contains uses from two or more of the three major land use categories; residential, commercial, and industrial as defined in Section 20.200.760 of the San José Municipal Code.

**17.84.116 New Construction Project**

New Construction Project means a project of any size that creates one or multiple new structures. The addition of square footage to an existing structure does not constitute a new construction project.

**17.84.117 Single-Family Detached Residence**

Single-Family Detached Residence has the same definition as used in Title 20 of this Code.

**17.84.118 Small Commercial/Industrial Building**

Small Commercial Project means a project involving construction of a new structure of less than twenty-five thousand (25,000) square feet for non-residential uses, and is not a high-rise building.

**17.84.119 Small Residential Project**

Small Residential Project means a Residential Project that has from two (2) to nine (9) single family or multi-family dwelling units and is not a high-rise building and is not one single-family detached residence.

**17.84.120 Tier One Project**

Tier One Project means a Small Commercial Industrial Building or a Small Residential Project or a Single Family Detached Residence.

**17.84.121 Tier Two Project**

Tier Two Project means a Large Commercial Industrial Building or a Large Residential Project.

### **Part 3 Compliance and Enforcement**

#### **17.84.200 Applicability**

- A. The provisions of this Chapter shall apply to all projects for which a building permit is applied for on or after September 8, 2009, with the following exceptions:
1. The provisions of this Chapter shall not apply to any Project for which a development permit application was first submitted before January 1, 2009.
  2. Projects exempted or modified based on unique circumstances pursuant to the provisions of Section 17.84.210.
- B. Nothing in this section is intended to create any vested right in any project.

#### **17.84.210 Exemption Based on Unique Circumstances**

- A. If an applicant for a New Construction Project believes that circumstances regarding the type of project or physical site conditions make it a hardship or infeasible to meet the requirements of this Chapter, then the applicant may request an exemption or modification from the Director. The burden shall be on the applicant to demonstrate the grounds for hardship or infeasibility.
- B. In making a determination in response to an application under subsection A above, if the Director determines that the facts offered in support of an application under subsection A demonstrate that the purposes of this Chapter will have been achieved to the maximum extent reasonably allowed by the circumstances, then the Director may issue a decision requiring compliance with less than the full extent of the requirements of this Chapter but to the fullest extent reasonably achievable given the circumstances.
- C. The Director's decision shall contain a statement of the facts upon which the decision was based, as well as the reduced compliance level requirements that must be achieved. The Director's decision shall become a condition of the Development Permit issued for the project.

#### **17.84.220 Green Building Compliance Requirements**

- A. No Building Permit shall be issued for a Tier One Project unless the application for building permit contains a completed Green Point Rated Checklist or LEED Checklist.
- B. All Tier 2 Projects for which this Chapter is applicable must receive the minimum green building certification of LEED Silver or, in the case of a Tier Two Residential Project, GreenPoint Rated as an alternative.

- C. High-Rise Residential Projects for which this Chapter is applicable shall receive certification as the minimum Green Building Performance Requirement of USGBC LEED™ Certified .
- D. Mixed Use New Construction Projects, for which this Chapter is applicable, must submit a checklist and receive the minimum green building new construction certification designation for the portion of the building under the requirements of the applicable subsections of this Section above

**17.84.300 Green Building Refundable Deposit**

No Building Permit shall be issued for a Tier Two Project or High Rise Residential Project unless the permit applicant pays the Green Building Refundable Deposit fees in an amount set by resolution of the City Council or submits a Housing Department In-Lieu Guarantee in order to warrant that the Project will meet the Green Building Certification Requirements as specified in this Chapter.

**17.84.305 Green Building Deposit Refund Administration**

- A. In order to obtain a refund of the Green Building Deposit the original building permit applicant or applicant's authorized representative must file a written request for refund and provides documentation satisfactory to the Director in support of the request.
- B. The Director may authorize the refund of any green building deposit under the following circumstances:
  - 1. when the Director determines that the deposit was erroneously paid or collected;
  - 2. when the building permit application is withdrawn or cancelled; or
  - 3. when the Director determines that the green building certification standards contained in section 17.84.220 have been achieved.
- C. The Green Building Deposit shall be considered forfeited if the City does not receive a request for refund together with green building certification evidence demonstrating the compliance provisions of section 17.84.220 within a year after the building permit expires or becomes final.
- D. An extension to the time set forth in subsection C above may be requested to the Director before the time has expired. The extension request shall include documentation satisfactory to the Director that the extension is required solely due to the delays resulting from the LEED or GreenPoint Rated certification bodies.

**17.84.310 Appeal**

Determinations of the Director on requests for exemption (as specified in Section 17.84.210) to this Chapter are appealable to the Planning Commission pursuant to the procedures set forth in Sections Section 20.100.240 and 20.100.270 of the San Jose Municipal Code..

**17.84.320 Regulations**

The Director is hereby authorized to promulgate forms, policies and regulations for the implementation of the provisions of this Chapter, including but not limited to the requirements for applications for exemptions, modifications of, or equivalency to the requirements of this Chapter.

PASSED FOR PUBLICATION of title this \_\_\_\_\_ day of \_\_\_\_\_, 2009, by the following vote:

AYES:

NOES:

ABSENT:

DISQUALIFIED:

\_\_\_\_\_  
CHUCK REED  
Mayor

ATTEST:

\_\_\_\_\_  
LEE PRICE, MMC  
City Clerk

## **San Jose Green Building Ordinance Energy Cost-Effectiveness Study**

**Revised June 9, 2009**

Report prepared for:

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## **1.0 Executive Summary**

Gabel Associates has researched and reviewed the feasibility and energy cost-effectiveness of building permit applicants exceeding the 2008 Building Energy Efficiency Standards to meet the minimum energy-efficiency requirements of the City of San Jose Council Policy (#6-32) regarding local green building standards for private sector new construction. The San Jose ordinance states that new construction meet the overall requirements summarized below:

<b>Applicable Project (San Jose Categories)</b>	<b>Effective Date: August 1, 2009</b>
<b>Commercial/Industrial – Tier 1</b>	<b>&lt; 25,000 sf = LEED-NC Checklist</b>
<b>Commercial/Industrial – Tier 2</b>	<b>= or &gt; 25,000 sf = LEED-NC Silver</b>
<b>Residential &lt; 10 Units – Tier 1</b>	<b>&lt; 10 Units = GreenPoint or LEED Checklist</b>
<b>Residential = or &gt; 10 Units – Tier 2</b>	<b>= or &gt; 10 Units = GreenPoint Rated 50 points or LEED Certified</b>
<b>High Rise Residential (75' or higher)</b>	<b>LEED Certified</b>

The study contained in this report shall be included in San Jose's application to the California Energy Commission. The application to the Energy Commission must meet the requirements specified in Section 10-106 of the California Code of Regulations, Title 24, Part 1, **LOCALLY ADOPTED ENERGY STANDARDS**. The proposed Green Building Ordinance shall be enforceable after the Commission has reviewed and approved the local energy standards as meeting all requirements of Section 10-106; and the Ordinance has been filed with the Building Standards Commission.

Please note that this cost-effectiveness study has been completed with respect to the 2008 Building Energy Efficiency Standards which are scheduled to take effect on August 1, 2009.

## **2.0 Impacts of the New Ordinance**

The energy performance impacts of the Ordinance have been evaluated using several case studies which collectively reflect a broad range of building types.

- Single family house: 1-story 1,705 sf
- Single family house: 2-story 2,682 sf
- Single family house: 2-story 5,074 sf
- High-rise residential: 4-story 36,800 sf, 40 dwelling units
- High-rise residential: 10-story 158,700 sf, 120 dwelling units
- Nonresidential: 3-story 31,740 sf, office building
- Nonresidential: 10-story 115,000 sf, retail/office building

The methodology used in the case studies is based on the way that real buildings are designed and evaluated to meet or exceed the energy standards.

- (a) Each prototype building design is tested for compliance with the 2008 Standards, and all energy measures are adjusted with common construction options to just barely meet the Standards. The energy measures chosen are a combination of measures which reflects how designers, builders and developers are likely to achieve a specified level of performance.
- (b) Starting with a 2008 Standards minimally compliant set of measures, various items are changed to just reach the minimum energy performance required by the Ordinance (e.g, 15% better than 2008 Title 24). In this study, the design choices are based on many years of experience with architects, mechanical engineers and builders and general knowledge of the relative incremental costs of most measures. The intent of this approach is for the study to reflect how building energy performance is actually studied and used to select final energy measures.
- (c) A minimum and maximum range of incremental costs of added energy measures is established by a variety of research means. A construction cost estimator, Building Advisory LLC, was contracted to conduct research and surveys to obtain accurate and current measure cost information. Site energy in KWh and Therms, is calculated for each run to establish the annual energy savings, energy cost savings and CO<sub>2</sub>-equivalent reductions in greenhouse gases.

## 2.1 Single Family House

Energy design descriptions of the single family building prototypes which just meet the 2008 Title 24 Building Energy Efficiency Standards:

### Single Family House: 1,705 square feet, 1-story, 16.3% glazing/floor area ratio – Option A

Energy Efficiency Measures
R-38 Roof w/ Radiant Barrier
R-13 Walls
R-0 Slab on Grade
Low E2 Vinyl Windows, U=0.36, SHGC=0.30
Furnace: 80% AFUE
Air Conditioner: 13 SEER
R-6 Attic Ducts
Reduced Duct Leakage/Testing (HERS)
50 Gallon Gas Water Heater: EF=0.60

### Single Family House: 1,705 square feet, 1-story, 16.3% glazing/floor area ratio – Option B

Energy Efficiency Measures
R-38 Roof w/ Radiant Barrier
R-13 Walls
R-0 Slab on Grade
Low E2 Vinyl Windows, U=0.36, SHGC=0.30
Furnace: 80% AFUE
Air Conditioning: None
R-6 Attic Ducts
Reduced Duct Leakage/Testing (HERS)
50 Gallon Gas Water Heater: EF=0.60

### Single Family House: 2,682 square feet, 2-story, 21.1% glazing/floor area ratio – Option A

Energy Efficiency Measures
R-38 Roof w/ Radiant Barrier
R-15 Walls
R-19 Raised Floor
Low E2 Vinyl Windows, U=0.36, SHGC=0.30
Furnace: 80% AFUE
Air Conditioner: 13 SEER
R-8 Attic Ducts
50 Gallon Gas Water Heaters: EF=0.60

**Single Family House: 2,682 square feet, 2-story, 21.1% glazing/floor area ratio  
– Option B**

<b>Energy Efficiency Measures</b>
R-38 Roof w/ Radiant Barrier
R-15 Walls
R-19 Raised Floor
Low E2 Vinyl Windows, U=0.36, SHGC=0.30
Furnace: 80% AFUE
Air Conditioner: None
R-8 Attic Ducts
50 Gallon Gas Water Heaters: EF=0.60

**Single Family House: 5,074 square feet, 2-story, 22.7% glazing/floor area ratio  
– Option A**

<b>Energy Efficiency Measures</b>
R-38 Roof w/ Radiant Barrier
R-13 Walls
R-19 Raised Floor
Housewrap
Low E2 Vinyl Windows, U=0.36, SHGC=0.30
(2) Furnaces: 80% AFUE
(2) Air Conditioners: 13 SEER
(2) Air Conditioners: TXV + Refrig. Charge (HERS)
R-6 Attic Ducts
Reduced Duct Leakage/Testing (HERS)
(2) 50 Gallon Gas Water Heaters: EF=0.62
Pipe Insulation

**Single Family House: 5,074 square feet, 2-story, 22.7% glazing/floor area ratio  
– Option B**

<b>Energy Efficiency Measures</b>
R-38 Roof w/ Radiant Barrier
R-13 Walls
R-19 Raised Floor
Housewrap
Low E2 Vinyl Windows, U=0.36, SHGC=0.30
(2) Furnaces: 80% AFUE
(2) Air Conditioners: 13 SEER
(2) Air Conditioners: TXV + Refrig. Charge (HERS)
R-6 Attic Ducts
Reduced Duct Leakage/Testing (HERS)
(2) 50 Gallon Gas Water Heaters: EF=0.62
Pipe Insulation

**Single Family Energy Measures Needed to Meet the City's Ordinance.**

The following energy features have been modified from the Title 24 set of measures so that the house design uses 15% less TDV energy than the corresponding Title 24 base case design per the 2009 GreePoint Rated minimum energy requirement. The incremental first cost to provide that measure in comparison with the equivalent base case measure is listed to the right.

The incremental energy improvements specified above to meet the proposed Ordinance requirements are variables selected by designer, builder or owner. There are a number of considerations in choosing the final mix of energy measures including first cost, aesthetics, maintenance and replacement.

**15% Better Than Title 24 Base Case, Option A**

1705 sf

Energy Efficiency Measures	Change Type	Incremental Cost Estimate		
		Min	Max	Avg
R-38 Roof w/ Radiant Barrier	-	\$ -	\$ -	\$ -
R-19 Walls (from R-13): 1,328 sf @ \$0.30 to \$0.40/sf	Upgrade	\$ 398	\$ 531	\$ 465
R-0 Slab on Grade	-	\$ -	\$ -	\$ -
Low E2 Vinyl Windows, U=0.36, SHGC=0.30	-	\$ -	\$ -	\$ -
Furnace: 90% AFUE (from 80% AFUE)	Upgrade	\$ 500	\$ 1,000	\$ 750
Air Conditioner: 13 SEER, 11 EER (HERS)	Upgrade	\$ 25	\$ 75	\$ 50
Air Conditioner: TXV + Refrig. Charge (HERS)	Upgrade	\$ 100	\$ 150	\$ 125
R-8 Attic Ducts	Upgrade	\$ 225	\$ 325	\$ 275
Reduced Duct Leakage/Testing (HERS)	-	\$ -	\$ -	\$ -
50 Gallon Gas Water Heater: EF=0.62 (from EF=0.60)	Upgrade	\$ 100	\$ 200	\$ 150
<b>Total Incremental Cost of Energy Efficiency Measures:</b>		<b>\$ 1,348</b>	<b>\$ 2,281</b>	<b>\$ 1,815</b>
<b>Total Incremental Cost per Square Foot:</b>		<b>\$ 0.79</b>	<b>\$ 1.34</b>	<b>\$ 1.06</b>

**15% Better Than Title 24 Base Case, Option B**

1705 sf

Energy Efficiency Measures	Change Type	Incremental Cost Estimate		
		Min	Max	Avg
R-38 Roof w/ Radiant Barrier	-	\$ -	\$ -	\$ -
R-19 Walls (from R-13): 1,328 sf @ \$0.30 to \$0.40/sf	Upgrade	\$ 398	\$ 531	\$ 465
R-0 Slab on Grade	-	\$ -	\$ -	\$ -
Low E2 Vinyl Windows, U=0.36, SHGC=0.30	-	\$ -	\$ -	\$ -
Furnace: 92% AFUE (from 80% AFUE)	Upgrade	\$ 500	\$ 1,200	\$ 850
Air Conditioning: None	-	\$ -	\$ -	\$ -
R-8 Attic Ducts	Upgrade	\$ 225	\$ 325	\$ 275
Reduced Duct Leakage/Testing (HERS)	-	\$ -	\$ -	\$ -
50 Gallon Gas Water Heater: EF=0.62 (from EF=0.60)	Upgrade	\$ 100	\$ 200	\$ 150
<b>Total Incremental Cost of Energy Efficiency Measures:</b>		<b>\$ 1,223</b>	<b>\$ 2,256</b>	<b>\$ 1,740</b>
<b>Total Incremental Cost per Square Foot:</b>		<b>\$ 0.72</b>	<b>\$ 1.32</b>	<b>\$ 1.02</b>

**15% Better Than Title 24 Base Case, Option A**

2682 sf

Energy Efficiency Measures	Change Type	Incremental Cost Estimate		
		Min	Max	Avg
R-38 Roof w/ Radiant Barrier	-	\$ -	\$ -	\$ -
R-15 Walls	-	\$ -	\$ -	\$ -
R-19 Floor	-	\$ -	\$ -	\$ -
Low E2 Vinyl Windows, U=0.36, SHGC=0.30	-	\$ -	\$ -	\$ -
Furnace: 90% AFUE (from 80% AFUE)	Upgrade	\$ 500	\$ 1,000	\$ 750
Air Conditioner: 13 SEER, 11 EER (HERS)	Upgrade	\$ 25	\$ 75	\$ 50
Air Conditioner: TXV + Refrig. Charge (HERS)	Upgrade	\$ 100	\$ 150	\$ 125
R-8 Attic Ducts	-	\$ -	\$ -	\$ -
Reduced Duct Leakage/Testing (HERS)	Upgrade	\$ 300	\$ 600	\$ 450
50 Gallon Gas Water Heater: EF=0.62 (from EF=0.60)	Upgrade	\$ 100	\$ 200	\$ 150
<b>Total Incremental Cost of Energy Efficiency Measures:</b>		<b>\$ 1,025</b>	<b>\$ 2,025</b>	<b>\$ 1,525</b>
<b>Total Incremental Cost per Square Foot:</b>		<b>\$ 0.38</b>	<b>\$ 0.76</b>	<b>\$ 0.57</b>

**15% Better Than Title 24 Base Case, Option B**

2682 sf

Energy Efficiency Measures	Change Type	Incremental Cost Estimate		
		Min	Max	Avg
R-38 Roof w/ Radiant Barrier	-	\$ -	\$ -	\$ -
R-15 Walls	-	\$ -	\$ -	\$ -
R-19 Floor	-	\$ -	\$ -	\$ -
Low E2 Vinyl Windows, U=0.36, SHGC=0.30	-	\$ -	\$ -	\$ -
Housewrap: 2,137 sf @ \$0.08 to 0.12/sf	Upgrade	\$ 171	\$ 256	\$ 214
Furnace: 90% AFUE (from 80% AFUE)	Upgrade	\$ 500	\$ 1,000	\$ 750
Air Conditioner: None	-	\$ -	\$ -	\$ -
R-8 Attic Ducts	-	\$ -	\$ -	\$ -
Reduced Duct Leakage/Testing (HERS)	Upgrade	\$ 300	\$ 600	\$ 450
50 Gallon Gas Water Heater: EF=0.62 (from EF=0.60)	Upgrade	\$ 100	\$ 200	\$ 150
<b>Total Incremental Cost of Energy Efficiency Measures:</b>		<b>\$ 1,071</b>	<b>\$ 2,056</b>	<b>\$ 1,564</b>
<b>Total Incremental Cost per Square Foot:</b>		<b>\$ 0.40</b>	<b>\$ 0.77</b>	<b>\$ 0.58</b>

**15% Better Than Title 24 Base Case, Option A**

5074 sf

Energy Efficiency Measures	Change Type	Incremental Cost Estimate		
		Min	Max	Avg
R-38 Roof w/ Radiant Barrier	-	\$ -	\$ -	\$ -
R-15 Walls (from R-13): 2,590 sf @ \$0.12 to \$0.20/sf	Upgrade	\$ 311	\$ 518	\$ 414
R-30 Raised Floor (from R-19): 3,044 sf @ \$0.10 to \$0.25	Upgrade	\$ 304	\$ 761	\$ 533
Housewrap	-	\$ -	\$ -	\$ -
Super Low E Vinyl Windows, U=0.36, SHGC=0.23, 1151.8 sf @ \$1.40 - \$1.60 / sf	Upgrade	\$ 1,613	\$ 1,843	\$ 1,728
(2) Furnaces: 92% AFUE (from 80% AFUE)	Upgrade	\$ 1,000	\$ 2,400	\$ 1,700
(2) Air Conditioners: 15 SEER, 12 EER (HERS)	Upgrade	\$ 1,000	\$ 3,000	\$ 2,000
(2) Air Conditioners: TXV + Refrig. Charge (HERS)	-	\$ -	\$ -	\$ -
R-8 Attic Ducts	Upgrade	\$ 400	\$ 600	\$ 500
Reduced Duct Leakage/Testing (HERS)	-	\$ -	\$ -	\$ -
(2) 50 Gallon Gas Water Heaters: EF=0.62	-	\$ -	\$ -	\$ -
Pipe Insulation	-	\$ -	\$ -	\$ -
<b>Total Incremental Cost of Energy Efficiency Measures:</b>		<b>\$ 4,628</b>	<b>\$ 9,122</b>	<b>\$ 6,875</b>
<b>Total Incremental Cost per Square Foot:</b>		<b>\$ 0.91</b>	<b>\$ 1.80</b>	<b>\$ 1.35</b>

**15% Better Than Title 24 Base Case, Option B**

5074 sf

Energy Efficiency Measures	Change Type	Incremental Cost Estimate		
		Min	Max	Avg
R-38 Roof w/ Radiant Barrier	-	\$ -	\$ -	\$ -
R-19 Walls (from R-13): 2,590 sf @ \$0.30 to \$0.40/sf	Upgrade	\$ 777	\$ 1,036	\$ 907
R-30 Raised Floor (from R-19): 3,044 sf @ \$0.10 to \$0.25	Upgrade	\$ 304	\$ 761	\$ 533
Housewrap	-	\$ -	\$ -	\$ -
Low E2 Vinyl Windows, U=0.36, SHGC=0.30	-	\$ -	\$ -	\$ -
(2) Furnaces: 92% AFUE (from 80% AFUE)	Upgrade	\$ 1,000	\$ 2,400	\$ 1,700
(2) Air Conditioners: 13 SEER, 11 EER (HERS)	Upgrade	\$ 50	\$ 150	\$ 100
(2) Air Conditioners: TXV + Refrig. Charge (HERS)	-	\$ -	\$ -	\$ -
R-8 Attic Ducts	Upgrade	\$ 400	\$ 600	\$ 500
Reduced Duct Leakage/Testing (HERS)	-	\$ -	\$ -	\$ -
(2) 50 Gallon Gas Water Heaters: EF=0.62	-	\$ -	\$ -	\$ -
Pipe Insulation	-	\$ -	\$ -	\$ -
<b>Total Incremental Cost of Energy Efficiency Measures:</b>		<b>\$ 2,531</b>	<b>\$ 4,947</b>	<b>\$ 3,739</b>
<b>Total Incremental Cost per Square Foot:</b>		<b>\$ 0.50</b>	<b>\$ 0.97</b>	<b>\$ 0.74</b>

## 2.2 High-Rise Residential Buildings

Energy design descriptions of the high-rise residential prototypes which just meet the 2008 Title 24 Building Energy Efficiency Standards:

**High-rise Residential: 4-story 36,800 square feet, 40 units,  
Window Wall Ratio = 35.2%**

Energy Efficiency Measures
R-30 Roof
R-19 Metal Stud Walls
R-0 Raised Slab
Low E2 Vinyl Windows, U=0.36, SHGC=0.35
Room PTACs: HSPF=7.2, EER=10.2 (No Ducts)
Central DHW Boiler, AFUE=82.7%

**High-rise Residential: 15-story 158,700 square feet, 120 units,  
Window Wall Ratio = 35.2%**

Energy Efficiency Measures
R-30 Roof
R-19 Metal Stud Walls
R-0 Raised Slab
Low E2 Vinyl Windows, U=0.34, SHGC=0.34
Hydronic HPs w/ Cooling Tower: COP=4.5, EER=13.5
Central Boilers, AFUE=92.2%
Central DHW Boiler, AFUE=80.4%

### LEED vs. Title 24 Building Energy Performance

LEED uses a very different metric than Title 24 in establishing a proposed building's energy performance with respect to the baseline energy performance. LEED requires the use of the Appendix G Performance Method to demonstrate that the annual energy cost of the proposed building is at least 10% less than the annual energy cost of the ASHRAE 90.1-2007 baseline reference building or 14% less than the cost of the ASHRAE 90.1-2004 reference building. Alternatively, LEED allows the option of using the 2008 Title 24 performance modeling assumptions to demonstrate that the proposed building is 10% less than the annual energy cost of the Title 24 standard design version of the building, including all site energy. In either case, all site energy is part of the LEED calculation of annual energy cost which includes exterior lighting, interior lighting (for high-rise residential), process loads and receptacle loads.

By comparison, the energy performance metric used by the 2008 Title 24 Building Energy Efficiency Standards is Time Dependent Valuation (TDV) Energy in KBtu/sf-yr. Process, receptacle and lighting loads are fixed in both the Standard Design and the Proposed Building within the Title 24 performance calculation. Preliminary results by Gabel Associates show that, based on variations in Climate Zone and building type, a nonresidential or high-rise residential building using 13% to 17% less TDV Energy than the 2008 Title 24 Standard Design has a projected annual energy cost approximately 10% less than the baseline building. The cost-effectiveness of the LEED minimum energy requirement has been established in this study by reducing TDV Energy use 15% below the 2008 Standard Design Title 24 TDV Energy. In the %-Better-Than-Title 24 calculation, energy use components which are fixed within the compliance simulation and which the permit applicant cannot receive credit for reducing (i.e., receptacle loads, process loads, exterior lighting and, in high-rise residential, interior lighting) may be omitted. Build-It-Green's 2008 – 2011 GreenPoint Rated System uses the same criteria for its minimum energy requirement for high-rise residential buildings (i.e., 15% better-than-Title 24).

**High-rise Residential Energy Measures Needed to Meet the City's Ordinance.**

Incremental energy measures to meet the Ordinance have been evaluated for the above high-rise residential buildings. The following energy features have been modified from the Title 24 measures so that these buildings use at least 15% less TDV energy than the corresponding base case design consistent with the LEED v3.0 (2009) minimum energy requirements. The incremental first cost to provide that measure in comparison with the equivalent base case measure is listed to the right.

**(A) 36,800 sq.ft. building: Reduction in 2008 T24 TDV Energy by 15%**

• R-30 attic insulation w/ Cool Roof (Reflectance=0.70, Emittance=0.75); 9,200 sf @ \$0.25 - \$0.40/sf	\$ 2,300 - 3,680
• Super Low-E Vinyl Windows U=0.36, SHGC=0.25; 6,240 sf @ \$1.40 - \$1.60/sf	\$ 8,736 - 9,984
• (80) Room PTACs: HSPF=7.84, EER=11.2 (No Ducts) @ \$150 - \$250/unit	\$ 12,000 - 20,000
<b>Total incremental cost of Ordinance energy measure:</b>	<b>\$ 23,036 - 33,664</b>
	<b>Avg = \$28,350</b>
<b>Incremental cost in \$/sq.ft.:</b>	<b>\$ 0.63 to \$0.91/sq.ft.</b>
	<b>Avg = \$0.77 /sf</b>

**(B) 36,800 sq.ft. building: Reduction in 2008 T24 TDV Energy by 15%**

• R-30 attic insulation w/ Cool Roof (Reflectance=0.70, Emittance=0.75); 9,200 sf @ \$0.25 - \$0.40/sf	\$ 2,300 - 3,680
• Super Low-E Vinyl Windows U=0.36, SHGC=0.25; 6,240 sf @ \$1.40 - \$1.60/sf	\$ 8,736 - 9,984
• (80) Room PTACs: HSPF=7.84, EER=11.2 (No Ducts) @ \$150 - \$250/unit	\$ 12,000 - 20,000
<b>Total incremental cost of Ordinance energy measure:</b>	<b>\$ 23,036 - 33,664</b>
	<b>Avg = \$28,350</b>
<b>Incremental cost in \$/sq.ft.:</b>	<b>\$ 0.63 to \$0.91/sq.ft.</b>
	<b>Avg = \$0.77 /sf</b>

**(A) 158,700 sq.ft. building: Reduction in 2008 T24 TDV Energy by 15%**

• R-19+R-5 exterior wall insulation; 48,798 sf @ \$5.00 - \$8.00/sf	\$243,990- 390,384
• Super Low-E Vinyl Windows U=0.34, SHGC=0.24; 26,550 sf @ \$1.40 - \$1.60/sf	\$ 37,170 - 42,480
• R-6.4, 2" spray-on insulation below raised slab; 9,200 sf @ \$2.00 - \$3.00/sf	\$ 18,400 - 27,600
• (2) 92% DHW boilers @ \$1,500 - 2,500 each	\$ 3,000 - 5,000
<b>Total incremental cost of Ordinance energy measure:</b>	<b>\$302,560 -465,464</b>
	<b>Avg = \$384,012</b>
<b>Incremental cost in \$/sq.ft.:</b>	<b>\$1.91 to \$2.93/sq.ft.</b>
	<b>Avg = \$2.42 /sf</b>

**(B) 158,700 sq.ft. building: Reduction in 2008 T24 TDV Energy by 15%**

• R-19+R-5 exterior wall insulation; 48,798 sf @ \$5.00 - \$8.00/sf	\$243,990- 390,384
• Super Low-E Vinyl Windows U=0.36, SHGC=0.23; 26,550 sf @ \$1.40 - \$1.60/sf	\$ 37,170 - 42,480
• (2) 92% DHW boilers @ \$1,500 - 2,500 each	\$ 3,000 - 5,000
<b>Total incremental cost of Ordinance energy measure:</b>	<b>\$284,160- 437,864</b>
	<b>Avg = \$361,012</b>
<b>Incremental cost in \$/sq.ft.:</b>	<b>\$ 1.79 to \$2.76/sq.ft.</b>
	<b>Avg = \$2.27 /sf</b>

## 2.4 Nonresidential Buildings

The following measures were first evaluated so that the building just meets the 2008 standards as follows:

### **31,740 SF 3-story building, 28.3% Window Wall Ratio glazing area**

#### **(A) 31,740 SF 3-story office building which just meet Title 24:**

- R-38 attic insulation w/ Cool Roof (Reflectance=0.70, Emittance=0.75)
- R-19 in metal frame exterior walls, slab-on-grade 1<sup>st</sup> floor;
- NFRC-rated Low-E windows: U-factor=0.50, SHGCc=0.38 (e.g., Viracon VE 1-2M)
- Lighting = 0.860 w/sf: 390 2-lamp 4' T8 fixtures w/ standard ballasts @ 62w each and 174 18w CFLs @ 18w each; no lighting controls
- 4 identical Packaged VAV units: Aaron 25 ton, EER=10.4, 10,000 CFM, standard efficiency fan motors, 30% VAV boxes w/ reheat
- Ducts in conditioned space, R-4.2 duct insulation
- Hot water is from a standard gas water heater or boiler

### **115,000 SF 10-story building, 34.2% Window Wall Ratio glazing area**

#### **(A) 115,000 SF 10-story office building which just meet Title 24:**

- R-30 attic insulation, R-19 in metal frame exterior walls, slab-on-grade 1<sup>st</sup> floor;
- Default Metal Low-E windows: U-factor=0.50, SHGCc=0.54 (e.g., Viracon VE1-85)
- Lighting = 0.878 w/sf: 1,276 2-lamp 4' T8 fixtures w/ standard ballasts @ 62w each and 840 26w CFLs @ 26 w each; no lighting controls
- (2) 150 Ton Cooling Tower, (2) 150 Ton Screw Chillers @ 0.72 kW/ton w/ zonal fan coils for heating and cooling
- Hot water is from the central boilers

### **Energy Measures Needed to Exceed the 2008 Standards**

Refer to "LEED vs Title 24 Building Energy Performance" above in subsection 2.3 for the basis of using 15%-Better-Than-Title 24 as equivalent to the minimum energy requirements of LEED v3.0 (2009).

The following energy features have been modified from the above Title 24 set of measures so that the proposed design uses 15% less TDV energy than the 2008 standards. The added first cost of that measure compared with the equivalent 2008 Title 24 design measure is listed to the right, as well as the sum of all incremental costs.

**(A) 31,740 sq.ft. building: Reduction in 2008 T24 TDV Energy by 15%**

• Lighting = 0.698 w/sf: 390 2-lamp 4' T8 fixtures with high efficiency instant start ballasts & lamps, 50 input watts @ \$40.00 - \$60.00/fixture	\$ 15,600 - 23,400
• 48 (12% of) T8 fixtures on 24 occupant sensors, small offices: @ \$75.00 - \$100.00 each	\$ 1,800 - 2,400
• (3) Trane 25 ton units, EER=11.0 @ \$9,000 to \$13,000 each w/ premium fan motors	\$ 27,000 - 39,000
<b>Total incremental cost of Ordinance energy measure:</b>	<b>\$ 44,400 - 64,800</b>
	<b>Avg = \$54,600</b>
<b>Incremental cost in \$/sq.ft.:</b>	<b>\$ 1.72 to \$2.04/sq.ft.</b>
	<b>Avg = \$1.88 /sf</b>

**(B) 31,740 sq.ft. building: Reduction in 2008 T24 TDV Energy by 15%**

• Lighting = 0.768 w/sf: 390 2-lamp 4' T8 fixtures with high efficiency instant start ballasts, 58 input watts @ \$15.00 - \$25.00/fixture	\$ 5,850 - 9,750
• 120 (31% of) T8 fixtures on 60 occupant sensors, small offices: @ \$75.00 - \$100.00 each	\$ 4,500 - 6,000
• U=0.50, SHGCc=0.31 (e.g., Viracon VE 2-2M) 5,576 sf @ \$2.00 - 3.00/sq.ft.	\$ 11,152 - 16,728
• (3) Trane 25 ton units, EER=11.0 @ \$9,000 to \$13,000 each w/ premium fan motors	\$ 27,000 - 39,000
• R-38 cool roof Reflectance=0.70, Emittance=0.75 10,580 sf @ \$0.50 - \$0.70/sf	\$ 5,290 - 7,406
<b>Total incremental cost of Ordinance energy measure:</b>	<b>\$ 53,792 - 78,884</b>
	<b>Avg = \$66,338</b>
<b>Incremental cost in \$/sq.ft.:</b>	<b>\$ 1.69 to \$2.49/sq.ft.</b>
	<b>Avg = \$2.09 /sf</b>

**(A) 115,000 sq.ft. building: Reduction in 2008 T24 TDV Energy by 15%**

• Installed LPD=0.726: 1,276 2-lamp 4' T8 fixtures w/ high eff. instant start ballasts and premium T8 lamps, 50w input @ \$40.00 - \$50.00/fixture	\$ 51,040 - 57,420
• 115 occupant sensors controlling (2) 2-lamp T8 fixtures; @ \$75.00 - \$100.00 each	\$ 8,625 - 11,500
• U=0.50, SHGCc=0.31 (e.g., Viracon VE 2-2M) 20,772 sf @ \$3.00 - 4.00/sq.ft.	\$ 62,316 - 83,088
<b>Total incremental cost of Ordinance energy measure:</b>	<b>\$121,981 - 152,008</b>
	<b>Avg = \$136,995</b>
<b>Incremental cost in \$/sq.ft.:</b>	<b>\$ 1.06 to \$1.32/sq.ft.</b>
	<b>Avg = \$1.19 /sf</b>

**(B) 115,000 sq.ft. building: Reduction in 2008 T24 TDV Energy by 15%**

• (2) 150 ton screw chillers 0.62 kW/ton @\$20,000 - \$30,000 ea.	\$ 40,000 - 60,000
• Installed LPD=0.726: 1,276 2-lamp 4' T8 fixtures w/ high eff. instant start ballasts and premium T8 lamps, 50w input @\$40.00 - \$50.00/fixture	\$ 51,040 - 57,420
• U=0.50, SHGCc=0.38 (e.g., Viracon VE 1-2M) 20,772 sf @\$2.00 - 3.00/sq.ft.	\$ 41,544 - 62,316
<b>Total incremental cost of Ordinance energy measure:</b>	<b>\$132,584 - 179,736</b>
	<b>Avg = \$156,160</b>
<b>Incremental cost in \$/sq.ft.:</b>	<b>\$ 1.15 to \$1.56/sq.ft.</b>
	<b>Avg = \$1.36/sf</b>

### **3.0 Cost Effectiveness**

Tables 3-1a through 3-5a in this section, “*Summary of Energy Savings from San Jose Energy Measures*”, are based upon:

- Incremental site electricity (kWh) and natural gas (therms) saved per year as calculated using the state-approved energy compliance software for the 2008 Building Energy Efficiency Standards, EnergyPro Version 5 and Micropas Version 8.
- Average utility rates of \$0.16/kWh for electricity and \$1.30/therm for natural gas in current constant dollars
- The assumption of no change (i.e., no inflation or deflation) of utility rates in constant dollars over time
- The assumption of no increase in summer temperatures, even though recent scientific studies suggest that global climate change will increase temperatures in the Western U.S. which in turn will increase air conditioning energy use

Tables 3-1b through 3-5b, “*Summary of Simple Payback for San Jose Energy Measures*”, include a cost-effectiveness analysis of the Ordinance with respect to each building occupancy type and design; and assumes:

- No external cost of global climate change -- and corresponding value of additional investment in energy efficiency and CO2 reduction – is included
- The cost of money invested in the incremental cost of energy measures is not included.

### **3.1 Single Family Houses**

<b>Building Description</b>	<b>Average Incremental First Cost (\$)</b>	<b>Net Incremental Annual Energy Cost Savings (\$)</b>	<b>Simple Payback (years)</b>
<b>1,705 sf (OptA-15%)</b>	<b>\$1,815</b>	<b>\$89</b>	<b>20.4</b>
<b>1,705 sf (OptB-15%)</b>	<b>\$1,740</b>	<b>\$91</b>	<b>19.1</b>
<b>Averages:</b>	<b>\$1,777</b>	<b>\$90</b>	<b>19.8</b>

Annual Reduction in CO2-equivalent: 0.41 lbs./sq.ft.- year

Building Description	Average Incremental First Cost (\$)	Net Incremental Annual Energy Cost Savings (\$)	Simple Payback (years)
2,682 sf (OptA-15%)	\$1,525	\$139	11.0
2,682 sf (OptB-15%)	\$1,564	\$146	10.7
Averages:	\$1,544	\$143	10.8

Annual Reduction in CO2-equivalent: 0.41 lbs./sq.ft.- year

Building Description	Average Incremental First Cost (\$)	Net Incremental Annual Energy Cost Savings (\$)	Simple Payback (years)
5,074 sf (OptA-15%)	\$3,739	\$187	20.0
5,074 sf (OptB-15%)	\$2,517	\$184	13.7
Averages:	\$3,128	\$186	16.8

Annual Reduction in CO2-equivalent: 0.28 lbs./sq.ft.- year

### 3.2 High-rise Residential Buildings

Building Description	Average Incremental First Cost (\$)	Net Incremental Annual Energy Cost Savings (\$)	Simple Payback (years)
36,800 sf (Opt-A -15%)	\$28,350	\$2,491	11.4
36,800 sf (Opt-B -15%)	\$29,860	\$2,618	11.4
Averages:	\$29,105	\$2,554	11.4

Annual Reduction in CO2-equivalent: 0.22 lbs./sq.ft.- year

Building Description	Average Incremental First Cost (\$)	Net Incremental Annual Energy Cost Savings (\$)	Simple Payback (years)
158,700 sf (Opt-A -15%)	\$384,012	\$11,550	33.2
158,700 sf (Opt-B -15%)	\$361,012	\$14,324	25.2
Averages:	\$372,512	\$12,937	29.2

Annual Reduction in CO2-equivalent: 0.30 lbs./sq.ft.- year

### 3.3 Nonresidential Buildings

Building Description	Total Incremental First Cost (\$)	Net Incremental Annual Energy Cost Savings (\$)	Simple Payback (years)
31,740 sf (Opt-A -15%)	\$49,248	\$4,215	11.7
31,740 sf (Opt-B -15%)	\$66,338	\$5,721	11.6
Averages:	\$57,793	\$4,968	11.6

Annual Reduction in CO2-equivalent: 0.70 lbs./sq.ft.- year

Building Description	Total Incremental First Cost (\$)	Net Incremental Annual Energy Cost Savings (\$)	Simple Payback (years)
115,000 sf (Opt-A -15%)	\$136,995	\$16,479	8.3
115,000 sf (Opt-B -15%)	\$156,160	\$18,784	8.3
Averages:	\$146,578	\$17,631	8.3

Annual Reduction in CO2-equivalent: 0.38 lbs./sq.ft.- year

### Conclusions

Regardless of the building design, occupancy profile and number of stories, the incremental improvement in overall annual energy performance of buildings under the San Jose Green Building Ordinance and 2008 Title 24 Building Energy Efficiency Standards is cost-effective. However, each building's specific design, occupancy type and the design choices may allow for a large range of incremental first cost and payback. As is the case in just meeting the requirements of the Title 24 energy standards, a permit applicant complying with the energy requirements of the San Jose Green Building Ordinance should carefully analyze building energy performance to reduce incremental first cost and reduce the payback for the required additional energy measures.