

# Passive Building in South Dakota: Risk or Reward

**South Dakota Housing Development Authority**  
Special Achievement

**HFA Staff Contact**

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A recent article by SDSU Associate Professor Charles MacBride raised the question – why do homeowners not care about their house’s performance when with every other item in their lives, performance is a top priority: phones, laptops, refrigerators, earbuds, cars, overnight delivery, etc.? The answer simplified is – is the risk worth the reward?

South Dakota Housing Development Authority (SDHDA) has always encouraged innovative approaches which are cost effective in providing affordable housing, including planning, design, construction, quality, energy efficiency, and financing. But with expanded interest from former Governor Dennis Daugaard, a four-pronged approach was forged to evaluate the risk versus the reward when it comes to passive building.

Passive building is designed and built in accordance with five principles: continuous insulation with no thermal bridging; an extremely airtight building envelope; high performance windows and doors; heat - recovery ventilation; and solar heat-gain management.

The first action in the four-pronged passive building approach was to take SDHDA’s Governor’s House program and build a prototype Governor’s House to passive standards. The Governor’s House is a reasonably sized, affordable home that is built by prison inmates for income-qualified families. While not financially feasible to build every Governor’s House to passive standards, many techniques learned from this prototype have been incorporated into every Governor’s House – continuous insulation, air-tight envelope, and heat recovery ventilation. Additionally, the inmates that build the Governor’s Houses have been trained in sustainable development and design and they can use those skills and knowledge in future employment opportunities upon parole.

The second approach was to provide passive building training. SDHDA sent three Governor’s House staff members to be trained in passive building techniques. SDHDA then facilitated a week long training, free of charge, to any South Dakota builder, developer or architect who was interested in learning the basics of Passive House design principles and how high-performance buildings can be built at costs comparable to typical new construction. The last training was provided to seven architects and two graduate students to become certified PHIUS CPHC® – the leading passive building credential. The industry training and the PHIUS CPHC® training was provided by a grant from the Governor’s Office of Economic Development.

The third process was PH01:BRK, the first custom designed single family passive house in South Dakota. The house was designed by six graduate students from South Dakota State University as part of an advanced studio. The project introduced Passive House principles to the students and resulted in the construction of a certified, student designed house. A grant from the Governor’s Office of Economic Development provided for student and faculty training, curriculum development, research, integration with industry and community outreach. The sale of the house will fund future student designed projects that challenge and exceed typical energy and construction standards.

The final approach was for SDHDA to partner with a multifamily developer to apply the principles learned from the single family builds and develop South Dakota’s first multifamily structure to Passive standards. To generate interest, SDHDA met with housing partners including architects, developers and lenders to discuss the idea of developing an apartment complex using the passive standards. Knowing this was uncharted territory, SDHDA made the commitment to work through this process with one

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developer as a pilot program.

SDHDA set aside \$500,000 in HOME funds and \$500,000 LIHTCs for the development. A Request for Proposals was then sent to prospective developers with the understanding that this project would be used as a learning tool and data collected would be shared within the multifamily construction industry. The developer chosen would work side by side with SDHDA staff and the team assembled for passive certification.

Copper Pass Apartments, a 30-unit apartment building was the result of the partnership and became South Dakota's first passive multifamily apartment building. Costello Companies, the developer on the project embraced the idea and to further help with data collection and comparison, planned a sister building, Majestic Ridge, to be built to ENERGY STAR® standards. Copper Pass and Majestic Ridge are identical in size, footprint and orientation so construction costs, energy performance and return-on-investment can be studied. Copper Pass was placed in service in September 2018 and Majestic Ridge is currently under construction.

As of May 1<sup>st</sup>, 2019, Copper Pass is 100% occupied. The utility consumption will be more accurate with 12 months of occupancy but to date, the consumptions averaged \$43 per month for a one bedroom unit (697 square feet), \$51 for a two bedroom unit (927 square feet) and \$63 for a three bedroom unit (1,238 square feet), including the extremely cold months of January and February. When SDHDA asked Costello Companies what they liked most about the development of Copper Pass, this was the response from Joan Franken, Managing Director:

*“We were excited for the opportunity to develop, build and manage a Passive apartment building because our focus and mission has been on being as energy efficient and environmentally sustainable as we possibly can when developing affordable units for individuals and families to live in. It is the right thing to do for our company, the tenants and communities.*

*We learned so much through the design process about the history and intent of Passive design and it motivated the development and management teams to approach our processes differently. For example, for the development and construction teams, we met weekly with the architect, engineers and key subcontractors to discuss the design and the scheduling for each week. The differences from our typical energy efficient design (ENERGY STAR® certified) to Passive design meant that the subcontractors had to be educated in the importance of specific installation instructions, methods and materials that may be different than what they were used to. For the property management team, it meant starting the education process with prospective tenants when they contacted us for an application to live at Copper Pass. We would explain what was unique and special about the building, what Passive design meant and what that correlated to when they would live in their unit. Some tenants would then assume that the unit would look very different than a typical apartment unit, but once they toured the building and the unit, they were excited. We created a flyer with Passive design information and a brochure about the energy efficient systems and amenities in the unit. We created a QR code that is located on items in the unit that a tenant would use to watch a video about how to use it. The window video would show them how to open and close their tilt-turn triple pane windows. The videos for the mini-split heating and cooling unit, heater, ERV vents and transfer fans would give instructions on the operation and importance of each item. And a video on the ventless dryer explained how to use the dryer to its highest efficiency.*

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*We took the development a step further and constructed a natural-playground on the site. This playground was made out of logs of trees (from a near-by tree farm) and rocks that were excavated on the site. The theory is having kids play in a more natural environment would spark imagination.*

*Based on our experience and the things we learned from Copper Pass, we intend to use some of the new methods and materials in future apartment complexes to make them more sustainable and energy efficient.”*

Recently SDHDA received a message from Costello Companies regarding a tenant’s comment regarding Copper Pass. This message was received from one of the owners of Costello Companies:

*“Last night Janet and I attended a jazz show at the Orpheum Theater. I needed to pick up my tickets at the Will call window. When I mentioned my name in order to get my tickets the woman behind the counter said are you Costello properties? I said yes that’s me. She said I live in one of your properties. I said which one? She said I live at Copper Pass and I absolutely love it. I said that’s fantastic. She said the greatest thing is my utilities are running me \$.92 a day! Wow!!! Is this fantastic or what!!!”*

To maintain integrity of the passive building and ensure the building operates at capacity, tenant education is very important. QR codes were placed throughout the units providing instruction on such items operating the windows. In addition tenants attend a brief training and are provided instructional information to ensure maximum comfort in their home.

The goal of each of these projects was to develop a suite of recommendations to spur builders and homeowners to invest in energy efficiency within the state. From the Governor’s House prototype completion in 2014 to the ribbon cutting of Copper Pass in September of 2018, new passive building standards were developed and instead of a one size fits all approach, metrics became climate specific, suppliers became aware of and willing to provide materials and developers became more educated in building techniques and energy efficiency. With that being said, costs are a big factor. To build the prototype Governor’s House, costs were 50 percent higher than a typical Governor’s House build. Those costs would not be as high today with the above-mentioned changes, but would still be more than 15 percent higher. As for Copper Pass, the construction costs for the multifamily project was \$4,730,405 and total development cost of \$6,338,415. At an average cost of \$211,281 per unit, Copper Pass is estimated to be roughly 30 percent higher than the ENERGY STAR® standard of Majestic Ridge Apartments.

While we know that construction costs are higher, we also know that the energy consumption and utility costs will be lower. Additional benefits of improved air quality and sound proofing are beneficial for the residents but are difficult to equate to cost. And with the long-term durability of the development, it will take time to fully calculate whether the reward outweighs the risk of higher construction costs.

SDHDA has enjoyed learning from this challenge set before us and we will continue to partner with housing developers to improve energy efficiency, incorporate innovative building techniques and improve living environments for our families; while maintaining the balance of keeping housing affordable.



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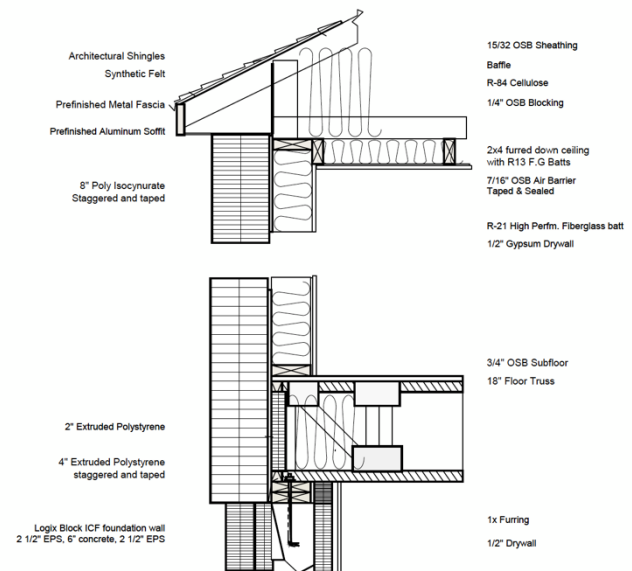
Supporting Visual Aids

Copper Pass Apartments



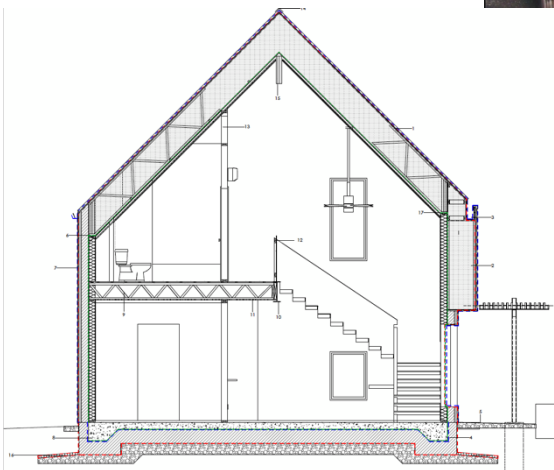
Informational Video about Copper Pass and the Passive standards with interviews - <https://app.frame.io/presentations/29720645-fa7f-413a-86f4-de5a5b77e677>

Passive Governor's House Prototype



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PH01:BRK



- 1.13 Vertical cross section
1. roof assembly  
 thermal bridge free to 206 btu/h/ft<sup>2</sup>D  
 24 gbs standing seam metal roofing  
 reverse board battens (1/3 one 2-4)  
 5/8" slip sheathing taped and sealed  
 waterproofing  
 2" open web joist with knuff mineral wool  
 1/2" oab taped and sealed  
 2x2 wood blocking 1/2" gap for electrical chase  
 1/2" magna/tech veneer plywood
  2. south wall  
 frame out on south wall  
 halfsawn  
 1/2" cecolux sheathing  
 2" wood joist filled with knuff mineral wool  
 built in gutter slope 1/4" per ft
  3. 12" Type II eps foam insulation density 1.80 pcf.  
 Rvalue = 5.00 per 1"
  4. 4" pcc rock
  5. taped and sealed around block of top of wall
  7. wall assembly  
 thermal bridge free to 206 btu/h/ft<sup>2</sup>D  
 6-25 handle board studs  
 2 1/2" insofast  
 4" eps foam insulation  
 7/16" slip sheathing taped and sealed  
 2x4 w/ 1/8" knuff mineral wool insulation  
 1/2" gwb finish
  8. slab assembly  
 thermal bridge free to 206 btu/h/ft<sup>2</sup>D  
 engineered joist  
 12" eps foam insulation seams taped and sealed  
 1/2" compacted fill  
 taped polyethylene water and vapor barrier  
 4" reinforced concrete
  9. ridge floor over 3/4" gwb  
 1" wood open web joist see struct.
  10. w/ flange brack
  11. gwb continues past flange
  12. 2x3 rafter 2" gap
  13. clearstory polycarbonate, note: some detail turns corner and terminates at ceiling line
  14. ridge vent
  15. ridge beam, note: tape and seal oab up barrier to glulam beam
  16. 2" 2" thick eps foam slab  
 oab sheathing continues on top of plate to brace to knee and to ceiling oab to maintain continuous air barrier.



# COPPER PASS



**3630 S Sparta Ave  
Sioux Falls  
1, 2 or 3 Bedrooms**

**Call Us Today!  
605-222-0390  
CostelloCo.com**

## **Brand New Passive Construction!**

- **Designed to reduce energy usage!**
- **Reduces temperature fluctuations**
- **Improves indoor air quality**
- **Fully equipped kitchens**
- **Washer/Dryer in every unit**

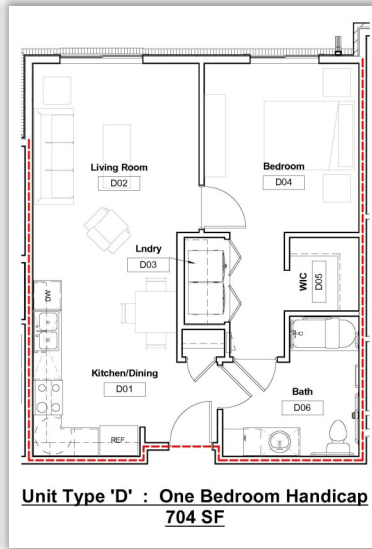
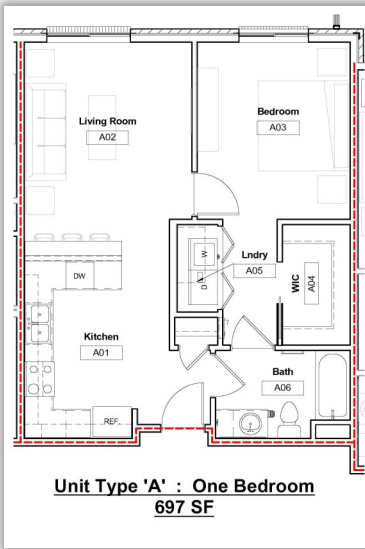
**Email Us! [CopperPass@costelloco.com](mailto:CopperPass@costelloco.com)**



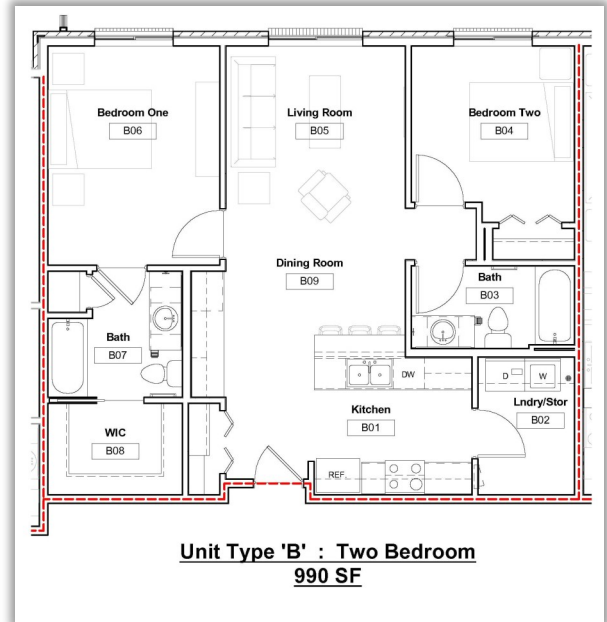
**Find us on  
facebook**



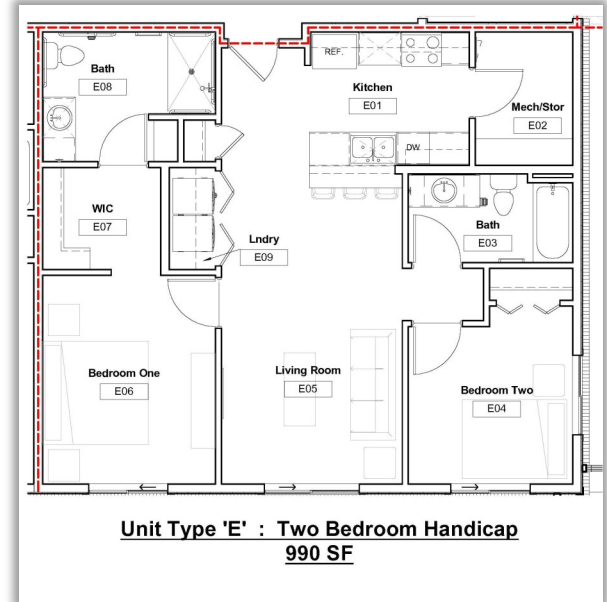
## 1 Bedroom / 1 Bath Floorplans



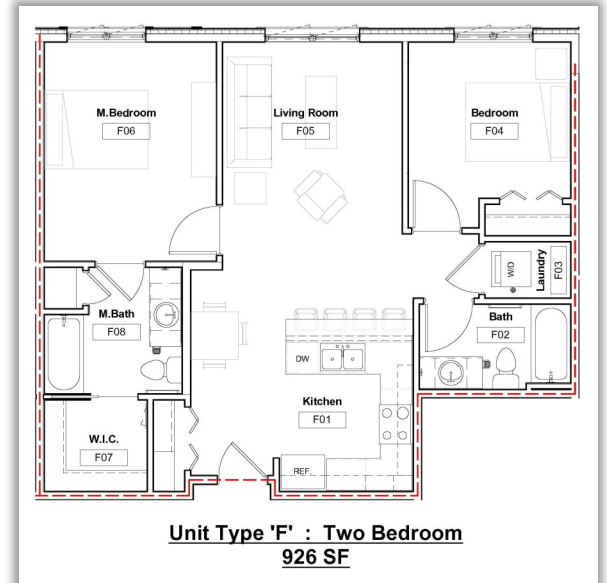
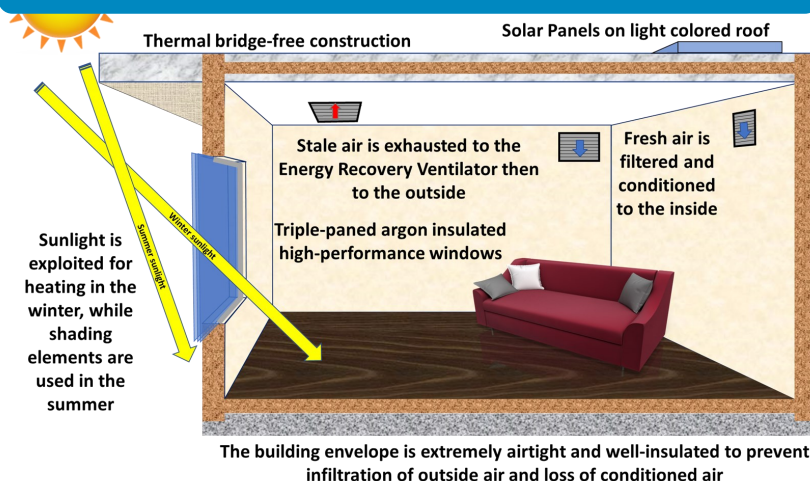
## 2 Bedroom / 2 Bath Floorplans



## 3 Bedroom / 2 Bath Floorplan



## Some Elements of a Passive Building





# COPPER PASS

South Dakota's First Passive  
Multi-family Building

## Passive Building Facts



*Passive Housing uses 90% less energy, but provide superior comfort and improved indoor air quality!*



*3-paned PVC-fiberglass windows keep heat in and street sounds out!*

*With an airtight thermal envelope, your home will stay moderate even in the midst of winter—with the electricity off!*

*A light colored roof and 22" of insulation harness the power of the sun!*

*A constant supply of fresh air replaces stale air in the home. Heated in the winter and cooled in the summer!*



Find us on  
**facebook**





## Your comfort depends on good air circulation!

Prevent any items from blocking your air vents!

- Use your kitchen hood fan when cooking
- Keep the bathroom door open when not in use
- Clean your dryer's lint filter before each use
- Change the settings on your ceiling fan in in the Spring and Fall



## Resident Information



No Smoking or Vaping is permitted in your apartment the building or on the property.



Additional Information Available Online Use this QR Code

## Important Numbers!

Manager:

605-222-0390

After-hours Maintenance:

605-335-4335

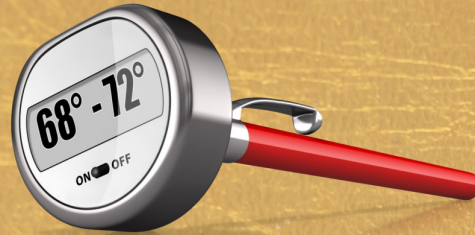




## Special Features of Your Home

The indoor temperature is primarily controlled with centralized equipment which provides fresh air to each apartment.

The fresh air coming to your apartment has been tempered — warmed or cooled as needed. It is designed to maintain a temperature in your unit of 68-72 degrees.



This system does NOT provide traditional air-conditioning and the temperature is not controlled by a thermostat in your apartment.

Unit back-up heaters are controlled by an internal thermostat.

The passive engineered features of your apartment require that nothing be hung over the windows (e.g. reflective foil, blankets, curtains or drapes etc.) Blinds are provided for each window.

The dryer is specially vented, so if an adjustment is needed, please call Maintenance. **Clean both of the 2 lint filters before each use.**

Avoid placing any items on your bathroom cove heater. Once a week gently wipe off any dust.

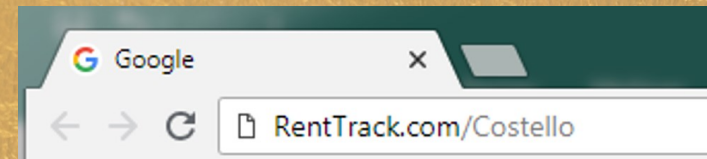


Your unit is furnished with ENERGY STAR appliances designed for cost-saving energy efficiency.

Do not block the vents in your unit. Your comfort depends on the vents functioning without any hinderance.

## Paying Rent Online

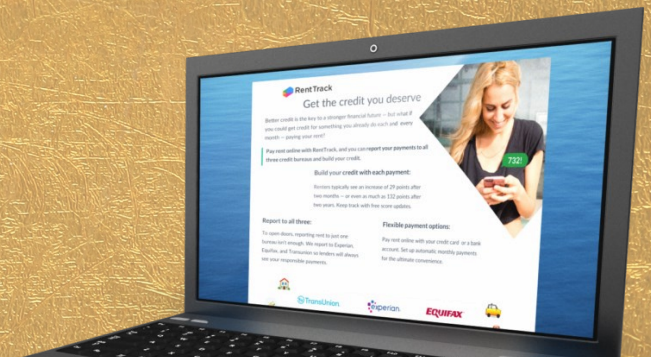
In your browser, enter: **RentTrack.com/Costello** <enter>



Enter your apartment address

Enter the needed information set up your account

Accept the terms of service and press “Continue”



## When Should You Call Maintenance?

- If you no longer have air flowing in your apartment
- If your plumbing is leaking or drains are clogged
- If you see a pest in your unit
- If your toilet overflows
- If your apartment is humid or uncomfortable
- **In case of fire** —exit first, then call 911, then manager



## Pest Prevention

- Eliminate excess clutter in your home and keep things tidy
- Sweep, mop and vacuum weekly
- Clean up spills right away and empty garbage/recycling bins
- Store food in tightly sealed containers
- Don't leave food or beverages (or used containers) out on tables or counters
- Store excess bedding and soft items in airtight plastic bins
- Notify maintenance immediately if you see a pest issue

### Ants

Ants will eat almost anything including bread and meat. They will forage up to 30 feet and can climb walls. Eliminating their food sources will prevent them looking in your home for an easy meal.



### Bed Bugs

Bed bugs are nocturnal insects that feed on blood. They are flat, reddish brown insects with 6 legs. Typically, they are found on mattresses, bedding, box springs and clothing. Bed bugs cannot survive heat above 122° Fahrenheit. So drying bedding, clothing, linens and other soft items in a dryer set on the highest heat setting will kill bed bugs in all stages.



### Cockroaches

Cockroaches will eat almost anything; soap glue and toothpaste included. Notify maintenance immediately if you have a plumbing leak as this is attractive to them. They are great hitchhikers and can be found in boxes, grocery bags and secondhand appliances.



Use the QR code on the front of this brochure to access an instructional video on opening and locking your windows.

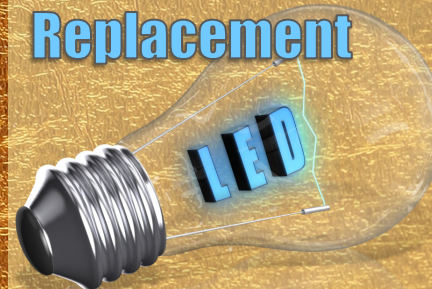
Your triple-paned, argon gas insulated windows are designed to reduce noise from outside when closed. These windows are also very energy efficient. To Open: Turn the window handle pointing up. Pull the top part

of the window in toward you. This allows fresh air into your home while keeping the elements out.

**NOTE: Do not disengage the safety bar which prevents the window opening far enough to cause damage. This limiter must only be disengaged when used as an emergency exit for building evacuation.**

Your apartment is equipped with LED light bulbs. These efficient, long lasting bulbs produce less heat and improved light quality. When these bulbs need to be replaced, Copper Pass will replace these bulbs at no cost to you.

**FREE LED Bulb Replacement**





## Tips for Comfort in Your Home

### During the warm summer months:

- At night, open the windows in your apartment, turn the handle up, then tilt the top of the window in toward you — this will flush the warm air from the building and help with cooling
- Avoid using the oven and other heat producing appliances when it's hot outside — your apartment is very efficient and your oven **will** heat your unit
- Close your window blinds from 10:00 am to 3:00 pm (the hottest part of the day)
- Set your ceiling fans to the summer setting



### During the cool winter months:

- Use your bathroom cove heater as needed (adjust the heater in gradual increments to ensure a comfortable temperature)
- Open your window blinds during daylight hours
- Set your ceiling fans to the winter setting



## Health and Safety Information

Due to tripping potential **NO** personal property or door mats are permitted in the hallways. Please place personal property inside your unit.



In the event of severe weather or tornado, go to the stairwell's lowest level landing.

In the event of a fire or building evacuation, go to the field west the building, across the street from the Copper Pass sign. This is where families, residents and staff will re-group.



Open flames in the unit are prohibited (This includes: candles, cigarettes, grills, E-cigarettes, and Vapes) No smoking or vaping is allowed in your unit, your building or on the property.

Prepare an Emergency Kit that includes:

- A well-stocked first aid kit
- A good, strong flashlight
- A portable radio
- Extra batteries
- Water
- Blankets, extra clothing, medication and prescriptions

