

**Comcast Center
Philadelphia, PA**

Heather Knizhnik
University of Pennsylvania
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In 2005, construction started on a landmark building that would set new standards for green design in Philadelphia and the U.S. The building which is known as the Comcast Center, is owned by Liberty Property Trust and Commerzbank Germany and was designed by Robert A.M. Stern Architects of New York. It is located at 1701 JFK Boulevard near the edge of center city Philadelphia. The building was completed in 2008 and is currently the tallest building in the city at 975 feet, 58 stories high; and the 15th tallest in the U.S (10th tallest by roof height). It is not only impressive to view with its obelisk shape and mirror-like facade; it contributes to the city's green initiatives and contains many examples of very innovative green technologies.

The Comcast Center was the brainchild of the late Willard J. Rouse III, the CEO of Liberty Property Trust, a major Philadelphia development firm. (*Rouse vision complete in new tower.* 2008) In 1999, with a number of companies' leases expiring and new companies moving into the city, he believed there was an opportunity for the development of a major office space. The 1.8 acre site was acquired in early 2001 and then a design was put in place for what would be the first new office tower built in the city for ten years. It was originally to be named One Pennsylvania Plaza and was envisioned to be 48 stories (750 ft) high and 1.1 million square feet with a golden Kasota stone facade to emulate the Philadelphia Art Museum. The projected cost was \$360 million. From this early stage, developers planned for it to be one of the first green certified skyscrapers in the country. There would be the added benefit of an expanded concourse from Suburban Station which would enhance public transit for many people working in that area by providing direct access to Regional Rail line and concourse access to the Market Frankford El, Broad Street Line and Trolleys. (*Controversial skyscraper will be built in downtown Philadelphia.* 2005)

As the economy began to falter in 2001 and '02, planning slowed down quite a bit. The developers were have trouble finding an anchor tenant. Early site work began in 2002 with the demolition of the existing building on the lot. Signs describing the new building went up on the site. Construction was stalled by controversy which broke out regarding the developers request for Keystone Opportunity Improvement Zone (KOZ). KOZ approval would have given the building large local and state tax breaks but opponents thought that the area was too successful and that KOZ status would give it an unfair advantage. It was not approved but did receive other state funds. (*Controversial*

skyscraper will be built in downtown Philadelphia. 2005)

In January 2005, Comcast signed a lease for the building and a construction contract was signed between Liberty Property Trust and construction company L.F. Driscoll. At this point, the design for the building was changed, the facade going from granite (it had already been changed from the Kasota stone) to glass and the shape of the top of the building changed, and the building being slightly taller at 975 feet. Its total area would increase to 1.25 million square feet. The final cost of the building would be \$495 million. After years of controversy and financial concerns, building was set to begin. Construction began after the groundbreaking ceremony, which took place on March 31, 2005.

Controversy over the building broke out again that March, but this time it was about one of the building's green design features, its waterless urinals. The urinals, which save 1.2 million gallons of water a year, were opposed by Philadelphia's Plumbers Union Local 690 who claimed that they would provide less work for plumbers and create unsanitary conditions. (Garvin, March 29, 2006) Liberty Property Trust stated that there were no issues with unsanitary conditions in any of its other buildings which utilized waterless urinals. A year later a compromise was reached and the Plumbing Advisory Board issued an approval; the agreement required the urinals' performance to be monitored and water piping to be installed as a backup plan in case the waterless technology failed.

The Comcast Center was "topped out" on in a ceremony held on June 18, 2007 when a steel beam was raised from the top of the skyscraper to the building's highest point. A statue of William Penn was attached to the top of the beam to try to break the "curse of Billy Penn", which supposedly prevented Philadelphia sports teams from winning any championships since the gentleman's agreement not to build higher than the statue of Penn that was atop City Hall was broken. (Holcomb, June 18, 2007) The Phillies did end up winning the World Series in 2008! The building officially opened June 6, 2008, however many office workers had started moving in early, since December 2007.



While designing the Comcast Center, developers had a plan to make it one of

the greenest skyscrapers in the country. Despite the expense of including green features, developers realized that what is better for the environment would also be a good investment. They succeeded in this goal – with a U.S. Green Building Council Gold LEED for Core and Shell (CS) rating that it received in April 2009, it is the tallest LEED certified building in the country. The building was designed with green technologies that would ensure that it would be energy efficient, reduce the urban heat island effect, conserve significant amounts of water within the building and prevent stormwater runoff outside the building. Responsible construction and waste reduction methods were also utilized throughout the building process. A detailed description of these technologies follows.

The building's low emissivity (low-E), low iron glass curtain wall blocks 60 percent of heat while at the same time allowing 70 percent of sunlight to enter. This has the dual benefit of keeping the interior of the building cooler in the summer and reducing the need for artificial light by allowing for a large amount of natural sunlight. (Comcast center achieves green design with duct products.2009) Clear, low-E glass covers the south facing winter garden, the nine stories above it, and the corners and crown of the building, reducing solar gain. Low-E coating, which is an extremely thin metal or metallic oxide coating, is applied to the surface of the glass to lower the U-Factor, or the incoming infrared radiation.(U.S. Department of Energy, Feb 9, 2011) The rest of the glass is lightly tinted and slightly reflective, giving the silvery appearance.(Stephens, 2009) The large 11 foot floor to ceiling windows ensure ample natural light throughout the building.

A 110 foot winter garden atrium serves as the main entryway to the building and the connection to retail stores and the public transit concourse. Winter gardens are an architectural design feature that comes from 17th to 19th century conservatories used to grow plants year round, which were often open to the public. The Comcast Center's winter garden also plays a major role in regulating air temperature in the building. Its atrium has sunshades and louvres to optimize daylight, reduce glare and provide an advanced ventilation system. The extra hot air is exhausted by the louvres and an active cooling system cools only the areas that people occupy, to avoid having to cool the entire 9 story space. In the winter, the sunshades deflect the cold air into the double wall of the atrium, preventing cold downdrafts from entering the indoor space. Another

interesting feature the underfloor water loop which is beneath a tempered floor surface; the loop is used to cool the winter garden and 6th floor atrium floor in the summer and provide radiant heat in the winter.(Liberty Property Trust)

Healthy indoor air quality was also promoted by using building products which emit less toxic fumes, such as low VOC paints, sealants, adhesives, carpets and composite woods. In addition, the building is equipped with CO2 sensors, that detect changes in the levels and trigger the ventilation system to provide fresh air. These feature all help ensure good air quality, which protects the health of the building occupants and is said to improve worker productivity.

Typically, adding buildings in a city increases the urban heat island effect, which is the phenomenon whereby air temperature in metropolitan areas is warmer than that of surrounding rural areas. The parking garage for the Comcast Center was placed underground, reducing heat absorption and trees were planted in the plaza area, providing cool shade for 30% of the plaza. A fountain which uses rainwater also provides evaporative cooling.(*Comcast center profile.*)

Several features that the building was designed with allow it to conserve 40% more water than the average office building of a similar size. Plumbing fixtures save over 3 million gallons of drinking water and the waterless urinals save 1.2 million gallons of water water from being used each year.(*Comcast center gets LEED certification.* April 22, 2009) The plumbing fixtures also reduce waste water from entering Philadelphia's overburdened sewer system. According to Liberty Property Trust, waste water is reduced by 4,950 gallons, or 25% of that produced by an average office building.(Liberty Property Trust,)

Stormwater runoff is reduced by the roof of the winter garden, which was designed to collect 60,000 gallons of rainwater a year. The water is used for irrigation of the plaza's vegetation. There is also a 4,500 sq. ft. green roof on top of the tower, which absorbs rain during storms and helps keep the building cool in the summer.(Liberty Property Trust)(*Center city green map: Green roofs in center city.* August 23, 2010)

A number of recycled, sustainably sourced or locally manufactured materials were utilized in the building's construction. Approximately 20% of the building materials contain recycled content.(DVGBC) Much attention to detail was paid to individual building components such as ceiling panels, duct wrap and insulation, which use recycled

materials. Former underground boiler oil tanks are being re-used as cisterns for stormwater capture. Also, 80% of wood products throughout the building are Forest Stewardship Council (FSC) certified. A significant effort was also made to reduce the amount of construction waste. A very substantial amount, approximately 77% (20,000 tons) of debris was diverted from the waste stream to be salvaged or recycled.

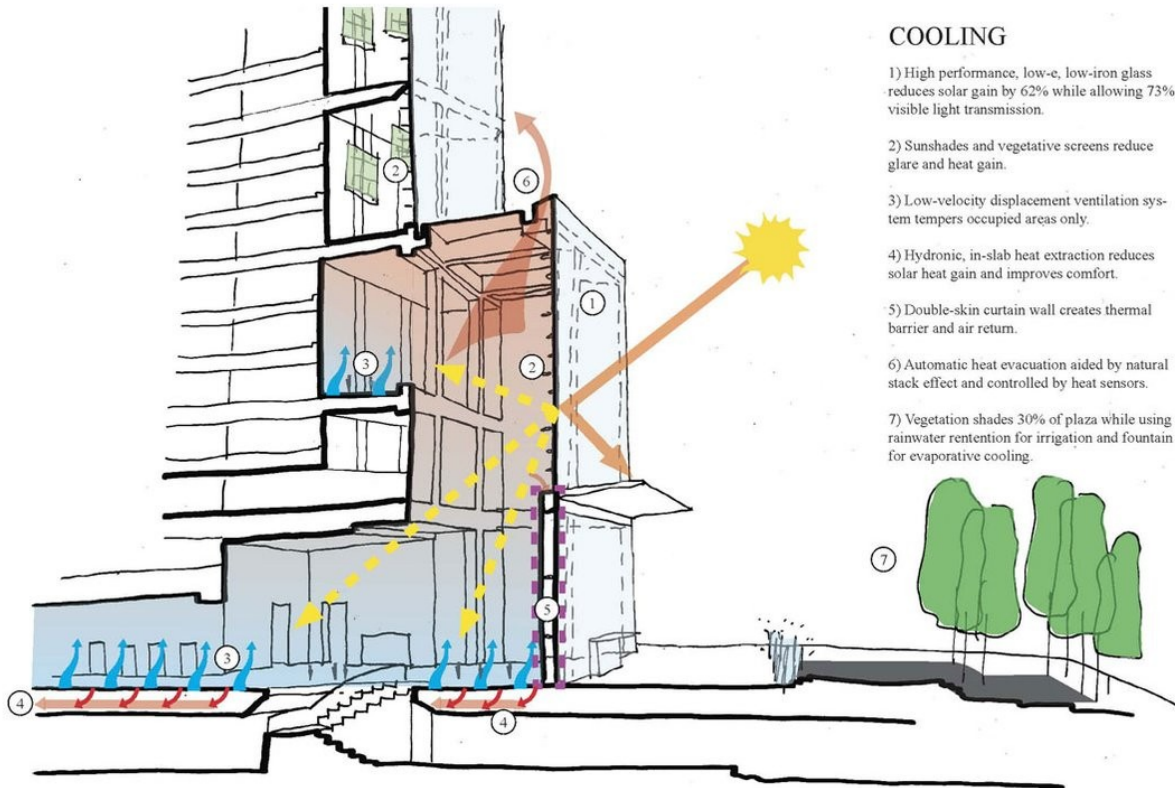
The winter garden also contains two interesting art displays, "Humanity in Motion" and "The Comcast Experience". Humanity in Motion designed by artist Jonathon Borofsky features human figures walking across multiple suspended poles in the atrium as well as a father and son figure observing the figures above. The Comcast Experience, which has become a tourist attraction in itself, is a 25.4 feet tall, 83.3 feet wide, high-definition panoramic LED screen which features content such as scenes from Philadelphia and images of space. (*The comcast experience HD video wall.*) It does run 18 hours a day, but it uses state-of-the-art LED technology which may minimize the amount of electricity needed for its operation. Though these art displays do not make the building more efficient in terms of green design, they do contribute a social dimension to the building which is an important quality for sustainable buildings. The building also has 36,000 square feet of retail and restaurant space, as well as a ½ acre public plaza, which provide the opportunity for additional shopping convenience, social interaction, jobs and economic productivity.

Urban developers and architects have some of the greatest challenges and biggest opportunities to design lower impact, highly sustainable buildings. The high densities and constant demand for construction and renovations mean that buildings must be designed in a manner that uses less resources. Downtown areas thrive on attracting businesses and the corporate world; and though not easily inclined to support environmental protection, they can clearly benefit by the investment in such technologies through reduced costs from measures such as those that increase energy and water efficiency. LEED certification is also a major attraction to potential tenants.

Having the Comcast Center in Philadelphia should be a source of pride for the city's residents, as it is a landmark in more than one sense. While not everyone may agree on its aesthetic appeal, it has undeniably changed the Philadelphia skyline. In its planning and construction, developers took advantage of the opportunity to incorporate green design into as many aspects of the building as possible. The Comcast Center is a

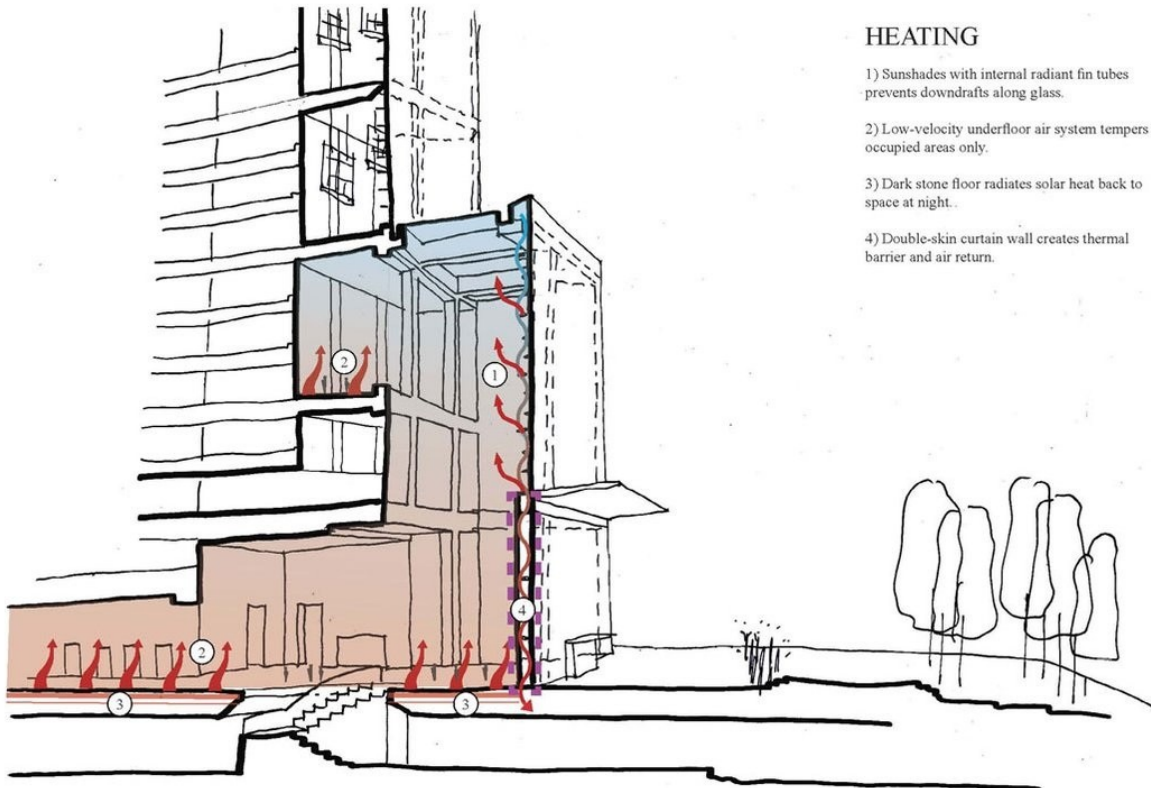
positive example of sustainable development, contributing to Philadelphia's initiative to become the greenest city in the country, and hopefully provides inspiration to other builders as well as home and business owners throughout the city.

Appendix



COOLING

- 1) High performance, low-e, low-iron glass reduces solar gain by 62% while allowing 73% visible light transmission.
- 2) Sunshades and vegetative screens reduce glare and heat gain.
- 3) Low-velocity displacement ventilation system tempers occupied areas only.
- 4) Hydronic, in-slab heat extraction reduces solar heat gain and improves comfort.
- 5) Double-skin curtain wall creates thermal barrier and air return.
- 6) Automatic heat evacuation aided by natural stack effect and controlled by heat sensors.
- 7) Vegetation shades 30% of plaza while using rainwater retention for irrigation and fountain for evaporative cooling.



HEATING

- 1) Sunshades with internal radiant fin tubes prevents downdrafts along glass.
- 2) Low-velocity underfloor air system tempers occupied areas only.
- 3) Dark stone floor radiates solar heat back to space at night.
- 4) Double-skin curtain wall creates thermal barrier and air return.

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