

4 Times Square

New York City

Highlighting high performance

Reaching 48 stories high, one of Manhattan's newest skyscrapers is also one of its greenest. Comprising 1.6 million square feet of environmentally responsible design, 4 Times Square is the first project of its size to adopt standards for energy efficiency, indoor ecology, sustainable materials, and responsible construction, operations, and maintenance procedures.

Developed by the Durst Organization and designed by Fox & Fowle Architects, the office tower sits at Broadway and 42nd Street, within walking distance of major mass transit systems in the city. Designers used a whole-building approach—

considering how the building's systems can work together most efficiently—and educated tenants on the benefits of the design. Tenants and their architects were informed of ways to take advantage of the building's infrastructure, as well as how to finish their spaces in a way that follows the spirit of the building's design.

The building required a higher initial investment, but with a promise of substantial savings on operating costs, less environmental impact, and a more productive, healthier work environment.



Low-energy design and renewable energy at 4 Times Square

Materials

4 Times Square designers emphasized environmentally responsible construction, choosing non-toxic and biodegradable materials as well as sustainably harvested wood and low-water-use equipment.

Resource conservation was also a priority. A structural steel **hat truss** at the top of the building significantly reduced the amount of steel used. The structure provides a rigid frame for resisting wind loads and reduces building sway. The introduction of concrete as a structural element further reduced the amount of steel needed. Also to save materials, the existing footings at the corner of 42nd and Broadway were reused. Approximately 65% of construction debris was recycled.

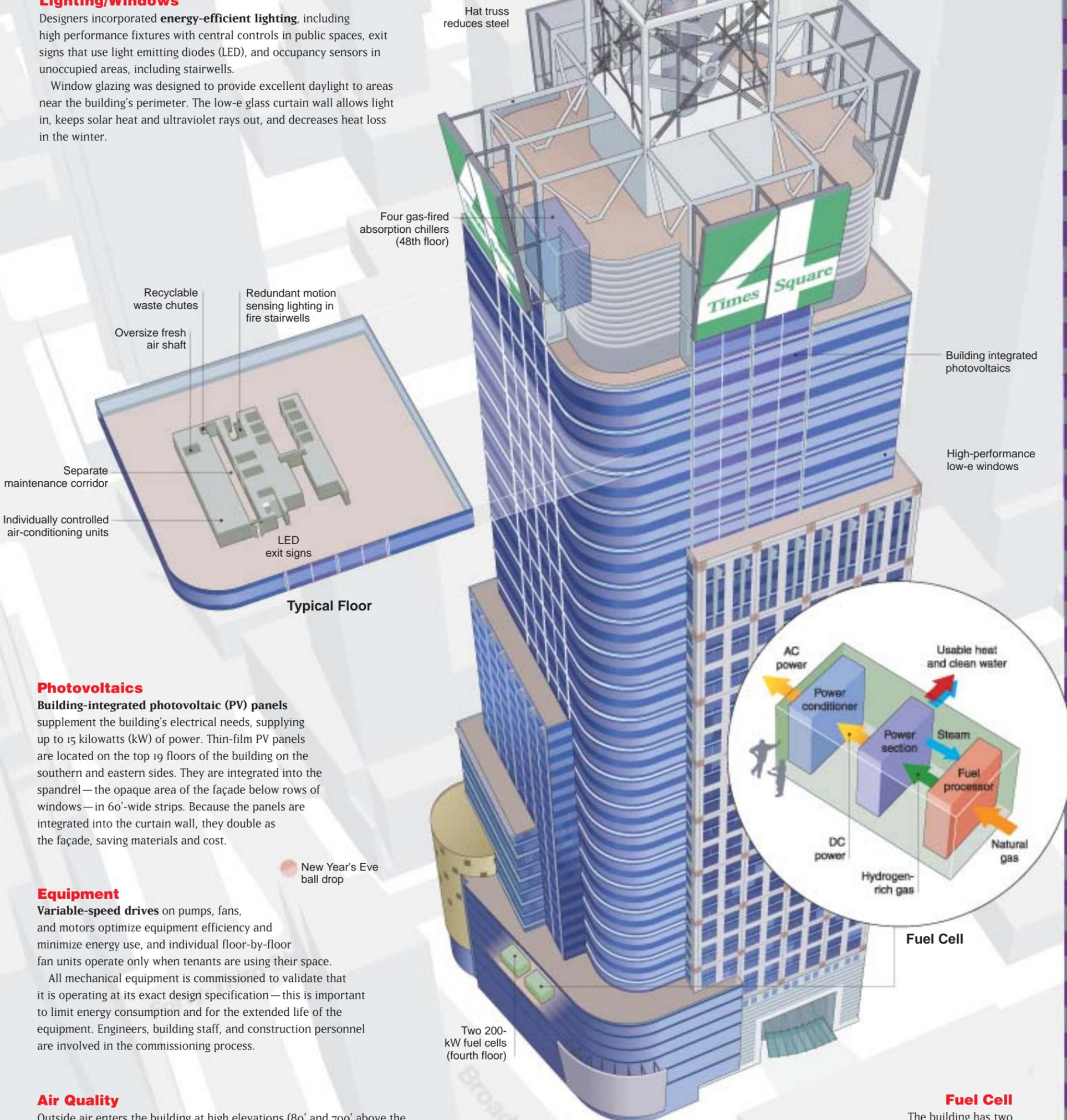
Lighting/Windows

Designers incorporated **energy-efficient lighting**, including high performance fixtures with central controls in public spaces, exit signs that use light emitting diodes (LED), and occupancy sensors in unoccupied areas, including stairwells.

Window glazing was designed to provide excellent daylight to areas near the building's perimeter. The low-e glass curtain wall allows light in, keeps solar heat and ultraviolet rays out, and decreases heat loss in the winter.

Cooling/Heating

Natural gas-powered **absorption chillers/heaters**, located on the roof, supply chilled and hot water to cool and heat the building. Comprising an absorber, a generator, a pump, and a recuperative heat exchanger, the chillers do not use ozone-depleting chlorofluorocarbons (CFCs). The systems vary in size, so they can be used at different times or in combination to match the building's needs.



Photovoltaics

Building-integrated photovoltaic (PV) panels supplement the building's electrical needs, supplying up to 15 kilowatts (kW) of power. Thin-film PV panels are located on the top 19 floors of the building on the southern and eastern sides. They are integrated into the spandrel—the opaque area of the façade below rows of windows—in 60'-wide strips. Because the panels are integrated into the curtain wall, they double as the façade, saving materials and cost.

Equipment

Variable-speed drives on pumps, fans, and motors optimize equipment efficiency and minimize energy use, and individual floor-by-floor fan units operate only when tenants are using their space.

All mechanical equipment is commissioned to validate that it is operating at its exact design specification—this is important to limit energy consumption and for the extended life of the equipment. Engineers, building staff, and construction personnel are involved in the commissioning process.

Air Quality

Outside air enters the building at high elevations (80' and 700' above the ground), avoiding as much street exhaust as possible. The building circulates 50% more indoor air than is required by New York City code, with additional capacity in the system to purge any four floors simultaneously with 100% outside air. The air is 85% filtered and monitored, and floor-by-floor air handling equipment allows individualized control and indoor air purge capacity.

A dedicated exhaust shaft is available to vent smoking and equipment rooms, and cleaning materials and building maintenance materials are non-toxic. Furniture, carpeting, materials, and finishes also affect air quality, but these are specified by tenants; a set of tenant guidelines encourages installation of the most benign furnishings and finishes.

Fuel Cell

The building has two 200-kW **fuel cells**, which use natural gas to generate power through a chemical reaction. Located on the fourth floor, the cells provide 100% of the nighttime electric demand without combustion, and hot water and carbon dioxide are the only by-products. The hot water is used to help heat the building during winter and to help heat domestic hot water. In the United States, 42% of all energy produced is lost as waste heat in combustion and transmission; generating energy on site and without combustion avoids substantial energy loss.

Buildings for the 21st Century

Buildings that are more energy efficient, comfortable, and affordable... that's the goal of the U.S. Department of Energy's Office of Building Technology, State and Community Programs (BTS). To accelerate the development and wide application of energy efficiency measures, BTS:

- Conducts R&D on technologies and concepts for energy efficiency, working closely with the building industry and with manufacturers of materials, equipment, and appliances
- Promotes energy/money saving opportunities to both builders and buyers of homes and commercial buildings
- Works with state and local regulatory groups to improve building codes, appliance standards, and guidelines for efficient energy use
- Provides support and grants to states and communities for deployment of energy-efficient technologies and practices.



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BUILDING TECHNOLOGY,
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AND RENEWABLE ENERGY



Predicting Savings through Computer Modeling

In the United States, 35% of the energy supply and 60% of annual electricity is used to operate buildings. 4 Times Square designers used the DOE-2 building energy simulation software to determine the most appropriate energy-efficiency alternatives for HVAC, lighting, and exterior cladding materials and techniques. DOE-2 simulates the building's hourly energy performance and energy costs, taking into account local weather conditions. The software models and allows users to compare potential energy savings, given a wide variety of options.

For more information on this and other building energy software tools, visit www.eren.doe.gov/buildings/energy_tools/.

More Information

The following table shows some of the energy-efficient features of the building as designed.

Key Features	
Wall insulation	R-value = 20
Windows	U-value 0.30; shading coefficient 0.30; visible transmittance 0.40
Daylight	High-performance windows and a partitioning design allow maximum daylight penetration to the interior; daylight sensors
Electric lights	Fluorescent fixtures and ballasts; occupancy sensors; central controls
Fans and pumps	High-efficiency variable-speed drives
Cooling/Heating	CFC- and HCFC-free natural gas-fired absorption chillers/heaters
Photovoltaics	15 kW, building integrated panels
Fuel cells	Two 200-kW fuel cells; hot water by-product helps to heat building and domestic water
Indoor air quality	50% more air than required by code is circulated; floor-by-floor air handling units; non-toxic cleaning and building maintenance materials
Materials	Sustainably harvested wood; low-water-use equipment
Resource conservation	Hat truss; 65% of construction debris recycled



The skyscraper was designed with two distinct façades, to mirror its diverse surroundings. It embraces the liveliness of the Times Square area to the west and north, and it maintains the composure of corporate midtown Manhattan on the south and east façades (shown above).

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