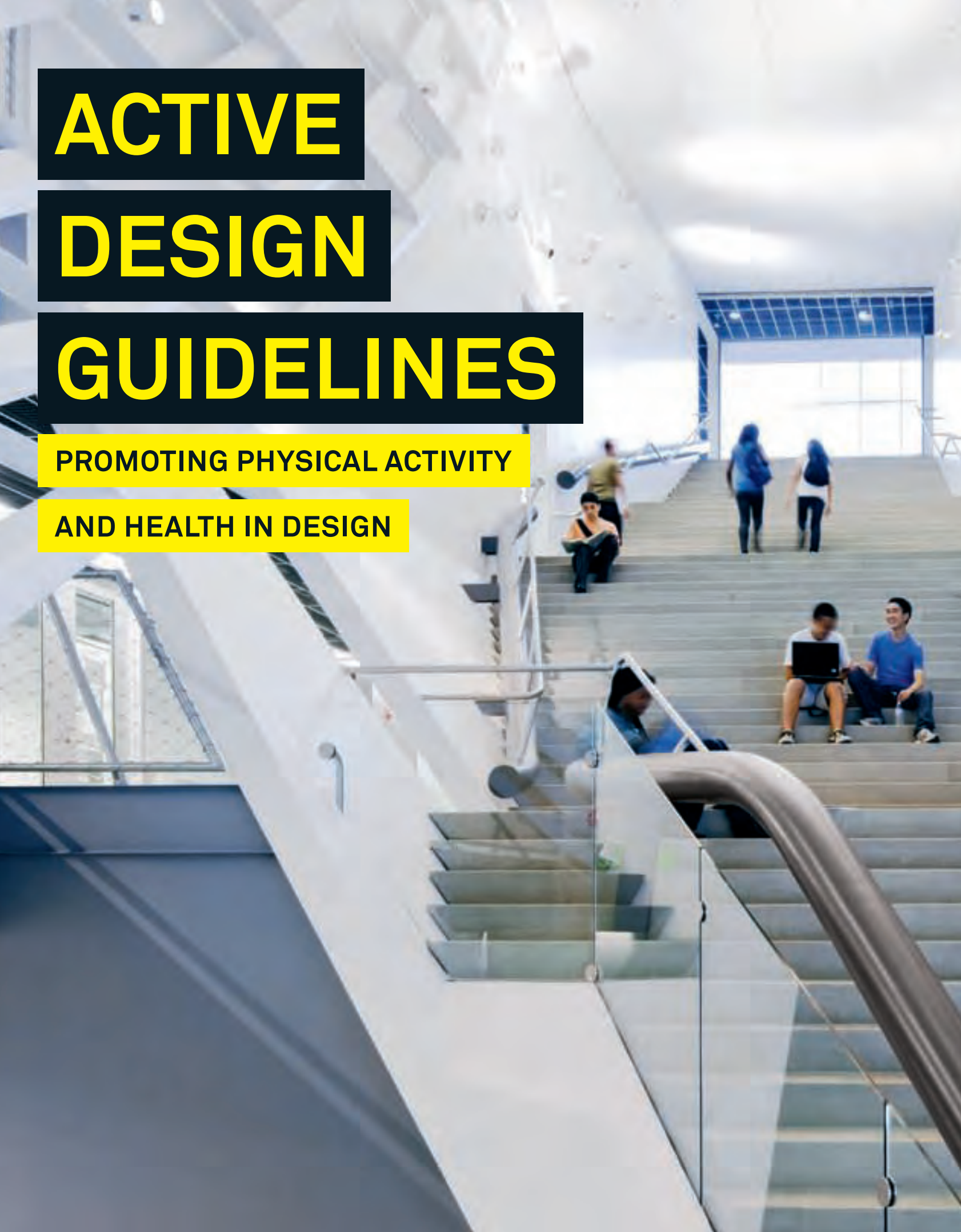
# ACTIVE DESIGN GUIDELINES

## PROMOTING PHYSICAL ACTIVITY AND HEALTH IN DESIGN



# ACTIVE DESIGN GUIDELINES

## PROMOTING PHYSICAL ACTIVITY AND HEALTH IN DESIGN

© 2010, City of New York
All rights reserved.

# TABLE OF CONTENTS


| | |
|---|---|
| Commissioners' Introduction | 004 |
| American Institute of Architects New York Introduction | 005 |
| **Executive Summary** | 006 |
| How to Use the Active Design Guidelines | 008 |
| Glossary of Symbols | 009 |
| Chapter 1<br>**Environmental Design and Health: Past and Present** | 010 |
| Chapter 2<br>**Urban Design: Creating an Active City** | 020 |
| Chapter 3<br>**Building Design: Creating Opportunities for Daily Physical Activity** | 066 |
| Chapter 4<br>**Synergies with Sustainable and Universal Design** | 108 |
| Appendix: LEED Physical Activity Innovation Credit | 130 |
| Photography Credits | 133 |
| Acknowledgments | 134 |

# COMMISSIONERS' INTRODUCTION

The New York City Departments of Design and Construction (DDC), Health and Mental Hygiene, Transportation (DOT), and City Planning are proud to present the *Active Design Guidelines: Promoting Physical Activity and Health in Design*. This publication complements other guidelines produced by the City of New York, such as the DDC's series of handbooks for architects and urban designers and the DOT's *Street Design Manual*. The *Guidelines* are also part of the vision of a more livable and hospitable NYC promoted in Mayor Bloomberg's Design + Construction Excellence Initiative. The *Active Design Guidelines* are the City's first publication to focus on designers' role in tackling one of the most urgent health crises of our day: obesity and related diseases including diabetes.

The *Active Design Guidelines* address those responsible for the planning and construction of buildings, streets, and neighborhoods. The publication seeks to educate designers about opportunities to increase daily physical activity, including measures such as making stairs more visible and providing inviting streetscapes for pedestrians and bicyclists. Several of these strategies are common sense; many are supported by academic research translated into practical recommendations. No single strategy alone will solve the obesity crisis. Implemented over a broad range of urban and architectural projects, however, these measures can contribute significantly toward bringing about healthier lifestyles in our communities. A number of the strategies in these guidelines can also reduce energy use in buildings, thereby benefiting the environment.

The four principal city agencies named above have partnered with the Mayor's Office of Management and Budget, the American Institute of Architects New York Chapter (AIANY), and with members of the academic community in developing the *Guidelines*. Earlier drafts of the *Guidelines* were circulated widely for review among public and private sector building professionals, and feedback was solicited in a design workshop held in January 2009. The authors also received helpful input from the Mayor's Office of Long-Term Planning and Sustainability; the Mayor's Office for People with Disabilities; School Construction Authority; the Departments of Buildings, Parks & Recreation, Housing Preservation and Development, and Aging; and from numerous design practitioners.

The goal of the *Guidelines* is to make New York City an even greater place to live, by creating an environment that enables all city residents to incorporate healthy activity into their daily lives.

David Burney
COMMISSIONER
*Department of Design and Construction*

Thomas Farley
COMMISSIONER
*Department of Health and Mental Hygiene*

Janette Sadik-Khan
COMMISSIONER
*Department of Transportation*

Amanda Burden
COMMISSIONER
*Department of City Planning*

# AMERICAN INSTITUTE OF ARCHITECTS NEW YORK INTRODUCTION

The City of New York should be commended for developing a cogent and concise set of active design guidelines. This manual draws upon specific examples to illustrate the most effective design strategies for achieving a more physically active way of living in New York City.

The tenets of the *Active Design Guidelines* draw on and go beyond the principles of the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) programs, addressing the ways that architectural, landscape, and urban design can meet people's varying needs. Through the conscientious integration of active design strategies into projects of all scales, design professionals can realize buildings and neighborhoods that seamlessly integrate more healthful and active living with attention to design excellence and sustainability.

The New York Chapter of the American Institute of Architects is dedicated to design excellence, professional development, and public outreach. The City's *Active Design Guidelines* combine these three goals in a well-written document that should be used by all architects, designers, and building owners as a reference and resource.

Sherida Paulsen, FAIA
2009 PRESIDENT
*AIA New York*

Fredric Bell, FAIA
EXECUTIVE DIRECTOR
*AIA New York*

# EXECUTIVE SUMMARY

Obesity and with it type 2 diabetes are now epidemic in New York City, and both problems are growing worse rapidly. The rise in obesity is tied to the population's over-consumption of calories and under-expenditure of human energy, both of which are shaped by the built environments in which we live, work, and play. Today, architectural and urban design too often support unhealthy rather than healthy diets, and sedentary rather than active daily lifestyles. The *Active Design Guidelines* aim to reverse these trends, by providing architects and urban designers in New York City and beyond with a manual for creating healthier buildings, streets, and urban spaces. Active design is environmental design that encourages stair climbing, walking, bicycling, transit use, active recreation, and healthy eating. Based on the latest academic research as well as best practices and cost-effective solutions developed in the field, the *Active Design Guidelines* suggest cost-effective ways to contribute toward the vision of a more livable and hospitable New York City promoted in Mayor Bloomberg's Design + Construction Excellence Initiative.

***Environmental Design and Health: Past and Present***

In the 19th and early 20th centuries, architects and urban reformers in New York City and elsewhere helped defeat infectious diseases like cholera and tuberculosis by improving buildings, streets, neighborhoods, clean water systems, and parks. In the 21st century, designers can again play a crucial role in combating the biggest public health epidemics of our time: obesity and related chronic diseases such as diabetes, heart disease, and some cancers. Today, physical inactivity and unhealthy diet are second only to tobacco as the main causes of premature death in the United States. A growing body of research suggests that evidence-based architectural and urban design strategies can increase regular physical activity and healthy eating.

***Urban Design: Creating an Active City***

The *Guidelines* present strategies for designing neighborhoods, streets, and outdoor spaces that encourage active transportation and recreation, including walking and bicycling. Key recommended measures include:

- Develop and maintain mixed land use in city neighborhoods;
- Improve access to transit and transit facilities;
- Improve access to plazas, parks, open spaces, and recreational facilities, and design these spaces to maximize their active use where appropriate;
- Improve access to full-service grocery stores and fresh produce;

- Design accessible, pedestrian-friendly streets with high connectivity, traffic calming features, landscaping, lighting, benches, and water fountains;

- Facilitate bicycling for recreation and transportation by developing continuous bicycle networks and incorporating infrastructure like safe indoor and outdoor bicycle parking.

***Building Design: Creating Opportunities for Daily Physical Activity***

**Opportunities for incorporating regular physical activity into daily life can be found not only outdoors but inside buildings as well. Architects can help building occupants incorporate physical activity into their daily routines through the following measures:**

- Increase stair use among the able-bodied by providing a conveniently located stair for everyday use, posting motivational signage to encourage stair use, and designing visible, appealing and comfortable stairs;

- Locate building functions to encourage brief bouts of walking to shared spaces such as mail and lunch rooms, provide appealing, supportive walking routes within buildings;

- Provide facilities that support exercise such as centrally visible physical activity spaces, showers, locker rooms, secure bicycle storage, and drinking fountains;

- Design building exteriors and massing that contribute to a pedestrian-friendly urban environment and that include maximum variety and transparency, multiple entries, stoops, and canopies.

***Synergies with Sustainable and Universal Design***

**Active design promises benefits not only for public health but also for the environment and for advancing universal design. Design strategies that increase physical activity and improve health—for example, measures that promote walking over driving, stair over elevator use, and active recreation over television watching—also tend to reduce energy consumption and greenhouse gas emissions. In addition, active design can assist not only people able to climb stairs daily, but users of all mobilities, ages, and backgrounds. A diverse, active, healthy population and a sustainable planet are synergistic.**

**This chapter describes the importance of value creation and cost-effectiveness, as well as points of synergy between active design strategies and a number of local, national, and international initiatives, including the Leadership in Energy and Environmental Design (LEED) green building rating system, PlaNYC—New York City's strategic plan for sustainability, the City Health Department's Take Care New York program, and efforts by the City's Departments of Transportation and City Planning to expand New York's bicycling infrastructure.**

***Conclusion***

**Designers have an essential role in addressing the rapidly growing epidemics of obesity and related chronic diseases, especially in light of mounting scientific evidence demonstrating the impact of environmental design on physical activity and healthy eating. By adopting the strategies included in the *Active Design Guidelines*, architects and urban designers can help to significantly improve the health and well-being of the population.**

# HOW TO USE THE ACTIVE DESIGN GUIDELINES

**Why do we need the *Guidelines*?**

History has shown that environmental design can play a crucial role in improving public health. Today, architects, urban designers, and planners can help address one of the most urgent and widespread epidemics of our time, obesity and its related diseases, by implementing the strategies contained in the *Active Design Guidelines*. Just as design professionals are increasingly embracing green building as an objective, so too should they consider the potential effects of their designs on public health and well-being. With the publication of the *Guidelines*, the City of New York signals its commitment to integrating active design principles into projects being developed in the metropolitan area.

**Who will use the *Guidelines*?**

The *Active Design Guidelines* address all who have a role in the design and construction of the built environment. This encompasses professional designers such as planners, urban designers, architects, landscape architects, and engineers; project sponsors such as government agencies, building owners, and private developers; building managers; and user groups, including bicyclists, city residents, and building occupants. Given the broad intended audience of the publication, the *Guidelines* incorporate strategies addressing a range of scales, from land use planning to the details of stair design. The presentation of a wide spectrum of strategies in one document is intended to aid and encourage collaboration among different design professionals in promoting health through design. Although the *Guidelines* are written with New York City as the focus, the strategies contained here can also be applied to other cities and communities. The *Guidelines* will also assist architectural, planning, and design educators seeking to incorporate key health-promoting design factors into student projects and curricula.

**How should the *Guidelines* be used?**

Readers are encouraged to peruse the *Guidelines* in their entirety, to get a clear understanding of the health problems addressed and the range of strategies available to combat these epidemics. Some parts of the publication may be more relevant to a given project than others. The *Guidelines* contain strategies as diverse as New York's five boroughs—addressing projects large and small, urban and suburban, public and private, new and existing. We encourage project sponsors and designers to incorporate as many relevant active design strategies as possible into each project, and to incorporate at least some strategies into every project. The more active design strategies are utilized, the more likely a project will increase daily physical activity—and the greater the project's potential impact on health.

Designers and project sponsors are encouraged to initiate discussions about active design issues early on, during a project's programming and scoping phase. Project partners should meet initially to set goals and to assess which potential active design strategies can be incorporated in the project. The *Guidelines* include checklists at the end of chapters 2 and 3, to assist in the identification of relevant strategies. The *Guidelines* are intended to complement and enhance existing regulating documents and agencies; where feasible, information about relevant legal references is included as "Additional Information" for readers' convenience. Designers may also find helpful a chart in chapter 4 that identifies LEED credits related to active design. The project team should continue to work together on pursuing active design principles as the project develops.

Project sponsors and decision makers should consider incorporating active design principles into contract criteria for future building and planning projects. Committed sponsors and designers may want to identify pilot or demonstration projects that focus on health by incorporating many active design strategies. Publicizing and emphasizing the health benefits of innovative pilot projects can help to educate the public and to create demand for more active design projects. Finally, designers and project sponsors may seek the assistance of health, architectural, and planning researchers in evaluating health, sustainability, and other outcomes of projects.

## GLOSSARY OF SYMBOLS

The design strategies in these *Guidelines* are rated according to the strength of the supporting research evidence. This rating system was developed by assessing the strength of individual research studies and the pattern of findings. We have attempted to distinguish between strategies that are based on theory and existing practice and those grounded in evidence-based research on the relationship between the built environment and physical activity. Strategies with strong underlying research are known to likely result in increased physical activity. Recommendations supported by emerging evidence or best practices may be just as effective as measures grounded in strong evidence, but have not yet been researched or quantified to the same degree.

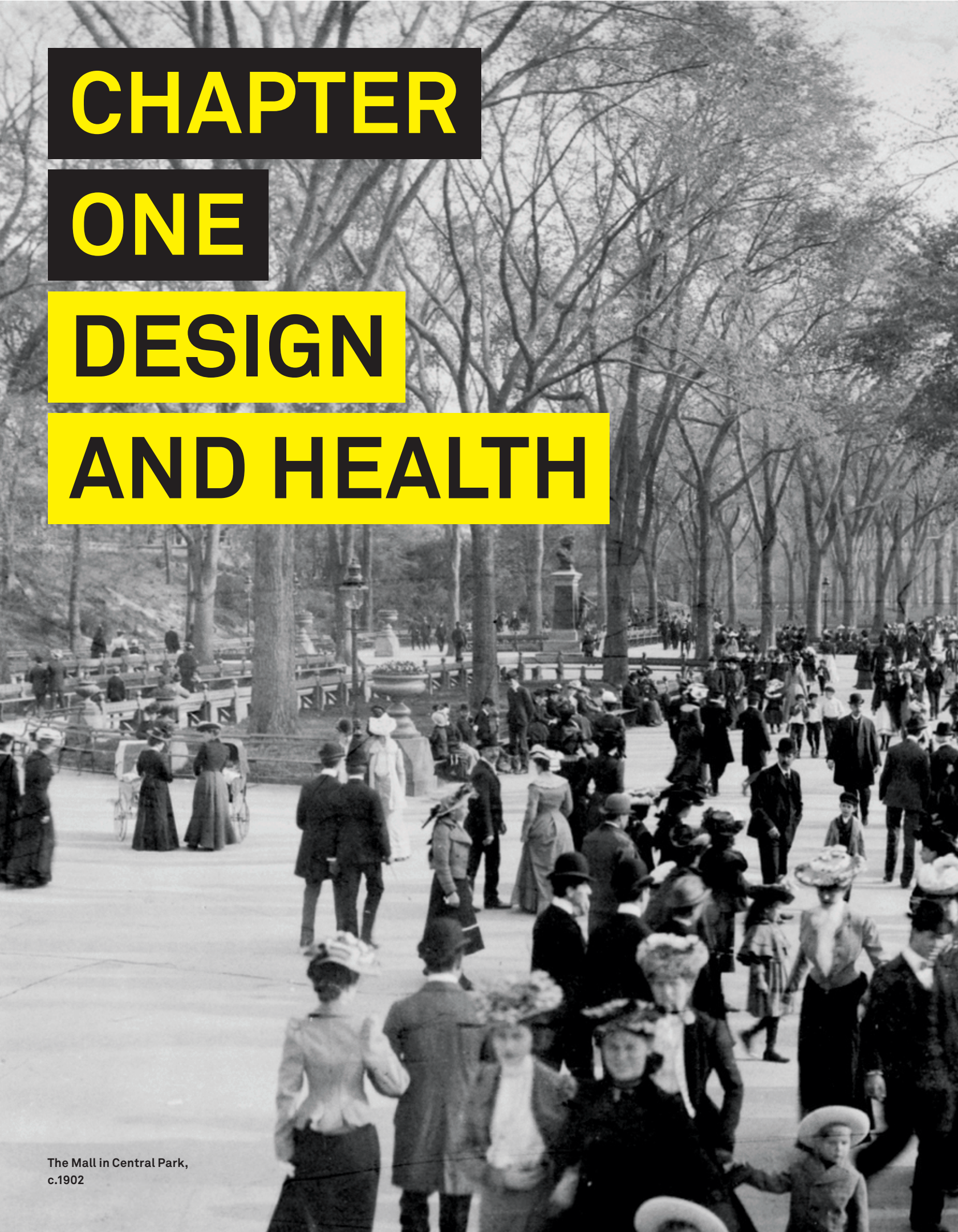
An icon system is used throughout the *Guidelines* to assist the reader in understanding the strength of the evidence underlying each strategy:

★ **Strong Evidence**
Indicates design strategies supported by a pattern of evidence from at least two longitudinal or five cross-sectional studies. The strength of the research allows us to discard alternative hypotheses and to conclude that there is a direct relationship between the suggested environmental intervention and the behavioral outcome.

☆ **Emerging Evidence**
Indicates design strategies supported by an emerging pattern of research. Existing studies give reason to believe that the suggested environmental intervention will likely lead to increased physical activity, but the research is not yet definitive.

◇ **Best Practice**
Indicates design strategies without a formal evidence base. However, theory, common understandings of behavior, and experience from existing practice indicate that these measures will likely increase physical activity.

# CHAPTER ONE DESIGN AND HEALTH



The Mall in Central Park, c.1902

# ENVIRONMENTAL DESIGN AND HEALTH: PAST AND PRESENT

The *Active Design Guidelines* are grounded in the idea that the design of the built environment can have a crucial and positive influence on improving public health. This notion is aptly demonstrated in the history of New York City, where public health officials have used environmental design strategies to help combat disease since the 19th century. Just as architecture and urban design were crucial to defeating epidemics like cholera and tuberculosis in the past, environmental design will be an essential tool in combating the most pressing public health problem of our time—obesity, and its related chronic diseases.

***Progress in Public Health and Environmental Design***

For centuries, societies have used environmental design measures to solve the worst public health problems. In 1854, John Snow, the founder of modern epidemiology, traced the source of a cholera outbreak in London to a contaminated water pump. The spread of the epidemic was stopped by removing the handle from the pump.

New York City officials likewise have employed environmental design interventions to combat epidemics of infectious disease throughout the city's history. In the late 19th and early 20th centuries, haphazard and relentless growth created an unhealthy urban landscape of dark, filthy streets and tenements. Rapid population growth—from a mere 40,000 in 1800 to approximately 4.5 million by 1900—resulted in massive overcrowding. Human, animal, and kitchen wastes abounded, contaminating the water supply. Not surprisingly, New York was plagued by repeated epidemics of infectious diseases such as tuberculosis, cholera, and yellow fever.[1] Between 1810 and 1856, mortality rates in the metropolis doubled. Then, as now, illness and death disproportionately affected the poor. In 1856, one

Throughout New York City's history, environmental design measures have been used to tackle diseases and epidemics such as tuberculosis and cholera. The construction of Central Park in 1857 provided open space and fresh air needed for health and well-being.

out of every 23 people died in the city's poorest ward, compared to one in 55 in the wealthiest quarter.[2]

Officials went to work, tackling the epidemics through a series of major environmental design responses: The Croton aqueduct system, created in 1842, brought fresh, clean water to the city from upstate New York. Central Park was built in 1857 and was hailed as the "working man's lungs." The Department of Street Sweeping (now the Department of Sanitation) was established in 1881. In 1901, the Tenement House Act banned the construction of dark, airless buildings. The subway was constructed in 1904, helping to disperse the population from overcrowded lower Manhattan. And in 1916, a zoning ordinance required that buildings be set back from the roadway as they grew taller, to allow light and air into streets and buildings.[1, 3–5]

Environmental design will be an essential tool in combating the most pressing public health problem of our time—obesity, and its related chronic diseases.

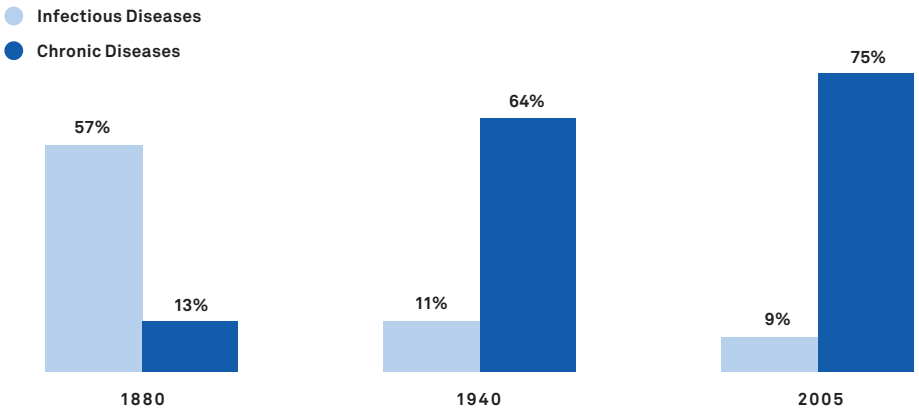
By 1940, environmental design strategies, in combination with societal changes, had successfully controlled infectious diseases like cholera and tuberculosis, even prior to the discovery of almost all antibiotics and other modern medical technologies. In 1940, infectious diseases—the major causes of mortality in the late 19th century—accounted for only 11 percent of deaths.[3,6] Even today, environmental strategies—such as the provision of clean water and adequate sanitation—are the main methods for controlling most water- and vector-borne diseases like cholera.

***Diseases of the 21st Century: Obesity and Chronic Diseases***

Environmental solutions were effective tools in the prevention and control of the infectious diseases of the last century, but it took time for the solutions to emerge. Today, environmental design remains key to building and maintaining a healthy society. Recent successes include the improvement of air quality through air pollution controls and smoke-free indoor air acts, the abatement of dangerous materials such as asbestos and lead, and laws mandating the installation of child window guards. These and other efforts have once again demonstrated that good environmental design can vastly improve public health and cut mortality rates.[3,7] Whereas infectious diseases were the gravest health threats of an earlier era, the largest killers of our time are chronic diseases such as heart disease and strokes, cancers, and diabetes, for which the leading risk factors are obesity, physical inactivity, poor diets and smoking.[8–11] We are only now identifying and deploying the best environmental practices to fight these conditions.

Chronic diseases have now replaced infectious diseases as the predominant cause of death in New York City.

**CHANGING PERCENTAGE OF DEATHS IN NYC ATTRIBUTED TO INFECTIOUS VERSUS CHRONIC DISEASES, 1880 TO 2005**




*Source: The City of New York Summary of Vital Statistics 2005*

Over the last two decades, obesity has become epidemic in New York City and the United States, and continues to rise at an alarming pace. The majority of adults and 43 percent of elementary school children in New York City are overweight or obese.[12,13] The underlying causes of obesity—namely, physical inactivity and unhealthy diet—are second only to tobacco as the major causes of premature death.[10,11,14] Obesity increases the risk of cardiovascular diseases, which are the leading cause of death globally[8,9] and in New York City, accounting for nearly 25,000 deaths annually in the metropolitan area.[15] Obesity is also associated with increased risk of several common and deadly cancers, including breast and colon cancers.[16] Perhaps the most widespread and direct epidemic linked to obesity is a more than doubling of the rate of diabetes in recent years. Diabetes in turn leads to complications such as blindness, limb amputations, cardiovascular disease, and kidney failure.[17] Whereas type 2 diabetes was once a condition seen mainly in older adults, today, as a result of obesity, it is increasingly found among children. When diagnosed in children and young adults, its complications can be anticipated to occur in early adulthood, with serious consequences for quality of life and health care costs. It is estimated that roughly one in three males and two in five females born in the United States in 2000 are at risk of being diagnosed with diabetes during their lifetimes.[18] The estimated lifetime risk is even higher among minority populations, with Hispanic females having a roughly one in two risk.[18]

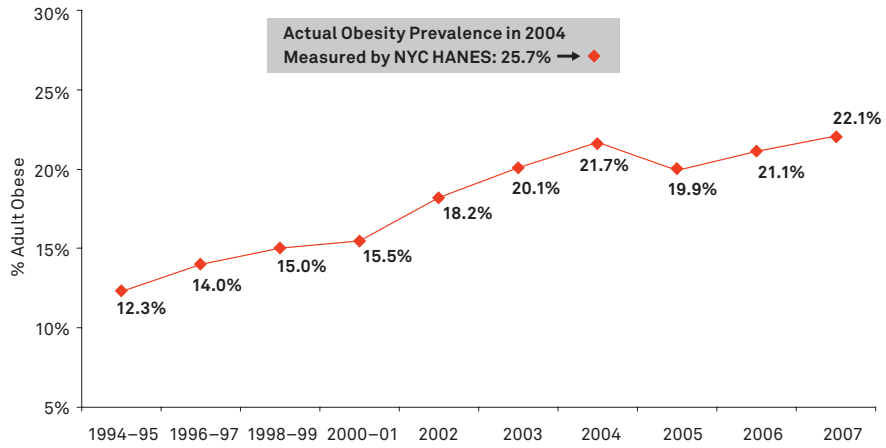
Obesity exacts a toll not only on our health but also on our economy, in the form of rising health care and disability costs and declining productivity and workforce availability. In 2000, the total direct and indirect health care costs attributable to obesity in the United States were estimated to be $117 billion.[19] More far-reaching economic consequences include fuel expenses[20] and costs from insurance, disability, absenteeism, and decreased productivity for the business sector.[21] This economic burden is only anticipated to grow. If the current rate of increase in obesity continues, the total health care costs attributable to obesity are anticipated to double every decade, reaching $860 to $960 billion by 2030.[22]

Today, Americans consume more calories than they expend, thanks to poor diet and low levels of physical activity. Physical activity is a critical factor in weight loss and weight loss maintenance, and in the prevention of weight gain. Physical activity

In the late 19th and early 20th centuries, haphazard and relentless growth in New York City created an unhealthy urban landscape of dark, filthy streets and tenements.

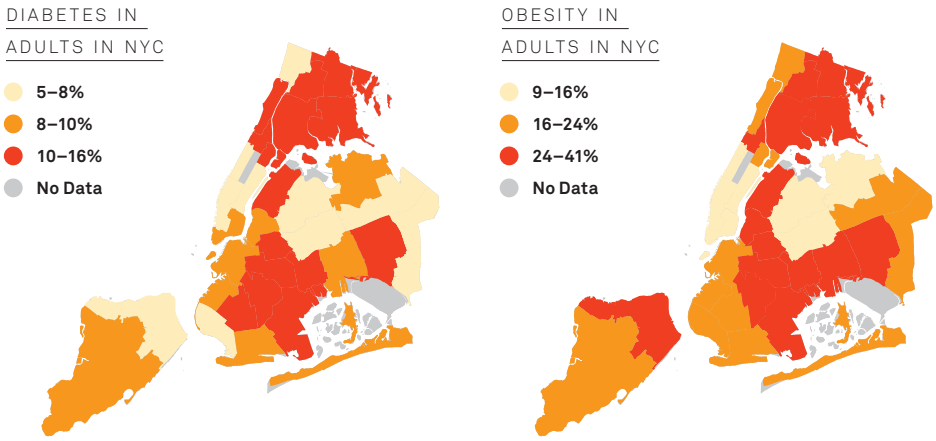
**Obesity has become epidemic in New York City. The majority of adults and 43 percent of elementary school children in New York City are overweight or obese.**

## ADULTS WITH SELF-REPORTED OBESITY, NYC, 1994–2007



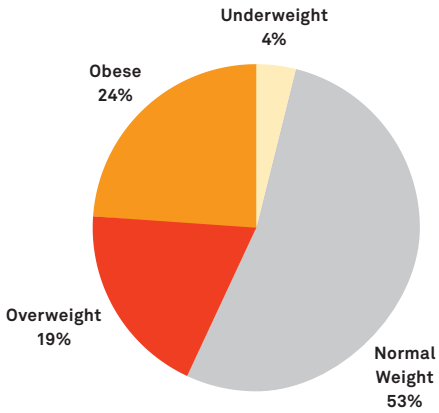

*Sources: NYC Department of Health and Mental Hygiene, Community Health Survey, 1994–2007; NYC Department of Health and Mental Hygiene, NYC Health and Nutrition Examination Survey, 2004*

## DIABETES AND OBESITY RATES IN NYC BY NEIGHBORHOOD




*Source: NYC Department of Health and Mental Hygiene, Community Health Survey, 2006*

## VERY HIGH RATES OF CHILDHOOD OVERWEIGHT & OBESITY, NYC




*Source: NYC Department of Health and Mental Hygiene, NYC Vital Signs, 2003*

also prevents leading chronic diseases including type 2 diabetes, cardiovascular disease, and some of our most common and deadly cancers, such as colon cancer, even when there is no reduction in weight.[23] With an aging population, the benefits of physical activity in preventing falls and protecting against cognitive decline are also critical.[23] For adults, the U.S. Department of Health and Human Services currently recommends at least 150 minutes of moderate aerobic physical activity (such as cycling or brisk walking) per week, or 75 minutes of vigorous activity (such as running) per week. Aerobic activity should be spread throughout the week, and can be accumulated in 10-minute bouts.[23] For children, the recommendation is 60 minutes or more of daily physical activity.[23,24]

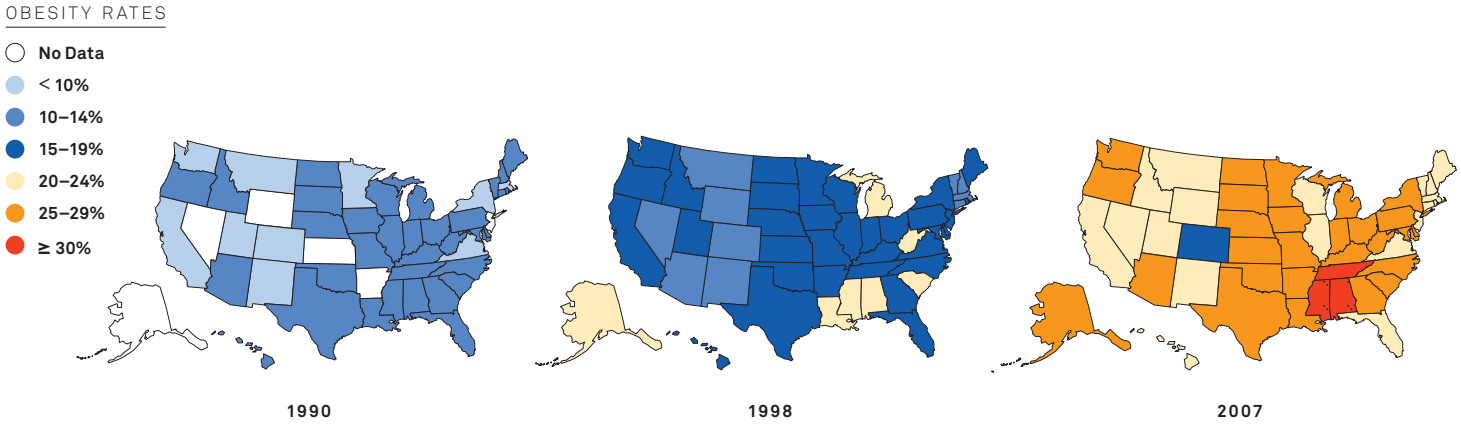
In NYC, only 42 percent of adults reported meeting the recommendations for physical activity in 2007.[25] Although leisure-time activity has been relatively stable or may have increased slightly in recent years, activity at work, at home, and from transportation has decreased.[26] Physical activity, once part of our normal lives, has been designed out of our daily routines. Sedentary jobs have taken the place of manual labor, cars have replaced walking or biking, elevators and escalators have supplanted stair climbing, and televisions, computers and video games have displaced active leisure pursuits, especially among children. The design of our buildings, streets, neighborhoods, and cities often makes physical activity unnatural and difficult to achieve. At the same time, instead of using our own physical energies, we have increased our reliance on external sources of energy, with negative consequences for the environment, and for our lungs.

Rather then just telling people to go the gym, public health professionals and advocates must work with architects, urban designers, and planners to reverse the design trends that have contributed to declining physical activity. Creating opportunities for exercise in daily life routines can increase physical activity and assist in controlling epidemics related to obesity, as well as contribute to environmental sustainability.

To take just one example, architects can encourage exercise by designing prominent and attractive stairs. Stair use burns calories and can also have a direct impact on cardiovascular health.[27–29] Stair climbing has also been shown to raise individuals' good cholesterol levels.[30] Conversely, elevator use not only reduces physical activity, but also typically accounts for 3 to 10 percent of a building's energy use.[31]

**Obesity has increased dramatically in the United States since 1990.**

## OBESITY TRENDS AMONG U.S. ADULTS




*Obesity is defined as a Body Mass Index (BMI) ≥ 30, or about 30 lbs overweight for a 5'4" person.*
*Source: CDC Behavioral Risk Factor Surveillance System*

Neighborhood design can also significantly impact physical activity and health, especially through features such as land use mix, walkability, bicycling infrastructure, and parks and open space. A study conducted in Atlanta, Georgia, found that each quartile increase of land-use mix—an attribute of neighborhoods that encourages walking—was associated with a 12 percent reduction in the likelihood of obesity.[32] The same study found a link between the walkability of a neighborhood and a reduction in per capita air pollutants and greenhouse gases, supporting the idea that physical activity and environmental improvement are linked.[33,34] Cycling even just 15 minutes or 2.5 miles—less than the average commuting distance—twice a day is enough to burn the equivalent of more than 10 pounds annually.[35] Other studies have found that obesity rates are lower in countries such as Germany, Denmark, and the Netherlands, where biking infrastructure is better and where more trips are taken by foot, bicycle, and transit.[36,37] Numerous studies have linked proximity of parks and other recreational facilities to higher levels of physical activity among both youth and adults.[38]

Neighborhood design may have particular consequences for the health of children, especially those in low-income neighborhoods.[38] Neighborhood blocks with higher socioeconomic status are more likely to have physical activity facilities than lower-income blocks.[39,40] Increased number of physical activity facilities has been associated with lower obesity and greater physical activity in youth.[40]

Finally, providing workplace exercise programs and access to healthy foods can also contribute to improved public health. Workplace physical activity programs in the United States have been shown to reduce short-term sick leave and health care costs and to increase productivity.[41] Research also clearly indicates that proximity to full service supermarkets is associated with lower obesity, yet access to fruits, vegetables and other healthy foods is limited in many urban neighborhoods, particularly low-income communities.[38,42,43]

As Dr. Thomas Frieden, former NYC Health Commissioner and current Director of the U.S. Centers for Disease Control and Prevention, states, "Changes in housing, water, and the physical environment were essential to controlling infectious disease. Today, modifications of the food environment to address obesity, or of the physical environment to promote physical activity, will be of central importance for chronic disease prevention and control."[44]

**Numerous studies have linked proximity of parks and other recreational facilities to higher levels of physical activity.** The Floating Pool Barge, a swimming facility designed by Jonathan Kirschenfeld for the Neptune Foundation, was moved in 2008 to Barretto Point Park in the Bronx. It is operated during the summer by City of New York / Parks & Recreation.

REFERENCES


1. Rosner D. A social history of disease in the 19th and early 20th century New York: lessons learned for the 21st century. Lecture presented at the NYC Department of Health and Mental Hygiene; March 17, 2008.
2. Rosner D, ed. *Hives of Sickness: Public Health and Epidemics in New York City.* New York: Museum of the City of New York; 1995.
3. Jones, MM. Protecting Public Health in New York City: 200 Years of Leadership; 1805–2005. 2005. http://www.nyc.gov/html/doh/downloads/pdf/bicentennial/historical-booklet.pdf. Accessed March 7, 2008.
4. Duffy J. *A History of Public Health in New York City: 1866–1966.* New York: Russell Sage Foundation; 1974.
5. Freudenberg N, Galea S, Vlahov D, eds. *Cities and the Health of the Public.* 1st ed. Nashville: Vanderbilt University Press; 2006.
6. Cutler D, Miller G. The role of public health improvements in health advances: the twentieth-century United States. *Demography.* 2005;42(1): p. 1–22.
7. Farley T, Cohen D. *Prescription for a Healthy Nation.* 1st ed. Boston: Beacon Press; 2005.
8. World Health Organization. Cardiovascular diseases: Fact sheet number 317; February 2007. http://www.who.int/mediacentre/factsheets/fs317/en/index.html. Accessed September 23, 2008.
9. Lopez AD, et al. Global and regional burden of disease and risk factors, 2001: systematic analysis of population health data. *Lancet.* 2006;367(9524): p. 1747–1757.
10. Mokdad AH, et al. Actual causes of death in the United States, 2000. *Journal of the American Medical Association*. 2004; 291(10): p. 1238–1245.
11. McGinnis JM, Foege WH. Actual causes of death in the United States. *Journal of the American Medical Association.* 1993;270: p. 2207–2212.
12. New York City Department of Health and Mental Hygiene. Epiquery: NYC Interactive Health Data System: Community Health Survey 2008. https://a816-healthpsi.nyc.gov/epiquery/EpiQuery/CHS/index2008.html. Accessed December 2, 2009.
13. New York City Department of Health and Mental Hygiene. Obesity begins early: findings among elementary school children in New York City. 2003. http://www.nyc.gov/html/doh/downloads/pdf/survey/survey-2003childobesity.pdf. Accessed June 8, 2008.
14. U.S. Department of Health and Human Services. *Physical Activity and Health: A Report of the Surgeon General.* Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion; 1996.
15. New York City Department of Health and Mental Hygiene. Summary of Vital Statistics 2007, The City of New York. 2008. http://www.nyc.gov/html/doh/html/vs/vs.shtml. Accessed January 27, 2009.
16. U.S. Department of Health and Human Services. The U.S. Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity: Overweight and Obesity: Health Consequences. 2007. http://www.surgeongeneral.gov/topics/obesity/calltoaction/fact_consequences.htm. Accessed July 10, 2008.
17. New York City Department of Health and Mental Hygiene. Diabetes in New York City: Public Health Burden and Disparities. 2007. http://home2.nyc.gov/html/doh/downloads/pdf/epi/diabetes_chart_book.pdf. Accessed July 10, 2008.

**18.** Narayan KM, et al. Lifetime risk for diabetes mellitus in the United States. *Journal of the American Medical Association.* 2003;290(14): p. 1884–90.

**19.** U.S. Department of Health and Human Services. The Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity. 2001. http://www.surgeongeneral.gov/topics/obesity/calltoaction/1_3.htm. Accessed January 30, 2008.

**20.** Dannenberg A, Burton DC, Jackson RJ. Economic and environmental costs of obesity: the impact on airlines. *American Journal of Preventive Medicine.* 2005;28(1): p. 145.

**21.** Thompson D, et al. Estimated economic costs of obesity to U.S. business. *American Journal of Health Promotion.* 1998;13(2): p. 120–127.

**22.** Wang Y, et al. Will all Americans become overweight or obese? Estimating the progression and cost of the US obesity epidemic. *Obesity.* 2008;16(10): p. 2323–2330.

**23.** U.S. Department of Health and Human Services. 2008 Physical Activity Guidelines for Americans. 2008. http://www.health.gov/PAGuidelines/guidelines/default.aspx. Accessed January 22, 2009.

**24.** Young C, et al. Obesity in early childhood: more than 40% of Head Start children in NYC are overweight or obese. *NYC Vital Signs.* 2006;5(2): p. 1–2.

**25.** New York City Department of Health and Mental Hygiene. Epiquery: NYC Interactive Health Data System: Community Health Survey 2007. https://a816-healthpsi.nyc.gov/epiquery/EpiQuery/CHS/index2007.html. Accessed December 2, 2009.

**26.** Brownson RC, Boehmer TK, Luke DA. Declining rates of physical activity in the United States: what are the contributors? *Annual Review of Public Health.* 2005;26: p. 421–443.

**27.** Zimring C, et al. Influences of building design and site design on physical activity: research and intervention opportunities. *American Journal of Preventive Medicine.* 2005;28(2S2): p. 186–193.

**28.** Brownell KD, Stunkard AJ, Albuam JM. Evaluation and modification of exercise patterns in the natural environment. *American Journal of Psychiatry.* 1980;137(12): p. 1540–1545.

**29.** Lee IM, Paffenbarger RS, Jr. Physical activity and stroke incidence: the Harvard Alumni Health Study. *Stroke.* 1998;29(10): p. 2049–2054.

**30.** Boreham CAG, Wallace WFM, Nevill A. Training effects of accumulated daily stair-climbing exercise in previously sedentary young women. *Preventive Medicine.* 2000;30: p. 277–281.

**31.** U.S. Department of Energy. Section 5.7.4: Energy-efficient elevators. In *Greening Federal Facilities: an Energy, Environmental, and Economic Resource Guide for Federal Facility Managers and Designers.* 2nd ed. Washington, DC: US Department of Energy; 2001. http://www1.eere.energy.gov/femp/pdfs/29267-5.7.4.pdf. Accessed February 11, 2009.

**32.** Frank LD, Andresen MA, Schmid TL. Obesity relationships with community design, physical activity, and time spent in cars. *American Journal of Preventive Medicine.* 2004;27(2): p. 87–96.

**33.** Goldberg DMB, Frank L, Chapman J, Kavage S. New data for a new era: a summary of the SMARTRAQ findings: linking land use, transportation, air quality and health in the Atlanta region. http://www.smartgrowthamerica.org/documents/SMARTRAQSummary_000.pdf.

**34.** Frank LD, et al. Many pathways from land use to health: associations between neighborhood walkability and active transportation, body mass index, and air quality. *Journal of the American Planning Association.* 2006;72(1): p. 75–87.

**35.** MyPyramid.gov. How many calories does physical activity use? http://www.mypyramid.gov/pyramid/calories_used.html#. Accessed Feburary 20, 2009.

**36.** Bassett DR, Jr, et al. Walking, cycling, and obesity rates in Europe, North America, and Australia. *Journal of Physical Activity and Health.* 2008;5(6): p. 795–814.

**37.** Pucher J, Buehler R. Making cycling irresistible: lessons from the Netherlands, Denmark, and Germany. *Transport Reviews.* 2008;28(4): p. 495–528.

**38.** Sallis JF and Glanz K. Physical activity and food environments: solutions to the obesity epidemic. *Milbank Quarterly.* 2009;87(1): p. 123–154.

**39.** Powell LM, Slater S, Chaloupka FJ, Harper D. Availability of physical activity–related facilities and neighborhood demographic and socioeconomic characteristics: a national study. *American Journal of Public Health.* 2006;96: p. 1676–1680.

**40.** Gordon-Larsen P, et al. Inequality in the built environment underlies key health disparities in physical activity and obesity. *Pediatrics.* 2006;117(2): p. 417–424.

**41.** World Health Organization. Health and Development Through Physical Activity and Sport. 2003. http://whqlibdoc.who.int/hq/2003/WHO_NMH_NPH_PAH_03.2.pdf. Accessed January 30, 2008.

**42.** Larson NI , Story MT, and Nelson MC. Neighborhood environments: disparities in access to healthy foods in the U.S. *American Journal of Preventive Medicine.* 2009;36(1): p. 74–81.

**43.** Morland K, Diez Roux A, Wing S. Supermarkets, other food stores, and obesity: the atherosclerosis risk in communities study. *American Journal of Preventive Medicine.* 2006;30(4): p. 333–339.

**44.** Frieden T. Asleep at the switch. *American Journal of Public Health.* 2004;94(12): p. 2059–2061.

# CHAPTER TWO URBAN DESIGN

**The High Line Park,**
Manhattan,
James Corner Field
Operations and Diller
Scofidio + Renfro

# URBAN DESIGN: CREATING AN ACTIVE CITY

The design of a city determines how its residents use it. Urban designers and architects can foster physical activity by designing spaces and streets that encourage walking, bicycling, and other forms of active transportation and recreation.

Active urban design entails several strategies. Recent research has demonstrated that a diverse mix of land uses, a well connected street system, and a good public transit system all tend to increase physical activity among city residents. Designers can make active recreation opportunities more accessible to children and their families through the organization and location of parks, playgrounds, and plazas. Urban planners and designers can assist with increasing access to healthy foods through the provision and placement of food markets. Careful street design measures can encourage walking and bicycling among young and old alike, by developing safe, vibrant, and accessible streetscapes. Streets that are safe for all will encourage more active use. Many of these active design strategies will benefit not only the health of New York City's population but also the environment, as they spur people to walk and bicycle more, and to drive less.

The following chapter offers several specific planning and design strategies that can promote physical activity. The recommendations address both public and private sector projects, ranging from the planning of roads to the design of children's playgrounds. It is understood that certain measures will be more appropriate on a given project than others. These recommendations are based on contemporary urban design practices in New York City and other locales, as well as the knowledge uncovered by recent academic research.

***Research on Urban Development and Travel: The Five "D" Variables***

The relationship between urban development and active modes of travel—that is, walking, running, bicycling, and other forms of physical activity—has become the most heavily investigated subject in urban planning, generating more than 150 studies in the past 15 years.[1]

Researchers have identified five "D" variables that are key to analyzing the relationship between urban design and travel patterns: *Density, diversity,* and *design*—the original "three Ds" coined by Robert Cervero and Kara Kockelman—have since been supplemented by *destination accessibility* and *distance to transit*.[2–4] *Density* describes the concentration of jobs and people in a given urban zone, while *diversity* gauges the number, variety, and balance of land uses in the area. *Design* includes the characteristics of a neighborhood's street network and streetscape. *Destination accessibility* reflects the ease of travel to a central business district or other concentrated area of jobs and attractions. *Distance to transit* measures the average distance from home or work to the nearest rail station or bus stop.

Walking and transit use (a factor connected to higher levels of physical activity) increase with density, diversity, good design, destination accessibility, and transit access. Developing and maintaining these five qualities is therefore essential to promoting active living through urban design and planning.

***New York's Unique Urban Environment and the Third D, Design***

New York City's built environment is unique within the United States. The city starts with high density, diverse land uses, robust residential and business centers, and unmatched transit access. In a 2002 comparative study of 83 major metropolitan areas, New York ranked first in density of development and overall compactness, second in street accessibility and connectivity, fourth in the strength of its residential and business centers, and eighth in land use diversity.[5,6] New York's unique development pattern translated into the highest percentages of commuting to work by both walking and transit among the 83 metropolitan areas.

Urban designers and architects can foster physical activity by designing spaces and streets that encourage walking, bicycling, and other forms of active transportation and recreation.

In other words, the city has largely achieved all of the D variables except perhaps the third D, design. Design is also, not coincidentally, the least well-studied of the five variables, in part because it is the most nuanced and hard to measure. However, researchers are making progress toward quantifying and defining the essential components of effective urban design. A recent study funded by the Robert Wood Johnson Foundation's Active Living Research Program developed several urban design metrics that eventually may be used to help explain differential rates of walking and physical activity.[7–9] The study found five design qualities to be critical to a good walking environment. These characteristics were defined qualitatively and then related to physical features of the street environment:

**Imageability** is the quality of a place that makes it distinct, recognizable, and memorable. A place has high imageability when specific physical elements and their arrangement capture attention, evoke feelings, and create a lasting impression.

**Enclosure** refers to the degree to which streets and other public spaces are visually defined by buildings, walls, trees, and other vertical elements.

**Human scale** refers to a size, texture, and articulation of physical elements that match the size and proportions of humans and, equally important, correspond to the speed at which humans walk.

**Transparency** refers to the degree to which people can see or perceive objects and activity—especially human activity—beyond the edge of a street.

**Complexity** refers to the visual richness of a place. The complexity of a place depends on the variety of the physical environment.

The researchers found that the presence of these five qualities enhances the public realm. The strategies outlined in this chapter describe ways to realize these and other qualities conducive to physical activity.

New York City has long been a leader among metropolitan areas in the diversity and density of its built environment, and in destination accessibility and distance to transit. This chapter includes several recommendations for maintaining and expanding upon the city's strengths in these areas. The strategies related to land use mix and transit in particular may serve as a model to other cities. The *Guidelines* also address the third D variable—the design of the city's streets and

public spaces. In addition to strategies for enhancing the walkability of the city's streets, attention is given to methods for making New York's roads more amenable to bicycling.

Since evidence regarding the relationship between design and physical activity is still emerging, many of the strategies below are drawn from current best practices in New York City and other densely populated areas. In the years ahead, the results of these strategies will be tested and refined. The goal is to develop an urban design toolbox, grounded on scientific research, to make New York a greener and healthier city.

**Summer Streets is a program of the NYC Department of Transportation in which designated routes are temporarily closed to motor vehicles and opened to people for walking, bicycling, running, and exercising over multiple weekends.**
Park Avenue

NYC

# 2.1 LAND USE MIX

OBJECTIVE

**Maintain and, where possible, enhance New York City's existing diverse mix of land uses. Research has suggested that greater land use mix is correlated with lower obesity.**[10–12]

STRATEGIES

★ **When planning urban-scale developments, provide for a mix of uses—for example, residences, offices, schools, retail stores, cultural and community spaces, and recreational facilities.**

Evidence suggests that the more schools, grocery stores, newsstands, and other useful destinations in an area, the more likely residents are to walk.[10] Locating schools near residential areas, for instance, encourages students to walk to school and promotes daily physical activity among children and youth.[12] Mixed land use may also be important for encouraging mobility among the elderly. Research has found that individuals aged 65 and over who live closer to shops and services are more likely to walk and use public transportation, and take more total trips outside the home.[13,14]

★ **Locate places of residence and work near destinations such as parks, walking paths, trails, and waterfront recreation areas to foster physical activity.**

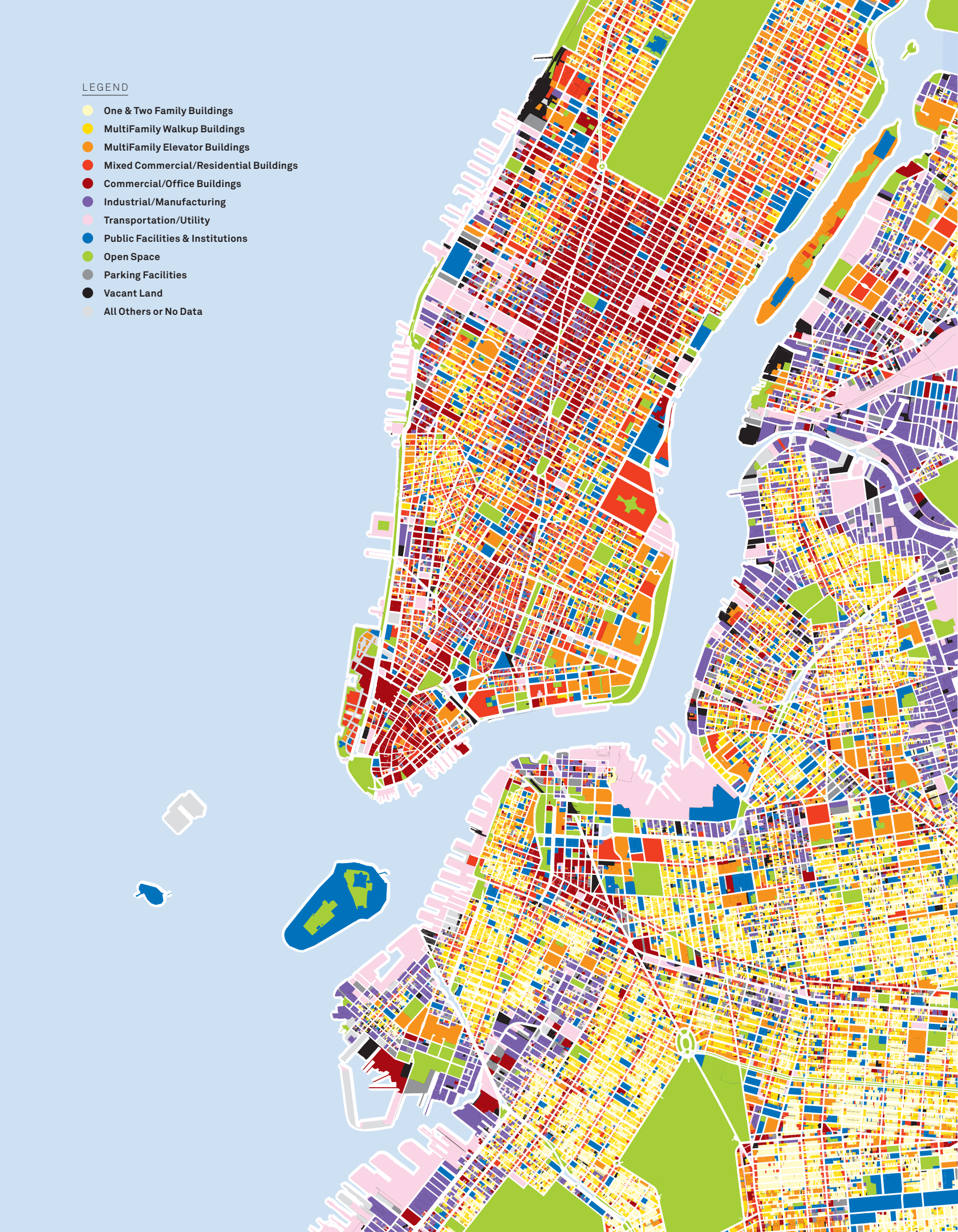
In New York City, the high connectivity of city streets tends to foster pedestrian access to a mixture of land uses, including recreational spaces. The goal is for every neighborhood to have an active recreation space within a ten-minute walk.[15]

★ **Develop supermarkets and full-service grocery stores near places of work and residence to promote healthier diets.**

Studies have demonstrated that the presence of full-service grocery stores in a neighborhood is associated with healthier diets and lower weight among residents.[12,16] Conversely, research has associated a high concentration of fast food restaurants with increased weight and risk of obesity among area residents.[10,17,18]

**Research has suggested that greater land use mix is correlated with lower obesity.**
Partial land use map of New York City, showing the intense mix of land uses in the city.

★ Strong Evidence ☆ Emerging Evidence ◇ Best Practice


LEGEND
One & Two Family Buildings
MultiFamily Walkup Buildings
MultiFamily Elevator Buildings
Mixed Commercial/Residential Buildings
Commercial/Office Buildings
Industrial/Manufacturing
Transportation/Utility
Public Facilities & Institutions
Open Space
Parking Facilities
Vacant Land
All Others or No Data

# 2.2 TRANSIT AND PARKING

OBJECTIVE

**Increase physical activity by improving access to public transit. Recent research has demonstrated a link between access to public transportation and physical activity, since transit use typically involves walking to a bus or subway stop.**[11,19–22]

**When deciding on the provision of parking, architects and urban designers should consider how parking affects the use of active modes of travel like walking, bicycling, and public transit. Parking should be provided for people with disabilities to support their opportunities for access and physical activity.**

**Promoting transit use and associated activities like walking or cycling can also help equalize opportunities for physical activity. Access to fitness facilities is more prevalent among certain groups in the population—typically, males, whites, and individuals with higher levels of education and income. However, when walking and cycling as part of transport are considered, socioeconomic discrepancies in physical activity are reduced.**[23]

STRATEGIES

☆ **Locate buildings and building entrances near public transit stops and along transit corridors.**

A study of New York residents found an inverse relationship between density of bus and subway stops and obesity among residents, after controlling for socioeconomic factors.[11]

☆ **Place public transit stops along well-connected streets.**

Recent research indicates that transit stops in areas with well-connected street grids are used more heavily than those in areas with less well-connected streets.[24]

◇ **Provide signage at buildings, transit stops, and major intersections showing a map and the distance, time, route, and calories burned to the nearest or next transit stop.**

Informational and motivational signage at points of decision can successfully prompt people to make healthier choices. Signage may also encourage people to walk an extra transit stop or two.

◇ **Encourage transit use by furnishing transit stops with pedestrian conveniences.**

The following design interventions can help make bus stops and subway stations more friendly to users:

- Make sidewalks wide enough to comfortably accommodate pedestrians, including those with disabilities.
- Provide additional space for passengers to wait by adding bus bulbs.[19,25–26]
- Create bus stop shelters that protect users from sun, wind, and rain.
- Furnish bus stop shelters with seating or places to lean.[19] This makes transit more accessible for users who have difficulty standing for extended periods, such as the elderly.

☆ **When designing sites that include parking, consider how the provision of parking can affect the use of more active modes of travel such as walking, bicycling, and public transit.**

In general, when parking is available, people use it. Research in California indicates that increased parking supply may result in reduced active transportation and public transit use.[24] Design car parking so as to reduce unnecessary automobile travel, particularly when walking, bicycling, and public transit are convenient alternatives.

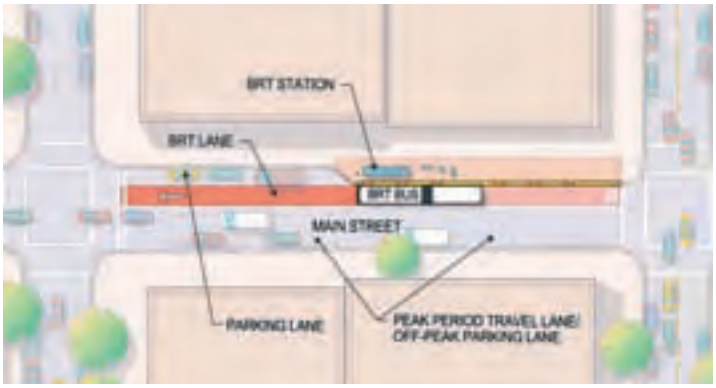
☆ **Provide parking for people with disabilities.**

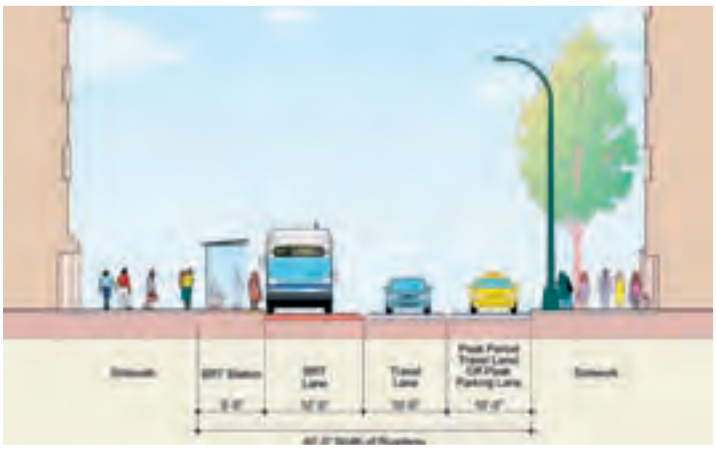
Supplying designated parking for people with disabilities improves their access to leisure activities.[27]

ADDITIONAL INFORMATION

For a list of relevant legal and design guidance references, please consult Appendices B and C of the NYC Department of Transportation's *Street Design Manual*. The *Manual* is available at http://www.nyc.gov/streetdesignmanual.

The NYC Department of City Planning recently completed a study of the relationship between zoning requirements for parking and automobile ownership, available at http://nyc.gov/html/dcp/html/transportation/residential_parking_study.shtml, and is currently undertaking several studies to better understand parking and mobility issues in New York.



**Pedestrian waiting areas increase the convenience of using public transportation.**
Plan and section of proposed bus station, Nostrand Avenue, Brooklyn

**Encourage transit use by furnishing transit stops with pedestrian conveniences like seating.**
Bus stop shelter, Manhattan

# 2.3 PARKS, OPEN SPACES, AND RECREATIONAL FACILITIES

OBJECTIVE

**Locate and design parks, open spaces, and recreational facilities to encourage physical activity. Design buildings to enhance, and to provide easy access to, nearby parks and open spaces.**

**Proximity to parks and other recreational facilities is consistently associated in recent research with higher levels of physical activity and healthier weight status among youth and adults.**[12,28,29]

STRATEGIES

★ **Design open spaces as part of large-scale developments, or locate buildings near open, public spaces, to promote activity.**

People with nearby access to parks are more likely to attain higher levels of physical activity.[12,30–34]

◇ **Make bicycle and pedestrian routes to parks and public spaces safe and visible.**

◇ **When planning a new development, aggregate open space in one large area rather than dispersing into smaller pieces. Where possible, provide residents with access to open space within a ten-minute walk.**

Creating a large area that accommodates multiple forms of recreation allows families to find activities for different ages in one location.

☆ **In the design of parks and open spaces, provide facilities like paths, running tracks, playgrounds, sports courts, and drinking fountains.**

People are more active in parks that include facilities like basketball and racquetball courts. Incorporating such active recreational areas is therefore essential.[35–37] Provide drinking fountains to encourage consumption of tap water for rehydration. New playgrounds and facilities should also always be designed to reflect changing knowledge about injury prevention.[38]

◇ **Locate new projects near existing public and private recreational facilities and encourage development of new facilities, including indoor activity spaces.**

★ **When designing offices and commercial spaces, provide exercise facilities or walking paths nearby.**

Research indicates that access to trails and exercise facilities at work, together with training on fitness equipment and other supports, results in increased physical activity among workers.[39–40]

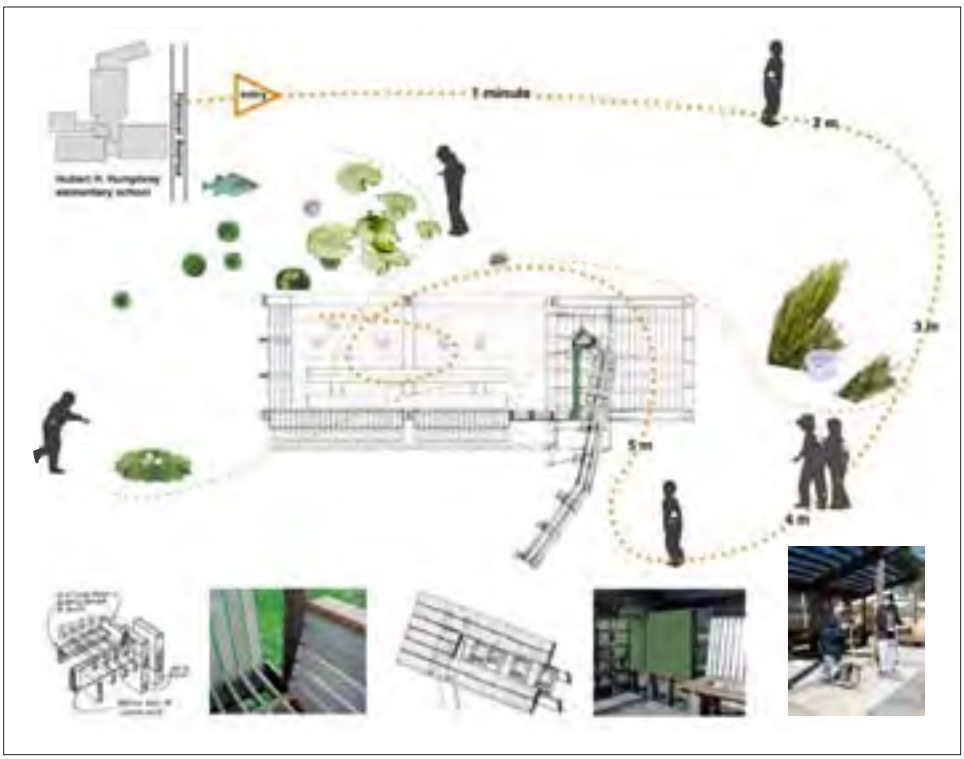
◇ **Design parks, open spaces, and recreational facilities to complement the cultural preferences of the local population, and to accommodate a range of age groups, including both children and their parents and guardians.**

Co-locating physical activity spaces for children and parents or guardians can simultaneously promote physical activity in different age groups.

◇ **Create partnerships with organizations to sponsor and maintain green spaces and gardens on building sites.**

Outdoor spaces that are adopted by volunteers are more vital and beautiful. Building owners can seek partnerships with local organizations that promote horticulture or other forms of green space, as a cost-effective way to maintain outdoor spaces.

**Locate buildings near open, public spaces.**
Eib's Pond Park in Staten Island includes an outdoor classroom for P.S. 57, an elementary school that is within a five-minute walk. Marpillero Pollak Architects




**Create partnerships with organizations to sponsor and maintain green spaces.**
Stone Avenue Learning Garden in Brooklyn is one of several gardens located in New York public branch libraries and developed in partnership with the Horticultural Society of New York's GreenBranches program. Marpillero Pollak Architects

**In the design of parks and open spaces, provide facilities like paths, running tracks, playgrounds, and sports courts that accommodate a range of activities safely and securely.**
Highbridge Mountain Bike Trail, Manhattan, and Bruckner Skate Park, the Bronx

# 2.4 CHILDREN'S PLAY AREAS

OBJECTIVE

**Provide children with access to outdoor space and recreational facilities. Research has linked time spent outdoors with moderate to vigorous physical activity among children.**[41–43]

STRATEGIES

◇ **Design courtyards, gardens, terraces, and roofs that can serve as outdoor spaces for children's play.**

When conventional spaces such as parks and schoolyards are not available, courtyards, gardens, and roofs can be designed for active use by children.

☆ **When designing playgrounds, include ground markings indicating dedicated areas for sports and multiple use.**

Playgrounds can be designed to increase physical activity as well as to prevent injuries.[38] A recent study found that children who attended schools where the playgrounds were redesigned with color-coded activity zones engaged in more vigorous activity than children in schools without the redesign.[37]

☆ **Preserve or create natural terrain in children's outdoor play areas.**

Children have been shown to physically acclimate to the demands of play on natural terrain. Additionally, children who played in natural areas scored better on physical fitness tests than children who played in conventional playgrounds.[44]

☆ **Provide lights on sidewalks and active play areas to extend opportunities for physical activity into the evening.**

A nationwide study of adolescent girls suggested that providing streetlights and floodlights in recreation areas contributed to increased activity levels.[45]

**Ground markings have been found to stimulate children's play. At this play area in a New York City Housing Authority development, a tricycle track and climbing mound are included to encourage gross motor play, while a water feature, sandbox, and a variety of textures are provided to promote finer motor skill development.**
Mary Walton Children's Center, Manhattan, Katie Winter Architect with Bothwell Site Design

◇ **In the design of parks and playgrounds, create a variety of climate environments to facilitate activity in different seasons and weather conditions.**
For example, include sunny, wind-protected areas for use in the winter and shaded zones for use in the summer.

☆ **Provide physical activity facilities for children and youth in schools.**
A richer physical activity environment in schools—one that includes equipment such as basketball hoops and adult supervision—has been found to increase the number of students who are active after lunch and after school.[46]

◇ **Design new school physical activity facilities to potentially allow for public use outside of school hours.**
Opening schoolyards and providing safety attendants during after-school and weekend hours have been shown to increase children's physical activity.[47]

**Color-coded activity zones encourage children's active play.**
Public School 64, Queens, Thomas Balsley Associates

# 2.5 PUBLIC PLAZAS

OBJECTIVE

**Create public spaces such as plazas that are easily accessible to pedestrians and bicyclists. Design plazas to support recreational activities, where space allows.**[48]

**A public plaza is a publicly accessible space that excludes cars and promotes walking by providing pedestrians with a safe, comfortable space to gather, play, or simply watch things go by.**[48] **Since plazas and open spaces often constitute welcome "interruptions" or places of respite from the urban grid, they contribute significantly to a city's imageability and to an active street environment. They also provide destinations for those engaged in active transport such as walking or bicycling.**

STRATEGIES

☆ **Create attractive plaza spaces that are well-maintained.**
Design plazas to include features such as trees, vegetation, lighting, drinking fountains, and both movable and fixed seating.[19,48–51]

◇ **Locate public plazas along popular pedestrian streets.**
Pedestrian networks that alternate street spaces and small squares can have the psychological effect of making walking distances seem shorter.[19,52]

◇ **Locate plazas near transit stops.**[48]

◇ **Make plazas accessible to bicyclists.**
Connect plazas to bicycle routes and provide bicycle parking nearby.[48]

**Create attractive plazas that include trees, lighting, and movable and fixed seating.**
Willoughby Street Plaza, Brooklyn

- **In general, create plazas that are level with the sidewalk so that they are clearly visible to pedestrians and safely connected to the street.**[48,50]
  Plazas that are raised or sunken tend to be less visible from the street, more difficult to secure, and less convenient for pedestrians—especially those with physical disabilities. In circumstances where a raised or sunken plaza is necessary due to existing topography or structures, design attractive and visible ramps or stairs to make the plaza accessible to all users.

- **Design plazas that allow for diverse functions.**
  Plazas can accommodate physical activities like dance and volleyball, passive activities like sitting and chess, and cultural events such as concerts, exhibits, and historical celebrations. Plazas can also provide space for cafe-style seating and farmers' markets. When programming plazas, consider the needs of users with varying mobility levels.

- **Design plazas to accommodate use in a variety of weather conditions.**
  Include sunny areas protected from the wind for use in the colder seasons and shaded areas for use in warm weather.

- **Seek partnerships with community groups to maintain and program plazas.**

ADDITIONAL INFORMATION

When designing or programming a plaza on city-owned property, refer to the Department of Transportation's Plaza Program for guidelines: http://www.nyc.gov/html/dot/html/sidewalks/publicplaza.shtml.

When developing or programming a plaza on private property, refer to the Department of City Planning's specifications for Privately Owned Public Plazas: http://www.nyc.gov/html/dcp/html/pops/index.shtml.

**Plazas provide space for recreational activities.** A hula hooping event in Herald Square, Manhattan, was organized by the 34th Street Business Improvement District as part of the DOT's Green Light for Broadway program.

# 2.6 GROCERY STORES AND FRESH PRODUCE ACCESS

OBJECTIVE

**Increase access to fresh food options.**[53,54]

**With few or no grocery stores in some New York City neighborhoods, many households make their food purchases at convenience stores and fast food franchises.**[53] **These establishments often offer fewer healthy food options, and can lead to New Yorkers preparing and consuming fewer healthy meals. Recent research has linked the presence of a supermarket or a grocery store with a lower rate of neighborhood obesity.**[53,55] **Greater availability of fresh food is also associated with lower prevalence of diet-related disease.**[12,17] **Furthermore, food costs in neighborhoods with full-service grocery stores and supermarkets are often lower than in areas without these services.**

STRATEGIES

☆ **Develop full-service grocery stores within walking distance in all residential neighborhoods.**[54]

In large-scale developments that have a retail component, include a grocery store offering a full range of fresh fruits and vegetables and other healthy items. Besides providing area residents with healthier eating options, a supermarket can further encourage physical activity by functioning as a walking or bicycling destination.

◇ **Introduce farmers' markets as a complement to grocery stores.**

Greenmarkets or farmers' markets, where farmers sell produce directly to consumers, are especially beneficial in densely populated areas that currently have little access to fresh produce or supermarkets.[56] Farmers' markets can be located near places of work or residence. Designers can partner with farmers' market organizers to create suitable spaces.

**Increase access to healthy foods by introducing farmers' markets as a complement to supermarkets.**
Union Square Greenmarket, Manhattan

◇ **Provide safe walking and bicycle paths between densely populated areas and grocery stores and farmers' market sites.**

◇ **Design grocery store layouts and parking to accommodate pedestrians, cyclists, automobiles, and loading trucks safely and conveniently.**
Include sufficient bicycle parking outside supermarkets. Provide conveniences such as drinking fountains.

## 2.7 STREET CONNECTIVITY

OBJECTIVE

**Encourage walking by maintaining a network of interconnected streets and sidewalks. In recent studies, higher street connectivity—as measured by small block sizes, for example—has been associated with increased pedestrianism.**[57,58]

STRATEGIES

★ **In large-scale developments, design well-connected streets with sidewalks and keep block sizes relatively small.**
Try to provide pedestrians with the most direct possible routes between destinations and with a choice of routes. Avoid long, continuous blocks.[19]

◇ **Where current connectivity of the sidewalks and streets on a building site is poor, provide pedestrian paths through existing blocks to increase the area's walkability.**
Where block sizes are large, consider retrofitting the area with pedestrian paths and crossings that form a grid with intersections every 200 to 300 feet.

◇ **Avoid creating pedestrian over- and underpasses that force walkers to change levels.**
In the case of existing over- and underpasses, increase visibility to enhance a sense of safety.[52] Maintaining a constant sidewalk level is also consistent with Americans with Disabilities Act (ADA) requirements.

◇ **Maintain dedicated pedestrian and bicycle paths on dead-end streets to provide access even where cars cannot pass.**[59]

◇ **Minimize addition of mid-block vehicular curb cuts on streets with heavy foot traffic.**
While corner curb cuts are required for ADA access, mid-block curb cuts for vehicles may interrupt pedestrian continuity and impede use by people with disabilities.

◇ **Design vehicular driveways and ramps to minimize contact between cars and pedestrians.**

ADDITIONAL INFORMATION

For a list of relevant legal and design references, please consult Appendices B and C of the NYC DOT *Street Design Manual.*

# 2.8 TRAFFIC CALMING

OBJECTIVE

**Promote walking and improve the overall pedestrian experience through traffic calming measures. Slowing traffic helps to maintain the human scale—and pace—of city streets.**

STRATEGIES

◇ **Design roads to be the minimum width and to have the minimum number of lanes practical.**

Minimize road width to reduce traffic speeds and pedestrian crossing distances.[19,60–63] Shorter crossing distances are especially beneficial to the elderly and people with physical disabilities, who may require more time to cross the street.

☆ **Incorporate street additions that have been shown to effectively calm traffic, such as curb extensions, medians, and raised speed reducers.**[64,65]

◇ **Consider other physical design measures where appropriate to calm traffic and promote pedestrian safety.**

Physical design measures may include:

- Horizontal deflections such as curved roadway alignments on local streets.

**Features such as medians and curved roadway alignments help calm traffic and facilitate pedestrian movement.**
The Bronx Hub

- Vertical deflections such as raised intersections or crossings at stop-controlled or otherwise low-speed locations.

- Low-speed intersection treatments such as traffic diverters, roundabouts, and mini-traffic circles.[65,66]

- A signal phasing plan with a protected left-turn lag phase. Such plans reduce risk for conflicts with opposing traffic or pedestrians.

- Advance warning signs for drivers to "Yield to Pedestrian."[13] These signs have been shown to reduce pedestrian crashes by ten percent.

- Avoidance of slip lanes and wide curb radii for turning vehicles in the urban setting because these can pose dangerous obstacles to pedestrians. Studies indicate that vehicles move faster, are less likely to stop, and exhibit higher crash rates at channelized intersections with wider curb radii.[13,67,68]

ADDITIONALINFORMATION

Traffic calming measures are of particular importance for certain populations, such as the elderly, who are more vulnerable to pedestrian accidents due to slower reaction time and limited mobility. In 2007, individuals 65 and older made up 12.5 percent of the U.S. population but comprised 19 percent of all pedestrian fatalities.[69]

For a list of relevant legal and design references, please consult Appendices B and C of the NYC DOT *Street Design Manual* as well as the New York City Fire Code: http://www.nyc.gov/html/fdny/html/firecode/index.shtml.

**Median refuge islands reduce crossing distances and improve pedestrian experiences.**
Broadway, Manhattan

# 2.9 DESIGNING PEDESTRIAN PATHWAYS

OBJECTIVE

**Encourage walking through the design of pedestrian pathways and sidewalks. Giving streets a human scale and sense of enclosure can encourage physical activity. In New York, pedestrian pathways include city streets, paved walkways through multi-block developments, and paved park paths.**

STRATEGIES

☆ **Create a buffer to separate pedestrians from moving vehicles using street furniture, trees, and other sidewalk infrastructure.**[19]

A buffer zone between moving automobiles and pedestrian spaces has been associated in recent research with increased walking.[70] Separating pedestrians and vehicles creates improved conditions for all users, especially those with impaired vision or hearing.

◇ **Provide seating, drinking fountains, restrooms, and other infrastructure that support increased frequency and duration of walking.**[19,50,71,72]

In focus groups, seniors reported that benches and restrooms would support them in walking more, while tripping and traffic hazards were deterrants.[71]

☆ **Provide exterior lighting along streets and outdoor paths.**

Recent research has linked street lighting to increased path use.[19,73,74] Pedestrian street lighting should be evenly spaced along the sidewalk, consistent in height, and offer adequate light coverage.

**Buffering pedestrian areas from vehicular traffic can help increase walking.**
Broadway, Manhattan

**Provide infrastructure such as benches to support increased frequency and duration of walking.**
The High Line Park, Manhattan

☆ **Include trees to provide shade and visual interest on streets and sidewalks.**

The presence of trees has been associated with higher rates of walking to school among children.[75] Trees and other landscape elements contribute to more appealing sidewalks and streets, provide shade in the summer, and can be used to help separate pedestrians from vehicular traffic.[19,75–77]

☆ **Make sidewalk widths consistent with their use.**[2,19,66,78–84]

Make sidewalks wide enough to accommodate a range of pedestrian users safely, while not so wide as to feel empty. The needs of people with strollers, wheelchairs, or luggage should be considered. A width that accommodates 12 people per minute per yard is desirable for a pedestrian throughway. However, a sidewalk should be wider if it is also meant to support lingering activities, such as sitting or waiting.

◇ **Provide for enhanced pedestrian crossings both at mid-block and at intersections.**

Techniques for improving pedestrian crossings include installing a full median, refuge islands, and clear markings in the middle of wide streets.[19,85–87] Curb cuts and signals with pedestrian countdowns should be included at intersections. These measures are especially helpful for individuals with reduced mobility, such as the elderly or disabled. When determining signal wait times in areas with significant elderly populations, consider the shorter strides and slower gaits of older pedestrians.[88]

◇ **Construct curb extensions along sections of the sidewalk that tend to attract greater pedestrian congestion.**

Curb extensions are especially appropriate at pedestrian crossings, bus stops, and subway entrances.[19,89,90] Curb extensions can also provide extra space for bicycle racks.

**Landscaping enhances the urban environment and provides shade in the summer**
Mulry Square, Manhattan

**Curb extensions provide additional room for pedestrians and facilities such as bicycle parking.**
46th Street, Queens

☆ **When designing large urban-scale developments, create on-site pathways as extensions to public sidewalks.**

Encourage the continuity of pedestrian movement from public sidewalks through the site and into the building. Research indicates that sidewalk coverage and continuity are associated with increased walking.[57]

☆ **Create or orient paths and sidewalks toward interesting views.**

Research indicates that the provision of attractive open views from a path encourages increased walking.[70]

◇ **Provide marked, measured walking paths on sites as part of a wayfinding system targeted to pedestrians and bicyclists.**

Wayfinding signs can provide distances and times to various points of interest, especially for tourists and in areas with many bicycle routes.[91] On larger building sites such as campuses, a marked, measured path has been shown to encourage employees to exercise. On smaller urban sites, a marked, measured path that incorporates the surrounding sidewalks, principal hallways through the building, and stairs may similarly prompt users to exercise as part of their daily activities.

☆ **Support physical activity among people with disabilities by making streets and paths universally accessible.**

For some individuals with disabilities, leisure activity may constitute moderate or vigorous physical activity. A number of environmental design factors have been shown to increase leisure-time activity among people with disabilities, including the quality of the path, the provision of targeted signage, and the accessibility of destinations and transportation along the path.[27,92] Specific measures include:

- Paths that are smooth, sufficiently wide, and that have curb cuts and turning radii adequate for a wheelchair or walker.
- Paths with auditory crossing signals, adequate crossing times, clear signage, visible access ramps, and connections to walking, cycling, and public transit routes.[27]

ADDITIONAL INFORMATION

For a list of relevant legal and design guidance references, please consult Appendices B and C of the NYC DOT *Street Design Manual.*

# 2.10 PROGRAMMING STREETSCAPES

OBJECTIVE

**Encourage walking by creating attractive and engaging street environments that can accommodate artwork and events.**

STRATEGIES

- **Incorporate temporary and permanent public art installations into the streetscape to provide a more attractive and engaging environment.**
  Seek collaborations with local arts organizations, philanthropic institutions, or other nongovernmental groups to create and help maintain the artwork.[19,93,94]

- **Organize pedestrian-oriented programs, such as charity walks and vehicular street closures, that make wide avenues available for walking and bicycling.**[95,96]
  Special programming can also help to increase the imageability of a place—making a site more memorable and distinct.

- **Increase the number of outdoor cafes to enhance street activity.**[19,97]
  Sidewalk cafes contribute to the complexity and imageability of urban places, which in turn can encourage their use by pedestrians.

ADDITIONAL INFORMATION

For a list of relevant legal and design guidance references, please consult Appendices B and C of the NYC DOT *Street Design Manual*.

**Sidewalk cafes enhance street activity.**
Broadway, Manhattan

**Pedestrian-oriented programs increase street activity and can promote walking and bicycling.**
Weekend Walks, Fifth Avenue, Brooklyn

**Incorporate public art into the streetscape.**
*Nature Matching Systems* by Tattfoo Tan, a temporary art installation at the Port Authority Bus Terminal in Manhattan

# 2.11 BICYCLE NETWORKS AND CONNECTIVITY

OBJECTIVE

**Encourage bicycling by creating a continuous network of bikeways. After considering pedestrian needs, provide bicyclists with the highest degree of travel continuity possible. Studies show that people bicycle more and obesity rates are lower in countries that have better bicycle infrastructure.**[98]

STRATEGY

☆ **Design interconnected bikeways and establish a backbone network of unbroken through routes across all five boroughs of New York.**

Strive to link high-bicycling-demand areas into a cohesive network.[99,100] At breaks in the network, provide signage directing cyclists to suggested bicycle routes.

☆ **Make links between bicycling and transit.**

Connect bikeways to transit stops, add additional bicycle parking by these stops, and provide adequate sidewalk space to accommodate bicycle parking.[100,101]

◇ **On bikeways, include signposts providing bicyclists with directions, distances, and times to various destinations.**[100,102]

ADDITIONAL INFORMATION

Please refer to the 1997 DCP/DOT Bicycle Master Plan for further information on bicycle networks and connectivity: http://www.nyc.gov/html/dcp/html/bike/mp.shtml. A free, current NYC DOT bicycle map can also be found at: http://www.nyc.gov/html/dot/html/bicyclists/bikenetwork.shtml.

For a list of relevant legal and design guidance references, please consult Appendices B and C of the NYC DOT *Street Design Manual.*

**Demand for bicycle parking at transit stops is high. At this location in Williamsburg, Brooklyn, a curb extension was added to provide more room for bicycles, yet the need for increased bicycle parking remains.**
Bedford Avenue and North 7th Street, Brooklyn

# 2.12 BIKEWAYS

OBJECTIVE

**Increase bicycling by designating bikeways that are appropriate to the street context.**

STRATEGIES

☆ **Use on-street markings or signage to visually reinforce the separation of areas for bicyclists and motorists.**[100]

Strategies can include markings, painting bike lanes onto the road surface, or creating a printed buffer between the bike and traffic lanes.[103–104] Color can enhance the visibility of bicycle lanes. Signage can remind bicyclists of one-way paths.

☆ **Where conditions warrant, separate bikeways and vehicular traffic lanes with physical demarcations.**

Adding a buffer between bicyclists and cars increases riders' confidence in biking as a safe and comfortable transportation choice.[100] A physical separation is especially valuable on busier streets and major bicycle routes. The buffer may take many forms, such as a grade separation or a median between the bicycle path and traffic lanes. Bicycle paths can also be located between a sidewalk curb and a parking lane.[104–105]

◇ **Expand existing bikeways where use has exceeded capacity.**

◇ **Pay special attention to the treatment of bikeways at intersections and other points where the street form changes, in order to mitigate potential visibility issues and turning conflicts.**[106]

**On-street markings reinforce separate areas for bicyclists and motorists.**
Grand Street, Manhattan

**Physically separating bicycle from vehicular lanes along busy roads creates more comfortable and convenient bicycling environments.**
Ninth Avenue, Manhattan

◇ **Avoid potential conflicts between cyclists and opening car doors.**
Use wide parking lanes (up to 10 feet) where parking is adjacent to an on-street bicycle lane and where physical separation between the bicycling and parking lanes is not desirable or possible. This measure should be given added consideration in areas with high parking turnover.

◇ **Further develop Greenways—alternative routes that are integrated into the regional park system.**
Greenways feature relatively few intersections, many plantings, and a dedicated bicycle right of way. These routes can serve as commuter corridors during the week and recreational paths on the weekend. Connect Greenways to street bikeways.[107]

◇ **Consider shared-use paths in areas with viewing attractions.**
Paths designed for common use by bicyclists, pedestrians, and other recreational users are particularly well-suited to roads along a waterfront, park, or other attractive open spaces. Shared-use paths integrated with scenic views can become recreational destinations.[108]

ADDITIONAL INFORMATION

Please refer to the 1997 DCP/DOT Bicycle Master Plan for further information on bikeways.

For a list of relevant legal and design references, please consult Appendices B and C of the NYC DOT *Street Design Manual.*

**Further develop Greenways—alternative routes that are integrated into the regional park system.**
Map of the Brooklyn-Queens Greenway

**Shared-use paths encourage walking and bicycling, especially in areas with viewing attractions.**
Riverside Park, Manhattan

# 2.13 BICYCLING INFRASTRUCTURE

OBJECTIVE

**Increase bicycling in the city by providing facilities such as indoor and outdoor bicycle parking, signals, and stair rails, and by instituting a bicycle share program.**

STRATEGIES

- ◇ **Provide adequate facilities for bicyclists to park along their route or at a final destination.**[109]
- ◇ **Designate bicycle-specific crossings and signals to organize the movements of pedestrians, cyclists, and motorists at busy intersections.**
- ◇ **Construct bicycle rails along outdoor stairways, such as those on "step streets," so that bicyclists can use these passageways and streets.**
- ☆ **Explore bicycle share programs to increase access to bicycles for both city residents and visitors.**[100]

ADDITIONAL INFORMATION

Please refer to the 1997 DCP/DOT Bicycle Master Plan for further information on bicycling infrastructure.

For a list of relevant legal and design guidance references, please consult Appendices B and C of the NYC DOT *Street Design Manual.*

**Providing bicycle parking can encourage ridership.** Outdoor bicycle parking area, Municipal Building, Manhattan

**Bicycle-specific signals help to coordinate the movements of pedestrians, bicyclists, and motorists.**

**Placing bicycle rails along outdoor stairways helps to maintain street connectivity for bicyclists.**

REFERENCES


1. Gebel K, Bauman AE, Petticrew M. The physical environment and physical activity: a critical appraisal of review articles. *American Journal of Preventive Medicine.* 2007;32: p. 361–369.
2. Cervero R, Kockelman K. Travel demand and the 3Ds: density, diversity, and design. *Transportation Research Part D.* 1997;2(3): p. 199–219.
3. Ewing R, Cervero R. Travel and the built environment. *Transportation Research Record.* 2001;1780: p. 87–114.
4. Ewing R, et al. Traffic generated by mixed-use developments: a six-region study using consistent built environmental measures. Paper presented at the Annual Meeting of the Transportation Research Board; January 12, 2009; Washington, DC.
5. Ewing R, Pendall R, Chen D. *Measuring Sprawl and Its Impact.* Washington, DC: Smart Growth America/U.S. Environmental Protection Agency; 2002.
6. Ewing R, Pendall R, Chen D. Measuring sprawl and its transportation impacts. *Transportation Research Record.* 2003;1832: p. 175–183.
7. Clemente O, Ewing R, Handy SL, Brownson R. Measuring Urban Design Qualities—An Illustrated Field Manual. Princeton, NJ: Robert Wood Johnson Foundation; 2005. http://www.activelivingresearch.org/downloads/fieldmanual_071605.pdf.
8. Ewing R, Clemente O, Handy SL, Brownson R, Winston E. Identifying and Measuring Urban Design Qualities Related to Walkability—Final Report. Princeton, NJ: Robert Wood Johnson Foundation; 2005. www.activelivingresearch.org/downloads/finalreport_071605.pdf.
9. Ewing R, Handy, SL. Measuring the unmeasurable: urban design qualities related to walkability. *Journal of Urban Design.* 2009;14(1): p. 65–84.
10. McCormack G, Giles-Corti B, Bulsara M. The relationship between destination proximity, destination mix and physical activity behaviors. *Preventive Medicine.* 2008;46: p. 33–40.
11. Rundle A, Roux AV, Free LM, Miller D, Neckerman KM, Weiss CC. The urban built environment and obesity in New York City: a multilevel analysis. *American Journal of Health Promotion.* 2007;21(4 Suppl): p. 326–334.
12. Sallis JF and Glanz K. Physical activity and food environments: solutions to the obesity epidemic. *Milbank Quarterly.* 2009;87(1): p. 123–154.
13. Jana Lynott, et al. Planning Complete Streets for an Aging America. Washington, DC: AARP Public Policy Institute; 2009. http://www.aarp.org/research/housing-mobility/transportation/2009_02_streets.html.
14. Bailey L. Aging Americans: Stranded without Options. Washington DC: Surface Transportation Policy Project; April 2004. http://www.transact.org/library/reports_html/seniors/aging.pdf.
15. City of New York. *PlaNYC: A Greener, Greater New York.* 2007. http://www.nyc.gov/html/planyc2030.
16. Morland K, Wing S, and Diez Roux A. The contextual effect of the local food environment on residents' diets: the atherosclerosis risk in communities study. *American Journal of Public Health.* 2002;92: p. 1761–1768.
17. Larson NI, Story MT, and Nelson MC. Neighborhood environments: disparities in access to healthy foods in the U.S. *American Journal of Preventive Medicine.* 2009;36(1): p. 74–81.
18. Moudon AV, et al. Operational definitions of walkable neighborhood: theoretical and empirical insights. *Journal of Physical Activity and Health.* 2006;3(Suppl 1): p. S99–S117.

**19**. Ewing R. *Pedestrian- and Transit-Friendly Design.* Washington, DC: Urban Land Institute/American Planning Association; 2009.

**20.** DeBourdeaudhuij ID, Sallis JF, Saelens B. Environmental correlates of physical activity in a sample of Belgian adults. *American Journal of Health Promotion.* 2003;18(1): p. 83–92.

**21.** Edwards RD. Public transit, obesity, and medical costs: assessing the magnitudes. *Preventive Medicine.* 2008;46(1): p. 14–21.

**22.** Wener, RE and Evans GW. A morning stroll: levels of physical activity in car and mass transit commuting. *Environment and Behavior.* 2007;39: p. 1–13.

**23.** Berrigan D, Troiano RP, McNeel T, DiSogra C, Ballard-Barbash R. Active transportation increases adherence to activity recommendations. *American Journal of Preventive Medicine.* 2006;31(3): p. 210–216.

**24.** Lund H, Wilson RW, Cervero R. A re-evaluation of travel behavior in California TODs. *Journal of Architectural and Planning Research.* 2006;23(3): p. 247–263.

**25.** New York City Department of Transportation. *World Class Streets: Remaking New York City's Public Realm.* New York: New York City Department of Transportation; 2008. http://www.nyc.gov/html/dot/downloads/pdf/World_Class_Streets_Gehl_08.pdf.

**26.** New York City Department of Transportation. *Street Design Manual.* 2.2.2. New York: New York City Department of Transportation; 2009. http://www.nyc.gov/streetdesignmanual.

**27**. Spivok M, Gauvin L, Riva M, Brodeur J. Promoting active living among people with physical disabilities: evidence for neighborhood-level buoys. *American Journal of Preventive Medicine.* 2008;34(4): p. 291–298.

**28.** Gordon-Larsen P, et al. Inequality in the built environment underlies key health disparities in physical activity and obesity. *Pediatrics.* 2006;117(2): p. 417–424.

**29.** Potwarka LR, Kaczynski AT, Flack AL. Places to play: association of park space and facilities with healthy weight status among children. *Journal of Community Health.* 2008;33(5): p. 344–350.

**30.** Giles-Corti B, et al. Increasing walking: how important is distance to, attractiveness, and size of public open space? *American Journal of Preventive Medicine.* 2005;28(2S2): p. 169–176.

**31.** Kaczynski A and Henderson K. Environmental correlates of physical activity: a review of evidence about parks and recreation. *Leisure Sciences.* 2007;29(4): p. 315–354.

**32.** Zlot, AI and Schmid TL. Relationships among community characteristics and walking and bicycling for transportation or recreation. *American Journal of Health Promotion.* 2005;19(4): p. 314–317.

**33.** Godbey G, Paune L, Orsega-Smith B. Examining the relationship of local government recreation and park services to the health of older adults. Robert Wood Johnson Foundation grant research results. 2004.

**34**. Diez-Roux A, Evenson K, McGinn A, Brown D, Moore L, Brines S and Jacobs D. Availability of recreational resources and public activity in adults. *American Journal of Public Health.* 2007;97: p. 493–99.

**35**. Kaczynski A, Potwarka L, Saelens B. Association of park size, distance, and features with physical activity in neighborhood parks. *American Journal of Public Health.* 2008;98: p. 1451–1456.

**36**. Shores KA, West ST. The relationship between built park environments and physical activity in four park locations. *Journal of Public Health Management Practice.* 2008;14: p. e9–16.

**37.** Ridgers ND, Stratton G, Fairclough SJ, Twisk JWR. Long-term effects of playground markings and physical structures on children's recess physical activity levels. *Preventive Medicine.* 2007;44: p. 393–397.

**38.** MacKay M. Playground injuries. *Injury Prevention.* 2003;9(3): p. 194–6.

**39.** Emmons KM, Linnan LA, Shadel WG, Marcus B, Abrams DB. The working healthy project: a worksite health-promotion trial targeting physical activity, diet, and smoking. *Journal of Occupational and Environmental Medicine.* 1999;41(7): p. 545–555.

**40.** Linenger JM, Chesson CV, Nice DS. Physical fitness gains following simple environmental change. *American Journal of Preventive Medicine.* 1991;7(5): p. 298–310.

**41.** Bower JK, Hales DP, Tate DF, Rubin DA, Benjamin SE, Ward DS. The childcare environment and children's physical activity. *American Journal of Preventive Medicine.* 2008;34(1): p. 23–29.

**42.** Saliis J, Prochaska J, Taylor W. A review of correlates of physical activity of children and adolescents. *Medicine and Science in Sports and Exercise.* 2000;32: p. 963–75.

**43.** Burdette HL, Whitaker RC, Daniels SR. Parental report of outdoor playtime as a measure of physical activity in preschool-aged children. *Archives of Pediatric and Adolescent Medicine.* 2004;158: p. 353–357.

**44.** Fjortoft I. Landscape as playscape: the effects of natural environments on children's play and motor development. *Children, Youth and Environments.* 2004;14(2): p. 21–44.

**45.** Cohen DA, Ashwood JS, Scott MM, Overton A, Evenson KR, Staten LK, Porter D, McKenzie TL, Catellier D. Public parks and physical activity among adolescent girls. *Pediatrics.* 2006;118: p. e1381–1389.

**46**. Sallis, JF, et al. The association of school environments with youth physical activity. *American Journal of Public Health.* 2001;91: p. 618–620.

**47.** Farley, TA, et al. Safe play spaces to promote physical activity in inner-city children: results from a pilot study of an environmental intervention. *American Journal of Public Health.* 2007;97(9): p. 1625–1631.

**48.** New York City Department of Transportation. NYC Plaza Program. http://www.nyc.gov/html/dot/html/sidewalks/publicplaza.shtml.

**49.** New York City Department of City Planning. Privately Owned Public Plazas, Design Standards. http://www.nyc.gov/html/dcp/html/pops/index.shtml.

**50.** Whyte WH. *The Social Life of Small Urban Spaces.* Washington, DC: The Conservation Foundation; 1980.

**51.** Kayden JS. *Privately Owned Public Space: The New York City Experience.* New York: John Wiley & Sons; 2000.

**52**. Gehl J. *Life Between Buildings: Using Public Space.* New York: Van Nostrand Reinhold; 1987: p. 144–147.

**53.** New York City Department of City Planning. Going to market: New York City's neighborhood grocery store and supermarket shortage. http://www.nyc.gov/html/dcp/html/supermarket/index.shtml.

**54.** Wrigley N, Warm D. Deprivation, diet, and food-retail access: findings from the Leeds 'food deserts' study. *Environment and Planning A.* 2003;35(1): p. 151–188.

**55.** Morland K, Diez Roux A, Wing S. Supermarkets, other food stores, and obesity: the atherosclerosis risk in communities study. *American Journal of Preventive Medicine.* 2006;30(4): p. 333–339.

**56.** Alberti P, Hadi E, Cespedes A, Grimshaw V, Bedell J. *Farmers' Markets—Bringing Fresh, Nutritious Food to the South Bronx.* New York: New York City Department of Health and Mental Hygiene; 2008.

**57.** Hess PM, Moudon AV, Snyder MC, Stanilov K. Site design and pedestrian travel. *Transportation Research Record.* 2001;1674: p. 9–19.

**58.** Baran PK, Rodriguez DA, Khattak AJ. Space syntax and walking in a new urbanist and suburban neighborhood. *Journal of Urban Design.* 2008;13(1): p. 5–28

**59.** Alexander C, Ishikawa S, Silverstein M. *A Pattern Language: Towns, Buildings, Construction.* New York: Oxford University Press; 1977: p. 262.

**60.** NYC DOT. *Street Design Manual*: 2.0.

**61.** Fitzpatrick K, Carlson P, Brewer M, Wooldridge M. Design factors that affect driver speed on suburban streets. *Transportation Research Record.* 2001;1751: p. 18–25.

**62.** Gattis JL, Watts, A. Urban street speed related to width and functional class. *Journal of Transportation Engineering.* 1999;125(3): p. 193–200.

**63.** Huang HF, Stewart JR, Zegeer CV. Evaluation of lane reduction "road diet" measures and their effects on crashes and injuries. *Transportation Research Record.* 2002;1784: p. 80–90.

**64.** NYC DOT. *Street Design Manual:* 2.2–2.3.

**65.** Ewing R. *Traffic Calming: State of the Practice.* Washington, DC: Institute of Transportation Engineers; 1999.

**66.** NYC DOT. *Street Design Manual*: 2.3.

**67.** Bauer KM and Harwood DW. *Statistical Models of At-Grade Intersection Accidents—Addendum.* Kansas City, MO and McLean, VA: Midwest Research Institute and Federal Highway Administration; 1998.

**68.** Fitzpatrick K and Schneider WH. T*urn Speeds and Crashes within Right-Turn Lanes.* College Station, Texas: Texas Transportation Institute; 2005.

**69.** National Highway Traffic Safety Administration, National Center for Statistics and Analysis. *Traffic Safety Facts: Older Population.* Washington, DC: National Highway Traffic Safety Administration; 2007.

**70.** Boarnet M, Forsyth A, Day K, Oakes JM. Irvine Minnesota inventory short forms: results of a predictive validity study. Under review.

**71.** Lockett D, Willis A, Edwards N. Through seniors' eyes: an exploratory qualitative study to identify environmental barriers to and facilitators of walking. *Canadian Journal of Nursing Research.* 2005;37(3): p. 48–65.

**72.** NYC DOT. *World Class Streets*: p. 25.

**73.** NYC DOT. *Street Design Manual*: 4.0–4.2.4.

**74.** Painter K. The influence of street lighting improvements on crime, fear and pedestrian street use, after dark. *Landscape and Urban Planning.* 1996;35: p. 193–201.

**75.** Larsen K, et al. The influence of the physical environment and sociodemographic characteristics on children's mode of travel to and from school. *American Journal of Public Health*. 2009;99(3): p. 520–526

**76.** NYC DOT. *Street Design Manual:* 2.4.

**77.** Arnold H. *Trees in Urban Design.* New York: Van Nostrand Reinhold; 1993.

**78.** NYC DOT. *Street Design Manual:* 2.2.1.

**79.** NYC DOT. *World Class Streets:* p. 20–21.

**80.** Fruin JJ. *Pedestrian Planning and Design.* New York: Metropolitan Association of Urban Designers and Environmental Planners, Inc.; 1971.

**81.** Eyler AA, Brownson RC, Bacak S, Houseman RA. The epidemiology of walking for physical activity in the United States. *Medicine & Science in Sports & Exercise.* 2003;35: p. 1529–1536.

**82.** Giles-Corti B, Donovan RJ. Socioeconomic status differences in recreational physical activity levels and real and perceived access to a supportive physical environment. *Preventive Medicine.* 2002;36: p. 601–611.

**83.** Knoblauch RL, Tustin BH, Smith SA, Pietrucha MT. *Investigation of Exposure Based Pedestrian Accident Areas: Crosswalks, Sidewalks, Local Streets and Major Arterials.* Washington, DC: Federal Highway Administration; 1988: p. 126–133.

**84.** Rodriguez DA, Joo J. The relationship between non-motorized mode choice and the local physical environment. *Transportation Research Part D.* 2004;9(2): p. 151–173.

**85.** NYC DOT. *Street Design Manual:* 2.2.3–2.2.4, 2.3.

**86.** Zegeer C, Stewart J, Huang H. *Safety Effects of Marked versus Unmarked Crosswalks at Uncontrolled Locations: Executive Summary and Recommended Guidelines.* Washington, DC: Federal Highway Administration; 2002.

**87.** Bowman BL, Vecellio RL. The effect of urban/suburban median types on both vehicular and pedestrian safety. Paper presented at the Transportation Research Board, 73rd Annual Meeting; 1994; Washington, DC.

**88.** Stollof E, McGee H, Eccles KA. *Pedestrian Signal Safety for Older Persons.* Washington, DC: AAA Foundation for Traffic Safety; 2007.

**89.** NYC DOT. *Street Design Manual*: 2.2.2

**90.** Ewing R, King M. Flexible Design of New Jersey's Main Streets. Trenton, NJ: New Jersey Department of Transportation.

**91.** Project for Public Spaces. *How to Turn a Place Around*. New York: Project for Public Spaces, Inc.; 2000.

**92.** Spivok M, Gauvin L, Brodeur J. Neighborhood-level active living buoys for individuals with physical disabilities. *American Journal of Preventive Medicine.* 2007;32(3): p. 224–230.

**93.** NYC DOT. *World Class Streets:* p. 46–47. Appropriate City approvals may be necessary.

**94**. New York City Department of Transportation. Urban Art Program. http://www.nyc.gov/urbanart.

**95.** NYC DOT. *World Class Streets:* p. 44–45.

**96**. Sarmiento O, Torres A, Jacoby E, Pratt M, Schmid T, and Stierling G..The Ciclovía-recreativa: a mass recreational program with public health potential. Unpublished manuscript.

**97.** NYC DOT. *World Class Streets:* p. 26–27.

**98.** Pucher J, Buehler, R. Making cycling irresistible: lessons from the Netherlands, Denmark, and Germany. *Transport Reviews.* 2008;28(4): p. 495–528.

**99.** New York City Department of City Planning and Department of Transportation. NYC Bicycle Master Plan. 1997: p. 11–18. http://www.nyc.gov/html/dcp/html/bike/mp.shtml.

**100.** Pucher J, Dill J, Handy S. Infrastructure, programs and policies to increase cycling: an international review. Prepared for the Active Living Research Program of the Robert Wood Johnson Foundation, and tentatively scheduled for publication in *Preventive Medicine*.

**101.** NYC DCP/NYC DOT. NYC Bicycle Master Plan: p. 27–29.

**102.** NYC DCP/NYC DOT. NYC Bicycle Master Plan: p. 39,43.

**103.** Dill J. Bicycling for transportation and health: the role of infrastructure. *Journal of Public Health Policy.* 2009;30: p. s95–s110.

**104**. NYC DCP/NYC DOT. NYC Bicycle Master Plan: p. 36–54.

**105.** NYC DOT. *Street Design Manual:* 2.2.

**106.** NYC DCP/NYC DOT. NYC Bicycle Master Plan: p. 40,46.

**107.** NYC DCP/NYC DOT. NYC Bicycle Master Plan: p. 19–26.

**108.** NYC DCP/NYC DOT. NYC Bicycle Master Plan: p. 42.

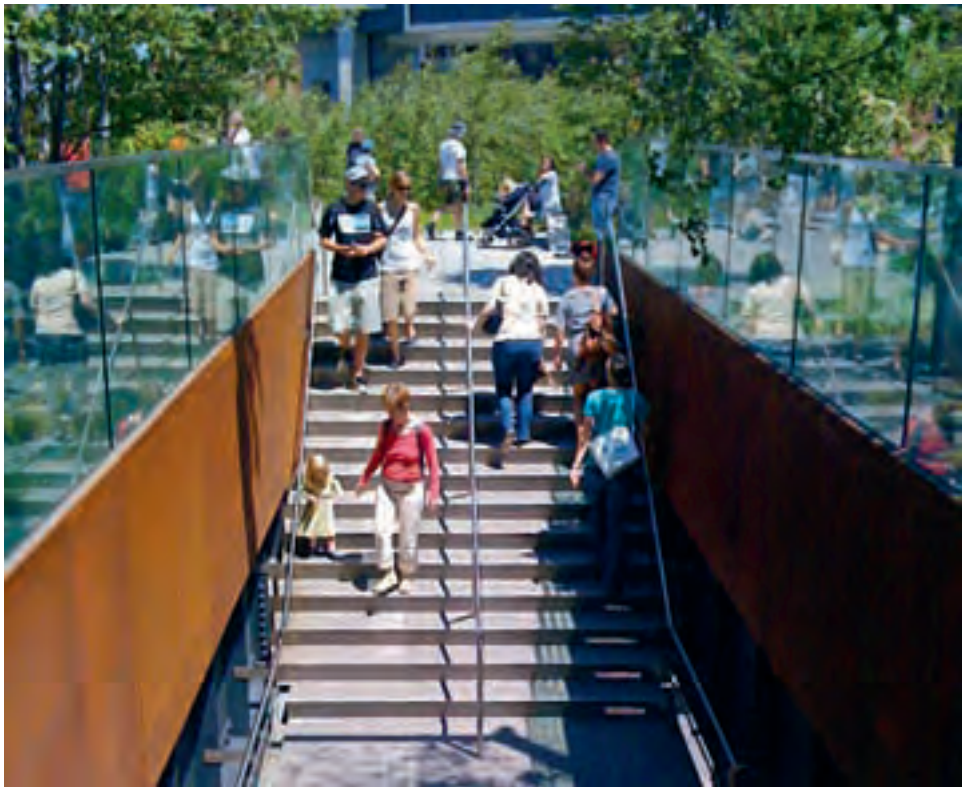
**109.** NYC DCP/NYC DOT. NYC Bicycle Master Plan: p. 32–33.

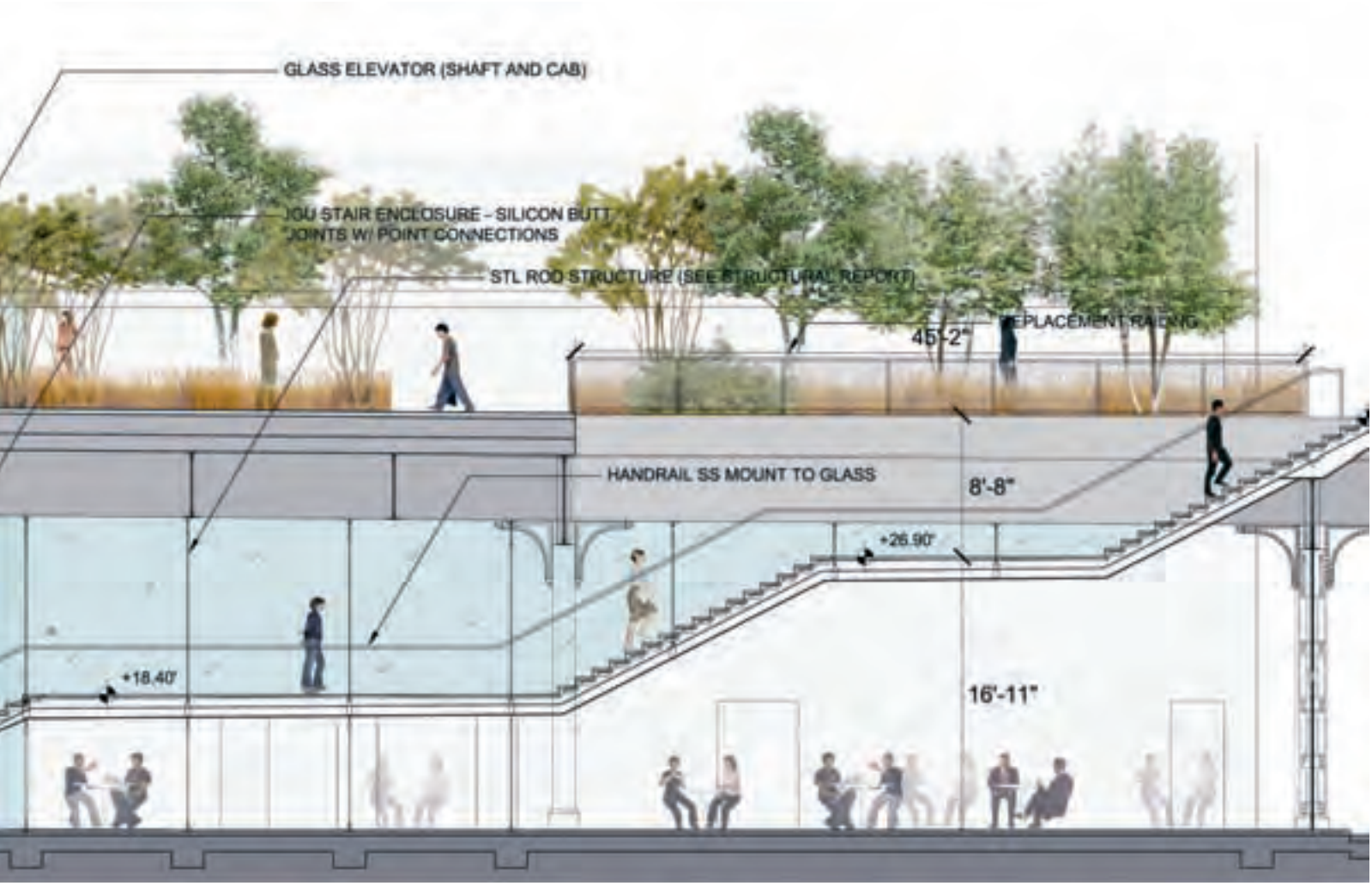
# CASE STUDY 1
## HIGH LINE PARK

In June 2009, the City of New York / Parks & Recreation opened the first portion of the innovative High Line Park. Built on an abandoned railway, the 1.5-mile-long park is one of only two urban railroad viaducts converted to park space in the world (the other is the Promenade Plantée in Paris). The High Line illustrates how cities as dense as New York can look for creative opportunities to carve recreational spaces out of the existing urban fabric.

Visitors reach the 30-foot-high park through intermittently located stairs, including a monumental and highly visible "slow stair" that permits users to fully experience the transition from the street through the existing steel structure and up to the new landscape. Elevators allow access for those unable to take the stairs. At the park level, the High Line features a mixture of landscape elements, including plantings, decks, innovative "peel-up" benches, water fountains, and recreational pathways. The project uses inventive design to encourage stair climbing, walking, and relaxation.

The High Line Park was designed by James Corner Field Operations and Diller Scofidio + Renfro, in partnership with the City and the nonprofit group Friends of the High Line.




GLASS ELEVATOR (SHAFT AND CAB)
JGU STAIR ENCLOSURE - SILICON BUTT JOINTS W/ POINT CONNECTIONS
STL ROD STRUCTURE (SEE STRUCTURAL REPORT)
45'-2"
PLACEMENT RAILING
HANDRAIL SS MOUNT TO GLASS
8'-8"
+26.90'
+18.40'
16'-11"

# CASE STUDY 2
## MADISON SQUARE / FLATIRON PLAZA

In 2008, the New York City Department of Transportation created a series of new plazas around the iconic Flatiron Building. The plazas include seating—an important element for encouraging greater use of streets by pedestrians, particularly families and seniors. The renovation also incorporated street improvements such as new, safer bicycle connections and shorter, more direct crosswalks. The plazas and accompanying road enhancements transformed a daunting pedestrian environment into a space that encourages physical activities like walking and bicycling. The City is partnering with the Madison Park Conservancy and Flatiron-23rd Street Business Improvement District on the maintenance of the plazas.

MODORE CRITERION
2792

# CASE STUDY 3
## GREEN STREETS

Launched in 1996, Greenstreets is New York City's program to convert paved, vacant traffic islands and medians into green spaces filled with shade trees, flowers, shrubs, and groundcover. Such efforts to transform the streetscape are more than a matter of beautification; they also have the potential to improve health. Research has shown that providing landscape elements and other visual attractions on streets is associated with walking and physical activity in a neighborhood. Greenstreets helped transform a Bronx intersection from a desolate zone into a more appealing pedestrian environment.

Greenstreets is a joint effort of New York City's Departments of Transportation and Parks & Recreation. The expansion of the Greenstreets program is an element of Mayor Bloomberg's PlaNYC.

GREENSTREETS
FOOD CORP.
UNION
DRIVING SCHOOL
RADIO DISPATCH INC.

# CASE STUDY 4
# BUS AND BICYCLE PARKING SHELTERS

Adding infrastructure like well-designed bus and bicycle parking shelters to city streets can help encourage active transportation and transit use.

In 2005, the New York City Department of Transportation began a project to replace and augment the city's over 3000 bus shelters by 2011. Grimshaw Architects designed the new shelters—sleek, elegant structures made of high-quality materials that can withstand the rigors of New York City's street life. Cemusa, a private street furniture company, manufactures, installs, and maintains the shelters at no cost to the City in exchange for the right to sell limited advertising within the structures. The new bus shelters offer seating—a feature especially important for the elderly and disabled.

The Department of Transportation is working with the same street furniture company to produce 37 new bicycle parking structures in the city. The shelters will display the annual NYC Cycling Map and bicycle safety tips. The structures do more than just provide parking: they convey New York City's support for cycling as a form of green and active transportation.

Parking
NYC Cycling Map
Amis Florals
Bicycle Parking

## CASE STUDY 5
## IMMACULATE CONCEPTION SCHOOL PLAY AREA

Small-scale interventions can have a big impact on children's physical activity. In her design for an outdoor area at a Bronx school, architect Katie Winter subdivided the site into a range of areas to encourage different types of play. Children can swing on colorful poles, jump on surface patterns, or climb on rocks and hills. Winter worked in collaboration with Bothwell Site Design.

# CHECKLIST URBAN DESIGN

## 2.1 LAND USE MIX

- [ ] When planning urban-scale developments, provide for a mix of uses—for example, residences, offices, schools, retail stores, cultural and community spaces, and recreational facilities.
- [ ] Locate places of residence and work near destinations such as parks, walking paths, trails, and waterfront recreation areas.
- [ ] Develop supermarkets and full-service grocery stores near places of work and residence.

## 2.2 TRANSIT AND PARKING

- [ ] Locate buildings and building entrances near public transit stops and along transit corridors.
- [ ] Place public transit stops along well-connected streets.
- [ ] Provide signage at buildings, transit stops, and major intersections showing a map and the distance, time, route, and calories burned to the nearest or next transit stop.
- [ ] Encourage transit use by furnishing transit stops with pedestrian conveniences.
  - [ ] Make sidewalks wide enough to comfortably accommodate pedestrians, including those with disabilities.
  - [ ] Provide additional space for passengers to wait by adding bus bulbs.
  - [ ] Create bus stop shelters that protect users from sun, wind, and rain.
  - [ ] Furnish bus stop shelters with seating or places to lean.
- [ ] When designing sites that include parking, consider how the provision of parking can affect the use of more active modes of travel such as walking, bicycling, and public transit.
- [ ] Provide parking for people with disabilities.

## 2.3 PARKS, OPEN SPACES, AND RECREATIONAL FACILITIES

- [ ] Design open spaces as part of large-scale developments, or locate buildings near open, public spaces.
- [ ] Make bicycle and pedestrian routes to parks and public spaces safe and visible.
- [ ] When planning a new development, aggregate open space in one large area rather than dispersing into smaller pieces. Where possible, provide residents with access to open space within a ten-minute walk.
- [ ] In the design of parks or open spaces, provide paths, running tracks, playgrounds, sports courts, and drinking fountains.
- [ ] Locate new projects near existing public and private recreational facilities and encourage development of new facilities, including indoor activity spaces.
- [ ] When designing offices and commercial spaces, provide exercise facilities or walking paths nearby.
- [ ] Design parks, open spaces, and recreational facilities to complement the cultural preferences of the local population, and to accommodate a range of age groups.
- [ ] Create partnerships with organizations to sponsor and maintain green spaces and gardens.

## 2.4 CHILDREN'S PLAY AREAS

| | |
|---|---|
| ☐ | Design courtyards, gardens, terraces, and roofs that can serve as outdoor spaces for children's play. |
| ☐ | When designing playgrounds, include ground markings indicating dedicated areas for sports and multiple use. |
| ☐ | Preserve or create natural terrain in children's outdoor play areas. |
| ☐ | Provide lights on sidewalks and active play areas to extend opportunities for physical activity into the evening. |
| ☐ | In the design of parks and playgrounds, create a variety of climate environments to facilitate activity in different seasons and weather conditions. |
| ☐ | Provide physical activity facilities for children and youth in schools. |
| ☐ | Design new school physical activity facilities to potentially allow for public use outside of school hours. |

## 2.5 PUBLIC PLAZAS

| | |
|---|---|
| ☐ | Create attractive plaza spaces that are well-maintained. |
| ☐ | Locate public plazas along popular pedestrian streets. |
| ☐ | Locate plazas near transit stops. |
| ☐ | Make plazas accessible to bicyclists. |
| ☐ | Create plazas that are level with the sidewalk. |
| ☐ | Design plazas that allow for diverse functions. |
| ☐ | Design plazas to accommodate use in a variety of weather conditions. |
| ☐ | Seek partnerships with community groups to maintain and program plazas. |

## 2.6 GROCERY STORES AND FRESH PRODUCE ACCESS

| | |
|---|---|
| ☐ | Develop full-service grocery stores within walking distance in all residential neighborhoods. |
| ☐ | Introduce farmers' markets as a complement to grocery stores. |
| ☐ | Provide safe walking and bicycle paths between densely populated areas and grocery stores and farmers' market sites. |
| ☐ | Design grocery store layouts and parking to accommodate pedestrians, cyclists, automobiles, and loading trucks safely and conveniently. Provide infrastructure such as bicycle parking and drinking fountains. |

## 2.7 STREET CONNECTIVITY

| | |
|---|---|
| ☐ | In large-scale developments, design well-connected streets with sidewalks and keep block sizes relatively small. |
| ☐ | Where current connectivity of the sidewalks and streets on a building site is poor, provide pedestrian paths through existing blocks. |
| ☐ | Avoid creating pedestrian over- and underpasses that force walkers to change levels. |
| ☐ | Maintain dedicated pedestrian and bicycle paths on dead-end streets to provide access even where cars cannot pass. |
| ☐ | Minimize addition of mid-block vehicular curb cuts on streets with heavy foot traffic. |
| ☐ | Design vehicular driveways and ramps to minimize contact between cars and pedestrians. |

## 2.8 TRAFFIC CALMING

- [ ] Design roads to be the minimum width and to have the minimum number of lanes practical.
- [ ] Incorporate traffic calming street additions such as curb extensions, medians, and raised speed reducers.
- [ ] Consider other physical design measures where appropriate, for example:
  - [ ] Horizontal deflections such as curved roadway alignments
  - [ ] Vertical deflections such as raised intersections or crossings
  - [ ] Traffic diverters, roundabouts, and mini-traffic circles
  - [ ] Signal phasing plan with a protected left-turn lag phase
  - [ ] "Yield to Pedestrian" signs
  - [ ] Avoidance of slip lanes and wide curb radii

## 2.9 DESIGNING PEDESTRIAN PATHWAYS

- [ ] Create a buffer to separate pedestrians from moving vehicles using street furniture, trees, and other sidewalk infrastructure.
- [ ] Provide seating, drinking fountains, restrooms, and other infrastructure that support increased frequency and duration of walking.
- [ ] Provide exterior lighting along streets and outdoor paths.
- [ ] Include trees and objects of visual interest on streets and sidewalks.
- [ ] Make sidewalk widths consistent with their use.
- [ ] Provide for enhanced pedestrian crossings both at mid-block and at intersections.
- [ ] Construct curb extensions along sections of the sidewalk that tend to attract greater pedestrian congestion.
- [ ] When designing large urban-scale developments, create on-site pathways as extensions to public sidewalks.
- [ ] Create or orient paths and sidewalks toward interesting views.
- [ ] Provide marked, measured walking paths on sites as part of a wayfinding system targeted to pedestrians and bicyclists.
- [ ] Make streets and paths universally accessible. Create:
  - [ ] Paths that are smooth, sufficiently wide, and that have curb cuts and turning radii adequate for a wheelchair or walker.
  - [ ] Paths with auditory crossing signals, adequate crossing times, clear signage, visible access ramps, and connections to walking, cycling, and public transit routes.

## 2.10 PROGRAMMING STREETSCAPES

- [ ] Incorporate temporary and permanent public art installations into the streetscape.
- [ ] Organize pedestrian-oriented programs, such as charity walks and vehicular street closures, that make wide avenues available for walking and bicycling.
- [ ] Increase the number of outdoor cafes to enhance street activity.

## 2.11 BICYCLE NETWORKS AND CONNECTIVITY

| | |
|---|---|
| ☐ | Design interconnected bikeways and establish a backbone network of unbroken through routes across all five boroughs of New York. |
| ☐ | Make links between bicycling and transit. |
| ☐ | On bikeways, include signposts providing bicyclists with directions, distances, and times to various destinations. |

## 2.12 BIKEWAYS

| | |
|---|---|
| ☐ | Use on-street markings or signage to visually reinforce the separation of areas for bicyclists and motorists. |
| ☐ | Where conditions warrant, separate bikeways and vehicular traffic lanes with physical demarcations. |
| ☐ | Expand existing bikeways where use has exceeded capacity. |
| ☐ | Pay special attention to the treatment of bikeways at intersections and other points where the street form changes, in order to mitigate potential visibility issues and turning conflicts. |
| ☐ | Avoid potential conflicts between cyclists and opening car doors—for example, by widening parking lanes where appropriate. |
| ☐ | Further develop Greenways—alternative routes that are integrated into the regional park system. |
| ☐ | Consider shared-use paths in areas with viewing attractions. |

## 2.13 BICYCLING INFRASTRUCTURE

| | |
|---|---|
| ☐ | Provide adequate facilities for bicyclists to park along their route or at a final destination. |
| ☐ | Designate bicycle-specific crossings and signals to organize the movements of pedestrians, cyclists, and motorists at busy intersections. |
| ☐ | Construct bicycle rails along outdoor stairways, such as those on “step streets.” |
| ☐ | Explore bicycle share programs to increase access to bicycles for both city residents and visitors. |

# CHAPTER THREE BUILDING DESIGN

**The New York Times Building,**
Manhattan, Renzo Piano Building Workshop

# BUILDING DESIGN: CREATING OPPORTUNITIES FOR DAILY PHYSICAL ACTIVITY

**The design of buildings provides an excellent opportunity to promote regular and important instances of physical activity. Most people spend as much as 90 percent of their days indoors, often engaged in sedentary occupations. For many, actions such as climbing stairs or getting up from a desk to use office equipment, although brief, are the most accessible and economical way to participate in some form of regular physical activity within long periods of inactivity.**

**The task of creating activity-friendly buildings largely depends on the integration of active design philosophies into the building's circulation systems—especially its stairs and elevators—and its program. Designers should pay special attention to four key opportunities, taking care to support accessibility for individuals of all mobility levels:**

1. The design of the building's circulation system—that is, the interior spaces, corridors, stairs, elevators, and lobbies that connect a building's programmed spaces. The circulation system provides opportunities for walking, the most popular type of physical activity. Stairs and ramps should be designed with attention to principles of universal accessibility.

2. The design of individual building elements such as stairs, exercise rooms, shower rooms, bicycle storage, or plazas. The design of these elements can either promote or deter activity through their availability, convenience, desirability, safety, and comfort. Providing conveniences like drinking fountains and benches can further support physical activity. In contrast, features such as unneeded escalators, an overemphasis on elevators, and barriers like door locks, grade changes, non-ergonomic design, and poor placement of building elements can deter physical activity.

3. Careful organization of the building program to encourage walking between destinations. Building inhabitants can exercise through regular travel to the mailbox in a residential building, for example, or to the cafeteria in a workplace.

4. The provision and design of programmed activity spaces, including exercise rooms, swimming pools, running tracks, multipurpose rooms, and other specialized spaces designated as venues for physical activity.

**In addition to these active design strategies targeting the building's interior elements, the massing and exterior design of a structure can also encourage physical activity by contributing to the creation of a walkable street environment. Although research on the relationship between facade design and physical activity is limited,**

East Harlem School, Manhattan, Peter L. Gluck and Partners

**The task of creating activity-friendly buildings largely depends on the integration of active design philosophies into the building's circulation systems—especially its stairs and elevators—and its program.**

experience from practice suggests that buildings that incorporate features like human-scale detailing, multiple entries, transparency, canopies, exterior stairs, porches, and terraces may encourage increased walking.

Finally, the siting of a building can also have a significant impact on physical activity levels, particularly through the handling of pedestrian paths, street connectivity, and outdoor spaces. For more information on site design strategies that encourage physical activity, readers should consult chapter 2, "Urban Design."

# 3.1 DESIGNATING STAIRS FOR EVERYDAY USE

OBJECTIVE

**Increase daily stair climbing by designating at least one stair in the building for everyday use. Stair use is one of the most accessible means for large portions of the New York City population to integrate physical activity into their daily lives.[1] Stair use burns calories, and research has linked stair use to other health benefits such as better cardiovascular health.[2,35,36] Stair climbing has been shown to raise individuals' good cholesterol levels.[37]**

STRATEGIES

☆ **Provide one or all stairs in a building for everyday use, whether in the form of a grand staircase or fire stairs that also serve as a principal means of travel.**

Include grand staircases and open interconnecting stairs where feasible. Research indicates that grand staircases in buildings tend to invite use. The evidence suggests that stairs attract more use when they are highly visible from paths of travel, easy to access, and feature finishes consistent with other public corridor finishes.[3] If the everyday stair also functions as a fire stair, maximize its accessibility, visibility, and aesthetics.

☆ **Focus on stairs rather than elevators as the principal means of vertical travel for those who are able to climb stairs, especially for travel of four stories or less.**

☆ **In high-rise buildings, provide an integrated vertical circulation system that incorporates stair use for travel between adjacent floors, so that elevators are used primarily for vertical travel of four floors or more.**

This strategy might include the use of a skip-stop elevator system in which all elevators except one stop only on designated floors, encouraging able-bodied travelers to access adjacent floors by stair while providing ADA accessibility for mobility-challenged users. Other features to consider include open stairs between two or more floors of a single-tenant office.

☆ **Integrate the stair with the principal areas of orientation and travel within the building.**

Include a stair as an integral component of the main circulation system of the building. Incorporate a stair within the main orientation lobby (which may or may not include the building's elevator) and as an extension of the most traveled paths within the building.

◇ **Make the stairs accessible to the public areas of the building and, where possible, eliminate locks between staircases and floor areas.**

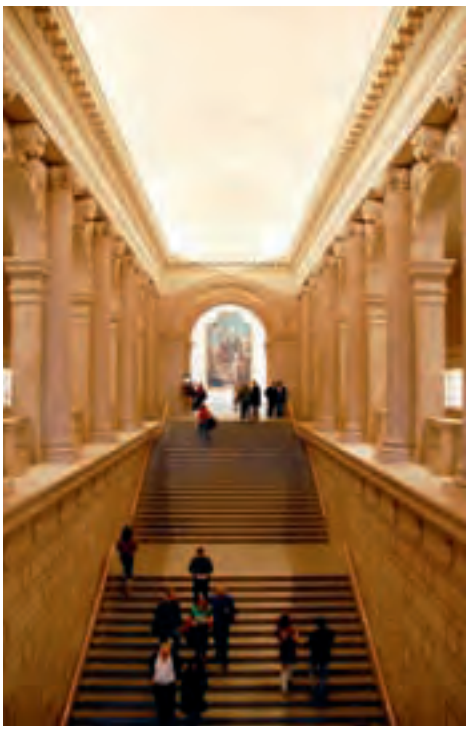
Stairs that require keys or access cards to enter floor areas are less likely to be used on a regular basis than openly accessible paths of travel.[3]

★ Strong Evidence ☆ Emerging Evidence ◇ Best Practice

ADDITIONAL INFORMATION

These strategies can complement stair planning issues such as fire safety, egress, and barrier-free design. Most building codes, including New York City's, regulate stairs primarily as a means of emergency egress while discouraging elevator use for emergency evacuations.[4] Buildings that incorporate everyday stair use may improve occupant safety in emergency situations by making building users more familiar with paths of egress. Americans with Disabilities Act (ADA) guidelines and universal design strategies generally focus on elevator use as the primary means of vertical circulation, but providing an integrated vertical circulation system incorporating stairs and elevators designed to meet or exceed ADA guidelines can enhance activity and accessibility for both ambulatory and mobility-challenged building users.

**Integrate the stair with the principal areas of orientation and travel within the building.**
Bronx Museum of the Arts, the Bronx, Arquitectonica



**Research indicates that grand staircases in buildings tend to invite use.**
Central staircase at the Metropolitan Museum of Art, Manhattan, Richard Morris Hunt

# 3.2 STAIR LOCATION AND VISIBILITY

OBJECTIVE

**Increase stair use by locating a highly visible and appealing stair within the building's orientation areas and points of decision.**

STRATEGIES

☆ **Locate stairs near the building's entrance.**

Research indicates that stairs located within 25 feet of an entrance and encountered prior to the elevator are more likely to be used for everyday travel.[3]

☆ **Locate a stair targeted for everyday use near the elevator.**

Users may consider taking a stair located near to and visible from the elevator lobby a more expedient option than waiting for the elevator.[3,5] Visual and physical proximity of a stair to the elevator can be supplemented by point-of-decision signage encouraging people waiting for elevators to take the stairs.

☆ **Locate an appealing, visible stair directly on the building's principal paths of travel.**

Research indicates that stairs directly accessible and visible from a building's elevator waiting areas, atrium, entry vestibules, and most-used public corridors are more likely to be utilized for everyday travel.[3] One study found that stair use decreased as the number of turns required to access the stairs from either the building's entrance or principal path of travel increased. Highly visible grand or ornamental stairs indicate that they are provided for use.

**Enclosing a stair with glass increases its visibility and encourages everyday use. The glass pictured here is fire protected through the use of a sprinkler water curtain.** Memorial Sloan-Kettering Cancer Center interaction staircase, Manhattan, SOM in collaboration with ZGF Architects

◇ **Design stairs to be more visible, in order to encourage their everyday use.**
Stairs, particularly those designated for fire egress, often are not visible from a building's main spaces. Code-mandated fire separations are traditionally achieved by encasing stairs in opaque masonry or gypsum board assemblies with solid metal doors. However, alternative assemblies, materials, and systems are available that allow egress stairs to be more visible while meeting code requirements for fire resistance ratings.

Egress stairs can be made more visible by incorporating:

- Fire-rated glass enclosures instead of traditional opaque enclosures.
- Open stairs between two or more floors with either the same or associated tenancies. Where open stairs connect more than two floors, additional sprinkler systems, smoke control system, and building code variance may be required, as per NFPA 13 and the New York City Building Code.[4,6]

**Locate stairs near the building's entrance to encourage everyday use.**
Apple store, Manhattan, Bohlin Cywinski Jackson with Ronette Riley Architect

# 3.3 STAIR DIMENSIONS

OBJECTIVE

**Provide stairs that can accommodate the needs of different users, including large or small groups who may be ascending and descending. Design stairs to make multi-floor travel more physically comfortable for the young, elderly, and others with minor physical challenges such as those carrying packages.**

STRATEGIES

☆ **Make stairs wide enough to accommodate travel in groups and in two directions.**
Research indicates that wider stairs are associated with increased stair use. Although building codes generally require minimum stair widths of 44 inches, stairs at least 56 inches wide can more comfortably accommodate the dimensions of two people talking and traveling together or two people traveling in opposite directions.[3,4,7]

☆ **Design stair risers and treads that are comfortable and safe.**
Research indicates that stairs with 7-inch risers and 11-inch treads may provide the most comfortable travel for the general population.[7] In order to accommodate people who find stair use physically challenging, provide at least one intermittent landing between floors, with no more than 11 risers between landings.

ADDITIONAL INFORMATION

The New York City Building Code regulates stair dimensions.[4] The code mandates that riser heights may range from 4 inches minimum to 7 inches maximum, and that tread depth must be 11 inches minimum in most occupancies. Dimensions must be consistent throughout the run of the stair. The maximum allowable height between stair landings is 12 feet, which would actually permit a challenging 20 risers per flight.

Although building owners may be concerned that wider stairs will take away from other programmed space or revenue-producing area in the building, wider, well-placed stairs can reduce the need for extensive public corridors and additional elevators, and can result in a cost-neutral or even cost-saving strategy in addition to increasing physical activity.

**Provide stairs that can accommodate different users' needs, including large or small groups.**
East Harlem School, Manhattan, Peter Gluck and Partners

**Research indicates that wider stairs are associated with increased stair use.**
Pratt Institute, Stabile Hall, Brooklyn, PKSB Architects

# 3.4 APPEALING STAIR ENVIRONMENT

OBJECTIVE

**Encourage stair use through appealing environments and experiences.**

STRATEGIES

☆ **Use articulated and unique stair compositions to promote interest in stair travel.**

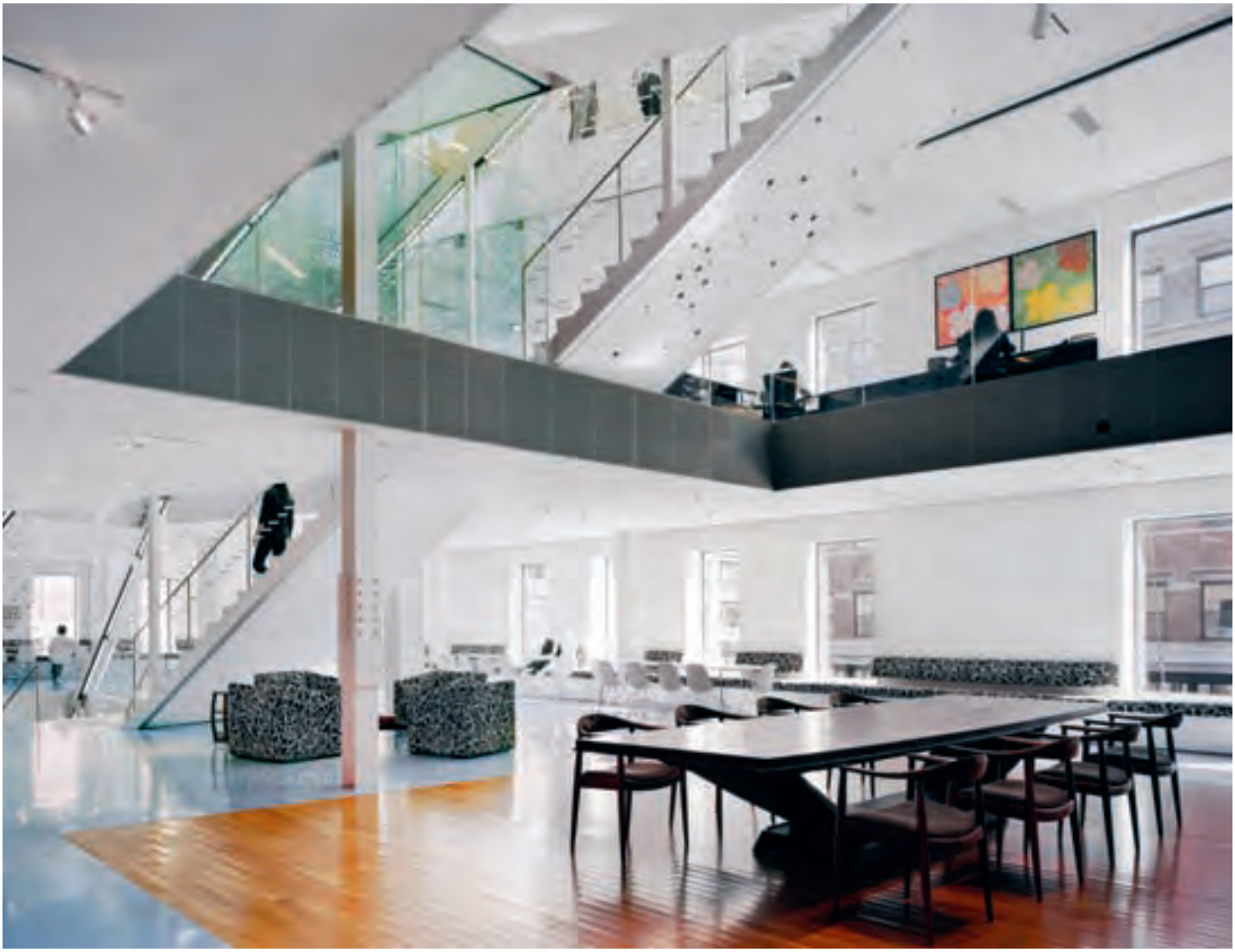
Two strategies for articulating the importance of the stair as an architectural element are:

- Grand, sculptural staircases. Grand stairs in a building's main orientation space are often used to define visitors' pace and sequence through a building.
- Exciting stair construction. Even if there is no room for a large grand stair, the articulation and unique detailing of elements like balustrades, handrails, and landings can attract building visitors to experience the stair.[3]

◇ **Provide visually appealing interior finishes.**

Create continuity between stairs and their adjoining spaces through the consistent expression and quality of wall and floor finishes, including those applied to stairs and risers.

**Articulated and unique stair compositions encourage use.**
Diane von Furstenberg Studio Headquarters, Manhattan, WORK Architecture Company



☆ **Design stair environments that appeal to the senses.**

Provide a stair experience that is more stimulating than the elevator. Strategies to enhance the sensory appeal of the stair include:

- Highlighting interesting views, such as prospects onto nature or indoor gathering areas.
- Incorporating artwork into the stair environment.[8,9] Note that artwork in egress stairs must be noncombustible.
- Adding music to stairwells.[8]
- Incorporating natural ventilation. For non-pressurized stairwells, natural ventilation can provide better indoor air quality and can provide pleasant auditory distractions or reduce unpleasant noises.
- Selecting bright, inviting colors that attract use.

◇ **Design safe stairs.**

Reduce the risk of falls that might limit stair use by older or less active individuals. Strategies for making stairs safe include:

- Provide slip-resistant floor finishes.
- Provide color or textural contrasts at tread nosings for safety.[7]

**At the Bronx Library Center, designed by Dattner Architects, daylight and an art installation by Inigo Manglano-Ovalle are integrated into generously scaled, open stairs to create inviting circulation paths.**

◇ **Provide well-lit stair environments that encourage use.**

Provide illumination levels within the stair environment corresponding to its purpose as an important public space in the building. Consider the following strategies:

- Incorporate natural daylight into the stair environment.
- Provide illumination levels of 75 percent to equal that of adjacent corridors, with a minimum of 10 foot-candles illumination within the stair.

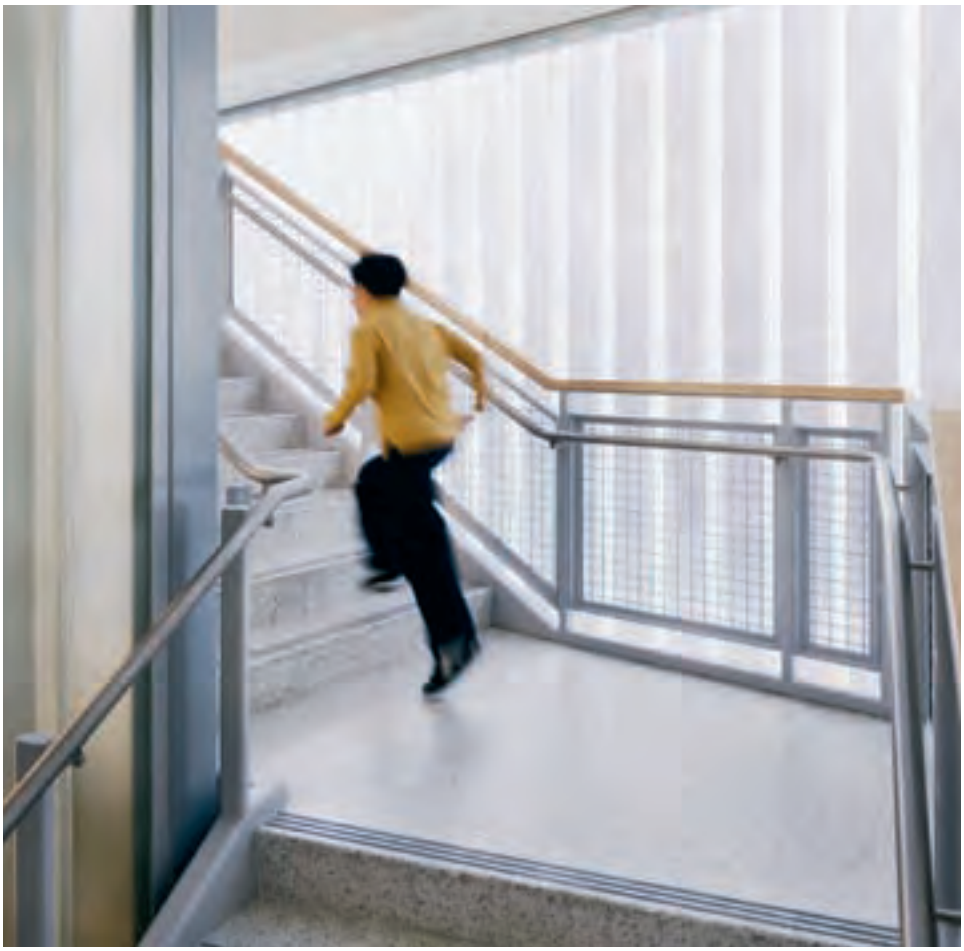
  Note that minimum building code illumination levels of 2 foot-candles (22 lux) at the walking surface are principally established for emergency egress, not to encourage daily use.

◇ **Design stairs to be easily maintained.**

As stair environments are not typically upgraded on a regular basis, select quality long-lasting materials. The initial building design should specify materials and finishes that are easy to clean and maintain, resistant to wear and tear, and that discourage graffiti and vandalism.

ADDITIONAL INFORMATION

The NYC Building Code allows certain types of interior finishes in stairwells based on material combustibility classifications, flame spread rating, and critical radiant flux ratings. Mirrors and other reflective materials are not allowed on exit doors.[4]



**Incorporate natural daylight into stairs to invite use.**
Bronx Library Center, the Bronx, Dattner Architects

# 3.5 STAIR PROMPTS

OBJECTIVE

**Encourage use of stairs by providing informational or motivational signage at points where users must decide between taking stairs or elevators and escalators.**

STRATEGIES

★ **Place signage at elevators and escalators to encourage stair use.**

Signage located at the elevator or escalator that directs building users to a nearby stair and that emphasizes the health benefits of stair climbing can prompt people who would otherwise use the elevator to take the stairs.[5,8-16] Across studies, simply the placement of such signage increases stair use by a median of 50%.[17] Visually link point-of-decision signage with the elevator's waiting area or control buttons and the stair location.

- When the stair entrance is visible from the elevator waiting area, design and locate signage to visually direct people to the stair.
- For stairs that are not visible from the elevator waiting area, use directional signage to link the stair to the elevator lobby.

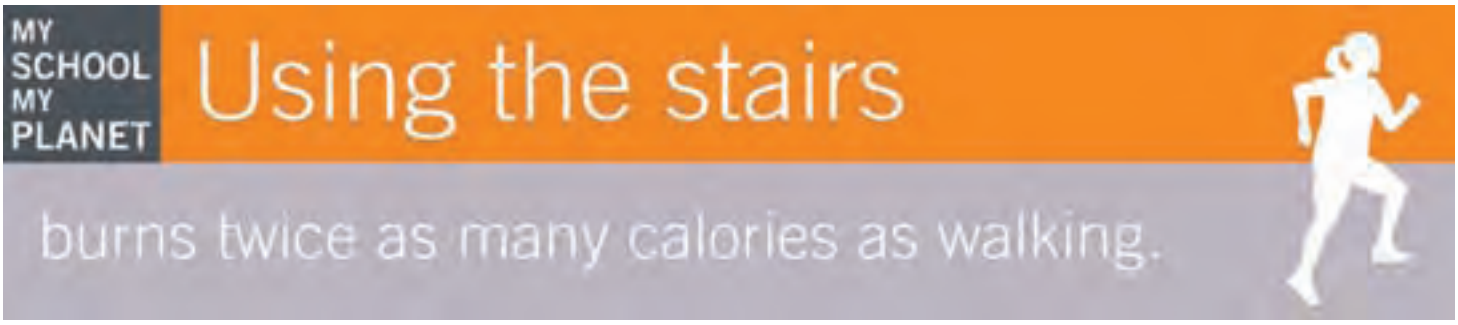
☆ **Locate stair prompts where they will be most visible.**

Stair prompts can be presented in many different forms and locations, including wall- or ceiling-mounted signage, stair riser banners, and footprint appliqués leading from an elevator to a stair entry. Highly visible signage can prompt elevator or escalator users to consider taking the stair instead.[14-16,18]

☆ **Design informational and motivational messages to be linguistically and culturally appropriate to the building's users.**[12]

Stair prompt signage should:

- Use multilingual messages compatible with building users.
- Match motivational message with building users' sensibilities and travel motivations. For example, signs may emphasize health benefits, calorie expenditures, weight control, or convenience.[10,18]
- Be age appropriate. Signs may feature larger fonts for the young and elderly, for example, or floor footprints for children.




**Signs are more effective when they address building users' cultural, gender, and age attributes, as well as their motivations regarding health behavior or energy use.** A point-of-decision sign directing and motivating people to use the stairs can be obtained from the New York City Department of Health and Mental Hygiene for free by calling 311. Also shown above is a stair prompt designed and used by the School Construction Authority.

# 3.6 ELEVATORS AND ESCALATORS

OBJECTIVE

**Reduce the emphasis on a building's elevators and escalators to promote everyday use of stairs among people who can use the stairs, while supporting accessibility for all building occupants.**

**Active design strategies that promote stair over elevator use by the able-bodied should maintain elevator access for those unable to take the stairs. Active and universal design can be synergistic: For example, the more general use of stairs can free up elevators for use by individuals with physical challenges. Design teams should seek integrated building circulation solutions that simultaneously provide for safety, accessibility, and the promotion of health and physical activity.**

**Reducing usage of elevators and escalators also promises benefits for the environment and attendant cost savings, since mechanized conveying systems such as elevators routinely account for approximately 3 to 10 percent of a building's energy use.**[19,20]

STRATEGIES

☆ **Design elevators to be less prominent than the stairs for people who can use the stairs, while providing elevator access for people with disabilities.**

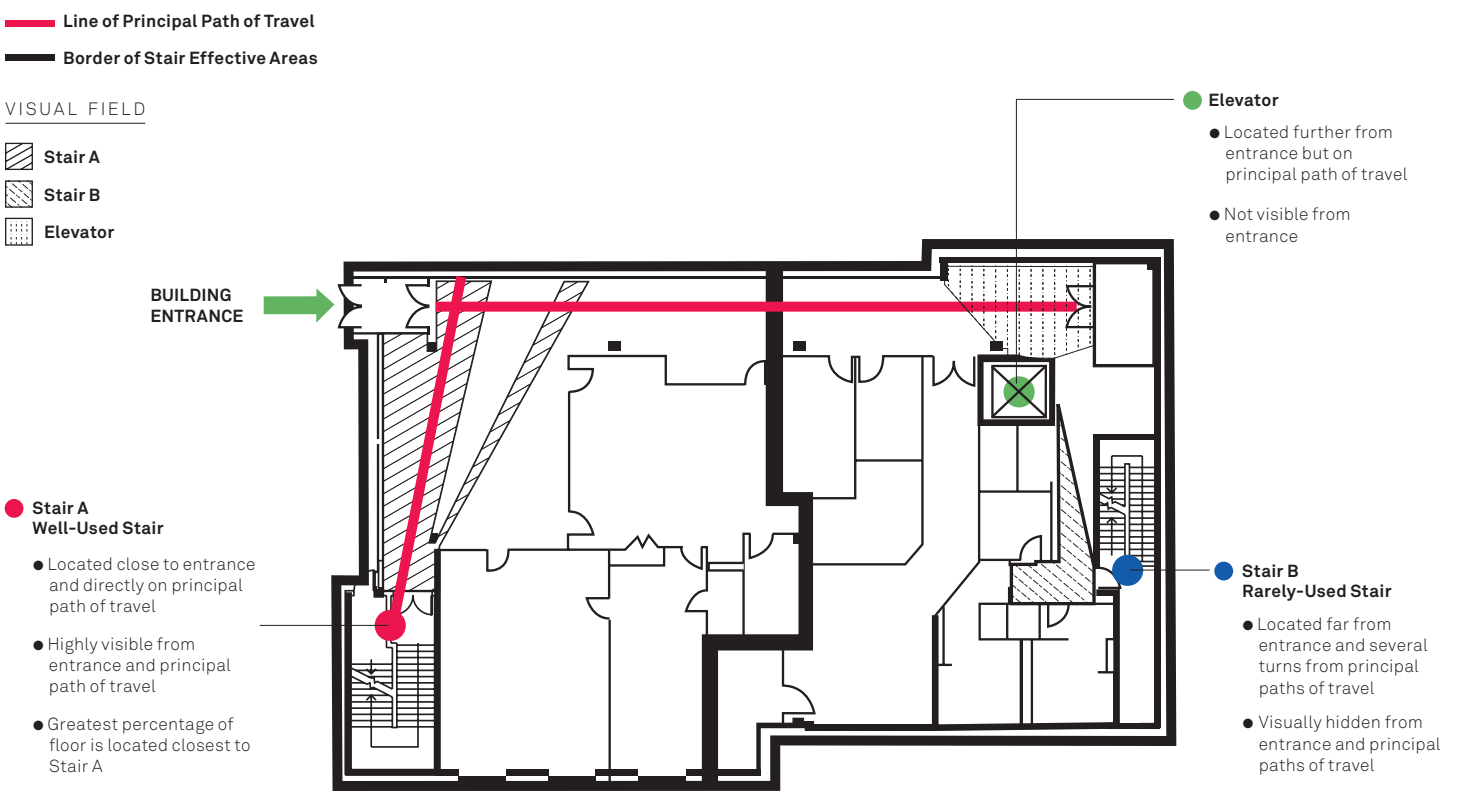
Make the stairs the initial and principal element for vertical travel in the building rather than the elevator, especially for routes under four stories.[3] Possible strategies include:

- Locate elevators out of direct view from the building's entrance. Provide clear signage directing individuals with disabilities to accessible elevators.
- Do not program the elevators to return to the ground floor and rest in the open position when not in use.
- Refrain from visually highlighting and articulating the elevator while visually emphasizing the stairs provided for everyday use.
- Where feasible, for example in high-rise commercial buildings, consider creating a second-floor lobby, accessible from ground level by a grand or open stair. Locating the main elevator banks on the second floor (except for one ADA elevator) would not only encourage stair use but could also provide more ground floor space for other functions.
- Where feasible—especially in low-rise buildings, consider limiting the number, size, and capacity of elevators to the minimum required by building code. This strategy is not appropriate in facilities such as hospitals, nursing homes, or assisted living sites, where there is a heavy reliance on the elevator due to the populations served.
- Consider reducing the elevator travel speed or the cab door open-and-close speeds, particularly in low-rise buildings.[21,22] Slowing the door open-and-close speeds can also make elevators more accessible to individuals with physical challenges.

☆ **Consider installing skip-stop elevators, where appropriate for the building type.** Where feasible, consider using skip-stop elevators that stop only on certain floors, encouraging able-bodied building users to take the stairs to access adjacent floors where the elevator does not stop.[1] This can be particularly effective in promoting stair use for trips of one to three floors. Include at least one elevator that stops at all floors, to ensure universal accessibility. Use of this elevator can be limited to those who need it—through an electronic card access system, for example.[23] The installation of a skip-stop elevator system may also lead to cost savings through a reduction in number of elevator doors, lower elevator maintenance costs, and addition of usable space that would otherwise be lost to elevator waiting areas.

☆ **Use signage at the elevator and escalator entry areas to promote nearby stair use.** Incorporate signage in elevator lobbies and near escalator entrances to indicate the location of nearby stairs and to encourage stair use as an alternative to mechanized travel.[21,22,24]

**For those able to take the stairs, make the stairs the initial and principal element for vertical travel in the building rather than the elevator.**



◇ **Limit the use of escalators in buildings.**

Avoid providing escalators except where the flow of large numbers of people makes it necessary for pedestrian safety. In high-travel facilities such as train stations, research indicates that stair use drops 50 percent with the provision of a second escalator.[25] Buildings with escalators also have the lowest rates of stair use.[26]

Also consider the following strategies where appropriate:

- Limiting escalator use to rush hours, when the volume of people requires the effective movement of large crowds. This would promote stair use during off-peak hours as well as potentially reducing energy use and maintenance costs.
- Slowing escalators during non-rush hours, to make adjacent stairs a more appealing option.
- Retrofitting existing escalators with motion sensor activation devices to both discourage use and save energy.

## 3.7 BUILDING PROGRAMMING

OBJECTIVE

**Locate the building's commonly used functions strategically to promote walking, standing, and wheelchair travel during the course of the day.**

STRATEGIES

◇ **Locate building functions to encourage brief bouts of walking or travel to commonly used amenities.**

- In work environments, organize functions such as restrooms, lunchrooms or cafeteria, photocopy rooms, mailrooms, shared equipment spaces, staff lounges, and meeting rooms a pleasant walking distance from individual work spaces. Grouping some of these shared functions together can help create routine travel breaks for workers at least once or twice a day.[27]
- In large-scale multiple-building developments, provide for tenant spaces that can accommodate newsstands, post offices, places to purchase healthy food, and other functions that people may want to access during the day.
- In mixed-use buildings, locate common functions in the lobby area to promote walking to routine lunchtime and after-work or after-school activities.
- In residential environments, place functions such as community and recreational spaces, mailrooms, and management offices on an alternative floor or a pleasant walking distance from individual residences and building entrances, in order to encourage daily bouts of walking and stair climbing.

◇ **Consider locating the principal building lobby functions on the second floor accessible by a prominent grand stair or ramp, as well as by a less prominent elevator, to encourage walking.**

This strategy could also provide more ground floor area for other functions and more space on the second floor for services and activities.

- **Consider locating shared functions on alternative floors, adjacent to staircases or ramps.**

- **When arranging a building's programs, consider the capacities and ages of specific inhabitants.**
  Maintain accessibility of all building functions for users of diverse physical abilities.

- **Encourage personal interaction in addition to electronic communication.**
  Design spaces and activities to encourage more personal communication between people within the building and less sedentary, electronic communication. Provide spaces where people can gather and engage in productive, pleasant, and safe social interaction.

**Locate shared functions, such as mailrooms, on the second floor to encourage walking and other forms of active travel among building occupants.**
Lerner Hall, Columbia University, Manhattan, Bernard Tschumi Architects

# 3.8 APPEALING AND SUPPORTIVE WALKING ROUTES

OBJECTIVE

**Increase the frequency and duration of recreational and task-oriented walking by providing an appealing environment and experience along paths of travel.**

STRATEGIES

☆ **Provide visually appealing environments along paths of travel.**

Incorporate interesting views along paths of travel within a building. These views may include natural and designed landscapes, nearby architecture, interior views of people-oriented activities, and visually appealing interior finishes.[28,29]

**Incorporate interesting views along paths of travel within a building, including natural and designed landscapes, nearby architecture, interior views of people-oriented activities, and visually appealing interior finishes.**
Lerner Hall, Columbia University, Manhattan, Bernard Tschumi Architects

**Provide daylighting along paths of travel.**
Queens Hospital Center Ambulatory Care Pavilion, Queens, Perkins Eastman Architects

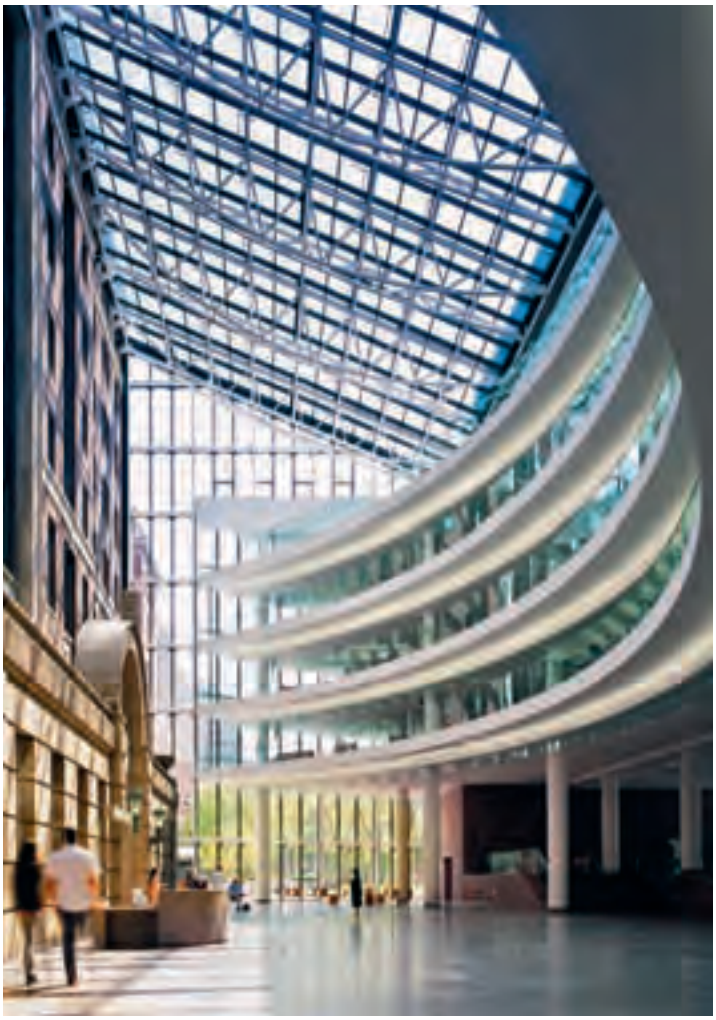
**Provide information about walking routes within and around the building. At Bellevue Hospital, a Wellness at Work program includes organized indoor walking and stair climbing sessions to encourage staff to exercise within the building.**
Bellevue Hospital Ambulatory Care Facility, Manhattan, Pei Cobb Freed & Partners

- **Provide daylighting along paths of travel.**
  Incorporate daylighting into walking paths within a building to provide a more appealing sensory experience.

- **Provide supportive infrastructure along walking routes.**
  Facilities such as restrooms, drinking fountains, water refilling stations, and benches both provide reasons for taking a walk within the workplace and offer refreshment and support during physical activity. Seating in landscaped areas can also offer sensory stimulation and lunchtime distraction from workplace stress.

- **Provide information about walking routes within and around the building.**
  Install information boards displaying the locations of walking paths within and outside the building, as well as the locations of nearby amenities such as shopping, restaurants, grocery stores, services, entertainment, exercise facilities, and other places of interest.

- **Consider providing incremental distance markers so that people can judge the amount of walking they've done.**
  Distance markers can assist people to set goals for daily walking and stair climbing, and may encourage individuals to incorporate short bouts of physical activity into daily routines.



# 3.9 BUILDING FACILITIES THAT SUPPORT EXERCISE

OBJECTIVE

**Provide building facilities that support recreational and transportation-related exercise.**

STRATEGIES

★ **Include physical activity spaces in commercial workplaces and residential buildings.**

Provide physical activity spaces such as exercise rooms, active play spaces, and multi-purpose recreational spaces in public, workplace, and residential buildings. This is particularly important in buildings serving low-income populations who may have limited access to private gyms or exercise programs, and who have higher rates of obesity and diabetes nationwide.[30]

☆ **Locate physical activity spaces in centrally visible locations in the building, to help increase awareness and use of these spaces.**

Provide views into activity spaces from well-traveled paths within the building.[28]

★ **Provide views to the outdoors from physical activity rooms.**

Research indicates that exercise is more appealing when it occurs in spaces with views to nature and human activities.[28,31]

☆ **Provide shower and locker room facilities in buildings to encourage bicycling, walking, and running between home and work, as well as other exercise at lunch hours and breaks.**

Shower and locker rooms can be integrated as part of on-site exercise facilities or provided adjacent to ground-floor restrooms.[32]

◇ **Provide secure, sheltered, and accessible bicycle storage, preferably on the ground floor.**

Safe, accessible bicycle storage supports individuals who commute by bicycle. Providing bicycle storage may also limit damage to building interiors from those who might otherwise bring their bicycles into work areas or residences, due to concerns about theft. New York City recently has enacted several laws mandating that certain buildings and facilities provide bicycle

**Encourage bicycling by providing a secure, accessible bicycle storage room, preferably on the ground floor.** Bicycle storage installation by Gale's Industrial Supply, Residential building, Manhattan

**Design activity spaces for users of multiple ages.** Children's play room at the Visionaire condominium, Manhattan, Pelli Clarke Pelli

parking or other accommodations for cyclists. When designing bicycle parking areas in residential buildings, consider providing additional space for storage of other recreational equipment such as kayaks.

◇ **Provide information boards and signage about facilities, services, and groups related to physical activities.**

Information and motivational messages may assist in prompting people to engage in planned group and individual exercise programs.

◇ **Design activity spaces to accommodate a building's various occupant groups.**

Architects should consider the special safety and security requirements of activity spaces that serve small children and older adults, in addition to other building user groups. To address issues such as parents' need for childcare while they exercise, consider design strategies that allow children and adults to exercise at the same time. For example, locating play areas with a surrounding walking track or adjacent to an adult exercise space allows parents to exercise and simultaneously watch their children at active play.

◇ **Provide easily accessible drinking fountains for building tenants and visitors throughout the building.**

ADDITIONAL INFORMATION:

The inclusion of bicycle storage and showers can qualify buildings for a Sustainable Site point under the LEED rating system. New York City zoning codes permit showers in most commercial buildings, with a few exceptions. City zoning codes also require that new multifamily residential, commercial, and community facility buildings, as well as public parking garages, include enclosed, secure bicycle parking. Additionally, Local Laws 51 and 52 require that existing parking garages and lots provide bicycle parking, and that existing office buildings with freight elevators allow tenants to bring bicycles into the buildings.

**Provide shower and locker room facilities to encourage exercise at lunch hours and breaks.**
Locker rooms, 14th Street Y, Manhattan, Z-A Studio and Studio ST

# 3.10 BUILDING EXTERIORS AND MASSING

OBJECTIVE

**Design building exteriors and massing that encourage physical activity. The exterior of a building may support physical activity indirectly, by animating a street and contributing to a human-scale, pedestrian-friendly urban environment, or directly—for example, through the inclusion of stairs or canopies that encourage walking. Research suggests that exterior design and massing may influence safety,[33] and can positively promote social support and daily activity among the elderly.[34] Experience from best practices in the field suggests that the design of building facades can help create inviting, active pedestrian environments.**

STRATEGIES

◇ **Maximize variety, detail, and continuity on the lower one-to-two floors of the building exterior.**

The lower portion of a building exterior is critical in contributing to an active street, and should contain appropriate variety and detailing to sustain pedestrians' interest. The size and texture of exterior details should relate to the scale of the human body and the speed at which humans walk. Variety and complexity at the smaller scale should be designed to contribute to a sense of continuity and cohesion at the larger neighborhood scale.

◇ **Provide multiple entries and maximum transparency along the street to help enliven the pedestrian environment.**

Providing multiple entries helps to activate the street and to maintain a human scale that is inviting to pedestrians. In lower density residential neighborhoods, porches, stoops, and terraces facing the road can facilitate a social street environment, foster a sense of security, and contribute to a neighborhood's character.

◇ **Incorporate canopies and awnings into building facades.**

Canopies and awnings can encourage walking by providing shade from the sun and shelter from inclement weather, while adding visual interest to the street.

**Provide multiple entries and maximum transparency along the street to help enliven the pedestrian environment.**
14 Townhouses, Brooklyn, Rogers Marvel Architects

Storefronts in Soho, Manhattan

◇ **Carefully incorporate stairs and ramps as building design features when needed.** In residential buildings, external stairs and short, landscaped ramps can help to activate the street and to provide a sense of privacy for inhabitants. Ramps also provide active living opportunities for individuals with disabilities. In commercial buildings, however, where the maintenance of a continuous street wall is desired, external stairs can pull the building facade further from the sidewalk or reduce the sidewalk width. In these cases, interior stairs and ramps may be preferable. When stairs and ramps must be exterior, they can serve the purpose not only of circulation but also as sitting and gathering places for walkers.

◇ **Design building massing to enhance nearby parks, plazas, and open spaces.** Minimize the building's potential to cast shadows or to create wind conditions that will adversely affect adjacent outdoor spaces.

ADDITIONAL INFORMATION:

The New York City Building Code limits exterior egress stairs and ramps to buildings no higher than six stories or 75 feet.

**Exterior stairs encourage physical activity and can animate a building facade and street.**
957 Pacific Street Condominium, Brooklyn, Loadingdock5 Architecture

REFERENCES


1. Nicoll G and Zimring C. The effect of innovative building design on physical activity. *Journal of Public Health Policy.* 2009;30(supplement 1): p. S111–S123.
2. Lee IM and Paffenbarger RS, Jr. Physical activity and stroke incidence: the Harvard alumni study. *Stroke.* 1998;29: p. 2049–2054.
3. Nicoll G. Spatial measures associated with stair use. *American Journal of Health Promotion.* 2007; 21(supplement 4): p. S346–S352.
4. New York City Building Code. New York City; 2008.
5. Bungum T, Meacham M, and Truax N. The effects of signage and the physical environment on stair usage. *Journal of Physical Activity and Health.* 2007;4(3): p. 237–44.
6. National Fire Protection Association. *NFPA 13: Installation of Sprinkler Systems;* 2002.
7. Templer J. *The Staircase: Studies of Hazards, Falls and Safer Design.* Cambridge, MA: Massachusetts Institute of Technology; 1992.
8. Kerr KA, et al. Increasing stair use in a worksite through environmental changes. *American Journal of Health Promotion.* 2004;18(4): p. 312–315.
9. Boutelle K, et al. Using signs, artwork and music to promote stair use in a public building. *American Journal of Public Health.* 2001;91(12): p. 2004.
10. Anderson RE, et al. Can inexpensive signs encourage the use of stairs? Results from a community intervention. *Annals of Internal Medicine.* 1998;129(5): p. 363–369.
11. Blamey A and Mutrie N. Health promotion by encouraged use of stairs. *Student BMJ.* 1995;3(33): p. 338.
12. Coleman K and Gonzalez E. Promoting stair use in a US-Mexico border community. *American Journal of Public Health.* 2001;91(12): p. 2007.
13. Kerr J, Eves F, and Carroll D. Posters can prompt less active people to use the stairs. *Journal of Epidemiology and Community Health.* 2000;54: p. 942–943.
14. Kerr J, Eves F, and Carroll D. Encouraging stair use: stair-riser banners are better than posters. *American Journal of Public Health.* 2001;91(8): p. 1192–1193.
15. Kerr J, Eves F, and Carroll D. The influence of poster prompts on stair use: the effects of setting, poster size and content. *British Journal of Health Psychology.* 2001;6(4): p. 397–405.
16. Kerr J, Eves F, Carroll D. Six-month observational study of prompted stair climbing. *Preventive Medicine.* 2001;33: p. 422–427.
17. Guide to Community Preventive Services. Environmental and policy approaches to physical activity: point-of-decision prompts to encourage use of stairs. www.thecommunityguide.org/pa/environmental-policy/podp.html. Accessed December 3, 2009.
18. Kreuter MW, Strecher VJ, Glassman M. One size does not fit all: a case for tailoring print materials. *Annals of Behavioral Medicine.* 1999;21: p. 1192–1193.
19. Sachs H. Opportunities for Elevator Energy Efficiency Improvements. Washington, DC: American Council for Energy-Efficient Economy; 2005. http://www.aceee.org/buildings/coml_equp/elevators.pdf. Accessed May 18, 2008.

**20.** Toledo C. Reduce greenhouse-gas emissions with vertical transportation equipment. *Buildings.* 2007. http://www.buildings.com/articles/detail.aspx?contentID=4823. Accessed May 21, 2008.

**21.** Van Houten R, Nau PA, Merrigan M. Reducing energy elevator use: a comparison of posted feedback and reduced elevator convenience. *Journal of Applied Behavior Analysis.* 1981; 14(4): p. 377–387.

**22.** Ford MA and Torok D. Motivational signage increases physical activity on a college campus. *Journal of American College Health.* 2008;57(2): p. 242–244.

**23.** United States Access Board. Americans with Disabilities Act and Architectural Barriers Act Accessibility Guidelines. http://www.access-board.gov.

**24.** Dolan MS, Weiss LA, Pietrobelli A, Heo M, Faith MS. Take the stairs instead of the escalator: effect of environmental prompts on community stair use and implications for a national "small steps" campaign. *Obesity Reviews.* 2006;7(1): p. 25–32

**25.** Faskunger J, Poorvliet E, Nylund K, Rossen J. Effect of an environmental barrier to physical activity on commuter stair use. *Scandinavian Journal of Nutrition.* 2003;47: p. 26–28.

**26.** Eves FF and Webb OJ. Worksite interventions to increase stair climbing; reasons for caution. *Preventive Medicine.* 2006;43(1): p. 4–7.

**27.** Sailer K. Movement in workplace environments: configurational or programmed? Istanbul: Proceedings, 6th International Space Syntax Symposium; 2007: p. 68–01 to 68–14.

**28.** Pikora T, Giles-Corti B, Bull F, Jamrozik K, Donavan R. Developing a framework for assessment of the environmental determinants of walking and cycling. *Social Science and Medicine.* 2003;56(8): p. 1693–1704.

**29.** Nicoll G. *Taking the Stairs: Environmental Features That Predict Voluntary Stair Use in 3 to 4 Story Academic Workplace Buildings* [dissertation]. Atlanta, Georgia: Georgia Institute of Technology; 2006.

**30.** Kahn EB, Ramsey LT, Brownson RC, Heath GW, Howze EH, Powell KE, Stone EJ, Rajab MW, Corso P, and the Task Force on Community Preventive Services. The effectiveness of interventions to increase physical activity: a systematic review. *American Journal of Preventive Medicine.* 2002;22(supplement 4): p. 73–107. http://www.thecommunityguide.org/pa/pa-ajpm-evrev.pdf.

**31.** Regnier V. *Assisted Living Housing for the Elderly: Design Innovations from the United States and Europe.* New York: Van Nostrand Reinhold; 1994.

**32.** Vuori IM, Oja P, Paronen M. Physically active commuting to work-testing its potential for exercise promotion. *Medicine & Science in Sports & Exercise.* 1994;26: p. 844–850.

**33.** Carter, SP, Carter SL & Dannenberg AL. Zoning out crime and improving community health in Sarasota, Florida: "Crime prevention through environmental design." *American Journal of Public Health.* 2003;93(9): p. 1442–1445.

**34.** Brown SC, et al. The relationship of built environment to perceived social support and psychological distress in Hispanic elders: the role of "eyes on the street." *The Journals of Gerontology Psychological Sciences and Social Sciences.* 2009;64(2): p. 234–246.

**35.** Zimring C, et al. Influences of building design and site design on physical activity: research and intervention opportunities. *American Journal of Preventive Medicine.* 2005;28(2S2): p. 186-193.

**36.** Brownell KD, Stunkard AJ, Albuam JM. Evaluation and modification of exercise patterns in the natural environment. *American Journal of Psychiatry.* 1980;137(12): p. 1540-1545.

**37.** Boreham CAG, Wallace WFM, Nevill A. Training effects of accumulated daily stair-climbing exercise in previously sedentary young women. *Preventive Medicine.* 2000;30: p. 277-281.

# CASE STUDY 1
# MUSEUM OF MODERN ART

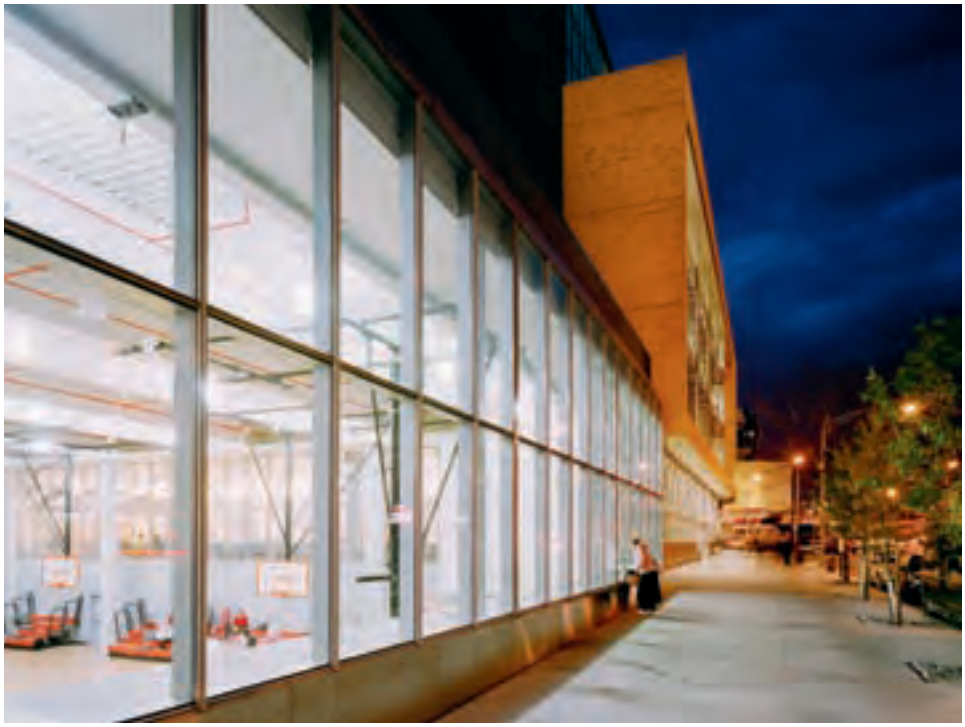
Prominent placement, natural light, and artwork can help make a stair more appealing to users. In Yoshio Taniguchi's design for the renovation and expansion of the Museum of Modern Art, a naturally illuminated stair replaces the escalator as the principal means of travel from the lobby to the first gallery level. The stairs are positioned prominently and are visible from the lobby, while the elevator and escalator are tucked away from view. A Bell-47D1 helicopter, designed by Arthur Young in 1945, is suspended above the main stair and helps draw visitors up to the galleries above.

## CASE STUDY 2
## ONE MADISON AVENUE BICYCLE ROOM

Providing a secure bicycle storage room near the workplace or home encourages daily ridership. An exemplary case can be found at One Madison Avenue, also known as the Met Life Building. In response to employee demand, the Credit Suisse Group created a dedicated bicycle room at the lobby level. The company's workers can register their bicycles and receive swipe-card access and identification tags. The company also provides air pumps to fill flat tires and discounts for the health club next door, which has showers and locker rooms. The *New York Times* recently called the company a "bicyclist's nirvana."

# CASE STUDY 3
# HARLEM CHILDREN'S ZONE

The Harlem Children's Zone Promise Academy Charter School and Community Center, designed by Davis Brody Bond Aedas, features a glass facade that allows the community to see the dynamic activity within. From the street, passersby can witness children exercising in the gymnasium and climbing the building's naturally illuminated staircase. The importance of physical activity is signaled by the fact that it is given a prominent, brightly lit space rather than being relegated to a less desirable location within the building. The facility houses a pioneering community-based organization and includes a charter school, medical clinic, community center, and administrative offices.



## CASE STUDY 4
## 10 WEST END AVENUE FITNESS AND PLAY ROOMS

Attention to the location and design features of a fitness room can promote its use. At 10 West End Avenue, an adult fitness area is located next to a children's play area on the lobby level. A glass partition allows parents to exercise while keeping an eye on their children. High ceilings and generous lighting help make physical activity more convenient and appealing. The building was designed by SLCE Architects. Murphy & Dine designed the interior of the fitness area and Children's Museum of Manhattan created the children's activity center.

TA

## CASE STUDY 5
## THE NEW YORK TIMES BUILDING

The New York Times Building, designed by Renzo Piano Building Workshop in association with FXFOWLE Architects and completed in 2007, is a case study of exemplary and innovative stair design and other active design strategies. The New York Times Company's space, with interiors by Gensler, features two central open staircases connecting the floors of the newsroom, encouraging intercommunication among the editorial staff and promoting everyday walking. A common cafeteria supports daily bouts of walking by the company's employees by virtue of its intermediate location on the fourteenth floor. Finally, the building's distinctive transparent red corner communicating stairs foster interaction between neighboring floors. The architects worked with the New York Department of Buildings to install an unconventional fire spread prevention system: horizontal shutters slide closed when the smoke alarms are activated. The system enables the stairs to be light and open while meeting fire spread regulations.

# CASE STUDY 6
# THE SCHOOL CONSTRUCTION AUTHORITY DESIGN STANDARDS AND THE GREEN SCHOOLS GUIDELINES

The New York City School Construction Authority (SCA) has instituted several policies intended to encourage health, recreation, and sustainability—most notably, new requirements for "gymatoriums" and bicycle storage.

In the past, primary and intermediate public schools in New York City included a gymnasium and an auditorium. In 2009, the School Construction Authority changed this policy as part of an initiative to focus on children's health and fitness. Since auditoriums typically are not used full time, schools will now be required to contain a gymnasium and, instead of an auditorium, a "gymatorium." A gymatorium is essentially a gymnasium with a stage and seating on one side; it provides additional exercise opportunities when an auditorium is not needed. This cost-effective solution provides over 50 percent additional space for physical education and after-school exercise without increasing a school's overall square footage.

The gymatoriums can be configured in multiple ways: An elevated stage can be paired with movable chairs and bleachers or retractable riser seating. Alternately, the exercise floor can function as the performance space, together with retractable risers or stadium seating.

City public schools have also embraced the recently enacted NYC zoning law requiring bicycle storage in public buildings. The SCA's NYC Green Schools Guide calls for a wide, deep entry vestibule that includes space for secure floor-or wall-mounted bicycle racks. The racks and bikes are to be within clear view of the school safety officer, and should be accessible without a key. Traditional bicycle racks will also be installed in the school yards. The provision of secure bicycle storage will support cycling by both school employees and students.

Together with primary schools' traditional emphasis on stair over elevator use, the new gymatoriums and bicycle storage encourage greater physical activity among the city's youth through strategies that are efficient in their utilization of energy, space, and resources.

**Gymatorium at Primary and Intermediate School 210M,** Manhattan, Michael Fieldman, Architect

# CHECKLIST BUILDING DESIGN

## 3.1 DESIGNATING STAIRS FOR EVERYDAY USE

- [ ] Provide one or all stairs in a building for everyday use, whether in the form of a grand staircase or fire stairs that also serve as a principal means of travel.
- [ ] Focus on stairs rather than elevators as the principal means of vertical travel for those who are able to climb the stairs.
- [ ] In high-rise buildings, provide an integrated vertical circulation system that incorporates stair use for travel between adjacent floors, so that elevators are used primarily for vertical travel of four floors or more.
- [ ] Integrate the stair with the principal areas of orientation and travel within the building.
- [ ] Make the stairs accessible to the public areas of the building and, where possible, eliminate locks between staircases and floor areas.

## 3.2 STAIR LOCATION AND VISIBILITY

- [ ] Locate stairs near the building's entrance.
- [ ] Locate a stair targeted for everyday use near the elevator.
- [ ] Locate an appealing, visible stair directly on the building's principal paths of travel.
- [ ] Design stairs to be more visible. Use one or more of the following:
  - [ ] Fire-rated glass enclosures instead of traditional opaque enclosures
  - [ ] Open stairs between two or more floors with either the same or associated tenancies

## 3.3 STAIR DIMENSIONS

- [ ] Make stairs wide enough to accommodate travel in groups and in two directions.
- [ ] Design stair risers and treads that are comfortable and safe.

## 3.4 APPEALING STAIR ENVIRONMENT

- [ ] Use articulated and unique stair compositions:
  - [ ] Grand, sculptural staircases
  - [ ] Exciting stair construction
- [ ] Provide visually appealing interior finishes.
- [ ] Design stair environments that appeal to the senses.
  - [ ] Highlight interesting views, such as prospects onto nature or indoor gathering areas.
  - [ ] Incorporate artwork into the stair environment.
  - [ ] Add music to stairwells.
  - [ ] Incorporate natural ventilation.
  - [ ] Select bright, inviting colors.

| | | | |
|---|---|---|---|
| | | | Design safe stairs. |
| | | | Provide slip-resistant floor finishes. |
| | | | Provide color or textural contrasts at tread nosings. |
| | | | Provide well-lit stair environments. |
| | | | Incorporate natural daylight into the stair environment. |
| | | | Provide illumination levels of 75 percent to equal that of adjacent corridors. |
| | | | Design stairs to be easily maintained. |

## 3.5 STAIR PROMPTS

| | | | |
|---|---|---|---|
| | | | Place signage at elevators and escalators to encourage stair use. |
| | | | Locate stair prompts where they will be most visible. |
| | | | Design informational and motivational messages to be linguistically and culturally appropriate to the building's users. |
| | | | Use multilingual messages compatible with building users. |
| | | | Match motivational message with building users' sensibilities and travel motivations. |
| | | | Use age appropriate messages. |

## 3.6 ELEVATORS AND ESCALATORS

| | | | |
|---|---|---|---|
| | | | Design elevators to be less prominent than the stairs for people who can use the stairs, while providing elevator access for people with disabilities. |
| | | | Locate elevators out of direct view from the building's entrance. |
| | | | Do not program the elevators to return to the ground floor and rest in the open position when not in use. |
| | | | Refrain from visually highlighting and articulating the elevator while visually emphasizing the stairs provided for everyday use. |
| | | | In high-rise commercial buildings, consider creating a second-floor lobby accessible from ground level by a grand or open stair. |
| | | | Consider limiting the number, size, and capacity of elevators to the minimum required by code, where appropriate. |
| | | | Consider reducing the elevator travel speed or the cab door open-and-close speeds, particularly in low-rise buildings. |
| | | | Consider installing skip-stop elevators, where appropriate for the building type. |
| | | | Use signage at the elevator and escalator entry areas to promote nearby stair use. |
| | | | Limit the use of escalators in buildings. Also consider one or more of the following strategies: |
| | | | Limit escalator use to rush hours. |
| | | | Slow escalators during non-rush hours. |
| | | | Retrofit existing escalators with motion sensor activation devices. |

## 3.7 BUILDING PROGRAMMING

| | | | |
|---|---|---|---|
| | | | Locate building functions to encourage brief bouts of walking to commonly used amenities within a building. |
| | | | In work environments, organize functions such as restrooms, lunchrooms or cafeteria, photocopy rooms, mailrooms, shared equipment spaces, staff lounges, and meeting rooms a pleasant walking distance from individual work spaces. |

| | | | |
|---|---|---|---|
| | | | In large-scale multiple-building developments, provide for tenant spaces that can accommodate newsstands, post offices, places to purchase healthy food, and other functions. |
| | | | In mixed-use buildings, locate common functions in the lobby area to promote walking to routine lunchtime and after-work or after-school activities. |
| | | | In residential environments, place functions such as community and recreational spaces, mailrooms, and management offices on an alternative floor or a pleasant walking distance from individual residences and building entrances. |
| | | Consider locating the principal building lobby functions on the second floor accessible by a prominent grand stair or ramp. | |
| | | Locate shared functions on alternative floors, adjacent to staircases or ramps. | |
| | | When arranging a building's program, consider the capacities and ages of specific inhabitants. | |
| | | Encourage personal interaction in addition to electronic communication. | |

## 3.8 APPEALING AND SUPPORTIVE WALKING ROUTES

| | | | |
|---|---|---|---|
| | | Provide visually appealing environments along paths of travel. | |
| | | Provide daylighting along paths of travel. | |
| | | Provide supportive infrastructure along walking routes. | |
| | | | Restrooms |
| | | | Drinking fountains or water refilling stations |
| | | | Benches |
| | | Provide information about walking routes within and around the building. | |
| | | Provide incremental distance markers. | |

## 3.9 BUILDING FACILITIES THAT SUPPORT EXERCISE

| | | |
|---|---|---|
| | | Include physical activity spaces in commercial workplaces and residential buildings. |
| | | Locate physical activity spaces within centrally visible locations in the building. |
| | | Provide views to the outdoors from physical activity rooms. |
| | | Provide shower and locker room facilities. |
| | | Provide secure, sheltered, and accessible bicycle storage, preferably on the ground floor. |
| | | Provide information boards and signage about facilities, services, and groups related to physical activities. |
| | | Design activity spaces to accommodate a building's various occupant groups. |
| | | Provide easily accessible drinking fountains throughout the building. |

## 3.10 BUILDING EXTERIORS AND MASSING

| | | |
|---|---|---|
| | | Maximize variety, detail, and continuity on the lower one-to-two floors of the building exterior. |
| | | Provide multiple entries and maximum transparency along the street to help enliven the pedestrian environment. |
| | | Incorporate canopies and awnings into building facades. |
| | | Carefully incorporate stairs and ramps as building design features. |
| | | Design building massing to enhance nearby parks, plazas, and open spaces. |

# CHAPTER FOUR SYNERGIES

Pratt Institute School of Architecture, Brooklyn, Rogers Marvel Architects

# SYNERGIES WITH SUSTAINABLE AND UNIVERSAL DESIGN

Active design not only enhances public health but can also reinforce the goals of environmental sustainability and universal access. Design strategies that increase physical activity and improve health—for example, measures that promote walking and cycling over driving, stair over elevator and escalator use, and active recreation over television watching—also tend to reduce energy consumption and greenhouse gas emissions. Strategies to increase healthy eating, such as the promotion of local farmers' markets and installation of tap water drinking fountains, can also help decrease food transportation costs and reduce waste from beverage containers. In addition, active design targets not only people able to climb stairs daily but users of all abilities, ages, and backgrounds. Building features like ramps contribute to an inclusive, universal environment while providing a non-mechanized means of vertical transport, thereby encouraging physical activity and saving energy. As these examples illustrate, a diverse, active, healthy population and a sustainable planet are synergistic.

Architects and urban designers should look for points of overlap and symbiosis among active, sustainable, and universal design strategies, to maximize the performance of their designs.

Architects and urban designers should therefore look for points of overlap and symbiosis among active, sustainable, and universal design strategies in order to maximize the performance of their designs. This chapter examines several opportunities for integrating design measures aimed at improving health, sustainability, and universal access: First, we recommend taking advantage of existing elements in the Leadership in Energy and Environmental Design (LEED) green building rating program that reward active design. The introduction of a new LEED Physical Activity Innovation Credit can act as an additional incentive. Second, urban designers and planners can find reinforcement for active design goals in two local strategic planning efforts: PlaNYC and the Health Department's Take Care New York. Third, we offer as examples and resources several other local initiatives that simultaneously promote physical activity and sustainability through design. Lastly, we suggest numerous areas of synergy between active and universal design strategies that enhance both health and accessibility. Integrating active, sustainable, and universal design contributes jointly toward the goal of Mayor Bloomberg's Design + Construction Excellence Initiative to create a more livable and hospitable New York City.

***Synergies with the LEED Green Building Rating System***

Established by the United States Green Buildings Council (USGBC) in 2000, LEED is today the most widely used system for certifying green buildings in the United States and around the world. It is currently used in more than 100 countries. To date, USGBC has certified over four billion square feet of building under the LEED program. Although LEED is commonly understood as a method for accrediting the environmental sustainability of buildings, the rating system also contains many

**Active and sustainable design are synergistic.** Visitors walk up a gently sloping green roof of the Queens Botanical Garden Visitor and Administration Center, designed by BKSK Architects, the first LEED Platinum certified public building in New York City.

**provisions intended to promote health. In fact, one of the few prerequisites that all LEED certified projects must meet is control of exposure to environmental tobacco smoke (ETS), through a ban on indoor smoking. This mandate is consistent with research showing tobacco to be the leading cause of premature deaths in the U.S. and is directly aimed at protecting and promoting the health of building users.**

**Beyond simply reducing buildings' environmental footprints, LEED seeks more broadly to encourage design professionals and owners to create exemplary places to live, work, and relax. In 2009, the USGBC adopted social equity—measured by, among other factors, health and community benefits—as one of the guiding principles in its strategic plan. LEED's expanding attention to health issues is an encouraging response to numerous factors: First, obesity and its underlying causes are urgent public health problems. Recent research has identified physical inactivity and unhealthy diets as second only to tobacco as the leading causes of premature death in the United States.[1,2] Globally too, cardiovascular diseases (such as heart disease and stroke) that are linked to physical inactivity and unhealthy diets have overtaken infectious diseases as the leading causes of death.[3,4] Second, research linking environmental design and increased physical activity is mounting. Given LEED's broad international reach among architects and clients, the integration of even more active design principles into this existing certification program can have a profound effect on enhancing health, as well as sustainability, around the world. LEED can also be a vehicle for developing metrics to gauge health-related benefits, similar to those created to measure energy and water efficiency.**

**Below, we have highlighted some of the key components of LEED related to health and physical activity for various project types. We hope that future amendments to LEED will continue to incorporate active design principles, and to demonstrate the synergies between active and sustainable design.**

**LEED New Construction (NC)**

Health and workplace benefits have been an important consideration in LEED since the program's inception. In addition to the prerequisite for control of environmental tobacco smoke, LEED also addresses the management of indoor air quality, control of chemical pollution, and enhancement of daylighting and views—all factors that contribute to the health of building inhabitants. As part of its Sustainable Sites criteria, LEED also awards points to buildings that promote transportation-related physical activity such as walking and bicycling.

**LEED Commercial Interiors (CI)**

Besides the provisions relating to environmental tobacco smoke, indoor air quality, chemical pollution, daylighting, and transportation-related physical activity described above, LEED CI includes an additional credit rewarding the use of system furniture made of materials that do not off-gas, thereby producing occupant health and workplace benefits through enhanced indoor air quality.

**LEED Existing Buildings (EB)**

LEED EB includes a significant focus on occupant health and indoor environmental quality. In addition to the credits related to indoor air quality contained in LEED NC, LEED EB rewards buildings that consistently use sustainable cleaning products and equipment. These measures aim to limit building occupants' exposure to hazardous chemicals and particulate contaminants. In addition, LEED guidelines favor cleaning equipment that is ergonomically designed to minimize vibration, noise, and user fatigue.

**LEED Neighborhood Development (ND)**

Green developments can benefit not only their occupants but also the residents of surrounding communities. LEED ND aims to reduce the environmental impact of communities at a neighborhood scale through new categories such as Smart Location and Linkage, and Neighborhood Pattern and Design. These strategies aim to diminish pollutants like sulfur oxides, nitrogen oxides, particulate matter, and carbon monoxide, and to minimize ozone depletion and heat island effects. Several LEED ND credits, created with the help of health professionals, also address critical public health issues like obesity. Many of the credits in LEED ND will assist in increasing physical activity and improving public health.

**LEED contains many provisions intended to promote health.** The Hearst Tower, designed by Foster and Partners with Adamson Associates, earned a LEED Gold rating. The building includes active and green design features such as a bicycle storage space.

# SYNERGIES BETWEEN LEED AND ACTIVE DESIGN

The chart below identifies LEED 2009 products and credit categories that address physical activity and health. The credit numbers and titles listed below may vary among different versions of LEED and are provided for reference only.

## CREDITS THAT ADDRESS HEALTH THROUGH PHYSICAL ACTIVITY

| LEED CATEGORY | LEED PRODUCT* | LEED CREDIT | HEALTH BENEFITS |
|---|---|---|---|
| **Sustainable Sites** | | | |
| Credit 2 | NC | Development Density and Community Connectivity | Increased walking and physical activity |
| Credit 4.1 | NC | Alternative Transportation—Public Transportation Access | Increased walking and physical activity |
| Credit 4.2 | NC | Alternative Transportation—Bicycle Storage and Changing Rooms | Increased bicycling and physical activity |
| Credit 4.4 | NC | Alternative Transportation—Parking Capacity | Increased walking, bicycling, and physical activity |
| Credit 2 | CI | Development Density and Community Connectivity | Increased walking and physical activity |
| Credit 3.1 | CI | Alternative Transportation—Public Transportation Access | Increased walking and physical activity |
| Credit 3.2 | CI | Alternative Transportation—Bicycle Storage and Changing Rooms | Increased bicycling and physical activity |
| Credit 3.3 | CI | Alternative Transportation—Parking Availability | Increased walking, bicycling, and physical activity |
| Credit 4 | EBOM | Alternative Commuting Transportation | Increased walking, bicycling, and physical activity |
| **Smart Location and Linkage** | | | |
| Prereq 1 | ND | Smart Location | Increased walking and physical activity |
| Credit 3 | ND | Reduced Automobile Dependence | Increased walking and physical activity |
| Credit 4 | ND | Bicycle Network and Storage | Increased bicycling and physical activity |
| Credit 5 | ND | Housing and Jobs Proximity | Increased walking and physical activity |
| **Neighborhood Pattern and Design** | | | |
| Prereq 1 | ND | Walkable Streets | Increased walking and physical activity |
| Prereq 2 | ND | Compact Development | Increased walking and physical activity |
| Prereq 3 | ND | Connected and Open Community | Increased walking and physical activity |
| Credit 1 | ND | Walkable Streets | Increased walking and physical activity |
| Credit 2 | ND | Compact Development | Increased walking and physical activity |
| Credit 3 | ND | Mixed-Use Neighborhood Centers | Increased walking and physical activity |
| Credit 5 | ND | Reduced Parking Footprint | Increased walking and physical activity |
| Credit 6 | ND | Street Network | Increased walking, bicycling, and physical activity |
| Credit 7 | ND | Transit Facilities | Increased walking and physical activity |
| Credit 8 | ND | Transportation Demand Management | Increased walking and physical activity |
| Credit 9 | ND | Access to Civic and Public Spaces | Increased walking and physical activity |
| Credit 10 | ND | Access to Recreation Facilities | Increased walking and physical activity |
| Credit 14 | ND | Tree-Lined and Shaded Streets | Increased walking and physical activity |
| Credit 15 | ND | Neighborhood Schools | Increased walking and physical activity |

## CREDITS THAT ADDRESS GENERAL HEALTH

| LEED CATEGORY | LEED PRODUCT* | LEED CREDIT | HEALTH BENEFITS |
|---|---|---|---|
| **Sustainable Sites** | | | |
| Prereq 1 | NC | Construction Activity Pollution Prevention | Reduced emissions and dust improve local air quality and water quality. |
| **Neighborhood Pattern and Design** | | | |
| Credit 13 | ND | Local Food Production | Increased access to healthy food and nutrition. |
| **Green Infrastructure and Buildings** | | | |
| Prereq 4 | ND | Construction Activity Pollution Prevention | Reduced emissions and dust improve local air quality and water quality. |
| **Indoor Environmental Quality** | | | |
| Prereq 1 | NC | Minimum Indoor Air Quality (IAQ) Performance | Improves indoor air quality and protects respiratory health. |
| Prereq 2 | NC | Environmental Tobacco Smoke (ETS) Control | Reduced exposure to environmental tobacco smoke and reduced risk of all tobacco-related diseases. |
| Credit 1 | NC | Outdoor Air Delivery Monitoring | Proper fresh air mix improves indoor air quality and protects respiratory health. |
| Credit 2 | NC | Increased Ventilation | Regulated air quality and temperature reduce risk of respiratory symptoms. |
| Credits 3.1 and 3.2 | NC | Construction IAQ Management Plan | Regulated air quality and temperature reduce risk of respiratory symptoms. |
| Credit 5 | NC | Indoor Chemical and Pollutant Source Control | Regulated air quality and temperature reduce risk of respiratory symptoms. |
| Credit 6.2 | NC | Controllability of Systems—Thermal Comfort | Regulated air quality and temperature reduce risk of respiratory symptoms. |
| Credits 7.1 and 7.2 | NC | Thermal Comfort | Regulated air quality and temperature reduce risk of respiratory symptoms. |
| Credits 8.1 and 8.2 | NC | Daylight and Views | Natural light and views are restorative, and can reduce pain in health care settings. |
| Prereq 1 | CI | Minimum Indoor Air Quality (IAQ) Performance | Improves indoor air quality and protects respiratory health. |
| Prereq 2 | CI | Environmental Tobacco Smoke (ETS) Control | Reduced exposure to environmental tobacco smoke and reduced risk of all tobacco-related diseases. |
| Credit1 | CI | Outdoor Air Delivery Monitoring | Proper fresh air mix improves indoor air quality and protects respiratory health. |
| Credit2 | CI | Increased Ventilation | Regulated air quality and temperature reduce risk of respiratory symptoms. |
| Credits 3.1 and 3.2 | CI | Construction IAQ Management Plan—During Construction | Regulated air quality and temperature reduce risk of respiratory symptoms. |
| Credit 5 | CI | Indoor Chemical and Pollutant Source Control | Regulated air quality and temperature reduce risk of respiratory symptoms. |
| Credit 6.2 | CI | Controllability of Systems—Thermal Comfort | Regulated air quality and temperature reduce risk of respiratory symptoms. |
| Credits 7.1 and 7.2 | CI | Thermal Comfort | Regulated air quality and temperature reduce risk of respiratory symptoms. |
| Credits 8.1 and 8.2 | CI | Daylight and Views | Natural light and views are restorative, and can reduce pain in health care settings. |
| Prereq 1 | EBOM | Minimum Indoor Air Quality (IAQ) Performance | Improves indoor air quality and protects respiratory health. |
| Prereq 2 | EBOM | Environmental Tobacco Smoke (ETS) Control | Reduced exposure to environmental tobacco smoke and reduced risk of all tobacco-related diseases. |
| Prereq 3 | EBOM | Green Cleaning Policy | Reduced risk of respiratory and neurological symptoms among maintenance staff. |
| Credits 1.1–1.5 | EBOM | Indoor Air Quality—Best Management Practices | Improves indoor air quality and protects respiratory health. |
| Credit 2.3 | EBOM | Occupant Comfort—Thermal Comfort Monitoring | Regulated air quality and temperature reduce risk of respiratory symptoms. |
| Credit 2.4 | EBOM | Daylight and Views | Natural light and views are restorative, and can reduce pain in health care settings. |
| Credits 3.1–3.6 | EBOM | Green Cleaning | Reduced risk of respiratory and neurological symptoms among maintenance staff. |

* NC—New Construction, ND—Neighborhood Development, CI—Commercial Interiors, EBOM—Existing Buildings: Operations & Maintenance

**LEED Physical Activity Innovation Credit**

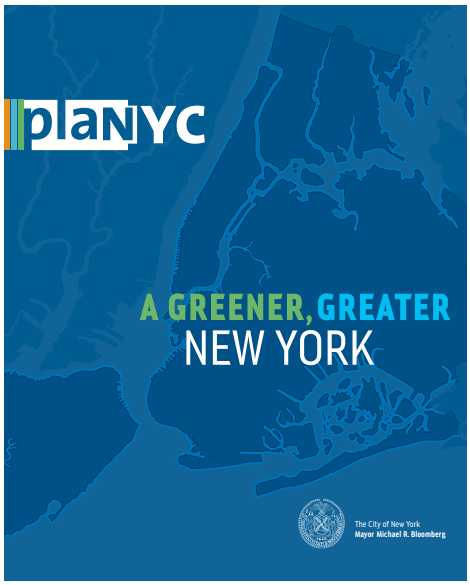
As part of the LEED rating system, the USGBC allows design teams to propose credits for exceptional or innovative performance. In 2009, a public-private partnership composed of the New York City Department of Health and Mental Hygiene, the Mayor's Office of Management and Budget, and the Department of Design and Construction, together with 1100 Architect and Atelier Ten, developed an innovation credit for the Riverside Health Center project entitled "Design for Health through Increased Physical Activity." The innovation credit rewards building design measures that increase regular intentional and incidental physical activity. The credit also develops methods for measuring these design features and for quantifying health benefits that can serve as a precedent for future projects.

The new innovation credit builds on existing elements in LEED that address health issues. Given the urgency and global scope of current health problems related to obesity and its associated chronic diseases, the development and broad use of LEED credits that promote physical activity and access to healthy food are critical. Whereas current LEED ND credits focus primarily on outdoor activities, the new Physical Activity Innovation Credit encourages regular exercise and active living within buildings. Opportunities for indoor exercise are important during inclement weather, especially for the young and the elderly.

The innovation credit's recommended design strategies will not only increase physical activity but may also yield other benefits, including: 1) decreased energy consumption associated with escalator and elevator use; 2) lower costs associated with construction, maintenance, and repair of mechanized vertical transport systems; 3) improved safety for building occupants—for example, through the increased visibility, usability, and familiarity of egress stairs; and 4) gains to the employer and broader community through long-term health care cost savings and increased productivity.

For more information, please see the LEED Physical Activity Innovation Credit chart included in the appendix.

**PlaNYC includes a goal of increasing New Yorkers' opportunities for active recreation by creating an open space—such as a park or playground—within ten minutes of every home. On the right is a map showing current playground access and proposed schoolyard-to-playground sites in PlaNYC.**




### *Synergies With Local Strategic Planning*

**PlaNYC**

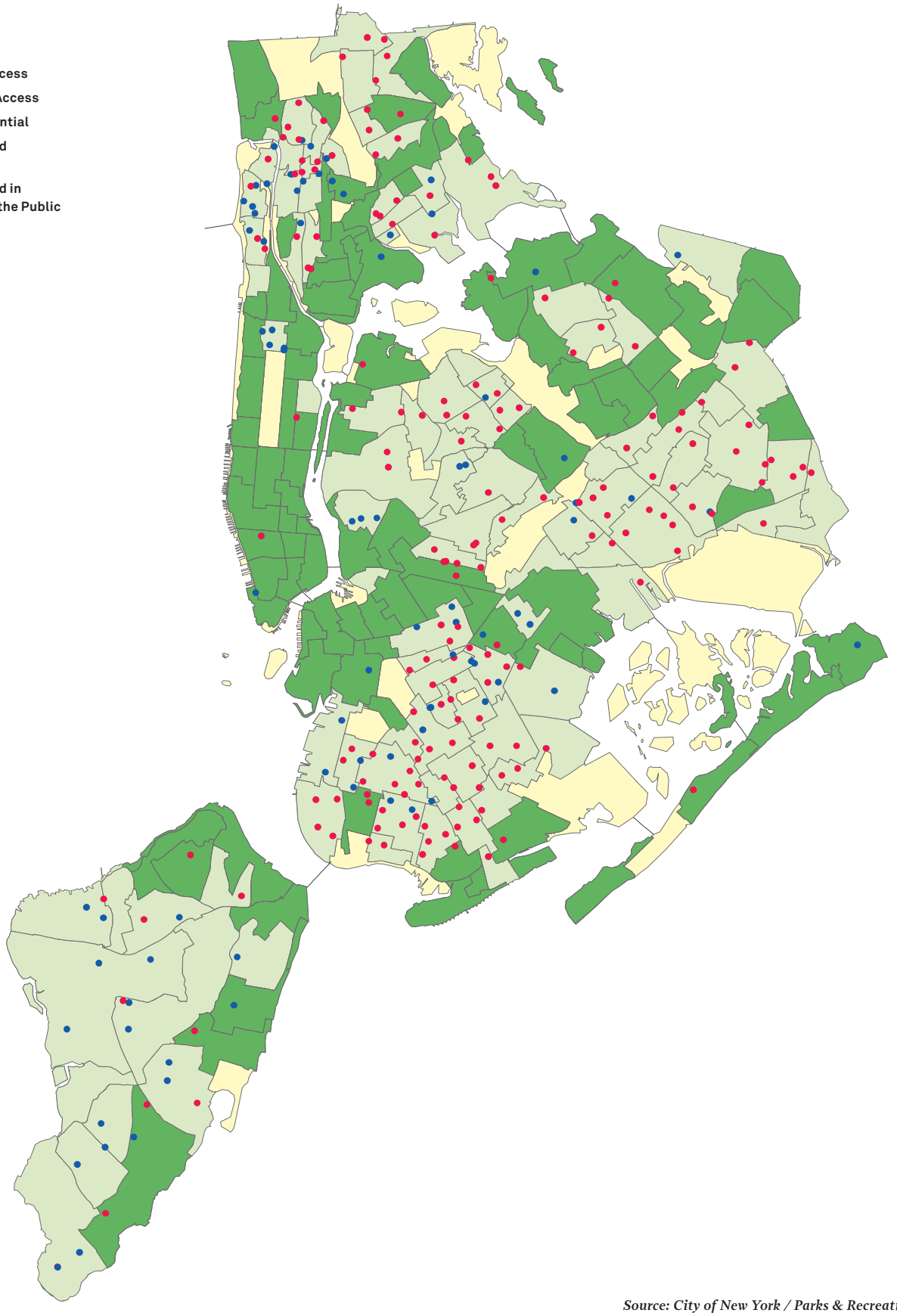
PlaNYC is New York City's strategic plan to address the threefold challenges of a rapidly growing population, an aging infrastructure, and global climate change. While the plan has been developed for New York City, the strategies can benefit designers in many urban environments. The plan outlines strategies for using our land, resources, and infrastructure more efficiently, with a focus on the physical city and the improvement of residents' daily lives. PlaNYC prepares the city to absorb future growth by creating affordable and sustainable housing, providing parks or playgrounds for every neighborhood, and shifting transportation increasingly toward walking, bicycling, and public transport. These strategies will enhance the already energy-efficient lifestyles of New Yorkers and help to further reduce the city's carbon footprint. The text of PlaNYC is available at http://www.nyc.gov/html/planyc2030.

PlaNYC and the City's active design and health strategies build on one another: Solutions that create opportunities for physical activity in the places where people live, work, and play also tend to be solutions

## CURRENT PLAYGROUND ACCESS AND SCHOOLYARD-TO-PLAYGROUND SITES

LEGEND

- Adequate Playground Access
- Inadequate Playground Access
- Open Space/Non-Residential
- Schoolyard to Playground Open to the Public
- Schoolyard to Playground in Production/Not Open to the Public



*Source: City of New York / Parks & Recreation*

that are more energy efficient and provide for a higher quality of life. For example, encouraging transit-oriented development will get people out of their cars and walking on city streets, which will simultaneously increase physical activity levels and decrease traffic congestion, gas consumption, and air pollution.

PlaNYC includes a goal of increasing New Yorkers' opportunities for active recreation by providing an open space—such as a park or playground—within ten minutes of every home, and by opening up waterways for recreation. The plan also includes a campaign to plant a million new trees, including many on city streets, which will contribute to decreased greenhouse gases while dramatically improving street aesthetics and comfort levels for pedestrians. PlaNYC's encouragement of mass transit and cycling will decrease congestion and increase walking and biking for both transportation and recreation. PlaNYC's strategies, many of which parallel those contained in the *Active Design Guidelines,* will assist in increasing New Yorkers' health and fitness levels while decreasing their carbon footprints.

**Take Care New York**

Take Care New York is a comprehensive health policy that guides the Health Department's efforts to help all New Yorkers live longer and healthier lives. First launched in 2004, Take Care New York's goals for 2008 included identifying and measuring progress on ten priority areas for preventing illness and death. In light of scientific evidence supporting the importance of the built environment in shaping health, Take Care New York's goals for 2012 include making all neighborhoods healthy places by addressing homes in disrepair, abating infestations of rodents and cockroaches, curbing the aggressive marketing of tobacco and alcohol, increasing access to healthy foods, and facilitating safe walking, bicycling, and active recreation.

***Synergies With Local Initiatives***

**Over the last few years, New York City has undertaken several initiatives that promote physical activity through environmental design. Many of these efforts focus on enhancing opportunities for walking and bicycling in the city, and hence tend to reduce fossil fuel consumption as well as promote active living. Architects, urban designers, and other professionals can look for opportunities to reinforce and build on these ongoing initiatives.**

**Department of Transportation Street Redesign**

The Department of Transportation (DOT) is making walking a more attractive choice for New Yorkers through a wide range of programs targeting different aspects of the pedestrian experience. DOT is continually expanding efforts to redesign streets and intersections in order to improve pedestrian safety and to increase convenient access to transit, particularly for vulnerable populations such as school children and senior citizens. These street redesign efforts are being undertaken in concert with public education and information programs and publications including the DOT's Strategic Plan 2008, *World Class Streets,* and the *Street Design Manual.* Beyond improving safety, DOT is expanding the public spaces available to pedestrians through its community-driven pedestrian plaza program, which creates public spaces out of underutilized street space all over the city. Finally, DOT is reimagining existing streets by sponsoring public programs such as Summer Streets, Bike Month events, and Weekend Walks.

DOT has also made significant commitments to improving the safety, convenience, and attractiveness of cycling in New York City. An unprecedented three-year, 200-mile expansion of the on-street bicycle network was completed in 2009. The expansion includes new, award-winning on-street protected bicycle paths, the first of their kind in the nation. DOT is on pace to install 5,000 new outdoor bicycle racks between 2007 and 2010. Demand for bicycle facilities is rising, as DOT estimates a 35 percent increase in bicycle commuting in the city between 2008 and 2009 alone.

**An example of synergistic design: Bicycle parking, seating, and a raised grating for storm water management are integrated in this sidewalk installation designed by Grimshaw Industrial Design for the Metropolitan Transportation Authority / New York City Transit.**
West Broadway, Manhattan

### Department of City Planning Bicycle Zoning Amendments

The Department of City Planning is also moving to promote bicycling in New York City. In November 2007, the City Council adopted a zoning text amendment proposed by the Department requiring outdoor bicycle parking in commercial and community facility parking lots. In April 2009, a further amendment was enacted requiring secure, enclosed bicycle parking in new multifamily residential, commercial, and community facility buildings citywide. These regulations are complemented by Local Laws 51 and 52, passed by the City Council in 2009, which respectively require that secure bicycle parking be provided in existing parking garages and lots, and that existing office buildings with freight elevators allow tenants to bring bicycles into buildings.

These requirements, which will help New Yorkers use bicycles for recreation, general-purpose transportation, and commuting to work, grew out of studies by City Planning showing that the lack of safe and secure bicycle parking is a hindrance to more widespread bicycle commuting. The legislative measures related to bicycling are part of a coordinated multi-agency effort to increase active transport in the city and are key components of Mayor Bloomberg's PlaNYC strategy.

### Green Codes Task Force

The City is undertaking a comprehensive process to green the codes that impact building construction and renovation. A Green Codes Task Force has been convened and charged with proposing changes to address a range of sustainability issues, such as energy and water consumption, recycling rates for construction waste, along with finding synergistic solutions for sustainability and health concerns.

**The New York City zoning code requires that new multifamily residential, commercial, and community facility buildings citywide include secure, enclosed bicycle parking. The Solaire, a LEED-Gold-certified residential building, contains two bicycle rooms protected by security cameras and accessible with electronic key cards.**
Manhattan,
Cesar Pelli & Associates

### *Synergies With Universal Design*

Active design can reinforce universal design—defined as the development of "products and environments that can be used effectively by all people, to the greatest extent possible, without the need for adaptation or specialized design."[5] The *Active Design Guidelines* emphasize strategies for improving physical activity for diverse users—whether through the provision of lighting, benches, and drinking fountains along interior and exterior pathways, or through the addition of curb cuts that serve the needs of wheelchair users, older adults, and mothers with strollers equally.

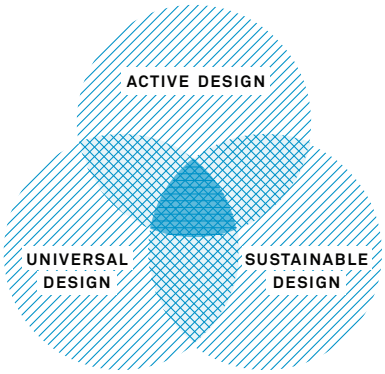
The synergies between active and universal design strategies include expanded circulation choices, accommodation of users of diverse abilities, clear signage, and visually stimulating pathways.

**Providing features like lighting, benches, and drinking fountains along pathways is a shared strategy of active and universal design.** GreenBranches Learning Garden, Queens Library Whitestone Branch, Queens, Horticultural Society of New York and Marpillero Pollak Architects

**Active design can reinforce universal design—defined as the development of "products and environments that can be used effectively by all people, to the greatest extent possible, without the need for adaptation or specialized design."** Cover of *Universal Design 2*, published by the New York City Department of Design + Construction

Additionally, some active design principles that might appear at first glance to be inconsistent with accessible design—such as an emphasis on stair over elevator use—can actually be complementary. Slowing down elevator door closing speeds, for example, may make elevators more usable for those with disabilities while acting as an incentive for able-bodied building occupants to use the stairs. Increasing general utilization of stairs can free up elevator space for use by those with physical challenges. Widening stairs, having fewer steps per flight, and providing intermittent landings between floors also makes the use of stairs more feasible and comfortable for those who have some physical challenges, such as the elderly and those carrying packages. Further synergies between strategies to improve physical activity and accessibility are highlighted throughout chapters 2 and 3 of the *Guidelines*. Interested readers should also consult the City publications *Universal Design 2* and *Age-Friendly NYC,* available at http://www.nyc.gov/buildnyc and http://www.nyc.gov/html/om/pdf/2009/pr386–09_report.pdf respectively.

***Active + Sustainable + Universal Design***




Over the past decade, building owners, architects, urban designers, and planners have increasingly come to recognize the importance of creating environments that are both sustainable and accessible. Changes in practice have been fostered both by market-based initiatives like LEED and universal design, as well as legal mandates such as the Americans with Disabilities Act. Part of the success of the universal and sustainable design movements has derived from their ability to demonstrate to building owners the multiple benefits—both human and financial—of applying specific design strategies. Short-term incremental costs are often offset by long-term energy savings, increased productivity, enhanced egress and fire safety, reduced long-term health care costs, quality-of-life benefits, and a healthier community.

A sustainable and universally accessible built environment goes hand in hand with a healthy and diverse population. By highlighting the synergies between active, sustainable, and universal design, we hope to further encourage all design and planning professionals to adopt the goal of increasing physical activity and health through their work.

***The Value Equation and Cost Efficiency***

The goal of design excellence must include attention to the expenditure of resources. The choices made in design and construction should be cost-effective to generate maximum value. Construction projects are inherently resource intensive, and cost efficiency is a critical consideration. Design excellence requires a balance of functionality and cost, including long-term life-cycle expenditures such as operations and maintenance.

REFERENCES


1. McGinnis JM, Foege WH. Actual causes of death in the United States. *Journal of the American Medical Association.* 1993;270: p. 2207–2212.
2. Mokdad AH, et al. Actual causes of death in the United States, 2000. *Journal of the American Medical Association.* 2004;291(10): p. 1238–1245.
3. World Health Organization. Cardiovascular diseases: Fact sheet number 317; Feburary 2007. http://www.who.int/mediacentre/factsheets/fs317/en/index.html. Accessed September 23, 2008.
4. Lopez AD, et al. Global and regional burden of disease and risk factors, 2001: systematic analysis of population health data. *Lancet.* 2006;367(9524): p. 1747–1757.
5. Connnell B, et al. The Principles of Universal Design: Version 2.0. Raleigh, NC: North Carolina State University, The Center for Universal Design; 1997. http://www.design.ncsu.edu/cud/about_ud/udprinciplestext.htm.

# CASE STUDY 1
# RIVERSIDE HEALTH CENTER

In 2009, a team composed of multiple New York City agencies and designers 1100 Architect and Atelier Ten received a LEED innovation credit entitled "Design for Health through Increased Physical Activity" for the NYC Health Department's Riverside Health Center. Several active design strategies are featured in the renovated building, which contains educational facilities, a physical exercise room, and administrative offices. Centrally placed stairs will be enhanced with attractive, colorful finishes, widened windows, improved ventilation, and increased lighting. Under the auspices of the Percent for Art program, artwork will extend from the corridors into the stair space. These measures, along with signage urging building occupants to take the stairs, are designed to increase stair use in the center. The introduction of an exercise room, additional multiple-use space for exercise classes, bicycle racks, shower facilities for staff, and maps highlighting nearby walking trails will further encourage active healthy living among the building's users.

For a list of specific strategies included in the Innovation Credit, please see the chart included in the appendix.

**Stair Location diagram: Research has indicated that a favored position for the stairs will increase use. Considerations include proximity to lobby and elevators and shortening travel distances where possible.**

# CASE STUDY 2
## 41 COOPER SQUARE

Designed by Morphosis Architects, this academic building for the Cooper Union exemplifies the potential synergies between active and sustainable design strategies. The architects conceived the building as a vertical campus centered on a grand atrium and central stair. The organization of the primary skip-stop elevators, which serve the first, fifth, and eighth floors, encourages occupants to use the grand stairs and sky bridges to access alternative floors. Additional elevators stop at each floor, both for ADA compliance and for the practical tasks of moving materials, artworks, and equipment.

The circulation system is designed so that 50 percent of the building's users will rely on the stairs as their sole means of vertical travel. The generously scaled stairs also provide space for social interactions and encounters. An innovative steel-and-glass double skin encloses the stair and atrium, giving the stairs a visual dynamism while also helping to control the internal climate. Both the vertical circulation system and the building envelope contribute to lowering the project's energy usage while encouraging walking and physical activity. The building, completed in 2009, is on target to achieve a LEED Platinum rating.

**Diagram of the skip-stop elevator system**

## CASE STUDY 3
## VIA VERDE MIXED-INCOME HOUSING DEVELOPMENT

The Via Verde project, located in the South Bronx, is a model of the symbiosis of green and active design. The development features a connected series of green spaces that encourage users to walk and engage in recreational activity. Programmed outdoor spaces include private backyard gardens, semi-private courtyards, green roofs, and public learning and gardening spaces, where residents can exercise and relax. An 18-story tower will be used to harvest rainwater for growing fruits and vegetables. Additional planned active design features include pleasant and prominent stairs provided for everyday use, a fitness center, and a bicycle storage space. Designed by Dattner Architects and Grimshaw Architects in collaboration with the progressive developers Jonathan Rose Companies and Phipps Houses, the innovative affordable housing development was the winner of the New Housing New York Legacy Project competition. The architects are designing the complex to achieve a LEED NC Gold rating and plan to incorporate an Innovation Credit for Health through Increased Physical Activity.

# APPENDIX: LEED PHYSICAL ACTIVITY INNOVATION CREDIT

The chart below details the requirements set forth in a LEED innovation credit entitled "Design for Health through Increased Physical Activity," developed by New York City and approved by the USBGC in 2009. The recommended strategies are based on current evidence and research. Included in the chart below are references to the scientific research underlying each strategy.

| | ITEM | DESIGN CASE | MEASUREMENT / DOCUMENTATION METHOD | BASE CASE— GENERAL CODE MINIMUM |
|---|---|---|---|---|
| **Prerequisite Element—Required** | | | | |
| 1 | Minimum accessible floors[1] | Occupants are granted access between the stairs and their own floor as well as other common use floors. | Door hardware schedule | In commercial buildings, stair access doors may be locked on the stair side, except at intervals of four stories or less. |
| **Credits—17 of 24 Required** | | | | |
| **Design for Increased Stair Use** | | | | |
| STAIR DOOR OPERATION | | | | |
| 1 | Locking operation[1] | Universal stair access shall be granted to and from all floors, with no limits on reentry. | Door schedule | In commercial buildings, stair access doors may be locked on the stair side except at intervals of four stories or less. |
| 2 | Transparency from corridor (material)[2] | Majority of stair entry doors to be clear glass (fire-rated as required by code), allowing stairs to be visible from building corridors. | Door schedule | Not required |
| 3 | Transparency from corridor (operation)[2] | Stair entry doors to be held open by magnetic catches (released through fire alarm system), allowing stairs to be visible from building corridors. | Door hardware schedule | Not required |
| STAIR LOCATION | | | | |
| 4 | Visibility[2,3] | Position at least one stair to be visible from the building's main lobby. A maximum of 25 feet travel and no turns should be required to reach stairs from the building's main entry. | Plan drawing highlighting lobby and stair | Exact location not mandated |
| 5 | Location with respect to elevators—priority[2] | Position at least one stair before access to elevators from the main building lobby, along the principal path of travel. | Plan drawing highlighting lobby, stair, and elevator | Exact location not mandated |
| 6 | Location with respect to elevators—visibility[2] | Position at least one stair within the elevators' *isovist* (the area visible from a location in a plan in two dimensions). | Plan drawing highlighting elevator and stair | Exact location not mandated |
| 7 | Location—principal path of travel[2] | At least one stair shall be located on, and visible from, the principal path of travel on each floor. | Plan drawing highlighting the principal path of travel and the stair location | Exact location not mandated |
| 8 | Proximity of occupants to stairs[2] | Reduce maximum primary travel distance to stairs to 75% or less of code requirement. | Plan drawing highlighting travel distance calculations | Maximum travel distance as stipulated by code |
| CIRCULATION SIGNAGE | | | | |
| 9 | Signage prompts at stairs[1,4–8] | Include permanent signage encouraging stair use, to be integrated with the building's way-finding program. | Drawings of signs | Not required |
| 10 | Signage prompts at elevators[1,4–8] | Include permanent signage encouraging stair use, to be integrated with the building's way-finding program. | Drawings of signs | Not required |

| | ITEM | DESIGN CASE | MEASUREMENT / DOCUMENTATION METHOD | BASE CASE—GENERAL CODE MINIMUM |
|---|---|---|---|---|
| STAIR DESIGN AND AESTHETICS | | | | |
| 11 | Electrical lighting[1, 4] | Incorporate a professionally designed lighting program utilizing architectural fixtures that provide the light level and quality mandated by code and consistent with lighting in the building corridors. | Lighting product cut sheets and calculations | Illumination Engineering Society recommends 200 lux in stairwell |
| 12 | Natural lighting[1, 4] | Provide windows or skylight at each level. | Drawings of windows | Not required |
| 13 | Music[1,4,7,8] | Provide music system within the stairs. | Drawings of music system | Not required |
| 14 | Artwork[1,4,7,8] | Include permanent non-combustible artwork to increase visual interest within the stairs. | Drawings or photos of artwork | Not required |
| 15 | Finishes[1,4,7,8] | Provide similar or better quality finishes as building corridors. | Finish schedule, elevation drawings | Not required |
| 16 | Ventilation[9] | Provide same heat and air-conditioning level as building corridors. | HVAC drawings | Not required |
| 17 | Security | Provide closed-caption television monitoring or similar system as provided in building corridors, or better. | Security system drawings | Not required |
| 18 | Size[2,10] | Provide stair width that is at least 20% greater than the minimum required by code. | Plan drawing | Minimum width is determined by egress requirements (usually 44 inches minimum). |
| ELEVATOR FUNCTIONALITY AND LOCATION | | | | |
| 19 | Door speed[11] | Set elevator door opening and closing speed to 50% of maximum, or 20 seconds or greater. | Elevator specification | Not stipulated: Typical practice is to use maximum speed possible. |
| 20 | Location[2] | Locate elevator away from the principal path of travel. At least one turn and 25 feet travel shall be required from the main lobby to the elevator(s). | Plan drawing highlighting the main lobby and the elevator location | Not stipulated: Typical practice is to locate the elevator prominently and centrally. |
| 21 | Operation[12] | Set elevators to skip stops—in other words, to open on every other floor or less (except for one elevator for individuals in need). | Elevator specification | Not stipulated: Typical practice is for elevator to stop at every floor. |
| **Design for Increased Access to Exercise Facilities** | | | | |
| FACILITIES | | | | |
| 22 | Exercise room or gym in building[6,13,14] | Provide dedicated exercise room. Include at least three varieties of cardio equipment and enough equipment for use by 1% of permanent building occupants, whichever is greater. Also include strength training equipment. Room must be open at convenient times (before and after work hours and at lunch, and a minimum of 10 hours per day). | Plan showing exercise room with equipment layout, Narrative describing hours of access | Not required |
| 23 | Designated exercise class space[6,13–15] | Provide a dedicated or multi-use space for on-site exercise programs. Capacity and class offerings should allow 10% of building occupants to take one class weekly. Classes shall be offered at a locally competitive cost or less. | Plan showing exercise class space, Narrative describing class offerings and capacity | Not required |
| 24 | Walking trails[6,13,14] | Provide on-site walking trails at least 0.5 mile long, with access for all building occupants during normal building hours of operation. Trails shall include lighting. Or, provide a map or other documentation showing publicly accessible trails at least 0.5 mile long within 0.5 mile of site. | Site plan highlighting on-site walking trails and light fixtures or map of public trails | Not required |

REFERENCES

1. Zimring C, et al. Influences of building design and site design on physical activity: research and intervention opportunities. *American Journal of Preventive Medicine.* 2005;28(2S2): p. 186–193.
2. Nicoll G. Spatial measures associated with stair use. *American Journal of Health Promotion.* 2007;21(4s): p. 346–352.
3. Nicoll G. *Taking the Stairs: Environmental Features that Predict Stair Use in 3 to 4 Story Academic Workplace Buildings.* [dissertation]. Atlanta, GA: Georgia Institute of Technology; 2006: p. 299.
4. Centers for Disease Control and Prevention. StairWELL to better health. http://www.cdc.gov/nccdphp/dnpa/hwi/toolkits/stairwell/index.htm. Accessed January 28, 2008.
5. Guide to Community Preventive Services. Environmental and policy approaches to physical activity: point-of-decision prompts to encourage use of stairs. www.thecommunityguide.org/pa/environmental-policy/podp.html. Accessed December 3, 2009.
6. Kahn EB, et al. The effectiveness of interventions to increase physical activity: a systematic review. A*merican Journal of Preventive Medicine.* 2002;22(4 Suppl): p. 73–107.
7. Boutelle KN, et al. Using signs, artwork, and music to promote stair use in a public building. *American Journal of Public Health.* 2001;91(12): p. 2004–2006.
8. Kerr NA, et al. Increasing stair use in a worksite through environmental changes. *American Journal of Health Promotion.* 2004;18(4): p. 312–315.
9. ASHRAE Standard 55, Thermal Comfort.
10. National Fire Protection Association. Building construction—life safety technical committee on means of egress. October 5, 2007.
11. Van Houten R, Nau PA, Merrigan M. Reducing elevator energy use: a comparison of posted feedback and reduced elevator convenience. *Journal of Applied Behavior Analysis.* 1981;14(4): p. 377–387.
12. Nicoll G and Zimring C. Effect of innovative building design on physical activity. *Journal of Public Health Policy.* 2009;30: p. S111–S123. Also see: http://www.activelivingresearch.org/files/Concurrent_Innovations_Nicoll.pdf
13. Guide to Community Preventive Services. Environmental and policy approaches to increase physical activity: creation of or enhanced access to places for physical activity combined with informational outreach activities. www.thecommunityguide.org/pa/environmental-policy/improvingaccess.html. Accessed December 3, 2009.
14. Golaszewski T, Fisher B. Heart check: the development and evolution of an organizational heart health assessment. *American Journal of Health Promotion.* 2002;17(2): p. 132–153.
15. Guide to Community Preventive Services. Worksite health promotion. www.thecommunityguide.org/worksite/index.html. Accessed December 3, 2009.

# PHOTOGRAPHY CREDITS

Front cover Iwan Baan; Back cover Iwan Baan; Inside cover photo Taggart Sorensen, courtesy of Katie Winter; 10–11 Library of Congress Prints and Photographs Division; 12 Library of Congress Prints and Photographs Division; 13 NYC Department of Health and Mental Hygiene and Pentagram; 14 National Library of Medicine; 15 NYC Department of Health and Mental Hygiene and Pentagram; 16 Centers for Disease Control and Pentagram; 17 Philip Baumann; 20–21 Iwan Baan; 25 NYC Department of Transportation; 27 NYC Department of City Planning; 29 left NYC Department of Transportation ; 29 right Heidi Wolf / NYC Department of Transportation; 31 top Marpillero Pollak Architects; 31 center Linda Pollak; 31 bottom left photo Daniel Avila, City of New York / Parks & Recreation; 31 bottom right photo Malcolm Pinckney, City of New York / Parks & Recreation; 32 photo Taggart Sorensen, courtesy of Katie Winter; 33 photo Michael Givan, School Construction Authority; 34 NYC Department of Transportation Pedestrian Projects Group; 35 NYC Department of Transportation; 36 Joel Metlen; 38 NYC Department of Transportation; 39 Heidi Wolf / NYC Department of Transportation; 40 left NYC Department of Transportation; 40 right Iwan Baan; 41 NYC Department of Transportation; 43 top left Wikimedia Commons; 43 top right NYC Department of Transportation; 43 bottom photo Emile Wamsteker, courtesy of the Times Square Alliance; 44 NYC Department of Transportation; 45 NYC Department of Transportation ; 46 NYC Department of Transportation; 47 left NYC Department of City Planning; 47 top right NYC Department of Transportation; 47 bottom right NYC Department of Transportation; 52 top Irene Cheng; 52 bottom City of New York / Parks & Recreation; 53 top Iwan Baan; 54–55 NYC Department of Transportation; 56–57 Daniella Zalcman; 58 Cemusa; 59 Harris Graber; 60–61 photo Taggart Sorensen, courtesy of Katie Winter; 66–67 Nic Lehoux; 69 Erik Freeland; 71 left Norman McGrath; 71 right Dan Tsai; 72 David Sundberg / ESTO; 73 © Peter Aaron / ESTO; 74 left Erik Freeland; 74 right Paul Warchol; 75 Elizabeth Felicella, courtesy of Work Architecture Company; 76 Dattner Architects; 77 Dattner Architects; 79 top NYC Department of Health and Mental Hygiene; 79 bottom NYC School Construction Authority; 81 Gayle Nicoll and NYC Department of Design and Construction; 83 Daniella Zalcman; 84 Lydia Gould; 85 left Paúl Rivera / ArchPhoto; 85 right Paul Warchol; 86 left Gale's Industrial Supply; 86 right The Visionaire; 87 Bilyana Dimitrova; 88 left Leder ; 88 right NYC Department of City Planning; 89 Marc Lins; 92 Cornelis Verwaal; 93 Kris Arnold; 94–95 Daniella Zalcman; 96–97 © Albert Vecerka / ESTO, courtesy of Davis Brody Bond Aedas; 98–99 Daniella Zalcman; 100–101 Nic Lehoux; 102–103 Eduard Hueber; 108–109 © David Sundberg / ESTO; 111 Nicole De Feo / Queens Botanical Garden; 113 left NYC Department of City Planning; 113 right Eric E. Yang; 117 City of New York / Parks & Recreation; 119 left Joyce Lee; 119 right NYC Department of Transportation; 120 NYC Department of City Planning; 121 right Linda Pollak; 122 Pentagram; 124-125 1100 Architect; 126 Morphosis; 127 Iwan Baan; 128–129 Phipps Houses, Jonathan Rose Companies, Dattner Architects, Grimshaw

# ACKNOWLEDGMENTS


Mayor Michael R. Bloomberg

Department of Design and Construction
Department of Health and Mental Hygiene
Department of Transportation
Department of City Planning
Office of Management and Budget

The *Active Design Guidelines* resulted from a collaborative, multidisciplinary effort among City agencies; New York's health, planning, design, and architecture communities; and academic institutions from across the country.

**SPECIAL THANKS TO:**

David Burney, FAIA
*Commissioner,*
*Department of Design and Construction*

Thomas Farley, MD, MPH
*Commissioner,*
*Department of Health and Mental Hygiene*

Janette Sadik-Khan
*Commissioner,*
*Department of Transportation*

Amanda Burden
*Commissioner,*
*Department of City Planning*

Mark Page
*Director,*
*Mayor's Office of Management and Budget*

Andrew Goodman, MD, MPH
*Deputy Commissioner, Division of Health Promotion and Disease Prevention,*
*Department of Health and Mental Hygiene*

Mary T. Bassett, MD, MPH
*Former Deputy Commissioner, Division of Health Promotion and Disease Prevention,*
*Department of Health and Mental Hygiene*

Thomas R. Frieden, MD, MPH
*Former Commissioner,*
*Department of Health and Mental Hygiene;*
*Director, United States Centers for Disease Control and Prevention*

**ACTIVE DESIGN GUIDELINES TEAM**

**Department of Design and Construction**
David Burney, FAIA
*Commissioner*

Margot Woolley, AIA
*Assistant Commissioner, Architecture and Engineering Division*

Victoria Milne, MID
*Director, Office of Creative Services*

**Department of Health and Mental Hygiene**
Lynn D. Silver, MD, MPH
*Assistant Commissioner, Bureau of Chronic Disease Prevention and Control*

Karen K. Lee, MD, MHSc, FRCPC
*Deputy Director, Bureau of Chronic Disease Prevention and Control*

Sarah Wolf, MPH, RD
*Built Environment Coordinator, Bureau of Chronic Disease Prevention and Control*

**Department of Transportation**
Wendy Feuer, MA
*Assistant Commissioner of Urban Design and Art, Division of Planning and Sustainability*

Hanna Gustafsson
*Former Urban Fellow, Division of Planning and Sustainability*

**Department of City Planning**
Alexandros Washburn, AIA
*Chief Urban Designer*

Skye Duncan, MSAUD, BArch
*Associate Urban Designer*

**Mayor's Office of Management and Budget**
Joyce Lee, AIA, LEED AP
*Chief Architect*

**Academic Partners**
Craig Zimring, PhD
*Professor,*
*Georgia Institute of Technology,*
*College of Architecture*

Gayle Nicoll, MArch, PhD, OAA
*Associate Professor and Chair,*
*University of Texas San Antonio,*
*Department of Architecture*

Julie Brand Zook, MArch
*Researcher,*
*Georgia Institute of Technology,*
*College of Architecture*

Reid Ewing, PhD
*Professor,*
*University of Utah, Department of City and Metropolitan Planning*

**American Institute of Architects New York Chapter**
Fredric Bell, FAIA
*Executive Director*

Sherida Paulsen, FAIA
*2009 President*

**Editor**
Irene Cheng, MArch, MPhil
*Cheng+Snyder*

OTHER CONTRIBUTORS:

**Department of Design and Construction**
Marika de la Maria, RA, *Deputy Director, Assessment Unit*

Zydnia Nazario, RA, LEED AP, *Senior Project Manager, Structures Division*

**Department of Health and Mental Hygiene**
Daniel Kass, MSPH, *Assistant Commissioner, Bureau of Environmental Surveillance and Policy*

Victoria Grimshaw, MPH, *Program Assistant, Built Environment Program, Bureau of Chronic Disease Prevention and Control*

**Department of Transportation**
Bruce Schaller, *Deputy Commissioner, Division of Planning and Sustainability*

Ryan Russo, *Assistant Commissioner, Traffic Management*

Joshua Benson, *Director, Bicycle and Pedestrian Programs*

Neil Gagliardi, *Director of Design Review, Division of Planning and Sustainability*

Michael Flynn, *Director, Capital Planning, Division of Finance, Contracting and Program Management*

Vaidila Kungys, *Senior Project Manager, Plaza Program, Division of Planning and Sustainability*

Patricia N. Browne, Esq., *Assistant Counsel, Legal Department*

**Department of City Planning**
Stephen Johnson, *City Planner*

Laura G. Smith, MA, *City Planner*

**Mayor's Office of Long Term Planning and Sustainability**
Laurie Kerr, RA, *Senior Policy Advisor*

**School Construction Authority**
Bruce Barrett, RA, *Vice President of Architecture and Engineering*

**Graphic Design**
Pentagram Design

THANKS TO THE FOLLOWING INDIVIDUALS FOR THEIR REVIEW AND INPUT:

**Department of City Planning**
Samuel Hornick, *Deputy Executive Director of Strategic Planning*

Howard Slatkin, *Deputy Director of Strategic Planning*

**Mayor's Office of Management and Budget**
Shivani Singh, *Senior Analyst*

**Department of Buildings**
Robert LiMandri, *Commissioner*

Keith Wen, RA, *Acting Director of Code Development and Interpretation*

**Mayor's Office of People with Disabilities**
Matt Sapolin, *Commissioner*

Robert Piccolo, AIA, *Deputy Commissioner*

**Parks & Recreation**
Charles McKinney, *Chief of Design, Capital Projects*

Nette Compton, *Senior Project Manager for Design*

**Housing Preservation and Development**
Beatriz de la Torre, *Chief of Staff, Office of Development*

**Department for the Aging**
Linda Black, MUP, *Urban Planner*

**Community, Academic, and Private Sector**
Ernest Hutton, *Hutton Associates, Inc.*
Ellen Martin, *1100 Architects*
Linda Pollak, *Marpillero Pollak Architects*
John Pucher, *Bloustein School of Planning and Public Policy, Rutgers University*
Jessica Spiegel, *1100 Architects*
William Stein, *Dattner Architects*
Shin-Pei Tsay, *Transportation Alternatives*

**Thanks to all the design practitioners and organizations who participated in the 2009 Design Workshop to help us test the *Guidelines.***

THANKS TO THE FOLLOWING FOR FUNDING AND SUPPORT:

**Robert Wood Johnson Foundation Active Living Research Program—Evaluation of the Active Design Guidelines**

**Milbank Memorial Fund—2009 Design Workshop**

FSC
Mixed Sources
Product group from well-managed forests, controlled sources and recycled wood or fiber
www.fsc.org Cert no. SW-COC-001855
© 1996 Forest Stewardship Council

STOP

NYC