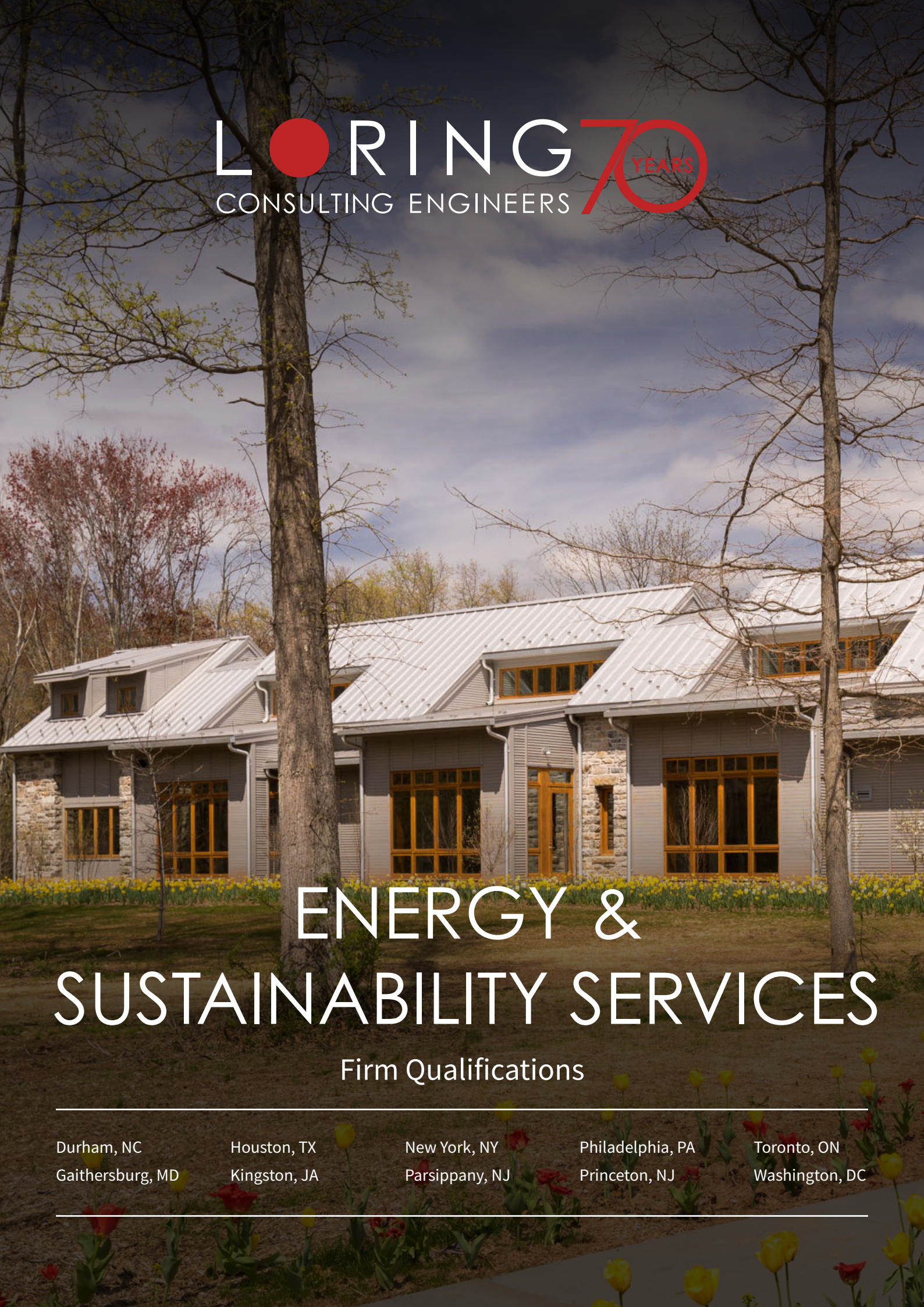


LORING CONSULTING ENGINEERS 70 YEARS

ENERGY & SUSTAINABILITY SERVICES

Firm Qualifications

Durham, NC
Gaithersburg, MD
Houston, TX
Kingston, JA
New York, NY
Parsippany, NJ
Philadelphia, PA
Princeton, NJ
Toronto, ON
Washington, DC

CONTENT

Willow School, Gladstone, NJ

OUR MISSION:

We deliver high value, smart engineering solutions tailored to optimize each client's investment and long-term needs.

WHY LORING?

When it comes to choosing a consulting engineering firm, the decision is critical to the success of your project. With so many options available, it's important to understand how Loring Consulting Engineers, Inc. is set apart from the competition.

Hands-on Principal-level Attention

Award-Winning Success

Tailored Solutions

Comprehensive Services

Innovative & Sustainable Approach

Expertise & Experience

Client-Centred Approach

When choosing a consulting engineering firm, it's essential to select a partner that offers the right combination of Principal-level attention, expertise, customized service, comprehensive offerings, sustainability, award-winning success, and a client-centric approach. With all these qualities and more, Loring is the ideal choice for your next engineering project.

Manhattan Municipal Building

Mosaic Pre-K Center Q369 NY Hall of Science

RIGHT SIZED FIRM

At Loring, quality lies at the very heart of everything we do. Each project benefits from hands-on, Principal-level attention and personal service, not only so that those at the highest levels of our organization can keep their finger on the pulse of our work, but also so that our clients can be rest assured that their projects are benefiting from years – often decades – of engineering experience. With over 200 employees in ten offices, we are large enough to meet all your needs but small enough to develop meaningful relationships with you and your team.

LEADERSHIP

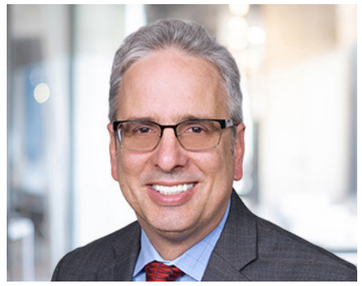
Oneil Gayle,
PE, CEA, CEM, CBCP, LEED AP
Chief Executive Officer

Steven Kenah,
PE, CEM, CFPS, LEED AP
President

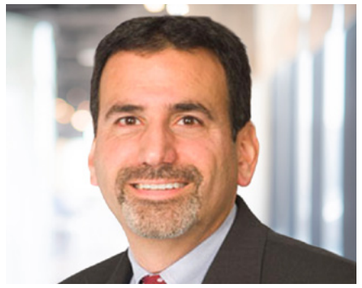
Hallah Abodaff,
PE, LEED AP
Senior Vice President

Cathy Chang
PE, LEED AP B+C
Senior Vice President

Joseph Charity III,
LEED Green Associate
Senior Vice President



Michael DesRochers,
PE, LEED AP
Chairman Emeritus



Vincent Farese,
PE, LEED AP
Senior Vice President

J. Michael Galway,
PE, LEED AP BD+C, CPD
Senior Vice President

Miguel Gaspar,
PE, LEED AP
Senior Vice President

Charles Johnson,
PE, LEED AP
Senior Vice President

Avash Joshi,
P.Eng., MEng, CEM, CBCP,
LEED AP BD+C
Senior Vice President

Kalpak K. Karule,
PE, CEM, CBCP, CMVP, DGCP, LEED AP
Senior Vice President

Barry Maltz,
PE, LEED AP
Chairman Emeritus

Damian Payne,
PE, LEED AP
Senior Vice President

Todd Steffens,
PE, CEA, CBCP, LEED AP
Senior Vice President

Rahul Tikekar,
PE, MS, MBA
Senior Vice President

Ivan Zgombic,
PE, LEED AP
Senior Vice President

AWARD-WINNING SUCCESS

With more than 65 years of engineering experience, Loring has built a solid reputation for not only meeting our clients' needs, but also exceeding their expectations… and we have engineering awards in various categories to prove it! Our trophy case boasts engineering excellence awards from different local and regional professional bodies comprised of our peers – those who truly understand what engineering is about and what makes our work exceptional. We also received an ACEC National Recognition Award in 2025 for our work on the New Jersey Executive Statehouse Renovation and Restoration project.

2025 Engineering Excellence Awards

Whitney Young Manor Renovation and Electrification, Yonkers, NY
2026 Platinum Award - Building/Technology Systems
ACEC New York Engineering Excellence Awards

Delacorte theatre, New York, NY
2026 Gold Award - Building/Technology Systems
ACEC New York Engineering Excellence Awards

Greening the City's Backyard: A Strategic Path to Decarbonizing NYC Parks, New York, NY
2026 Gold Award - Studies, Research and Consulting Engineering Services
ACEC New York Engineering Excellence Awards

Bronx Zoo – Con Edison Switchgear Upgrade, Bronx, NY
2025 Gold Award - Special Projects
ACEC New York Engineering Excellence Awards

SUNY Purchase Clean Energy Master Plan – A Roadmap to a Sustainable Net Zero Campus, Purchase, NY
2025 Platinum Award - Studies, Research and Consulting Engineering Services
ACEC New York Engineering Excellence Awards

New Jersey Executive Statehouse Renovation & Restoration, Trenton, NJ
2025 Grand Honor Award for Non-Transportation Projects
ACEC New Jersey Engineering Excellence Awards
2025 National Recognition Award
ACEC Engineering Excellence Awards

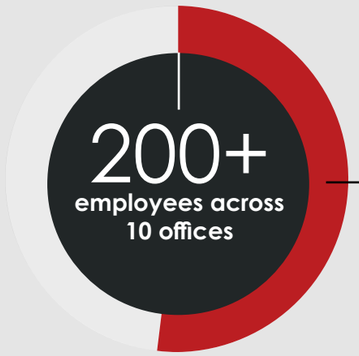
H. Carl Moultrie Courthouse C Street Addition with District of Columbia Courts, Washington, DC
2025 Merit Award
ACEC Metropolitan Washington Engineering Excellence Award

Mosaic Pre-K Center Q369 at NY Hall of Science, Queens, NY
2024 AIA NYS Excelsior Award
AIA New York State

Clean Energy Master Plan for SUNY Downstate Medical Center, Brooklyn, NY
2024 Platinum Award - Studies, Research and Consulting Engineering Services
ACEC New York Engineering Excellence Award

Rockefeller University, Detlev W. Bronk Laboratory Fire Alarm/ Sprinkler Infrastructure Upgrades, New York, NY
2024 Silver Award - Building/ Technology Systems
ACEC New York Engineering Excellence Award

WHO WE ARE



52%
of Management and Staff are Minorities

OFFICES

New York, NY
Durham, NC
Gaithersburg, MD
Houston, TX
Parsippany, NJ
Philadelphia , PA
Princeton, NJ
Toronto, ON
Washington, DC
Kingston, JA

Loring Consulting Engineers, Inc. (Loring) is a full-service consulting engineering firm founded in 1956 with offices in New York City, Washington-DC, Gaithersburg-MD, Durham-NC, Kingston, JA, Parsippany, NJ, Philadelphia-PA, Princeton-NJ, Houston-TX, and Toronto-ON. With a fully diversified staff of over 200 employees, Loring is the "right size" firm – large enough to handle your most technically challenging projects yet small enough to ensure that each client receives the Principal-level attention and personal service that is the hallmark of our firm.

Our staff is comprised of Professional Engineers, and accredited professionals in sustainability (LEED, WELL, Passive House), Energy Services, Commissioning and Life Safety Systems. Our clients include Fortune 100 companies, some of the most prestigious academic, cultural and healthcare institutions in North America, as well as federal, state, and local public agencies. Our portfolio includes new construction, renovations, adaptive re-use and restorations of national historic landmarks.

Our reputation for responsible engineering and valued service stands on the successful completion of technically challenging projects that are delivered on time and within project budgets. We are committed to partnering with our fellow design and construction team members to provide our clients with high-value, seasoned expertise that optimizes their investment. We are extremely proud of our past and equally excited about our future. We continue to embrace change in the ever-evolving science of engineering and will seek out new and emerging markets while continuing our standards of exceptional quality and service.

Loring is certified by the City of New York as a Minority-Owned Business (MBE) and a Black-Owned Business.

TECHNICAL TEAM

42 LEED and WELL Accredited Professionals

40 Mechanical Engineers

35 Mechanical Designers

30 Electrical Engineers

20 Electrical Designers

06 BIM Specialists

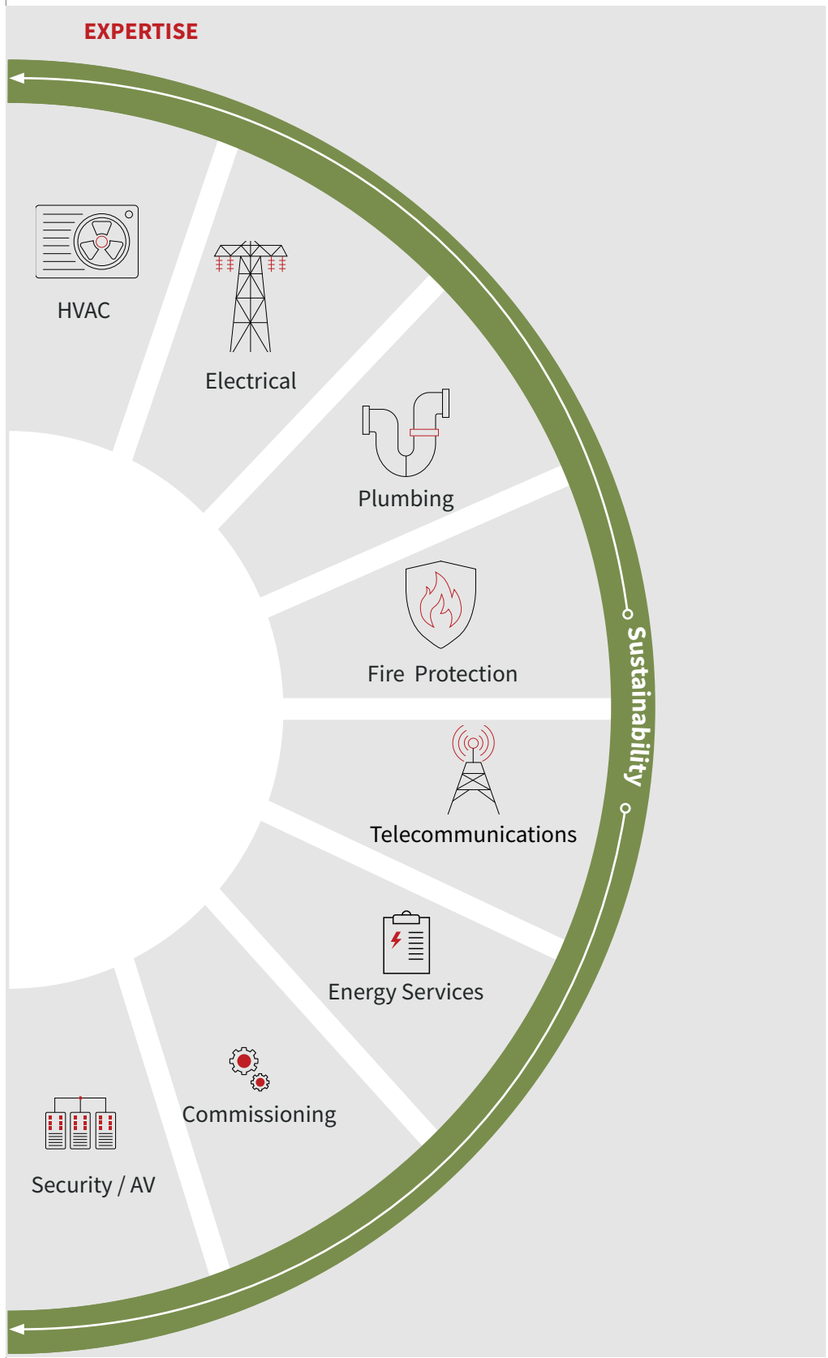
04 Building Envelope Cx Specialists

07 IT Designers

03 Building System Analytics and CFD Engineers

62 PEs in the USA and Canada

Licensed in **38** States in the USA and **8** Provinces in Canada



MARKETS

Arts & Culture
Commercial
Electrical
Government
Healthcare
Historic Restoration
Interiors
K-12 & Higher Education
Labs & Research
Mission Critical
Residential & Hospitality
Technology
Utilities Infrastructure

SERVICES

Engineering & Design
Energy Services
LEED / Sustainability Consulting
Building Assessments
Commissioning /
Retro-Commissioning
Computational Fluid Dynamics
Construction Administration
Feasibility Studies
Master Planning
Matterport Planning
Sustainable Design
Value Engineering

ENERGY SERVICES

Loring's Energy Services Group helps building owners identify and implement energy and cost savings opportunities and reduce greenhouse gas emissions.

Loring provides technical assistance that allows our clients to make informed energy-related decisions for their facilities. The Energy Services Group works with building owners to identify and implement energy and cost savings opportunities and achieve mandated or discretionary greenhouse gas (GHG) emission reductions. Loring's design engineers incorporate energy strategies that optimize the balance between the first cost, operating and maintenance costs, and any potential future energy or carbon penalties, to help identify system selections that are customized to meet each project's unique needs. Applying life-cycle cost analysis, we review alternative energy source technologies, including solar photovoltaics, geothermal systems, fuel cells, rainwater harvesting, thermal energy storage, and combined heat and power (CHP) systems to determine if they meet Owner investment criteria.

Loring's Energy Services team includes Professional Engineers, Certified Energy Managers, Certified Energy Auditors, Building Energy Assessment Professionals, Certified Building Commissioning Professionals, Certified Passive House Consultants, Distributed Generation Certified Professionals, LEED Accredited Professionals, and WELL Accredited Professionals. This team has performed energy audits, deep energy retrofits, energy master plans, feasibility studies, and retro-commissioning in over 500 buildings, in addition to supporting hundreds of design and commissioning projects undertaken by our engineers that involved energy performance upgrades. Loring earned a Diamond Award (First Place) from ACEC NY for our energy work in New York City public buildings.

We understand building electrification technologies. Consideration for building electrification has become necessary in recent times with city, regional, and federal governments, as well as public agencies, issuing guidelines for greenhouse gas emission reductions aligning with the Paris Climate Agreement. Governments are establishing policies that will significantly penalize fossil fuel-fired plants and incentivize electrification and the contribution of renewable energy technologies in the future. We have a deep understanding of technologies that shift the energy curve by activating low-cost energy utilization like energy storage, demand response, and optimization of time-of-day use of energy when developing energy strategies for each building.

Loring is a NYSERDA-approved FlexTech Consultant and a registered District of Columbia PACE Clean Energy Contractor.

SERVICES

- ASHRAE Level I, Level II, and Level III Energy Audits
- Energy Master Planning
- Decarbonization Planning
- Deep Energy Retrofits
- Electrification Feasibility Studies
- Geothermal Feasibility & Planning
- Energy Modeling and Advanced Energy Simulations
- Computational Fluid Dynamics (CFD) Analysis
- On-site Energy Generation and Storage Evaluation
- Solar Photovoltaic (PV) Assessments
- Renewable Energy Studies
- Retro-Commissioning
- LEED / Sustainability Consulting

NYC, Department of Administrative Services Facility

New York City Hall

KEY FIGURES

50+
LEED Certified Projects

30+
Electrified Buildings

750+
Energy Audits and Retro-Commissioning Projects

3,500,000+
MMbtu of Annual Energy Savings

150,000+
Metric Tons CO_2e of Annual GHG Emissions Reductions

Road Map to Net-Zero Emissions

In order to begin implementing any net-zero strategies, an existing building requires a baseline for current emissions; only then can we begin the process of change in building operation towards the target. In some cases, a net-zero operation may not be possible; however, understanding those limitations is critical as part of developing a roadmap towards net zero emissions.

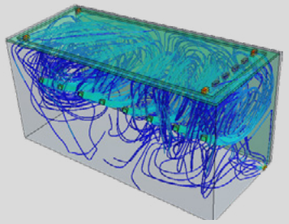
ASHRAE Energy Audit

Energy audits are the first step in a project focussed on sustainability. Our experts conduct thorough assessments which provide a detailed analysis of a building's existing energy consumption patterns, identifying areas of inefficiency and opportunities for improvement. The outcome of the audit yields a series of engineering and architectural projects with the end goal of reducing building emissions – reducing carbon and greenhouse gases. The energy audit helps the team to identify, prioritize, and plan for these projects by identifying potential project costs as well as expected energy and emissions reductions.

Energy Modelling

A whole building energy model goes beyond a standard ASHRAE Level II audit and provides in-depth analysis of the impact of identified Energy Conservation Measures (ECMs) on the overall building energy as required for Level III energy audits. We employ advanced energy modelling techniques to simulate various scenarios and optimize system designs. Using cutting-edge software and computational tools, our team can accurately predict the performance of proposed energy-efficient systems, allowing us to offer solutions for maximum efficacy in reducing emissions while maintaining occupant comfort and operational functionality. Through iterative modeling, we can provide clients with a clear visualization of the potential impact of sustainability upgrades, aiding in decision-making and budgeting processes.

Manhattan Municipal Building



A Museum Space

PROCESS:

Step 1

Inventory the building systems that contribute towards emissions

Step 2

Propose measures that will reduce emissions and select the most viable options that satisfy the capital investment criteria for implementation

Step 3

Implement best options as design projects to upgrade the existing systems or install new systems that offset carbon output

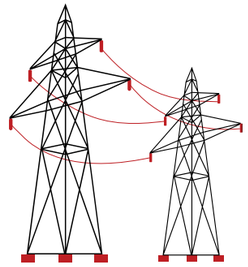
Step 4

Verify results of the implementation over 12 months

Building Electrification

WHY?

Federal, State, Local Government, or Private Decarbonization Goals (ex. New York City Local Law 97)

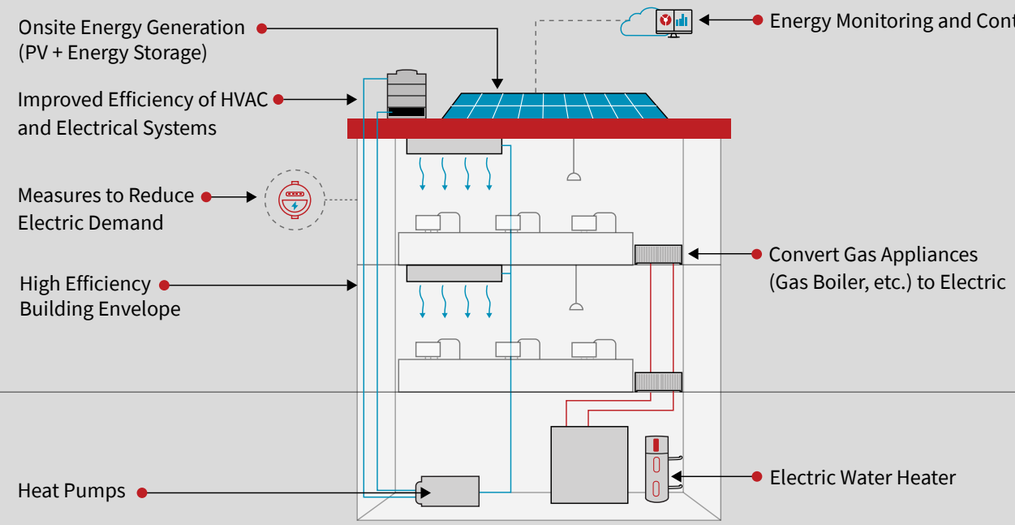


Electric grid power has lower emissions than fossil fuel combustion (e.g. natural gas)

Buildings are one of the largest sources of GHG emissions

Policy requirements

HOW?



Higgins Hall - Pratt Institute

TAILORED SOLUTIONS

At Loring, we believe in providing customized solutions adapted to each project's specific requirements. We take the time to understand your goals, constraints, and unique needs, enabling us to develop tailored, innovative engineering solutions that maximize efficiency, minimize costs, and deliver exceptional results. With a company culture that promotes camaraderie and collaboration over competition, we can pull on the expertise of more than 200 team members to ensure that every nuance of your project is attended to by the ideal professional with the right mix of knowledge, skills, and experience. Our commitment to continuing professional education also means our team is knowledgeable with the most recent technologies and is ready to incorporate them into your projects as appropriate.

Brooklyn STEAM Center

COMPREHENSIVE SERVICES

We offer a wide range of engineering services, covering all stages of your project lifecycle. From feasibility studies and conceptual design to detailed engineering, construction administration, commissioning, and quality assurance/ quality control, we provide you with end-to-end solutions. This integrated approach ensures seamless coordination, efficient communication, and streamlined project delivery within your schedule and budget.

Energy Audits and Retro-Commissioning for New York City-Owned Buildings

INNOVATIVE & SUSTAINABLE APPROACH

At Loring, we pride ourselves on our commitment to innovation and sustainability. Our engineers are at the forefront of industry advancements, utilizing cutting-edge technologies and best practices to deliver forward-thinking solutions. Whether your sustainability goals are mandatory or discretionary, we prioritize them by integrating eco-friendly designs, renewable energy solutions, and energy-efficient systems into our projects, helping you minimize environmental impact for the long term.

Columbia Business School, Site 6B & 7 Above-Ground

EXPERTISE & EXPERIENCE

Our team of highly skilled engineers boasts a wealth of expertise and decades of industry experience. Having successfully completed thousands of projects across various sectors, we have the right combination of knowledge and skills to tackle any challenge you or your clients may face, all while remaining dynamic and flexible enough to adapt to changes as they arise. We have worked on large-scale commercial, institutional, industrial, partnering with a range of clients that includes multinational corporations.

NYC Department of Citywide Administrative Services Energy Audits & Retro-Commissioning (FY'14 – FY'24) Various Locations, NY








400+ Buildings

PROJECT HIGHLIGHTS

Client:
NYC Department of Parks and Recreation, NYC Department of Citywide Administrative Services, Division of Facilities Management and Construction

Services:
Energy Commissioning + Retro-Commissioning

Area:
80,000,000 SF

Awards:
Diamond Award - Studies, Research and Consulting Engineering Services Category, 2020
ACEC New York Engineering Excellence Award

Energy audits and retro-commissioning surveys for over 400 buildings, including laboratories, schools, offices, courthouses, libraries, recreational facilities, family residences, police precincts, DSNY garage buildings, and detention centers. Notable buildings include the New York City Hall, Manhattan Municipal Building, Tweed Courthouse, Surrogate's Courthouse, Bronx County Hall of Justice, Office of Chief Medical Examiner, Court Square Building, Queens Central Library, NYPD Headquarters, NYPD Police Academy, and NYPD Police Laboratory. Campuses include Central Park and Flushing Meadows Corona Park Campus. These facilities are located across all five boroughs of New York City. The purpose of these studies was to identify energy conservation, retro-commissioning, and operations and maintenance measures as per the requirements of New York City's Local Law 87 (LL87), under New York City's Greener, Greater Buildings Plan (PlaNYC) and New York Executive Order 111. An additional objective was to identify building decarbonization opportunities to meet the requirements of Local Law 97 (LL97) for 50% greenhouse gas emission reductions by 2030, and 80% greenhouse gas emission reductions by 2050.

The following three steps indicate the implementation of ASHRAE Level II Energy Audit and Retro-Commissioning Surveys for Local Law 87:

ASHRAE Level II Energy Audit: This involves analysis of the building's energy consumption, followed by a site survey where our certified engineers and auditors evaluate the performance of building's energy-related systems: heating, cooling, ventilation, domestic hot water, lighting, other miscellaneous loads, and also the building envelope. Energy conservation measures (ECMs) are developed along with cost estimates. Examples of recommended ECMs include implementation of heat pump technologies for building electrification, steam system upgrades, heating and domestic hot water system upgrades, ventilation system upgrades, low flow plumbing fixtures to reduce domestic hot water use, thermal envelope and infiltration improvements, lighting, and electric baseload improvements, etc.

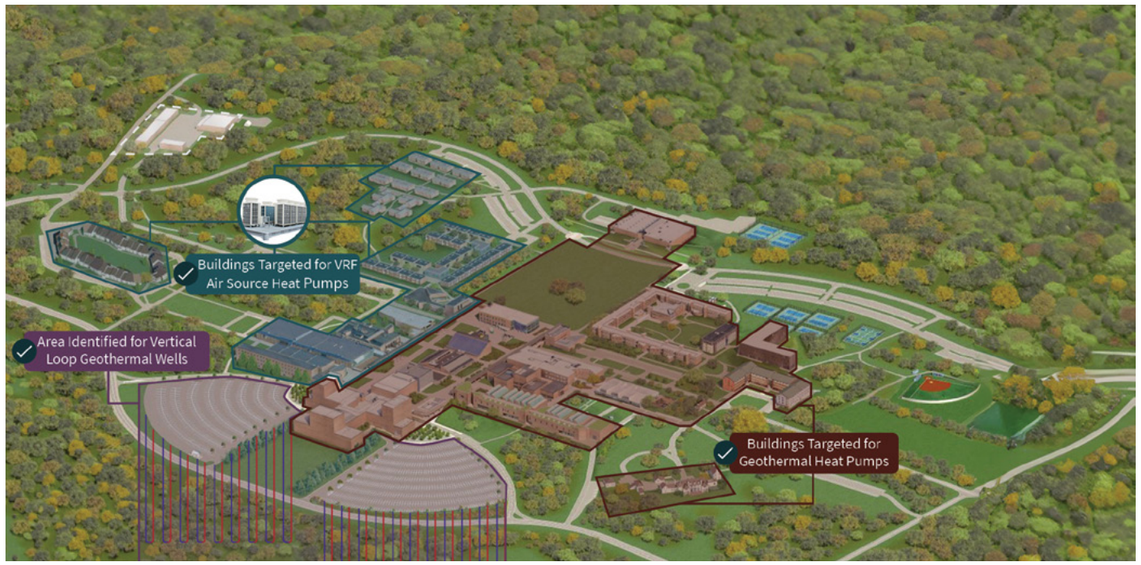
Retro-Commissioning: This involves surveying and testing of equipment, identifying operational and calibration issues, developing the Retro-Commissioning Measures (RCMs), cost estimates, and verifying the implementation of RCMs. Examples of RCMs identified through the retro-commissioning process include HVAC and lighting controls repairs, replacement of faulty steam traps, boiler tuning, adjustment of ventilation airflow rates, equipment cleaning, etc. Additional testing, if needed, is performed post-implementation.

Energy Efficiency Report: The energy conservation measures, and the retro-commissioning measures are presented to the client along with a payback analysis, savings calculations, and information on reduction of greenhouse gases. The report also includes the description of existing building conditions, energy breakdown analysis before and after the implementation of measures, detailed equipment and lighting inventories, functional check sheets and other retro-commissioning findings.

To deal with volume of work performed under this project, and to maintain the highest quality standard that we always thrive for, Loring deployed economies of scale and implemented lean principles for this project, which allowed completion of all studies on time and within budget. To allow the participating engineers to only focus on value addition components of the project, a standard template was developed to compile the information collected from the building surveys, generate automatic charts based on data analysis, and standardize the presentation of developed measures. This also included a table to generate existing and proposed lighting inventories using NYSERDA fixtures wattages. The deliverables generated were very well appreciated by the New York City Agencies associated with the buildings in scope.

Another big component of this project was the significant research that was performed to develop non-traditional energy efficiency measures, which goes above and beyond the requirements for Local Law 87 or any other Energy Code compliance. The recommended measures affect all possible systems in the buildings: heating, cooling, ventilation, lighting, domestic hot water, miscellaneous loads, and building envelope. The additional research will go a long way in meeting the client's objectives of converting their old existing buildings to sustainable buildings of the future.

State University of New York, SUNY Purchase Campus Clean Energy Master Plan, Purchase, NY



PROJECT HIGHLIGHTS

Client:
State University Construction Fund

Services:
Energy

Area:
2,599,697 SF

Awards:
Platinum Award - Studies, Research and Consulting Engineering Services, 2025
ACEC New York Engineering Excellence Award

Loring Consulting Engineers, Inc. (Loring) was retained by State University of New York (SUNY) to develop a Clean Energy Master Plan (CEMP) for the SUNY Purchase Campus. The SUNY Purchase Campus is in Purchase, NY just across the border from Connecticut and approximately 1 mile south of the Westchester County airport. The 500-acre campus includes a total of 49 structures including various dormitories, academic buildings, mechanical services, support services, and student life buildings with an approximate gross area of 2,559,697 square feet.

The primary purpose of the CEMP was to drive significant long-term, proven, cost effective building upgrades and infrastructure changes that can help lead to carbon neutrality by 2050 to align with the Climate Leadership and Community Protection Act (CLCPA). The primary goals of this CEMP were to:

1. Complete ASHRAE Level II audits to identify and recommend building upgrades and improvements.
2. Assess building and plant level efficiency improvements and load reduction strategies including beneficial electrification.
3. Assess opportunities to decarbonize electricity and heating fuel sources.
4. Provide detailed analysis and recommendations to support the university's contributions as they move towards New York State's overarching greenhouse gas and renewable energy goals.
5. Implementation Plan - develop a financially viable, realistic, and implementable multi-year and phased plan using multi-criteria scenario planning with available resources.

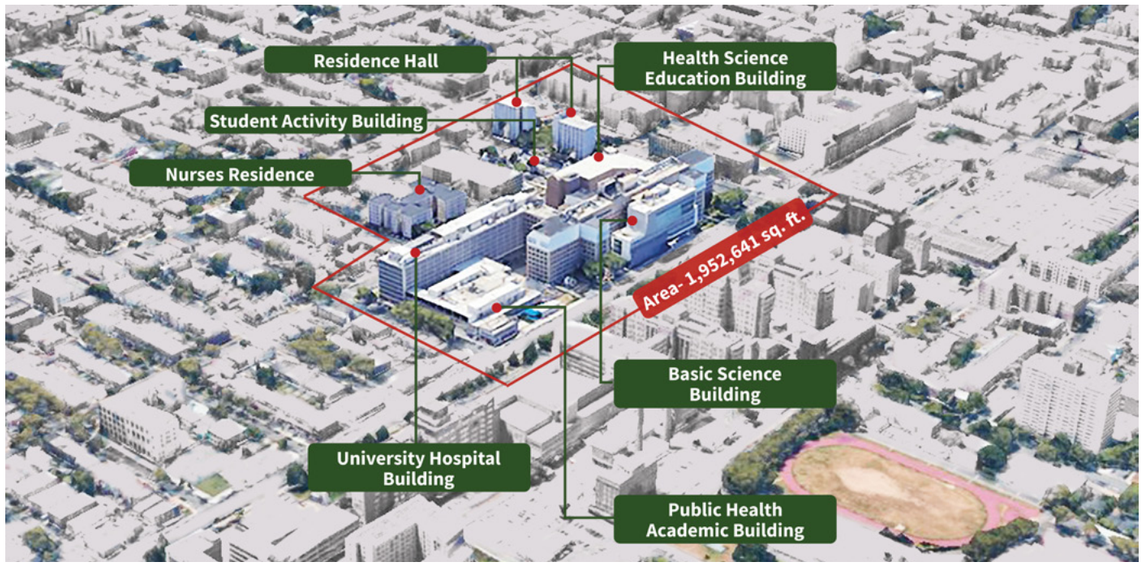
Loring performed an ASHRAE Level II Energy Audit and developed four (4) potential roadmaps to transition the Purchase Campus to a net-zero emissions facility by 2050 and meet the CLCPA and BuildSmart targets for 2025. Additionally, these scenarios were analyzed to verify if they met the University's Directive 1B-2 EUI targets for existing buildings. Directive 1B-2 outlines specific Energy Use Intensity (EUI) targets for existing buildings and specifies requirements for building electrification and carbon emissions reductions. The SUNY Purchase Campus has an EUI target of 47 kBtu/sq ft-yr. The campus energy consumption for Fiscal Year 2014-2015 was approximately 107 kBtu/sq ft-yr.

The adjoining table presents the four scenarios analyzed by Loring for SUNY Purchase Campus.

Measure Type	Package A Air Source Heat Pump	Package B Full Ground Source Heat Pump	Package C Chiller Heater with Condensing	Package D Hybrid GSHP and ASHP
Improvement to Lighting and Lighting Controls	x	x	x	x
Elevator Upgrade	x	x	x	x
Plug Load Management	x	x	x	x
Electrification of DHW System	x	x	x	x
Solar PV Installation	x	x	x	
Envelope Upgrade	x	x	x	x
Eliminates Carbon Fuel Source Heating	x			x
Greatest Energy Savings				x
Uses only Existing open Fields/ Parking Lots	x		x	x

After careful evaluation, Package A was identified as the most feasible scenario for implementation. By adopting the heat pump technology specified in Package A, the SUNY Purchase Campus aims to achieve several important goals. Firstly, it will reduce the Energy Use Intensity (EUI) to 34 kBtu/sq ft-yr. Additionally, this transition will enable the campus to shift to fully electric systems. Moreover, it will play a vital role in achieving net-zero carbon emissions once the New York State electric grid transitions to zero-emissions by 2040.

State University of New York, SUNY Downstate Medical Center Campus
Clean Energy Master Plan
Brooklyn, NY



PROJECT HIGHLIGHTS

Client:
State University Construction Fund

Services:
Energy

Area:
1,952,641 SF

Awards:
Platinum Award - Studies, Research and Consulting Engineering Services, 2024
ACEC New York Engineering Excellence Award

Loring Consulting Engineers, Inc. (Loring) was retained by State University of New York (SUNY) to develop a Clean Energy Master Plan (CEMP) for the SUNY Downstate Medical Center Campus. The SUNY Downstate Medical Center Campus is in the east Flatbush section of Brooklyn. The campus is divided into three (3) sections - hospital, educational and residential. The hospital section includes the outpatient department, hospital, MRI, pharmacy buildings, and dialysis Center. The educational section provides programs for medicine, nursing, health related professions, public health, and graduate studies. The residential section includes residential apartments for the nurses, student dorms and student activity building. The total gross area of the buildings in the scope of the CEMP project was about 1,952,641 square feet.

The primary purpose of the CEMP was to drive significant long-term, proven, cost effective building upgrades and infrastructure changes that can help lead to carbon neutrality by 2050 to align with the Climate Leadership and Community Protection Act (CLCPA). The primary goals of this CEMP were to:

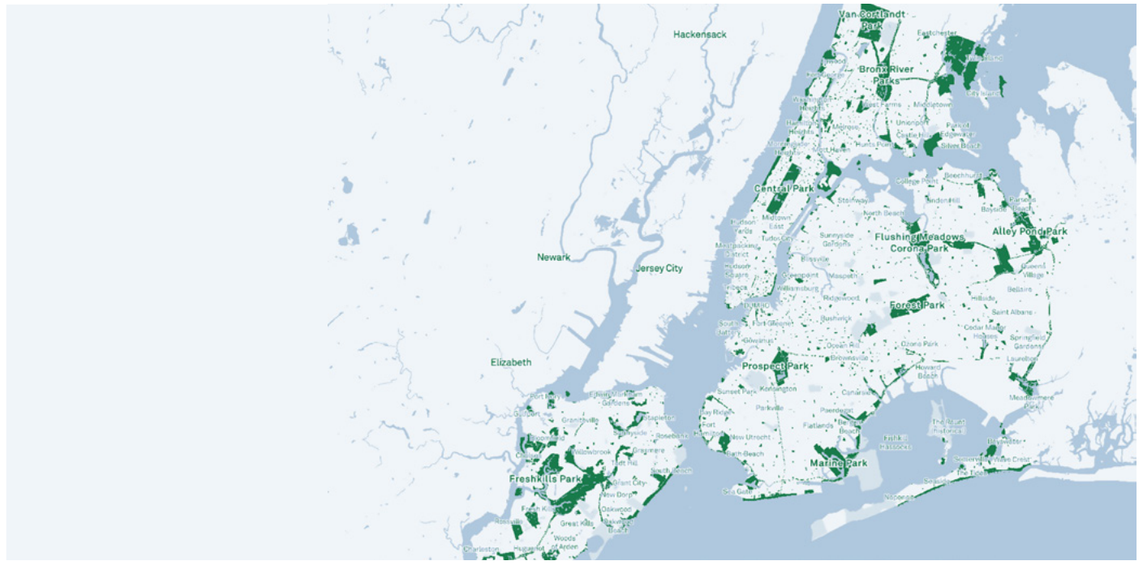
1. Complete ASHRAE Level II audits to identify and recommend building upgrades and improvements.
2. Assess building and plant level efficiency improvements and load reduction strategies including beneficial electrification.
3. Assess opportunities to decarbonize electricity and heating fuel sources.
4. Provide detailed analysis and recommendations to support the university's contributions as they move towards New York State's overarching greenhouse gas and renewable energy goals.
5. Implementation Plan - develop a financially viable, realistic, and implementable multi-year and phased plan using multi-criteria scenario planning with available resources.

Loring performed an ASHRAE Level II Energy Audit and developed three (3) potential roadmaps to transition the Downstate Medical Center Campus to a net-zero emissions facility by 2050 and meet the CLCPA and BuildSmart targets for 2025. Additionally, these scenarios were analyzed to verify if they met the University's Directive 1B-2 EUI targets for existing buildings. Directive 1B-2 outlines specific Energy Use Intensity (EUI) targets for existing buildings and specifies requirements for building electrification and carbon emissions reductions. The SUNY Downstate Medical Center Campus has an EUI target of 124 kBtu/sq ft-yr. The campus energy consumption for Fiscal Year 2018-2021 was approximately 252 kBtu/sq ft-yr. The adjoining table presents the three scenarios analyzed by Loring for SUNY Downstate Medical Center Campus.

Measure Type	Package A Minor Upgrades	Package B Partial Electrification/ Fuel Change	Package C Electrification
Improvement to Lighting and Lighting Controls	x	x	x
Low-Cost Measures for Improved HVAC Controls	x	x	x
Elevator Upgrade	x	x	x
Plug Load Management and IT Upgrades	x	x	x
Renewable Energy Sources	x	x	x
Insulation of Exposed Piping	x	x	
Condensing Boilers for Nurses Residence	x	x	
Fuel Change for HPS Boilers		x	
Envelope Upgrades		x	x
Electrification of Cooling System (Magnetic Roaring Chillers)		x	x
Electrification of Medical Equipment			x
Electrification of Dorms and SAB			x

After careful evaluation, Package C was identified as the most feasible scenario for implementation. By adopting the electrification technologies specified in Package C, the SUNY Downstate Medical Center Campus aims to achieve several important goals. Firstly, it will reduce the Energy Use Intensity (EUI) to 123 kBtu/sq ft-yr. Additionally, this transition will enable the campus to shift to fully electric systems, while also allowing critical system to keep operating without affecting the building comfort levels. Moreover, it will play a vital role in achieving net-zero carbon emissions once the New York State electric grid transitions to zero-emissions by 2040.

Department of Parks and Recreation (Parks) and Department of Citywide Administrative Services (DCAS), NYC Parks Energy Reduction Plan New York, NY



PROJECT HIGHLIGHTS

Client:
New York City Department of Parks & Recreation (Parks)

Services:
Energy

Area:
5,000,000 SF

Awards:
Gold Award - Studies, Research and Consulting Engineering Services, 2026 ACEC New York Engineering Excellence Award

Loring was retained by the New York City Department of Citywide Administrative Services (DCAS) to develop an Energy Reduction Plan (ERP) to decarbonize buildings operated by the New York City Department of Parks and Recreation (Parks). The ERP's primary goal was to outline how Parks will contribute to a greener New York City by reducing greenhouse gas (GHG) emissions in compliance with New York City's decarbonization law (Local Law 97). This plan will not only enhance Parks' environmental impact but also serve as an example for other organizations and agencies working towards a sustainable future.

Recommendations within the ERP take into account Parks' funding sources for project contracts and consider their financial implications. Priority is given to cost-effective measures before exploring those requiring more substantial investment. The funding mechanisms employed for capital improvements are categorized as follows:

- Non-Capitally Eligible: These pertain to operation and maintenance-related projects that require minor funding for implementation, such as conserving existing systems (e.g., Adjust Setpoints and Setbacks for Minor System Components).
- Capital Eligible "Limited Scope": These encompass broad-scope projects involving the reconstruction of entire systems (e.g., the installation of a heat pump system).
- Full Reconstruction Project: These are capital-intensive initiatives demanding significant investment (e.g., wall insulation upgrades).

In this ERP, Loring conducted AICAs at one hundred and twenty-seven (127) representative sites and carried out energy audits at forty-four (44) preselected sites. In addition, Loring conducted a comprehensive analysis of all available building information collected by DCAS and Parks over the past two decades. This analysis encompassed data on energy usage, construction upgrades, building systems, and typical operations and maintenance practices, offering a deeper understanding of the types of buildings and equipment that Parks operates. This comprehensive and far-reaching analysis played a critical role in shaping the ERP, ultimately providing an effective and efficient path for Parks to achieve its emission reduction goals.

The table below presents the GHG emissions for the baseline year 2006, the current year 2021, and the specified target years. The table details the emissions reductions required to achieve the GHG emissions goals for each target year. Notably, GHG emissions in 2006 and 2021 were 64,009 and 36,668 Metric Tons of CO2 equivalent MT CO2e respectively. This translates to Parks having achieved a current GHG reduction of 43% compared to 2006. At present, Parks stands roughly 7% and 37% away from the 2030 and 2050 targets, respectively.

Reference Year	GHG (MT CO2e)	Annual GHG (MT CO2e) Reduction from 2006	Percent GHG Reduction
2006 (Baseline)	64,009	0	0%
2021 (Current)	36,668	27,341	43%
2030 (Target)	32,005	32,005	50%
2050 (Target)	12,802	51,207	80%

The Parks ERP provided a comprehensive analysis to guide Parks in meeting the above targets. The intent was to assist in planning to help decarbonize Park's building operations. The analysis considered cost, Parks' funding categories, and source/grid emissions factors, all of which collectively influenced the GHG emissions within the Parks portfolio. To achieve this, the ERP accomplished the following objectives:

- Extrapolation of surveyed and audited parameters to encompass the entire Parks portfolio.
- Highlighting the most effective energy conservation and operational measures across typologies and agencies.
- Estimation of the costs associated with proposed measures.
- Description of the systems, space usage, and building conditions within the surveyed buildings.
- Historical energy use analysis for both the surveyed and non-surveyed typologies.
- Comprehensive breakdowns of energy end use within the portfolio and typologies.
- Considering the potential for achieving net-zero emissions within the Parks portfolio.
- Consideration of the potential for achieving net-zero emissions within the Parks portfolio.

Mitchell-Giurgola Architects , NYBG Workers Operation Center
Net-Zero Energy Study
Bronx, NY

PROJECT HIGHLIGHTS

Client:
New York Botanical Garden

Services:
Net-Zero Energy Study

Area:
N/A

Architect:
Mitchell Giurgola Architects

Loring was retained by Mitchell-Giurgola Architects to develop a Net-Zero energy study for a new Workers Operations Center at the New York Botanical Garden (NYBG). The proposed facility will consolidate various programs and replace the existing Lower Garage Facility. The building will consist of office space, repair shops, locker rooms, vehicle storage and repair areas. The overall intent for the building is to achieve a high level of sustainability through both passive and active design elements, with the potential of achieving a Net-Zero energy building. Through this study, Loring evaluated if a Net-Zero energy performance is achievable for the selected building layout with the proposed building envelope elements, mechanical systems, and equipment.

Loring performed a preliminary energy modeling analysis using eQUEST. Five energy models were created for analysis as listed below. All models comply with the New York City Energy Conservation Code (NYCECC), as well as the requirements for New York City's Local Law 86 (LL86), Local Law 31 (LL31), and Local Law 32 (LL32) that apply to this project. While the NYCECC requires that all buildings be designed to meet the minimum energy efficiency criteria as defined in the code; LL86, LL31, and LL32 require that qualifying new city buildings be designed to efficiency levels that go above and beyond the requirements of NYCECC. LL31 requires that qualifying new city buildings be designed as low energy intensity buildings. Low energy intensity buildings are the buildings that consume 50% less energy than other constructions of their type.

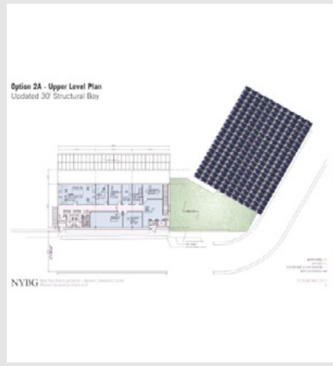
Baseline Model (NYCECC/LL86/LL31/LL32):
Developed to match minimum requirements for New York City Energy Conservation Code for new building construction, as well as the requirements for LL86, LL31, and LL32.

Proposed Option A Model:
Ground source heat pump with condensing boiler as backup, variable speed drive (VSD) driving pumps, and other parameter to meet New York City Energy Conservation Code, LL86, LL31, and LL32.

Proposed Option A Net-Zero Model:
Description automatically generated Ground source heat pump, architecture envelope design for Net-Zero, energy recovery ventilation efficiency increased to 75%, lighting power density 25% below the requirements of NYCECC, and other parameter to meet New York City Energy Conservation Code, LL86, LL31, and LL32.

Proposed Option B Model:
Variable refrigerant flow (VRF) air source heat pump with condensing boiler as backup, VSD driving pumps, and other parameter to meet New York City Energy Conservation Code, LL86, LL31, and LL32.

Proposed Option B Net-Zero Model:
Variable refrigerant flow (VRF) air source heat pump, architecture envelope design for Net-Zero, energy recovery ventilation efficiency increased to 75%, lighting power density 25% below the requirements of NYCECC, and other parameter to meet New York City Energy Conservation Code, LL86, LL31, and LL32.



To evaluate if a Net-Zero energy performance is achievable, Loring also performed a Solar Photovoltaic (PV) analysis to estimate the potential onsite power generation from solar PV arrays that could be installed on the roof of the new Workers Operations Center building. The energy output from these arrays was then compared against the energy consumption profiles from the building energy models. Finally, a sensitivity analysis was performed to verify the effect on Net-Zero performance if either the building energy consumption, or the solar PV array output, deviate from the energy analysis developed in this study.

It was concluded that the proposed Workers Operations Center building will achieve Net-Zero energy performance for both proposed HVAC options – Option A (ground source heat pump), and Option B (VRF air source heat pump).

NYU Langone Health, 333 East 38th Street
Energy Master Plan and Infrastructure Design
New York, NY

PROJECT HIGHLIGHTS

Client:
NYU Langone Health

Services:
Energy Master Plan and Infrastructure Design

Area:
480,000 SF

Loring was retained by NYU Langone Health (NYULH) to develop an energy master plan for 333 East 38th Street facility located in New York, NY. The objective of this energy master plan was to align the facility's requirements with the organization's energy and sustainability goals. The facility was undergoing a fit-out to convert several floors into medical surgical floors, and since this conversion was going to require realignment of heating and cooling plants as they existed, NYULH believed that it was the right time to develop an energy master plan for the entire facility.

333 East 38th Street is an approximately 480,000 GSF, 13-story building, which was recently purchased by NYULH. The building renovation included approximately eighteen (18) new operating rooms with supporting post-anesthesia care unit (PACU) spaces, a new central sterile processing department (CSPD), as well as an expanded loading dock. Additionally, there were major expansions of the existing occupational/physical therapy (OT/PT) programs located throughout the existing building.

As part of the energy master plan, Loring assessed the following five (5) infrastructure options for 333 East 38th Street with the primary intent to save energy and reduce the building's carbon footprint /associated greenhouse gas emissions.

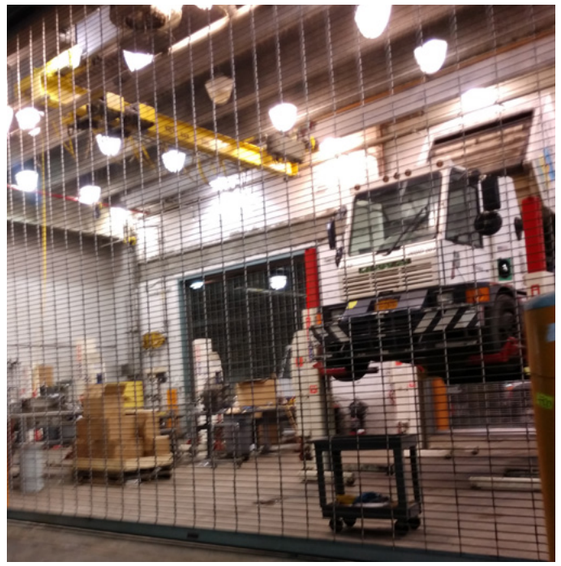
Option	Cooling	Annual GHG (MT CO2e) Reduction from 2006	Percent GHG Reduction	DHW
Option 1 - Conventional Plant	Large capacity, centrifugal, water-cooled chillers	District steam (Con Edison)	District steam (Con Edison)	District steam (Con Edison)
Option 2 – Condenser Water Plant	Water-cooled packaged AC units with rooftop cooling towers (large capacity centrifugal water-cooled chillers for surgical areas only)	Gas-fired condensing type boilers	Gas-fired steam boilers	Gas-fired
Option 3 – Max Electrification	Modular centrifugal air-cooled heat pumps	Modular centrifugal air-cooled heat pumps with supplemental gas-fired boilers	District steam (Con Edison)	District steam (Con Edison)
Hybrid Plant Option A	Large capacity, centrifugal, water-cooled chillers	Gas-fired condensing type boilers	District steam (Con Edison)	Gas-fired
Hybrid Plant Option B	Combination of large capacity centrifugal water-cooled chillers and heat pumps	Combination of water-cooled heat pumps and gas-fired condensing type boilers	Gas-fired steam boilers	Gas-fired

One of the challenges with this project was to plan out the phasing. NYULH wanted to upgrade the central heating and cooling plants with an intent to transition the entire building to the new, more efficient plants. However, not all floors within the building were ready to transition as the same time, and some of the existing systems had to be retained to support these floors. As a result, Loring analyzed the impact of connecting the fit-out floors to the new plant options immediately (Short Term) and a full migration to the new plant options at about 10 years in the lifecycle of the plant (Long Term).

Loring also performed a lifecycle cost assessment for all plant options. The lifecycle cost assessment was performed over a 30-year analysis period using a 3% discount rate, and varying escalation rates for the energy units. Lifecycle cost analysis included: initial and mid-life equipment costs, energy costs, New York City Local Law 97 penalties, and operations and maintenance costs. Based on the lowest total cost of ownership over a 30-year lifecycle period, Hybrid Plant Option B was determined as the most practical and feasible design option to implement. Based on this selection, Loring developed schematic design level scope of work for Hybrid Plant Option B. It is anticipated that the mechanical systems and equipment in the Hybrid Plant Option B will support the facility to meet/exceed the new program requirements for occupant safety indoor air quality, comfort, maintenance, as well as energy efficiency.

The Energy Master Plan and Infrastructure Design project for 333 East 38th Street was offered as a NYSERDA FlexTech project to NYULH.

NYC Department of Citywide Administrative Services & Department of Sanitation, Manhattan District 4 / 4A / 7 Garage
Deep Energy Retrofit
New York, NY



PROJECT HIGHLIGHTS

Client:
NYC Department of Citywide Administrative Services - NYC Department of Sanitation

Services:
Energy Commissioning + Retro-Commissioning

Area:
420,000 SF

Deep energy retrofit study was performed for DSNY's 420,000 square feet Manhattan District 4 / 4A / 7 Garage located at 930 West 57th Street, New York, NY 10019. The project involved two phases: (1) ASHRAE Level III Energy Audit; and (2) Deep Energy Technical Report. The objective of this project was to identify and implement Energy Conservation Measures (ECMs) to reduce the building's Energy Use Intensity (EUI) by at least 50% from the baseline. These ECMs were presented in packages that will maximize energy savings based on interactions between the various measures to be implemented.

With the ASHRAE Level III Energy Audit, Loring identified 45 potential ECMs within seven different packages with the primary intent to save energy and reduce associated greenhouse gas emissions. These included three separate ECMs to improve the efficiency of interior and exterior lighting systems. Implementing these ECMs will also provide additional benefits such as improved comfort and lighting levels, complying with minimum ventilation requirements, better maintenance feedback and system responsiveness. Each package included between 24 and 29 ECMs that can be implemented together. Energy models were developed for base-building scenario, and also for each ECM and combined package separately. A matrix showing greenhouse gas emission reductions was developed for each package. The various ECM packages were analyzed were mostly driven by heating and cooling plant options. Each package also comprised of lighting efficiency measures, building envelope upgrade measures, and renewable energy measures. Following presentation of lifecycle cost analysis scenarios for all packages, and several discussions with DCAS and

DSNY, it was decided that Package C, which provides the best balance between energy savings and DSNY's operational needs, will be analyzed further for deep energy retrofit.

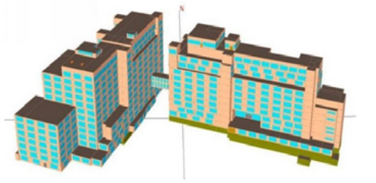
The following recommendations from Package C were analyzed for deep energy retrofit:

- Rapid Roll Up Doors for All Garages
- Variable Volume Hot Water Pumping
- Install Garage Door Air Curtains
- Install Control Valves on Unit Heaters
- Replace Garage Lighting With LED, Provide Sensors
- Valve Off Existing Unit Heaters
- Replace T-8 Lighting with LED and Install Sensors
- Install Low-E Window Film
- Replace Tunnel Lighting with LED
- Provide Heat Recovery for Roof Mounted Exhaust Fans
- Full BMS Installation Connecting All Major Equipment
- Upgrade AHUs with Variable Volume System
- Upgrade the Chilled Water Loop
- Rebalance Ventilation System to Reduce OA Intake
- Install Water Cooled Electrically Driven Chillers
- Install Filters in H&Vs and Rebalance
- Install Low Pressure Steam Boilers for Garage Space Heating, Eliminate District Steam Service
- Install Heat Pump Hot Water Systems
- Install Condensing Hot Water Boilers for Office Space Heating, Eliminate Heat Exchangers
- Equip Elevators with Regenerative Drives
- Upgrade H&V Units and Exhaust Fans to Variable Volume System
- Retro-Commissioning of Existing Building Systems
- Install Solar Photovoltaic Array - Direct Roof Mounted
- Continuous Commissioning

Loring developed schematic level design scopes of work for the above ECMs as part of the Deep Energy Technical Report. The energy analysis and cost estimates were further adjusted to account for scope changes between ASHRAE Level III Energy Audit and Deep Energy Retrofit Technical Report. Together, the selected measures in Package C will reduce the building's energy use intensity from 400 kBTU/sf-yr to about 90 kBTU/sf-yr, reduce the energy cost by over $3,275,000 per year, and reduce the greenhouse gas emissions by over 4,800 metric tons of CO2 equivalent per year.

One of the challenges with this project was that the existing building, although not relatively old (10 years old at the time of this project), had major systems that were not properly commissioned at the time of the building opening. There were secondary and tertiary heating systems that were intended as backup to the primary systems but were all operating together due to lack of functional controls. This was resulting in overheating of the garage spaces and was causing unintended simultaneous heating and cooling leading to significant inefficiencies with existing building operation. Similar inefficiencies existed with other building systems as well. Through Loring's schematic scopes, DCAS and DSNY were able to narrow down the implementation plan and take this project to the next phase. An additional aspect of this project was to develop Deep Energy Retrofit Guidelines, which should include DCAS Methodologies and Procedures for Execution of Deep Energy Retrofit Scope of Work. Such a guidelines document did not exist at the time of this project because this was the first Deep Energy Retrofit project being pursued by any New York City agency. This guidelines document was to be used as a reference for similar DCAS projects in the future. Loring was able to successfully develop and deliver Deep Energy Retrofit Guidelines, as an additional deliverable to this project.

CIM Group, 25 Columbia Heights and 30 Columbia Heights
Energy Audit
Brooklyn, NY



PROJECT HIGHLIGHTS

Client:
CIM Group

Services:
Energy

Area:
650,000 SF

ASHRAE Level II Energy Audit and associated engineering services were performed for 25 Columbia Heights and 30 Columbia Heights. The two buildings have a total gross area of approximately 650,000 square feet. The buildings were undergoing rehabilitation at the time of the survey. Most of the base building systems were to remain as-is following this rehabilitation. The purpose of the study was to: (a) Develop baseline energy consumption profile for the buildings assuming full occupancy; and (b) Identify Energy Conservation Measures (ECMs) that can be implemented to reduce the building's total energy use and associated greenhouse gas emissions.

A baseline energy consumption profile for the buildings was developed using an eQUEST energy model. Since the buildings were not occupied at the time of the surveys, and a significant change to the occupancy type would happen following the building rehabilitation, a new energy baseline was necessitated as a starting point towards the Energy Audit. This baseline was developed assuming full building occupancy, and typical tenant fit-out equipment as coordinated with CIM operations team and Loring's internal Tenant Fit-Out team. Using the data collected from the buildings and interviews with the building engineering team, The Energy Audit team identified several ECMs. Implementation was recommended for 16 ECMs. In addition, 12 ECMs that were not recommended for implementation were also investigated. All ECMs were individually analyzed using energy models, and lifecycle cost analysis was developed for each. An interactive energy model combining the effect of all ECMs was also developed, following which the findings were presented in the form of an ASHRAE Level II Energy Audit report.

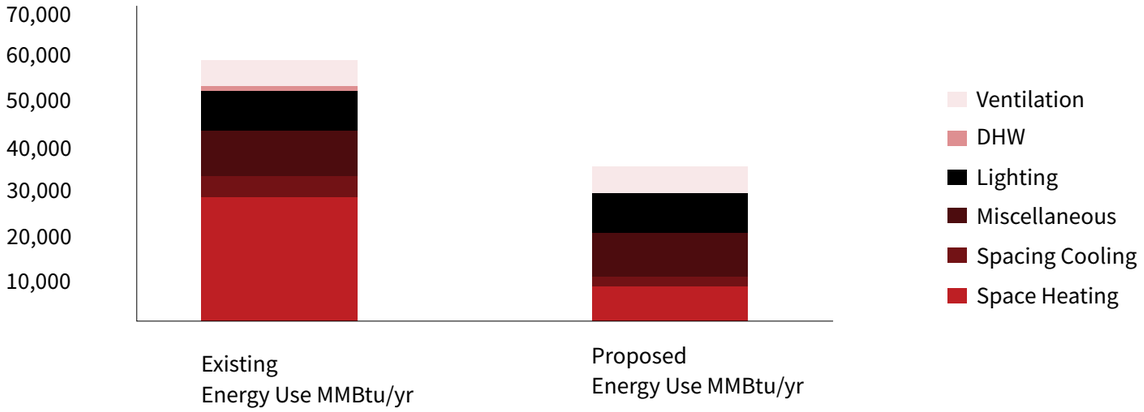
The following ECMs were recommended for implementation

- Lighting Upgrade for Parking Garage
  Prismatic Collectors for Upper Floor Day Lighting
- Install Energy Valves on all Process Water Loops
  Chiller Optimization Program
- Demand Control Ventilation for AHUs Install Atmos
  Air Ionization Units in AHU Discharge
- Install Heat Pump Hot Water Heaters
  Retro-Commissioning of Existing Building Systems
- Installation of Solar PV, Maximum Deployment
  Full BMS Implementation
- Thermal Storage for Reduced Chiller Operation
  Demand Control Exhaust for Parking Garage
- Rapid Roll Up Door for Parking Garage
  Lighting Upgrade, Exterior Lighting
- Replacement of Existing Roofing, More Insulation
  Replace the Low-Pressure Steam Boilers with Hot Water Boilers

Together, the recommended ECMs will result in energy savings of 41%, and cost savings of 29%. It is expected that the buildings will reduce their CO2 emissions by a combined 1,375 metric tons per annum. This project was offered to CIM Group as a NYSERDA FlexTech study.

Energy Use	EUI (kBtu/sq ft-yr)	ECI ($/sq ft-yr)	Annual Energy Cost ($/yr)
Baseline Use Model Year	91	$2.01	$1,305,935
Proposed Energy Use	54	$1.43	$931,831
% Savings	41%	29%	29%

Total Project Energy Savings by End Use



NYC Department of Environmental Protection (NYC DEP)
North River and Coney Island Water Pollution Control Plants Energy Audits & Retro-Commissioning,
New York, NY

PROJECT HIGHLIGHTS

Client:
NYC Department of Environmental Protection (NYC DEP)

Services:
Energy

Area:
5,000,000 SF

Loring was engaged by the Department of Environmental Protection (NYC DEP) to conduct comprehensive ASHRAE Level II energy audits and retro-commissioning (RCx) studies for two of New York City's largest and most critical wastewater treatment facilities: North River WPCP (170 MGD) and Coney Island WPCP (110 MGD). Both facilities operate 24/7, serving essential functions in wastewater management while housing extensive mechanical and process-related infrastructure that accounts for significant municipal energy use. The audits and RCx efforts aimed to identify Energy Conservation Measures (ECMs), Retro-Commissioning Measures (RCMs), Operations and Maintenance Measures (OMMs), and Distributed and Renewable Energy Measures (DRMs), in accordance with Local Law 87 (LL87) and Executive Order 111 mandates.

At the North River WPCP, located along the Hudson River in Manhattan and spanning approximately 1.13 million square feet, Loring identified 22 ECMs, 10 RCMs, and 3 OMMs. Notable opportunities included VFD implementation on large pump motors, BMS optimization, lighting upgrades, and ventilation control improvements in administrative and mechanical areas. As part of the process, extensive field inspections and system diagnostics were conducted on chillers, AHUs, pumps, process ventilation systems, and heating/cooling distribution systems. Loring's team also evaluated the feasibility of on-site renewable energy integration and demand response compatibility. The recommended measures targeted improved equipment efficiency, reduced electric and steam consumption, and enhanced system control to better match operational schedules. The project estimated an annual GHG emissions reduction of over 145 metric tons CO_2e, while laying the groundwork for broader decarbonization efforts at the site.

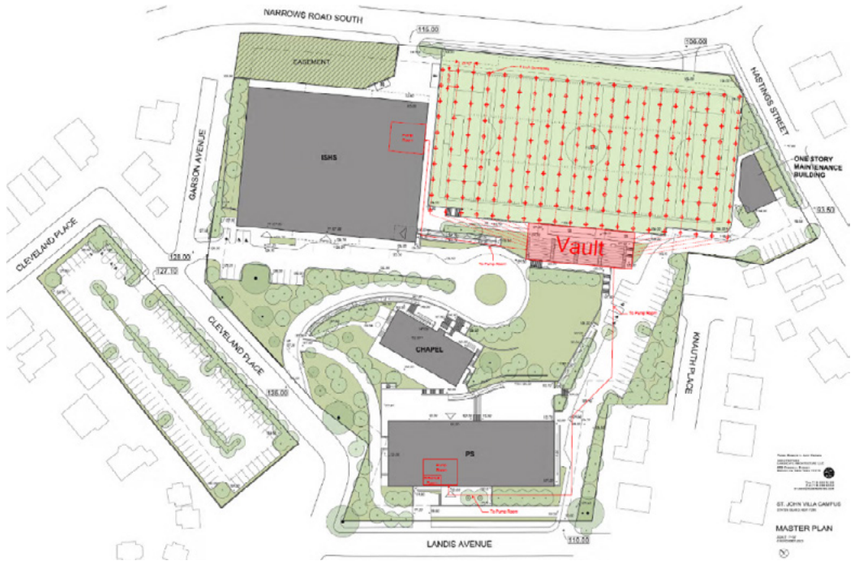
At the Coney Island WPCP, located in Brooklyn's Sheepshead Bay neighborhood, Loring conducted a similarly rigorous assessment across 19 buildings that make up the treatment campus. The plant, originally established in 1935 and heavily modernized in the 1980s, required detailed energy diagnostics given the diverse array of process-related mechanical systems and space types. The study yielded 14 ECMs, 7 RCMs, 4 OMMs, and 3 DRMs. Key findings included potential for pumping system optimization, boiler reconfiguration, steam trap maintenance, and lighting and controls upgrades throughout administrative and operational buildings. In addition, Loring provided preliminary analysis of future electrification opportunities, including heat pump integration and solar PV feasibility for administrative areas.

For both facilities, Loring's approach included:

- Review of building and utility documentation, including historical utility usage and BMS data
- Field inspections and performance testing of HVAC, steam, and pumping systems
- Data logger deployment to capture system trends and occupancy-related loads
- Identification of system deficiencies, controls issues, and sequencing misalignments
- Development of scope-ready ECMs with implementation cost and savings estimates
- Compliance verification with LL87 and preparation of associated EERs and RCx reports

Loring collaborated closely with DEP plant personnel, DCAS Energy Management staff, and external stakeholders to ensure that recommended measures were practical, implementable, and aligned with the City's broader energy and climate goals. The studies do not only fulfill compliance requirements but also offered a roadmap for strategic reinvestment in long-lived assets, many of which are approaching or exceeding their design lifespan.

NYC School Construction Authority (SCA), St. John Villa Campus
Geothermal Feasibility Study
Staten Island, NY



PROJECT HIGHLIGHTS

Client:
NYC School Construction Authority (SCA)

Services:
Energy

Area:
301, 000 SF

Loring Consulting Engineers was engaged by the NYC School Construction Authority (SCA) to perform a geothermal feasibility study for the St. John Villa Campus in Staten Island, NY. The project included four buildings: a new elementary school, a consolidated middle and high school, an existing chapel, and a maintenance building. The study was conducted in accordance with Local Law 6 of 2016, which requires city-owned new construction projects to evaluate geothermal heating and cooling alternatives. The analysis focused on the new PS and IS/HS buildings, providing both technical and economic assessments of geothermal versus conventional rooftop (RTU) heat pump systems.

Loring developed grey-box load models in CHVAC to calculate peak heating and cooling requirements and used eQUEST to simulate annual energy use profiles. The models were calibrated using the 2019 Green School Guide and the 2020 NYC Energy Conservation Code. Soil thermal conductivity data from a geotechnical study was integrated into GLHEPro software to design and size closed-loop borehole fields. Multiple configurations were evaluated to optimize borehole spacing, depth, and arrangement. The final layout consisted of approximately 160 vertical boreholes at 500 feet each, organized in a grid beneath the existing soccer field. This design balanced drilling logistics, thermal performance, and long-term system stability. Sensitivity analyses were also performed to account for variations in building load and soil conditions.

To assess cost-effectiveness, Loring prepared a 30-year life-cycle cost analysis comparing geothermal systems with RTUs. Inputs included capital costs, energy consumption, maintenance requirements, and penalties associated with

NYC's carbon reduction legislation (Local Law 97). Results showed that geothermal could yield over $5 million in operating cost savings across the analysis period, with a 20.6-year simple payback. Additionally, the system was projected to reduce energy consumption by 15–17% and lower campus-wide greenhouse gas emissions significantly.

The study addressed logistical and operational challenges including drilling feasibility, long-term ground temperature stability, and system maintenance protocols. Recommendations included phased borehole drilling, advanced monitoring to track loop performance, and integration with the campus's future building management system for optimized operation. Maintenance strategies were developed to ensure long-term reliability, including fluid quality checks, system pressure monitoring, and staff training.

The study concluded that a closed-loop geothermal heat pump system is both technically feasible and economically viable for the St. John Villa Campus. The recommended system supports the City's decarbonization commitments, provides significant long-term cost savings, and demonstrates SCA's leadership in advancing high-performance, sustainable school facilities.

Royal Bank of Canada,
Feasibility Study
Across Canada

PROJECT HIGHLIGHTS

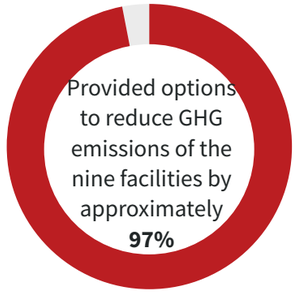
Client:
Royal Bank of Canada

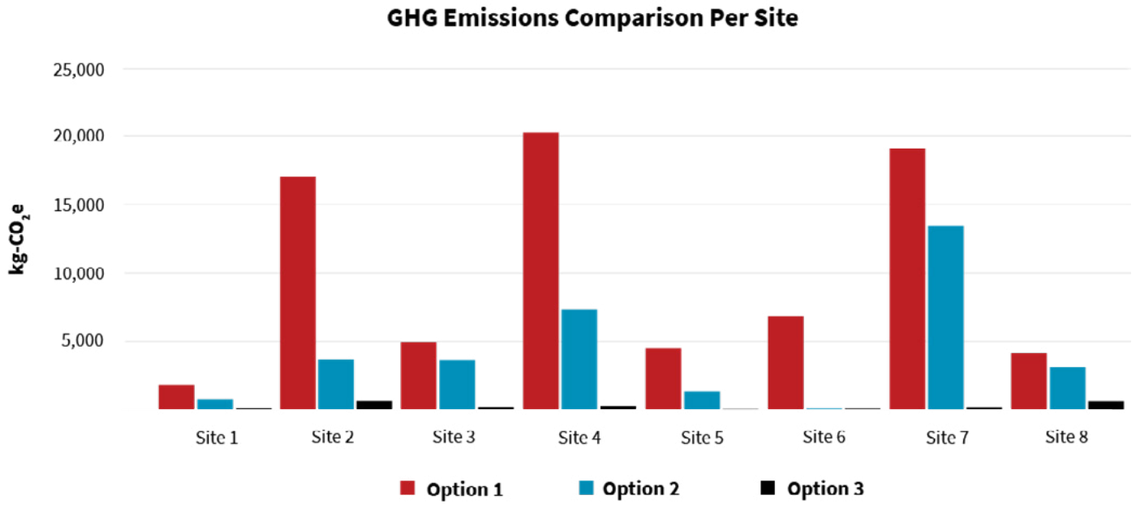
Services:
ME Engineering

Area:
N/A

Architect:
N/A

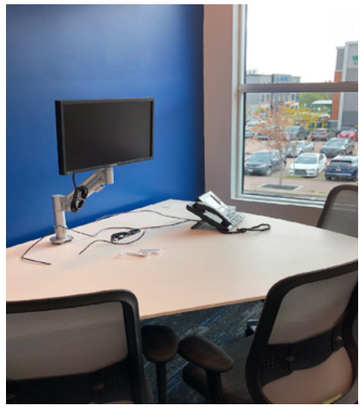
Loring conducted an electrification feasibility study at nine Royal Bank of Canada (RBC) sites across Canada to aid RBC in their goals for improved sustainability and greenhouse gas emissions reduction. The team at Loring reviewed and evaluated the feasibility of electrifying these units with the existing electrical system infrastructure. Loring is currently engaged in Phase 2 with the 2023 program.





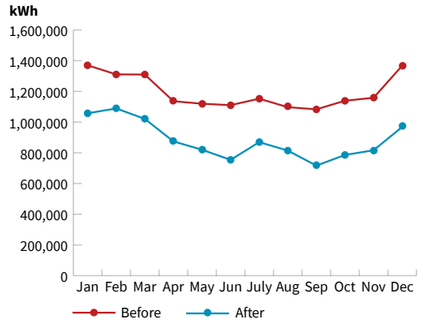
- **Option 1** – Like-for-like replacement
- **Option 2** – Hybrid dual fuel system and partial electric
- **Option 3** – Full electric

RBC has selected 90 locations to implement HVAC equipment replacement strategies to reduce the GHG emissions and move the buildings towards all electric.



City of Toronto,City Hall
Energy Upgrades

Electricity Consumption



Annual Savings

730,000 kWh

840,000 lbs steam

$141,000 utility costs

95 tons GHG

PROJECT HIGHLIGHTS

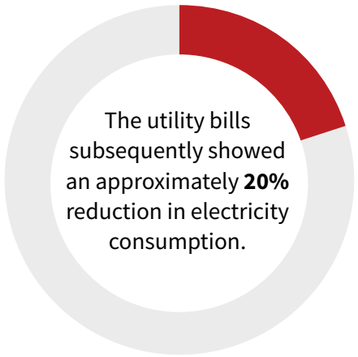
Client:
City of Toronto

Services:
Mechanical and Electrical Engineer

Area:
700,000 SF

Architect:
N/A

A complete overhaul of the Building Automation System at the 700,000 SF Toronto City Hall complex was completed by Loring Consulting Engineers. The project included replacing the entire BAS throughout the facility including the two towers, podium, and Nathan Phillips Square. As part of the upgrade, the mechanical systems were reviewed and several energy conservation measures were implemented to reduce the energy consumption and greenhouse gas emissions of the facility. The measures included converting airside and waterside systems to variable volume and adding optimized control sequences. Upon completion of the BAS upgrade, electricity and steam consumption were evaluated.



Michigan State Capitol, Heritage Hall
Infrastructure Upgrades and Below-Grade Engineering
Lansing, MI

PROJECT HIGHLIGHTS

Client:
Michigan State Capitol Commission

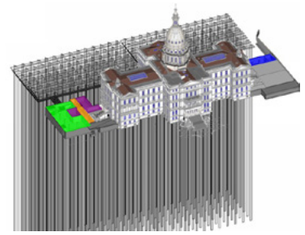
Services:
MEP Engineering

Area:
202,500 SF Historic Capitol Renovation
40,000 SF Heritage Hall New Construction

Architect:
EYP Architecture & Engineering

Award:
ACEC MW Engineering Excellence Award (Honor Award, 2022)

The project integrates resilient and carbon-free MEP (Mechanical, Electrical, Plumbing) systems into the historic Michigan State Capitol with a 35,000 sf below-grade visitor center, Heritage Hall. Geothermal energy coupled with a state-of-the-art Central Utility Plant (CUP) generates year-round comfort heating and cooling for this historic site while providing significant life-cycle savings.



Willow School
Gladstone, NJ

PROJECT HIGHLIGHTS

Client:
Willow School

Services:
MEP Engineering
Fire Protection + Life Safety
Information + Communication Technology

Area:
Phase I - 14,000 SF
Primary K-8 School
Phase II - 5,000 SF Arts Barn
Phase III - 22,000 SF Health, Wellness and Nutrition Center

Architect:
Phase I - Ford & Associates, Farewell Mills & Gatsch Architects
Phase II - Hone + Architects
Phase III - Farewell Architects

Sustainability:
LEED Gold Certification
LEED Platinum Certification
Net Zero Energy Building
Living Building Challenge

Award:
Phase I - ACEC NY Engineering Excellence Award (Gold 2008)
Phase II - ACEC NY Engineering Excellence Award (Platinum 2009)
Phase III - ACEC NY Engineering Excellence Award (Diamond 2016)
ACEC National Honorable Mention Award
New York Construction News, Best of 2008 Award of Merit: Green Project (2008)

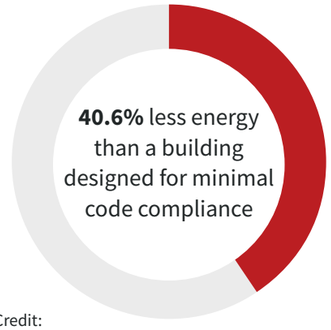
For over 20 years, Loring has been an integral part of the design and construction of all three phases of Willow School with their cutting-edge sustainable philosophy, from the original Campus Master Plan and Phase I Classroom Building and the renovated Phase II Arts Barn to the Phase III Health, Wellness & Nutrition Center, a Net Zero Energy Building that has met the qualifications of the Living Building Challenge.

"A conventional facility built to code uses between 100-150 kBtu per square foot … but this building uses only 21 kBtu per square foot – and that was including our commercial kitchen. If you remove the kitchen, it would only use 15 kBtu per square foot. When people look at this building, they're looking at one of the most energy-efficient buildings in the country."

Mark Biedron, co-founder, The Willow School

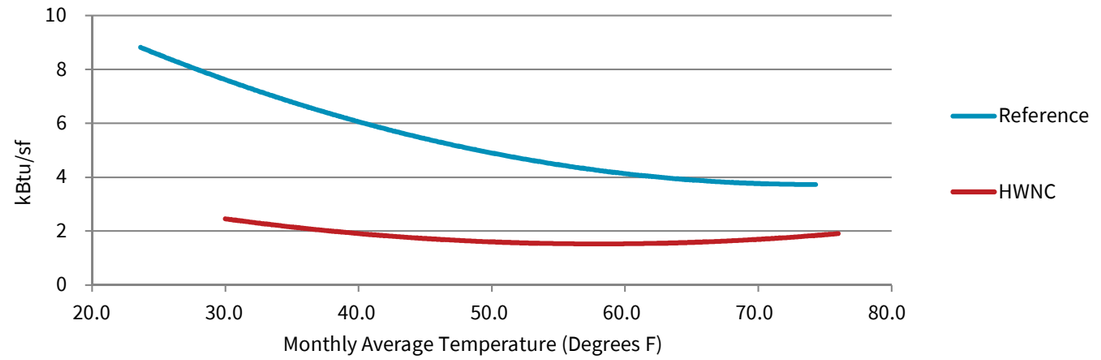
Credit: www.mitsubishipro.com

Predicted to Use:



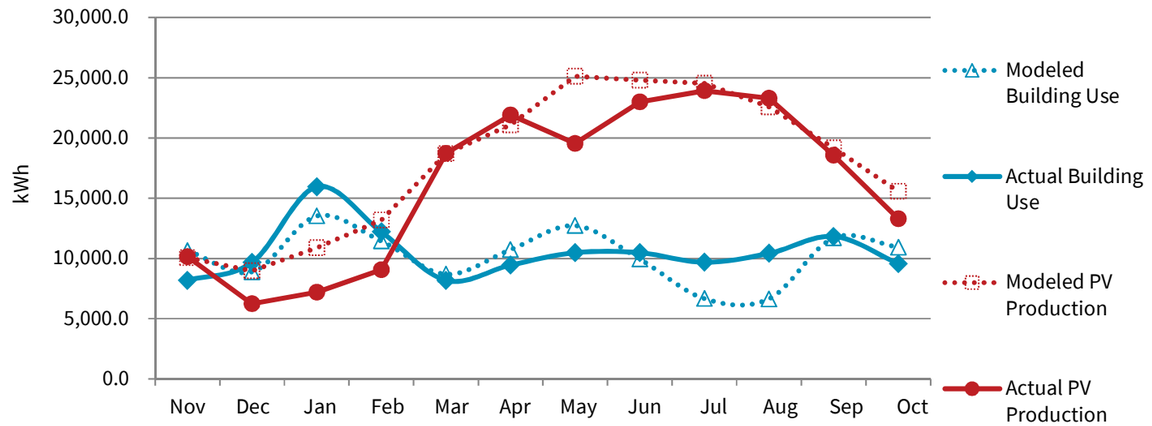
Credit:

Energy Signature Comparison of The Willow School Health, Wellness & Nutrition Center (HWNC)



Credit: 7group

Modeled vs. Actual Monthly Energy Use of The Willow School Health, Wellness & Nutrition Center (HWNC)



Credit: 7group

1500 K Street NW, High-Rise Office Tower
Washington, DC

PROJECT HIGHLIGHTS

Client:
Grosvenor-Property Americas

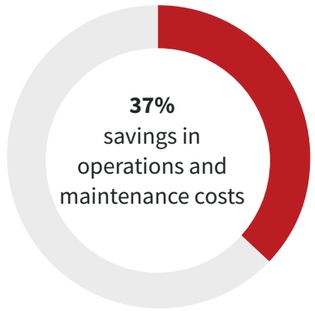
Services:
MEP Engineering
Fire Protection + Life Safety
Energy
Commissioning +
Retro-Commissioning

Area:
260,000 SF

Architect:
Various

1500 K Street NW is an 11-story, 260,000-SF Class “A” commercial office building constructed in 1928. For nearly a decade, Loring has provided MEP engineering to dozens of tenants who occupy retail and office spaces throughout the building. Our involvement began in 2014 with a life-cycle cost analysis to examine replacement options for outdated MEP systems and an energy benchmark to assess the relative energy use of the property. The modernization upgrades were carried out with minimum disruption to occupied spaces while the building was fully operational.

The chosen solution results:



District of Columbia Court of Appeals (Old City Hall)
Washington, DC

PROJECT HIGHLIGHTS

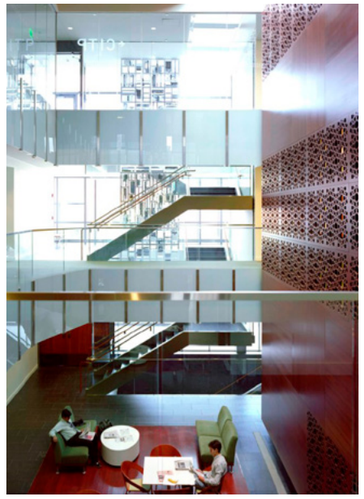
Client:
General Services Administration /
District of Columbia Courts

Services:
MEP Engineering
Fire Protection + Life Safety
Energy

Area:
99,000 SF Restoration
40,000 SF New Construction

Restoration, modernization, and conversion of this 99,000-SF historic structure built in the early 19th century and originally used as the Old City Hall. Its most recent use has been that of a courthouse whose activities were gradually transferred to other facilities as the building ultimately lapsed into disuse. As part of a DC Court consolidation program, the scope of this project included a total renovation and restoration of the original building while upgrading its infrastructure to “state-of-the-art” and converting it to serve as the District of Columbia Court of Appeals. The project included a 40,000-SF addition and a two-level, 90,000-SF underground parking structure.

Princeton University, OFRE Building
Princeton, NJ



Natural Daylighting Combined with Lighting Controls = Energy Savings

PROJECT HIGHLIGHTS

Client:
Princeton University

Services:
MEP Engineering
Fire Protection + Life Safety
Energy

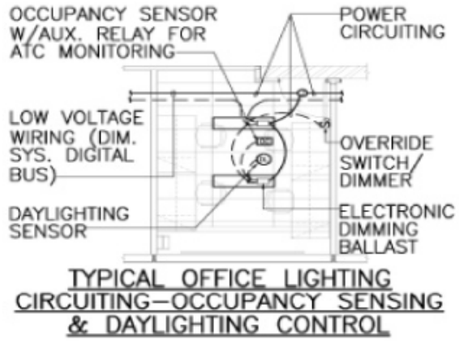
Area:
46,000 SF

Architect:
Frederick Fisher and Partners

Sustainability:
Designed to LEED Green Building Standards

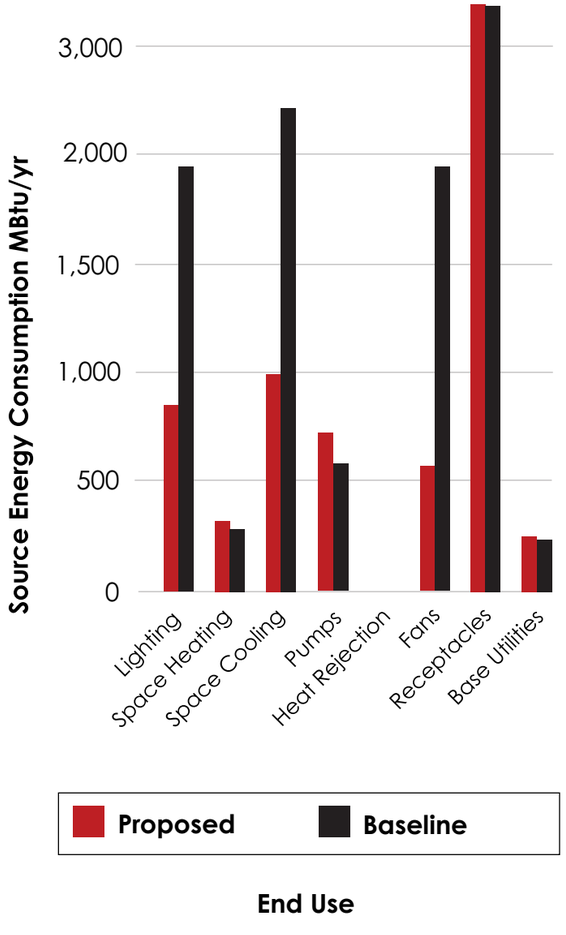
This new academic building houses computer-intensive spaces as well as a lecture hall, classrooms, and offices. Sustainable design techniques were investigated and implemented in accordance with Princeton University's Sustainable Design Standard & USGBC's LEED Green Building Standards.

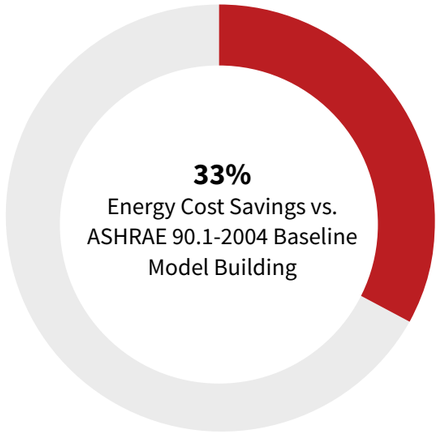
Interfaces with Existing Campus Central Utilities = Maximum Efficiencies



TYPICAL OFFICE LIGHTING CIRCUITING–OCCUPANCY SENSING & DAYLIGHTING CONTROL

- Daylight harvesting via continuous fluorescent dimming
- Automatic on/off lighting controls & set-back of HVAC systems via occupancy sensors
- Provisions for future central campus controls for load-shedding





Department of Homeless Services Facilities
New York, NY

PROJECT HIGHLIGHTS

Client:
NYC Department of Citywide Administrative Services

Services:
Energy

Area:
263,000 SF

Loring Consulting Engineers, Inc. provided ASHRAE Level III Energy Audits and Deep Energy Retrofits for four Department of Homeless Services (DHS) Facilities:

- Bushwick Family Residence
- Stockholm Family Residence
- Harlem 1 Men's Shelter
- Keener Assessment Shelter

Total area of buildings is approximately 263,000 sf ASHRAE Level III Energy Audit report identified between 33 and 39 Energy Conservation Measures (ECMs) for each building, typically within five package options. Loring is currently working with DCAS and DHS to identify the optimum package for each building, following which a schematic level design scope of work will be developed for the ECMs in the selected package.

Deep Energy Retrofit Path Analysis
New York, NY


Impact of Deep Energy Retrofits on Your Building

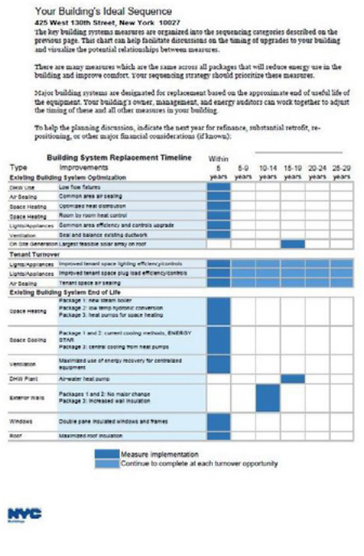
All deep energy retrofit paths are significant scopes of work and may require dramatically changing building operations. The set of measures included in your building's LL87 Energy Efficiency Report (EER) is shown for comparison to your building's deep energy retrofit path options. As an ASHRAE Level II audit*, the LL87 EER recommendations are not meant to achieve the deep level of energy savings that are included in these options.

Potential Site Energy Use Reductions for Your Building
425 West 130th Street, New York 10027

Benefit and Cost Comparison***

		Deep Optimization	Hydronic Conversion	Heat Pumps for Heating
BENEFIT	Site Energy Savings	33% to 45%	39% to 51%	66% to 72%
BENEFIT	GHG Savings	Lowest Savings	Medium Savings	Highest Savings
BENEFIT	Improved Occupant Experience	Lowest Improvement	Lowest Improvement	High Improvement
COST	Capital Costs	Lowest Costs	High Costs	High Costs
COST	Operations & Maintenance	High Costs	Medium Costs	Lowest Costs

*ASHRAE: the American Society of Heating, Refrigeration, and Air Conditioning Engineers, who sets standards for building energy audits.
**The recommendation package from the LL87 does not include the impact of retrocommissioning, which can be substantial.
***Metrics are detailed starting on page 8 of this report. For examples of costs for deep energy retrofit options, case studies of completed retrofits are included on the NYC Retrofit Accelerator website at: www.nyc.gov/retrofitaccelerator#part


Your Building's Ideal Sequence

425 West 130th Street, New York 10027

The key building systems measures are organized into the sequencing categories described on the previous page. This chart can help facilitate discussions on the timing of upgrades to your building and visualize the potential relationships between measures.

There are many measures which are the same across all packages that will reduce energy use in the building and improve comfort. Your sequencing strategy should prioritize these measures.

Major building systems are designated for replacement based on the approximate end of useful life of the equipment. Your building's owner, management, and energy auditors can work together to adjust the timing of these and all other measures in your building.

To help the planning discussion, indicate the next year for refinance, substantial retrofit, re-positioning, or other major financial considerations (if known):

Building System Replacement Timeline

Type	Improvements	Within 5 years	5-9 years	10-14 years	15-19 years	20-24 years	25-29 years
Existing Building System Optimization							
Desk Lamps	Low flow fixtures						
Air Sealing	Common area air sealing						
Space Heating	Optimized heat combustion						
Space Heating	Room by room heat control						
Lights/Appliances	Common area efficiency and controls upgrade						
Ventilation	Seal and balance existing ductwork						
On Site Generation	Largest feasible solar array on roof						
Tenant Turnover							
Lights/Appliances	Improved tenant space lighting efficiency/controls						
Lights/Appliances	Right-set tenant space plug load efficiency/controls						
Air Sealing	Tenant space air sealing						
Existing Building System End of Life							
Space Heating	Package 1: new steam boiler Package 2: low temp hydronic conversion Package 3: heat pumps for space heating						
Space Cooling	Package 1 and 2: current cooling methods, ENERGY STAR Package 3: central cooling from heat pumps						
Ventilation	Maximized use of energy recovery for centralized equipment						
DHW Plant	Air-water heat pump						
Exterior Walls	Packages 1 and 2: No major change Package 3: Increased wall insulation						
Windows	Double pane insulated windows and frames						
Roof	Maximized roof insulation						

Measure implementation
Continue to complete at each turnover opportunity

PROJECT HIGHLIGHTS

Client:
NYC Department of Citywide Administrative Services

Services:
Energy

Area:
Development of Retrofit Planning Module

Loring Consulting Engineers, Inc. developed a retrofit planning module that will be integrated with the existing spreadsheet-based Local Law 87 (LL87) reporting tool to help energy professionals, building owners and tenants to develop a comprehensive series of building upgrades, with the goal of reducing energy use 40-60% by 2050. The new module will also provide outputs in a format that can be used by the Department of Buildings to determine LL87 compliance, and by the Mayor's Office of Sustainability (MOS) to develop detailed information about energy use in the City's large and mid-size buildings. The new Deep Energy Retrofit Path Analysis tool was incorporated as part of Local Law 87 requirements in 2019 (mandatory requirement for 2020).

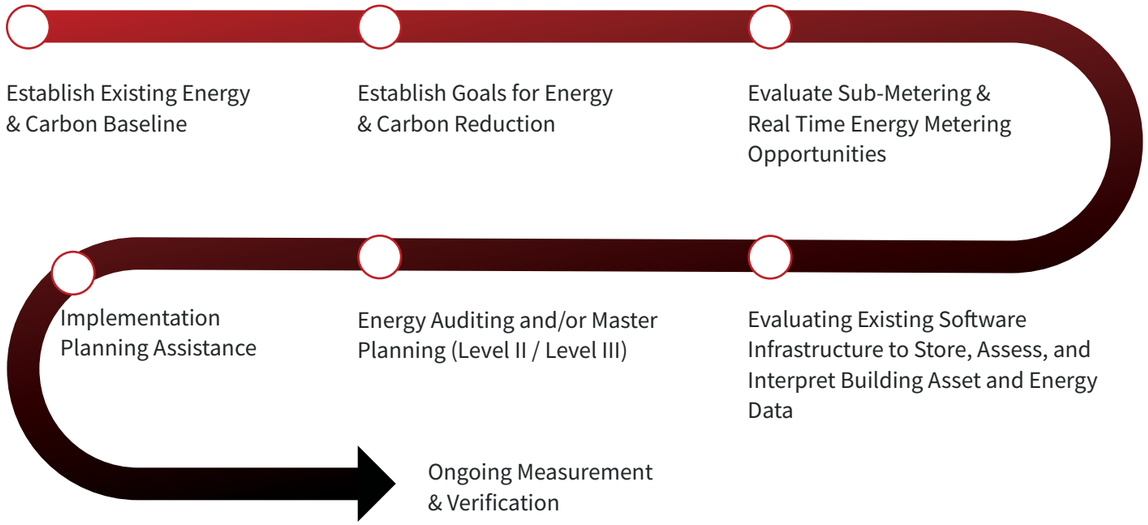
The Pennington Elementary School’s Kenneth Kai Tai Yen Humanities Building

CLIENT-CENTRED APPROACH

We excel at providing exceptional client service and strive to exceed your expectations at every interaction. Our responsive team is always available to address your concerns, provide regular project updates, and ensure clear and transparent communication throughout the engagement. We value long-term relationships and aim to be your trusted engineering partner for all your projects.

PROJECT APPROACH

Loring's approach to executing the project will rely heavily on a process that has been proven successful for us, especially for projects that include multiple phases. The chart is an example that depicts our approach to these projects with components intended to be repeated from one phase to the next.

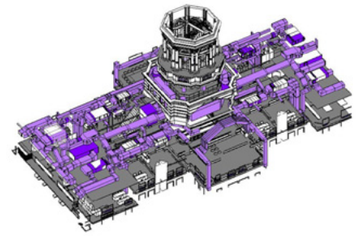


DESIGN TOOLS

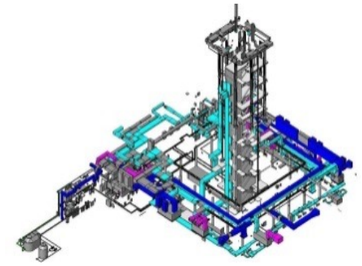
Loring relies on many tools that can be applied at various stages of the Project.

Building Information Modeling

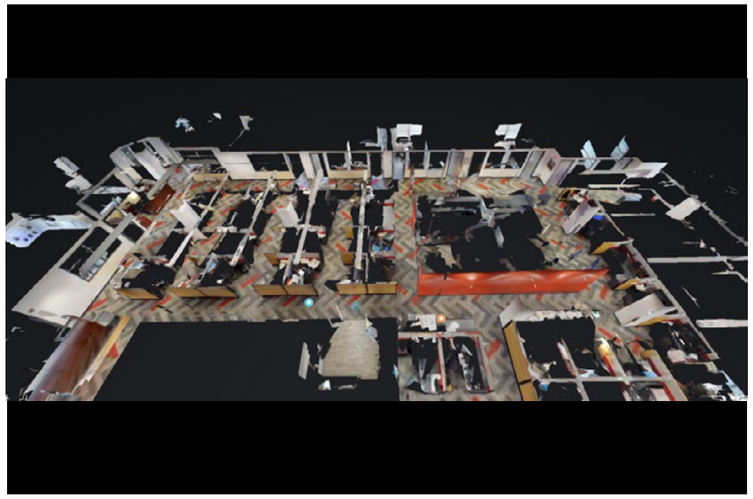
Creating a Building Information Model (BIM) is central to the implementation process. Loring with its commitment to new technology, utilizes Autodesk's Revit MEP and AutoCAD as the base platforms for engineering and design. Revit is based on the Building Information Modeling (BIM) process and has the ability to create three-dimensional, real-time, dynamic building models. BIM encompasses building geometry, spatial relationships, geographic information, and quantities and properties of building components. Because both Revit and CAD are software from Autodesk, one can seamlessly convert Revit files to AutoCAD files.



The Revit software utilizes intelligent parametric components to create 3D representations of the Building Systems and its components. As a result, the software allows our project team to perform clash reporting and in turn produce a completely coordinated model. In addition, Revit MEP allows the architectural and structural Revit models to be imported for coordination purposes and clash detection among all trades. The benefits of Revit and BIM are directly related to increased productivity in building design and construction.



360 Photography & SLAM Technology (Matterport)



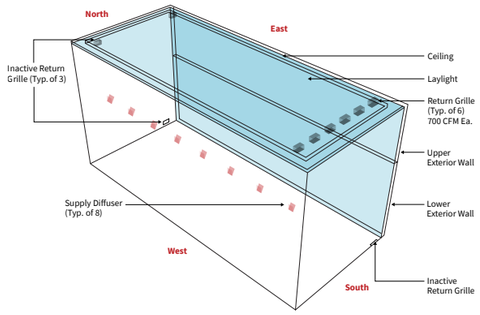
360 photography and SLAM technology (Matterport) are technologies available to Loring and will be provided during this initial phase. The end product is a 3D imaging model that shows visible elements and integrates dimensional data. This model will in turn be interfaced with the BIM model used during the design process to ensure existing conditions are captured accurately and to reduce exposure to risk due to unforeseen conditions.

Computational Fluid Dynamics

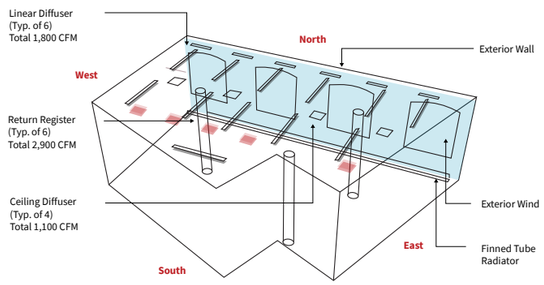
Computational Fluid Dynamics (CFD) is a highly advanced technique used to simulate fluid flows, and its importance is hard to overstate in modern industry. By using CFD, engineers can accurately predict fluid dynamics, such as pressure, temperature, velocity, and turbulence in complex systems or processes that would be impossible to study through traditional experimentation.

CFD can be used to design and optimize heating, ventilation, and air conditioning (HVAC) systems. By simulating the airflow in buildings, Loring can determine the most effective placement of ducts, diffusers, and air handlers to ensure proper air distribution and minimize energy consumption.

CASE STUDY: MUSEUM SPACE



Typical Gallery Room 204



Typical Gallery Room 206

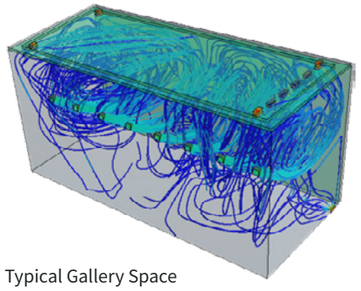
Scope

- Multiple galleries housing high value sculptures and paintings
- Strict indoor temperature and humidity requirements for all leased spaces (non-gallery spaces used for storage/ inspection)
- Study conducted of existing conditions
- Pre-simulation data logging indicated condensation and temperature deviation was likely to occur

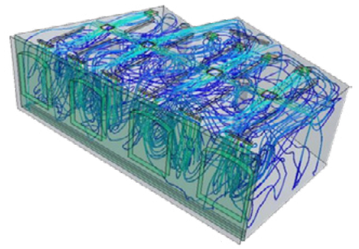
Purpose of CFD

- Analyze existing HVAC design
- Recommend improvements to design

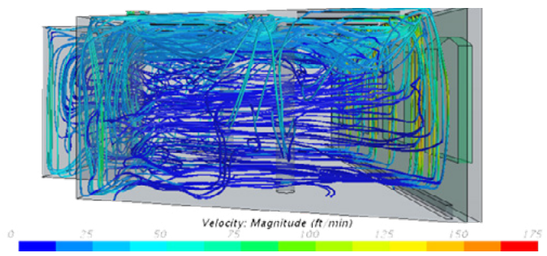
Loring conducted a Computation Fluid Dynamics (CFD) study of a typical gallery and non-gallery space at a museum. The spaces were to be maintained at 70 F, +/- 5 F and 50% Relative Humidity (RH), +/-5% RH to ensure ideal conditions for the exhibits. Loring's CFD analyzed the temperature, airflow and humidity distribution in the spaces and identified issues with the existing HVAC design scheme that could cause areas in the gallery to stray outside the temperature and humidity requirements. After identifying the issues, Loring worked with the architectural and mechanical engineering teams to provide cost-effective solutions and analyzed those solutions to ensure that the space conditions requirements were met.



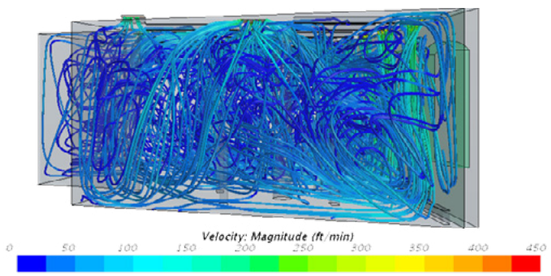
Typical Gallery Space



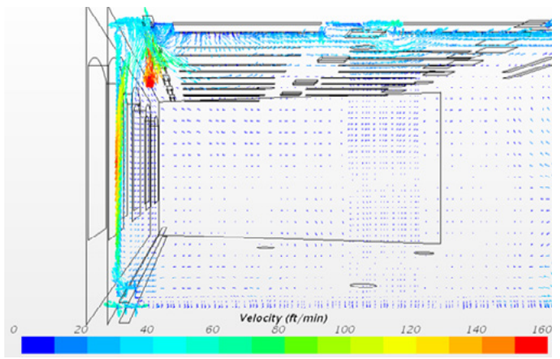
Typical Non-Gallery Space



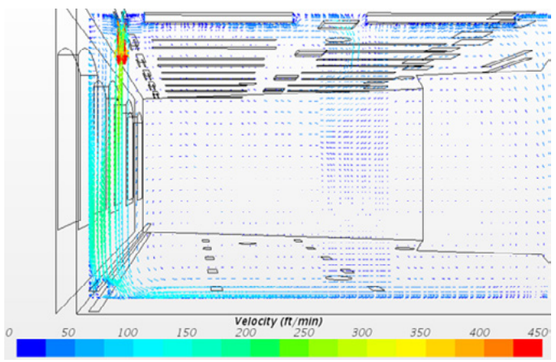
Typical Non-Gallery Space - Winter



Typical Non-Gallery Space - Summer



Typical Non-Gallery Space - Winter



Typical Non-Gallery Space - Summer

New Settlement Community Campus

CONTACT

Kalpak Karule, PE, CEM, CBCP, CMVP, LEED AP
Principal & Energy Group Leader
E: KKarule@loringengineers.com
T. 646-674-6176
M. 408-431-2735

New York Office
360 West 31st Street, 14th Floor
New York, NY 10001
212 563 7400

LORING 70 YEARS
CONSULTING ENGINEERS

New York City, NY
Durham, NC
Gaithersburg, MD
Houston, TX
Parsippany, NJ
Philadelphia, PA
Princeton, NJ
Toronto, ON
Washington, DC
Kingston, JA

www.loringengineers.com