



Building Ideas

SYSTEMIC ACTION RESEARCH
IN THE BUILT ENVIRONMENT

Volume Two
2010—11

About Town+Gown

Town+Gown is a systemic action research program aimed at collectively increasing applied built environment research, information transfer and understanding. Town+Gown marshals and coordinates research between City's agencies and academic institutions with programs of study overlapping the Built Environment disciplines: Management, Economics, Law, Technology and Design.¹

In 2009, in response to calls from groups as diverse as the construction industry and the preservation community to increase built environment research, Town+Gown embarked on a pragmatic, integrated approach known as "systemic action research". This methodology provides Town+Gown with a "learning architecture" within which system stakeholders can bring about changes in practice and policy in a complex and dynamic social system where issues "cannot be adequately comprehended in isolation from the

wider system of which they are a part.”²

Town+Gown matches academics and practitioners to collaborate on research projects, articulated in the Research Agenda (<http://www.nyc.gov/html/ddc/html/design/tg.shtml>). In its first two years, Town+Gown primarily tapped into action- or service-learning and research programs that highlight the importance of practice as a source of knowledge. The results of completed projects will facilitate conversation and follow-up research directed at making appropriate changes in practices and policies. In addition, Town+Gown disseminates, within the Town+Gown community, the results of completed projects in its annual review, Building Ideas.

This volume of Building Ideas represents the capstone of Town+Gown’s second completed year of operation. The 19 projects from the 2010-2011 academic year abstracted in this volume join the 2009-2010 projects, for a total of 32 completed projects for 14 New York City agencies produced at 11 graduate academic programs.

1. Paul Chynoweth, The Built Environment Interdiscipline: A Theoretical Model for Decision Makers in Research and Teaching (Proceeding of the CIB Working Commission Building Education and Research Conference 2006), <http://www.lawlectures.co.uk/bear2006/chynoweth.pdf>, pp. 1, 5.

2. Danny Burns, Systemic Action Research: A Strategy for Whole System Change (Bristol: 2007), p. 1.

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Management

For the projects under Management, the City acts primarily in the role of an owner. A critical objective for an owner is to align its interests in budget, schedule, safety and quality with those of its agents in construction whose knowledge increases during the pendency of a particular project. Since project needs, materials, building methods and information technology continually change “on the ground”, construction market participants adapt to such changes by using an evolving menu of service delivery methodologies as well as various management theories, techniques and tools, not dissimilar to those found in other industries or sectors.

TRANSITIONING INTO LIFECYCLE COST ANALYSIS

TOWN

New York City Department of Transportation (DOT)

New York City Department of Design and Construction

GOWN

New York University/Wagner School of Public Service

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PURPOSE Graduate students Carrie David, LaVickie Jones, Edna Marinelarena, Jennifer Proulx and Yvonne Wang, with Academic Advisor Maria Doulis (the “Team”), were asked to develop a more

effective and holistic approach to funding, building, maintaining and managing the City’s streets. While current capital planning and budget mechanisms aim to ensure that street and public space projects make the most efficient use of taxpayer funds, they do not currently take life-cycle costs into consideration, nor do they account for externalities, including cross-system benefits.

METHODOLOGY The Team conducted qualitative and quantitative analyses to examine the costs and benefits of various design elements used in City streetscape projects in order to develop a lifecycle costing model and a methodology to assess related externalities. The Team developed a model that included costs of constructing and maintaining a project over its entire useful life and applied the model to four DOT projects, with the goal of assessing their cost-effectiveness in the long-term. In addition, the Team created a benefits matrix database and interactive scorecard methodology to assess the long-term benefits of these project types with respect to safety, mobility/accessibility, environmental health/sustainability and economic vitality.

RESEARCH

FINDINGS In applying the lifecycle cost model to completed projects, the Team identified data gaps created, in part, by the complex system that consist of urban streets and, in part, by the government systems currently in place to collect cost data at the agencies involved with streets and public spaces. The

matrix/scorecard analysis revealed that, among design elements in current use, a combination of Class I bike paths, curb extensions with vegetation and planted medians ranked the highest in long-term benefits.

NEXT

STEPS The Team recommended steps to generate data currently missing due, in part, to the lack of operation and maintenance data at City agencies involved in maintaining the streets and public spaces.

Net Present Value

$$\text{Initial Cost} + \sum_{k=1}^N \text{Rehab Cost} \left[\frac{1}{(1+i)^n} \right]$$

where: i = discount rate
 n = year of expenditure
 $\left[\frac{1}{(1+i)^n} \right]$ = present value (PV) factor

INCREASING PROJECT PLANNING AND SCHEDULING CERTAINTY FOR CRITICAL CONSTRUCTION PROJECTS

TOWN
Mayor's Office of Capital Project Development

New York City Department of Design and Construction (DDC)

GOWN
Columbia University/
School of International and Public Affairs

TO OBTAIN COPY
http://sipa.columbia.edu/academics/workshops/sample_reports.html

PURPOSE Graduate students Maira Ayala, Robert Han, Junji Koike and Milagros Lecuona, with Academic Advisor Avi Schwartz (the “Team”), were asked to review the literature to identify best practices of managing project schedule volatility, map all processes related to capital planning and project execution, with a view toward analyzing factors related to project schedule volatility, and design a risk-based model.

METHODOLOGY The literature survey revealed a paucity of research, based on City projects, on the relation of project planning-related activities and schedule volatility, in both design and construction phases, as well as on the relation of planning risks to overall construction risk. As a result, the Team began with a quantitative analysis of DDC project data to identify the processes governing City capital projects and related metrics, and then, using regression techniques, to identify case study projects for a qualitative assessment including interviews, all as the foundation for a process map and simulation risk model.

RESEARCH FINDINGS While noting that a long duration of the design phase may not always be a negative indicator, the Team found that, for the data set, longer design durations did not lead to shorter durations during construction. Most project types in the data set evidenced high uncertainty during the design phases and, after normalizing certain benchmark terms, actual delay during the design period is considerable for certain project types.

Weak correlation of factors with design delay proved to be an obstacle for creating a predictive simulation model based on available data. Interviews related to case study projects confirmed aspects of the quantitative analysis and supplemented the data to permit the creation of process maps. From interviews, the Team identified the outlines of a predictive simulation model, for which much of the necessary data is available in the paper-based project files at agencies.

NEXT STEPS The Team identified a number of steps the City could take to create the necessary data over time to permit use of a predictive simulation model.

Proposed Simulation Model

	Regulatory Compliance	Resource Constraints	Funding Constraints	Public Perception
Feasibility		*		
Scoping			*	
Conceptual	*			*
Preliminary Design				
Design Development		*		*
Construction Documents				
Bidding			*	
Construction				

DESIGN, MATERIAL AND CONSTRUCTION STANDARDS

TOWN
Mayor's Office of Capital
Project Development

New York City Department
of Design and Construction
(DDC)

GOWN
Pace University/College of
Arts and Sciences

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PURPOSE Graduate student
Michael Petrizzo was asked to
identify the relation of design
and construction standards
use to project costs.

METHODOLOGY Petrizzo
conducted a literature survey,
developed a questionnaire

with which he conducted interviews of prac-
titioners in the City and elsewhere, and from
those results created a survey instrument.

**RESEARCH
FINDINGS** The literature survey revealed a
paucity of research focusing on the relation of
design and construction standards to project
costs, so that it was necessary to "begin from
scratch." Since standards practices relate to
issues as varied as basic management theory
and practice, the impact of technology change
within an organization, and the relation of
the construction industry to technology, a
baseline statistically valid survey exercise
seemed to be the necessary first step to begin
to answer the research question. Petrizzo,
in consultation with DDC, developed a
questionnaire that he used to conduct a series
of extensive interviews to assess current and
past practices and inform his development
of a survey instrument. Interviews revealed
a wide variety of the use of standards in
construction management practice over a
long period of time, as well as the absence of
any evaluation of past or current practices.

**NEXT
STEPS** The survey instrument created by
Petrizzo would form the basis of future
work related to questions on design,
materials and construction standards in
the Research Agenda.

Survey Instrument

What kinds of construction does your agency/ department /
office work on?

- A) Structures _____
- B) Infrastructure _____
- C) Structures and Infrastructure _____

List all the various types of structures and infrastructures that
your agency/ department/ office works on:

What is the value of your annual capital program? _____

What is the average cost of projects that you tend to construct?

- A) Less than \$100,000 _____
- B) \$100,000 to \$1million _____
- C) \$1million to \$10million _____
- D) \$10million to \$100million _____
- E) \$100million plus _____



CONSTRUCTION STANDARDS ANALYZED

TOWN

Mayor's Office of Contract Services (MOCS)

New York City Department of Design and Construction

GOWN

Brooklyn Law School

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PURPOSE Law student Howard Eichenblatt was asked to review construction standards and related memoranda (collectively, the "directives") promulgated from 1970 to 1993 by the

Office of the Director of Construction, which was merged in 2005 with MOCS, and develop a methodology to analyze them.

METHODOLOGY After conducting interviews to develop a context for the project, Eichenblatt catalogued the extant directives and analyzed them for relevance, from the perspective of practical relevance under current practice and technical relevance as the result of changes in law and regulation.

RESEARCH

FINDINGS Eichenblatt found that the vast majority of the directives are no longer relevant in practice or under law.

NEXT

STEPS The chart analyzing the directives joins a chart analyzing construction standards promulgated during that time period by the Mayor's Office of Management and Budget. Both charts represent foundational research for future work related to questions on design, materials and construction standards in the Research Agenda.

Analysis Framework

Directive	Date	Category	Validity
1	12.02.1970	Design	Outdated
JD1.1	03.01.1999	Procurement	Still Enforced
2	10/26/1971	Site Req.	Outdated
3	02/05/1971	Design	Outdated
4A		Punch List	Irrelevant
5	06/10/1971	Partial Payment	Superseded
6	03/01/1971	Design	Outdated
7	03/05/1971	Design	Outdated

DECONSTRUCTING THE ARTICULATED ENSEMBLE: ANALYTICS AND NEW YORK CITY'S CAPITAL BUDGET

TOWN

Mayor's Office of Management and Budget

New York City Department of Environmental Protection

New York Economic Development Corporation

New York City Department of Design and Construction

GOWN

The New School/Milano School for Management and Urban Policy

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PURPOSE Graduate student Gary Bennett was asked to conduct a literature survey on the impact of the politics of the capital planning and budgeting processes on the costs of the public capital program and to provide a conceptual evaluation model.

METHODOLOGY After identifying the central research question as deciding when,

during the capital-planning-to-project-execution continuum, it is appropriate to establish a baseline cost estimate against which to evaluate cost increases, Bennett pursued multiple avenues of research. He conducted technical background research on the City's capital program processes, including planning and budget processes, supplemented with interviews of actors at all levels of the process, and a review of secondary sources. From the background analysis, Bennett outlined prevailing viewpoints and practices and established comparative hypotheses. The few existing studies of capital budget process impact on individual projects focus on mega-projects with unique characteristics. Bennett thus aimed at identifying several analytic models and evaluating them against comprehensiveness and feasibility criteria.

RESEARCH

FINDINGS Bennett identified five analytic models—the City's status quo evaluation, cost-benefit analysis, financial risk-assessment, temporal risk-assessment and reference class forecasting. Evaluated against comprehensiveness and feasibility criteria—whether the model provides information and whether it captures economic, temporal

and political considerations as a whole—the reference class forecasting model ranked highest.

NEXT

STEPS Bennett recommended the City use the reference-class forecasting model in future work to capture the effects of the capital planning and budgeting processes on scoping, bid estimates and the final costs of capital projects.

Capital Budgeting Actions and Actors

Action	Actors
Drafting Modifications to Capital Budget	<ul style="list-style-type: none"> • Mayor • Office of Mgnt. and Budget (OMB) • Dept. of City Planning (DCP) • Borough Presidents (BP) • City Council (CC)
Suggest Modification to Capital Budget	<ul style="list-style-type: none"> • Community Boards (CB) • City Agencies with capital needs • Borough Boards • Borough Presidents
Analysis of Capital Budget	<ul style="list-style-type: none"> • Comptroller • Independent Budget Office
Disclosure Response to Capital Budget	<ul style="list-style-type: none"> • City Planning Commission • Community Boards • City Council Hearings • Borough Presidents
Approval of Capital Budget	<ul style="list-style-type: none"> • City Council • Mayor
Certification of Capital Budget	<ul style="list-style-type: none"> • Mayor • Comptroller • City Clerk

SETTING THE STAGE FOR CO-LOCATION OF SENIOR CENTERS IN PUBLIC SCHOOLS

TOWN

New York City Department for the Aging (DFTA)

New York City Department of Design and Construction

Mayor's Office of Management and Budget

GOWN

The New School/Milano School for Management and Urban Policy

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PURPOSE Pablo Arboleda, Christine Flynn, Joe Mejia, Taryn Yaeger and Ashley Wessier, with Academic Advisor William Thomas (the "Team"), were asked to design a template to accomplish the multi-use of underutilized City buildings, using, as the case study, the co-location of DFTA senior services in underutilized school buildings. As part of

the template, the Team was asked to construct a cost/savings methodology for the expense and capital budgets, map out the related processes, identify impediments to achieving such an initiative, and make recommendations to overcome them. This project is the third in a series of related projects that attempt to address the challenges posed by the inevitable mismatch between long-lived public capital assets and continuing demographic change across the City.

METHODOLOGY After preliminary analyses of the environment, including a survey of demographic trends and co-location projects tried elsewhere, the Team conducted a series of interviews with stakeholders, visited various community centers and reviewed relevant laws and regulations. Limitations encountered during the Team's work, such as uncertainty about how the definition of under-utilization translates into available space for co-location, established parameters for their completed work.

RESEARCH

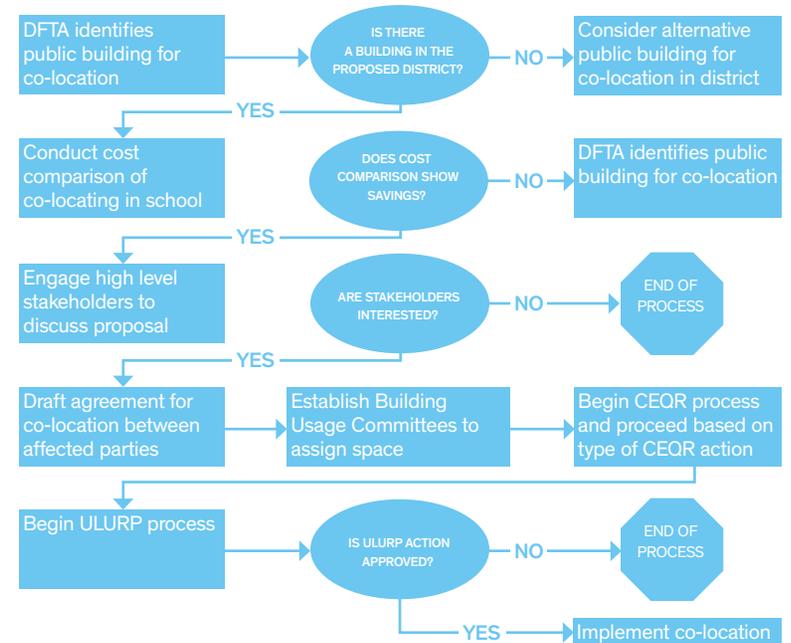
FINDINGS The idea of multi-use of buildings is not new, but it has proved resistant to implementation. The Team found that, while there may be multiple ways to approach

co-location of public programs, when public schools are under consideration as sites of co-location, it becomes more complex than a simple budget exchange between two public agencies due to unique regulations governing public school operations. Thus, the Team based their co-location model on the City's Department of Education's charter school siting process, which is the most conservative of possible processes. This model, expressed as a step-by-step flowchart, includes a cost analysis step that the Team developed using four senior center scenarios as case studies to explore the implications of the various financing mechanisms.

NEXT

STEPS Team suggested that the proposed co-location model be used to initiate a policy conversation about difficulties of implementing change in the built environment.

Co-Location Model Flow Chart



Management with an Urban Planning Twist

In the projects that follow under Management with an Urban Planning Twist, some management issues are made more powerful when the owner is a governmental entity with formal municipal planning powers. The use of this heading is an attempt to conform to the identified core disciplines of the Built Environment for projects with an urban planning twist.

PLANNING FOR THE FUTURE OF THE PARK AVENUE CORRIDOR

TOWN
Manhattan Community Board 11

GOWN
Columbia University/Graduate School for Architecture, Planning and Preservation

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PURPOSE Graduate students, Judy Chang, Lindsey Langenburg, Caroline Massa, Jake Schabas, Diana Switaj and Joyce Tam, with Academic Advisor Ethel Sheffer (the “Team”), were asked to explore how the urban planning function can take advantage of the full accounting cost methodology, which considers environmental, economic and equity issues

simultaneously, focusing on the Park Avenue corridor between 116th and 132nd streets as the case study.

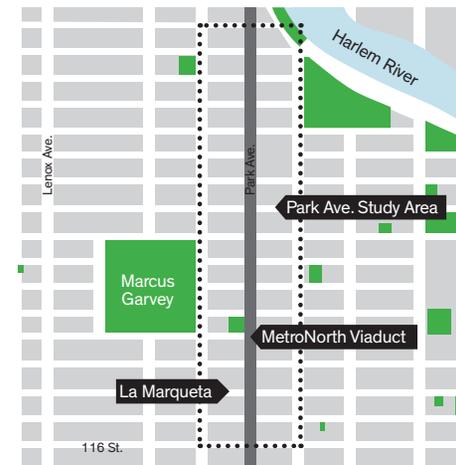
METHODOLOGY The Team conducted a foot survey of the area, documenting the survey with photos; performed an historical assessment of the area as well as a related demographic study; reviewed the zoning code and current uses, such as manufacturing and distribution activities and affordable and moderate income housing, and various other public planning documents related to the area, including the broad PlaNYC initiative; identified the area’s public and private stakeholders, interviewing many of their representatives; and, conducted a survey of area residents, all as the foundation for identifying a set of inter-related and reinforcing land use and urban design strategies to increase affordable housing, visually improve the Park Avenue corridor and to spur the local economy.

RESEARCH FINDINGS The Team’s research revealed place-based facts that provided the context for their specific proposed integrated public planning and urban design interventions that account for the area’s natural and built environment, its economy and embedded equity issues.

Some of these place-based facts include a high level of surface parking lots, an attribute rarely found in Manhattan that also illustrates the underutilization of several blocks along the corridor; a mix of residential, commercial and industrial land uses, including vacant land; the partial re-zoning of East Harlem between 2003 and 2007, recent construction of market housing and significant demographic shifts during that period; a percentage of open space that is 55% of the Manhattan average; and higher than average public transit and bicycle usage among residents.

NEXT STEPS The integrated land use and urban design proposals that emerged from the studio, treating the viaduct as an urban design opportunity to improve the area instead of an obstacle, could provide a basis for stakeholders to align the City’s interests in guiding future economic and residential development and anticipated growth, the interests of the community itself and the City’s environmental sustainability priorities set out in PlaNYC.

Park Avenue Study Area



WHAT COLOR IS MIXED USE ON A LAND USE MAP?

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New York City Department of Design and Construction

GOWN

New York Institute of Technology/School of Architecture and Design

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PURPOSE Graduate students, Mario Cisneros, Seyed Mohammad Jafari, Jaroslav Kurcik, Xiao Ma, Alexia Nikyema, Nidhi Parekh, Dandan Xi, Urvashi Patel, Aditi Desai and Dhaval Panchal, with Academic

Advisor Michael Schwarting (the “Team”), reviewed the land use map practices of various dense built urban systems, settled and developed over a long period of time (the “historical cities”), as a planning exploration of the broader question about the relation between land use law techniques and urban design and function. In particular, this project is the foundation for an exploration of how a city’s traditional land use map might be transformed to relate better to contemporary planning and urban design theories and be more useful as a tool.

METHODOLOGY A land use map is a planning tool that both informs and is informed by its related zoning code. Both types of maps developed in tandem with each other since the early 20th century. The land use map enables planners to see the distribution of land use. In historical cities where the separation of use theory underlies the nature of their zoning codes, the related zoning map often uses a numbering or color system to identify uses. A planning map based on this type of a system will render uses horizontally and may not adequately reveal actual uses of land, in particular, mixed use, that tend to be vertically distributed. The Team began with a survey of land use map practices at historical cities to identify best practices and technologies in presenting vertical mixed land uses.

RESEARCH

FINDINGS The Team researched land use maps from major historical cities within and outside the United States. They identified Los Angeles and Singapore as jurisdictions that present land use maps with existing vertical mixed uses. These maps also permit examination of land use at various scales with different information at each scale and they delineate many types of uses.

NEXT

STEPS The Team suggested that additional research into the development of vertical land use mapping, focusing on geographic information systems technology, in particular, be conducted as the next step for researchers. The next iteration of this project plans to construct a mock-up of a map that permits display of vertical uses.

Primary Land Use Key

-  Residential
-  Residential w/ GF Commercial
-  Commercial
-  Industrial
-  Institutional
-  Open Space
-  Park/ Beach/ Cemetery
-  Transportation/ Parking
-  Vacant Building
-  Vacant Land

Economics

For the projects under Economics, the City acts in the role of either economic policy maker or regulator. The City builds and funds, through its capital program, a significant portion of New York City's public realm. The public works or capital programs of all levels of government are, in essence, work orders for facilities relating to "social" or "public" goods and to "mixed goods" that correct for negative and positive externalities, and while engaging in such activities, the City acts in its role of economic policy maker. In its role of regulator, the City directs and regulates private capital participation in the public realm and regulates the safety of the construction process and the products of both public and private construction.

SUSTAINABILITY INCENTIVES AND MANDATES: ANALYZING HOW CITIES ARE INCENTIVIZING AND REQUIRING SUSTAINABLE DEVELOPMENT

TOWN

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GOWN

New York University/Schack Institute of Real Estate Center for the Sustainable Built Environment

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PURPOSE Graduate students Joe Stampone, Justin Chu, Andy Grover and Leon Hovsepian, with Academic Advisor Constantine Kontokosta (the “Team”), were asked to investigate and analyze how cities are incentivizing sustainable development. This incentive approach can either stand in contrast to or complement traditional enforcement techniques.

METHODOLOGY The Team surveyed best practices in “green” construction and renovation as well as the

many jurisdictions with active programs designed to incentivize behavior to construct or renovate “green” buildings. The Team conducted follow-up interviews with the dozen jurisdictions with characteristics and programs most relevant to the City. The Team categorized the incentive programs by type and developed a methodology to evaluate the risks, costs, benefits and impacts over a temporal continuum.

RESEARCH

FINDINGS The incentive programs fell into four types: expedited permit and plan review, marketing incentives, financial incentives and planning tools such as density bonuses. Each type had a different risk/cost/benefit/impact profile over the short-, medium- and long-term.

NEXT

STEPS The Team suggested, for subsequent phases of this research, that students develop a cost-benefit model to evaluate the surveyed

incentive techniques in order to estimate their impact on the City budget.

Summary Findings

City	Population*	Expedited Permitting / Plan Review	Marketing /Outreach	Direct Financial Incentive	Density Bonus	Mandate / Code Requirement
Chicago, IL	2,851,268	*				
San Francisco, CA	815,358	*				*
Denver, CO	815,358					*
Seattle, WA	616,627	*			*	
Nashville, TN	605,473	*				
Washington, D.C.	599,657	*	*			*
Portland, OR	566,143		*	*		*
Austin, TX	566,143		*			*
Pittsburgh, PA	311,647				*	
Arlington, VA	217,483				*	
Salt Lake City, UT	183,102	*				
Santa Fe, NM	73,979					*

* U.S. Census 2009 Estimates

UTILIZING THE PRO FORMA INVESTMENT MODEL IN A SENSITIVITY ANALYSIS TO MOVE TOWARDS A FULL COST ACCOUNTING OF PROPOSED BUILT ENVIRONMENT REGULATION

TOWN
New York City Department of Design and Construction

GOWN
Brooklyn Law School/ Corporate and Real Estate Clinic

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PURPOSE Law student Ian Henri was asked to explore how analysis of built environment regulation might take advantage of the full accounting cost methodology, which considers environmental, economic and equity issues. This research project, based on the research question entitled How to Promote More Sustainable Neighborhoods—Economically, Socially and Environmentally, picks up on the tension between environmental sustainability regulations and affordable housing needs identified in a 2009-2010 project, which suggested that unintended economic consequences of built environment regulation could work against the intended goals of such regulation in addition to

other public policy goals.

METHODOLOGY Henri conducted an extensive literature survey on construction economics, the full accounting cost methodology and fiscal impact analysis methodologies and researched recent proposals for comprehensive environmental sustainability regulations, recently adopted environmental sustainability legislation and local law requirements for fiscal impact analysis of legislation. In addition, Henri conducted interviews with a range of finance and real estate development specialists.

RESEARCH FINDINGS Henri found support in the literature and among those interviewed for a correlation between built environment regulation and construction costs. He concluded

that the full cost accounting methodology falls between the static estimate methodology required by local law and the more difficult dynamic scoring methodology that would assist in capturing the impact of regulation on the regulated activity and larger economy. Aided by a recent analysis of local legislation applying costs associated with the proposed regulation to the pro forma balance sheets of selected built environment activities that would be subject to the proposal, Henri finally concludes that this type of sensitivity analysis would be a necessary component of analyses that inform the decision-making process.

NEXT STEPS Henri concluded with a “recipe” to apply this analytical method, suggesting, as follow-up research, that future researchers reach out to developers in the field to collect project construction and operations data for application of the methodology to case study regulations.

Development Budget

Development Costs	
Construction - Hard Costs	
Construction - Soft Costs	
Purchase of site	
RENTAL INCOME	
Residential	
Commercial	
Expenses	
Personnel	
Maintenance	
General Administration	
Management Fee	
NET INCOME	
BANK FINANCE CHARGE	
CASH FLOW	
ROI	
TAXES	

THE SOLAR ROOF POD IN CONTEXT: INHABITED ROOFTOPS AND THEIR IMPLICATION FOR PLANYC 2030

TOWN

New York City Department of City Planning

New York City Economic Development Corporation

New York City Department of Citywide Administrative Services*

GOWN

City College of New York/ Sustainability in the Built Environment Program

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PURPOSE This is one of four projects to originate outside the Town+Gown program that nonetheless relate to existing research questions. Graduate students Dominic Alberto, Lia Kelerchian, George Smith and Alex Vlachokostas, with Academic Advisor Hillary Brown (the “Team”), as part of City College’s entry in the U.S. Department of Energy’s 2011 Solar Decathlon competition, performed an environmental

cost-benefit analysis of the entry, a net-zero energy two-person rooftop dwelling (the “solar roof pod”) in the context of PlaNYC’s objectives. It focused on additional analyses for an enhanced version of the solar roof pod – optimizing the building roof surface with green roof under additional photovoltaic arrays (the “enhanced roof pod”). The purposes of the solar roof pod and the enhanced roof pod are to utilize the urban rooftop and to improve the performance of urban rooftops in the context of environmental sustainability.

METHODOLOGY After conducting a literature review, the Team developed a matrix of benefits, aligned with seven of PlaNYC’s articulated sustainability performance measures, and quantified the benefits accruing to a solar roof pod for a single enhanced roof pod, a 46-building housing complex, a hypothetical Downtown Brooklyn Solar Empowerment Zone, and the City at large. The Team also modeled rental housing market use of an enhanced roof pod, to identify the rental income necessary to make such a product marketable.

RESEARCH

FINDINGS The Team concluded that net long-term benefits of the enhanced roof pod,

especially at higher scale-up levels, align closely with PlaNYC goals, because they would permit clean-source capacity to substitute for existing capacity. While present rental market conditions require significant rental income to support an enhanced roof pod, either reductions in production costs or appropriate subsidies could increase its affordability.

NEXT

STEPS The Team made several recommendations for future work, including the making of basic engineering improvements to any of the subsystems of the roof pod, use of data from the newly-developed solar map of the City to model scaling up of the roof pod, future research to estimate the optimal configuration of green roofs and photovoltaic arrays and future investigations of local law to determine optimal building types and locations for market rate enhanced solar pods.

Social Benefits of Roof Pods

BENEFIT	FIGURED INTO ANALYSIS?
PV's cleanly generate electricity	Yes
Vegetation (garden, green roof) captures rain water	Yes/ No
Efficient plumbing	No
Vegetation lowers roof temperature vs. conventional roofs	No
Housing for two people	No
Vegetation absorbs particulate matter	No
Vegetation serves as a carbon sink	No
Vegetation enhances biodiversity	No
Biophilia	No
Esthetic pleasure	No
Inspirational value	No

*The agencies listed did not participate as clients but their practically-based input also makes this project appropriate to capture in this review.

Law

For projects under Law, the City acts as an owner, primarily through the contractual relationship between it and its designers and contractors, which is the product of industry standard practice, governing law and past experience. The City also acts in the role of a regulator and policy maker, and projects related to those roles are found above under Economics.

WHAT IS THE CURRENT PATTERN OF CONSTRUCTION PARTICIPANT LICENSURE?

PURPOSE Law student, Timothy Kane, was asked to review the statutory licensing schemes for participants in the construction process, and document such review, in order to facilitate future analyses on the varied pattern of licensure across the State, its historical antecedents and its impact on the efficiency of the construction industry in New York.

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Brooklyn Law School/
Corporate and Real Estate Clinic

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METHODOLOGY Kane reviewed State and local statutes governing the licensure of two archetypal participants—the designer and the constructor—and documented his findings in an Excel spreadsheet to facilitate future analyses. Kane also supplemented the chart with a memorandum describing the statutory landscape.

RESEARCH FINDINGS As this project was of a foundational nature, setting the stage for future research, Kane presented no findings other than a detailed description of the State’s statutory scheme governing built environment professionals and the City’s statutory scheme governing the built environment trades and businesses. Responsibility for built environment regulation in New York is split, with the State regulating the professions and local governments regulating what is considered occupations or businesses.

NEXT STEPS The charts and supplemental memorandum will form the basis of future work related to questions on the impact of licensure on construction industry economics in the Research Agenda.

Analysis Framework

Jurisdiction	New York City
Agency / Department	Department of Buildings
Primary regulator / evaluator	Yes
Trade	Master Electrician
Licensing Statute(s)	NYC Admin. Code, Title 27, Chapter electrician's and special electrician's
Requirements / Terms	1. A journeyman electrician who has a minimum of ten thousand five working with his or her tools on the and power in or on buildings or con
Business Organization	NYC Admin. Code, Title 27, Chapter cians and special electricians
Plate / Seal	NYC Admin. Code, Title 27, Chapter cians and special electricians
Duration of License / Registration	License: 1 Year
Continuing Education Requirements / Renewal	NYC Admin. Code, Title 27, Chapter special electrician's licenses.
Insurance Required	NYC Admin. Code, Title 27, Chapter cians and special electricians
Revocation	NYC Admin. Code, Title 27, Chapter surrender of master electrician's an of master electrician business
Also regulated by	

WHAT TYPES OF CONSTRUCTION CONTRACT PROVISIONS WOULD INCREASE ALIGNMENT BETWEEN PRINCIPAL AND AGENT?

TOWN

New York City Department of Design and Construction

Construction Law Committee of the New York City Bar Association

GOWN

Brooklyn Law School/ Corporate and Real Estate Clinic

CONTACT

Terri Matthews
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PURPOSE Law student, Aaron Edelman, was asked to deconstruct the City's standard construction contract, as a follow up to an earlier deconstruction of three industry standard design-bid-build construction contracts performed by Brooklyn Law School Fellow, Jacob Zambrzycki. The deconstruction of the standard contracts is part of a comparative contract analysis project underway to analyze risk allocation provisions in public and private construction contracts.

METHODOLOGY The comparative contract analysis

began with deconstructing construction contracts so that all contract provisions can be easily be compared and analyzed regardless of location in the original documents. The next phase is currently underway and consists of an analysis of the deconstructed provisions re-arranged along the lines of a 1986 survey of built environment participants that identified certain contract provisions causing problems "on the ground". These provisions fall into three main groupings: work scope definition clauses, change clauses and project control clauses.

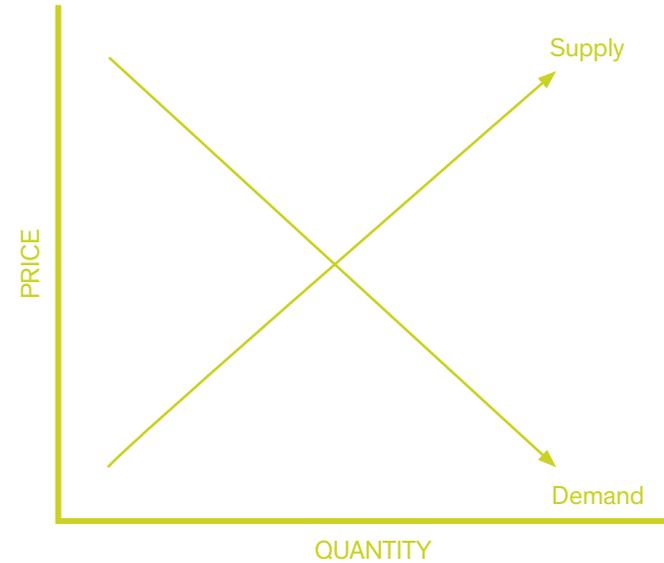
RESEARCH

FINDINGS As this project joins others that provide foundational analyses for the overall comparative contract analysis project, there were no specific findings.

NEXT

STEPS The broader research project is expected to be completed by the end of academic year 2011-2012.

The Lens of the Contract



WHAT ARE STATUTORY CONSEQUENCES OF BEING A “PUBLIC WORKS”?

TOWN

New York City Department of Design and Construction

SCHOOL

Brooklyn Law School/
Corporate and Real Estate Clinic

CONTACT

Terri Matthews
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PURPOSE Law student, Steven Spada, was asked to analyze the statutory consequences for construction projects being deemed “public works” in various construction-related statutory schemes as a foundation for future analysis of the economic consequences of projects being deemed “public works”.

METHODOLOGY

Spada reviewed the state statutes and related case law and documented his findings in various charts to facilitate future analyses.

RESEARCH

FINDINGS While the statutory consequence depends on the particular statute, the term “public works” present in all the statutes is defined in none of them. The term “public works” has been defined in related case law in which the courts inferred meaning from legislative intent. Spada identified parallels between federal and State case law, providing an historical context for future research. Further, Spada’s research into statutes involving the term “public works” revealed a similar term, “public improvement”, used in a series of public finance laws, providing additional historical context for future research.

NEXT

STEPS The charts created by Spada will form the basis of future work related to questions on the impact of regulation on construction industry economics in the Research Agenda.

Analysis Framework

Statute / Provisions	Case Law	Other Public Work References
<p>General Municipal Law § 101 Enacted: 1953</p> <p>1. Except as otherwise provided in section two hundred twenty-two of the labor law, every officer, board or agency of a political subdivision or of any district therein, charged with the duty of preparing specifications or awarding or entering into contracts for the erection, construction, reconstruction or alteration of buildings, when the entire cost of such public work shall exceed three million dollars in the counties of Nassau, Suffolk the counties of</p>	<p>Diamond Asphalt Corp. v. Sander Year: 1998</p> <p>“Neither the statute nor legislative history provide a definition of “public work.” Therefore, in determining whether traditional private utility work may be deemed and converted into “public work” for purposes of General Municipal Law § 103(1) General Municipal Law § 103(1), it is useful to examine the nature of the public bidding process in precedential context...In making these rulings, the Court has articulated and</p>	<p>Justice Freedman summarized the General Municipal Law in Diamond Asphalt as follows:</p> <p>“The statute[...] unequivocally states that the ‘lowest responsible bidder’ shall be awarded ‘contracts for public work,’ i.e., work done on behalf of the City and citizenry. The Utility Work included in the project contracts is not ‘public work’; the Utility Work directly benefits and is on behalf of privately-owned Utilities, and any benefit to the City is indirect. To claim that bidders to project</p>

WHAT IS THE RELATION BETWEEN LAND USE LAW TECHNIQUES AND URBAN DESIGN AND FUNCTION?

TOWN
New York City Department of Design and Construction

SCHOOL
Brooklyn Law School/
Corporate and Real Estate Clinic

CONTACT
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PURPOSE Law students, Matthew Lawrence and Christopher Colon, were asked to research the history of zoning, generally and in New York City, and to conduct a comparative analysis of land use tools across the country, as a foundational analysis for future explorations of the relation between land use law techniques and urban design and function.

METHODOLOGY Lawrence and Colon, beginning from a legal disciplinary perspective, conducted meta-research into the history of zoning and the related history of zoning technique development across the country. Lawrence and Colon also conducted a number of interviews with land use professionals in the City.

RESEARCH FINDINGS Lawrence found that New York City's land use history, focusing on the 1916 and 1961 codes, has been consistent with trends in zoning across the country. The first code reflected the separation of uses theory that was prevalent at that time and operated by controlling building features, such as height and bulk, not uses. A significant impetus for the second code was to reflect then current conditions and simplify, for developers, a document that had been amended 1,400 times. Uses were still separated, but they were expressly permitted instead of expressly excluded. The adopted 1961 code envisioned a city with a strong manufacturing sector, an active port and a strong middle class that would be located across the city at lower densities than the original plan had envisioned.

In his historical survey of zoning tools and methodologies at five large American cities, Colon noted the city without classic separation of uses zoning, Houston, has subtle land use strictures and governmental influence that tend, in practice, to segregate uses. Los Angeles originated the use of zoning in the late 19th century, and, in contrast to cities in the east that controlled building features, it also pioneered a zoning approach that controlled uses as a planning tool. Colon also reviewed three cities in various stages of comprehensive planning and modernization. Philadelphia and Oakland are still engaged in modernizing their codes which were adopted around the same time as New York City's second code. In Philadelphia, this effort was initiated by an open participatory charter revision that has led to a comprehensive planning process. Chicago modernized its code in 2004, modulating its incentive-based zoning features to reflect current needs and concerns.

NEXT STEPS Lawrence and Colon collectively established a foundational comparative analysis of zoning tools. This analysis will form the basis of future work on the relation of land use techniques to urban design and function, as one variation of regulatory impact analysis.

Zoning Key

	Lower Density Zoning		Existing C1-2
	3-5 Story Apartment Bldg.		Existing C1-3
	5-7 Story Apartment Bldg.		Existing C1-4
	6-8 Story Apt. or Mixed Use		Existing C2-2
	5-12 Story Mixed Use		Existing C2-4

HOW CAN THE CITY USE ITS CONCESSION PROCESS TO APPROXIMATE STANDARD THIRD PARTY FINANCING OF SUSTAINABLE BUILDING SYSTEM UPGRADES?

TOWN
New York City Department of Design and Construction

SCHOOL
Brooklyn Law School

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PURPOSE Law student, Patrick Hagerty, was asked to research how the City might take advantage of existing procedures to approximate standard third-party financing of sustainable building system upgrades, as part of the broader research question on best practices for public private partnerships to promote “green” projects. The City’s PlaNYC policy initiative has used the tool of targeted legislation to reduce the City’s carbon footprint, including legislation that requires the City to retrofit its many building systems. Private sector third-party financing and the public sector version—public private partnerships—transfer all risk of construction, finance and operation and maintenance

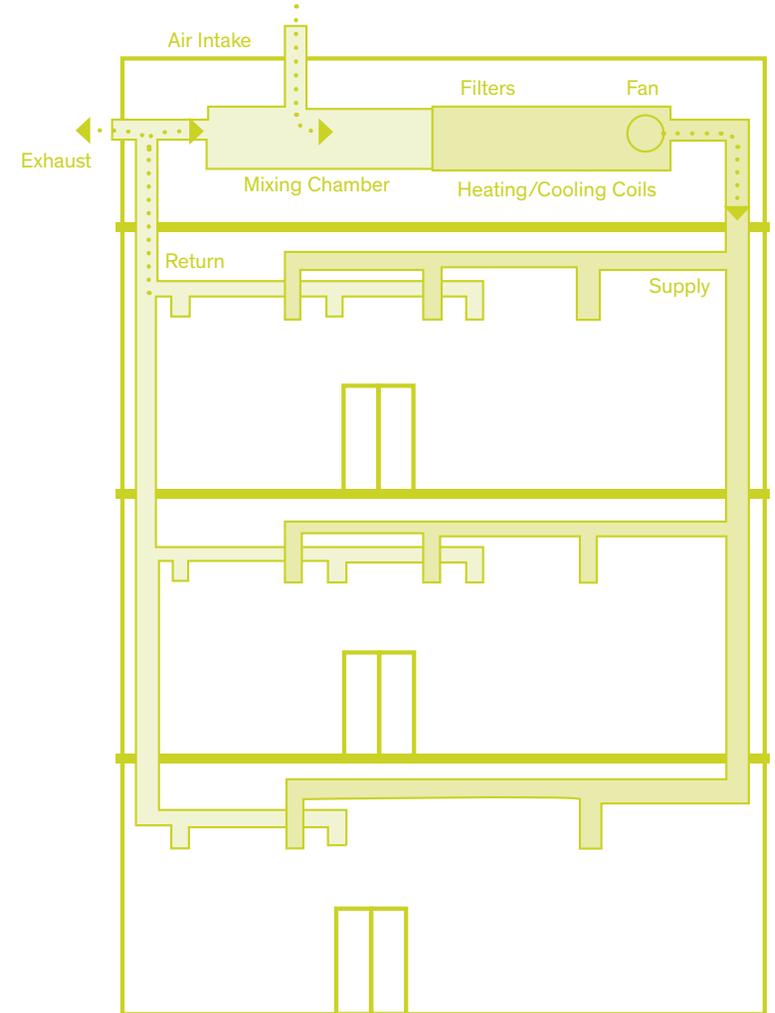
to a third-party. What options are available to the City to approximate the benefits of public/private partnerships?

METHODOLOGY Hagerty interviewed people familiar with lease finance programs and conducted extensive research into the literature of energy service company financing, along with more traditional legal research into municipal laws, with particular attention to those of the City.

RESEARCH FINDINGS Hagerty concludes that the City’s existing concession process would be available for the City to use in developing a third-party financing plan for sustainable building upgrades as part of the mandatory retrofitting of building systems.

NEXT STEPS The City has begun to use existing processes as it implements various environmental sustainability projects. This analysis would be available for the broader research question on best practices.

HVAC Schematic



Design

Public capital programs generate public architecture that becomes part of the visible built environment and the places the public encounters its government. Mayor Bloomberg has, in the past, noted an observation of I.N. Phelps Stokes, who presided over the Art Commission under Mayor LaGuardia: *“The production of beauty, especially by simple and inexpensive means is a very subtle problem and can be solved successfully only by a combination of ability, experience and care.”* This expression of the challenges inherent in municipal architecture provides the context for Design projects.

For projects under Design, the City act primarily as an owner and a purchaser of design—architectural and engineering—services.

FROM WAITING ROOMS TO RESOURCE HUBS

TOWN

New York City Department of Probation (DOP)

Mayor's Office of Operations (Operations)

SCHOOL

Columbia University/ Graduate School of Architecture, Planning and Preservation (GSAPP)

CONTACT

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Download report at:
<http://www.spatialinformationdesignlab.org/publications.php>

PURPOSE This is one of four projects to originate outside the Town+Gown program that nonetheless relate to existing research questions. DOP and Operations staff and Associate Professor of

Architecture Laura Kurgan (the "Team"), applied the collective findings of earlier academic-practitioner explorations at GSAPP of the criminal justice system to the reality of DOP operations. These earlier explorations, published in 2008, include using spatial mapping technology to investigate the geography of incarceration (The Pattern), a workshop to engage in scenario planning for justice reinvestment strategies (Scenario Planning Workshop), fieldwork to identify sites for justice reinvestment strategies (Justice Reinvestment in New Orleans), and an analysis using criminal justice mapping data as a scoping tool for physical structures (Architecture and Justice). This project also explores, "on the ground" at a City criminal justice agency, questions present in the Research Agenda related to the impact of design on human services programs.

METHODOLOGY Informed by the work that preceded it, the Team engaged in a participatory design process that began with an analysis of the location and current state of the physical spaces and program functions of DOP's waiting rooms and the work flows within them, giving rise to design challenges to be solved, followed by identification of integrated design practices, process analysis and a related blue sky exploration of solutions and challenges.

RESEARCH

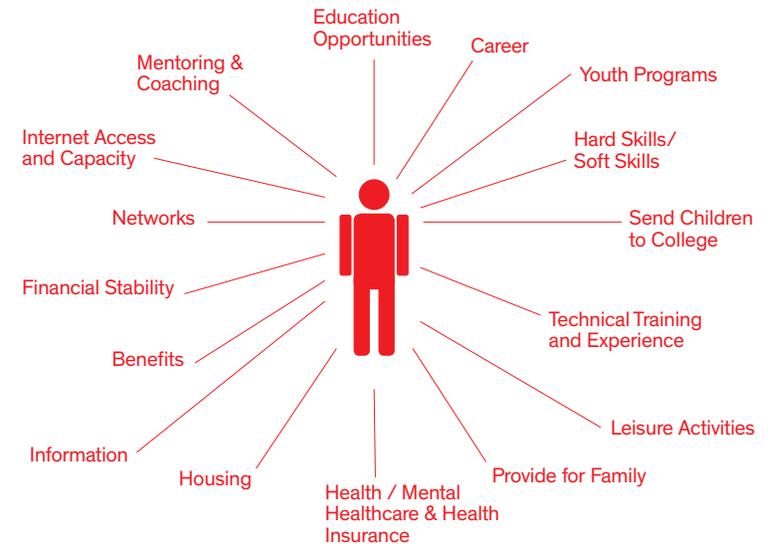
FINDINGS The collaborative process identified, as a tipping point for the program design, a need for DOP to

address—figuratively and literally—its clients as whole persons. This tipping point led to an integrated design solution that supported DOP's new policies and practices. The waiting room would be repurposed as a Resource Hub, using a "kit of parts" including technology with site specific programs, new signage and improved furniture and arrangements to facilitate new roles for DOP staff and partnering with other agencies and organizations.

NEXT

STEPS To implement the integrated design solution, the Team paired the list of small steps leading to big changes in DOP's program, with a series of next steps that include creating model Resource Hubs using the "kit of parts" that are scalable across the agency and conducting a full process evaluation of current operations to support future replication of the model. Some of these next steps have already been implemented.

Client Needs and Wants



Technology

The City has an interest in technology solutions as an owner, and projects under Technology are related to government in its role as owner on particular projects. Yet government can exercise another role in advancing technology innovation, as economic policy maker, by subsidizing the research and development necessary for innovation in construction technology. Projects related to this role are found under Economics.

EXPERIMENTAL AND NUMERICAL EVALUATION OF CIPP LINING SYSTEMS FOR HIGH TEMPERATURE APPLICATIONS IN SEWER PIPES

TOWN

New York City Department of Design and Construction

Consolidated Edison Company of New York

SCHOOL

Louisiana Tech University/
Trenchless Technology Center

CONTACT

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PURPOSE This is one of four projects to originate outside the Town+Gown program that nonetheless relate to existing research questions. The purpose of this research was to evaluate the suitability of various cured-in-place pipe (CIPP) materials for use in relining existing sewer pipes exposed to high temperatures emitted from other component systems in the underground infrastructure network.

METHODOLOGY The researchers conducted a state-of-the-technology industry survey, bench scale experimental testing of the candidate materials, long-term experimental testing of resulting leading candidate materials under cyclic thermal conditions and a three-dimensional numerical modeling.

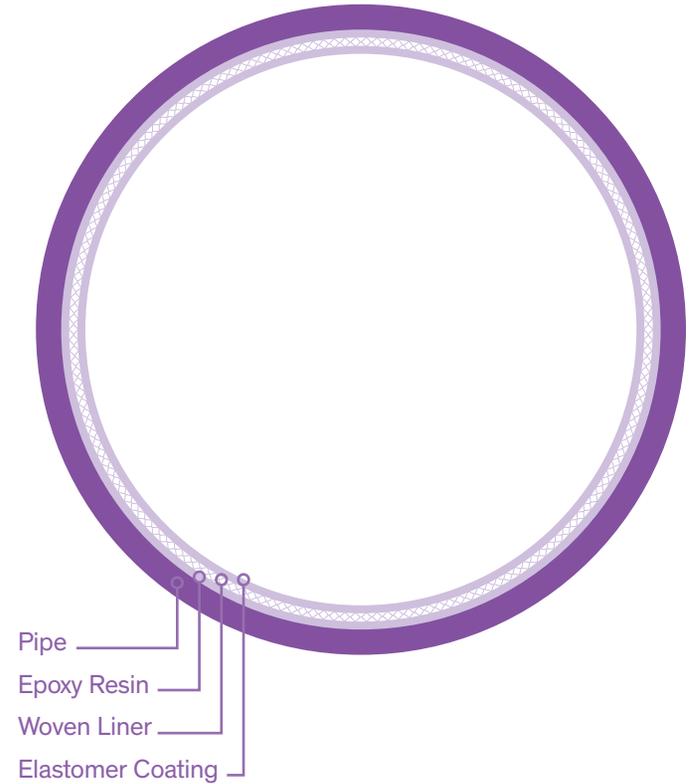
RESEARCH

FINDINGS The analysis identified sewer lining materials that are more suitable than others in environments with high temperatures.

NEXT

STEPS This project provides a window into issues present “under the ground” of City streets. The Research Agenda contains questions that relate to the nature of urban streets as complex designed machines.

Cured-in-Place Pipe



MADISON AVENUE WATERMAIN TRENCHLESS TECHNOLOGY ASSESSMENT

TOWN
New York City Department of Design and Construction (DDC)

SCHOOL
New York University/
Polytechnic Institute of NYU-
Urban Utility Center

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conducted by DDC on a trunk water main rehabilitation project to determine the watermain's condition and assess trenchless technology rehabilitation options in order to develop a methodology for use on future projects. The researchers also summarized observations made during the first year of the project as well as guidelines that were implemented in the second year of the project. The researchers reviewed methodologies to evaluate the social costs associated with major infrastructure rehabilitation projects, as well as bidding methods to optimize the match between construction method and cost, and conducted a survey of businesses affected by the project under investigation using trenchless technology, which was compared to a similar survey related to a nearby project that did not utilize trenchless technology.

RESEARCH FINDINGS The researchers developed a methodology to review options that permit more efficient selection of candidate technologies using a performance record-based rating system. The comparative survey analysis indicated that using trenchless technology on infrastructure rehabilitation projects is less

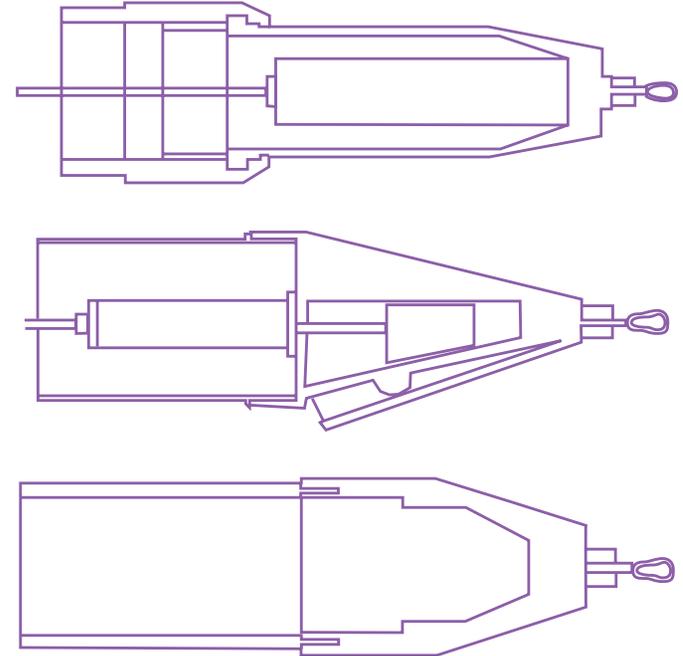
PURPOSE This is one of four projects to originate outside the Town+Gown program that nonetheless relate to existing research questions. The purpose of this research was to observe and summarize lessons learned at different stages of a water main rehabilitation using trenchless technology.

METHODOLOGY The researchers reviewed preliminary investigations

disruptive to adjacent businesses than using conventional excavation techniques.

NEXT STEPS This project provides a window into issues present "under the ground" of City streets. The Research Agenda contains questions that relate to the nature of urban streets as complex designed machines.

Pneumatic, Hydraulic and Static Heads



2011, The City of New York
Michael R. Bloomberg, Mayor

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PAPER

Finch Casa Opaque
30% post-consumer recycled content

TYPEFACES

Theinhardt Optimo by François Rappo
Leitura by Dino dos Santos

**BUILD
PING
IDEAS**
TOWN+GOWN

DDC
NEW YORK CITY DEPARTMENT OF
DESIGN + CONSTRUCTION