Getting Building Codes Right: Implementation and Enforcement

New York City

John Lee, NYC Mayor's Office of Long Term Planning & Sustainability

Buildings by the Numbers

Buildings + Properties	975,000
Employees	1,041
Inspectors	317
Plan Examiners	172
Department Offices	9

2011 at a Glance

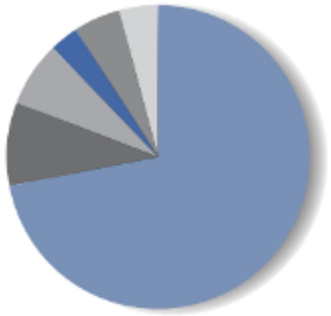
Plan Reviews	450,508
311 Calls	417,123
Inspections	293,778
Work Permits	143,999
Violations	56,472
Licenses + Registrations	10,142
Certificates of Occupancy	6,531
Stop Work Orders	5,189
New Building Permits	1,523
Dollars to Be Generated	$9.6 billion

Revenues and Expenses

Agency Resources	FY07	FY08	FY09	FY10	FY11
Expenditures ($ mill.)*	$87.2	$99.4	$109.7	$101.5	$99.6
Revenues ($ mill.)	$133.0	$152.9	$147.1	$132.9	$164.9
Personnel	1,181	1,240	1,227	1,174	1,094

* Expenditures do not include fringe benefits.

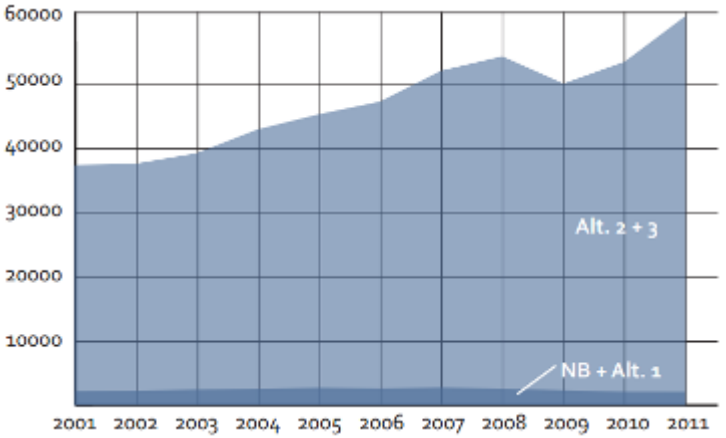
Spending



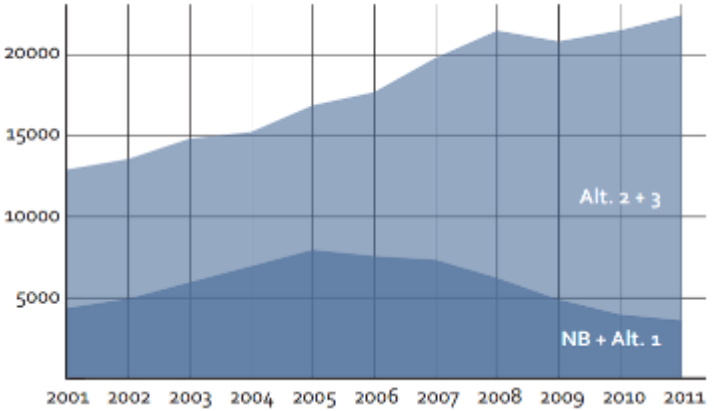
- 72% Staffing + Overtime
- 9% Contracts
- 7% Information Technology
- 3% Supplies + Equipment
- 5% Facilities
- 4% Miscellaneous

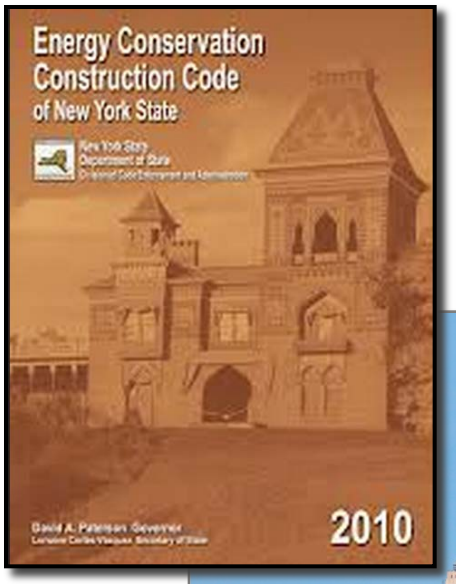
December 31, 2011 Data

Manhattan permits

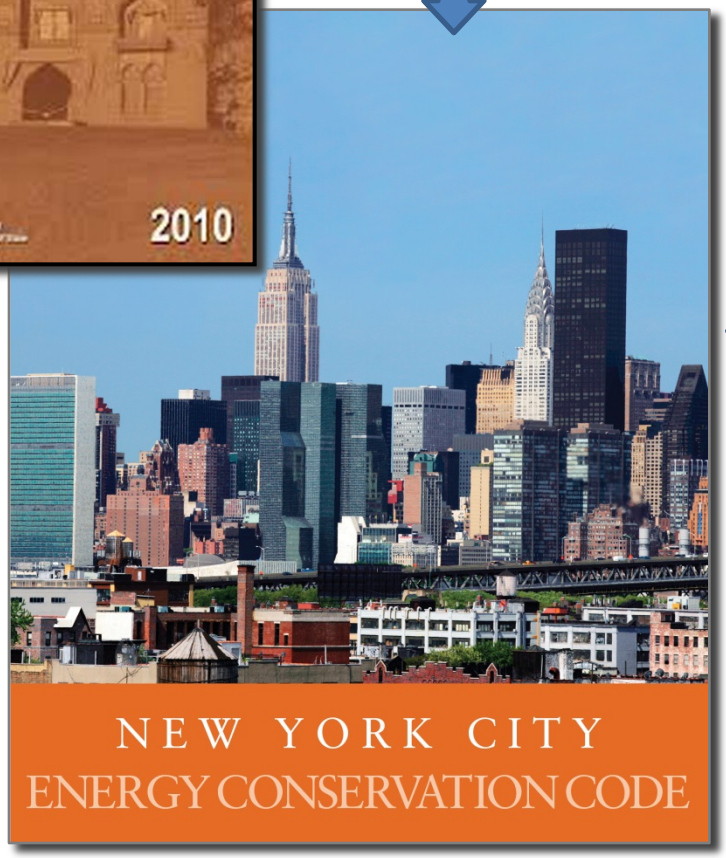


Brooklyn permits

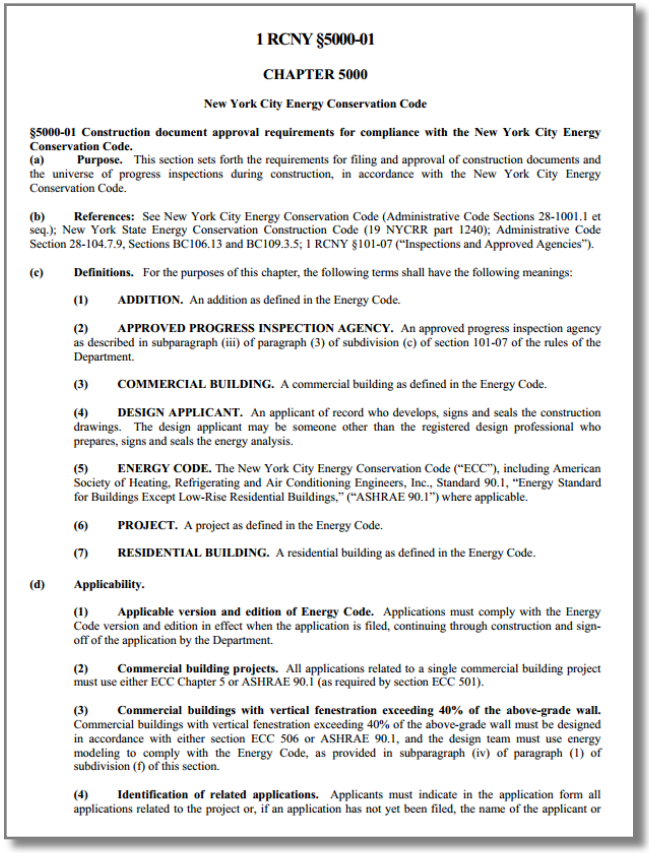




New York State Energy Conservation Construction Code
through Governor's Office
Basis for City Energy code



New York City Energy Conservation Code
through legislation by City Council



1 RCNY §5000-01

CHAPTER 5000

New York City Energy Conservation Code

§5000-01 Construction document approval requirements for compliance with the New York City Energy Conservation Code.

(a) Purpose. This section sets forth the requirements for filing and approval of construction documents and the universe of progress inspections during construction, in accordance with the New York City Energy Conservation Code.

(b) References: See New York City Energy Conservation Code (Administrative Code Sections 28-1001.1 et seq.); New York State Energy Conservation Construction Code (19 NYCRR part 1240); Administrative Code Section 28-104.7.9, Sections BC106.13 and BC109.3.5; 1 RCNY §101-07 ("Inspections and Approved Agencies").

(c) Definitions. For the purposes of this chapter, the following terms shall have the following meanings:

(1) ADDITION. An addition as defined in the Energy Code.

(2) APPROVED PROGRESS INSPECTION AGENCY. An approved progress inspection agency as described in subparagraph (iii) of paragraph (3) of subdivision (c) of section 101-07 of the rules of the Department.

(3) COMMERCIAL BUILDING. A commercial building as defined in the Energy Code.

(4) DESIGN APPLICANT. An applicant of record who develops, signs and seals the construction drawings. The design applicant may be someone other than the registered design professional who prepares, signs and seals the energy analysis.

(5) ENERGY CODE. The New York City Energy Conservation Code ("ECC"), including American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc., Standard 90.1, "Energy Standard for Buildings Except Low-Rise Residential Buildings," ("ASHRAE 90.1") where applicable.

(6) PROJECT. A project as defined in the Energy Code.

(7) RESIDENTIAL BUILDING. A residential building as defined in the Energy Code.

(d) Applicability.

(1) Applicable version and edition of Energy Code. Applications must comply with the Energy Code version and edition in effect when the application is filed, continuing through construction and sign-off of the application by the Department.

(2) Commercial building projects. All applications related to a single commercial building project must use either ECC Chapter 5 or ASHRAE 90.1 (as required by section ECC 501).

(3) Commercial buildings with vertical fenestration exceeding 40% of the above-grade wall. Commercial buildings with vertical fenestration exceeding 40% of the above-grade wall must be designed in accordance with either section ECC 506 or ASHRAE 90.1, and the design team must use energy modeling to comply with the Energy Code, as provided in subparagraph (iv) of paragraph (1) of subdivision (f) of this section.

(4) Identification of related applications. Applicants must indicate in the application form all applications related to the project or, if an application has not yet been filed, the name of the applicant or

Dept of Buildings Administrative rules
by agency authority

1 RCNY §5000-01

CHAPTER 5000

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New Buildings

- All must comply via Prescriptive or Performance-Based Approaches
- Only exemption is for envelope in low-energy/unconditioned buildings

Additions

- Must comply as a stand-alone addition or with the building as a single entity

Alterations / Renovations

- Only applies to scope of alteration work; unaltered portions are not required to comply
- Some exceptions may apply (per Bulletins)

Repairs

- Technically applies even if a permit is not required (e.g., window or roof replacements or repairs)

ENERGY CODE ENFORCEMENT: Requirements for construction permit

Prior to permit:

1. Energy analysis required on submitted drawings
    - Tabular Analysis
    - REScheck or COMcheck
    - Energy Modeling
    - Alternative format as approved by the department
2. Progress Inspections required during construction

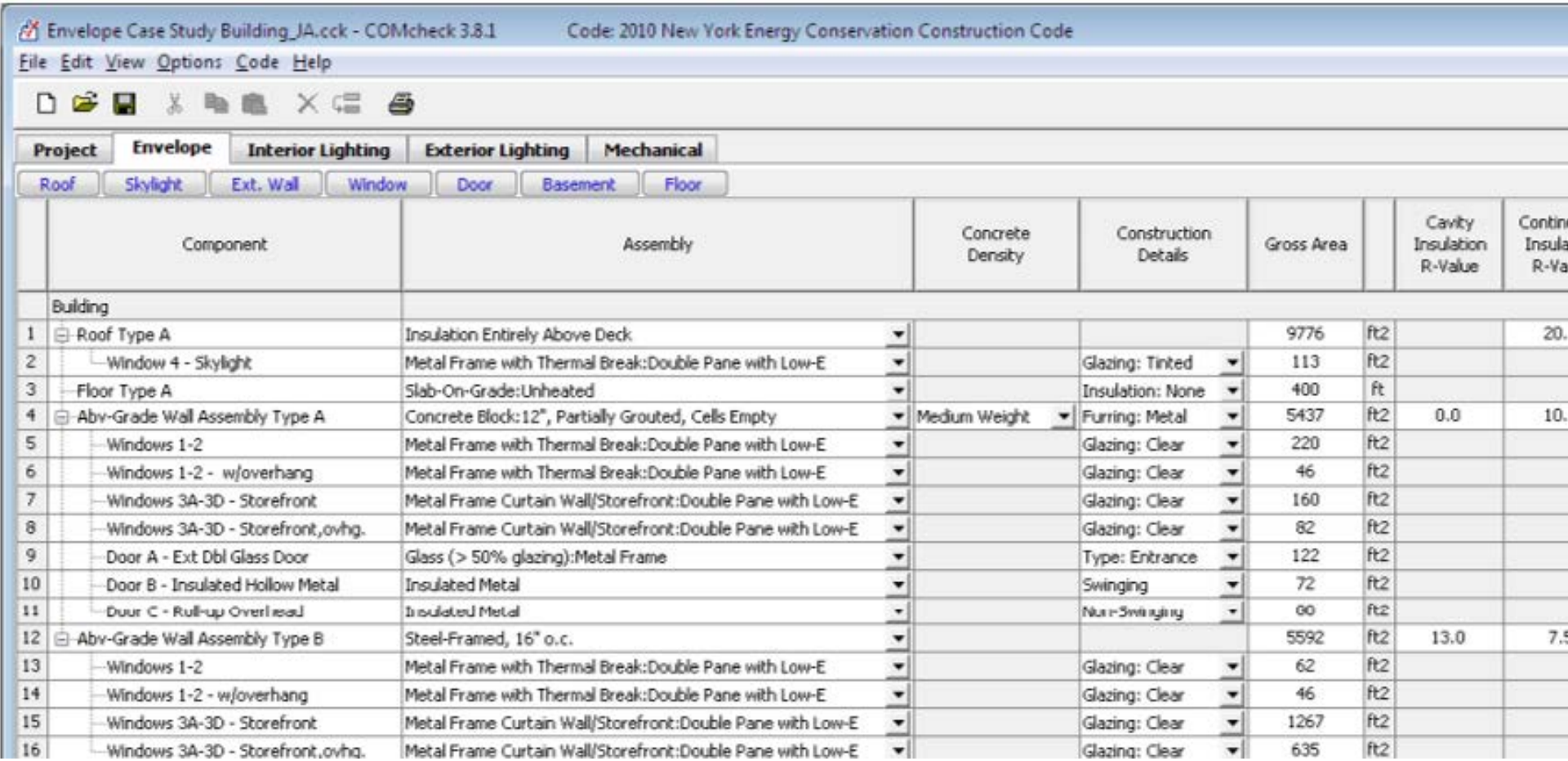
Prior to Closeout:

1. Declaration of completed progress inspections
2. As-built energy analysis

Tabular Analysis

ITEM DESCRIPTION	PROPOSED DESIGN VALUE	CODE PRESCRIPTIVE VALUE AND CITATION	SUPPORTING DOCUMENTATION
BUILDING ENVELOPE			
Replace roof membrane and add insulation SRR = 2.2%	Roof Type 1: 4" XPS (R -20) continuous insulation above deck	Minimum R-20 continuous insulation NYCECC Table 502.2(1)	Roof Type 1: A-106 (Roof Plan) A-402 (Wall Sections) 6-8/A-603 (Roof Details)
Replace existing windows w/new aluminum framed windows, Floors 2 - 4 WWR = 32% PF = 0	Window Type A: U = 0.46, SHGC = 0.29, Air leakage ≤ 0.10 cfm/SF Window Types B + C: U = 0.41, SHGC = 0.31, Air leakage ≤ 0.30 cfm/SF Window Type D: U = 0.41, SHGC = 0.23, Air leakage ≤ 0.30 cfm/SF	Window Types A-D: Maximum U-Factor = 0.55 Maximum SHGC = 0.40 NYCECC Table 502.3 Maximum Air Leakage = 0.3 cfm/SF NYCECC 502.4.1	Window Types A-D: A-301-302 (Elevations) A-501 (Schedules)
Renovate interior side of exterior walls around new window openings – repair/replace gwb	N/A - No change proposed to existing 3 ½" metal stud furring walls which are completely filled with fiberglass batts (estimated R-3.1/inch).	NYCECC 101.4.3 Exception 3 – Alterations, renovations, or repairs to roof/ceiling, wall, or floor cavities which are insulated to full depth with insulation having a minimal nominal value of R-3.0/inch.	A-102-104 (Floor Plans) 1-2/A-305 (Interior Elevations)

COMcheck Sample screenshot of COMcheck input



Envelope Case Study Building_JA.cck - COMcheck 3.8.1 Code: 2010 New York Energy Conservation Construction Code

File Edit View Options Code Help

Project | Envelope | Interior Lighting | Exterior Lighting | Mechanical

Roof | Skylight | Ext. Wall | Window | Door | Basement | Floor

	Component	Assembly	Concrete Density	Construction Details	Gross Area		Cavity Insulation R-Value	Contin Insula R-Va
	Building							
1	Roof Type A	Insulation Entirely Above Deck			9776	ft2		20.
2	Window 4 - Skylight	Metal Frame with Thermal Break:Double Pane with Low-E		Glazing: Tinted	113	ft2		
3	Floor Type A	Slab-On-Grade:Unheated		Insulation: None	400	ft		
4	Abv-Grade Wall Assembly Type A	Concrete Block:12", Partially Grouted, Cells Empty	Medium Weight	Furring: Metal	5437	ft2	0.0	10.
5	Windows 1-2	Metal Frame with Thermal Break:Double Pane with Low-E		Glazing: Clear	220	ft2		
6	Windows 1-2 - w/overhang	Metal Frame with Thermal Break:Double Pane with Low-E		Glazing: Clear	46	ft2		
7	Windows 3A-3D - Storefront	Metal Frame Curtain Wall/Storefront:Double Pane with Low-E		Glazing: Clear	160	ft2		
8	Windows 3A-3D - Storefront,ovhg.	Metal Frame Curtain Wall/Storefront:Double Pane with Low-E		Glazing: Clear	82	ft2		
9	Door A - Ext Dbl Glass Door	Glass (> 50% glazing):Metal Frame		Type: Entrance	122	ft2		
10	Door B - Insulated Hollow Metal	Insulated Metal		Swinging	72	ft2		
11	Door C - Roll-up Overhead	Insulated Metal		Non-Swinging	60	ft2		
12	Abv-Grade Wall Assembly Type B	Steel-Framed, 16" o.c.			5592	ft2	13.0	7.5
13	Windows 1-2	Metal Frame with Thermal Break:Double Pane with Low-E		Glazing: Clear	62	ft2		
14	Windows 1-2 - w/overhang	Metal Frame with Thermal Break:Double Pane with Low-E		Glazing: Clear	46	ft2		
15	Windows 3A-3D - Storefront	Metal Frame Curtain Wall/Storefront:Double Pane with Low-E		Glazing: Clear	1267	ft2		
16	Windows 3A-3D - Storefront,ovhg.	Metal Frame Curtain Wall/Storefront:Double Pane with Low-E		Glazing: Clear	635	ft2		

COMcheck Sample COMcheck report

COMcheck Software Version 3.8.0

Envelope Compliance Certificate

2010 New York Energy Conservation Construction Code

Section 1: Project Information

Project Type: **New Construction**
Project Title :

Construction Site: Owner/Agent: Designer/Contractor:

Section 2: General Information

Building Location (for weather data):	**New York, New York**
Climate Zone	**4a**
Vertical Glazing / Wall Area Pct.:	**24%**
Skylight Glazing / Roof Area Pct.:	**1%**

Activity Type(s)	Floor Area
Floor 01 (Office)	9322
Floor 02 (Office)	9322
Floor 01 (Dining: Cafeteria/Fast Food)	637
Floor 01 (Retail)	815

Section 3: Requirements Checklist

Envelope PASSES: Design 1% better than code.

Climate-Specific Requirements:

Component Name/Description	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Proposed U-Factor	Budget U-Factor(a)
Roof Type A: Insulation Entirely Above Deck	9776	---	20.0	0.048	0.048
Window 4 - Skylight: Vinyl Frame:Double Pane with Low-E, Tinted, SHGC 0.40	113	---	---	0.600	0.600
Floor Type A: Slab-On-Grade:Unheated	400	---	---	---	---
Abv-Grade Wall Assembly Type A: Concrete Block:12", Partially Grouted, Cells Empty,Medium Density , Furring: Metal	5437	11.0	10.0	0.062	0.104
Window 1 - Framed: Metal Frame with Thermal Break:Double Pane with Low-E, Clear, SHGC 0.40	282	---	---	0.550	0.550
Window 10 - Storefront: Metal Frame Curtain Wall/Storefront:Double Pane with Low-E, Clear, SHGC 0.40	160	---	---	0.550	0.500
Window 10 - Storefront: Metal Frame Curtain Wall/Storefront:Double Pane with Low-E, Tinted, SHGC 0.20	82	---	---	0.550	0.500
Door 5 - Ext Dbl Glass Door: Glass (> 50% glazing):Metal Frame, Entrance Door, SHGC 0.40	48	---	---	0.850	0.850
Door 6 - Ext Sng Glass Door: Glass (> 50% glazing):Metal Frame, Entrance Door, SHGC 0.40	24	---	---	0.850	0.850
Door 7: Insulated Metal, Swinging	24	---	---	0.700	0.700
Door 7: Insulated Metal, Swinging	24	---	---	0.700	0.700
Door 8 - Roll-up Overhead: Uninsulated Single-Layer Metal, Non-Swinging	69	---	---	0.500	0.500
Abv-Grade Wall Assembly Type B: Steel-Framed, 16" o.c.	5592	13.0	7.5	0.064	0.064
Window 1- Framed: Metal Frame with Thermal Break:Double Pane with Low-E, Clear, SHGC 0.40	108	---	---	0.550	0.550
Window 10 - Storefront: Metal Frame Curtain Wall/Storefront:Double Pane with Low-E, Clear, SHGC 0.40	1267	---	---	0.550	0.500
Window 10 - Storefront: Metal Frame Curtain Wall/Storefront:Double Pane with Low-E, Tinted, SHGC 0.20	635	---	---	0.550	0.500

(a) Budget U-factors are used for software baseline calculations ONLY, and are not code requirements.

Air Leakage, Component Certification, and Vapor Retarder Requirements:

- ☐ 1. All joints and penetrations are caulked, gasketed, weather-stripped, or otherwise sealed.
- ☐ 2. Windows, doors, and skylights certified as meeting leakage requirements.
- ☐ 3. Component R-values & U-factors labeled as certified.

Section 4: Compliance Statement

Compliance Statement: The proposed envelope design represented in this document is consistent with the building plans, specifications and other calculations submitted with this permit application. The proposed envelope system has been designed to meet the 2010 New York Energy Conservation Construction Code requirements in COMcheck Version 3.8.0 and to comply with the mandatory requirements in the Requirements Checklist.

When a Registered Design Professional has stamped and signed this page, they are attesting that to the best of his/her knowledge, belief, and professional judgment, such plans or specifications are in compliance with this Code.

Name - Title Signature Date

Energy Modeling Energy Cost Budget declaration

NYC BUILDINGS

EN1 : Energy Cost Budget Worksheet

Do Not Submit Separately. Must be incorporated in the drawing set.

Energy Cost Budget Conformance	Proposed Design Output	Budget (Standard Design) Output
Annual Regulated Energy Cost ($)	1,458,109	1,477,272
Annual Regulated Energy Use (BTU/GSF)	44,161	48,006
Annual Regulated Energy Cost Per Sq. Ft. ($/GSF)	2.31	2.34

Energy Model Output Breakdown

Energy Use Breakdown	Proposed Design Output (% BTU/yr)	Budget (Standard Design) Output (% BTU/yr)
Heating	24.2%	32.9
Cooling	13.9%	7.7
Heat rejection	3.9%	2.4%
Fans	8.9%	8.6%
Pumps	1.2%	2.2%
Lighting	19.3%	19.4%
Unregulated loads (e.g., plug loads, elevators, escalators, kitchen, process equipment, exterior lighting)	28.5%	26.9%
Total	100%	100%

The overall regulated annual energy use and annual energy cost of the Proposed and Budget building designs are summarized at the end of the EN1 form. As this example illustrates, if the Proposed Design cost is less than the Budget Design cost, the project passes.

Progress Inspection

NYC Buildings

TR8: Technical Report
Statement of Responsibility for
Energy Code Progress Inspections
This form must be typewritten

1 **Location Information** *Required for all applications*

House No(s) Street Name

3 Energy Code Progress Inspection *Required for applications where Energy Code Compliance Progress Inspection is marked Yes on TR1*

3A ← Identification of Requirement			3B Identification of Responsibilities	3C Certificate of Complete Inspections / Tests	3D Withdraw Responsibilities
Y	N Progress Inspections	Table Reference in 1RCNY §5000-01(h) (1)and (2)	Initial & Date	Initial & Date	Initial & Date
☐	☐ Protection of foundation insulation	(IA1), (IIA1)			
☐	☐ Insulation placement and R values	(IA2), (IIA2)			
☐	☐ Fenestration thermal values and ratings	(IA3), (IIA3)			
☐	☐ Fenestration ratings for air leakage	(IA4), (IIA4)			
☐	☐ Fenestration areas	(IA5), (IIA5)			
☐	☐ Air sealing and insulation — visual	(IA6), (IIA6)			
☐	☐ Air sealing and insulation — testing	(IA7)			
☐	☐ Projection factors	(IIA7)			
☐	☐ Loading deck weather seals	(IIA8)			
☐	☐ Vestibules	(IIA9)			
☐	☐ Fireplaces	(IB1), (IIB1)			

Progress Inspection

	Inspection/Test	Frequency (minimum)	Reference Standard (See NYCECC Chapter 10) or Other Criteria	NYCECC or Other Citation
IIA	**Envelope Inspections**			
IIA1	**Protection of exposed foundation insulation:** Insulation shall be visually inspected to verify proper protection where applied to the exterior of basement or cellar walls, crawl-space walls and/or the perimeter of slab-on-grade floors.	As required during foundation work and prior to backfill	Approved construction documents	303.2.1
IIA2	**Insulation placement and R-values:** Installed insulation for each component of the conditioned space envelope and at junctions between components shall be visually inspected to ensure that the R-values are marked, that such R-values conform to the R-values identified in the construction documents and that the insulation is properly installed. Certifications for unmarked insulation shall be similarly visually inspected.	As required to verify continuous enclosure while walls, ceilings and floors are open	Approved construction documents	303.1,303.1.1, 303.1.2, 502.1, 502.2
IIA3	**Fenestration values and product ratings for U-factors and SHGC values:** U-factors and SHGC values of installed fenestration shall be visually inspected for conformance with the U-factors and SHGC values identified in the construction drawings by verifying the manufacturer's NFRC labels or, where not labeled, using the ratings in NYCECC Tables 102.1.3(1), (2) and (3). Where ASHRAE 90.1 is used, visible light transmittance values shall also be verified.	As required during installation	Approved construction documents; NFRC 100, NFRC 200, Tables 102.1.3	303.1, 303.1.3; 502.3
IIA4	**Fenestration and door assembly product ratings for air leakage:** Windows, skylights and sliding or swinging door assemblies, except site- built windows, skylights and/or doors, shall be visually inspected to verify that installed assemblies are listed and labeled by the manufacturer to the referenced standard.	As required during installation	NFRC 400, AAMA/WDMA101/I.S.2, AAMA/WDMA101/I.S.2/ NAFS-02; ASTM E283	502.3
IIA5	**Fenestration areas:** Dimensions of window			
IIA6	**Sealing:** Openings and penetrations in the b inspected to verify that they are properly se			
IIA7	**Projection factors:** Where the Energy Analy permanently attached shading devices shal			

A Progress Inspections Table must be included in the Supporting Documentation drawings, noting all applicable inspections to be performed based on the scope of work, plus Reference Standards and NYCECC Citations.

The design applicant must also include contract language requiring the contractor to identify time in the construction schedule for the progress inspections.

As-built Energy Analysis prior to closeout

NYC Buildings

EN2: As Built Energy Analysis

This form must be typewritten and submitted in person to the Certificate of Occupancy Division's Borough Office where energy analysis was reviewed.

Orient and affix BIS job number label here

1 Progress Inspector Information *Required for all applications.*

Last Name | First Name | Middle Initial

Business Name | Business Telephone

Business Address | Business Fax

City | State | Zip | Mobile Telephone

License Type *choose one:* ☐ P.E. ☐ R.A. | License Number

2 Location Information *Required for all applications.*

3 As Built Information *P.E./R.A. responsible for progress inspections, choose one below and sign/seal.*

☐ The as-built conditions of the completed building conform to the originally approved energy analysis and do not require a revised energy analysis.

☐ The energy analysis has been revised according to *one* of the statements below:

- ☐ Attached is a revised energy analysis, prepared, signed and sealed by the registered design professional who prepared the previously submitted and approved energy analysis. The as-built conditions of the completed building conform to this revised energy analysis.

- ☐ The last revised energy analysis was submitted and approved as a post approval amendment on _____(date). The as-built conditions of the completed building conform to this revised energy analysis.

sealed and submitted TR8.

Name (please print)

Signature | Date

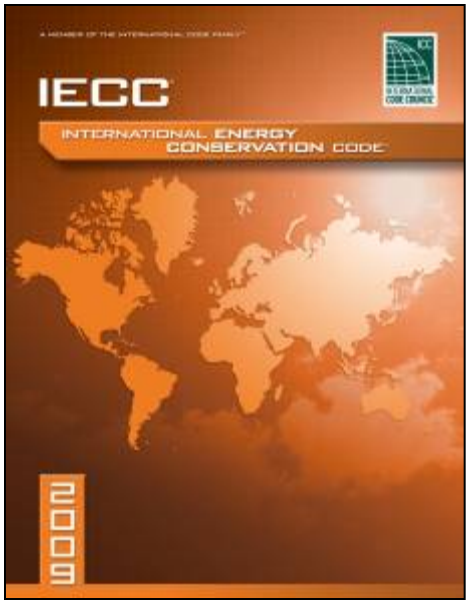
P.E. / R.A. Seal *(apply seal, then sign and date over seal)*

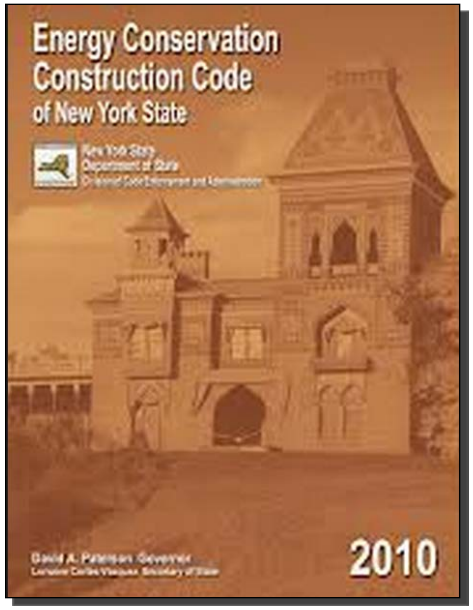
01/11

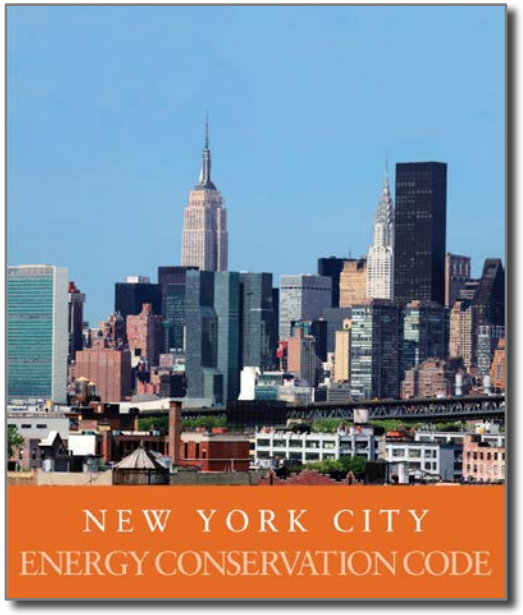
ARRA

By accepting *State Energy Program* funding under the American Recovery and Reinvestment Act, states are required to submit and implement plans to **achieve 90 percent compliance with building energy codes by 2017.**

Based on 2009 International Energy Conservation Code







New York State Energy Code training through in-person sessions and online courses for Code Enforcement Officials and practitioners.

New Energy Code Enforcement unit at the Dept of Buildings

5 plan examiners, 1 director, 1 support staff, 1 inspector

New energy code review requirement and filing fee for all new buildings and major alterations permits

As of January 13, 2014, all New Building and Alteration Type-1 applications includes a $220 review fee to reinforce compliance with the New York City Energy Conservation Code (NYCECC / Energy Code).

Energy Code review performed concurrently with the review for NYC Building Code and Zoning Resolution compliance.

Objections for non-compliance with the Energy Code will be issued in conjunction with other objections and must be resolved prior to approval.

Alteration Type-2 and Type-3 projects will continue to be subject to an Energy Code review by random audit.

NYC Buildings

Department of Buildings
280 Broadway
New York, New York 10007
(212) 566-5000 | TTY (212) 566-4769
nyc.gov/buildings

MANHATTAN (1)
280 BROADWAY 2ND FLOOR
New York, NY 10007

BRONX (2)
1932 ARTHUR AVENUE
BRONX, NY 10457

BROOKLYN (3)
210 JORALEMON STREET
BROOKLYN, NY 11201

QUEENS (4)
120-55 QUEENS BLVD.
QUEENS, NY 11424

STATEN ISLAND (5)
ROSCI HALL- 57 GEORGE
STATEN ISLAND, NY 10301

Notice of Energy Code Objections

Applicant:	**Date:**
	Job Application #:
	Application Type: ASHRAE 90.1/ 2007 - NB
	Premises Address:
	Zoning District:
	Block: x **Lot:** x
NYC Department of Buildings Examiner: YOUR NAME	

Examiner's Signature:

To discuss and resolve these objections, please call 311 to schedule an appointment with the Plan Examiner listed above. You will need the application number and document number found at the top of this objection sheet. To make the best possible use of the Plan Examiner's and your time, please make sure you are prepared to discuss and resolve these objections before arriving for your scheduled plan examination appointment.

Obj. #	Doc. #	Section of Code	Objections: The following are required and where indicated, have NOT been correctly performed by the applicant.	Date Resolved	Comments
			"JOB DESCRIPTION PASTED HERE"		
			Administrative Objections:		
1)		PW1, Sec 7	Energy Analysis documents not checked on PW1.		
2)		PW1, Sec 9L	PW1, 9L should not be left blank. Should indicate "Yes" – that work includes lighting fixtures.		
3)		PW1, Sec 10	"Exemption" indicated, but this application is not entirely exempt. "Compliance" should be checked.		
4)		PW1, Sec 10	Energy analysis is checked, but other job number not listed.		
5)		PW1, Sec 10	1st "Compliance" sub-box should be checked "Yes" since this application utilizes trade-offs among different major systems.		
6)		PW1, Sec 10	2nd "Compliance" sub-box should be checked "Yes" since this application utilizes trade-offs within a single major system.		
7)		PW1, Sec 10	PW1 indicates "exemption" due to Historic building status but no verification was provided. New York City Landmark status only is insufficient. Provide proof of National or State historic designation status from LPC.		
8)		PW1, Sec 11	Section 11 does not indicate the related application numbers.		
9)		PW1C	PW1C is required - Gas boiler is >350 K or >6 family.		
10)		TR1	"Energy Code Compliance Inspections" not checked "Yes".		
11)		TR8	Mandatory and/or required inspections not checked.		
			Professional Statement:		
12)		101.5.3.1	Professional statement not indicated on plans.		
13)		101.5.3.1	Incorrect citation for professional statement.		

	mechanical contractor.
503.2.10	Drawings do not indicate that systems with total fan power exceeding 5hp meet the allowable fan hp or motor nameplate hp.
503.2.11	Heating system for heating outside the building should be a radiant system.
503.3, 503.4	Requirements for economizers and hydronic system controls for mechanical system not fully addressed.
503.4.5, 503.4.6, 503.4.7	Drawings do not indicate for complex systems: VAV systems where serving multiple zones, condenser heat recovery installation for service water heating, hot gas bypass limits.
1 RCNY §5000-01 (g)(2)	A narrative is not provided for each mandatory control system describing its function and operation and specifying proper setpoints of equipment and controls.
504.2	No indication of service water heating equipment performance efficiency ratings.
504.3	Drawings do not indicate set point temperature controls, 110°F for dwellings and 90°F for other occupancies.
504.4	Heat traps not provided on the supply and discharge piping associated with equipment for non-circulating systems.
504.5	No service water pipe insulation indicated.
504.6	Service hot water system controls not indicated for automatic circulating systems.

Getting Building Codes Right: Implementation and Enforcement

New York City

John Lee, NYC Mayor's Office of Long Term Planning & Sustainability