
***LONG ISLAND
RESIDENTIAL NEW CONSTRUCTION
TECHNICAL BASELINE STUDY***

***Report Prepared for the
Long Island Power Authority***

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I. EXECUTIVE SUMMARY

A. Overview

Each year 4,000 to 5,000 new single-and multi-family buildings are built on Long Island. In 2004, the Long Island Power Authority (LIPA) will launch its New York ENERGY STAR[®] Labeled Homes Program (NYESLHP) to promote greater energy efficiency in these residential buildings. Homes participating in this program will save more than 30% of the energy consumed by comparable new buildings constructed to national minimum energy code requirements. The program will provide cost-effective energy savings that will reduce the pressure on LIPA's generation, transmission and distribution systems from new residential electricity demand and will also save participating LIPA customers money on their annual energy bills. In addition, the program will help Long Island builders produce high performance homes with superior comfort and durability.

Figure 1 ENERGY STAR Label



The NYESLHP will be the newest addition to LIPA's Clean Energy Initiative, a portfolio of programs designed to support the sustained market development of energy efficiency and renewable energy on Long Island, NY. This study presents a detailed analysis of baseline new construction practices and market conditions from the summer and fall of 2003, prior to the start of NYESLHP. The information contained in the report has been used to inform program design. In the future, changes in new construction market activity and building practice will be monitored and compared to this baseline to evaluate the program's success in accelerating the adoption of high performance building technology and practices.

B. Approach

Over the summer and fall of 2003, our team visited 76 newly constructed single-family homes and multi-family buildings¹ in Nassau and Suffolk Counties, New York. Each home was subjected to a comprehensive inspection and testing in order to characterize typical Long Island residential new construction practices. The text box that follows summarizes the investigative steps and findings for a typical home in the study. Concurrently, we gathered statistical data on the new housing markets on Long Island from a variety of national and local sources. This report presents the results and analysis of the on-site research and a compilation of statistical market data on the new residential marketplace.

¹ For purposes of the baseline study, a multi-family building includes either a shared entrance or a common hallway.

Representative Long Island Home

Figure 2 Typical Long Island Single-Family Detached House



Although the houses in the survey were visually attractive from the outside, below the surface we found many cost-effective opportunities for improved energy and comfort performance. Figure 2 shows a typical Long Island house (in the fog) that was included in the study. As with all homes, the inspectors conducted a thorough energy investigation and testing, including at least the following steps:

- Measured and recorded all exterior surfaces (walls, windows, doors, roof/ceilings, foundation) and determined the amount of insulation or other thermal properties;
- Tested the house air leakiness with a calibrated blower door and the duct tightness with a duct blaster;
- Recorded the make and model numbers of all mechanical equipment in order to look up their rated efficiencies from published directories;
- Tested the cooling system refrigerant charge and air flow across the cooling coil to determine cooling system efficiency; and
- Interviewed homeowners to gauge how the home performs from an energy and comfort perspective.

For all 76 buildings in this study, the information collected at each home was compiled and run through analysis tools to determine the results. For this particular home, the characteristics include the following:

- Home Energy Rating Score: 83.3;
- Cooling system oversized by 72%, and rated efficiency (SEER) of 10.2 was de-rated to SEER 5.5, based on improper installation and sizing;
- Estimated total energy consumption of 1178 MMBtu/year at a cost of \$3,001

Typical customer comments on the energy performance of similar homes: "The room over the garage was very cold, the duct system does not seem to be well balanced as some rooms are cool, others hot."

C. Key Findings

Our research clearly indicates that there are significant, cost-effective, opportunities to improve the efficiency of residential new construction on Long Island. This is not unusual, as virtually all residential new construction markets nationwide show substantial room for potential improvement through the promotion of cost-effective, market transformation oriented, energy efficiency programs. However, this study finds that the opportunities on Long Island are greater than in other parts of the Northeast region.

In some ways, the new housing market on Long Island is not that different from the rest of the region. The New York State housing market as a whole has been strong for several years with over 21,000 starts in 2003. The price of a new home has been climbing steadily. Single-family detached housing is the dominant type of new housing.

Table 1 Average Characteristics of Long Island New Single-Family Detached Homes

Features	Units	Value
House Size	Square Feet	2,696
Envelope		
Walls	R-Value	13.8
Basement Ceilings	R-Value	18.4
Ceilings	R-Value	27.5
Windows	U-Value	0.47
Air Leakage		
Blower Door Tested	CFM-50	3,099
Natural Air Changes Per Hour	Nat. ACH	0.56
Space Heating		
Fuel Type		
Natural Gas	%	62%
Fuel Oil	%	35%
Propane	%	3%
Efficiency		
Furnaces	AFUE	83.4%
Boilers	AFUE	81.1%
Cooling		
Central Air Conditioning (homes with)	%	81%
Efficiency		
Unadjusted SEER	SEER	10.3
Adjusted SEER	SEER	7.0
Duct Leakage		
Leakage to Outside	CFM-25	383
Leakage to Outside	% of System Flow	30%
Domestic Hot Water		
Stand-Alone Tank (Natural Gas)	Energy Factor	0.56
Lights and Appliances		
Light Fixtures – Total	Count	29
Light Fixtures – Fluorescent	% Fluorescent	3%
Appliances		
Clothes Washers	% ENERGY STAR	28%
Dishwashers	% ENERGY STAR	73%
Refrigerators	% ENERGY STAR	46%

As shown in Table 1, insulation values for walls, basements and ceilings tend to be somewhat typical. Current residential new construction on Long Island tends to have relatively few energy efficiency features beyond the minimum required by code. Although individual homes met code, the average home examined in this study did not even meet the New York state residential energy code.

Windows were an area of opportunity as the vast majority of windows observed were only standard double-glazed without any low-E or other solar-control or heat-saving characteristics.

Our research specifically suggests that new homes on Long Island perform relatively poorly in terms of thermal shell air leakage and forced air distribution duct system leakage – two of the most important indicators of home energy efficiency when compared to other homes in the region. For instance, compared to average Massachusetts new homes², Long Island homes are 64% leakier (in terms of natural air changes per hour; .56 vs. .34) and have duct leakage rates 109% higher (383 vs. 183 CFM-25).

Natural gas is the preferred space heating fuel, although fuel oil still has a niche (although not in single-family attached homes or multi-family buildings). Natural gas is also the predominant fuel for water heating.

The vast majority of new single-family homes on Long Island are now sold with central air conditioning installed. An important area of opportunity for improved energy performance includes cooling equipment. This study found that although the nameplate SEER ratings of installed equipment was slightly higher than national standards (10.3), when taking into account equipment over-sizing and improper installation (refrigerant charge and air flow over the coil), the actual average delivered SEER for single-family detached homes is 7.0, a greater than 30% reduction in efficiency.

As well, there are tremendous opportunities for improving lighting efficiency, with an average of only one fluorescent fixture per new home. However, the existing ENERGY STAR appliance program seems to be quite successful, given the relatively high occurrence of efficient major appliances.

Another important finding was a disturbingly high incidence of sub-par building practices and problems with ventilation and moisture control. Shortcomings of this type typically lead to poor building performance and durability, as well as uncomfortable and unhappy customers. Two-thirds of homeowners interviewed expressed some negative statement about the energy, builder or comfort issues with their new home.

However, experience has shown significantly improved energy efficiency can be obtained at a modest cost. New Long Island homes already have adequate levels of insulation, and a relatively high incidence of ENERGY STAR appliances. Our least-cost analysis suggests that homebuilders could upgrade the typical new Long Island home to an ENERGY STAR Home level of energy efficiency for slightly more than \$1,000.

The report presents key findings in the following areas:

- Housing starts, transactions, pricing and other market-based information;
- House size, areas, R-values, leakage and other energy-related characteristics;
- Heating, cooling and domestic hot water fuel and system types, sizing, duct characteristics and consumption;
- Lighting and appliance characteristics;

² "Impact of the Massachusetts 1998 Residential Energy Code Revisions" prepared for Massachusetts Board of Building Regulations and Standards by XENERGY, May 14, 2001.

- Home Energy Rating System (HERS) scores; and
- Analysis of code compliance, cost to achieve ENERGY STAR and impacts based on adjusted SEER; and occupant satisfaction.

D. Recommendations

LIPA's NYESLHP will involve a number of strategies, including technical assistance, direct incentives, marketing and consumer education. The program will work closely with builders and other important stakeholders to encourage energy efficient homes that are also high performance buildings. Based on the research conducted for this study, including field testing and observations, discussions with homeowners and data analysis, we make the following recommendations to help improve program performance and maximize market impacts:

1. *Improve Central Air-Conditioning Performance* - NYESLH should focus on encouraging builders to choose energy-efficient cooling equipment, but more importantly to also size it correctly, charge it correctly with refrigerant and to make sure that there is adequate air flow through the system. Our study found that the nameplate SEER level of central air-conditioning installed in new homes was typically low to begin with, and that the effective SEER level was actually much lower due to poor installation practices.
2. *Seal Ducts* – A large percentage of both the heated and cooled air is lost in many new homes due to leaky ducts. NYESLH should emphasize comprehensive duct sealing to reduce duct leakage to industry standards.
3. *Reduce Infiltration* – We found that the average air infiltration (leakage) was 2,000 to 3,000 CFM-50. This should be cut by least 50% to meet the ASHRAE standard of less than 1,000 CFM-50.
4. *Increase HERS Scores* - Encourage energy efficiency performance as measured by the Home Energy Rating System (HERS) scale to capture greater energy savings. Higher scores should perhaps be tied to additional program incentives.
5. *Include All Multi-family Buildings* - Include multi-family buildings of all heights in the program in order to capture the energy saving opportunities in that building sector.
6. *Focus on Lights and Appliances* - ENERGY STAR appliances are already popular in new homes on Long Island and their use could be further expanded. ENERGY STAR residential light fixtures reduce lighting energy, and cooling energy.
7. *Support the New York Energy Code* – The average home in the study did not meet state energy code. NYESLH should work with New York Department of State officials to train builders to meet the requirements of the New York State Energy Conservation Construction Code.
8. *Increase Customer Satisfaction* – The Long Island new home owners in this study were dissatisfied with the performance of their builders, and of their new homes. The NYESLH program is an opportunity to improve builder and home performance and build a positive name for the program and LIPA.

9. *Coordinate Efforts with Gas Utilities* – More energy efficient new homes on Long Island will create benefits for LIPA, and for Keyspan Natural Gas as well. Keyspan should be encouraged to participate in the program, and to take advantage of the technical and economic potential of improved gas efficiency.

The remainder of this report presents the research in the following order:

- Section II: Introduction;
- Section III: Methodology;
- Section IV Residential Market Statistics;
- Section V: Technical Baseline Results; and
- Appendices.

II. INTRODUCTION

In 2004, the Long Island Power Authority (LIPA) will launch the New York ENERGY STAR Labeled Homes Program (NYESLHP) on Long Island. The goals of the NYESHP are to encourage and accelerate the use of proven new construction building practices, equipment and materials to improve the energy performance, durability and comfort levels of new construction on Long Island. The program provides services to, and works closely with the building community and a range of partners. Program activities and strategies include marketing, technical assistance, direct incentives, and quality control.

New construction markets often provide classic examples of important market barriers to energy efficiency including split incentives between the builder and consumer, lack of technical understanding of key efficiency features by builders and subcontractors (e.g., air leakage, duct leakage, etc.) and a lack of consumer inability to differentiate information and labeling to allow for rational comparison of the costs and performance of apparently similar buildings. Also, importantly for LIPA from the long-term resource perspective, cost-effective efficiency upgrades in new construction, if not captured during construction are often “lost opportunities” that negatively impact building performance and durability for decades. For these and other reasons, the NYESLHP is an important addition to LIPA’s Clean Energy Initiative program portfolio.

A. Goals

In order to better understand the residential new construction market on Long Island and to build up a base of knowledge to help in strategically approaching builders, LIPA embarked on a comprehensive study of local residential new construction.³ This study was commissioned by LIPA in the summer of 2003 to provide a baseline analysis of the building and equipment characteristics that impact residential new construction. In carrying out this effort, LIPA commissioned Optimal Energy, Inc. (OEI) and Vermont Energy Investment Corporation (VEIC) to conduct a study of Long Island’s residential market. This effort targets efficiency opportunities in residential new construction with the following goals:

- *Baseline measurement:* The primary objective of the study is to establish a technical baseline that documents the current market for ENERGY STAR Homes to inform initial program designs and future program evaluation.
- *Program Design and Implementation:* A secondary objective of the study is to enhance LIPA’s understanding of the new and existing residential construction markets to inform program design. This information will be used as the NYESLHP is modified and enhanced over time.
- *Builder Outreach Strategies:* With a better understanding of the homes they are building and the market in which the homes are being built, LIPA’s NYESLHP will be more effective in targeting builders and focusing on the problem areas in their homes in order to achieve the greatest program participation and energy savings per participant at the least cost.

³ LIPA’s service territory includes Far Rockaway in Queens. However, Census data for Queens County did not break out Far Rockaway. Therefore, Far Rockaway is excluded from this report. According to LIPA, most of the new residential construction in Far Rockaway is multi-family developments.

- *Program Savings:* As the NYESLHP commences, this study provides a technical baseline against which to compare future participating homes and to assess program savings.

B. Project Team

With these goals in mind, OEI and VEIC oversaw a comprehensive in-field assessment of new homes while also developing an up-to-date characterization of the Long Island residential construction marketplace.

The in-field portion of the study was carried out by certified Energy Raters from the Conservation Services Group (CSG). Analysis of the HVAC systems was performed by the Proctor Engineering Group (PEG) using PEG's CheckMe charge and airflow central air conditioner software and other analysis tools. VEIC and OEI compiled all of these the results, conducted all the analyses, gathered the market statistics and produced this report.

C. Organization of Report

This study provides comprehensive information in two areas:

- **Residential Markets Statistics** – Research into residential transactions, marketplace characteristics, and market actor information statistics from Internet, organizational contacts and personal interviews; and
- **Technical Baseline Study** - Results from on-site new home inspections, testing and home energy ratings and subsequent follow-up detailed analysis. The Technical Baseline Study analyzed three major house types:
 - **Single-Family Detached** – (“SFD”) The predominant house type that is physically separate from other living structures and sits alone on its lot.
 - **Single-Family Attached** – (“SFA”) A living unit with its own separate entrance, with walls that extend from the ground all the way to the roof and separate it from another living unit attached on one or more sides.
 - **Multi-Family Building** – (“MF”) A building with multiple living units and a common entrance and/or hallway and other shared spaces, for example apartment building or senior-living facility.

These three house types are shown in images of representative buildings from the survey in Figure 3, Figure 4, and below.

The main body of the study contains the highlights and primary findings for the single-family detached homes while the appendices include all of the detailed findings, tables and charts for all three house types. As presented further in the methodology, given the small sample sizes of the single-family attached and multi-family house types, we feel that those results, while indicative, cannot be considered statistically valid. As such, the body of this report focuses on the larger sample size captured for single-family detached. When clear differences were identified between the three house types, reference is made in the main section of the report.

In addition, there is significantly more data stored in electronic form that was collected as part of the on-site rating process. If there is some technical aspect of a house that is not presented here but is still of interest, chances are that it was collected, but just not reported. That additional information may be made available upon request.

Figure 3 Representative Long Island Single-Family Detached Home



Figure 4 Representative Long Island Single-Family Attached Home



Figure 5 Representative Long Island Multi-Family Building



III.METHODOLOGY

The study is separated into two primary sections. The Residential Markets Statistics includes the research conducted on Long Island housing and market data. The Technical Baseline Study then includes all of the on-site field inspection information and the analysis of that information.

A. Market Statistics

Extensive market data is provided in this study on residential new construction building trends, major builders, and real estate prices. In addition to the new construction statistics, in Appendix VIII, we also provide data on the market for existing homes. This information will assist in planning and implementation of the Home Performance with ENERGY STAR Program. Refer to the List of Tables and List of Figures after the Table of Contents for a complete list of the available data in this report.

The study gathered data from the following sources: public data sources such as the US Census (web sites), commercial data sources such as the Multiple Listing Service of Long Island, Inc. for home sales data and Statistical Surveys, Inc. for US HUD homes data, and personal interviews.

B. Technical Study

1. Sample and House Types

We designed a target sample of 80 new homes built within the last two years for this study based on location and building type information from Long Island building permit and U.S. Census data. Table 2 shows the target sample by county and house type and the number of actual units included in the study, including two multi-family buildings. Through computer modeling, the two multi-family building surveys yielded projections for 75 multi-family units.

Table 2 Target Sample and Completed On-site Surveys

	Single-Family Detached	Single-Family Attached	Multi-Family	Total
Nassau County				
Target Sample	8	0	5 units	13
Completed On-Site Surveys	5	1	1 building w/ 40 units	7
Suffolk County				
Target Sample	51	2	10 units	63
Completed On-Site Surveys	58	10	1 building w/ 35 units	69
Combined Nassau & Suffolk Counties				
Target Sample	59	2	15 units	76
Completed On-Site Surveys	63	11	2 buildings w / 75 units	76

The target sample proportions in Table 2 also shows how single-family detached homes dominate the new housing market on Long Island. Even though we completed more on-site surveys than needed for single-family attached and multi-family homes, those components of the sample will still too small to yield statistically significant results, as discussed above.

OEII and VEIC contracted with CSG to recruit participants, perform the field inspections, collect the house and customer data, run the tests on the homes, complete the REM/Rate Home Energy Ratings, Right-J building heating and cooling load analysis, and complete a field survey with the homeowner in an Access database. In addition, 50 cooling systems were analyzed in detail using PEG’s CheckMe charge and airflow procedures. CSG offered each customer \$100

for their participation, but still had great difficulty in recruiting. Hundreds of calls were required to schedule 140 site visits. Out of the 140 scheduled visits, almost half cancelled. As a result, the final sample ended up being 76.

Given the difficulty of successfully completing the on-site inspections, there is probably participant self-selection bias in the sample. However, we do not believe that a participant’s willingness to participate in this study was strongly correlated with the energy efficiency of the participant’s home.

The distribution of site-visits was as follows:

- Single-family detached homes: 63
- Single-family attached (i.e. townhouse, walk-up, condo, etc.) units: 11
- Multi-family: 2 buildings (comprising a total of 75 apartments)

The statistical validity of the single-family detached sample in this study is quite good. Given the team was able to survey 63 single-family detached homes, with an emphasis on proportional sample selection based on building patterns, we feel the results are indicative of building practices throughout Nassau and Suffolk counties. As indicated in Table 3, at a 95% confidence interval, the variance for some key measurements in the baseline study is small. However, given our small sample of single-family attached (11 homes) and multi-family (2 buildings), we do not feel those two sub-samples are statistically valid. Nevertheless, the results from those two samples are noteworthy in several categories as detailed in the report.

Table 3 Single-Family Detached – Confidence Intervals

Category	Average	Confidence Interval @ 95.0% (+/-)
HERS Rating	84	0.6%
SEER (Rated)	10	2.0%
SEER (Adjusted)	7	12.5%
Duct Leakage (CFM-25)	375	22.1%

Because we did not have access to all of the units in any entire multi-family building, we had to “construct” theoretical models of the multi-family buildings to use in the analysis. These models were based on thorough inspections of three units in the two buildings.

The data and analyses throughout the study have been separated into the three building types mentioned above (Single-Family Detached, or “SFD”; Single-Family Attached, or “SFA”; and Multi-Family, or “MF”). These three building types can be distinctly different with respect to construction, whether owner-occupied or rented. The NYESLH program may choose to treat each type differently in terms of standards, recommended measures and incentives, based on the study’s results.

2. Data

After the field component of this study was completed, the results from the REM/Rate energy audit, charge and airflow analysis, and in-field homeowner survey were exported into Access for detailed data analysis. The type of data and results contained herein include the following:

- Detailed characteristics of each building component (e.g. area and R- or U-values);
- Equipment efficiencies (e.g. Annual Fuel Utilization Efficiency, AFUE; Energy Factor);
- System performance test results (e.g. house infiltration and duct leakage rates);
- Presence and lack of certain equipment (e.g. manual vs. setback thermostat or ENERGY STAR appliances); and
- Composite average buildings ("User-Defined Reference Home") based on the results of the REM/Rate survey.

Comprehensive technical data were gathered through this effort and includes information and sources from the following:

- REM/Rate (v. 11.2) Home Energy Rating System (HERS) software and accompanying database completed by certified energy raters from on-site inspections and testing;
- Access database (custom-built by VEIC) constructed from supplemental data collected while on-site by the energy raters;
- Right J (Right-Suite Residential J8 v. 5.8.41) mechanical equipment system sizing software;
- CheckMe (Proctor Engineering Group) software to determine the effective cooling system efficiency based on field measurements of system refrigerant charge and airflow over the system coil;
- REScheck (v 3.5 Release 1e) software from the Department of Energy to determine New York State Energy Conservation Construction Code compliance; and
- Blower door and duct blaster testing to measure house air infiltration and duct leakage.

Large amounts of data were gathered for this study. In an attempt to provide a thorough, yet not overwhelming document, we have not included all of it in this report. There are certainly additional ways of examining and analyzing the available data for future dissection and analysis.

3. Analyses

Based on the survey data, the following analyses were conducted in order to better understand the characteristics of the average Long Island new home and to help in designing a more effective New York ENERGY STAR Labeled Homes Program:

- Home Energy Rating System (HERS) results;
- Adjusted Seasonal Energy Efficiency Rating (SEER) results from Check-Me tests of 50 air conditioning systems (in 31 homes);
- Proper heating and cooling system sizing from Right-J load calculation software;
- Least-cost analysis to determine the upgrade cost of the optimal package of energy efficiency improvements to bring the average SFD, SFA and MF buildings to 86, 88 and 90 HERS scores;
- New York State Energy Conservation Construction Code (NY ECCC) compliance for the average SFD, SFA and MF buildings; and

- International Energy Conservation Code 2001 compliance for the average SFD, SFA and MF buildings. (The NY ECC is based on the IECC 2001.)

Conclusions and recommendations for program design and implementation conclude the technical portion of the baseline study.

IV. RESIDENTIAL MARKET STATISTICS

A. Total Residential Transactions

To better understand the residential new construction market, data were collected on “the total number of homes” – new or existing – purchased each year. The Multiple Listing Service of Long Island, Inc. (MLS LI) is responsible for tracking information on the sale of real estate on Long Island, including Nassau and Suffolk counties. MLSLI data shows there were over 22,000 (new and existing) homes sold in 2003. “For-sale-by-owner” homes may account for an additional 10% or more of the market, although no data is available to support this assumption.

B. Residential New Construction Data

1. Sources of Data on New Housing Units

The U.S. Census Bureau (Census) collects data on “New Residential Housing Units Authorized by Building Permit.” Often, permit data may overstate the number of housing units constructed in Long Island each year. However, according to Jim Madsen, Residential Sales Manager for Key Span Gas on Long Island, “virtually all permitted projects get built on Long Island within six months. Therefore, for the Long Island residential market, permit data should be a very reliable proxy for the number of actual units constructed.”⁴

2. Number and Location of New Housing Units

Appendix VIII provides additional data on new construction on Long Island.

Table 4 shows the Census estimates of the number of new housing units for 2001 in Nassau and Suffolk Counties. In 2001, as in 2000, the bulk of new construction, over 75%, occurs in Suffolk County.

Table 4 2001 Nassau and Suffolk County Building Permits

Territory	1-Family	2-Family	3 to 4-Family	5 or More Family	Total
Nassau County	643	32	4	265	972
Suffolk County	3,486	190	104	898	4,678
Combined Nassau/Suffolk	4,129	222	108	1,163	5,650
combined %	73%	4%	2%	21%	100%

Source: U.S. Census Bureau

⁴ Personal Communication with Jim Madsen, KeySpan Gas, Residential Sales Manager, July 2003.

3. Prefabricated Housing

There are two types of prefabricated housing: manufactured housing (a.k.a. mobile homes or HUD homes, which are factory built and delivered on a chassis) and modular homes (which are factory built, but not delivered on a chassis.)

Manufactured housing is subject to U.S. Department of Housing and Urban Development (HUD) regulations. According to the New York Manufactured Housing Association (NYMHA) and as reported by Statistical Surveys, Inc., an average of 74 manufactured homes was installed annually in Nassau and Suffolk Counties, with the majority sold in Suffolk County, during the 2000 - 2002. Table 5 lists the number of units by county for this period. As the data show, compared with the number of site-built homes, manufactured housing does not constitute a significant portion of new housing units on Long Island (less than 1.5% of all new housing units).

Table 5 HUD Homes without Conventional Mortgages

HUD Homes	2000	2001	2002
Nassau	14	15	8
Suffolk	61	58	66
Total	75	73	74

Source: Statistical Surveys, Inc.

No source of information on modular housing units on Long Island was available. However, according to Fred Hallahan, Jr., a consultant to the residential housing industry, each year, there are between 300 and 800 modular housing units installed on Long Island each year. This represents between 5-12% of all new housing units, including HUD Homes.⁵

4. Largest Long Island Builders

Table 6 lists the seven builders who contracted at least 100 homes per year on Long Island. Together they account for 43% of new homes built. An additional 9 builders constructed between 10 and 95 homes each on Long Island in 2001. These sixteen builders accounted for a total of 47% of residential new construction on Long Island. However, this also shows that over half of all new homes on Long Island are constructed by builders who produce fewer than 10 homes per year.

⁵ Personal communication with Fred Hallahan, Jr., Hallahan Associates, Baltimore, Maryland, September 2003.

Table 6 2001 Largest Residential Builders

BUILDER - 2001	Total No. Units Completed & Under Construction	Type	Price Range (\$000)	Long Island Builder's Institute Member?
1. Beechwood Homes	734	Single Family / Condominiums	200-300 / 280+	yes
2. Klar Organization	486	Single Family / Condominiums / Cooperatives	190-300 / 185-300 / 80-150	yes
3. Holiday Organization	376	Single Family / Condominiums / Rental Apartments	265-550 / 250-265 / 125 per mo.	yes
4. Park Ridge Estates	302	Single Family Condominiums Rental Apartments	160-1000 / NA / 1500-1800	yes
5. Klein & Eversoll	220	Single Family	175-450	yes
6. Emmy Building	210	Single Family	250-350	yes
7. LI Housing Partnership, The	112	Single Family / Condominiums	65-125 / NA	no
8. Springbriar Homes	60	Single Family	250-500	yes
9. Country View Properties	51	Single Family / Single Family Condominiums	400 / 225 / 115	yes
10. Windwood Oaks	42	Single Family	350	no
11. Homeworks	25	Single Family	100-700	no
12. Kummer Construction	15	Single Family	300-400	no
13. Torkian Development	12	Single Family	900-4000	no
14. Metro Group	11	Single Family / Condominiums	450-1000 / 250-350	yes
15. Town & Country Estates	11	Single Family	190-250	no
16. Prestan Homes	10	Single Family / Condominiums / Rental Apartments	300-400	no

Source: Long Island Business News: 2001 Books of Lists and Long Island Builder's Institute, Inc.

5. Residential Transactions by County and Zone

Multiple Listing Service of Long Island, Inc. tracks the number of home closings by month.⁶ Table 7 lists the number of units sold in Nassau County from 2000 to 2003. Table 8 shows this data for Suffolk County. MLS LI tracks home closings in Nassau County by five zones. and in Suffolk County by six zones. The annual rate of change in home sales appears to be roughly the same for each county, and has increased over the three year period.

Table 7 Nassau County Number of Units Sold by Zone

Nassau Zone	Sold in 2000	Sold in 2001	Sold in 2002	Sold in 2003
3	1,822	2,118	2,782	3,009
4	735	768	912	1,006
5	1,193	1,230	1,286	1,412
6	1,982	2,216	2,352	2,683
8	1,270	1,213	1,327	1,527
Total	7,002	7,545	8,659	9,637

Note: Data may include sales of new homes as well as existing units

Zone Key:

3	Most of North Hempstead Town & Northern Oyster Bay Town
4	Northeastern Hempstead Town and Oyster Bay communities of Bethpage & Farmingdale
5	Southeastern Hempstead Town 7 southern Oyster Bay Town
6	Southeastern & south-central Hempstead Town & Rockville Centre
8	Northwestern & north-central Hempstead Town, & North Hempstead communities of Albertson, Williston Park & Mineola

Source: Multiple Listing Service of Long Island, Inc.

⁶ MLSLI data may include sales of new homes as well as existing units.

Table 8 Suffolk County Number of Units Sold by Zone

Suffolk Zone	Sold in 2000	Sold in 2001	Sold in 2002	Sold in 2003
20	1,725	1,640	1,902	2,089
21	2,796	2,793	3,129	3,438
24	1,251	1,281	1,384	1,591
25	1,845	1,908	2,001	2,207
28	2,594	2,635	2,717	3,055
30	155	141	240	291
Total	10,366	10,398	11,373	12,671

Note: Data may include sales of new homes as well as existing units

Zone Key:

20	Huntington Town
21	Babylon Town & most of Western Islip
24	Most of Smithtown Town, & Brookhaven communities of Stony Brook & Lake Grove
25	Brookhaven Town south of LIE, most of eastern Islip Town, & towns of Southampton, East Hampton & Shelter Island
28	Brookhaven Town north of LIE, and towns of Riverhead & Southold
30	East of Brookhaven Town line

Source: Multiple Listing Service of Long Island Inc.

6. Sales Prices

Table 9 shows the median sales price by county for 2000 through 2002 as reported by the New York State Association of Realtors (NYSAR) and the New York State Association of Realtors (NYSAR). The value of homes sold in Nassau County is much higher than for homes sold in Suffolk County.

Table 9 Median Sales Price by County

	2000	2001	2002
Nassau	\$260,000	\$293,000	\$350,000
Suffolk	\$188,000	\$220,000	\$269,990
Nassau/Suffolk	\$214,000	\$248,400	\$312,900

Note: Data may include sales of new homes as well as existing units

Source: New York State Association of Realtors

Table 10 shows the percentage change in the data by county, by year and over a two year period from 2000 to 2002. The median sales value has increased significantly from each year.

Table 10 Percentage Change in Median Unit Value by County

	2000-2001	2001-2002	2000-2002
Nassau	12.7%	19.5%	34.6%
Suffolk	17.0%	22.7%	43.6%

Note: Data may include sales of new homes as well as existing units
 Source: New York State Association of Realtors

C. Residential Construction-Related Businesses and Jobs

Table 11 shows data from the Census for 2001 by NAICS code for the number of employees and establishments (businesses) by county. As the data show, the residential construction industry is a significant economic engine for Long Island, with over 41,000 residential construction-related jobs.

Table 11 2001 Residential Construction-Related Jobs

Industry	Nassau		Suffolk		Total	
	Employees	Businesses	Employees	Businesses	Employees	Businesses
Single-family housing construction	2,600	893	3,909	1,221	6,509	2,114
Multi-family housing construction	258	62	245	58	503	120
Plumbing, heating & AC contractors	3,817	595	5,397	834	9,214	1,429
Electrical contractors	3,186	463	5,314	640	8,500	1,103
Carpentry contractors	1,218	342	2,179	572	3,397	914
Wood window & door manufacturing	184	8	183	11	367	19
Lumber, plywood, millwork & wood panel wholesale	287	42	449	40	736	82
Plumbing & heating & AC equip. supplies wholesale	314	41	262	37	576	78
Home Centers	2,612	35	2,658	30	5,270	65
Lessors of residential buildings & dwellings	2,118	607	1,233	212	3,351	819
Residential property managers	1,612	199	314	90	1,926	289
Architectural services	766	157	785	152	1,551	309
Total	18,972	3,444	22,928	3,897	41,900	7,341

Source: 2001 County Business Patterns, U.S. Census Bureau

V. BASELINE TECHNICAL RESULTS

This section contains the results of the in-field investigations of the 76 buildings, including 63 single-family detached housing units, 11 single-family attached housing units and two (2) multi-family buildings (for a total of 75 MF units). Usually, only the information for single-family detached homes is reported. However, where there are significant differences or it is noteworthy, we discuss results for either single-family attached or multi-family housing units. For more information, see Appendix D: Residential new construction survey data, which includes detailed results for all building types.

A. Summary Technical Results

The following tables highlight some of the major findings and characteristics of the average single-family detached houses found on Long Island. More detail on all of these summary results can be found in the sections that follow.

Table 12 provides average single-family detached house characteristics, including size, incidence of central air conditioning, fuel used for space and water heating and prevalence of efficient lighting. Single-family attached homes were about half the size of detached homes, while the two multi-family buildings were significantly larger. All of the single family attached and multifamily homes had central air conditioning and were heated exclusively with natural gas. There were half as many light fixtures in the attached homes as in the detached homes, and typically two of the fixtures were fluorescent. In units in multi-family buildings we found just six light fixtures, two of which were fluorescent.

Table 12 Summary Average House Characteristics for Single-Family Detached

Feature	Units	Single-Family Detached
House Size	Sq Ft	2,696
Central Air Conditioning	%	81%
Space Heating Fuel		
Natural Gas	%	62%
Fuel Oil	%	35%
Propane	%	3%
Domestic Hot Water Fuel		
Natural Gas	%	60%
Fuel Oil	%	36%
Propane	%	2%
Electricity	%	3%
Light Fixtures		
Incandescent	Count	28
Fluorescent	Count	1
Fluorescent	%	3%

Table 13 presents a summary of the average energy rating (assuming properly installed and sized equipment) and the results of our “least-cost” analysis to improve an average single-family detached home to ENERGY STAR standards. Energy ratings for the other house types were in the same range (83.5 for attached homes, and 82.9 for multi-family buildings). As expected, on a per-unit basis it cost the least to upgrade the multi-family units to ENERGY STAR, upgrading the attached homes was somewhat more expensive and then most costly was upgrading the detached homes. In terms of energy code compliance, the single-family attached homes were about twice as likely to fail as the detached homes, and about three times as likely to fail as the multi-family buildings. It also should be noted that the existing New York state code does not have a direct correlation with the Home Energy Rating system.

Table 13 Summary Average Energy Characteristics

Feature	Single-Family Detached
Unadjusted Energy Rating (using HVAC name plate performance)	83.6 points
Adjusted Energy Rating (using actual HVAC performance)	81.6 points
Cost to Achieve 86 Energy Rating Points (including proper sizing and installation)	\$1,084

Table 14 displays the summary HVAC features, including the type of distribution system installed, efficiency (AFUE), rated and adjusted SEER (based on extensive testing and analysis of a subset of homes for which charge and air flow were tested), the resulting HERS ratings using the adjusted SEER efficiencies, duct leakage and domestic hot water characteristics. Single-family attached homes had fewer hydronic systems, while multi-family buildings were 100% hydronic heat with through-the-wall packaged ductless cooling systems. Heating efficiencies (AFUE) for attached and multi-family house types were not far above minimum national standards. The adjusted SEER for the attached homes, taking into account refrigerant charge, air flow over the coil and over-sizing was half (5.0) the rated SEER (10.0) for the three homes included in this sample. Duct leakage for the attached homes was similar to the detached homes. The attached and multi-family buildings used tank-type water heaters with minimal Energy Factor levels (.54 and .55).

Table 14 Summary Average HVAC Characteristics

Feature	Units	Single-Family Detached
Distribution System		
Ducted	% present	59%
Hydronic	% present	41%
Heating Efficiency		
Furnaces	AFUE	83.4%
Boilers	AFUE	81.1%
Cooling Efficiency		
Unadjusted SEER	Rated SEER	10.3
Adjusted SEER	SEER from Proctor	7.0
Adjusted HERS Scores	Energy rating using adjusted SEER	81.6 (from 28 homes)
Duct Leakage		
CFM-25	CFM-25 to outside	383
% of Total System Flow	% leakage to outside	30% (from 49 homes)
Domestic Hot Water Type		
Storage Tank	% present	50%
Tankless Coil	% present	21%
Indirect-Fired Tank	% present	29%
Gas-fired Storage Tank	Energy Factor	.56
Oil-fired Storage Tank	Energy Factor	.57

Table 15 examines appliance efficiency for refrigerators, clothes washers and dishwashers and suggests that LIPA’s residential lighting and appliance program, and support for ENERGY STAR, have been effective. The incidence of ENERGY STAR appliances on Long Island is above both the New York State and national averages. Our research found that new single-family attached homes had fewer Energy Star refrigerators and dishwashers, but twice as many Energy Star clothes washers than did detached homes. Multi-family buildings had about the same incidence of refrigerators but the buildings examined in the study did not have washing machines or dishwashers present in the units.

Table 15 Average Energy Star Appliance Penetration – LIPA, New York State and US

Appliance	LIPA SF Detached	LIPA SF Attached	LIPA MF Building	New York State	All States
Refrigerator	46%	33%	50%	23%	20%
Clothes Washer	28%	55%	NA	18%	16%
Dishwasher	73%	55%	NA	34%	36%

Note: New York State and All States Averages from D&R International (2003).

B. House Characteristics

1. Size

Table 16 provides the size range for new single-family detached houses in square feet. Single-family attached and multi-family individual units averaged almost 1,475 and 815 square feet, respectively.

Table 16 Single-Family Detached Housing Units – Size in Square Feet

Mean	2,696
Minimum	1,130
Maximum	5,997

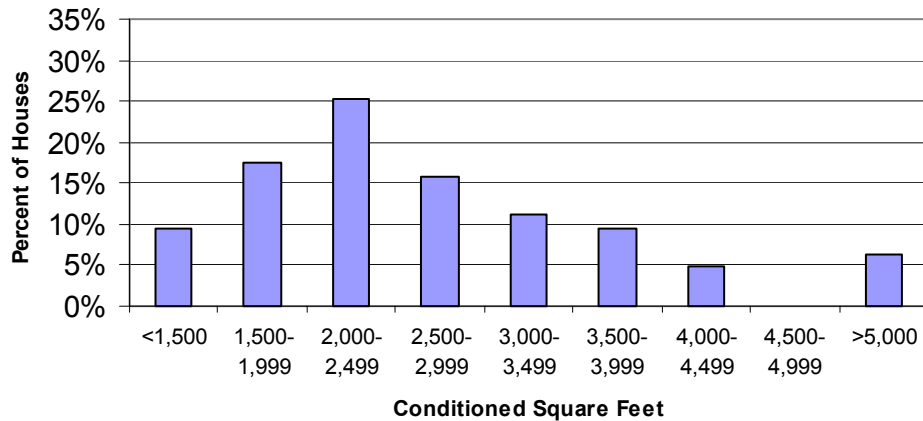
Figure 6 shows a typical Long Island home from the survey.

Figure 6 Typical Long Island Single-Family Detached Home



Figure 7 shows the distribution of single-family detached house sizes. The greatest percentage of units, over 25%, are between 2,000 to 2,499 square feet, followed by units in the 1,500 to 1,999 square feet range.

Figure 7 Distribution of Single-Family Detached Housing Sizes



C. Space Heating

1. Heating Fuel Type, Use and Cost

Table 17 shows data on primary heating fuel for single-family detached homes. Natural gas is used in over sixty percent of new homes. Oil is used in 35% of new units. The only other fuel used is propane.

Assuming only one fuel is used to heat the average home, a home heated with natural gas consumes 954 therms costing \$1154 yearly. On average, an oil heated home consumes 690 gallons, costing \$932 yearly. A home heated with propane consumes 1,041 gallons, costing \$1,562 yearly.

Weighted by fuel type, the average annual cost of heating is about \$1,090⁷. Also, electricity is used to power fans and pumps used in heat delivery and costs just under \$50 per year on average.

In single-family attached homes, 100% of space heating is with natural gas at a cost of approximately \$700 per year. Both multi-family buildings surveyed in the study were heated with natural gas using a hydronic piping distribution system. The average apartment used 119 therms of gas, costing \$143 to heat annually.

Table 17 Single-Family Detached Housing Fuel Use

Primary Heating Fuel	Percent Fuel Type	If Only Fuel, Avg Use/Yr	Average Annual Cost
Natural Gas (Therms)	62%	954	\$ 1,154
Oil (Gallons)	35%	690	\$ 932
Propane (Gallons)	3%	1041	\$ 1,562
Total Weighted Average	100%	-	\$ 1,089

⁷ All costs are estimated using REM/Rate software from Architectural Energy Corp. and current electricity (12.6¢/kWh) and fuel rates for natural gas (\$1.21/therm), oil (\$1.35/gallon) and propane gas ((\$1.50)/gallon) on Long Island.

2. Heating System Types

Table 18 shows data on the number of heating units installed per house for single-family detached units. Most homes have one heating system installed, but approximately 15% have two or more systems. About 80% of single-family attached homes had one heating unit and the rest had two units. In the multi-family buildings we examined, both had a single central boiler that provided heat for the entire building.

Table 18 Single-Family Detached Housing Systems

Number of Heating Units	Percent
1	86%
2	13%
3	0%
4	2%
None	0%
Totals	100%
Weighted Avg # of Units = 1.2	

Table 19 shows the average rated heating output as well as the average Manual J heating design load for single-family units. On average, heating equipment in homes is oversized by almost 90%.

Table 19 Single-Family Detached – Percent Heating Equipment Oversized

Avg Rated Output (Kbtu/hr)	Avg Design Load (Kbtu/hr)	Percent Oversized
87	48	87%

Table 20 presents information on the type of distribution system installed along with primary fuel type. We found that most ducted distribution systems used natural gas, and that oil was used slightly more often than natural gas when by hydronic distribution systems. Propane was never used with hydronic heat. Single-family attached homes only used natural gas, but with a distribution similar breakout to that for detached units. Ducted, forced hot air systems occur more frequently than hydronic hot water heating systems in the single-family homes. One reason for this is that a ducted distribution system can also be used to provide cooling through a central air-conditioning system. In the multi-family buildings, both had hydronic gas heat (and through-the-wall (ductless) units for cooling.)

Table 20 Single-Family Detached Housing Units – Primary Fuel and Distribution System

Primary Heating Fuel	Ducted	Hydronic	Overall
Natural Gas	71%	47%	61%
Oil	25%	53%	37%
Propane	5%	0%	3%
Overall	59%	41%	100%

The average Annual Fuel Utilization Efficiency (AFUE) for single-family detached housing is 83.4% for furnaces, while boilers have a lower average AFUE of 81.1%. In single-family attached units, furnace AFUE is 84%.

D. Cooling

We looked at various aspects of Long Island residential new construction cooling systems, including the following:

- incidence (presence or lack) of both central and room air conditioning systems;
- efficiency (i.e. SEER) as rated by the manufacturer and as installed;
- charge/airflow levels relative to manufacturer’s specifications;
- sizing; and
- adjusted efficiency based on installation and sizing.

The combined effect of these factors has a significant impact on cooling system performance and total electricity consumption during the critical summer peak load period.

1. Central Cooling System Incidence

More than 80% of single-family detached homes have at least one central cooling system. Table 21 shows that almost half the single-family detached homes with a cooling system have one unit. A sizeable number, over one third, have two units. Almost five percent have three or four units.

Table 21 Single-Family Detached Central AC Cooling Penetration

Number of CAC Units	Incidence
1	46%
2	30%
3	3%
4	2%
None	19%
Totals	100%
Weighted Avg # of Units = 1.2	

There is an open question regarding how many homes without central air conditioning systems will install a system at a later date. Follow-up inquiries to survey customers with no central cooling systems in a year or two could reveal how many put in cooling, either as a central system or as window units.

There is a 73% incidence of houses without central air-conditioning when there is a hydronic distribution system, presumably because ducts are not available to transport both heating and cooling.

2. Room Air Conditioner Incidence

Table 22 lists the average number of room air conditioners per house. Most homes do not have any room units, perhaps since they already have a central air conditioning system. Those homes that do have a room AC unit usually have at least two or more wall units installed. Multi-family units all had packaged through-the-wall cooling systems installed in each housing unit.

Table 22 Single-Family Detached Housing Units – Number of Room AC Units

Number of Window AC Units	Incidence
1	46%
2	30%
3	3%
4	2%
None	19%
Totals	100%
Weighted Avg # of Units = 1.2	

3. Cooling System Efficiency

The range of Central Air Conditioning efficiency in the analysis sample ranged from federal standard minimum of 10.0 SEER to a maximum of 14.0 SEER and a mean of 10.3 SEER. Table 23 illustrates the effect cooling system efficiency can have on energy consumption.

Table 23 Single-Family Detached Housing Units – Cooling

	System Efficiency	Avg Cooling MMBtu/Yr All Homes
Mean	10.3	5.2
Minimum	8.0	-
Maximum	14.0	20.6

4. System Sizing

Every central air-conditioner (CAC) was analyzed with the Right-J software to determine proper heating and cooling load sizing. The Right-J results were then compared to the actual listed capacity for all cooling systems to determine the extent each piece of equipment was oversized (or undersized). The results are significant in that single-family detached housing cooling systems were found to be typically 1.7 tons (or about 70%) oversized.

Table 24 presents the average cooling equipment nameplate capacities for single-family detached homes. The industry standard ACCA Manual J version 8 (as calculated by Right-J software) was used to calculate the size that the equipment *should be* for the average house. The table compares the two values, and expresses the resulting oversizing in terms of cooling capacity tons. (A ton of cooling capacity is equivalent to 12,000 Btus.)

Table 24 Single-Family Detached Average Central Air Conditioning Oversizing

Rated Capacity (tons)			Manual J Design Load (tons)			%	Tons
Sensible	Latent	Total	Sensible	Latent	Total	Oversized	Oversized
3.6	1.1	4.6	2.3	0.4	2.7	56.5%	1.7

Notes:

1. Sensible Heat Ratio of 0.77 applied to rated total capacity to derive sensible capacity estimates (ASHRAE Fundamentals, 1993, page 25-4)
2. The estimated degree of oversizing is based on a comparison of the rated sensible load to the design sensible load. Using only total capacity and total load estimates, while providing useful insights, is not as precise since the sensible load is the critical element here.
3. The software includes a 15% allowance for oversizing (in addition to the inherent oversizing allowances already embedded in Manual J)
4. The analysis shows worse oversizing taking place than was found during the Cool Homes baseline update, but because that analysis also looked at existing housing and had a slightly different analytical approach the results are not directly comparable. Both analyses are consistent in the finding that oversizing of residential central cooling equipment is the rule, rather than the exception, on Long Island.

Cooling system oversizing has a number of energy, demand, comfort and first-cost impacts. On Long Island, cooling coincides with system peak so reducing peak demand generates sizeable financial savings for the utility. In addition, when CAC systems are oversized, the larger unit will cycle more often than a properly-sized unit, thereby increasing electrical consumption, household noise, and discomfort. This occurs because CACs operate below rated efficiency when they first turn on and for a short time thereafter. Oversized CAC systems also do a poor job of dehumidifying the air, impacting comfort and increasing the potential for mold and mildew growth. Lastly, oversized CAC systems represent a lost opportunity to reduce the initial purchase costs of the equipment, and the savings could have been directed to other energy-saving measures in the house.

5. Adjusted SEER Results

Tests were conducted on 50 central air conditioning systems in 31 homes (some homes had two or three systems) and measurements on refrigerant charge and air flow over the cooling coil were taken. The results of these tests were then analyzed by Proctor Engineering Group to determine the impact on the seasonal energy efficiency rating (SEER) for each tested unit. An adjustment to account for oversizing was made in addition to the refrigerant charge and airflow adjustments, resulting in a final adjusted SEER rating for each system. The SEER ratings were then averaged in the case of multiple systems to determine the mean adjusted SEER rating for each of the 31 homes.

It is important to note that these 50 central cooling systems in 31 homes are a subset of the entire 76 home/building baseline survey. Therefore some of the findings (e.g. "rated SEER") will show numbers that are slightly different than the average value for the entire 76 homes.

The adjusted SEER ratings reveal that the impact of improper installation of cooling equipment is significant. As Table 25 shows, for single-family detached homes, there is a 23% reduction in SEER, from 10.5 to 8.1 for the subset of units tested, when taking into account improper installation (i.e. improper charge and improper air flow). With the inclusion of improper sizing, the average reduction in SEER rating is 33%.

Table 25 Single-Family Detached Housing Units – Effects of Improper Installation and Sizing

SEER rating				
nominal	w/improper installation	resulting efficiency reduction	w/improper installation and oversizing	overall efficiency reduction
10.5	8.1	22.9%	7.0	33.3%

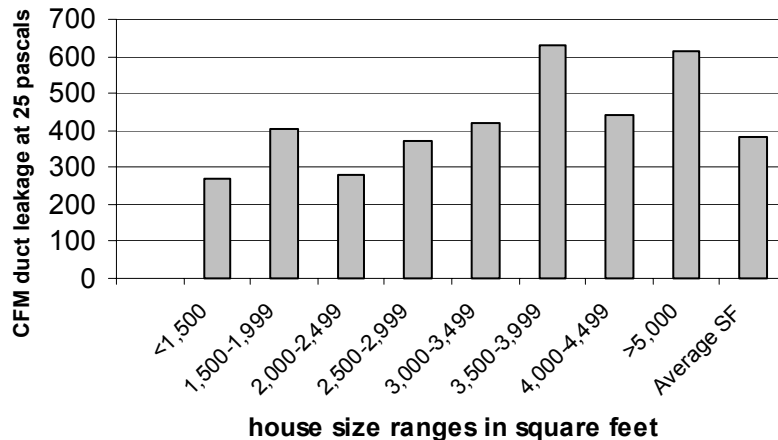
E. HVAC Distribution

1. Duct Leakage

The Long Island houses in the study had extremely high duct leakage (among the highest ever documented). On average, single-family detached homes ducts leaked 383 cubic feet per minute (CFM) at 25 Pascals of pressure to the outside, the standard duct leakage measure. For 25 of the single-family detached homes for which the necessary data were available, an average 30% of all the conditioned air leaked directly to the outdoors. As a point of reference, typical industry standards focus on target duct leakage in the range of 6% of total system capacity. Long Island ducts are 400% to 600% leakier than this standard.

Figure 8 presents information on the average duct leakage to outside, by house size, based on the industry standard test condition of 25 pascals duct pressure. For the most part, duct leakage increases linearly with home size, which makes sense as bigger homes tend to have more ducts. However, for this particular sample, the opposite trend occurred for single-family attached homes - larger homes had less leakage. This is most likely an anomaly due to the relatively small sample size.

Figure 8 Single-Family Detached Housing Units Duct Leakage



2. Furnace Fans

For the homes in which there were furnaces, the collected nameplate data was used with the Gas Appliance Manufacturer’s Association (GAMA) directories to determine the average listed kWh/year consumed. There were no high efficiency electrically commutating motor (ECM) motors found in the sample homes. The average installed furnace fan is rated to use 756 kWh/year in the single –family detached housing examined. Homes with multiple furnaces would use proportionally more electricity to operate the furnace fans.

F. Thermostats

Almost two-thirds (62%) of the new single-family detached homes visited did not have programmable thermostats installed. In the single-family attached homes sampled, more programmable thermostats were present (about 45%), yet in the two multi-family buildings inspected, only non-programmable thermostats were installed.

G. Mechanical Ventilation

Surprisingly, very few single-family homes visited had any type of mechanical ventilation system (i.e. a quality fan on automatic controls) beyond standard bath fans and kitchen range hoods. One attached housing unit had an exhaust-only system and another had a balanced system. In the multi-family buildings inspected, one of the two buildings did have a balanced supply and return ventilation system, whereas the other building had no mechanical ventilation system.

H. Domestic Hot Water

1. Domestic Hot Water Fuel Use and Cost

Table 26 shows that in single-family detached homes, natural gas is the predominant fuel for domestic water heating followed by oil. Propane was the only other combustion fuel used for domestic hot water. As might be expected, the fuel type used for domestic hot water very closely mirrors that of the primary heating fuel used. On average, it costs a little more than \$300 to heat water each year with significantly higher costs if the fuel source is electricity or propane.

Table 26 Single-Family Detached Housing Units – Domestic Hot Water Fuel

Type of Energy	Percent	Avg Unit Annual Consumption	Avg Annual Cost
Electricity (kWh)	3%	5438	\$685
Natural Gas (Therms)	60%	260	\$315
Oil (Gallons)	36%	190	\$256
Propane (Gallons)	2%	294	\$441
Weighted Average	-	-	\$308

Note: Estimated fuel costs in LIPA service territory are: Electricity \$0.126/kWh (\$36.92/MMBtu); Natural Gas \$1.21/therm (\$12.10/MMBtu); Oil \$1.35/gal (\$9.74/MMBtu); and Propane \$1.50/gal (\$16.38/MMBtu),

2. Domestic Hot Water System Type

The most efficient way to heat hot water is by running a zone off of a hydronic system boiler through a storage tank (“indirect-fired storage tank”). A less efficient approach, also using a boiler, is the tankless coil, which typically requires the boiler to be ignited each time there is a call for hot water. A standard stand-alone storage tank domestic hot water system efficiency is similar to that of a tankless coil. The average stand-alone storage size is 43 gallons in single-family detached housing with slightly smaller sizes on average in the other housing stock types.

Figure 9 shows the distribution of domestic hot water heat system type. Half the units installed in single-family detached houses are stand-alone tanks with the remainder very roughly split between the other two types of systems.

Figure 9 Single-Family Detached Housing Units – DHW System Type

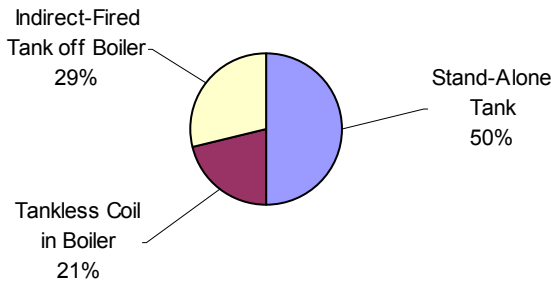


Table 27 shows the percent domestic hot water fuel type compared to the system type. Most stand-alone tanks use natural gas as the fuel source. Virtually all tankless coils are used in conjunction with oil-fired boilers. Indirect-fired tanks were found in roughly equal proportions using either natural gas or oil fired boilers. To a much lesser extent, stand-alone tanks use electricity and propane as a fuel source.

Table 27 Single-Family Detached Housing Units – DHW Types

	Electricity	Natural Gas	Oil	Propane
Stand-Alone Tank	3%	42%	3%	2%
Tankless Coil in Boiler	0%	2%	19%	0%
Indirect-Fired Tank off Boiler	0%	16%	13%	0%

3. Domestic Hot Water Energy Factor

Table 28 shows the average domestic hot water heating system Energy Factor (efficiency) by system and fuel type for single-family detached homes.

Table 28 Single-Family Detached Housing Units – Average DHW Energy Factor

	Electricity	Natural Gas	Oil	Propane
Stand-Alone Tank	0.88	0.56	0.57	0.62
Tankless Coil in Boiler	N/A	0.55	0.53	N/A
Indirect-Fired Tank off Boiler	N/A	0.76	0.76	N/A

4. Number of Domestic Hot Water Units

Very few homes have more than one domestic hot water system or tank. All single-family attached and multi-family homes had just one unit each.

5. Location of Domestic Hot Water Units

Two-thirds of the domestic hot water systems are located in unconditioned spaces, typically the basement. A sizeable number of the single-family detached systems (13%) are located in the garage. Overall, only a fifth of the hot water heaters are located within a conditioned area.

I. Building Envelope

Table 29 summarizes average house thermal characteristics for air leakage, windows, walls and insulation.

Table 29 Single-Family Detached Summary Average Thermal Envelope Characteristics

Feature	Units	Single-Family Detached
Air Leakage		
Blower Door Tested	CFM-50	3,099
Natural Air Changes per Hour	Nat. ACH	0.56
Windows		
Thermal Properties	U-Value	0.47
Shading Properties	Solar Heat Gain Coefficient	0.54
Glazing Percentage	% Window to Wall Ratio	17.7%
Walls	R-Value	13.8
Basement Ceilings	R-Value	18.4
Ceiling	R-Value	27.5

1. Foundations

Figure 10 shows the prevailing foundation types for single-family detached homes. For detached homes almost three-quarters are over an unconditioned basement. For single-family attached homes, 45% are on a slab, followed equally by conditioned and unconditioned basements (18% each). In the two multi-family buildings included in the study, both were on slabs.

Figure 10 Single-Family Detached Housing Units – Foundation Type

Foundation Type	Frequency	Percent
Conditioned Basement	4	6%
Enclosed Crawlspace	2	3%
Multiple Types	6	10%
Open Crawlspace	2	3%
Slab	2	3%
Unconditioned Basement	47	75%
Total	63	100%

The findings indicated that there is very little slab edge and basement wall insulation in new homes on Long Island, unless the foundation is intentionally built as “conditioned space”, in which case the walls are insulated with R-13. In most situations with unconditioned basements, the basement ceilings are insulated.

2. Band Joists

Most band joists occur between conditioned or unconditioned to the ambient. The average band joist insulation is similar to the R-values in walls. Single-family detached units have an average of R-15 band joist insulation vs. R-10 for attached and multi-family housing units.

3. Exposed Floors (Over Unconditioned Basements)

Exposed floors exist most often over unconditioned basements and crawlspaces. This finding is significant in that it appears that many homes on Long Island insulate the floor over the basement or crawlspace, which increases the thermal performance of homes, but results in cooler basements and places any of the ducts, hydronic distribution pipes and mechanical systems outside the thermal envelope of the house.

4. Above Grade Wall Insulation

The majority of above grade wall insulation occurs between conditioned to the ambient and is predominantly about R-13.

5. Windows

The solar heat gain coefficient (“SHGC”) is the standard indicator of a window's shading ability. (SHGC is the fraction of solar radiation admitted through a window or skylight, both directly transmitted, and absorbed and subsequently released inward.) SHGC is expressed as a number without units between 0 and 1. Low SHGC will increase heating energy consumption and decrease cooling.

The window average U-value (or U-factor, a measure of the rate of heat flow through a material or assembly) is expressed in units of Btu/hr-ft²-°F or W/m²-°C. Window manufacturers and

engineers commonly use the U-factor to describe the rate of non-solar heat loss or gain through a window or skylight. Lower window U-factors have greater resistance to heat flow and better insulating value. Detailed window information is available in the appendices.

Table 30 All Buildings – Window Characteristics

Window Glazing	Single-Family Detached	Single-Family Attached	Multi-Family
Average Percent Glazing	18%	15%	30%
Average SHGC	0.54	0.55	0.73
Average U-Factor	0.47	0.50	0.87

The characteristics of the windows found in single-family detached and attached units indicates standard double-glazed windows, likely vinyl or wood, without any special low-E (emissivity) coatings or other beneficial components are what is present. For multi-family buildings, the windows described are most likely double-glazed with poorly insulating metal frames. All of these are poor windows and leave much room for improvement.

6. Skylights

SHGC and U-Values for the average skylights found in the single-family detached study homes were generally better performers (U-value = 0.44 and SHGC = 0.41) than the windows, which can be partly attributed to the fact that some skylight manufacturers only make their models available in low-E and high performance glazing options.

7. Doors

Homes include an average of two doors (39 square feet) that are not highly insulated (R-3.2) and which contain some glazing.

8. Ceilings

Almost three quarters of ceilings are flat. Both flat and sloped ceilings in single-family attached homes had about the same R-27 insulation.

9. Infiltration (Air Leakage)

The Long Island homes in the study were extremely leaky when tested with a blower door.

Single-family detached homes had an average air leakage rate of 3,099 CFM at 50 Pascals pressure differential. Homes leaked more the larger the home, as Figure 11 shows for single-family detached homes.

Figure 11 Single-Family Detached Housing Units – Air Leakage Rate by House Size

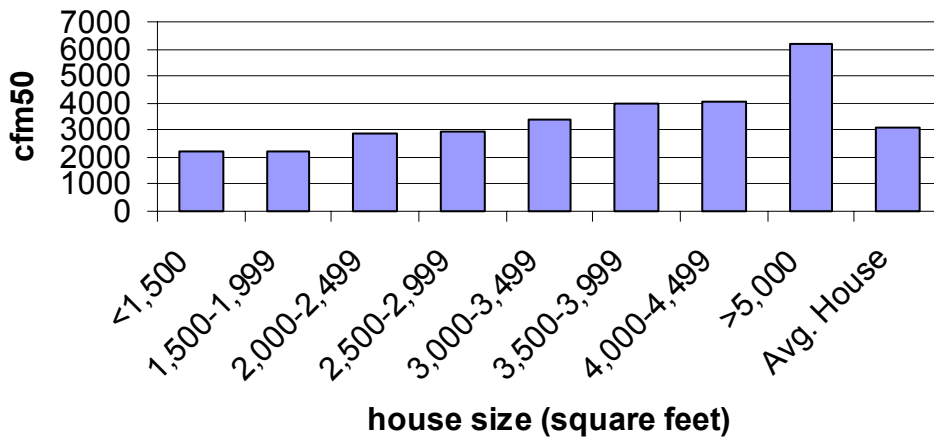


Table 31 provides the range of infiltration rates expressed in projected natural air changes per hour. While there were some homes tighter than ASHRAE 62-89 standards (0.35 air changes per hour), there were also some very leaky homes exceeding one air change per hour. On average, these homes were more than half again as leaky as recommended by ASHRAE.

Table 31 Single-Family Detached and Attached Housing Units – Natural Air Changes Per Hour

Natural Air Changes Per Hour	Single-Family Detached	Single-Family Attached
Mean	0.56	0.63
Minimum	0.26	0.33
Maximum	1.09	0.79

J. Lighting and Appliances Characteristics

As part of the study, we collected detailed information on the make and model of the major household appliances in each home. We also collected the number of incandescent and fluorescent hard-wired fixtures in each room.

1. Light Fixtures

Table 32 shows the average number of fluorescent and incandescent hard-wired fixtures by location in single-family detached homes. Fluorescent (pin-based) fixtures are a very low percentage, just 3%, of all fixtures. The average Long Island detached new home has just one fluorescent fixture installed (out of twenty nine total fixtures.)

In single-family attached homes fluorescent fixtures are almost twelve percent (12%) of fixture types. The average new single-family attached unit has two fluorescent fixture installed (out of

seventeen total fixtures.) Virtually all fluorescent fixtures are installed in kitchens, with a few in bathrooms and none elsewhere.

The average new multi-family unit has two fluorescent fixture installed (out of 5.5 total fixtures.) Fluorescent fixtures are installed in kitchens, living and bathrooms. No incandescent fixtures were installed in kitchens, living or bathrooms in the two buildings included in the survey.

Table 32 Single-Family Detached Housing Units – Lighting Fixture Types

Location	Fluorescent	Incandescent	Total
Bedrooms	0.4%	20.3%	20.7%
Kitchen	1.1%	17.0%	18.0%
Bathrooms	0.4%	12.8%	13.3%
Hallway/Entry	0.2%	11.2%	11.4%
Living Room	0.1%	8.0%	8.1%
Dining Room	0.1%	7.8%	8.0%
Office	0.0%	5.8%	5.8%
Family Rm/Den	0.7%	4.7%	5.4%
Exterior/Yard/Unheated Porch	0.0%	4.8%	4.8%
Basement	0.0%	3.0%	3.0%
Garage	0.0%	3.0%	3.0%
Finished Work Area	0.0%	0.5%	0.5%
Utility/Laundry Room	0.0%	0.4%	0.4%
Mudroom/Heated Porch	0.0%	0.1%	0.1%
Total	3.1%	96.9%	100.0%
Avg Number of Fixtures / Unit	1	28	29

Table 33 compares the incidence of lighting fixture types on Long Island with that in Vermont, Connecticut and New Jersey. Long Island was well below that of Vermont, just behind New Jersey and ahead of Connecticut in fluorescent fixture installation. All of the other studies predated the Long Island survey.

Table 33 Comparison of Fixture Type By Residential New Construction Study

Baseline Study	Incandescent	Fluorescent	Other	Sample Size
Connecticut, 2002 (CLP & UI)	99%	1%	n/a	n/a
Long Island, 2003 (LIPA)	97%	3%	n/a	1,404
New Jersey, 1997 (PSE&G)	96%	4%	n/a	1,355
Vermont, 2002	79%	14%	7%	5,310

2. Appliances

Major appliance make and model numbers were recorded in each home inspected. This information was used to ENERGY STAR rated appliances. Notably, there were quite a few ENERGY STAR appliances going into new homes. LIPA has offered incentives for the purchase of ENERGY STAR clothes washers for several years, and has participated in regional ENERGY STAR awareness campaigns which probably influenced builder and homeowner choices. Table 34 shows that over one-quarter of the clothes washers were also ENERGY STAR. Almost one-

half of all refrigerators in the study were ENERGY STAR, as were almost three quarters of the dishwashers, when present (ENERGY STAR clothes washers have the highest incremental cost over conventional models of the three appliance types). None of the freezers or second refrigerators were ENERGY STAR units. The table also indicates the tendency to move major appliances from previous homes.

Table 34 Single-Family Detached Housing Units – ENERGY STAR Qualified Appliances

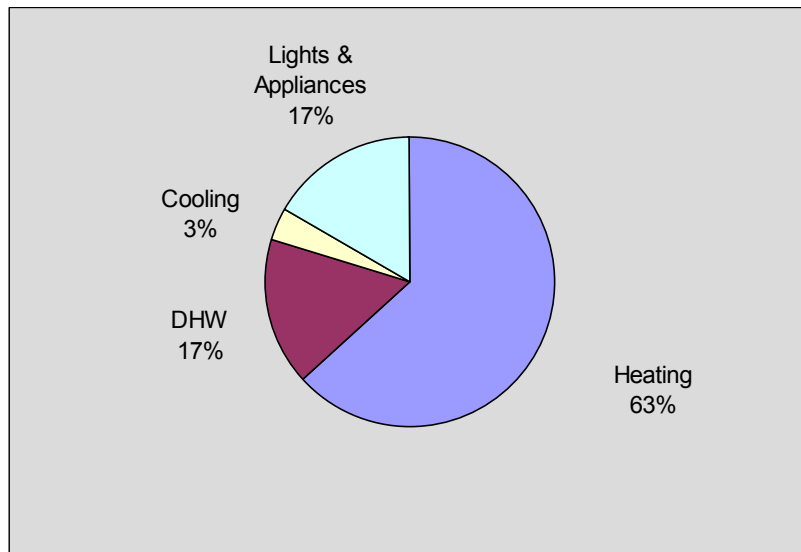
Appliance Type	Energy Star	moved from previous home
Clothes Washers	28%	10%
Dishwashers	73%	2%
Freezers	0%	20%
Refrigerators	46%	2%

K. Energy Consumption

REM/Rate modeling software was used to calculate not only the energy ratings of each home as well as the projected energy consumption. Figure 12 shows the breakout of energy use (in MMBtu per year) for heating, domestic hot water (DHW), cooling and lights and appliances. Heating comprises almost two-thirds of total usage in new single-family detached homes. Domestic hot water, and lights and appliances contribute almost 17% each, followed by cooling at about 3%.

In single-family attached homes, since some of the walls are attached to other units, there is less heat loss or gain. Therefore, heating is about half of total consumption (compared to almost two-thirds for detached homes). Domestic hot water and lighting and appliances make up about 20% each. Only about 3% of total energy use is for cooling. In multi-family buildings, the largest energy end-use is domestic hot water (about 40%), followed by lights and appliances at 32%, heating at 23% and cooling at 5%.

Figure 12 Single-Family Detached - Average Consumption by Major End Use Category



Consumption magnitude of single-family housing, as projected by REM/Rate, ranges widely from a low of 70.8 MMBtu to a high of 377.8 MMBtu. The average consumption projected is 151.6 MMBtu.

More detailed information on consumption by heating, cooling, domestic hot water and lights and appliances can be found in the appendix.

L. Home Energy Rating System (HERS) Scores

We used REM/Rate extensively to determine how the survey buildings rate, perform and cost to operate. This software is generally regarded as the most widely used home energy rating system (HERS) software and is expected to be used on Long Island for the New York ENERGY STAR Homes Program.

In order for a home to receive an ENERGY STAR label, it needs to score at least 86 points (out of a possible 100) on the HERS scale. This level is set at 30% more efficient than the CABO Model Energy Code (MEC), which would score at 80. For each 5% savings relative to the 80-point MEC home, one point is earned.

1. Unadjusted and Adjusted HERS Scores

On Long Island, the average HERS scores came in higher than expected given significant inefficiencies found in some system components. The scores presented in Table 35 are the average of all 76 homes and buildings in the survey (from all three house types). The average energy rating is 83.4 points. However, when taking into account the lower effective SEER ratings in single-family detached homes due to improper charge and air flow, the “adjusted” average energy rating is 81.1 points. As shown in the Table 35, at the score range extremes, improper CAC sizing and installation has no effect, presumably due to being outweighed by other house characteristics. Typically, however, the proper sizing and installation results in an increase in the HERS score by over 2 points.

Although HERS ratings currently assume that all equipment is properly installed and provide full credit given that assumption, there are proposed changes to the national HERS standards (through the Residential Energy Services Network or RESNET) that will only allow full credit if equipment is tested and demonstrated that it is properly installed. In anticipation of this new scoring in 2005, we projected energy rating scores both under the current scenario assuming equipment is properly installed (“unadjusted” for all 76 homes) and with the lower efficiencies using the “adjusted” SEER ratings (resulting in the “adjusted” HERS scores for the 31 homes that had the cooling systems tested).

Table 35 All Building Types – Effect of Improper Installation and Sizing Practices

All Building Types	Unadjusted HERS Score	Adjusted for Proper Central AC Unit Installation and Sizing
Mean	83.4	81.1
Minimum	77.9	77.9
Maximum	88.0	88.0

One of the outputs of this study was the definition of the “User-Defined Reference Home” (UDRH) for Long Island. The UDRH is a composite average building constructed from the average areas, R- and U-values, efficiencies and other characteristics of the study sample. A UDRH was calculated for each of the three house types to serve as a benchmark against which the success of the NYESLH program may be measured.

Table 36 provides a comparison between SEER-unadjusted and -adjusted rating scores for the single-family detached UDRH, relative to the actual buildings evaluated. Rating scores dropped 1.3 points from 83.8 to 82.5 for the single-family detached homes. This is due primarily to the 33% lower SEER ratings due to improper cooling system installations.

Table 36 Single-Family Detached Housing Units - Rating Scores

Single-Family Detached	Average Unadjusted HERS Score	Average HERS Score Adjusted for Actual AC Installation and Sizing
Actual Bldgs	83.6	81.6
Composite Bldg	83.8	82.5

The difference between the average score for the actual buildings and the score for the UDRH is a result of the difference between simple numerical averaging and the estimation process used to calculate the UDRH.

2. Reasons for High HERS Scores

It surprised us that the HERS rating scores for new homes on Long Island came out as high as they did, given that there was no prior energy efficiency program for residential new construction, and major energy-efficiency-related problems, opportunities and issues identified. We reviewed the results with Architectural Energy Corp., the developers of REM/Rate, to see if they could help explain the situation, and they made the following observations about the homes in this study:

- House air infiltration was a little less (better) than the HERS reference home, which would result in some rating points;
- Duct losses (leakage and conduction) were less than the HERS reference house, resulting in some credit;
- Heating system AFUE was higher than the reference home’s (83% vs. 78%), gaining points; and
- Window area was less than for the reference home, resulting in greater energy savings and some additional credit.

However, just because new Long Island homes are superior in some ways to the HERS reference home does not mean that they are energy efficient by current standards. The HERS reference home is based on the CABOMECE 1993 code, and as a result is now somewhat outdated. RESNET is in the process of upgrading the standard reference home to the current IECC code.

3. HERS Score Statistical Validity

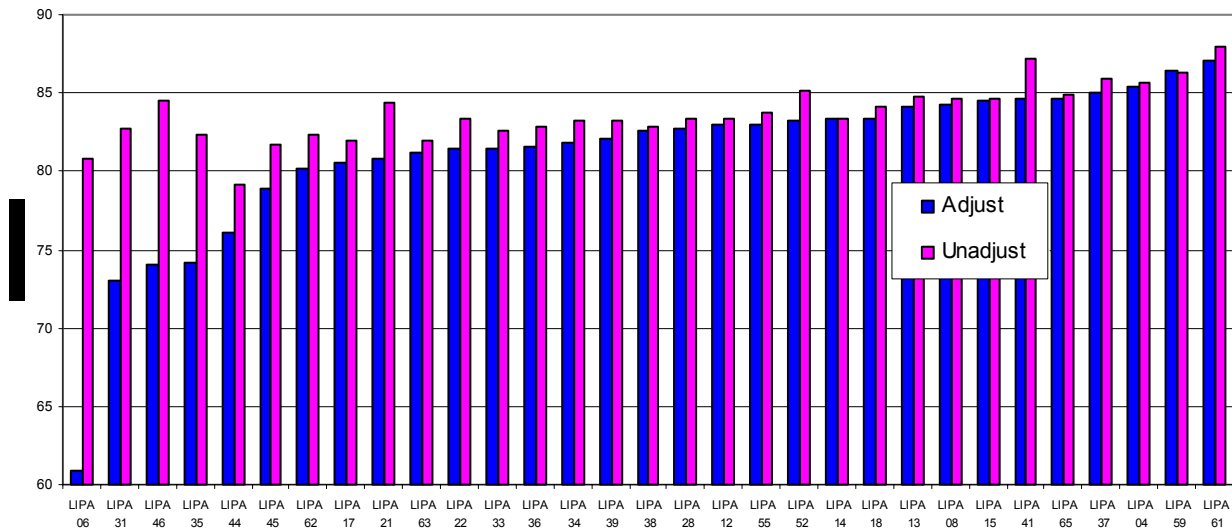
The statistical validity of the HERS scores is provided below.

Table 37 HERS Score Statistical Validity

House Type	Unadjusted HERS Score	Adjusted HERS Score
Single-family detached	83.6 +/- 0.5 at a 95% confidence level	81.6 +/- 1.4 at a 95% confidence level

Figure 13 portrays rating scores, with both unadjusted and adjusted SEERs, by house for the 31 single-family detached and attached homes. For these homes, the impact of taking into account proper CAC sizing and installation on the HERS rating was about 2.3 points on average. This can be significant when trying to achieve ENERGY STAR status. The graph shows that for some homes that had properly installed cooling systems, the “adjusted” and “unadjusted” rating scores were just about the same. (The sites are shown in ascending order of adjusted SEER rather than by numeric identification to provide greater visual clarity.)

Figure 13 Comparison of HERS Ratings – Adjusted SEER vs. Unadjusted SEER



4. HERS Score Distribution

Table 38 shows the distribution of HERS scores. Eight percent of new single-family detached and attached homes meet the ENERGY STAR threshold of 86 points. This was somewhat surprising since it has been 10 years since there has been a comprehensive residential new construction energy efficiency program on Long Island (“NY-STAR”).

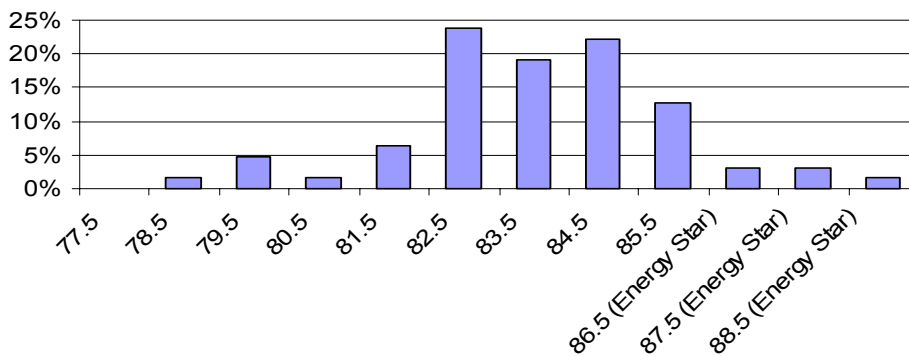
Comments from some of the owners of the high-scoring homes suggest that they have a higher-than-usual awareness of energy efficiency and were able to work with their builders during construction to improve the efficiency of their homes. It may also be that the high-scoring homes were built by an enlightened builder or builders, but the sample size is too small to support that type of analysis.

Table 38 Single-Family Detached – HERS Score Distribution

HERS Score	Frequency	Percent
77.0 - 77.9	0	0.0%
78.0 - 78.9	1	1.6%
79.0 - 79.9	3	4.8%
80.0 - 80.9	1	1.6%
81.0 - 81.9	4	6.3%
82.0 - 82.9	15	23.8%
83.0 - 83.9	12	19.0%
84.0 - 84.9	14	22.2%
85.0 - 85.9	8	12.7%
86.0 - 86.9 (Energy Star)	2	3.2%
87.0 - 87.9 (Energy Star)	2	3.2%
88.0 - 88.9 (Energy Star)	1	1.6%
Total	63	100.0%

Figure 14 Single-Family Detached Housing Units – Percent HERS Score provides a graphic view of the home energy rating score distribution for single-family detached housing units using the score range bin mid-point. While only eight percent of new single-family detached homes currently meet the ENERGY STAR threshold of 86.0 points, it appears that the bulk of the remaining housing could achieve ENERGY STAR status with a moderate level of performance upgrades.

Figure 14 Single-Family Detached Housing Units – Percent HERS Score

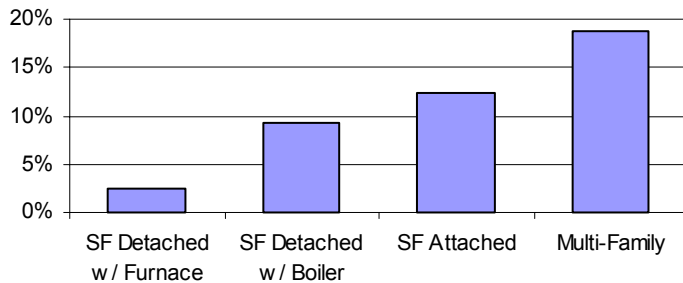


M. Analysis Results

1. New York State Energy Conservation Code Compliance

Using code compliance software, we analyzed the 2002 New York State Energy Conservation Construction Code compliance of the single-family detached, single-family attached and multi-family composite UDRHs. As Figure 15 illustrates, none of these composite buildings actually met the New York energy efficiency code (last updated in July 2002).

Figure 15 All Building Types – Heat Loss Rate Greater than NY Energy Code (REScheck)

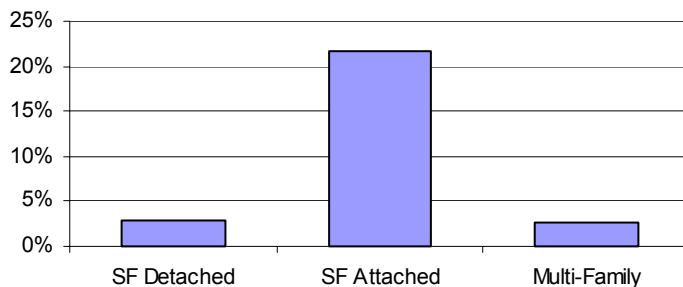


There appears to be a significant opportunity for the New York ENERGY STAR Labeled Homes Program to assist with code compliance on Long Island.

2. Energy Code Compliance using REM/RATE

We conducted the same type of analysis, using REM/Rate software, comparing the composite UDRH homes against the 2001 International Energy Conservation Code (IECC 2001) As indicated in Figure 16, none of the UDRHs actually met the IECC 2001 code either.⁸

Figure 16 All Building Types – Heat Loss Rate Greater than IECC 2001



When each home was run individually to verify code compliance, over 75% of single-family detached homes in the study failed to meet the IECC 2001 thermal code requirements.

⁸ The 2002 New York State Energy Conservation Construction Code is roughly equivalent in stringency to the IECC 2001 code.

3. Least-Cost Analysis

Least-Cost Overview

The purpose of the least-cost incentives analysis is to determine those combinations of measure upgrades that would most cost-effectively bring the homes in the study to the designated ENERGY STAR home levels of 86, 88, and 90 points. The results of this study will assist planners to design programs and set incentive levels that will truly move the market toward higher levels of ENERGY STAR residential new construction. In addition, the analysis demonstrates which measures are generally more cost-effective and yield greater energy savings.

The methodology used to conduct this least-cost analysis consists of several key parts. First, the three separate user-defined reference homes (UDRH) were created, as discussed above, to serve as proxies for all single-family detached, single-family attached and multi-family housing on Long Island. Second, the design energy efficiency of central AC equipment installed in the UDRHs was compared to information gathered from actual installations and the effective SEER of the central AC system in the UDRHs were adjusted downward.⁹ Third, potential efficiency measures such as improved building shell, better mechanical equipment, etc. were added to the REM/Rate models of the UDRHs. Through an iterative process, the most cost-effective combination of efficiency measures needed to reach 86, 88, and 90 points were determined. The incremental costs for the efficiency measures were based on existing information collected from an extensive survey of builders and product distributors in New Jersey¹⁰.

Least-Cost Modeling Requirements

Healthy air-tight homes are dependent on key building components such as mechanical ventilation systems. As such, all least-cost modeling included mechanical ventilation systems. In addition, six ENERGY STAR interior fixtures, programmable thermostats and duct sealing were modeled in all house types. All equipment included as part of an upgrade was assumed to be properly installed (per program requirements) and to operated at rated efficiency levels (e.g. SEER 13 equipment was modeled at SEER 13). Cost credit was given for right-sizing equipment and for the elimination of a chimney when installing a sidewall-venting high efficiency furnace.

Least-Cost Modeling Results

In general, across the three house types, the most cost-effective measures, not including the required components (discussed above), were the following:

- Air sealing to 0.25 ACH (with mechanical ventilation) and 0.35 ACH;
- Water heater upgrades to an energy factor of 0.61, 0.64, and 0.84;
- Furnace upgrades to an AFUE of 90% and 92%;
- Cooling system upgrades to 13 and 14 SEER; and
- ENERGY STAR windows (U=0.39, SHGC=0.53 and U=0.37, SHGC=0.46).

⁹ No SEER adjustments were made for multi-family air-conditioning units as charge and air-flow analysis was not completed for this house type since they have packaged, through-the-wall units..

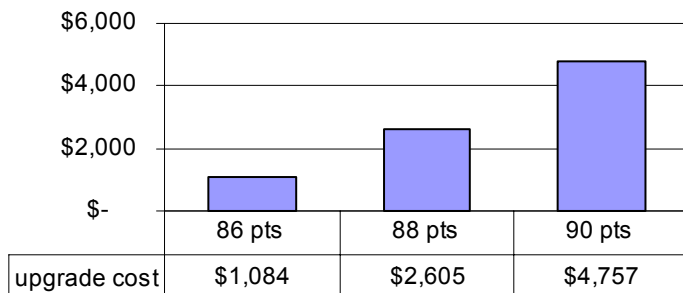
¹⁰ Faesy et al. 2003. New Jersey ENERGY STAR Homes Program Incentives and Smart Growth Analysis. Prepared for New Jersey Utilities Collaborative.

Table 39 Typical Effect of Cost-Effective Upgrades on Energy Star rating

	86 points	88 points	90 points
Air Leakage Rate			
0.35 ACH	X		
0.25 ACH		X	X
Water Heater			
0.61 EF	X		
0.64 EF		X	
0.84 EF			X
Heating System			
90% AFUE	X		
92% AFUE		X	X
Cooling System			
Actual 13 SEER	X		
Actual 14 SEER		X	X
Windows			
0.39 U-value	X	X	
0.37 U-value			X

With limited incentive dollars, focusing on HVAC improvements, air-sealing and water heating upgrades appears to be the most cost-effective route toward ENERGY STAR levels. As Figure 17 below indicates, the incremental costs to reach 86, 88 and 90 points increase with the desired point level. As expected, the least-cost path to obtaining ENERGY STAR levels of 86, 88, and 90 points is greatest for single-family detached, followed by single-family attached, and multi-family units.

Figure 17 Single-Family Detached Least-Cost Analysis Results



Recommendations

This least-cost analysis provides useful guidance for program planning. Because the LIPA new home baseline is relatively high already (82.5 points with “UDRH” average composite house with adjusted SEER), the cost to reach ENERGY STAR at 86 points are relatively modest. In fact the current incentives of \$1,270 (\$850 plus \$420 for the HVAC) are about in line, considering the rating fee (approximately \$400 to \$500) needs to be deducted from this amount.

If LIPA wishes to incentivize builders to achieve higher HERS scores in the future, this analysis provides some useful guidance about the approximate costs to achieve 88 and 90 points, taking a least-cost path.

4. Occupant Satisfaction

As part of the on-site inspections, raters asked homeowners a few general questions about the energy performance of their homes and satisfaction with its energy performance. They also noted aspects of the home that were in need of energy improvements. The responses clearly showed that homeowners did not consider Long Island builders to be quality builders in terms of energy, and in terms of related performance characteristics including comfort.

In one set of open-ended questions about their homes, 68% of customers made comments critical of their home builder's quality of work. Some examples follow below:

- Owner and neighbors all complained about high energy bills
- Owner says first floor does not get warm; they had to weather strip the slider themselves
- Cooling bills high
- AC systems have not worked right since day one, builder not to be found
- Room over garage is very cold, carpeted floor there is cold as well
- Room over garage very cold, duct system does not seem to be well balanced some rooms cool, others hot
- Draft, uneven temps, no setback

The energy raters were able to express their professional judgment about aspects of the homes that they felt deserved some attention or were otherwise worthy of comment. Although many of their comments were favorable, regarding "typical construction", there were a number of comments that indicate a real need for builder education. Some of their comments follow:

- Pretty good quality, but huge building science errors, gutters dumping water against foundation, wet crawl, lots of mold in less than one year, bath fans emptying in roof bays, uninsulated cooling ducts in attic
- No 'building science' here, evidently bath fans are not required in New York; Jacuzzi or not.
- Very leaky, large leaks in ducts, uninsulated slab, 2x4 construction
- 2x4 framing, no low-E on windows, basement ceiling insulation poor
- Duct leakage abysmal, R-19 insulation in attic, clear windows, very thin uninsulated, attic hatch not-weather-stripped

In the recommendations section, raters named practically every component of the homes as needing attention and upgrading. Windows, ceiling and wall insulation, duct and air leakage were frequently mentioned. The recommendations suggest that home construction practices might be improved through LIPA/LIBI-sponsored builder trainings.

N. Conclusions and Recommendations

Based on the above analyses and a thorough review of the data, we provide the following conclusions and recommendations in order to optimize Program impacts and energy savings in the new homes market:

1. *Improve Central Air-Conditioning Performance* - NYESLH should focus on encouraging builders to choose energy-efficient cooling equipment, but more importantly to also size it correctly, charge it correctly with refrigerant and to make sure that there is adequate air flow through the system. Our study found that the nameplate SEER level of central air-conditioning installed in new homes was typically low to begin with, and that the effective SEER level was actually much lower due to poor installation practices.
2. *Seal Ducts* – a large percentage of both the heated and cooled air is lost in many new homes due to leaky ducts. NYESLH should emphasize comprehensive duct sealing to reduce duct leakage to industry standards.
3. *Reduce Infiltration* – We found that the average air infiltration (leakage) was 2,000 to 3,000 CFM-50. This should be cut by least 50% to meet the ASHRAE standard of less than 1,000 CFM-50.
4. *Increase HERS Scores* - Encourage energy efficiency performance as measured by the Home Energy Rating System (HERS) scale to capture greater energy savings. Higher scores should perhaps be tied to additional program incentives.
5. *Include All Multi-family Buildings* - Include multi-family buildings of all heights in the program in order to capture the energy saving opportunities in that building sector.
6. *Focus on Lights and Appliances* - ENERGY STAR appliances are already popular in new homes on Long Island and their use could be further expanded. ENERGY STAR residential light fixtures reduce lighting energy, and cooling energy.
7. *Support the New York Energy Code* – The average home in the study did not meet state energy code. NYESLH should work with New York Department of State officials to train builders to meet the requirements of the New York State Energy Conservation Construction Code.
8. *Increase Customer Satisfaction* – The Long Island new home owners in this study were dissatisfied with the performance of their builders, and of their new homes. The NYESLH program is an opportunity to improve builder and home performance and build a positive name for the program and LIPA.
9. *Coordinate Efforts with Gas Utilities* – More energy efficient new homes on Long Island will create benefits for LIPA, and for Keyspan Natural Gas as well. Keyspan should be encouraged to participate in the program, and to take advantage of the technical and economic potential of improved gas efficiency.

VI. APPENDIX A: LIST OF ACRONYMS

ACH	Air Change Per Hour
ACCANY	Air Conditioning Contractors Association of America - Greater New York Chapter
AFUE	Annual Fuel Utilization Efficiency
AIA LI	American Institute of Architects, New York Chapter, Long Island
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
BIANCO	Building Inspectors Association of Nassau County
CFM	Cubic Feet Per Minute
CSG	Conservation Services Group
DHW	Domestic Hot Water
EER	Energy Efficiency Ratio
GAMA	Gas Appliance Manufacturer's Association
HERS	Home Energy Rating System
HUD	U.S. Department of Housing and Urban Development
IECC	International Energy Conservation Code
kWh	Kilowatt-hour
LIBI	Long Island Builders Institute, Inc.
LIBN	Long Island Business News
LIBOR	Long Island Board of Realtors, Inc.
LILA	Long Island Lumber Association
LIPA	Long Island Power Authority
Low-E	Low Emissivity
MMBtu	Million British Thermal Units
MF	Multi-Family
MLSLI	Multiple Listing Service of Long Island, Inc.
NEL	Nassau Electric League
NAR	National Association of Realtors
NCAPHCC	Nassau County Association of Plumbing Heating & Cooling Contractors
NY ECCC	New York Energy Conservation Construction Code
NYESLHP	ENERGY STAR [®] Labeled Homes Program
NY DOS	New York Department of State, Codes Division
NYMHA	New York Manufactured Housing Association, Inc.
NYSAR	New York State Association of Realtors
NYSBA REF	New York State Builder's Association Research & Education Foundation, Inc.
Optimal	Optimal Energy Inc.,
PEG	Proctor Engineering Group
RESNET	Residential Energy Services Network
SCAMP	Suffolk County Association of Master Plumbers
SCECA	Suffolk County Electrical Contractors Association, Inc.
SEER	Seasonal Energy Efficiency Rating
SFA	Single-Family Attached
SFD	Single-Family Detached
SHGC	Solar Heat Gain Coefficient
UDRH	User-Defined Reference Home
VEIC	Vermont Energy Investment Corporation

VII. APPENDIX B: TECHNICAL BASELINE CHARACTERISTICS DATA

User-Defined Reference Home

The "User-Defined Reference Home" (UDRH) is a compilation of average home surface areas, thermal characteristics and efficiencies that describe the "composite average home" by each of the three house types. A detailed description of the UDRH is included presented below.

Table 40 User Defined Reference Home Summary

Typical Composite Home	Single-family Detached (SFD)	Singe Family Attached (SFA)	Multi Family (MF)
Sample Size	63	11	2
Sq. Ft.	2,696	1,473	30,563
Volume	23,264	12,343	244,445
Bedrooms	4	2	46
Living Units	1.00	1.00	38.00
Foundation	Unconditioned Basement	Slab	Slab
Ceiling	R-27.5	R-27.5	R- 24
AG Walls	R-13	R-13	R-13
Foundation Walls	uninsulated	uninsulated	NA
Floors Over Basement	R-18	R-19	NA
Floors Over Garage	R-21	R-24	NA
Windows	U- .47, SHGC - .55	U- .49, SHGC - .55	U - .87, SHGC - .73
Skylights	U - .44, SHGC - .42	U - .44, SHGC - .42	U - .44, SHGC - .42
Doors	R-3.17	R-3.48	R-2.6
Slab	R- 45	R-1.25	NA
Average Infiltration (cfm-50)	3098.77	2167.10	NA
Average Infiltration ACH	0.53	0.70	0.45
Joists	R-14	R-10	R-13
Whole house leakage to outside	382.60	299.60	NA
Mechanical Ventilation	0.18	0.02	0.50
Number of Central Air Conditioning Units	1.00	1.00	38.00
SEER - Unadjusted (EER for MF)	10.26	10.00	9.10
SEER - Adjusted (charge, airflow, size)	7.00	5.00	N/A
Number of Heating Units	1.00	1.00	1.00
Heating Fuel Type	Natural Gas	Natural Gas	Natural Gas
Heating Distribution System	Ducted	Ducted	Hydronic
Duct Insulation	R-4.25	R-2.1	NA
Duct Leakage (cfm-25)	382.60	299.60	NA
Heating System Efficiency (AFUE)	83.40	84.00	81.00
DHW Type	Conventional Tank	Conventional Tank	Conventional Tank
DHW Energy Factor	0.56	0.54	0.55
Average Tank Size (gallons)	33.55	41.82	40.00
Number of DHW Units	1.00	1.00	38.00
DHW Tank Location	Garage	Garage	Garage

The following tables highlight some of the major findings and characteristics of the average houses found on Long Island, sorted by house type (single-family detached, single family attached and multi-family). Table 41 lists the average house characteristics, including size, incidence of central air conditioning, fuel used for space and water heating and prevalence of efficient lighting.

Table 41 Summary Average House Characteristics

Feature	Units	Single-Family Detached	Single-Family Attached	Multi-family Building
House Size	Square feet	2,696	1,473	30,562
Central Air Conditioning	% with CAC	81%	100%	100%
Space Heating Fuel				
Natural Gas	% present	62%	100%	100%
Fuel Oil	% present	35%	--	--
Propane	% present	3%	--	--
Domestic Hot Water Fuel				
Natural Gas	% present	60%	100%	100%
Fuel Oil	% present	36%	--	--
Propane	% present	2%	--	--
Electricity	% present	3%	--	--
Light Fixtures				
Incandescent	Count	28	15	4
Fluorescent	Count	1	2	2
Fluorescent	% present	3%	12%	36%

Table 42 presents a summary of the average energy rating by house type (using the rating as listed on the equipment, assuming it was properly installed), the results of our "least-cost" analysis to improve an average home to ENERGY STAR, and the total fuel used (in MMBtu).

Table 42 Summary Average Energy Characteristics

Feature	Notes	Single-Family Detached	Single-Family Attached	Multi-family Building
Energy Rating	Unadjusted for lower SEER	83.6	83.5	82.9
Costs to Achieve 86 Points	Adjusted for lower SEER	\$1,084	\$830	\$25,466 / bldg \$670 / apartment
Annual Total Fuel Use	MMBtu/year	151.6	107.1	1,924 / bldg 51.3 / apartment
NY Energy Code Compliance	RES <i>Check</i> code software	Failed by 2% to 9%	Failed by 12%	Failed by 18%

Table 43 displays the summary HVAC features, including the type of distribution system installed, efficiency (AFUE), rated and adjusted SEER (based on extensive testing and analysis of a subset

of homes for which charge and air flow were tested. The resulting HERS ratings used the adjusted SEER efficiencies, duct leakage and domestic hot water characteristics.

Table 43 Summary Average HVAC Characteristics

Feature	Units	Single-Family Detached	Single-Family Attached	Multi-family Building
Distribution System				
Ducted	% present	59%	69%	0%
Hydronic	% present	41%	31%	100%
Heating Efficiency				
Furnaces	AFUE	83.4%	80.0%	NA
Boilers	AFUE	81.1%	84.0%	81.0%
Cooling Efficiency				
Unadjusted SEER	Rated SEER	10.3	10.0	9.1
Adjusted SEER	Adjusted SEER	7.0	5.0	NA
Adjusted HERS Scores	Energy rating adjusted SEER	81.6 (from 28 homes)	75.8 (from 3 homes)	82.9 (no adjustment)
Duct Leakage				
CFM-25	CFM-25 to outside	383	300	NA
% of Total System Flow	% leakage to outside	30% (from 49 homes)	43% (from 7 homes)	NA
Domestic Hot Water Type				
Tank	% present	50%	100%	100%
Tankless Coil	% present	21%	--	--
Indirect-Fired Tank	% present	29%	--	--
Efficiency – Natural Gas Tank	Energy Factor	0.56	0.54	0.55
Efficiency – Oil Tank	Energy Factor	0.57	--	--

Table 44 presents characteristics by house type for air leakage, windows, walls, basement ceilings and house ceilings

Table 44 Summary Average Thermal Envelope Characteristics

Feature	Units	Single-Family Detached	Single-Family Attached	Multi-family Building
Air Leakage				
Blower Door Tested	CFM-50	3,099	2,167	Not measured
Natural Air Changes per Hour	Nat. ACH	0.56	0.63	0.35 (assumed)
Windows				
Thermal Properties	U-Value	0.47	0.50	0.87
Shading Properties	Solar Heat Gain Coefficient	0.54	0.55	0.73
Glazing Percentage	% Window to Wall Ratio	17.7%	15.3%	29.9%
Walls	R-Value	13.8	12.8	12.1
Basement Ceilings	R-Value	18.4	19.0	NA
Ceiling	R-Value	27.5	24.7	28.0

Table 45 examines appliance efficiency for refrigerators, clothes washers and dishwashers and presents the finding that the existing LIPA appliance program is having an effective impact on the market given the incidence of ENERGY STAR appliances. The incidence of ENERGY STAR Appliances in Long Island is above both the New York State and national averages.

Table 45 Summary Average Appliance Characteristics – LIPA, New York State and US

Appliance	Units	Single-Family Detached	Single-Family Attached	Multi-Family Building	New York State	All States
Refrigerator	% ENERGY STAR®	46%	33%	50%	23%	20%
Clothes Washer	% ENERGY STAR®	28%	55%	NA	18%	16%
Dishwasher	% ENERGY STAR®	73%	55%	NA	34%	36%

Source: NY State and National estimates from D&R International 2003.

Table 46 provides the comprehensive results for the composite user-defined reference homes for the three house types analyzed in this report.

Table 46 User Defined Reference (UDRH) – Shell Area, RAR- and U-Values and Efficiencies

User Defined Reference Home (UDRH) - Shell Area, R- and U-values and Efficiencies

General Information

BldgType	SQFT	Vol	Stories	Bedrooms	Living Units
Single-family Detached (SFD)	2,696	23,264	1.9	3.7	1
Singe Family Attached (SFA)	1,473	12,343	1.5	2.2	1
Multi Family (MF)	30,563	244,445	2.0	46.0	38

Foundation	SFD	SFA	MF
Apart. Over Cond. Space	0.0%	9.1%	0.0%
Conditioned Basement	6.3%	18.2%	0.0%
Enclosed Crawlspace	3.2%	0.0%	0.0%
Multiple Types	9.5%	9.1%	0.0%
Open Crawlspace	3.2%	0.0%	0.0%
Slab	3.2%	45.5%	100.0%
Unconditioned Basement	74.6%	18.2%	0.0%
Total	100.0%	100.0%	100.0%

Number of Homes	SFD	SFA	MF
Quantity	63	11	2

Building Shell

Note: Only fields with installed insulation are included.

CavityIns:

Average R-value of insulation present.

UDRH-Ceiling: Sum / # of House Type

		BldgType		
CeilType	Data	SFD	SFA	MF
Flat	Area	1,503.16	427.36	-
Sloped	Area	232.10	339.82	7,640.50
Total	Area	1,735.25	767.18	7,640.50
Flat	CavityIns UValue	27.51 0.07	24.73 0.11	
Sloped	CavityIns UValue	27.68 0.09	14.77 0.06	- 0.08

UDRH - AG Walls: Sum / # of House Type

		BldgType		
Location	Data	SFD	SFA	MF
Conditioned to Ambient	Area	-	-	10,554.00
Conditioned to Attic	Area	-	-	-
Conditioned to Garage	Area	-	-	-
Conditioned to Unconditioned Basement	Area	-	-	-
Total	Area	2,539.03	1,256.27	10,554.00
Conditioned to Ambient	CavityIns UValue	3.78 0.09	12.82 0.10	12.12 0.15
Conditioned to Attic	CavityIns UValue	13.60 0.10	13.00 0.10	
Conditioned to Garage	CavityIns UValue	13.30 0.10	12.54 0.10	
Conditioned to Unconditioned Basement	CavityIns UValue	13.20 0.10	12.59 0.10	

UDRH - Foundation Walls: Sum / # of House Type

		BldgType		
Location	Data	SFD	SFA	MF
Conditioned to Ambient	Area	-	-	-
Conditioned to Garage	Area	-	-	-
Enclosed Crawlspace to Ambient	Area	-	-	-
Enclosed Crawlspace to Garage	Area	-	-	-
Unconditioned Basement to Ambient	Area	-	-	-
Unconditioned Basement to Garage	Area	-	-	-
Unconditioned Basement to Open Crawlspace	Area	-	-	-
Totals	Area	1,285.48	615.13	-
Conditioned to Ambient	Masonry Thickness (inches)	10.00	10.57	
	Interior Cavity Insulation (R-Value)	11.78	9.32	
	Interior Rigid Insulation (inches)	1.85	-	
Conditioned to Garage	Masonry Thickness (inches)	8.56		
	Interior Cavity Insulation (R-Value)	3.64		
Enclosed Crawlspace to Ambient	Masonry Thickness (inches)	9.58		
	Interior Cavity Insulation (R-Value)	9.54		
Enclosed Crawlspace to Garage	Masonry Thickness (inches)	8.00		
	Interior Cavity Insulation (R-Value)	-		
Unconditioned Basement to Ambient	Masonry Thickness (inches)	9.34	9.72	
	Exterior Insulation (inches)	0.17	-	
	Interior Cavity Insulation (R-Value)	0.62	-	
Unconditioned Basement to Garage	Masonry Thickness (inches)	9.28	10.00	
	Interior Cavity Insulation (R-Value)	0.42	-	
Unconditioned Basement to Open Crawlspace	Masonry Thickness (inches)	10.00		
	Interior Cavity Insulation (R-Value)	13.00		

UDRH - Floors: Sum / # of House Type

Location	Data	BldgType		
		SFD	SFA	MF
Conditioned to Ambient	Area	-	-	-
Conditioned to Enclosed Crawlspace	Area	-	-	-
Conditioned to Garage	Area	-	-	-
Conditioned to Open Crawlspace	Area	-	-	-
Conditioned to Unconditioned Basement	Area	-	-	-
Total	Area	1,452.40	318.55	-
Conditioned to Ambient	Average Cavity Insulation R-Value	20.98	27.64	
	Average Total U-Value	0.05	0.04	
Conditioned to Enclosed Crawlspace	Average Cavity Insulation R-Value	7.82		
	Average Total U-Value	0.20		
Conditioned to Garage	Average Cavity Insulation R-Value	21.17	23.53	
	Average Total U-Value	0.05	0.05	
Conditioned to Open Crawlspace	Average Cavity Insulation R-Value	9.13		
	Average Total U-Value	0.16		
Conditioned to Unconditioned Basement	Average Cavity Insulation R-Value	18.35	19.00	
	Average Total U-Value	0.06	0.05	

UDRH - Windows: Sum / # of House Type

Location	Data	BldgType		
		SFD	SFA	MF
East	Area	67.94	37.16	202.00
NE	Area	14.52	-	-
North	Area	81.55	34.45	951.00
NW	Area	17.35	-	-
SE	Area	18.33	-	-
South	Area	77.10	42.09	951.00
SW	Area	20.92	-	-
West	Area	72.01	46.32	202.00
Total	Area	369.72	160.03	2,306.00
East	Avg SHGC	0.55	0.52	0.73
	Avg UValue	0.47	0.48	0.87
NE	Avg SHGC	0.56		
	Avg UValue	0.47		
North	Avg SHGC	0.53	0.53	0.73
	Avg UValue	0.46	0.48	0.87
NW	Avg SHGC	0.54		
	Avg UValue	0.47		
SE	Avg SHGC	0.54		
	Avg UValue	0.47		
South	Avg SHGC	0.55	0.59	0.73
	Avg UValue	0.47	0.58	0.87
SW	Avg SHGC	0.54		
	Avg UValue	0.48		
West	Avg SHGC	0.54	0.57	0.73
	Avg UValue	0.46	0.49	0.87

UDRH - Window Shading

		BldgType		
Window shading	Data	SFD	SFA	MF
	Winter	some	some	some
	Shading	none	none	none

UDRH - Windows: Sum / # of House Type

		BldgType		
Surf_Num	Data	SFD	SFA	MF
1.00	Area	367.92	160.03	2,306.00
2.00	Area	1.14	-	-
3.00	Area	0.19	-	-
4.00	Area	-	-	-
5.00	Area	0.46	-	-
6.00	Area	-	-	-
7.00	Area	-	-	-
8.00	Area	-	-	-
Total	Area	369.72	160.03	2,306.00

UDRH - Skylights: Sum / # of House Type

OrientDescript	Data	BldgType		
		SFD	SFA	MF
East	Area	0.94	5.36	29.50
North	Area	0.37	2.09	11.50
South	Area	0.25	1.45	8.00
West	Area	0.35	2.00	11.00
Total	Area	1.90	10.91	60.00
East	Avg SHGC	0.43	0.42	0.42
	Avg UValue	0.44	0.44	0.44
North	Avg SHGC	0.56	0.42	0.42
	Avg UValue	0.50	0.44	0.44
South	Avg SHGC	0.30	0.42	0.42
	Avg UValue	0.42	0.44	0.44
West	Avg SHGC	0.38	0.42	0.42
	Avg UValue	0.39	0.44	0.44

UDRH - Skylights: Sum / # of House Type

Ceiling #	Data	BldgType		
		SFD	SFA	MF
1.00	Area	0.56	3.18	17.50
2.00	Area	1.35	7.73	42.50
3.00	Area	-	-	-
4.00	Area	-	-	-
Total	Area	1.90	10.91	60.00

UDRH - Doors: Sum / # of House Type

Data	BldgType		
	SFD	SFA	MF
Area	47.14	39.66	50
Avg RValue	3.17	3.48	2.60
Avg UValue	0.27	0.25	0.28

UDRH – Slab: Sum / # of House Type

Data		BldgType		
		SFD	SFA	MF
Average Slab Area (Sq. Ft.)		175.75	722.45	7,640.50
Average Perimeter (Ft.)		21.75	73.00	409.00
Average Exposed Perimeter (Ft.)		7.15	40.95	409.00
Average Perimeter R-Value		0.45	1.25	-
Average Depth Below Grade (inches)	REM requires 0	3.48	1.50	-
Average Perimeter Insulation Depth (inches)		0.03	0.29	-
Average Under Slab Insulation (inches)		0.45	1.25	-
Average Under Slab Insulation Width (inches)		0.18	3.00	-

UDRH Average Infiltration

INF_Units		BldgType		
		SFD	SFA	MF
Blower Door Infiltration Values at CFM-50		3,098.77	2,167.10	0.45 NACH

UDRH - Joists: Sum / # of House Type

Location	Data	BldgType		
		SFD	SFA	MF
Conditioned to Ambient	Sum of AreaSQFT	-	-	-
Conditioned to Attic	Sum of AreaSQFT	-	-	-
Conditioned to Garage	Sum of AreaSQFT	-	-	-
Unconditioned Basement to Ambient	Sum of AreaSQFT	-	-	-
Grand Total	Sum of AreaSQFT	98.18	40.00	667.50
Conditioned to Ambient	Average Area (Sq. Ft.)	137.13	110.00	445.00
	Average Rigid Insulation (U-Value)	0.07	-	-
	Average Batt Insulation (R-Value)	14.00	10.25	13.00
	Average Batt Insulation Thickness (inches)	3.84	2.88	3.50
	Average Spacing (inches)	16.00	16.00	16.00
	Average U-Value	0.07	0.10	0.07
Con_Attic	Average Area (Sq. Ft.)	54.00		
	Average Batt Insulation (R-Value)	19.00		
	Average Batt Insulation Thickness (inches)	5.50		
	Average Spacing (inches)	16.00		
	Average U-Value	0.05		
Con_Garage	Average Area (Sq. Ft.)	26.00		
	Average Batt Insulation (R-Value)	15.40		
	Average Batt Insulation Thickness (inches)	4.30		
	Average Spacing (inches)	16.00		
	Average U-Value	0.06		
UnCondBsmnt_Amb	Average Area (Sq. Ft.)	189.30		
	Average Batt Insulation (R-Value)	13.00		
	Average Batt Insulation Thickness (inches)	3.50		
	Average Spacing (inches)	16.00		

	Average U-Value	0.07		
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HVAC

Distribution System Type

System Type	Data	BldgType		
		SFD	SFA	MF
	Ducted	59.5%	69.2%	0.0%
	Hydronic	40.5%	30.8%	100.0%
	Total	100.0%	100.0%	100.0%

Duct Area Wgt Avg

DuctLocation	Data	BldgType		
		SFD	SFA	MF
Attic Exposed	Avg Square Feet	78.24	38.34	
Attic Under Insulation	Avg Square Feet	6.40	-	
Conditioned	Avg Square Feet	17.41	56.59	
Enclosed Crawlspace	Avg Square Feet	0.72	-	
Heated Basement	Avg Square Feet	7.74	9.33	
Open Crawlspace	Avg Square Feet	2.19	-	
Unheated Basement	Avg Square Feet	55.25	17.25	
Wall No Top Plate	Avg Square Feet	-	13.53	

= Return
= Supply

Duct Insulation

DuctLocation	Data	BldgType		
		SFD	SFA	MF
Attic Exposed	Average Duct Insulation R-Value	4.25	2.10	
Attic Under Insulation	Average Duct Insulation R-Value	4.68		
Conditioned	Average Duct Insulation R-Value	1.97	1.05	
Enclosed Crawlspace	Average Duct Insulation R-Value	4.20		
Heated Basement	Average Duct Insulation R-Value	4.20	4.20	
Open Crawlspace	Average Duct Insulation R-Value	4.20		

Unheated Basement	Average Duct Insulation R-Value	4.22	3.05	
Wall No Top Plate	Average Duct Insulation R-Value		4.20	

Duct Leakage

		BldgType		
	Data	SFD	SFA	MF
Whole house leakage to outside	CFM-25	382.60	299.60	

Mechanical Ventilation

		BldgType		
	Data	SFD	SFA	MF
	ExhaustOnly	9.1%	1.6%	0.0%
	None	81.8%	98.4%	50.0%
	Supply&Return	9.1%	0.0%	50.0%
Grand Total		100.0%	100.0%	100.0%

Number of Central Air Conditioning Units

		BldgType		
	Data	SFD	SFA	MF
Number of CAC Units	1	46.0%	90.9%	38
Number of CAC Units	2	30.2%	9.1%	
Number of CAC Units	3	3.2%	0.0%	
Number of CAC Units	4	1.6%	0.0%	
Number of CAC Units	None	19.0%	0.0%	
Totals		100.0%	100.0%	38
Weighted Avg		1.22	1.09	38

SEER

		BldgType		
	Data	SFD	SFA	MF(EER)
	Avg SEER	10.3	10.0	9.10
	Adjusted SEER (charge, airflow, size)	7.00	5.00	N/A

Number of Heating Units

		BldgType		
	Data	SFD	SFA	MF
	1	85.7%	81.8%	100.0%
	2	12.7%	18.2%	0.0%
	3	0.0%	0.0%	0.0%
	4	1.6%	0.0%	0.0%
	None	0.0%	0.0%	0.0%
	Weighted Avg	1.17	1.18	1.00

Heating Fuel Type

		BldgType		
	Data	SFD	SFA	MF
	NGas	60.8%	100.0%	100.0%
	Oil	36.5%	0.0%	0.0%
	Propane	2.7%	0.0%	0.0%

Heating Distribution System

		BldgType		
	Data	SFD	SFA	MF
	Unit Heater	0.0%	0.0%	0.0%

Heating System Efficiency (AFUE)

		BldgType		
	Data	SFD	SFA	MF
	Fuel_Hydrionic	81.1		81.0

DHW Types by House Type

	DHW Type	BldgType		
		SFD	SFA	MF
	Conventional Tank	50.0%	100.0%	100.0%
	Tankless Coil in Boiler	21.0%	0.0%	0.0%
	Indirect-Fired off Boiler	29.0%	0.0%	0.0%

DHW Fuel Type v DHW Type

	DHW_Fuel	BldgType		
		SFD	SFA	MF
	Electric	3.23%	0.00%	0.00%
	NGas	59.68%	100.00%	100.00%
	Oil	35.48%	0.00%	0.00%
	Propane	1.61%	0.00%	0.00%

DHW Fuel by House Type

DHW_Type	DHW_Fuel	BldgType		
		SFD	SFA	MF
Stand-Alone Tank	Electric	3.2%	0.0%	0.0%
	NGas	41.9%	100.0%	100.0%
	Oil	3.2%	0.0%	0.0%
	Propane	1.6%	0.0%	0.0%
Tankless Coil in Boiler	NGas	1.6%	0.0%	0.0%
	Oil	19.4%	0.0%	0.0%
Indirect-Fired Off Boiler	NGas	16.1%	0.0%	0.0%
	Oil	12.9%	0.0%	0.0%

Average Energy Factor

		BldgType		
DHW_Type	DHW_Fuel	SFD	SFA	MF
Stand-Alone Tank	Electric	0.88		
	NGas	0.56	0.54	0.55
	Oil	0.57		
	Propane	0.62		
Tankless Coil in Boiler	NGas	0.55		
	Oil	0.53		
Indirect-Fired Off Boiler	NGas	0.76		
	Oil	0.76		

Average Tank Size

		BldgType		
	DHW Tank Size	SFD	SFA	MF
	Avg Gallons	33.55	41.82	40.00

Number of DHW Units

		BldgType		
	Units	SFD	SFA	MF
	1	95.2%	100.0%	
	2	1.6%	0.0%	
	3	0.0%	0.0%	
	4	0.0%	0.0%	
	None	3.2%	0.0%	
	Totals	100.0%	100.0%	38
	Weighted Avg	0.98	1.00	38

DHW Tank Location

	Location	BldgType		
		SFD	SFA	MF
	Unconditioned	66.1%	45.5%	50.0%
	Conditioned	21.0%	9.1%	50.0%
	Garage	12.9%	45.5%	0.0%

VIII. APPENDIX C: LONG ISLAND NEW HOUSING DATA

Table 47 shows the Census estimates of the number of new housing units for 2000 in Nassau and Suffolk Counties. The bulk of new construction, over 75%, occurs in Suffolk County.

Table 47 2000 Nassau and Suffolk County Building Permits

2000	Building Permits				
Nassau County	Single Family	Two Family	Three and Four Family	Five or More Family	Total
Totals	747	142	6	605	1500
Percent Totals	49.8%	9.5%	0.4%	40.3%	100.0%
2000	Building Permits				
Suffolk County	Single Family	Two Family	Three and Four Family	Five or More Family	Total
Totals	3874	234	126	662	4896
Percent Totals	79.1%	4.8%	2.6%	13.5%	100.0%
2000	Building Permits				
Combined Nassau/Suffolk	Single Family	Two Family	Three and Four Family	Five or More Family	Total
Combined Totals	4621	376	132	1267	6396
Percent Total	72.2%	5.9%	2.1%	19.8%	100.0%

Source: U.S. Census Bureau

Table 48 shows a detailed listing of building permits issued by town in Nassau County in 2000 as reported by the Census. This data also is presented in summary in Table 66 shows the Census estimates of the number of new housing units for 2000 in Nassau and Suffolk Counties. Permits issued were focused in a small number of towns in 2000.

Table 48 2000 Nassau County Building Permits – Number of Units

Nassau County town	2001 Building Permits - Units				Total
	Single Family	Two Family	Three and Four Family	Five or More Family	
Atlantic Beach	-	-	-	-	0
Baxter Estates	0	0	0	0	0
Bayville	2	0	0	0	2
Bellerose	0	0	0	0	0
Brookville	4	0	0	0	4
Cedarhurst	0	0	0	0	0
Centre Island	1	0	0	0	1
Cove Neck	1	0	0	0	1
Dering Harbor	0	0	0	0	0
East Hills	0	0	0	0	0
East Rockaway	0	0	0	0	0
East Williston	0	0	0	0	0
Farmingdale	8	0	4	18	30
Floral Park	6	0	0	0	6
Flower Hill	3	0	0	0	3
Garden City	1	0	0	0	1
Glen Cove	22	6	0	0	28
Great Neck	9	0	0	0	9
Great Neck Estates	3	0	0	0	3
Great Neck Plaza	27	0	0	70	97
Hempstead (town)	207	6	0	0	213
Hempstead (village)	6	0	0	0	6
Hewlett Bay Park	1	0	0	0	1
Hewlett Harbor	0	0	0	0	0
Hewlett Neck	1	0	0	0	1
Island Park	7	0	0	0	7
Kensington	0	0	0	0	0
Kings Point	10	0	0	0	10
Lake Success	4	0	0	0	4
Lattingtown	4	0	0	0	4
Laurel Hollow	5	0	0	0	5
Lawrence	5	0	0	0	5
Long Beach	9	14	0	0	23
Lynbrook	4	0	0	0	4
Malverne	0	0	0	0	0
Manorhaven	10	6	0	0	16
Massepequa	1	0	0	0	1
Matinecock	4	0	0	0	4
Mill Neck	3	0	0	0	3
Mineola	4	0	0	0	4
Munsey Park	0	0	0	0	0
Muttontown	6	0	0	0	6
New Hyde Park	1	0	0	0	1
North Hempstead	57	0	0	0	57
North Hills	0	0	0	0	0
Old Brookville	5	0	0	0	5
Old Westbury	16	0	0	0	16
Oyster Bay Cove	1	0	0	0	1
Oyster Bay	148	0	0	177	325
Plandome	1	0	0	0	1
Plandome Heights	0	0	0	0	0
Plandome Manor	4	0	0	0	4
Port Washington N.	1	0	0	0	1
Rockville Centre	0	0	0	0	0
Roslyn	1	0	0	0	1
Roslyn Estates	1	0	0	0	1
Roslyn Harbor	2	0	0	0	2
Russell Gardens	0	0	0	0	0
Saddle Rock	0	0	0	0	0
Sands Point	7	0	0	0	7
Sea Cliff	0	0	0	0	0
South Floral Park	1	0	0	0	1
Stewart Manor	0	0	0	0	0
Thomaston	2	0	0	0	2
Upper Brookville	8	0	0	0	8
Valley Stream	4	0	0	0	4
Westbury	5	0	0	0	5
Williston Park	0	0	0	0	0
Woodsburgh	0	0	0	0	0
Totals	643	32	4	265	944
Percent Totals	68.1%	3.4%	0.4%	28.1%	100.0%

Source: U.S. Census Bureau

Table 49 2000 Nassau County Building Permits – Number of Buildings

Nassau County town	2000 Building Permits - Buildings			
	Single Family	Two Family	Three and Four Family	Five or More Family
Atlantic Beach	-	-	-	-
Baxter Estates	-	-	-	-
Bayville	-	-	-	-
Bellerose	-	-	-	-
Brookville	-	-	-	-
Cedarhurst	-	-	-	-
Centre Island	-	-	-	-
Cove Neck	-	-	-	-
Dering Harbor	-	-	-	-
East Hills	-	-	-	-
East Rockaway	-	-	-	-
East Williston	-	-	-	-
Farmingdale	3	0	0	1
Floral Park	-	-	-	-
Flower Hill	-	-	-	-
Garden City	-	-	-	-
Glen Cove	38	5	0	0
Great Neck	15	0	0	0
Great Neck Estates	-	-	-	-
Great Neck Plaza	31	0	0	12
Hempstead (town)	276	54	0	0
Hempstead (village)	3	0	0	1
Hewlett Bay Park	-	-	-	-
Hewlett Harbor	-	-	-	-
Hewlett Neck	-	-	-	-
Island Park	-	-	-	-
Kensington	-	-	-	-
Kings Point	9	0	0	0
Lake Success	-	-	-	-
Lattingtown	-	-	-	-
Laurel Hollow	-	-	-	-
Lawrence	-	-	-	-
Long Beach	12	4	0	0
Lynbrook	-	-	-	-
Malverne	-	-	-	-
Manorhaven	11	4	0	0
Massepequa	-	-	-	-
Matinecock	-	-	-	-
Mill Neck	-	-	-	-
Mineola	-	-	-	-
Munsey Park	-	-	-	-
Muttontown	17	0	0	0
New Hyde Park	-	-	-	-
North Hempstead	46	0	0	0
North Hills	13	0	0	0
Old Brookville	-	-	-	-
Old Westbury	21	0	0	0
Oyster Bay Cove	-	-	-	-
Oyster Bay	128	4	1	40
Plandome	-	-	-	-
Plandome Heights	-	-	-	-
Plandome Manor	-	-	-	-
Port Washington N.	-	-	-	-
Rockville Centre	-	-	-	-
Roslyn	-	-	-	-
Roslyn Estates	-	-	-	-
Roslyn Harbor	-	-	-	-
Russell Gardens	-	-	-	-
Saddle Rock	-	-	-	-
Sands Point	9	0	0	0
Sea Cliff	-	-	-	-
South Floral Park	-	-	-	-
Stewart Manor	-	-	-	-
Thomaston	-	-	-	-
Upper Brookville	8	0	0	0
Valley Stream	-	-	-	-
Westbury	4	0	0	1
Williston Park	-	-	-	-
Woodsburgh	-	-	-	-
Totals	644	71	1	55
Percent Totals	83.5%	9.2%	0.1%	7.1%

Source: U.S. Census

Table 50 2000 Nassau County Building Permits – Number of Units per Building

Nassau County town	2000 Building Permits - Units Per Buildings			
	Single Family	Two Family	Three and Four Family	Five or More Family
Atlantic Beach	-	-	-	-
Baxter Estates	-	-	-	-
Bayville	-	-	-	-
Bellerose	-	-	-	-
Brookville	-	-	-	-
Cedarhurst	-	-	-	-
Centre Island	-	-	-	-
Cove Neck	-	-	-	-
Dering Harbor	-	-	-	-
East Hills	-	-	-	-
East Rockaway	-	-	-	-
East Williston	-	-	-	-
Farmingdale	1	-	-	12
Floral Park	-	-	-	-
Flower Hill	-	-	-	-
Garden City	-	-	-	-
Glen Cove	1	2	-	-
Great Neck	1	-	-	-
Great Neck Estates	-	-	-	-
Great Neck Plaza	1	-	-	5.4
Hempstead (town)	1	2	-	-
Hempstead (village)	1	-	-	57
Hewlett Bay Park	-	-	-	-
Hewlett Harbor	-	-	-	-
Hewlett Neck	-	-	-	-
Island Park	-	-	-	-
Kensington	-	-	-	-
Kings Point	1	-	-	-
Lake Success	-	-	-	-
Lattingtown	-	-	-	-
Laurel Hollow	-	-	-	-
Lawrence	-	-	-	-
Long Beach	1	2	-	-
Lynbrook	-	-	-	-
Malverne	-	-	-	-
Manorhaven	1	2	-	-
Massepequa	-	-	-	-
Matinecock	-	-	-	-
Mill Neck	-	-	-	-
Mineola	-	-	-	-
Munsey Park	-	-	-	-
Muttontown	1	-	-	-
New Hyde Park	-	-	-	-
North Hempstead	1	-	-	-
North Hills	1	-	-	-
Old Brookville	-	-	-	-
Old Westbury	1	-	-	-
Oyster Bay Cove	-	-	-	-
Oyster Bay	1	2	3	11.4
Plandome	-	-	-	-
Plandome Heights	-	-	-	-
Plandome Manor	-	-	-	-
Port Washington N.	-	-	-	-
Rockville Centre	-	-	-	-
Roslyn	-	-	-	-
Roslyn Estates	-	-	-	-
Roslyn Harbor	-	-	-	-
Russell Gardens	-	-	-	-
Saddle Rock	-	-	-	-
Sands Point	1	-	-	-
Sea Cliff	-	-	-	-
South Floral Park	-	-	-	-
Stewart Manor	-	-	-	-
Thomaston	-	-	-	-
Upper Brookville	1	-	-	-
Valley Stream	-	-	-	-
Westbury	1	-	-	14
Williston Park	-	-	-	-
Woodsburgh	-	-	-	-
Totals	17	10	3	99.8
Percent Totals	13.1%	7.7%	2.3%	76.9%

Source: U.S. Census

Table 51 2000 Nassau County Construction Cost Per Unit

Nassau County	2000 Building Permits - Cost Per Unit			
	town	Single Family	Two Family	Three and Four Family
Atlantic Beach	-	-	-	-
Baxter Estates	-	-	-	-
Bayville	-	-	-	-
Bellerose	-	-	-	-
Brookville	-	-	-	-
Cedarhurst	-	-	-	-
Centre Island	-	-	-	-
Cove Neck	-	-	-	-
Dering Harbor	-	-	-	-
East Hills	-	-	-	-
East Rockaway	-	-	-	-
East Williston	-	-	-	-
Farmingdale	100,000	-	-	46,667
Floral Park	-	-	-	-
Flower Hill	-	-	-	-
Garden City	-	-	-	-
Glen Cove	275,763	114,600	-	-
Great Neck	285,362	-	-	-
Great Neck Estates	-	-	-	-
Great Neck Plaza	164,383	-	-	164,384
Hempstead (town)	78,523	52,519	-	-
Hempstead (village)	90,000	-	-	63,158
Hewlett Bay Park	-	-	-	-
Hewlett Harbor	-	-	-	-
Hewlett Neck	-	-	-	-
Island Park	-	-	-	-
Kensington	-	-	-	-
Kings Point	1,014,333	-	-	-
Lake Success	-	-	-	-
Lattingtown	-	-	-	-
Laurel Hollow	-	-	-	-
Lawrence	-	-	-	-
Long Beach	139,167	80,275	-	-
Lynbrook	-	-	-	-
Malverne	-	-	-	-
Manorhaven	299,000	64,099	-	-
Massepequa	-	-	-	-
Matinecock	-	-	-	-
Mill Neck	-	-	-	-
Mineola	-	-	-	-
Munsey Park	-	-	-	-
Muttontown	359,000	-	-	-
New Hyde Park	-	-	-	-
North Hempstead	180,358	-	-	-
North Hills	500,000	-	-	-
Old Brookville	-	-	-	-
Old Westbury	1,000,952	-	-	-
Oyster Bay Cove	-	-	-	-
Oyster Bay	254,363	622,523	157,205	129,178
Plandome	-	-	-	-
Plandome Heights	-	-	-	-
Plandome Manor	-	-	-	-
Port Washington N.	-	-	-	-
Rockville Centre	-	-	-	-
Roslyn	-	-	-	-
Roslyn Estates	-	-	-	-
Roslyn Harbor	-	-	-	-
Russell Gardens	-	-	-	-

Source: U.S. Census

Table 52 2000 Nassau County Construction Cost Per Building

Nassau County	2000 Building Permits - Cost Per Building			
	town	Single Family	Two Family	Three and Four Family
Atlantic Beach	-	-	-	-
Baxter Estates	-	-	-	-
Bayville	-	-	-	-
Bellerose	-	-	-	-
Brookville	-	-	-	-
Cedarhurst	-	-	-	-
Centre Island	-	-	-	-
Cove Neck	-	-	-	-
Dering Harbor	-	-	-	-
East Hills	-	-	-	-
East Rockaway	-	-	-	-
East Williston	-	-	-	-
Farmingdale	300,000	-	-	46,667
Floral Park	-	-	-	-
Flower Hill	-	-	-	-
Garden City	-	-	-	-
Glen Cove	10,479,000	573,000	-	-
Great Neck	4,280,436	-	-	-
Great Neck Estates	-	-	-	-
Great Neck Plaza	5,095,873	-	-	1,972,610
Hempstead (town)	21,672,400	2,836,000	-	-
Hempstead (village)	270,000	-	-	63,158
Hewlett Bay Park	-	-	-	-
Hewlett Harbor	-	-	-	-
Hewlett Neck	-	-	-	-
Island Park	-	-	-	-
Kensington	-	-	-	-
Kings Point	9,129,000	-	-	-
Lake Success	-	-	-	-
Lattingtown	-	-	-	-
Laurel Hollow	-	-	-	-
Lawrence	-	-	-	-
Long Beach	1,670,000	321,100	-	-
Lynbrook	-	-	-	-
Malverne	-	-	-	-
Manorhaven	3,289,000	256,394	-	-
Massepequa	-	-	-	-
Matinecock	-	-	-	-
Mill Neck	-	-	-	-
Mineola	-	-	-	-
Munsey Park	-	-	-	-
Muttontown	6,103,000	-	-	-
New Hyde Park	-	-	-	-
North Hempstead	8,296,475	-	-	-
North Hills	6,500,000	-	-	-
Old Brookville	-	-	-	-
Old Westbury	21,020,000	-	-	-
Oyster Bay Cove	-	-	-	-
Oyster Bay	32,558,502	2,490,091	157,205	5,167,110
Plandome	-	-	-	-
Plandome Heights	-	-	-	-
Plandome Manor	-	-	-	-
Port Washington N.	-	-	-	-
Rockville Centre	-	-	-	-
Roslyn	-	-	-	-
Roslyn Estates	-	-	-	-
Roslyn Harbor	-	-	-	-
Russell Gardens	-	-	-	-
Saddle Rock	-	-	-	-
Sands Point	8,892,000	-	-	-
Sea Cliff	-	-	-	-
South Floral Park	-	-	-	-
Stewart Manor	-	-	-	-
Thomaston	-	-	-	-
Upper Brookville	5,000,000	-	-	-
Valley Stream	-	-	-	-
Westbury	645,000	-	-	71,429
Williston Park	-	-	-	-
Woodsburgh	-	-	-	-

Source: U.S. Census

Table 53 shows a detailed listing of building permits issued by town in Nassau County in 2001 as reported by the Census. Similar to 2000, construction in Nassau County was focused in a small number of towns in 2001.

Table 53 2001 Nassau County Building Permits – Number of Units

Nassau County	2001 Building Permits - Units					
	town	Single Family	Two Family	Three and Four Family	Five or More Family	Total
Atlantic Beach	-	-	-	-	-	0
Baxter Estates	0	0	0	0	0	0
Bayville	2	0	0	0	0	2
Bellerose	0	0	0	0	0	0
Brookville	4	0	0	0	0	4
Cedarhurst	0	0	0	0	0	0
Centre Island	1	0	0	0	0	1
Cove Neck	1	0	0	0	0	1
Dering Harbor	0	0	0	0	0	0
East Hills	0	0	0	0	0	0
East Rockaway	0	0	0	0	0	0
East Williston	0	0	0	0	0	0
Farmingdale	8	0	4	18	0	30
Floral Park	6	0	0	0	0	6
Flower Hill	3	0	0	0	0	3
Garden City	1	0	0	0	0	1
Glen Cove	22	6	0	0	0	28
Great Neck	9	0	0	0	0	9
Great Neck Estates	3	0	0	0	0	3
Great Neck Plaza	27	0	0	70	0	97
Hempstead (town)	207	6	0	0	0	213
Hempstead (village)	6	0	0	0	0	6
Hewlett Bay Park	1	0	0	0	0	1
Hewlett Harbor	0	0	0	0	0	0
Hewlett Neck	1	0	0	0	0	1
Island Park	7	0	0	0	0	7
Kensington	0	0	0	0	0	0
Kings Point	10	0	0	0	0	10
Lake Success	4	0	0	0	0	4
Lattingtown	4	0	0	0	0	4
Laurel Hollow	5	0	0	0	0	5
Lawrence	5	0	0	0	0	5
Long Beach	9	14	0	0	0	23
Lynbrook	4	0	0	0	0	4
Malverne	0	0	0	0	0	0
Manorhaven	10	6	0	0	0	16
Massepequa	1	0	0	0	0	1
Matinecock	4	0	0	0	0	4
Mill Neck	3	0	0	0	0	3
Mineola	4	0	0	0	0	4
Munsey Park	0	0	0	0	0	0
Muttontown	6	0	0	0	0	6
New Hyde Park	1	0	0	0	0	1
North Hempstead	57	0	0	0	0	57
North Hills	0	0	0	0	0	0
Old Brookville	5	0	0	0	0	5
Old Westbury	16	0	0	0	0	16
Oyster Bay Cove	1	0	0	0	0	1
Oyster Bay	148	0	0	177	0	325
Plandome	1	0	0	0	0	1
Plandome Heights	0	0	0	0	0	0
Plandome Manor	4	0	0	0	0	4
Port Washington N.	1	0	0	0	0	1
Rockville Centre	0	0	0	0	0	0
Roslyn	1	0	0	0	0	1
Roslyn Estates	1	0	0	0	0	1
Roslyn Harbor	2	0	0	0	0	2
Russell Gardens	0	0	0	0	0	0
Saddle Rock	0	0	0	0	0	0
Sands Point	7	0	0	0	0	7
Sea Cliff	0	0	0	0	0	0
South Floral Park	1	0	0	0	0	1
Stewart Manor	0	0	0	0	0	0
Thomaston	2	0	0	0	0	2
Upper Brookville	8	0	0	0	0	8
Valley Stream	4	0	0	0	0	4
Westbury	5	0	0	0	0	5
Williston Park	0	0	0	0	0	0
Woodsburgh	0	0	0	0	0	0
Totals	643	32	4	265	944	
Percent Totals	68.1%	3.4%	0.4%	28.1%	100.0%	

Source: U.S. Census Bureau

Table 54 2001 Nassau County Building Permits – Number of Buildings

Nassau County				
town	2001 Building Permits - Buildings			
	Single Family	Two Family	Three and Four Family	Five or More Family
Atlantic Beach	-	-	-	-
Baxter Estates	-	-	-	-
Bayville	-	-	-	-
Bellerose	-	-	-	-
Brookville	-	-	-	-
Cedarhurst	-	-	-	-
Centre Island	-	-	-	-
Cove Neck	-	-	-	-
Dering Harbor	-	-	-	-
East Hills	-	-	-	-
East Rockaway	-	-	-	-
East Williston	-	-	-	-
Farmingdale	8	0	1	2
Floral Park	-	-	-	-
Flower Hill	-	-	-	-
Garden City	-	-	-	-
Glen Cove	22	3	0	0
Great Neck	9	0	0	0
Great Neck Estates	-	-	-	-
Great Neck Plaza	27	0	0	13
Hempstead (town)	207	3	0	0
Hempstead (village)	6	0	0	0
Hewlett Bay Park	-	-	-	-
Hewlett Harbor	-	-	-	-
Hewlett Neck	-	-	-	-
Island Park	-	-	-	-
Kensington	-	-	-	-
Kings Point	10	0	0	0
Lake Success	-	-	-	-
Lattingtown	-	-	-	-
Laurel Hollow	-	-	-	-
Lawrence	-	-	-	-
Long Beach	9	7	0	0
Lynbrook	-	-	-	-
Malverne	-	-	-	-
Manorhaven	10	3	0	0
Massepequa	-	-	-	-
Matinecock	-	-	-	-
Mill Neck	-	-	-	-
Mineola	-	-	-	-
Munsey Park	-	-	-	-
Muttontown	6	0	0	0
New Hyde Park	-	-	-	-
North Hempstead	57	0	0	0
North Hills	0	0	0	0
Old Brookville	-	-	-	-
Old Westbury	16	0	0	0
Oyster Bay Cove	-	-	-	-
Oyster Bay	148	0	0	17
Plandome	-	-	-	-
Plandome Heights	-	-	-	-
Plandome Manor	-	-	-	-
Port Washington N.	-	-	-	-
Rockville Centre	-	-	-	-
Roslyn	-	-	-	-
Roslyn Estates	-	-	-	-
Roslyn Harbor	-	-	-	-
Russell Gardens	-	-	-	-
Saddle Rock	-	-	-	-
Sands Point	7	0	0	0
Sea Cliff	-	-	-	-
South Floral Park	-	-	-	-
Stewart Manor	-	-	-	-
Thomaston	-	-	-	-
Upper Brookville	8	0	0	0
Valley Stream	-	-	-	-
Westbury	5	0	0	0
Williston Park	-	-	-	-
Woodsburgh	-	-	-	-
Totals	555	16	1	32
Percent Totals	91.9%	2.6%	0.2%	5.3%

Source: U.S. Census

Table 55 2001 Nassau County Building Permits – Number of Units per Building

Nassau County		2001 Building Permits - Units Per Building			
town	Single Family	Two Family	Three and Four Family	Five or More Family	
Atlantic Beach	-	-	-	-	
Baxter Estates	-	-	-	-	
Bayville	-	-	-	-	
Bellerose	-	-	-	-	
Brookville	-	-	-	-	
Cedarhurst	-	-	-	-	
Centre Island	-	-	-	-	
Cove Neck	-	-	-	-	
Dering Harbor	-	-	-	-	
East Hills	-	-	-	-	
East Rockaway	-	-	-	-	
East Williston	-	-	-	-	
Farmingdale	1	-	4	9	
Floral Park	-	-	-	-	
Flower Hill	-	-	-	-	
Garden City	-	-	-	-	
Glen Cove	1	2	-	-	
Great Neck	1	-	-	-	
Great Neck Estates	-	-	-	-	
Great Neck Plaza	1	-	-	5.4	
Hempstead (town)	1	2	-	-	
Hempstead (village)	1	-	-	-	
Hewlett Bay Park	-	-	-	-	
Hewlett Harbor	-	-	-	-	
Hewlett Neck	-	-	-	-	
Island Park	-	-	-	-	
Kensington	-	-	-	-	
Kings Point	1	-	-	-	
Lake Success	-	-	-	-	
Lattingtown	-	-	-	-	
Laurel Hollow	-	-	-	-	
Lawrence	-	-	-	-	
Long Beach	1	2	-	-	
Lynbrook	-	-	-	-	
Malverne	-	-	-	-	
Manorhaven	1	2	-	-	
Massepequa	-	-	-	-	
Matinecock	-	-	-	-	
Mill Neck	-	-	-	-	
Mineola	-	-	-	-	
Munsey Park	-	-	-	-	
Muttontown	1	-	-	-	
New Hyde Park	-	-	-	-	
North Hempstead	1	-	-	-	
North Hills	-	-	-	-	
Old Brookville	-	-	-	-	
Old Westbury	1	-	-	-	
Oyster Bay Cove	-	-	-	-	
Oyster Bay	1	-	-	10.4	
Plandome	-	-	-	-	
Plandome Heights	-	-	-	-	
Plandome Manor	-	-	-	-	
Port Washington N.	-	-	-	-	
Rockville Centre	-	-	-	-	
Roslyn	-	-	-	-	
Roslyn Estates	-	-	-	-	
Roslyn Harbor	-	-	-	-	
Russell Gardens	-	-	-	-	
Saddle Rock	-	-	-	-	
Sands Point	1	-	-	-	
Sea Cliff	-	-	-	-	
South Floral Park	-	-	-	-	
Stewart Manor	-	-	-	-	
Thomaston	-	-	-	-	
Upper Brookville	1	-	-	-	
Valley Stream	-	-	-	-	
Westbury	1	-	-	-	
Williston Park	-	-	-	-	
Woodsburgh	-	-	-	-	
Totals	16	8	4	24.8	
Percent Totals	30.3%	15.2%	7.6%	47.0%	

Source: U.S. Census

Table 56 2001 Nassau County Construction Cost Per Unit

Nassau County	2001 Building Permits - Cost Per Unit			
	town	Single Family	Two Family	Three and Four Family
Atlantic Beach	-	-	-	-
Baxter Estates	-	-	-	-
Bayville	-	-	-	-
Bellerose	-	-	-	-
Brookville	-	-	-	-
Cedarhurst	-	-	-	-
Centre Island	-	-	-	-
Cove Neck	-	-	-	-
Dering Harbor	-	-	-	-
East Hills	-	-	-	-
East Rockaway	-	-	-	-
East Williston	-	-	-	-
Farmingdale	86,250	-	37,500	44,444
Floral Park	-	-	-	-
Flower Hill	-	-	-	-
Garden City	-	-	-	-
Glen Cove	311,864	109,667	-	-
Great Neck	305,349	-	-	-
Great Neck Estates	-	-	-	-
Great Neck Plaza	164,383	-	-	164,384
Hempstead (town)	98,150	49,667	-	-
Hempstead (village)	67,500	-	-	-
Hewlett Bay Park	-	-	-	-
Hewlett Harbor	-	-	-	-
Hewlett Neck	-	-	-	-
Island Park	-	-	-	-
Kensington	-	-	-	-
Kings Point	981,935	-	-	-
Lake Success	-	-	-	-
Lattingtown	-	-	-	-
Laurel Hollow	-	-	-	-
Lawrence	-	-	-	-
Long Beach	143,667	76,900	-	-
Lynbrook	-	-	-	-
Malverne	-	-	-	-
Manorhaven	281,386	64,099	-	-
Massepequa	-	-	-	-
Matinecock	-	-	-	-
Mill Neck	-	-	-	-
Mineola	-	-	-	-
Munsey Park	-	-	-	-
Muttontown	782,758	-	-	-
New Hyde Park	-	-	-	-
North Hempstead	173,963	-	-	-
North Hills	-	-	-	-
Old Brookville	-	-	-	-
Old Westbury	820,520	-	-	-
Oyster Bay Cove	-	-	-	-
Oyster Bay	282,625	-	-	138,641
Plandome	-	-	-	-
Plandome Heights	-	-	-	-
Plandome Manor	-	-	-	-
Port Washington N.	-	-	-	-
Rockville Centre	-	-	-	-
Roslyn	-	-	-	-
Roslyn Estates	-	-	-	-
Roslyn Harbor	-	-	-	-
Russell Gardens	-	-	-	-
Saddle Rock	-	-	-	-
Sands Point	1,303,443	-	-	-
Sea Cliff	-	-	-	-
South Floral Park	-	-	-	-
Stewart Manor	-	-	-	-
Thomaston	-	-	-	-
Upper Brookville	625,000	-	-	-
Valley Stream	-	-	-	-
Westbury	108,000	-	-	-
Williston Park	-	-	-	-
Woodsburgh	-	-	-	-

Source: U.S. Census

Table 57 2001 Nassau County – Construction Cost per Building

Nassau County	2001 Building Permits - Cost Per Building			
	town	Single Family	Two Family	Three and Four Family
Atlantic Beach	-	-	-	-
Baxter Estates	-	-	-	-
Bayville	-	-	-	-
Bellerose	-	-	-	-
Brookville	-	-	-	-
Cedarhurst	-	-	-	-
Centre Island	-	-	-	-
Cove Neck	-	-	-	-
Dering Harbor	-	-	-	-
East Hills	-	-	-	-
East Rockaway	-	-	-	-
East Williston	-	-	-	-
Farmingdale	690,000	-	37,500	88,889
Floral Park	-	-	-	-
Flower Hill	-	-	-	-
Garden City	-	-	-	-
Glen Cove	6,861,000	329,000	-	-
Great Neck	2,748,138	-	-	-
Great Neck Estates	-	-	-	-
Great Neck Plaza	4,438,341	-	-	2,136,994
Hempstead (town)	20,317,000	149,000	-	-
Hempstead (village)	405,000	-	-	-
Hewlett Bay Park	-	-	-	-
Hewlett Harbor	-	-	-	-
Hewlett Neck	-	-	-	-
Island Park	-	-	-	-
Kensington	-	-	-	-
Kings Point	9,819,350	-	-	-
Lake Success	-	-	-	-
Lattingtown	-	-	-	-
Laurel Hollow	-	-	-	-
Lawrence	-	-	-	-
Long Beach	1,293,002	538,300	-	-
Lynbrook	-	-	-	-
Malverne	-	-	-	-
Manorhaven	2,813,860	192,296	-	-
Massepequa	-	-	-	-
Matinecock	-	-	-	-
Mill Neck	-	-	-	-
Mineola	-	-	-	-
Munsey Park	-	-	-	-
Muttontown	4,696,545	-	-	-
New Hyde Park	-	-	-	-
North Hempstead	9,915,887	-	-	-
North Hills	-	-	-	-
Old Brookville	-	-	-	-
Old Westbury	13,128,325	-	-	-
Oyster Bay Cove	-	-	-	-
Oyster Bay	41,828,573	-	-	2,356,899
Plandome	-	-	-	-
Plandome Heights	-	-	-	-
Plandome Manor	-	-	-	-
Port Washington N.	-	-	-	-
Rockville Centre	-	-	-	-
Roslyn	-	-	-	-
Roslyn Estates	-	-	-	-
Roslyn Harbor	-	-	-	-
Russell Gardens	-	-	-	-
Saddle Rock	-	-	-	-
Sands Point	9,124,100	-	-	-
Sea Cliff	-	-	-	-
South Floral Park	-	-	-	-
Stewart Manor	-	-	-	-
Thomaston	-	-	-	-
Upper Brookville	5,000,000	-	-	-
Valley Stream	-	-	-	-
Westbury	540,000	-	-	-
Williston Park	-	-	-	-
Woodsburgh	-	-	-	-

Source: U.S. Census

Table 58 shows a detailed listing of building permits issued by town in Suffolk County in 2000 as reported by the Census. In 2000, construction in Suffolk County was spread across more towns than in Nassau County.

The Census estimates of the number of new housing units for 2000 and 2001 by towns and villages in Suffolk County. Villages are found within a town. The ten towns in Suffolk County are: Babylon, East Hampton, Huntington, Islip, Riverhead, Shelter Island, Smithtown, Southampton and Southold. Except for the Town of Riverhead, each town includes at least one village.

Table 58 2000 Suffolk County Building Permits – Number of Units

Suffolk County	2000 Building Permits - Units				
	Single Family	Two Family	Three and Four Family	Five or More Family	Total
Town					
Amityville	6	0	0	0	6
Asharoken	3	0	0	0	3
Babylon (town)	117	0	0	208	325
Babylon (village)	3	0	0	0	3
Bay Shore	-	-	-	-	0
Belle Terre	0	0	0	0	0
Bellport	2	0	0	0	2
Brightwaters	6	0	0	0	6
Brookhaven	1393	0	0	0	1393
East Hampton (town)	394	0	0	0	394
East Hampton (village)	11	0	0	0	11
E. Setauket	-	-	-	-	0
Greenport	2	0	0	0	2
Head of the Harbor	11	0	0	0	11
Huntington (town)	221	0	0	0	221
Huntington (Bay village)	0	0	0	0	0
Islandia	6	0	0	0	6
Islip	360	0	0	281	641
Lk. Grove	33	0	0	0	33
Lloyd Harbor	6	0	0	0	6
Lindenhurst	4	0	0	0	4
Nissequogue	5	0	0	0	5
Northport	4	0	0	0	4
North Haven	32	0	0	0	32
Ocean Beach	5	0	0	0	5
Old Field	6	0	0	0	6
Patchogue	4	0	0	0	4
Puquoott	2	0	0	0	2
Port Jefferson	11	0	0	10	21
Quogue	20	0	0	0	20
Riverhead	180	234	108	76	598
St. James	-	-	-	-	0
Sag Harbor	14	0	0	0	14
Saltaire	4	0	0	0	4
Setauket	-	-	-	-	0
Shelter Island	52	0	0	0	52
Shoreham	0	0	0	0	0
Smithtown	167	0	15	87	269
Southampton (town)	576	0	0	0	576
Southampton (village)	30	0	3	0	33
Southold	153	0	0	0	153
Village of the Branch	7	0	0	0	7
W. Hampton Beach	24	0	0	0	24
W. Hampton	-	-	-	-	0
Totals	3874	234	126	662	4896
Percent Totals	79.1%	4.8%	2.6%	13.5%	100.0%

Source: U.S. Census Bureau

Table 59 2000 Suffolk County Building Permits – Number of Buildings

Suffolk County	2000 Building Permits - Buildings			
	Single Family	Two Family	Three and Four Family	Five or More Family
Town				
Amityville	-	-	-	-
Asharoken	-	-	-	-
Babylon (town)	117	0	0	26
Babylon (village)	-	-	-	-
Bay Shore	-	-	-	-
Belle Terre	-	-	-	-
Bellport	-	-	-	-
Brightwaters	-	-	-	-
Brookhaven	1393	0	0	0
East Hampton (town)	394	0	0	0
East Hampton (village)	-	-	-	-
E. Setauket	-	-	-	-
Greenport	-	-	-	-
Head of the Harbor	-	-	-	-
Huntington (town)	221	0	0	0
Huntington (Bay village)	-	-	-	-
Islandia	-	-	-	-
Islip	360	0	0	10
Lk. Grove	33	0	0	0
Lloyd Harbor	-	-	-	-
Lindenhurst	-	-	-	-
Nissequogue	-	-	-	-
Northport	-	-	-	-
North Haven	32	0	0	0
Ocean Beach	-	-	-	-
Old Field	-	-	-	-
Patchogue	-	-	-	-
Puquoctt	-	-	-	-
Port Jefferson	-	-	-	-
Quogue	20	0	0	0
Riverhead	180	117	27	5
St. James	-	-	-	-
Sag Harbor	14	0	0	0
Saltaire	-	-	-	-
Setauket	-	-	-	-
Shelter Island	52	0	0	0
Shoreham	-	-	-	-
Smithtown	167	0	4	14
Southampton (town)	576	0	0	0
Southampton (village)	30	0	1	0
Southold	153	0	0	0
Village of the Branch	-	-	-	-
W. Hampton Beach	24	0	0	0
W. Hampton	-	-	-	-
Totals	3766	117	32	55
Percent Totals	94.9%	2.9%	0.8%	1.4%

Source: U.S. Census

Table 60 2000 Suffolk County Building Permits – Number of Units per Building

Suffolk County	2000 Building Permits - Units Per Building			
	Single Family	Two Family	Three and Four Family	Five or More Family
Amityville	-	-	-	-
Asharoken	-	-	-	-
Babylon (town)	1	-	-	8
Babylon (village)	-	-	-	-
Bay Shore	-	-	-	-
Belle Terre	-	-	-	-
Bellport	-	-	-	-
Brightwaters	-	-	-	-
Brookhaven	1	-	-	-
East Hampton (town)	1	-	-	-
East Hampton (village)	-	-	-	-
E. Setauket	-	-	-	-
Greenport	-	-	-	-
Head of the Harbor	-	-	-	-
Huntington (town)	1	-	-	-
Huntington (Bay village)	-	-	-	-
Islandia	-	-	-	-
Islip	1	-	-	28.1
Lk. Grove	1	-	-	-
Lloyd Harbor	-	-	-	-
Lindenhurst	-	-	-	-
Nissequogue	-	-	-	-
Northport	-	-	-	-
North Haven	1	-	-	-
Ocean Beach	-	-	-	-
Old Field	-	-	-	-
Patchogue	-	-	-	-
Puquott	-	-	-	-
Port Jefferson	-	-	-	-
Quogue	1	-	-	-
Riverhead	1	2	4	15.2
St. James	-	-	-	-
Sag Harbor	1	-	-	-
Saltaire	-	-	-	-
Setauket	-	-	-	-
Shelter Island	1	-	-	-
Shoreham	-	-	-	-
Smithtown	1	-	3.8	6.2
Southampton (town)	1	-	-	-
Southampton (village)	1	-	3	-
Southold	1	-	-	-
Village of the Branch	-	-	-	-
W. Hampton Beach	1	-	-	-
W. Hampton	-	-	-	-
Totals	16	2	10.8	57.5
Percent Totals	18.5%	2.3%	12.5%	66.7%

Source: U.S. Census

Table 61 2000 Suffolk County Construction Cost Per Unit

Suffolk County	2000 Building Permits - Cost Per Unit			
	Single Family	Two Family	Three and Four Family	Five or More Family
Amityville	-	-	-	-
Asharoken	-	-	-	-
Babylon (town)	93,016	-	-	56,211
Babylon (village)	-	-	-	-
Bay Shore	-	-	-	-
Belle Terre	-	-	-	-
Bellport	-	-	-	-
Brightwaters	-	-	-	-
Brookhaven	129,552	-	-	-
East Hampton (town)	117,962	-	-	-
East Hampton (village)	-	-	-	-
E. Setauket	-	-	-	-
Greenport	-	-	-	-
Head of the Harbor	-	-	-	-
Huntington (town)	64,454	-	-	-
Huntington (Bay village)	-	-	-	-
Islandia	-	-	-	-
Islip	129,513	-	-	62,993
Lk. Grove	327,976	-	-	-
Lloyd Harbor	-	-	-	-
Lindenhurst	-	-	-	-
Nissequogue	-	-	-	-
Northport	-	-	-	-
North Haven	255,219	-	-	-
Ocean Beach	-	-	-	-
Old Field	-	-	-	-
Patchogue	-	-	-	-
Puoquott	-	-	-	-
Port Jefferson	-	-	-	-
Quogue	504,119	-	-	-
Riverhead	231,583	516,248	488,685	344,276
St. James	-	-	-	-
Sag Harbor	150,527	-	-	-
Saltire	-	-	-	-
Setauket	-	-	-	-
Shelter Island	292,132	-	-	-
Shoreham	-	-	-	-
Smithtown	160,583	-	96,337	89,461
Southampton (town)	129,202	-	-	-
Southampton (village)	742,808	-	236,667	-
Southold	122,922	-	-	-
Village of the Branch	-	-	-	-
W. Hampton Beach	345,500	-	-	-
W. Hampton	-	-	-	-

Source: U.S. Census

Table 62 2000 Suffolk County Construction Cost Per Building

Suffolk County	2000 Building Permits			
	Single Family	Two Family	Three and Four Family	Five or More Family
Amityville	-	-	-	-
Asharoken	-	-	-	-
Babylon (town)	93,016	-	-	449,691
Babylon (village)	-	-	-	-
Bay Shore	-	-	-	-
Belle Terre	-	-	-	-
Bellport	-	-	-	-
Brightwaters	-	-	-	-
Brookhaven	129,552	-	-	-
East Hampton (town)	117,962	-	-	-
East Hampton (village)	-	-	-	-
E. Setauket	-	-	-	-
Greenport	-	-	-	-
Head of the Harbor	-	-	-	-
Huntington (town)	64,454	-	-	-
Huntington (Bay village)	-	-	-	-
Islandia	-	-	-	-
Islip	129,513	-	-	1,770,105
Lk. Grove	327,976	-	-	-
Lloyd Harbor	-	-	-	-
Lindenhurst	-	-	-	-
Nissequogue	-	-	-	-
Northport	-	-	-	-
North Haven	255,219	-	-	-
Ocean Beach	-	-	-	-
Old Field	-	-	-	-
Patchogue	-	-	-	-
Puquott	-	-	-	-
Port Jefferson	-	-	-	-
Quogue	504,119	-	-	-
Riverhead	231,583	1,032,496	1,954,741	5,233,000
St. James	-	-	-	-
Sag Harbor	150,527	-	-	-
Saltaire	-	-	-	-
Setauket	-	-	-	-
Shelter Island	292,132	-	-	-
Shoreham	-	-	-	-
Smithtown	160,583	-	361,263	555,936
Southampton (town)	129,202	-	-	-
Southampton (village)	742,808	-	710,000	-
Southold	122,922	-	-	-
Village of the Branch	-	-	-	-
W. Hampton Beach	345,500	-	-	-
W. Hampton	-	-	-	-

Source: U.S. Census

Table 63 shows a detailed listing of building permits issued by town in Suffolk County in 2001 as reported by the Census. In 2001, as in 2000, construction in Suffolk County was spread across more towns than in Nassau County.

Table 63 2001 Suffolk County Building Permits – Number of Units

Suffolk County	2001 Building Permits				
Town	Single Family	Two Family	Three and Four Family	Five or More Family	Totals
Amityville	14	0	6	0	20
Asharoken	2	0	0	0	2
Babylon (town)	131	0	0	122	253
Babylon (village)	5	0	0	0	5
Bay Shore	-	-	-	-	0
Belle Terre	0	0	0	0	0
Bellport	0	0	0	0	0
Brightwaters	1	0	0	0	1
Brookhaven	1460	2	0	344	1806
East Hampton (town)	297	0	0	0	297
East Hampton (village)	9	0	0	0	9
E. Setauket	-	-	-	-	0
Greenport	3	0	0	0	3
Head of the Harbor	2	0	0	0	2
Huntington (town)	205	0	0	0	205
Huntington (Bay village)	0	0	0	0	0
Islandia	2	0	0	0	2
Islip	213	0	0	333	546
Lk. Grove	50	0	0	0	50
Lloyd Harbor	3	0	0	0	3
Lindenhurst	18	0	0	0	18
Nissequogue	0	0	0	0	0
Northport	9	0	0	0	9
North Haven	18	0	0	0	18
Ocean Beach	4	0	0	0	4
Old Field	6	0	0	0	6
Patchogue	10	0	0	0	10
Puquoctt	1	0	0	0	1
Port Jefferson	8	0	0	0	8
Quogue	24	0	0	0	24
Riverhead	176	188	85	43	492
St. James	-	-	-	-	0
Sag Harbor	17	0	0	0	17
Saltaire	0	0	0	0	0
Setauket	-	-	-	-	0
Shelter Island	42	0	0	0	42
Shoreham	1	0	0	0	1
Smithtown	127	0	13	56	196
Southampton (town)	430	0	0	0	430
Southampton (village)	16	0	0	0	16
Southold	146	0	0	0	146
Village of the Branch	12	0	0	0	12
W. Hampton Beach	24	0	0	0	24
W. Hampton	-	-	-	-	0
Totals	3486	190	104	898	4678
Percent Totals	74.5%	4.1%	2.2%	19.2%	100.0%

Source: U.S. Census Bureau

Table 64 2001 Suffolk County Building Permits – Number of Buildings

Suffolk County	2000 Building Permits - Buildings			
Town	Single Family	Two Family	Three and Four Family	Five or More Family
Amityville	-	-	-	-
Asharoken	-	-	-	-
Babylon (town)	117	0	0	26
Babylon (village)	-	-	-	-
Bay Shore	-	-	-	-
Belle Terre	-	-	-	-
Bellport	-	-	-	-
Brightwaters	-	-	-	-
Brookhaven	1393	0	0	0
East Hampton (town)	394	0	0	0
East Hampton (village)	-	-	-	-
E. Setauket	-	-	-	-
Greenport	-	-	-	-
Head of the Harbor	-	-	-	-
Huntington (town)	221	0	0	0
Huntington (Bay village)	-	-	-	-
Islandia	-	-	-	-
Islip	360	0	0	10
Lk. Grove	33	0	0	0
Lloyd Harbor	-	-	-	-
Lindenhurst	-	-	-	-
Nissequogue	-	-	-	-
Northport	-	-	-	-
North Haven	32	0	0	0
Ocean Beach	-	-	-	-
Old Field	-	-	-	-
Patchogue	-	-	-	-
Puquott	-	-	-	-
Port Jefferson	-	-	-	-
Quogue	20	0	0	0
Riverhead	180	117	27	5
St. James	-	-	-	-
Sag Harbor	14	0	0	0
Saltaire	-	-	-	-
Setauket	-	-	-	-
Shelter Island	52	0	0	0
Shoreham	-	-	-	-
Smithtown	167	0	4	14
Southampton (town)	576	0	0	0
Southampton (village)	30	0	1	0
Southold	153	0	0	0
Village of the Branch	-	-	-	-
W. Hampton Beach	24	0	0	0
W. Hampton	-	-	-	-
Totals	3766	117	32	55
Percent Totals	94.9%	2.9%	0.8%	1.4%

Source: U.S. Census

Table 65 2001 Suffolk County Building Permits – Number of Units per Building

Suffolk County	2001 Building Permits - Units Per Building			
Town	Single Family	Two Family	Three and Four Family	Five or More Family
Amityville	-	-	-	-
Asharoken	-	-	-	-
Babylon (town)	1	-	-	17.4
Babylon (village)	-	-	-	-
Bay Shore	-	-	-	-
Belle Terre	-	-	-	-
Bellport	-	-	-	-
Brightwaters	-	-	-	-
Brookhaven	1	2	-	7.5
East Hampton (town)	1	-	-	-
East Hampton (village)	-	-	-	-
E. Setauket	-	-	-	-
Greenport	-	-	-	-
Head of the Harbor	-	-	-	-
Huntington (town)	1	-	-	-
Huntington (Bay village)	-	-	-	-
Islandia	-	-	-	-
Islip	1	-	-	15.9
Lk. Grove	1	-	-	-
Lloyd Harbor	-	-	-	-
Lindenhurst	-	-	-	-
Nissequogue	-	-	-	-
Northport	-	-	-	-
North Haven	1	-	-	-
Ocean Beach	-	-	-	-
Old Field	-	-	-	-
Patchogue	-	-	-	-
Puquott	-	-	-	-
Port Jefferson	-	-	-	-
Quogue	1	-	-	-
Riverhead	1	2	3.7	6.1
St. James	-	-	-	-
Sag Harbor	1	-	-	-
Saltaire	-	-	-	-
Setauket	-	-	-	-
Shelter Island	1	-	-	-
Shoreham	-	-	-	-
Smithtown	1	-	3.3	5.6
Southampton (town)	1	-	-	-
Southampton (village)	1	-	-	-
Southold	1	-	-	-
Village of the Branch	-	-	-	-
W. Hampton Beach	1	-	-	-
W. Hampton	-	-	-	-
Totals	16	4	6.9	52.5
Percent Totals	20.1%	5.0%	8.7%	66.1%

Source: U.S. Census

Table 66 2001 Suffolk County Construction Cost Per Unit

Suffolk County	2001 Building Permits - Cost Per Unit			
	Single Family	Two Family	Three and Four Family	Five or More Family
Amityville	-	-	-	-
Asharoken	-	-	-	-
Babylon (town)	104,142	-	-	23,834
Babylon (village)	-	-	-	-
Bay Shore	-	-	-	-
Belle Terre	-	-	-	-
Bellport	-	-	-	-
Brightwaters	-	-	-	-
Brookhaven	138,488	-	-	63,972
East Hampton (town)	152,717	-	-	-
East Hampton (village)	-	-	-	-
E. Setauket	-	-	-	-
Greenport	-	-	-	-
Head of the Harbor	-	-	-	-
Huntington (town)	64,454	-	-	-
Huntington (Bay village)	-	-	-	-
Islandia	-	-	-	-
Islip	138,434	-	-	63,972
Lk. Grove	357,959	-	-	-
Lloyd Harbor	-	-	-	-
Lindenhurst	-	-	-	-
Nissequogue	-	-	-	-
Northport	-	-	-	-
Northport	-	-	-	-
North Haven	235,889	-	-	-
Ocean Beach	-	-	-	-
Old Field	-	-	-	-
Patchogue	-	-	-	-
Puoquott	-	-	-	-
Port Jefferson	-	-	-	-
Quogue	518,021	-	-	-
Riverhead	185,088	516,248	488,685	344,276
St. James	-	-	-	-
St. James	-	-	-	-
Sag Harbor	219,118	-	-	-
Sag Harbor	-	-	-	-
Saltaire	-	-	-	-
Setauket	-	-	-	-
Shelter Island	351,929	-	-	-
Shoreham	-	-	-	-
Smithtown	168,479	-	101,381	102,230
Southampton (town)	139,653	-	-	-
Southampton (village)	535,803	-	-	-
Southold	122,907	-	-	-
Village of the Branch	-	-	-	-
W. Hampton Beach	345,500	-	-	-
W. Hampton	-	-	-	-

Source: U.S. Census

Table 67 2001 Suffolk County Construction Cost Per Building

Suffolk County	2001 Building Permits - Cost Per Building			
Town	Single Family	Two Family	Three and Four Family	Five or More Family
Amityville	-	-	-	-
Asharoken	-	-	-	-
Babylon (town)	104,142	-	-	415,389
Babylon (village)	-	-	-	-
Bay Shore	-	-	-	-
Belle Terre	-	-	-	-
Bellport	-	-	-	-
Brightwaters	-	-	-	-
Brookhaven	138,488	-	-	478,399
East Hampton (town)	152,717	-	-	-
East Hampton (village)	-	-	-	-
E. Setauket	-	-	-	-
Greenport	-	-	-	-
Head of the Harbor	-	-	-	-
Huntington (town)	64,454	-	-	-
Huntington (Bay village)	-	-	-	-
Islandia	-	-	-	-
Islip	138,434	-	-	1,014,413
Lk. Grove	357,959	-	-	-
Lloyd Harbor	-	-	-	-
Lindenhurst	-	-	-	-
Nissequogue	-	-	-	-
Northport	-	-	-	-
Northport	-	-	-	-
North Haven	235,889	-	-	-
Ocean Beach	-	-	-	-
Old Field	-	-	-	-
Patchogue	-	-	-	-
Puoquott	-	-	-	-
Port Jefferson	-	-	-	-
Quogue	518,021	-	-	-
Riverhead	185,088	1,032,496	1,806,010	2,114,840
St. James	-	-	-	-
St. James	-	-	-	-
Sag Harbor	219,118	-	-	-
Sag Harbor	-	-	-	-
Saltaire	-	-	-	-
Setauket	-	-	-	-
Shelter Island	351,929	-	-	-
Shoreham	-	-	-	-
Smithtown	168,479	-	329,488	572,485
Southampton (town)	139,653	-	-	-
Southampton (village)	535,803	-	-	-
Southold	122,907	-	-	-
Village of the Branch	-	-	-	-
W. Hampton Beach	345,500	-	-	-
W. Hampton	-	-	-	-

Table 68 2000 to 2002 U.S. HUD (Manufactured) Homes without Conventional Mortgage

2000					
	Single Wide	Multiple Wide	Sixteen Wide	Extra Wide	Total
Nassau	2	12	0	0	14
Suffolk	20	41	0	0	61
Total	22	53	0	0	75

2001					
	Single Wide	Multiple Wide	Sixteen Wide	Extra Wide	Total
Nassau	5	10	0	0	15
Suffolk	18	40	0	0	58
Total	23	50	0	0	73

2002					
	Single Wide	Multiple Wide	Sixteen Wide	Extra Wide	Total
Nassau	1	7	0	0	8
Suffolk	22	42	0	2	66
Total	23	49	0	2	74

Source: Statistical Surveys, Inc.

IX. APPENDIX D: RESIDENTIAL NEW CONSTRUCTION SURVEY DATA

A. House Characteristic

1. Size, Volume, Number of Bedrooms, Number of Stories

Table 69 All Building Types – Size in Square Feet

Size in Square Feet	Single-Family Detached	Single-Family Attached	Multi-Family Per Building	Multi-Family Per Unit
Mean	2,696	1,473	30,563	815
Minimum	1,130	672	26,611	710
Maximum	5,997	2,886	34,514	920

Figure 18 shows the distribution of single-family attached house sizes. Not surprisingly, over seventy-five percent are less than 1,500 square feet in size.

Figure 18 Single-Family Attached Housing Units – Percent Size in Square Feet

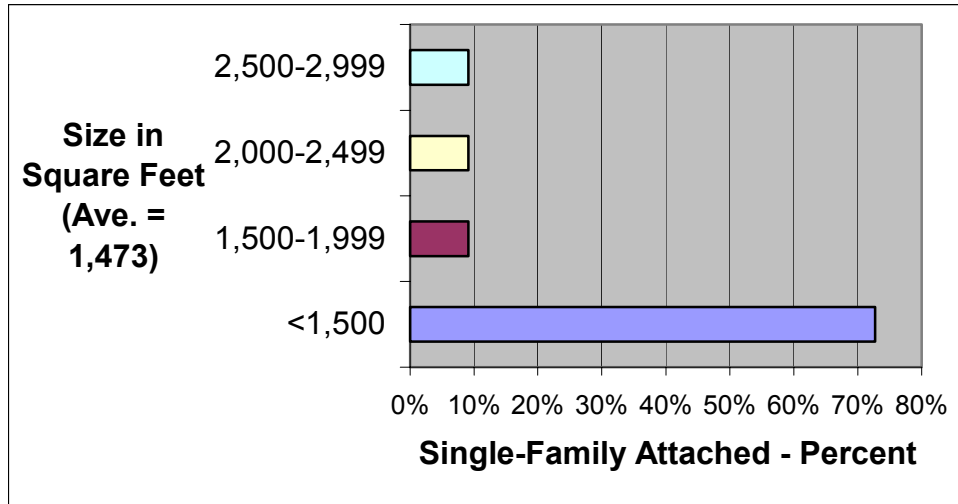


Table 70 shows the distribution of single-family attached house sizes. Not surprisingly, over seventy-five percent are less than 1,500 square feet in size.

Table 70 Single-Family Detached and Attached Housing Units – Square Feet Range

Single-Family Detached			Single-Family Attached		
Square Feet Range	Frequency	Percent	Square Feet Range	Frequency	Percent
<1,500	6	9.5%	<1,500	8	72.7%
1,500-1,999	11	17.5%	1,500-1,999	1	9.1%
2,000-2,499	16	25.4%	2,000-2,499	1	9.1%
2,500-2,999	10	15.9%	2,500-2,999	1	9.1%
3,000-3,499	7	11.1%	3,000-3,499	NA	-
3,500-3,999	6	9.5%	3,500-3,999	NA	-
4,000-4,499	3	4.8%	4,000-4,499	NA	-
4,500-4,999	0	0.0%	4,500-4,999	NA	-
>5,000	4	6.3%	>5,000	NA	-
Total	63	100.0%	Total	11	100.0%

Table 71 All Building Types – Volume (cu. ft.)

Volume (cu. ft.)	Single-Family Detached	Single-Family Attached	Multi-Family Per Building	Multi-Family Per Unit
Mean	23,264	12,343	244,445	6,519
Minimum	9,325	5,376	212,890	5,677
Maximum	54,550	23,223	276,000	7,360

Figure 19 Single-Family Detached Housing Units – Percent Number of Bedrooms

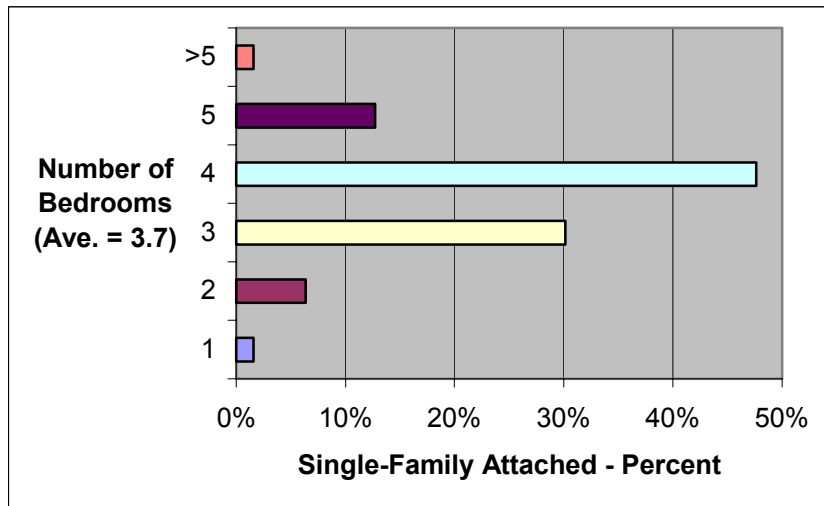


Figure 20 Single-Family Attached Housing Units – Percent Number of Bedrooms

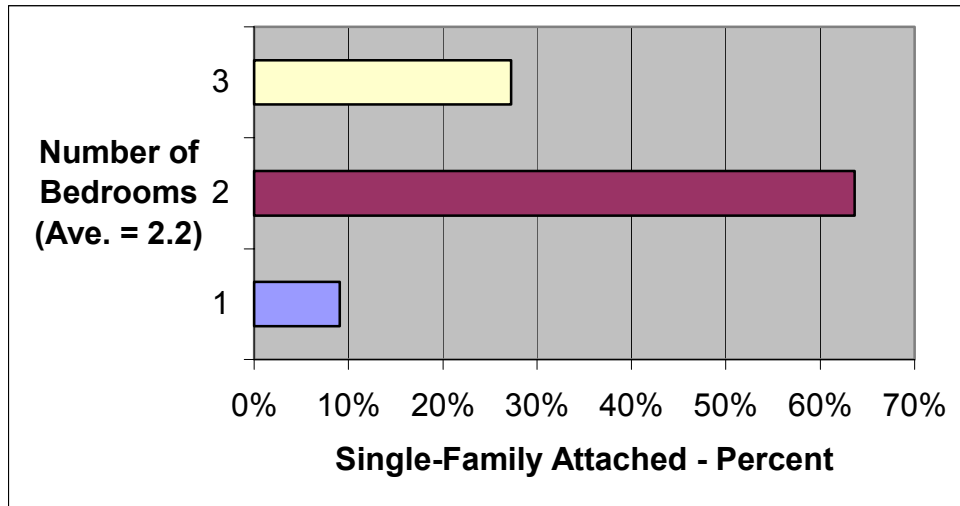


Table 72 Multi-Family Housing Units – Number of Bedrooms

Multi-Family	No. of Bedrooms Per Building	No. of Bedrooms Per Unit
Average	46	1.2

Table 73 Single-Family Detached and Attached Housing Units – Number of Bedrooms

Single-Family Detached			Single-Family Attached		
No. of Bedrooms	Frequency	Percent	No. of Bedrooms	Frequency	Percent
1	1	1.6%	1	1	9.1%
2	4	6.3%	2	7	63.6%
3	19	30.2%	3	3	27.3%
4	30	47.6%	4	NA	-
5	8	12.7%	5	NA	-
>5	1	1.6%	>5	NA	-
Total	63	100.0%	Total	11	100.0%
Average	3.7		Average	2.2	

Table 74 presents the mean number of bedrooms by house type. Single-family detached homes average between three and four, single-family attached homes average about two, and multi-family units have between one and two bedrooms.

Table 74 All Building Types – Mean Number of Bedrooms

Number of Bedrooms	Single-Family Detached	Single-Family Attached	Multi-family
Mean	3.7	2.2	1.2

Table 75 shows the number of stories for single-family detached and attached housing units. Most single-family homes are at least two levels above grade, while single-family units are fairly evenly split between single level or greater. This excludes finished basements and walkout basements.

Table 75 Single-Family Detached and Attached Housing Units – Number of Stories

Single-Family Detached			Single-Family Attached		
No. of Stories	Frequency	Percent	No. of Stories	Frequency	Percent
1 Level	9	14.3%	1 Level	6	54.5%
>1 Level	54	85.7%	>1 Level	5	45.5%
Total	63	100.0%	Total	11	100.0%

B. Space Heating

Table 76 Single-Family Detached and Attached Housing Units – Number of Heating Units

	Single-Family Attached
Number of Heating Units	Percent
1	82%
2	18%
3	NA
4	NA
None	NA
Totals	100%
Weighted Average	1.2

Table 77 shows data on primary heating fuel for single-family attached homes. In single-family attached homes, 100% of space heating is with natural gas at a cost of approximately \$700 per year.

Table 77 Single-Family Attached Housing Units – Primary Heating Fuel

Single-Family Attached Primary Heating Fuel	Percent Fuel Type	Average Consumption Per Year	Average Cost Per Year
Electricity (kWh)	0%	321	\$ 40
Natural Gas (Therms)	100%	584	\$ 707
Total	100%	-	-

Note: Electricity is used as a supplemental fuel type

Table 78 presents the average space heating cost by multi-family building and by unit. The average apartment costs about \$143 to heat annually.

Table 78 Multi-Family Housing Units – Primary Heating Fuel

Multi-Family Primary Heating Fuel	Percent Fuel Type	Average Consumption Per Building	Average Consumption Per Unit	Average Cost Per Building	Average Cost Per Unit
Electricity (kWh)	0%	645	17	\$ 81	\$ 2
Natural Gas (Therms)	100%	4445	119	\$ 5,379	\$ 143

Note: Electricity is used as a supplemental fuel type

C. Cooling

1. Central Air Conditioner Incidence

Table 79 Single-Family Detached and Attached Housing Units – Number of Central AC Cooling Units

Number of Central AC Units	Single-Family Detached	Single-Family Attached	Multi-Family
1	46%	91%	NA
2	30%	9%	43%
3	3%	NA	58%
4	2%	NA	NA
None	19%	NA	NA
Totals	100%	100%	100%
Weighted Average	1.2	1.1	2.5

Table 80 Single-Family Detached and Attached Housing Units – Average Central Air Conditioning Oversizing Summary Results (tons)

	Rated Capacity (Sensible)	Rated Capacity (Latent)	Total Rated Capacity (Sens&Latent) (Tons)	Manual J Capacity (Sensible)	Manual J Capacity (Latent)	Total Manual J Calculated Size (Latent + Sensible) (Tons)	% Oversized (at 100% of Manual J)	Tons Oversized
SFD	3.6	1.1	4.6	2.3	0.4	2.7	155%	1.7
SFA	2.2	0.7	2.9	1.3	0.3	1.6	172%	1.2

Table 81 shows the results of the Manual J cooling system sizing calculations for each of the multi-family buildings and units in terms of the number of air conditioning systems in each unit and the capacity of those systems. As mentioned above, these cooling systems were through-the-wall ductless units. In one multi-family building, we found three of this type of units, in the other building two units per apartment. In comparing the calculated cooling loads per unit (0.8 tons per apartment) to the installed system capacity (1.6 tons per apartment), one can see that twice the cooling capacity than is needed was installed.

Table 81 Multi-Family Housing Units – Air Conditioning Sizing Analysis Manual J

Multi-Family Air Conditioning Unit Sizing Analysis				Installed AC Capacity			
Bldg #	# Building Units	# of AC Systems	EER	Total Building Installed Capacity (kBtu)	Tons/ Bldg. Unit	No. of AC Systems/ Apt)	Tons/AC System
10	35	105	9.2	840	2.0	3	0.7
53	40	80	9.0	560	1.2	2	0.6
Average	37.5	92.5	9.0	700	1.6	2.5	0.6

Table 82 Single-Family Detached Housing Units – Central Air Conditioning Oversizing Summary Results (kBtu)

Central Air Conditioner Oversizing Results (kBtu)			
Single-Family Detached	Rated Capacity (Sensible & Latent)	Manual J Calculated Size (Latent + Sensible)	% Oversized (at 100% of Manual J)
Mean	55719	31937	183%
Minimum	22800	15122	76%
Maximum	109800	51884	287%
Count	27		

Table 83 Single-Family Detached and Attached Housing Units – Central Air Conditioning Oversizing Summary Results (tons)

Central Air Conditioner Oversizing Results (kBtu)	Single-Family Detached			Single-Family Attached		
	Rated Capacity (Sensible & Latent)	Manual J Calculated Size (Latent + Sensible)	% Oversized (at 100% of Manual J)	Rated Capacity (Sensible & Latent)	Manual J Calculated Size (Latent + Sensible)	% Oversized (at 100% of Manual J)
Mean	55719	31937	183%	34900	16065	236%
Minimum	22800	15122	76%	33800	11769	166%
Maximum	109800	51884	287%	36000	20361	306%
Count	27			2		

Table 84 Single-Family Detached and Attached Housing Units – Central Air Conditioning Results (tons)

Central Air Conditioner Oversizing Results (tons)	Single-Family Detached			Single-Family Attached		
	Rated Capacity (Sensible & Latent)	Manual J Calculated Size (Latent + Sensible)	% Oversized (at 100% of Manual J)	Rated Capacity (Sensible & Latent)	Manual J Calculated Size (Latent + Sensible)	% Oversized (at 100% of Manual J)
Mean	4.6	2.7	183%	2.9	1.3	236%
Minimum	1.9	1.3	76%	2.8	1.0	166%
Maximum	9.2	4.3	287%	3.0	1.7	306%
Count	27			2		

2. Room Air Conditioner Incidence

Table 85 Single-Family Detached Housing Units – Number of Room AC Units

Number of Room AC Units	Single-Family Detached	Single-Family Attached
1	2%	0%
2	8%	18%
3	2%	9%
4	2%	2%
None	86%	73%
Total Responses (51)	100%	100%
Weighted Average	0.3	0.3

3. Cooling System Efficiency

Table 86 All Building Types – Cooling

Cooling	Single-Family Detached		Single-Family Attached		Multi-Family
	System Efficiency SEER	Consumption All Homes MMBtu/Yr	System Efficiency SEER	Consumption All Homes MMBtu/Yr	System Efficiency EER
Mean	10.3	5.2	10.0	3.4	9.1
Minimum	10.0	-	10.0	0.9	9.0
Maximum	14.0	20.6	10.0	5.7	9.2

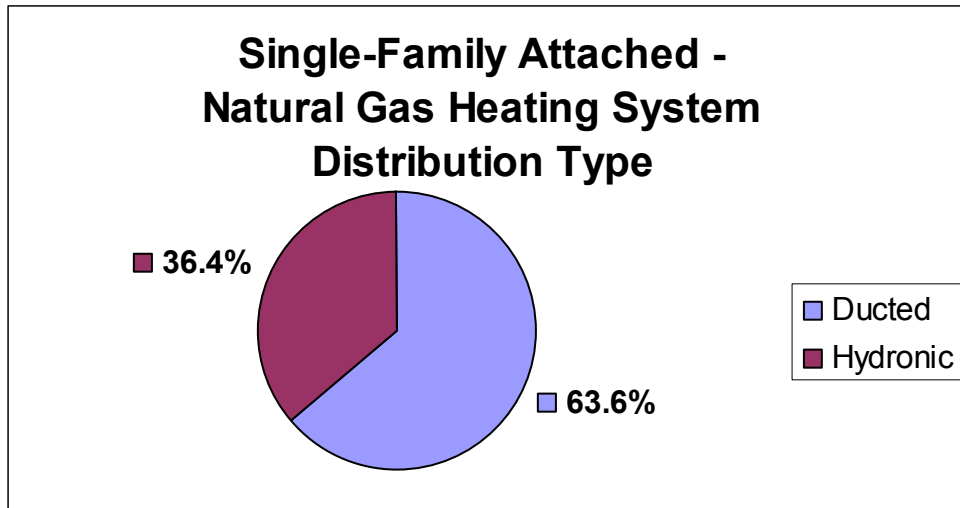
4. Adjusted SEER Results

Table 87 Single-Family Detached and Attached Housing Units – Adjusted SEER Summary Results

Adjusted SEER Results	Single-Family Detached			Single-Family Attached		
	Rated SEER ("SEER-Eff")	Charge / Airflow Adjusted SEER	New Adjusted SEER (accounting for charge/airflow and oversizing)	Rated SEER ("SEER-Eff")	Charge / Airflow Adjusted SEER	New Adjusted SEER (accounting for charge/airflow and oversizing)
Mean	10.5	8.1	7.0	10.7	6.4	5.0
Minimum	10.0	2.4	2.2	10.0	1.6	1.2
Maximum	13.1	11.9	10.6	12.0	9.0	8.2
Count	28			3		

D. HVAC Distribution

Figure 21 Single-Family Attached Housing Units – Natural Gas Heating System Distribution Type



E. Duct Leakage

Table 88 Single-Family Detached and Attached Housing Units – Ducts

Ducts	Single-Family Detached		Single-Family Attached	
	Weighted Average Duct Area (Sq. Ft.)	Average Duct Insulation R-Value	Weighted Average Duct Area (Sq. Ft.)	Average Duct Insulation R-Value
Attic Exposed	166.2	4.3	91.1	2.1
Attic Under Insulation	207.5	4.7	NA	NA
Conditioned	171.8	2.0	248.5	1.1
Open Crawlspace	119.1	4.2	NA	NA
Enclosed Crawlspace	190.2	4.2	NA	NA
Heated Basement	208.3	4.2	84.8	4.2
Unheated Basement	162.6	4.2	104.8	3.1
Wall No Top Plate	NA	NA	176.8	4.2

Table 89 Single-Family Detached and Attached Housing Units – Average Duct Leakage at CFM 25

Average Duct Leakage at CFM 25	Single-Family Detached	Single-Family Attached
Building Size (Sq. Ft.)		
<1,500	271	337
1,500-1,999	406	230
2,000-2,499	279	183
2,500-2,999	372	NA
3,000-3,499	420	NA
3,500-3,999	630	NA
4,000-4,499	440	NA
>5,000	615	NA
Average	383	300

F. Furnace Fans

Table 90 Single-Family Detached and Single-Family Attached – Furnace Fan Consumption and Percent ECM Motors

Single-Family Detached Furnace Fan kWh	Avg kWh/Yr	% ECM Motor
Furnace Fan kWh/yr	756	0%
Furnace Fan kWh/yr/home	792	0%

n=22% of total SFD sample

Single-Family Attached Furnace Fan kWh	Avg kWh/Yr	% ECM Motor
Furnace Fan kWh/yr	1004	0%
Furnace Fan kWh/yr/home	1004	0%

n=36% of total SFA sample

Note: Furnace fan kWh/yr estimates from GAMA with a locational adjustment to consumption due to increased run time of 13.3%

G. Thermostats

Table 91 All Building Types – Percent Programmable Thermostats

Percent Programmable Thermostats	Yes	No
Single-Family Detached	38%	62%
Single-Family Attached	46%	55%
Multi-Family	0%	100%

H. Domestic Hot Water

1. DHW Fuel Use and Cost

As Table 92 displays, all single-family attached units we inspected used natural gas for domestic hot water heating and space heating. It costs about \$300 per year for domestic hot water.

Table 92 Single-Family Attached Housing Units – DHW Fuel

Single-Family Attached DHW Fuel	Percent Fuel Type	Average Consumption Per Year	Average Cost Per Year
Natural Gas (Therms)	100%	249	\$ 301

Table 93 shows that, like the single-family attached homes, the two multi-family buildings we inspected both heated water with natural gas. In multi-family units, it costs about \$245 annual to heat water per apartment.

Table 93 Multi-Family Housing Units – DHW Fuel

Multi-Family DHW Fuel	Percent Fuel Type	Average Consumption Per Building	Average Consumption Per Unit	Average Cost Per Building	Average Consumption Per Unit
Natural Gas (Therms)	100%	7609	203	\$ 9,207	\$ 246

2. DHW System Size and Energy Factor

Table 94 shows, for single-family attached and multi-family housing units, that 100% use stand-alone tanks, with an average size of about 42 gallons for single-family attached and 40 gallons for the multi-family units.

Table 94 Single-Family Attached and Multi-Family Housing Units – DHW Average Size and Energy Factor

Single-Family Attached		Multi-Family	
DHW	Percent	DHW	Percent
Stand-Alone Tank	100%	Stand-Alone Tank	100%
Average Size (Gallons)	42	Average Size (Gallons)	40
Average Energy Factor	0.54	Average Energy Factor	0.55

3. Location of DHW Units

Table 95 shows the average natural gas tank type water heater Energy Factor (efficiency) for single-family attached homes and multi-family buildings. The Energy Factors of 0.54 and 0.55 are about as low as you can legally go under Federal standards.

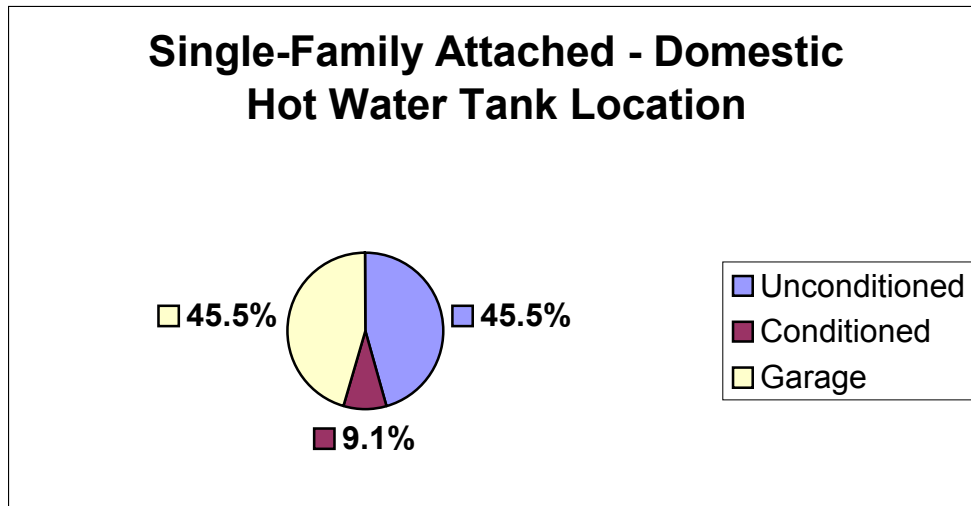
Table 95 Single-Family Attached and Multi-Family Housing Units – DHW Tank Location

Single-Family Attached		Multi-Family	
DHW Tank Location	Percent	DHW Tank Location	Percent
Unconditioned	46%	Unconditioned	50%
Conditioned	9%	Conditioned	50%
Garage	46%	Garage	0%

Table 96 Single-Family Attached and Multi-Family Buildings – DHW Tank Location

Single-Family Attached		Multi-Family	
DHW Tank Location	Percent	DHW Tank Location	Percent
Unconditioned	46%	Unconditioned	50.0%
Conditioned	9%	Conditioned	50.0%
Garage	46%	Garage	0.0%

Figure 22 Single-Family Attached Housing Units – DHW Tank Location



I. Building Envelope

1. Foundations

Table 97 Single-Family Detached and Attached Housing Units – Foundation Type shows the prevailing foundation types for single-family detached and attached homes. For detached homes almost three-quarters are over an unconditioned basement. For single-family attached homes, 45% are on a slab, followed equally by conditioned and unconditioned basements (18% each). In the two multi-family buildings included in the study, both were on slabs.

Table 97 Single-Family Detached and Attached Housing Units – Foundation Type

Single-Family Detached	Foundation Type	
	Frequency	Percent
Apart. Over Cond. Space	0	0%
Conditioned Basement	4	6%
Enclosed Crawlspace	2	3%
Multiple Types	6	10%
Open Crawlspace	2	3%
Slab	2	3%
Unconditioned Basement	47	75%
Total	63	100%

Single-Family Attached	Foundation Type	
	Frequency	Percent
Apart. Over Cond. Space	1	9%
Conditioned Basement	2	18%
Enclosed Crawlspace	0	0%
Multiple Types	1	9%
Open Crawlspace	0	0%
Slab	5	45%
Unconditioned Basement	2	18%
Total	11	100%

Figure 23 Single-Family Attached Housing Units – Foundation Type

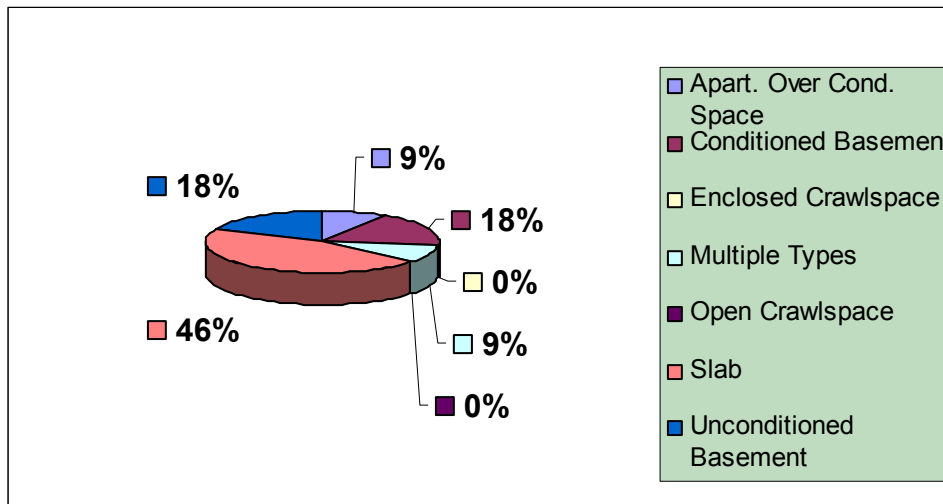


Table 98 Single-Family Detached and Attached Housing Units – Foundation Walls

Foundation		Single Famil Detache	Single Famil Attache
Conditioned Ambien	Average Area (Sq.	1139.	2114.
	Average Masonry Thickness (inches) (Weighted Average by	10.	10.
	Average Exterior Insulation (inches) (Weighted Average by	0.	0.
	Average Interior Cavity Insulation (R-Value) (Weighted Average	11.	9.
	Average Interior Rigid Insulation (inches) (Weighted Average	1.	0.
Conditioned Garag	Average Area (Sq.	542.	N
	Average Masonry Thickness (inches) (Weighted Average by	8.	N
	Average Exterior Insulation (inches) (Weighted Average by	0.	N
	Average Interior Cavity Insulation (R-Value) (Weighted Average	3.	N
	Average Interior Rigid Insulation (inches) (Weighted Average	0.	N
Enclose Crawlspace Ambien	Average Area (Sq.	558.	N
	Average Masonry Thickness (inches) (Weighted Average by	9.	N
	Average Exterior Insulation (inches) (Weighted Average by	0.	N
	Average Interior Cavity Insulation (R-Value) (Weighted Average	9.	N
	Average Interior Rigid Insulation (inches) (Weighted Average	0.	N
Enclose Crawlspace Garag	Average Area (Sq.	200.	N
	Average Masonry Thickness (inches) (Weighted Average by	8.	N
	Average Exterior Insulation (inches) (Weighted Average by	0.	N
	Average Interior Cavity Insulation (R-Value) (Weighted Average	0.	N
	Average Interior Rigid Insulation (inches) (Weighted Average	0.	N
Unconditione Basement Ambien	Average Area (Sq.	1212.	651.
	Average Masonry Thickness (inches) (Weighted Average by	9.	9.
	Average Exterior Insulation (inches) (Weighted Average by	0.	0.
	Average Interior Cavity Insulation (R-Value) (Weighted Average	0.	0.
	Average Interior Rigid Insulation (inches) (Weighted Average	0.	0.
Unconditione Basement Garag	Average Area (Sq.	230.	292.
	Average Masonry Thickness (inches) (Weighted Average by	9.	0.
	Average Exterior Insulation (inches) (Weighted Average by	0.	0.
	Average Interior Cavity Insulation (R-Value) (Weighted Average	0.	0.
	Average Interior Rigid Insulation (inches) (Weighted Average	0.	0.
Unconditone Basement Ope Crawlspac	Average Area (Sq.	168.	N
	Average Masonry Thickness (inches) (Weighted Average by	10.	N
	Average Exterior Insulation (inches) (Weighted Average by	0.	N
	Average Interior Cavity Insulation (R-Value) (Weighted Average	13.	N
	Average Interior Rigid Insulation (inches) (Weighted Average	0.	N

Table 99 Multi-Family Buildings – Foundation Walls

Multi-Family	Slab Edge
Average Slab Area (Sq. Ft.)	7640.5
Average Perimeter (Ft.)	409.0
Average Exposed Perimeter (Ft.)	409.0
Average Perimeter R-Value	0.0
Average Depth Below Grade (inches)	3.48
Average Perimeter Insulation Depth (inches)	0.03
Average Under Slab Insulation (inches)	0.45
Average Under Slab Insulation Width (inches)	0.18

2. Band Joists

The average band joist insulation is similar to the R-values in walls. Table 100 All Building Types – Band Joists presents data on the band joist details for area, location and R-values. The two predominant locations are between an unconditioned basement to ambient, and from a conditioned interior to the ambient. In all cases, the average batt insulation R-value is generally between R-10 and R-19, with R-13 as the most common value.

Table 100 All Building Types – Band Joists

Band Joists		Average Area (Sq. Ft.)	Average Rigid Insulation (U-Value)	Average Batt Insulation (R-Value)	Average Batt Insulation Thickness (inches)	Average Spacing (inches)	Average U-Value
Single-Family Detached	Conditioned to Ambient	137.1	0.073	14.0	3.8	16.0	0.07
	Conditioned to Attic	54.0	NA	19.0	5.5	16.0	0.05
	Conditioned to Garage	26.0	NA	15.4	4.3	16.0	0.06
	Unconditioned Basement to Ambient	189.3	NA	13.0	3.5	16.0	0.07
Single-Family Detached	Conditioned to Ambient	110.0	NA	10.25	2.88	16.0	0.10
Multi-Family	Conditioned to Ambient	445.0	NA	13.0	3.5	16.0	0.10

Table 101 presents data on the different places where exposed floors occur, their area and R-values. Exposed floors exist most often over unconditioned basements and crawlspaces. In these situations, there is typically R-18 or 19. This finding is significant in that it appears that most homes on Long Island insulate the floor over the basement or crawlspace, which increases the thermal performance of homes, but results in cooler basements and places any of the ducts, hydronic distribution pipes and mechanical systems outside the thermal envelope of the house.

Table 101 Single-Family Detached and Attached Housing Units – Exposed Floors

Exposed Floors		Average Area (Sq. Ft.)	Average Cavity Insulation R-Value (Weighted)	Average Total U-Value
Single-Family Detached	Conditioned to Ambient	125.7	21.0	0.052
	Conditioned to Enclosed Crawlspace	1080.0	7.8	0.199
	Conditioned to Garage	296.7	21.2	0.053
	Conditioned to Open Crawlspace	1078.0	9.1	0.162
	Conditioned to Unconditioned Basement	1389.9	18.4	0.064
Single-Family Attached	Conditioned to Ambient	28.0	27.6	0.043
	Conditioned to Enclosed Crawlspace	NA	NA	NA
	Conditioned to Garage	280.5	23.5	0.048
	Conditioned to Open Crawlspace	NA	NA	NA
	Conditioned to Unconditioned Basement	775.3	19.0	0.054

Note: No Buildings Included Continuous Insulation

Table 102 All Building Types –Slab Edge

Slab Edge	Single-Family Detached	Single-Family Attached	Multi-Family
Average Slab Area (Sq. Ft.)	1006.5	993.4	7640.5
Average Perimeter (Ft.)	124.5	100.4	409.0
Average Exposed Perimeter (Ft.)	41.0	56.3	409.0
Average Perimeter R-Value	0.45	1.25	0.0
Average Depth Below Grade (inches)	3.48	1.50	3.48
Average Perimeter Insulation Depth (inches)	0.03	0.29	0.03
Average Under Slab Insulation (inches)	0.45	1.25	0.45
Average Under Slab Insulation Width (inches)	0.18	3.00	0.18

Table 103 lists information on the different above grade wall types found in new housing units. The overwhelming majority of above grade wall occur between conditioned to the ambient. The above grade wall type, cavity insulation is installed is predominantly about R-13.

Table 103 All Building Types – Above Grade Walls

Above Grade Walls		Single-Family Detached	Single-Family Attached	Multi-Family
Conditioned to Ambient	Average Area (Sq. Ft.)	2194.6	1015.6	10,062.0
	Cavity Insulation R-Value (Weighted Average by Sq. Ft.)	13.8	12.8	12.1
	Cavity Insulation U-Value (Weighted Average by Sq. Ft.)	0.095	0.103	0.154
Conditioned to Attic	Average Area (Sq. Ft.)	175.4	99	NA
	Cavity Insulation R-Value (Weighted Average by Sq. Ft.)	13.6	13.0	NA
	Cavity Insulation U-Value (Weighted Average by Sq. Ft.)	0.097	0.099	NA
Conditioned to Garage	Average Area (Sq. Ft.)	254.3	261.8	NA
	Cavity Insulation R-Value (Weighted Average by Sq. Ft.)	13.3	12.5	NA
	Cavity Insulation U-Value (Weighted Average by Sq. Ft.)	0.098	0.101	NA
Conditioned to Unconditioned Basement	Average Area (Sq. Ft.)	120.4	85.3	NA
	Cavity Insulation R-Value (Weighted Average by Sq. Ft.)	13.2	12.6	NA
	Cavity Insulation U-Value (Weighted Average by Sq. Ft.)	0.098	0.101	NA

Note: No Buildings Included Continuous Insulation

3. Windows

Table 104 Single-Family Detached Housing Units – Average Window Glazing by Orientation

Average Window Glazing by Orientation		Weighted Average by Sq. Ft.	
Single-Family Detached	Average Area (sq. ft.)	Average SHGC	Average U-Value
East	75.1	0.55	0.47
Northeast	41.8	0.56	0.47
North	82.9	0.53	0.46
Northwest	42.0	0.54	0.47
Southeast	41.3	0.54	0.47
South	75.9	0.55	0.47
Southwest	42.5	0.54	0.48
West	90.7	0.54	0.46

Table 105 Single-Family Attached Housing Units – Average Window Glazing by Orientation

Average Window Glazing by Orientation		Weighted Average by Sq. Ft.		
Single-Family Attached	Average Area (sq. ft.)	Average SHGC	Average U-Value	
East	58.4	0.52	0.48	
North	75.8	0.53	0.48	
South	51.4	0.59	0.58	
West	84.9	0.57	0.49	

Table 106 Multi-Family Housing Units – Average Window Glazing by Orientation

Average Window Glazing by Orientation Multi-Family	Weighted Average by Sq. Ft.		
	Average Area (sq. ft.)	Average SHGC	Average U-Value
East	202.0	0.73	0.87
North	634.0	0.73	0.87
South	634.0	0.73	0.87
West	202.0	0.73	0.87

Figure 24 Single-Family Detached Housing Units – Average Window Glazing by Orientation

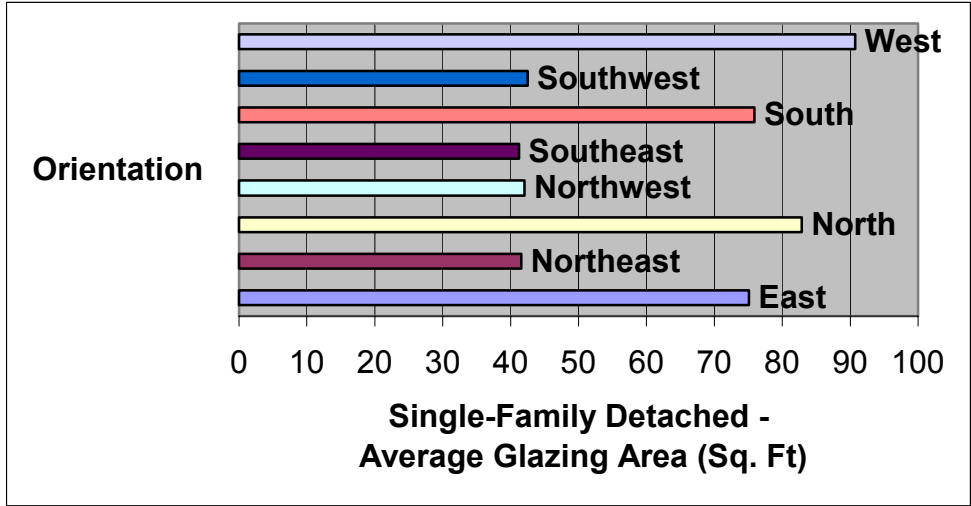


Figure 25 Single-Family Attached Housing Units – Percent Average Window Glazing by Orientation

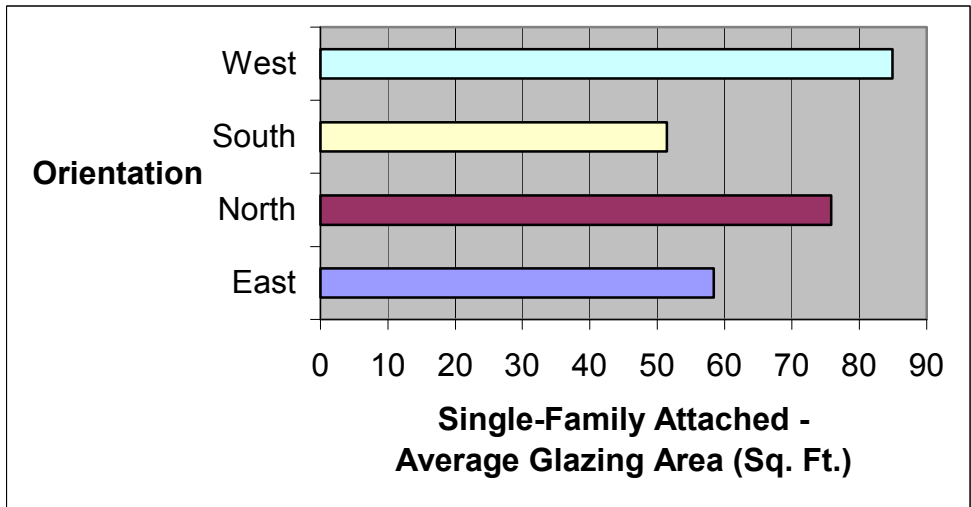
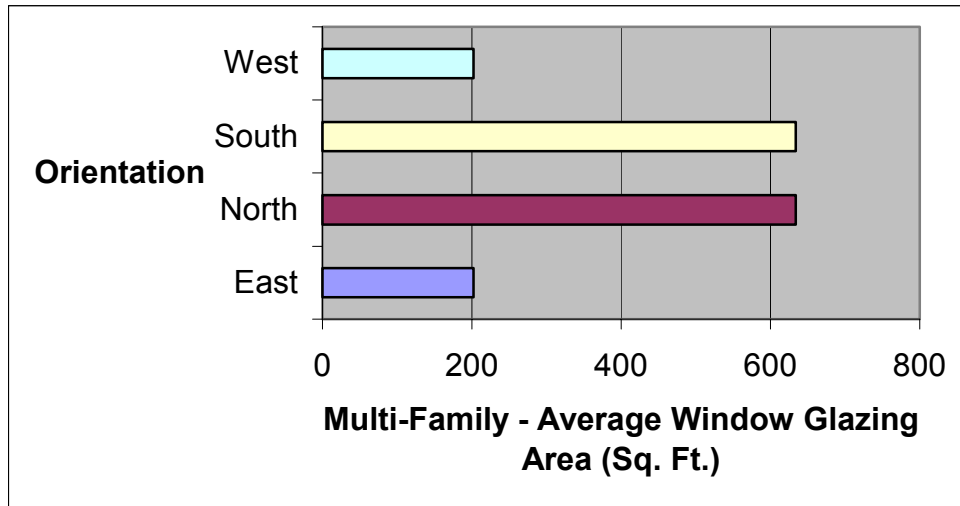


Figure 26 Multi-Family Housing Units – Percent Average Window Glazing by Orientation



4. Skylights

Table 107 Single-family Detached Housing Units – Average Sq. Ft. Area Skylight Glazing by Orientation

Single-Family Detached		Weighted Average by Sq. Ft.	
Average Sq. Ft. Area Skylight Glazing by Orientation		Average SHGC	Average U-Value
East	14.8	0.43	0.44
North	11.5	0.56	0.50
South	16.0	0.30	0.42
West	11.0	0.38	0.39

5. Ceilings

Table 108 Multi-Family Housing Units – Ceilings

Multi-Family	Ceilings	
Sloped Ceiling	Average Area	7640.5
	Continuous Insulation R-Value (Weighted Average by Sq. Ft.)	28.0
	Continuous Insulation U-Value (Weighted Average by Sq. Ft.)	0.079

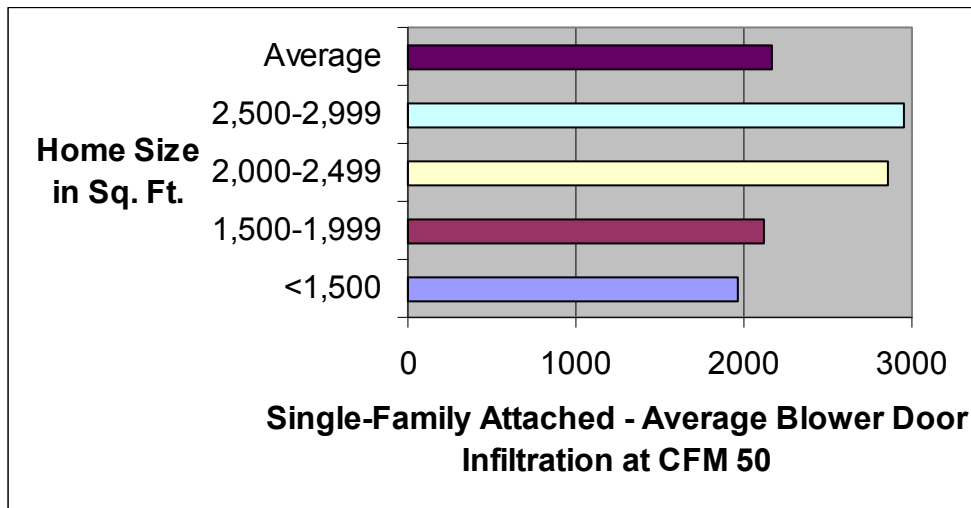
Note: No Buildings Included Cavity Insulation

6. Infiltration (Air Leakage)

Table 109 Single-Family Detached and Attached Housing Units – Infiltration by House Size

Infiltration by House Size	Average Blower Door Infiltration Values at CFM-50	
	Single-Family Detached	Single-Family Attached
Area (Sq. Ft.)		
<1,500	2200.8	1964.6
1,500-1,999	2235.5	2117.0
2,000-2,499	2905.6	2852.0
2,500-2,999	2957.0	2950.0
3,000-3,499	3387.9	NA
3,500-3,999	3964.8	NA
4,000-4,499	4032.3	NA
>5,000	6158.0	NA
Average	3098.8	2167.1

Figure 27 Single-Family Attached Housing Units – Average Blower Door Infiltration at CFM 50



J. Lighting and Appliances

1. Lighting

Table 110 shows the average number of fluorescent and incandescent fixtures by location in single-family attached homes. Fluorescent fixtures are almost twelve percent (12%) of fixture types. The average new single-family attached unit has two fluorescent fixture installed (out of seventeen total fixtures.) Virtually all fluorescent fixtures are installed in kitchens, with a few in bathrooms and none elsewhere.

Table 110 Single-Family Attached Housing Units – Lighting Fixtures Types

Single-Family Attached	Lighting Fixtures Installed		
Lighting Fixture Types	Fluorescent	Incandescent	Total
Kitchen	11%	8%	19%
Bedroom	0%	19%	19%
Bathroom	1%	17%	18%
Living	0%	14%	14%
Hallway/Entry	0%	12%	12%
Exterior/Yard/Unheated Porch	0%	9%	9%
Dining	0%	4%	4%
Office	0%	4%	4%
Finished Work Area	0%	1%	1%
Utility/Laundry	0%	1%	1%
Total	12%	88%	100%
Average Number of Fixtures / Unit	2	15	17

Table 111 shows the average number of fluorescent and incandescent fixtures by location in multi-family building units. Fluorescent fixtures are over one third of the fixture types. The average new multi-family unit has two fluorescent fixture installed (out of 5.5 total fixtures.) Fluorescent fixtures are installed in kitchens, living and bathrooms. No incandescent fixtures were installed in kitchens, living or bathrooms in the two buildings included in the survey.

Table 111 Multi-Family Housing Units – Lighting Fixture Types

Multi-Family	Lighting Fixture Locations		
Lighting Fixture Types	Fluorescent	Incandescent	Total
Bedroom	0%	36%	36%
Kitchen	18%	0%	18%
Hallway/Entry	0%	18%	18%
Living	9%	0%	9%
Finished Work Area	0%	9%	9%
Bathroom	9%	0%	9%
Grand Total	36%	64%	100%
Average Number of Fixtures / Unit	2.0	3.5	5.5

2. Appliances

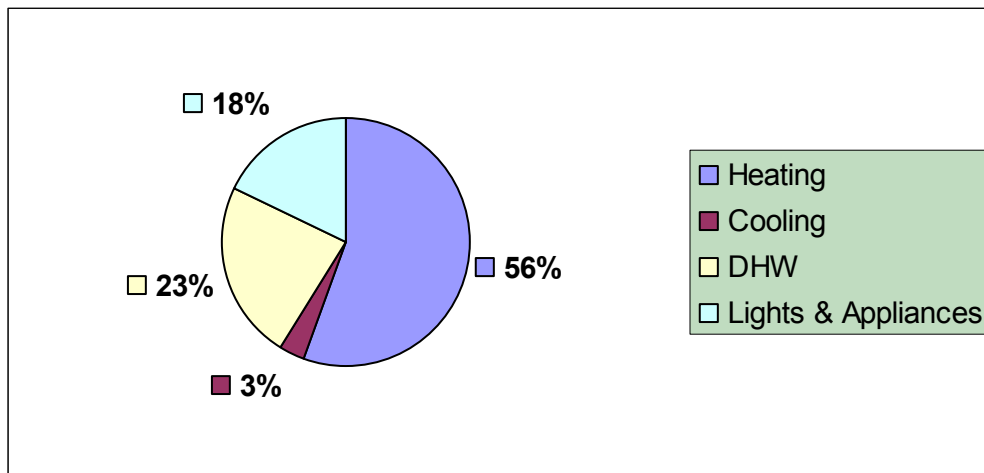
Table 112 All Building Types – ENERGY STAR Qualified Appliances

Energy Star Qualified Appliances	Single-Family Detached	Single-Family Attached	Multi-Family
Refrigerators	46%	33%	50%
Clothes Washers	28%	55%	NA
Dishwashers	73%	55%	NA
Second Refrigerators	0%	0%	NA
Freezers	0%	0%	NA

K. Energy Consumption

In single-family attached homes, since some of the walls are attached to other units, there is less heat loss or gain. Therefore, heating is about half of total consumption (compared to almost two-thirds for detached homes). Domestic hot water and lighting and appliances make up about 20% each. Only about 3% of total energy use is for cooling.

Figure 28 Single-Family Attached Housing Units – Percent Average Consumption (MMBtu/Yr)



In multi-family buildings, the majority of energy use is for domestic hot water (about 40%), followed by lights and appliances at 32%, heating at 23% and cooling at 5%.

Figure 29 Multi-Family Housing Units – Percent Average Consumption Per Unit (MMBtu/Yr)

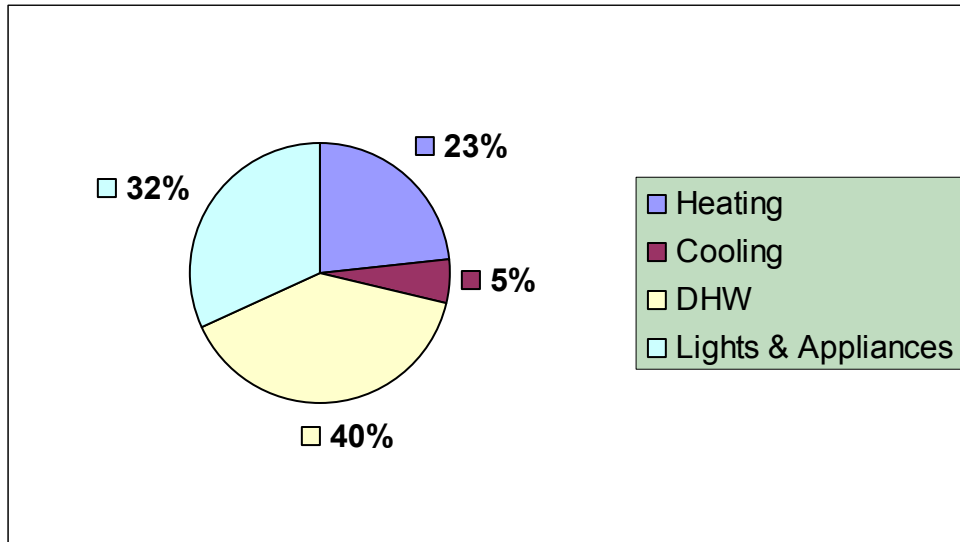


Table 113 lists the total energy consumption in MMBtu per year for all three building types surveyed.

Table 113 All Building Types – Total Consumption (MMBtu/Yr)

Total Consumption (MMBtu/Yr)	Single-Family Detached	Single-Family Attached	Multi-Family Per Building	Multi-Family Per Unit
Mean	152	107	1924	51
Minimum	71	52	1792	48
Maximum	378	168	2056	55

Table 114 All Building Types – Heating Consumption (MMBtu/Yr)

Primary Heating Consumption (MMBtu/Yr)	Single-Family Detached	Single-Family Attached	Multi-Family Per Building	Multi-Family Per Unit
Mean	95.4	59.5	446.7	11.9
Minimum	38.3	14.4	300.5	8.0
Maximum	309.3	124.4	593.0	15.8

Table 115 All Building Types – Cooling Consumption (MMBtu/Yr and kWh/Yr)

Cooling Consumption (for Homes with Cooling)	Single- Family Detached	Single- Family Attached	Multi- Family Per Building	Multi- Family Per Unit
Average (MMBtu/Yr)	6.9	3.6	101.9	2.7
Maximum (MMBtu/Yr)	20.6	5.7	109.5	2.9
Minimum (MMBtu/Yr)	3.4	0.9	94.3	2.5
Average (kWh/Yr)	2007	1062	29861	796
Maximum (kWh/Yr)	6028	1681	32082	856
Minimum (kWh/Yr)	1008	272	27640	737

Table 116 All Building Types – DHW Consumption (MMBtu/Yr)

DHW Consumption (MMBtu/Yr)	Single- Family Attached	Single- Family Attached	Multi- Family Per Building	Multi- Family Per Unit
Mean	25.6	24.9	760.9	20.3
Minimum	0.0	19.1	755.9	20.2
Maximum	40.3	31.1	765.8	20.4

Table 117 All Building Types – Lights and Appliances Consumption (MMBtu/Yr)

Lights and Appliances Consumption (MMBtu/Yr)	Single- Family Detached	Single- Family Attached	Family Per Building	Family Per Unit
Mean	25.4	19.2	614.5	16.4
Minimum	12.7	15.4	612.9	16.3
Maximum	40.6	24.1	616.0	16.4

L. Home Energy Rating System (HERS) Scores

1. Unadjusted and Adjusted HERS Scores

Table 118 All Building Types - Rating Scores

Building Type - Rating Scores	Using Nameplate SEER	With Total Adjusted SEER
Single-Family Detached		
Ratings from Actual Buildings	83.6	81.6
UDRH Composite Building	83.8	82.5
Single-Family Attached		
Ratings from Actual Buildings	83.5	75.8
UDRH Composite Building	83.7	81.2
Multi-Family		
Ratings from Actual Buildings	82.9	NA
UDRH Composite Building	83.1	NA

Using REM/Rate v. 11.2

2. HERS Score Statistical Validity

For each of the house types, the statistical validity of the scores is as follows in Table 119 HERS Score Statistical Validity:

Table 119 HERS Score Statistical Validity

House Type	Unadjusted HERS Score	Adjusted HERS Score
Single-family detached	83.6 +/- 0.5 at a 95% confidence level	81.6 +/- 1.4 at a 95% confidence level
Single-family attached	83.5 +/- 1.8 at a 95% confidence level	75.8 +/- 32.1 at a 95% confidence level
Multi-family	82.9 +/- 1.8 at a 95% confidence level	NA

3. HERS Score Distribution

Figure 30 All Building Types - Mean HERS Score

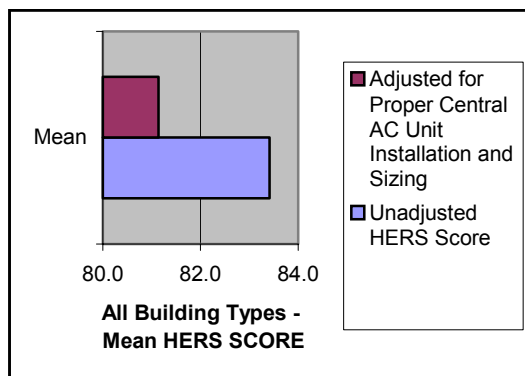


Table 120 Single-Family Detached and Attached Housing Units – HERS Score by Home Size

HERS Score by Home Size	Single-Family Detached	Single-Family Attached
<1,500	82.1	81.7
1,500-1,999	82.5	85.3
2,000-2,499	83.7	87.3
2,500-2,999	84.9	83.4
3,000-3,499	83.8	NA
3,500-3,999	84.0	NA
4,000-4,499	83.7	NA
4,500-4,999	0.0	NA
>5,000	83.6	NA
Weighted Average	83.7	83.4
Mean	83.6	82.7
Minimum	78.7	77.9
Maximum	88.0	87.3

Table 121 Single-Family Detached and Attached Housing Units – HERS Score

HERS Score	Single-Family Detached		Single-Family Attached	
	Frequency	Percent	Frequency	Percent
77.0 - 77.9	0	0%	1	9%
78.0 - 78.9	1	2%	0	0%
79.0 - 79.9	3	5%	2	18%
80.0 - 80.9	1	2%	1	9%
81.0 - 81.9	4	6%	0	0%
82.0 - 82.9	15	24%	2	18%
83.0 - 83.9	12	19%	1	9%
84.0 - 84.9	14	22%	1	9%
85.0 - 85.9	8	13%	2	18%
86.0 - 86.9 (Energy Star)	2	3%	0	0%
87.0 - 87.9 (Energy Star)	2	3%	1	9%
88.0 - 88.9 (Energy Star)	1	2%	0	0%
Total	63	100%	11	100%
ENERGY STAR (86.0 or more)	8%		9%	
Non ENERGY STAR (Less than 86.0)	92%		91%	

Figure 31 shows the percent home energy rating score by different ranges for single-family attached housing units. Over nine percent of new single-family attached homes meet the ENERGY STAR of 86.0 points.

Figure 31 Single-Family Attached Housing Units – Percent HERS Score Range

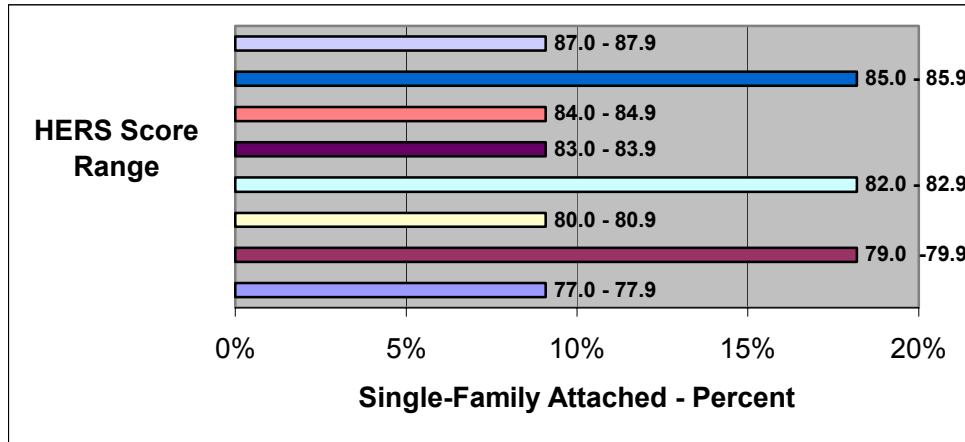


Table 122 Multi-Family Housing Units – Number of Ratings and Charge and Air Flow

Number of Ratings and Check-Me Tests		
Building Type	Count	Notes
Single Family Detached		
Home Energy Ratings	63	
Charge and Air Flow	28	
Single Family Attached		
Home Energy Ratings	11	
Charge and Air Flow	3	
Multi-family		
		MF ratings are run on whole-buildings based on hypothetical composites which come from site visits of two individual units, one per building.
Home Energy Ratings	2	
Charge and Air Flow	0	
Average Number of Units/Building	38	Based on two buildings visited.

M. Analysis Results

1. New York State Energy Conservation Code Compliance

Table 123 User Defined Reference Home – Percent Heat Loss Worse than 2002 NY ECCC

User Defined Reference Home	% UA Worse than NY Code
SF Detached / Furnace	2.5%
SF Detached / Boiler	9.2%
SF Attached	12.3%
Multi-Family	18.7%

2. Energy Code Compliance Using REM/RATE

Table 124 User Defined Reference Home – Percent Overall Performance Worse than IECC 2001

User Defined Reference Home	% Overall Performance Worse than IECC 2001
SF Detached	2.9%
SF Attached	21.6%
Multi-Family	2.7%

3. Least-Cost Analysis

Figure 32 Least-Cost Analysis Results

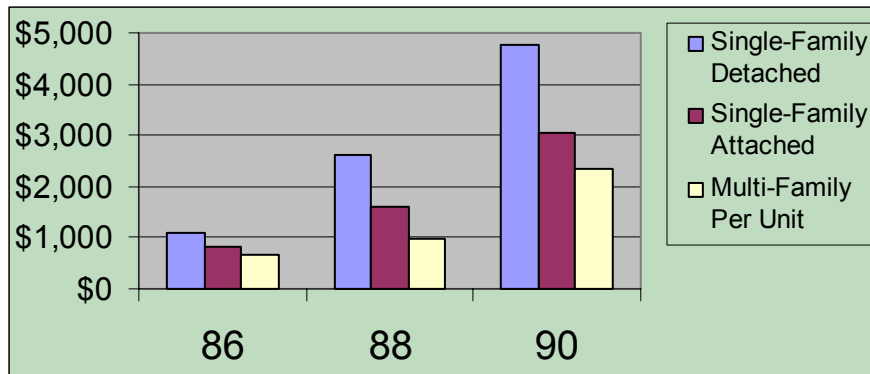


Table 125 Least-Cost Incremental Results by House Type and ENERGY STAR® Score

	Incremental Cost for ENERGY STAR Homes		
	86	88	90
Single-Family Detached	\$ 1,084	\$ 2,605	\$ 4,757
Single-Family Attached	\$ 830	\$ 1,603	\$ 3,046
Multi-Family Per Unit	\$ 670	\$ 989	\$ 2,345

X. APPENDIX E: EXISTING RESIDENTIAL MARKET DATA

A. Existing Residential Data

Statistics on existing housing stock is included here, with additional more detailed information in the appendices.

1. Occupied Housing Units

Table 126 2002 Occupied Housing Units presents existing housing units by county for 2000 and 2002. While population in Nassau County dropped by 10,000, Suffolk County increased in population by more than 13,000, or almost 3%.

Table 126 2002 Occupied Housing Units

	Occupied Housing Units	
	2000	2002
Nassau	447,387	437,538
Suffolk	469,299	

Source: U.S. Census Bureau

2. Median House Value

Table 127 2000 Median House Unit Value and Number of Occupied Units by County presents median house unit value and the number of occupied housing units in 2000 from the Census. The median house unit value is less than, but close to the median sales price indicated in Table 127.

Table 127 2000 Median House Unit Value and Number of Occupied Units by County

	2000	
	Median Value	Occupied Housing Units
Nassau	\$ 242,300	447,387
Suffolk	\$ 185,200	469,299

Source: U.S. Census Bureau

3. Median Income

Table 128 2002 Median Household Income and Total Number of Households by County lists median household income and total households for 2002 from the Census. Median income did not differ significantly between Nassau and Suffolk Counties in 2002.

Table 128 2002 Median Household Income and Total Number of Households by County

	Median Household Income	Total Households
2002		
Nassau	\$ 70,766	437,538
Suffolk	\$ 70,445	482,562

Source: 2002 American Community Service Profile 2002: 2002 ACS Tabular Profile for Nassau County - Table 3

4. Housing Units in Structure

Table 129 shows a Census break out of units by type by County in 2002. Single unit detached housing is by far the predominant type, with 78% or more, in both counties.

Table 129 2002 Number of Units in Structure by County

Units in Structure - 2002	Nassau		Suffolk	
	Count	Percentage	Count	Percentage
1-unit detached	358,408	77.9%	428,022	80.5%
1-unit attached	8,751	1.9%	17,248	3.2%
2 units	40,774	8.9%	27,146	5.1%
3 or 4 units	6,926	1.5%	13,906	2.6%
5 to 9 units	5,326	1.2%	14,157	2.7%
10 to 19 units	6,463	1.4%	12,136	2.3%
20 or more units	32,760	7.1%	14,148	2.7%
Mobile Home	194	0.0%	5,216	1.0%
RV, Boat, Van, etc.	260	0.1%	-	0.0%
Total Housing Units	459,862	100.0%	531,979	100.0%

Source: 2002 American Community Service Profile 2002: 2002 ACS Tabular Profile for Nassau County - Table 4

5. Year Built

Table 130 shows the year each structure was built by county. Over 75% the structures in Nassau County were built earlier than 1970. In Suffolk County, the housing stock is a bit more recent, with over 40% of the units built since 1970.

Table 130 Year Structure Built by County

Year Structure Built	Nassau		Suffolk	
	Count	Percentage	Count	Percentage
1999 or later	3,014	0.7%	18,710	3.5%
1995 to 1998	4,611	1.0%	25,229	4.7%
1990 to 1994	7,489	1.6%	22,992	4.3%
1980 to 1989	15,056	3.3%	50,092	9.4%
1970 to 1979	25,476	5.5%	110,780	20.8%
1960 to 1969	59,060	12.8%	116,049	21.8%
1950 to 1959	166,244	36.2%	101,860	19.1%
1940 to 1949	83,029	18.1%	27,349	5.1%
1939 or earlier	95,883	20.9%	58,918	11.1%
Total	459,862	100.0%	531,979	100.0%

Source: 2002 American Community Service Profile 2002: 2002 ACS Tabular Profile for Nassau County - Table 4

6. Heating Fuel Used

Table 131 shows a break out of house heating fuel by county from 2002 Census data. Fuel oil / kerosene is the predominant primary fuel in both Nassau and Suffolk Counties. Natural gas closely follows fuel oil / kerosene in Nassau County, but is less than half of that in Suffolk County. In both counties, the use of both of these fuels accounts for over 90% of the fuel used. In Suffolk County, there are a few island communities where natural gas is not available (i.e., Shelter Island and Fire Island.)

Table 131 2002 House Heating Fuel by County

House Heating Fuel - 2002	Nassau		Suffolk	
	Count	Percentage	Count	Percentage
Utility (Natural) Gas	188,058	43.0%	133,597	27.6%
LP Gas	5,242	1.2%	8,521	1.8%
Electricity	15,898	3.6%	39,913	8.2%
Fuel Oil / Kerosene	225,261	51.5%	299,138	61.7%
Coal	885	0.2%	-	0.0%
Wood	439	0.1%	2,037	0.4%
Solar Energy	259	0.1%	-	0.0%
Other Fuel	726	0.2%	1,068	0.2%
No Fuel Used	770	0.2%	288	0.1%
Total Occupied Households	437,538	100.0%	484,562	100.0%

Source: 2002 American Community Service Profile 2002: 2002 ACS Tabular Profile for Nassau County - Table 4

7. Owner-Occupied Units by Median Value

Table 132 shows Census data for the number of owner-occupied units by median value by county in 2002. The value of units in Nassau County is much greater than for Suffolk County.

Table 132 2002 Number of Owner-Occupied Units and Median Value by County

Number of Owner-Occupied Units - 2002	Nassau	Suffolk
Less Than \$50,000	1,932	1,173
\$50,000 to \$99,999	2,029	4,032
\$100,000 to \$149,999	3,935	37,634
\$150,000 to \$199,999	26,728	58,344
\$200,000 to \$299,999	105,795	117,512
\$300,000 to \$499,999	132,017	106,486
\$500,000 to \$999,999	44,479	30,726
\$1,000,000 or more	11,381	8,369
Median Value	\$ 324,870	\$ 249,704

Source: 2002 American Community Service Profile 2002: 2002 ACS Tabular Profile for Nassau County - Table 4

XI. APPENDIX F: CENTRAL AIR CONDITIONING DATA

Single-Family Detached		Raw Data from Proctor Engineering										
File No.	Flow	CFM/ton	Temp Split	Target Temp	Charge Result	Cap Result	Manuf.	Model	Rated Capacity (Sens&Latent)	Rated SEER ("SEER-Eff")	Charge / Airflow Adjusted SEER	
4	911	364	19	18.60516	Over	OK	Ruud	UAKA-030JAZ	28000	10.0	9.7	
4	981	392	21	17.70102	Over	OK	Ruud	UAKA-030JAZ	28000	10.0	9.9	
8	843	337	21	19.26065	Under	OK	York	AC030M10211A	28400	10.0	8.7	
8	973	389	23	19.14905	Over	OK	York	AC030M10211A	28400	10.0	9.9	
12	888	296	23	18.23879	Under	OK	Lennox	10ACB36-12P	36000	10.1	9.0	
13	563	188	16	12.62234	Under	Low	Carrier	38TKB036300	33000	11.0	9.0	
13	669	223	26	17.51737	Under	Low	Carrier	38TKB036300	33000	11.0	9.3	
15	832	277	23	19.86527	NA	OK	Lennox	HS26-036-2P	35600	13.1	11.9	
17	1188	297	18	18.80292	Under	M Low	Rheem	FADC-048JAS	47000	10.0	8.4	
18	576	230	16	15.3418	NA	Low	Lennox	HS26-030-2P	31600	13.1	11.4	
18	590	236	23	19.34682	Under	Low	Lennox	HS26-030-2P	31600	13.1	10.5	
21	619	177	2	12.46506	NA	Low	Trane	2TTB0042A1000AA	39000	10.0	1.6	
21	652	217		12.2621	Over	Low	Trane	2TTB0036A1000AA	33600	10.0	8.6	
22	541	216	8	12.46691	Over	Low	Lennox	10ACB30-11P	28800	10.2	6.5	
22	924	308	7	11.92302	OK	Low	Lennox	10ACB36-12P	36000	10.1	5.9	
28	943	236	18	17.08508	Over	Low	Trane	TTD048B100A0	48000	10.0	8.8	
28	1408	469	16	15.52637	Over	OK	Trane	TTB036C100A2	33600	10.0	10.3	
31	949	475	4	16.25153	Under	Low	Rudd	UAKA024JAZ	22800	10.0	2.5	
33	791	198	14	13.64513	Over	Low	Trane	2ttb0048a1000aa	45500	10.0	8.5	
33	819	205	14	17.15713	Over	Low	Trane	2ttb0048a1000aa	45500	10.0	8.2	
34	920	307	15	23.88679	Under	M Low	Bryant	61CJX036000AFAJ	33600	10.0	6.3	
35	643	257	6	14.80069	Over	Low	Goodman	CK-30-10	30000	10.0	4.1	
35	765	306	1	15.52637	OK	Low	Goodman	CK3010	30000	10.0	0.6	
36	862	216	14	17.70102	Under	Low	Goodman	CKL49-1	45000	10.0	7.8	
37	616	246	16	15.18452	Over	Low	Rheem	RAMB-030JAZ	30000	12.0	10.6	
37	761	304	15	15.9973	Over	M Low	Rheem	RAMB-030JAZ	30000	12.0	11.1	
38	1133	283	17	16.36459	Under	M Low	Rheem	RAMB-048JAZ	46500	12.0	10.6	
39	886	354	11	14.18902	OK	Low	Rheem	RAKA-030-JAZ	28200	10.0	7.8	
41	656	219	11	15.51933	Under	Low	Lennox	10ACB36-12P	36000	10.1	7.2	
41	905	302	10	14.09674	OK	Low	Lennox	10ACB36-12P	36000	10.1	7.2	
44	1261	252	10	14.43859	Under	Low	Rheem	RAKA-060-JAZ	57000	10.0	6.9	
45			13	15.8207	Under	OK	Rheem	FADC-030JAS	30000	10.0	8.2	
45			6	14.98248	Under	Low	Rheem	FADC-030JAS	30000	10.0	4.0	
46			4	16.06322	Under	Low	Rheem	FADC-030JAS	30000	10.0	2.5	
46			3	12.46506	Under	Low	Rheem	FADC-030JAS	30000	10.0	2.4	
55	787	315	18	17.8832	Under	M Low	Weatherking	10AJA3001	28000	10.0	9.4	
55	895	358	16	19.32138	Under	M Low	Weatherking	10AJA3001	28000	10.0	8.3	
59	911	304	16	16.81805	OK	M Low	Aire-Flo	AFAIR10B36B	35000	10.0	9.3	
59			15	14.80069	Over	OK	Bryant	563CN024B	23200	12.0	12.0	
61	700	200	18	14.79791	Over	Low	Rheem	RAMB-042-JAZ	42500	12.0	10.2	
62	800	200	18	14.97544	NA	Low	Bryant	561CJ048-F	46000	10.0	8.5	
62	821	328	16	14.99568	OK	M Low	Bryant	561CJ030-D	30000	10.0	9.5	
62	829	276	15	14.99568	NA	M Low	Bryant	561CJ036-f	33800	10.0	9.1	
63	1243	414	14	14.36562	OK	M Low	Bryant	561CJ036-F	33800	10.0	9.7	
65	919	460	11	13.35081	Over	M Low	Weatherking	10AJA2501	22200	10.0	8.2	
65	951	476	14	12.08123	OK	OK	Weatherking	10AJA2501	22200	10.0	10.6	
Average											10.5	8.1

Single-Family Detached		Raw Data from Proctor Engineering									
File No.	flow	CFM/ton	tsplit	tstarg	Charge Result	Cap Result	Manuf.	Model	Rated Capacity (Sens&Latent)	Rated SEER ("SEER-Eff")	Charge / Airflow Adjusted SEER
6	764	255	2	15.3418	Over	Low	Tempstar	NACC-036-23002	35000	12.0	1.6
14	809	270	21	16.5308	NA	M Low	Lennox	10ACC-036-230-02	33800	10.0	9.0
52	576	192	36	11.16948	Over	Low	Lennox	10ACB36-12P	36000	10.1	8.5

XII. APPENDIX G: 2002 NEW YORK STATE ENERGY CONSERVATION CONSTRUCTION CODE USING RESCHECK SOFTWARE

A. UDRH Single-Family Detached Housing with Furnace

Permit Number

REScheck Compliance Certificate Checked By/Date
 New York State Energy Conservation Construction Code
 REScheck Software Version 3.5 Release 1e
 Data filename: C:\2003 Stu\LIPA\REScheck\Check\REScheck\LIPA Nassau UDRH SFD furnace 121103.rck

PROJECT TITLE: Nassau Single-Family UDRH furnace

COUNTY: Nassau
 STATE: New York
 HDD: 4910
 CONSTRUCTION TYPE: Detached 1 or 2 Family
 HEATING TYPE: Non-Electric

DATE: 01/07/04

COMPLIANCE: Fails

Maximum UA = 746
 Your Home UA = 770
 3.2% Worse Than Code (UA)

	Gross Area or Perimeter	Cavity Cont.	Glazing or Door	R-Value	R-Value	U-Factor	UA
Ceiling 1: Flat Ceiling or Scissor Truss	1503	27.5		0.0		57	
Skylight 1: Vinyl Frame:Double Pane	2			0.440	1		
Ceiling 2: Cathedral Ceiling (no attic)	232	27.7	0.0		9		
Wall 1: Wood Frame, 16" o.c.	2264	13.8	0.0		148		
Window 1: Vinyl Frame:Double Pane	370			0.470	174		
Door 1: Solid	47		0.270	13			
Wall 2: Wood Frame, 16" o.c.	56	13.6	0.0		5		
Wall 3: Wood Frame, 16" o.c.	166	13.3	0.0		13		

Wall 4: Wood Frame, 16" o.c.	53	13.2	0.0	4	
Wall 5: Wood Frame, 16" o.c.	137	14.0	0.1	11	
Wall 6: Wood Frame, 16" o.c.	54	19.0	0.0	3	
Wall 7: Wood Frame, 16" o.c.	26	15.4	0.0	2	
Wall 8: Wood Frame, 16" o.c.	189	13.0	0.0	15	
Basement Wall 1: Solid Concrete or Masonry	109	11.8	1.9	6	
Wall height: 8.0'					
Depth below grade: 6.0'					
Insulation depth: 8.0'					
Basement Wall 3: Solid Concrete or Masonry	27	9.5	0.0	2	
Wall height: 8.0'					
Depth below grade: 6.0'					
Insulation depth: 8.0'					
Basement Wall 5: Solid Concrete or Masonry	1040	0.6	0.2	185	
Wall height: 8.0'					
Depth below grade: 6.0'					
Insulation depth: 8.0'					
Basement Wall 6: Solid Concrete or Masonry	88	0.0	0.4	22	
Wall height: 8.0'					
Depth below grade: 6.0'					
Insulation depth: 8.0'					
Floor 1: All-Wood Joist/Truss:Over Outside Air	64	21.0	0.0	3	
Floor 2: All-Wood Joist/Truss:Over Unconditioned Space	34	7.8	0.0	3	
Floor 3: All-Wood Joist/Truss:Over Unconditioned Space	151	21.2	0.0	7	
Floor 4: All-Wood Joist/Truss:Over Outside Air	34	9.1	0.0	3	
Floor 5: All-Wood Joist/Truss:Over Unconditioned Space	1169	18.4	0.0	57	
Floor 6: Slab-On-Grade:Unheated	22	0.5	23		
Insulation depth: 0.0'					
Crawl 1: Solid Concrete or Masonry	27	9.5	0.0	3	
Wall height: 4.0'					
Depth below grade: 2.0'					
Insulation depth: 4.0'					
Crawl 2: Solid Concrete or Masonry	3	0.0	0.0	1	
Wall height: 4.0'					
Depth below grade: 2.0'					
Insulation depth: 0.0'					
Crawl 3: Solid Concrete or Masonry	3	13.0	0.0	0	
Wall height: 4.0'					
Depth below grade: 2.0'					
Insulation depth: 4.0'					

Furnace 1: Forced Hot Air, 83.4 AFUE

Air Conditioner 1: Electric Central Air, 10.3 SEER

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.

Builder/Designer _____

Date _____

B. UDRH Single-Family Detached Housing with Boiler

Permit Number

REScheck Compliance Certificate Checked By/Date
 New York State Energy Conservation Construction Code
 REScheck Software Version 3.5 Release 1e
 Data filename: C:\2003 Stu\LIPA\REScheck\Check\REScheck\LIPA Nassau UDRH SFD
 boiler121103.rck

PROJECT TITLE: Nassau Single-Family UDRH boiler

COUNTY: Nassau
 STATE: New York
 HDD: 4910
 CONSTRUCTION TYPE: Detached 1 or 2 Family
 HEATING TYPE: Non-Electric

DATE: 01/07/04

COMPLIANCE: Fails

Maximum UA = 705
 Your Home UA = 770
 9.2% Worse Than Code (UA)

	Gross Area or Perimeter	Cavity Cont.	Glazing or Door R-Value	R-Value	U-Factor	UA
Ceiling 1: Flat Ceiling or Scissor Truss	1503			27.5	0.0	57
Skylight 1: Vinyl Frame:Double Pane	2				0.440	1
Ceiling 2: Cathedral Ceiling (no attic)	232	27.7		0.0		9
Wall 1: Wood Frame, 16" o.c.	2264	13.8		0.0	148	
Window 1: Vinyl Frame:Double Pane	370				0.470	174
Door 1: Solid	47		0.270	13		
Wall 2: Wood Frame, 16" o.c.	56	13.6		0.0	5	
Wall 3: Wood Frame, 16" o.c.	166	13.3		0.0	13	
Wall 4: Wood Frame, 16" o.c.	53	13.2		0.0	4	
Wall 5: Wood Frame, 16" o.c.	137	14.0	0.1		11	
Wall 6: Wood Frame, 16" o.c.	54	19.0	0.0		3	
Wall 7: Wood Frame, 16" o.c.	26	15.4	0.0		2	
Wall 8: Wood Frame, 16" o.c.	189	13.0	0.0		15	

Basement Wall 1: Solid Concrete or Masonry	109	11.8	1.9		6	
Wall height: 8.0'						
Depth below grade: 6.0'						
Insulation depth: 8.0'						
Basement Wall 3: Solid Concrete or Masonry	27	9.5	0.0		2	
Wall height: 8.0'						
Depth below grade: 6.0'						
Insulation depth: 8.0'						
Basement Wall 5: Solid Concrete or Masonry	1040	0.6	0.2		185	
Wall height: 8.0'						
Depth below grade: 6.0'						
Insulation depth: 8.0'						
Basement Wall 6: Solid Concrete or Masonry	88	0.0	0.4		22	
Wall height: 8.0'						
Depth below grade: 6.0'						
Insulation depth: 8.0'						
Floor 1: All-Wood Joist/Truss:Over Outside Air	64	21.0	0.0		3	
Floor 2: All-Wood Joist/Truss:Over Unconditioned Space	34	7.8	0.0			3
Floor 3: All-Wood Joist/Truss:Over Unconditioned Space	151	21.2	0.0			7
Floor 4: All-Wood Joist/Truss:Over Outside Air	34	9.1	0.0		3	
Floor 5: All-Wood Joist/Truss:Over Unconditioned Space	1169	18.4	0.0			57
Floor 6: Slab-On-Grade:Unheated	22	0.5		23		
Insulation depth: 0.0'						
Crawl 1: Solid Concrete or Masonry	27	9.5	0.0		3	
Wall height: 4.0'						
Depth below grade: 2.0'						
Insulation depth: 4.0'						
Crawl 2: Solid Concrete or Masonry	3	0.0	0.0		1	
Wall height: 4.0'						
Depth below grade: 2.0'						
Insulation depth: 0.0'						
Crawl 3: Solid Concrete or Masonry	3	13.0	0.0		0	
Wall height: 4.0'						
Depth below grade: 2.0'						
Insulation depth: 4.0'						

Air Conditioner 1: Electric Central Air, 10.3 SEER

Boiler 1: Other (Except Gas-Fired Steam), 81.1 AFUE

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.

Builder/Designer _____

Date _____

C. UDRH Single-Family Attached Housing

Permit Number

REScheck Compliance Certificate Checked By/Date
 New York State Energy Conservation Construction Code
 REScheck Software Version 3.5 Release 1e
 Data filename: C:\2003 Stu\LIPA\REScheck\Check\REScheck\LIPA Nassau UDRH SFA
 121103.rck

PROJECT TITLE: Single-Family Attached UDRH

COUNTY: Nassau
 STATE: New York
 HDD: 4910
 CONSTRUCTION TYPE: Detached 1 or 2 Family
 HEATING TYPE: Non-Electric

DATE: 01/07/04

COMPLIANCE: Fails

Maximum UA = 383
 Your Home UA = 430
 12.3% Worse Than Code (UA)

	Gross Area or Perimeter	Cavity Cont. R-Value	Glazing or Door R-Value	U-Factor	UA
Ceiling 1: Flat Ceiling or Scissor Truss	427	24.7	0.0		17
Skylight 1: Vinyl Frame:Double Pane	11		0.440	5	
Ceiling 2: Cathedral Ceiling (no attic)	340	14.8	0.0		22
Wall 1: Wood Frame, 16" o.c.	1016	12.8	0.0	68	
Window 1: Vinyl Frame:Double Pane	160		0.510	82	
Door 1: Solid	40		0.250	10	
Wall 2: Wood Frame, 16" o.c.	27	13.0	0.0	2	
Wall 3: Wood Frame, 16" o.c.	190	12.5	0.0	16	
Wall 4: Wood Frame, 16" o.c.	23	12.6	0.0	2	
Wall 5: Wood Frame, 16" o.c.	110	10.2	0.0	10	
Basement Wall 1: Solid Concrete or Masonry	384	9.3	0.0		41
Wall height: 8.0'					
Depth below grade: 2.0'					
Insulation depth: 8.0'					
Basement Wall 3: Solid Concrete or Masonry	178	0.0	0.0		52

Wall height: 8.0'					
Depth below grade: 6.0'					
Insulation depth: 2.0'					
Basement Wall 4: Solid Concrete or Masonry	53	0.0	0.0		15
Wall height: 8.0'					
Depth below grade: 6.0'					
Insulation depth: 2.0'					
Floor 1: All-Wood Joist/Truss:Over Outside Air	5	27.6	0.0		0
Floor 2: All-Wood Joist/Truss:Over Unconditioned Space	102	23.5	0.0		4
Floor 3: All-Wood Joist/Truss:Over Unconditioned Space	211	19.0	0.0		10
Floor 4: Slab-On-Grade:Unheated	73	0.8	74		
Insulation depth: 0.3'					

Air Conditioner 1: Electric Central Air, 10 SEER

Furnace 1: Forced Hot Air, 84 AFUE

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.

Builder/Designer _____

Date _____

D. UDRH Multi-Family Buildings

Permit Number

REScheck Compliance Certificate Checked By/Date
New York State Energy Conservation Construction Code
REScheck Software Version 3.5 Release 1e
Data filename: C:\2003 Stu\LIPA\REScheck\Check\REScheck\LIPA Nassau UDRH MF 121103.rck

PROJECT TITLE: Multi-Family UDRH

COUNTY: Nassau
STATE: New York
HDD: 4910
CONSTRUCTION TYPE: Multi-family
HEATING TYPE: Non-Electric

DATE: 01/07/04

COMPLIANCE: Fails

Maximum UA = 2916
Your Home UA = 3460
18.7% Worse Than Code (UA)

	Gross Area or Perimeter	Cavity Cont. R-Value	Glazing or Door R-Value	U-Factor	UA
Ceiling 1: Cathedral Ceiling (no attic)	7641	28.0	0.0		283
Wall 1: Wood Frame, 16" o.c.	10062	12.1	0.0	650	
Window 1: Metal Frame:Double Pane			2306		0.870 2006
Window 2: Vinyl Frame:Double Pane	60			0.440	26
Door 1: Solid	50		0.280 14		
Wall 5: Wood Frame, 16" o.c.	668	13.0	0.0	55	
Floor 1: Slab-On-Grade:Unheated	409			0.0	426
Insulation depth: 0.0'					

Boiler 1: Other (Except Gas-Fired Steam), 81 AFUE

Air Conditioner 1: Electric Central Air, 10 SEER

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.

Builder/Designer _____
Date _____

XIII. APPENDIX H: IECC 2001 CODE COMPLIANCE USING REM/RATE SOFTWARE

A. URDH Single-Family Detached Housing

2001 IECC ANNUAL ENERGY CONSUMPTION COMPLIANCE

Date: January 09, 2004 Rating No.: LIPA 1000

Building Name: LIPA SFD Adj SEER Rating Org.: VEIC

Owner's Name: LIPA SFD Phone No.:

Property Rater's Name: Richard Faesy

Address: Riverhead, NY Rater's No.:

Builder's Name:

Weather Site: Riverhead, NY Rating Type: Based On Plans

File Name: LIPA SFD UDRH Adj SEER 12-13-03.bl Rating Date: 12/13/03

REM/Rate - Residential Energy Analysis and Rating Software v11.2

This information does not constitute any warranty of energy cost or savings.

© 1985-2003 Architectural Energy Corporation, Boulder, Colorado.

Annual Energy Consumption (MMBtu)

2001 IECC As Designed

Heating: 79.7 88.0

Cooling: 11.0 8.0

Water Heating: 30.6 29.8

Lights and Appliances: 28.5 28.5

Photovoltaics: 0.0 0.0

Total: 149.8 154.2 *

This home DOES NOT meet the annual energy consumption requirements of the International Energy

Conservation Code based on 5324 heating degree-days. (Section 402, International Energy Conservation Code, 2001 edition.)

* Design consumption is based on the following:

Heating: Fuel-fired air distribution, 150.0 kBtuh, 83.4 AFUE.

Cooling: Air conditioner, 48.0 kBtuh, 7.0 SEER.

Water Heating: Conventional, Gas, 0.56 EF.

Window-to-Wall Area Ratio: 0.15

In accordance with the IECC, building inputs such as setpoints, infiltration rates, and window shading may have been changed prior to calculating annual energy consumption.

B. UDRH Single-Family Attached Housing

2001 IECC ANNUAL ENERGY CONSUMPTION COMPLIANCE

Date: January 09, 2004 Rating No.: LIPA 1001

Building Name: LIPA SFA Adj SEER Rating Org.: VEIC

Owner's Name: LIPA SFA Phone No.:

Property Rater's Name: Richard Faesy

Address: Riverhead, NY Rater's No.:

Builder's Name:

Weather Site: Riverhead, NY Rating Type: Based On Plans

File Name: LIPA SFA UDRH Adj SEER 1.8.04.blg Rating Date: 12/13/03

REM/Rate - Residential Energy Analysis and Rating Software v11.2

This information does not constitute any warranty of energy cost or savings.

© 1985-2003 Architectural Energy Corporation, Boulder, Colorado.

Annual Energy Consumption (MMBtu)

2001 IECC As Designed

Heating: 39.3 56.0

Cooling: 5.3 6.6

Water Heating: 22.5 23.4

Lights and Appliances: 19.8 19.8

Photovoltaics: 0.0 0.0

Total: 87.0 105.8 *

This home DOES NOT meet the annual energy consumption requirements of the International Energy

Conservation Code based on 5324 heating degree-days. (Section 402, International Energy Conservation Code, 2001 edition.)

* Design consumption is based on the following:

Heating: Fuel-fired air distribution, 100.0 kBtuh, 84.0 AFUE.

Cooling: Air conditioner, 48.0 kBtuh, 5.0 SEER.

Water Heating: Conventional, Gas, 0.54 EF.

Window-to-Wall Area Ratio: 0.13

In accordance with the IECC, building inputs such as setpoints, infiltration rates, and window shading may have been changed prior to calculating annual energy consumption.

C. Multi-Family Buildings

2001 IECC ANNUAL ENERGY CONSUMPTION COMPLIANCE

Date: January 09, 2004 Rating No.: LIPA 1002

Building Name: LIPA MF Rating Org.: VEIC

Owner's Name: LIPA MF Phone No.:

Property Rater's Name: Richard Faesy

Address: Riverhead, NY Rater's No.:

Builder's Name:

Weather Site: Riverhead, NY Rating Type: Based On Plans

File Name: LIPA MF UDRH 1.8.04.blg Rating Date: 12/13/03

REM/Rate - Residential Energy Analysis and Rating Software v11.2

This information does not constitute any warranty of energy cost or savings.

© 1985-2003 Architectural Energy Corporation, Boulder, Colorado.

Annual Energy Consumption (MMBtu)

2001 IECC As Designed

Heating: 361.6 457.9

Cooling: 114.0 79.1

Water Heating: 781.9 771.3

Lights and Appliances: 620.0 620.0

Photovoltaics: 0.0 0.0

Total: 1877.5 1928.3 *

This home DOES NOT meet the annual energy consumption requirements of the International Energy

Conservation Code based on 5324 heating degree-days. (Section 402, International Energy Conservation Code, 2001 edition.)

* Design consumption is based on the following:

Heating: Fuel-fired hydronic distribution, 400.0 kBtuh, 81.0 % EFF.

Cooling: Air conditioner, 7.5 kBtuh, 9.1 EER.

Water Heating: Conventional, Gas, 0.55 EF.

Window-to-Wall Area Ratio: 0.22

In accordance with the IECC, building inputs such as setpoints, infiltration rates, and window shading may have been changed prior to calculating annual energy consumption.

XIV. APPENDIX I: LEAST-COST ANALYSIS CALCULATIONS

LIPA Residential New Construction Least Cost ENERGY STAR Measure Incentives			Target		Target		Target	
Single Family Detached (SFD) (2,696 sqft, 4 bedrooms)			86.2		88.2		90.2	
(Adjusted SEER)			Adj. Measure	Base	Adj. Measure	Base	Adj. Measure	Base
Component	Base	Upgrade	Cost	Cost	Cost	Cost	Cost	Cost
LIPA Service Territory, NY								
E-Star Lighting Fixtures (79.2 kWh savings/fix)	Incandescent	E-Star Int. Fixtures	\$120	82.5	\$120	82.5	\$120	82.5
Mechanical Ventilation System	None	Installed	\$290	82.0	\$290	82.0	\$290	82.0
Duct Sealing (No. of Tons)	Code Duct Sealed	ENERGY STAR Duct Seal	\$248	83.6	\$306	83.6	\$306	83.6
Programmable T-stat (weighted)	Manual	Programmable	\$23	84.1	\$23	84.1	\$23	84.1
Air Conditioner -13	SEER 10 (Adj 7.0)	SEER 13, EER 11	\$506	85.8	\$624	85.8		
Air Conditioner -14	SEER 10 (Adj 7.0)	SEER 14, EER 12						
Air Conditioner -15	SEER 10 (Adj 7.0)	SEER 15, EER 12					\$939	86.1
GSHP (tons req. based on final Heating kBTU load)	AFUE 80 / SEER 10	GSHP 13 EER, closed loop						
Duct Returns (No. of Tons Required)	Cavities	Hard						
Air-Sealing -2 (ACH=0.25)	CFM-50=3098	Natural ACH = 0.25 (heating/cooling)						
Air-Sealing-1 (ACH=0.35)	CFM-50=3098	Natural ACH = 0.35 (heating/cooling)			\$623	86.4	\$623	86.6
Gas Water Heater - 50 gal. (EF.64)	EF = .56	EF = .64			\$280	87.0		
Gas Water Heater - 50 gal. (EF.61)	EF = .56	EF = .61	\$237	86.3				
Gas Water Heater 50 gal. EF.84 (Polaris)	EF = .56	EF = .84					\$1,562	88.4
Electric Water Heater - 50 gal.	EF = .86	EF = .89						
Electric Water Heater - 50 gal.	EF = .86	EF = .91						
Gas Water Heater - 75 gal. (EF=.84)	EF = .50	EF = .64						
Gas Water Heater - 75 gal. (EF=.58)	EF = .50	EF = .58						
GFX w/ Gas Water Heater (Polaris -50 gal)	EF = .50	EF = .97						
GFX w/ Gas Water Heater - 50 gal.	EF = .54	EF = .74						
GFX w/ Gas Water Heater - 50 gal.	EF = .54	EF = .70						
GFX w/ Electric Water Heater - 50 gal.	EF = .86	EF = .98						
GFX w/ Electric Water Heater - 50 gal.	EF = .86	EF = .98						
GFX w/Gas Water Heater - 75 gal. (EF=.74)	EF = .50	EF = .74						
GFX w/ Gas Water Heater - 75 gal. (EF=.68)	EF = .50	EF = .68						
GFX Drain Water Heat Exchanger	None	Installed						
Slab insulation upgrade-2' (R10,2')	R-0, 2' down	R-5, 2' down						
Slab insulation upgrade-4'	R-0, 2' down	R-10, 4' down/horizontal						
Gas Furnace - 92	AFUE = 83.4	AFUE = 92			\$679	88.3		
Gas Furnace - 90	AFUE = 83.4	AFUE = 90						
Gas Furnace - 96	AFUE = 83.4	AFUE = 96					\$1,234	90.2
Gas Furnace - 94	AFUE = 83.4	AFUE = 94						
Gas Attic 90%+ Furnace Freeze Prot	None	Installed						
Windows - Wood/Vinyl Low E-1	U=0.50.SHGC=0.60	U=0.39.SHGC=0.53						
Wood/Vinyl Composite Low E-2	U=0.50.SHGC=0.60	U=0.37.SHGC=0.46						
Wood/Vinyl Composite Low E-3	U=0.50.SHGC=0.60	U=0.35.SHGC=0.38						
Windows - Canadian Fiberglass	U=0.50.SHGC=0.60	U=0.28.SHGC=0.41						
Exterior Walls - 3 (R-4 cont)	Housewrap	R-4 continuous						
Exterior Walls - 4 (R7-cont)	Housewrap	R-7 continuous						
Exterior Walls -1 (R-15)	R-13	R-15						
Exterior Walls -2 (R-19)	R-13	R-19						
Exterior Walls - 5 (R-5)	Sheathing/housewrap	R-5 foam board						
Exterior Walls - 6 (R-7.5)	Sheathing/housewrap	R-7.5 foam board						
Ceiling - Flats - 1	R-30	R-38						
Ceiling - Flats - 2	R-30	R-45						
Ceiling - Flats - 3 (R-45)	R-38	R-45						
Foundation Insulation (R-19)	R-11	R-19						
Duct Insulation Attic (R-8)	R-6	R-8						
Total for Duct Returns and Duct Sealing								
A/C Downsizing-1 ton	None	Installed	-\$340	86.3	-\$340	88.3	-\$340	90.2
Chimney	B-vent	Direct Vent (DHW + Heating)	\$1,084		\$2,605	88.3	\$4,757	90.2
TOTAL POINTS				86.3		88.3		90.2
UPGRADE COST				\$1,084		\$2,605		\$4,757
Heat Design (kBtu)	40.5				39.5			39.9
Tons Heat Equip	4				4			4
Cool Design (kBtu)	25.40				27.2			27.1
Tons Cool Equip.	2.5				3			3

LIPA SFD UDRH Inputs (2,696)	SqFt	Linear Feet	Unadj. Tons	Adj Tons	Units	Cooling Design Load kBtu/hr
House size	2696					
Ceiling - Flats (Area)	1503					
Foundation Wall Insulation	1284					
Exterior Walls (Above Grade Walls)	2539					
Doors	47.1					
Windows	369.7					
Slab exposed perimeter (linear feet)		176				
Duct Returns (No. of Tons)			2.5	2.5	3	
Duct Sealing (No of Tons)			2.5	2.5	3	
Air Conditioner (Size of required system in tons)			2.5	2.5	3	
Heat (No. of Units)					1	
Cooling Equipment (No. of Units)					1	
Duct Area	136.4					
Base Design Load Heating (kBtu/hr)						54.10
Base Design Load Cooling (kBtu/hr)						29.70
Duct Sealing Air leakage at CFM-25					50	
CAC Equipment Oversizing (tons)					1.7	

LIPA Residential New Construction Least Cost ENERGY STAR Measure Incentives			Target		Target		Target	
Single Family Attached (SFA) (1,473 sqft, 2 bedrooms)			(Adjusted SEER)					
Component	Base	Upgrade	Adj. Measure Cost	Base	Adj. Measure Cost	Base	Adj. Measure Cost	Base
LIPA Service Territory, NY				81.2		81.2		81.2
E-Star Lighting Fixtures (79.2 kWh savings/fix)	Incandescent	E-Star Int. Fixtures	\$120	81.2	\$120	81.2	\$120	81.2
Mechanical Ventilation System	None	Installed	\$290	80.8	\$290	80.8	\$290	80.8
Duct Sealing (No. of Tons)	Code Duct Sealed	ENERGY STAR Duct Seal	\$153	82.3	\$153	82.3	\$153	82.3
Programmable T-stat (weighted)	Manual	Programmable	\$23	82.8	\$23	82.8	\$23	82.8
Air Conditioner -13	SEER 10 (Adj 5.0)	SEER 13, EER 11	\$287	85.6				
Air Conditioner -14	SEER 10 (Adj 5.0)	SEER 14, EER 12						
Air Conditioner -15	SEER 10 (Adj 5.0)	SEER 15, EER 12			\$470	85.8	\$470	85.8
GSHP (tons req. based on final Heating kBtu load)	AFUE 80 / SEER 10	GSHP 13 EER, closed loop						
Duct Returns (No. of Tons Required)	Cavities	Hard						
Air-Sealing -2 (ACH=0.25)	CFM-50=2167	Natural ACH = 0.25 (heating/cooling)			\$548	87.3	\$548	87.3
Air-Sealing-1 (ACH=0.35)	CFM-50=2167	Natural ACH = 0.35 (heating/cooling)						
Gas Water Heater - 40 gal. (EF.64)	EF = .54	EF = .64			\$280	88.3	\$280	88.3
Gas Water Heater - 40 gal. (EF.61)	EF = .54	EF = .61	\$237	86.3				
Gas Water Heater 40 gal. EF.84 (Polaris)	EF = .54	EF = .84						
Gas Water Heater 50 gal. EF.84 (Polaris)	EF = .54	EF = .84						
Electric Water Heater - 50 gal.	EF = .86	EF = .89						
Electric Water Heater - 50 gal.	EF = .86	EF = .91						
Gas Water Heater - 75 gal. (EF=.64)	EF = .50	EF = .64						
Gas Water Heater - 75 gal. (EF=.58)	EF = .50	EF = .58						
GFX w/ Gas Water Heater (Polaris -50 gal)	EF = .50	EF = .97						
GFX w/ Gas Water Heater - 50 gal.	EF = .54	EF = .74						
GFX w/ Gas Water Heater - 50 gal.	EF = .54	EF = .70						
GFX w/ Electric Water Heater - 50 gal.	EF = .86	EF = .98						
GFX w/ Electric Water Heater - 50 gal.	EF = .86	EF = .98						
GFX w/Gas Water Heater - 75 gal. (EF=.74)	EF = .50	EF = .74						
GFX w/ Gas Water Heater - 75 gal. (EF=.68)	EF = .50	EF = .68						
GFX Drain Water Heat Exchanger	None	Installed						
Slab insulation upgrade-2' (R10,2')	R-0, 2' down	R-5, 2' down						
Slab insulation upgrade-4'	R-0, 2' down	R-10, 4' down/horizontal						
Gas Furnace - 92	AFUE = 84	AFUE = 92						
Gas Furnace - 90	AFUE = 84	AFUE = 90						
Gas Furnace - 96	AFUE = 84	AFUE = 96						
Gas Furnace - 94	AFUE = 84	AFUE = 94					\$1,127	89.6
Gas Attic 90%+ Furnace Freeze Prot	None	Installed						
Windows - Wood/Vinyl Low E-1	U=0.50, SHGC=0.60	U=0.39, SHGC=0.53						
Wood/Vinyl Composite Low E-2	U=0.50, SHGC=0.60	U=0.37, SHGC=0.46						
Wood/Vinyl Composite Low E-3	U=0.50, SHGC=0.60	U=0.35, SHGC=0.38					\$316	90.2
Windows - Canadian Fiberglass	U=0.50, SHGC=0.60	U=0.28, SHGC=0.41						
Exterior Walls - 3 (R-4 cont)	Housewrap	R-4 continuous						
Exterior Walls - 4 (R7-cont)	Housewrap	R-7 continuous						
Exterior Walls -1 (R-15)	R-13	R-15						
Exterior Walls -2 (R-19)	R-13	R-19						
Exterior Walls - 5 (R-5)	Sheating/housewrap	R-5 foam board						
Exterior Walls - 6 (R-7.5)	Sheating/housewrap	R-7.5 foam board						
Ceiling - Flats - 1	R-30	R-38						
Ceiling - Flats - 2	R-30	R-45						
Ceiling - Flats - 3 (R-45)	R-38	R-45						
Foundation Insulation (R-19)	R-11	R-19						
Duct Insulation Attic (R-8)	R-6	R-8						
Total for Duct Returns and Duct Sealing								
A/C Downsizing-1 ton	None	Installed	-\$280	86.3	-\$280	88.3	-\$280	90.2
Chimney Savings	B-vent	Direct Vent (DHW + Heating)	\$830		\$1,603	88.3	\$3,046	90.2
TOTAL POINTS UPGRADE COST			\$830	86.3	\$1,603	88.3	\$3,046	90.2
TOTAL POINTS UPGRADE COST			\$830	86.3	\$1,603	88.3	\$3,046	90.2
Heat Design (kBtu)	25.3				21.9			20.8
Tons Heat Equip	2.5				2.5			2
Cool Design (kBtu)	14.4				14.5			12.7
Tons Cool Equip.	1.5				1.5			1.5

LIPA SFA UDRH Inputs	SqFt	Linear Feet	Unadj. Tons	Adj Tons	Units	Cooling Design Load kBtu/hr
House size	1473					
Ceiling - Flats (Area)	427					
Foundation Wall Insulation	612.8					
Exterior Walls (Above Grade Walls)	1256.3					
Doors	39.7					
Windows	160					
Slab exposed perimeter (linear feet)		41				
Duct Returns (No. of Tons)			1.3	1.5	1.5	
Duct Sealing (No of Tons)			1.3	1.5	1.5	
Air Conditioner (Size of required system in tons)			1.3	1.5	1.5	
Heat (No. of Units)					1	
Cooling Equipment (No. of Units)					1	
Duct Area	55.6					
Base Design Load Heating (kBtu/hr)						30.80
Base Design Load Cooling (kBtu/hr)						16.10
Duct Sealing Air leakage at CFM-25					30	
CAC Equipment Oversizing (tons)					1.4	

LIPA MF UDRH Inputs/unit (Total of 38 Units)	SqFt	Linear Feet	Unadj. Tons	Adj Tons	Units	Cooling Design Load kBtu/hr
House size	30563					
Ceiling - Flats (Area)	0					
Foundation Wall Insulation	0					
Exterior Walls (Above Grade Walls)	10554					
Doors	50					
Windows	2306					
Slab exposed perimeter (linear feet)		409				
Duct Returns (No. of Tons)			20.7	21.0	21.0	
Duct Sealing (No of Tons)			20.7	21.0	21.0	
Air Conditioner (Size of required system in tons)			20.7	21.0	76.0	
Heat (No. of Units)					1	
Cooling Equipment (No. of Units)					1	
Duct Area	0					
Base Design Load Heating (kBtu/hr)						304.4
Base Design Load Cooling (kBtu/hr)						248.2
Duct Sealing Air leakage at CFM-25					420	
CAC Equipment Oversizing (tons)						
MF Housing Units					38	

Mechanical Ventilation REM Inputs

From ASHRAE 62.2:

$$Q_{\text{fan}} = 0.01A_{\text{floor}} + 7.5(N_{\text{br}} + 1)$$

[Eq. 4.1a]

where:

Q_{fa} = fan flow rate in cubic feet per minute (cfm).

A_{floor} = floor area in square feet (ft²).

N_{br} = number of bedrooms; not to be less than 1.

Sq. Ft.

Avg. Bedrooms

of Units

Mechanical Ventilation fan CFM

Watts

Hours/Day

SFD	SFA	MF
2696	1473	30563
4	2	46
NA	NA	38
57	30	651
20	20	760
24	24	24

		Heating Unit A	Heating Unit B	Heating Unit C
26.	House Section(s) ¹¹			
27.	Make			
28.	Model number			
29.	Venting (W = Wall Vent, R = Roof Vent, U = Unvented)			
30.	Sealed Combustion (Y/N)			
31.	Induced-Draft (Y/N)			
32.	Pipes/ducts fully insulated? (Y/N)			
33.	Notes:			

IV. CENTRAL COOLING

		Cooling Unit A	Cooling Unit B	Cooling Unit C
34.	House Section(s) ²			
35.	Condensing Unit -Make			
36.	Condensing Unit - Model number			
37.	Indoor Coil -Make			
38.	Indoor Coil - Model number			
39.	Rated system efficiency (SEER) ¹²			

40. How many room air conditioners are used? _____

V. DOMESTIC HOT WATER (DHW)

		DHW Unit A	DHW Unit B	DHW Unit C
41.	System location (<u>B</u> asement, <u>G</u> arage, <u>C</u> loset, <u>O</u> ther)			
42.	Make			
43.	Model number			
44.	Venting (W = Wall Vent, R = Roof Vent, U = Unvented)			
45.	Sealed Combustion (Y/N)			
46.	Induced-Draft (Y/N)			
47.	Pipes fully insulated? (Y/N)			
48.	Notes:			

VI. AIR INFILTRATION

¹¹ Use same name as in REM/Rate name field.

¹² VEIC to complete.

49. Measured infiltration rate - CFM50 _____ (to be input into REM/Rate)

50. Select one: Depressurized Pressurized

51. Temperature

- a. Indoor _____
- b. Outdoor _____

52. Basement door closed YES NO

53a. Calculate Natural Air Changes per Hour (for Right-J): _____

53b. CFM50: _____

53c. Number of Stories: _____

53d. Winter CFM_{natural} = CFM50 / [18 / (Stories^{0.325})] = _____

53e. Summer CFM_{natural} = .67 * Winter CFM_{natural} = _____

VII. APPLIANCES

	Appliance	A. Make	B. Model*	C. New (N) / Moved (M)	D. Age When House First Occupied ¹³	E. Type
54.	Refrigerator #1					
55.	Refrigerator #2					
56.	Freezer					
57.	Clothes washer					
58.	Dishwasher #1					
59.	Dishwasher #2					
60.	Ceiling Fan #1	ENERGY STAR: Y, N, DK				
61.	Ceiling Fan #2	ENERGY STAR: Y, N, DK				
62.	Ceiling Fan #3	ENERGY STAR: Y, N, DK				

*Only record model numbers if the appliance was purchased within the last four years.

Type:

Refrigerator Types : **TM** - Top Mount, **SS** - Side by Side, **BM** - Bottom Mount Freezer

Clothes washer Types: **H** - horizontal axis, **T** - top loader

Freezer Types: **U** – upright, **C**-chest

	Appliance	A. #	B. Location Code (see Lighting Codes)	C. Fuel Type (NG-Natural Gas, LP-Propane, E-Electricity, O-Oil, K-Kerosene, W-Wood)
63.	Sauna			

¹³ For moved appliances only.

64.	Hot Tub			
65.	Jacuzzi			
66.	Dehumidifier			

VIII. VENTILATION

67. Kitchen range hood vented to the outside? Yes No

68. Does the cooking stove have downdraft ventilation? Yes No
 (Ex., JennAir)

69. Number of bathroom fans vented to the outside: _____

70. Describe any “whole house ventilation system” in REM/Rate.

IX. GENERAL OBSERVATIONS

(Auditor to rank and record general observations after spending time in house completing survey.)

Characteristics	Ranking				
	1 (lowest)	2	3	4	5 (highest)
71a. Construction quality					
71b. Comments:					
72a. Missed energy opportunities by builder (1=many, 5=none)					
72b. Comments					
73a. Recommendations for energy improvements (1=many, 5=none)					
73b. Comments					

X. QUALITATIVE OBSERVATIONS

Recommendations for top four (4) worst energy features that could be improved; rank 1 (worst) to 4 (least). Place the letter of the feature next to each question.

- | | | |
|--|---|-------|
| <input type="checkbox"/> Wall insulation installation | 74a- Most Worst Energy Feature | _____ |
| <input type="checkbox"/> Wall insulation R-values | 74b- Second Worst Energy Feature | _____ |
| <input type="checkbox"/> Wall air leakage | 74c- Third Worst Energy Feature | _____ |
| <input type="checkbox"/> Ceiling insulation installation | 74d- Least Worst Energy Feature | _____ |
| <input type="checkbox"/> Ceiling insulation R-values | | |
| <input type="checkbox"/> Ceiling air leakage | | |
| <input type="checkbox"/> Basement insulation installation (select only if insulation present) | | |
| <input type="checkbox"/> Basement insulation R-value (including no insulation) | | |
| <input type="checkbox"/> Basement air leakage | | |
| <input type="checkbox"/> Window quality | | |
| <input type="checkbox"/> Window U-value | | |
| <input type="checkbox"/> Window air leakage | | |
| <input type="checkbox"/> House air leakage reduction (overall) | | |
| <input type="checkbox"/> Furnace installation quality | | |
| <input type="checkbox"/> Furnace efficiency (AFUE) | | |
| <input type="checkbox"/> Central air conditioning installation quality | | |
| <input type="checkbox"/> Central air conditioning efficiency (SEER) | | |
| <input type="checkbox"/> Duct system installation (craftsmanship of duct system, not including insulation) | | |
| <input type="checkbox"/> Duct system tightness | | |
| <input type="checkbox"/> Duct system insulation installation | | |
| <input type="checkbox"/> Duct system insulation R-value | | |
| <input type="checkbox"/> Water heater installation quality | | |
| <input type="checkbox"/> Water heater efficiency (Energy Factor) | | |
| <input type="checkbox"/> House solar orientation | | |
| <input type="checkbox"/> Kitchen range hood quality/effectiveness | | |
| <input type="checkbox"/> Bathroom fan quality/effectiveness | | |

<u>Location:</u>		<u>Controls Types:</u>	
Bathroom	T	Motion Sensor	M
Bedroom	B	On/Off Switch	SW
Basement	C	Photo Cell	P
Dining	D	w/Motion Sensor	PM
Exterior/Yard/Unheatd Porch	E	Photo Cell & Timer	PT
Family Rm/Den	F	Timer	T
Garage	G		
Hallway/Entry	H		
Kitchen	K		
Living	L		
Mudroom/Heated Porch	P		
Office	O		
Utility/Laundry	U		
Finished Work Area	W		
(Don't record closets)			

**Long Island Power Authority Residential new construction technical baseline survey
2003**

Fuel Information Release Form

I hereby authorize release of my energy consumption history information for research and analysis purposes. I understand that it will be kept strictly confidential and may only be made public in aggregate, not attributed to any particular customer. My account information is provided below.

LIPA Account #	
KeySpan Gas Account #	
Oil Dealer	Name:
	Account Number:
LP Dealer	Name:
	Account Number:
Wood Dealer	Name:
	Account Number:
	Number of Cords burned last year:

Thank you very much

Name: (please print)

Address:

Phone:

Signed

Date

XVI. APPENDIX K: BIBLIOGRAPHY

Statistical Surveys, Inc., 1693 Sutherland Dr., S.E., Grand Rapids, MI 49508

U.S. Census Bureau

Long Island Board of Realtors, Inc. / Multiple Listing Service of Long Island, Inc.

U.S. Department of Housing and Urban Development

Long Island Business News

National Association of REALTORS

New Jersey ENERGY STAR Homes Program Incentives and Smart Growth Analysis, Vermont Energy Investment Corp., EAM Associates, MaGrann Associates. March 1, 2003.

New York State Association of REALTORS

Conservation Services Group Summer 2003 On-Site Survey of New Residential Units in LIPA's service territory

XVII.APPENDIX L: LIST OF ORGANIZATIONS

	Acronym	Web Site Address	Postal Address
1	ACCANY	http://www.accany.org	229 South Street Oyster Bay NY 11771
2	AIA LI	http://www.aialongisland.com	499 Jericho Turnpike Suite 101 Mineola NY 11501
3	BIANCO	http://www.bianco1.org/sys-tmpl/door/	
4	BOASCO	http://www.freewebs.com/boasc/	
5	LILA	http://www.nrla.org/state-locals/lila/index.htm	
6	LIBI	http://libi.org/libi5/	1757-8 Veteran's Memorial Highway Islandia NY 11749
7	LIBOR / MLS LI	http://www.mlslirealtor.com/	300 Sunrise Highway West Babylon NY 11704
8	LIBN	http://www.libn.com/	2150 Smithtown Avenue Ronkonkoma NY 11779
9	NEL	http://www.nassauelectricleague.com	481 Franklin Avenue Franklin Square NY 11010
10	NCAPHCC	http://www.nassau-phcc.com	
11	NY DOS	http://www.dos.state.ny.us/code/energycode/nyenergycode.htm	41 State Street Albany NY 12231
12	NYMHA	http://www.nymha.org/	36 Commerce Avenue Albany NY 12206
13	NYSAR	http://www.nysar.com/	130 Washington Avenue Albany NY 12210
14	NYSBA REF	http://www.nysba.com/	1 Commerce Plaza Suite 704 Albany NY 12210
15	SCAMP	http://www.scampweb.net	P.O. Box 644 Wyandanch NY 11798
16	SCECA	http://www.sceca.com/	P.O. Box 696 Smithtown NY 11787-7474

	Acronym	Contact	Voice	Fax	E-Mail Address
1	ACCANY		516-922-5832	516-922-1414	info@accany.org
2	AIA LI	Ann LoMonte Executive Director, Hon. AIA	516-294-0971	516-294-0973	annlomonte@aialongisland.com
3	BIANCO				ceotob@bianco1.org
4	BOASCO	Tom Mahler	631-957-7515		Inspector7515@optonline.net
5	LILA				
6	LIBI	Robert A. Wieboldt, Executive Vice-President	631-232-2345	631-232-2349	evp@libi.org
7	LIBOR / MLS LI	Donna Lee Wimmers	631-661-4800 ext . 348	631-661-5202	DWimmers@mlsli.com
8	LIBN	Jo Ann Buynoch, Director	631-737-1700 ext. 261		
9	NEL		516-354-1300	516-354-1086	kpdliny@aol.com
10	NCAPHCC				info@nassau-phcc.com
11	NY DOS	Ray Andrews, R.A., Assistant Director of Energy	518-474-4073	518-486-4487	codes@dos.state.ny.us
12	NYMHA	Nancy Gear, Executive Director	800-721-HOME / 518-435-9858		Nancy@nymha.org
13	NYSAR		518-463-0300		admin@nysar.com
14	NYSBA REF	Frank Champitto, Program Director	518-0465-2492	518-465-0635	FrankC@nysba.com
15	SCAMP		631-279-0374		suffolkplumbers@hotmail.com
16	SCECA		631-361-7474		

