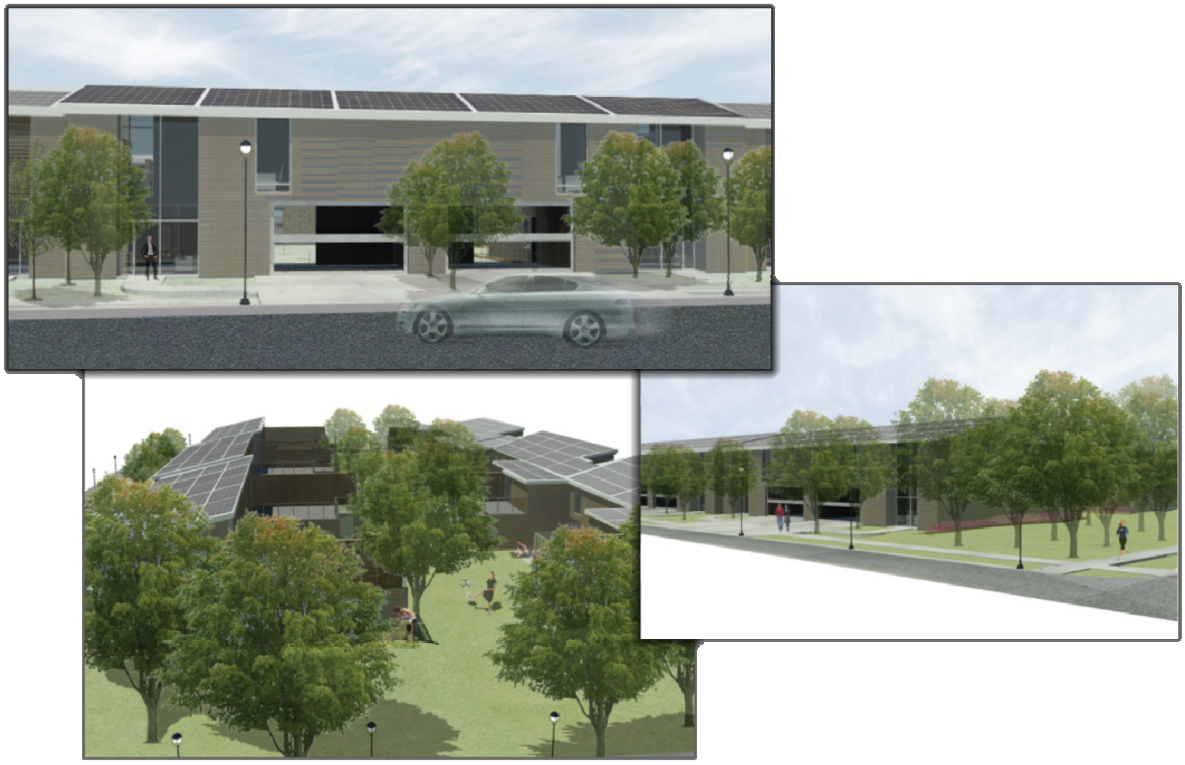
IPRO 357 :

Final Report

SMAART

Sustainable **M**aterials **A**nd **A**ffordable **R**esourceful **T**echnology



Smaarter Homes for a Smarter Tomorrow.

Content:

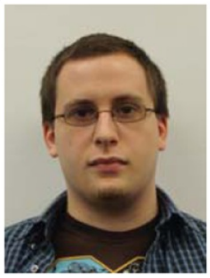
Introduction:

The purpose of this project is to create a marketable home with self-sustaining, highly efficient systems. Using the latest in home automation technology and creative design, this home will set a new standard in energy-cost efficient housing.

The objectives for our team are as follows:

1. Decide what type of housing and target buyers we will be gearing the design towards.
2. Take advantage of previous iPro research in order to improve upon such areas as design, marketability and engineering.
3. Discover and Address the needs of the Evanston community by taking a survey in the area and contacting local businesses and real estate agencies.
4. Follow the zoning restrictions and building codes of Evanston.
5. Make sure that the design is energy efficient and marketable.

Team Members:



Anderson, Aaron
Major: Architectural Engineering **Year:** Senior

Strengths: HVAC focus, including HVAC design, sound and vibration control, building envelope design. Good writing skills.

Things to improve: Business awareness, understanding the customer, market sense, control systems.

What I want out of the project: To learn how to better understand a market how to deal with a potential customer, how to design for advanced controls systems/building AI.

Bigart, Kyle
Major: Architecture **Year:** Senior

Strengths: Ability to formulate concepts into feasible design strategies. Overall building understanding, and great presentation skills.

Things to improve: Understanding the bottom line and how it affects architecture in the real world.

What I want out of the project: Gain an insight to the world of community developments and how the new age in design and technology will be affecting home ownership and residential design.

Blakely, Luke
Major: Business **Spec:** Marketing **Year:** Senior

Strengths: Taken a number of classes in marketing research and sales. I have vast marketing experience so i can ensure that this project will be marketable and desirable. I also have leadership skills and can bring some organizational management. Also, have attended several real estate seminars.

Things to improve: I would like to gain some more knowledge about the real estate industry and the development of new properties.

What I want out of the project: Experience of working with students of various majors and have the opportunity to be part of a successful diverse team. There is much that I can learn from the various majors in my team and I'm sure i can share my marketing knowledge with my team mates.

Harmon, Stephanie
Major: Physics **Year:** Senior

Strengths: Unique problem solving skills and a different perspective other than architecture and engineering. Experience in presenting personal research and in leadership roles.

Things to improve: Understanding of design/engineering/community code requirements that go into building a home.

What I want out of the project: Learn about the housing market and all steps involved in designing, building, and marketing a home.

Horchin, Marina
Major: Architectural Eng **Year:** Senior

Strengths: I am majoring in Architectural Engineering and can benefit the project with my MEP design skills. However, I am looking to also contribute on any scale possible, by pushing my skills and learning new ones.

Things to improve: I am currently taking an advanced level Energy Modelling class, and would like to perform the building performance calculations and energy simulations so we can adjust for the best envelope and lowest energy usages.

What I want out of the project: I am expecting great team-work, a smart business plan and marketing research, excellent architectural and engineering design resulting into a perfect and feasible smart-home design suitable to the specific neighborhood.

Jani, Arjun
Major: Civil Engineering **Year:** Senior

Strengths: Proficient computer knowledge at using Autocad 2000-2011, Mathcad, SAP(structural analysis program),Abode Photo shop, and Microsoft Office 2000-2010.

Things to improve: I would like to improve my skill in communication and writing.

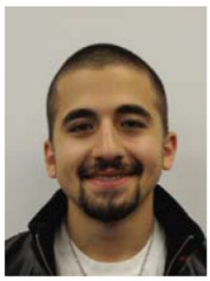
What I want out of the project: I want to gain my knowledge in business/marketing and entrepreneurship in this IPRO. I am also looking forward to work with different students with different majors/specialization. I can also work very well in a team.

Chapa, Bernardo
Major: Architecture **Year:** Senior

Strengths: ?

Things to improve: ?

What I want out of the project: ?



Hagopian, Matthew
Major: Chemical Eng **Year:** Junior

Strengths: Teamwork, design, research, creativity, Computer knowledge, communications.

Things to improve: Leadership skills and communication abillity.

What I want out of the project: Learn leadership, communications. Learn to work in groups and on my own. Gain a better understanding of the topics at hand. Etc.

Handzhiyski, Lachezar
Major: Civil Engineering **Year:** Senior

Strengths: I have coursework experience in micro- and macro-economics, as well as in the analysis of capital investments. I have taken primarily structural engineering courses and would like to develop the structural design of the future building. Knowledgeable with: Microstation, AutoCAD, SAP2000, C++, Mathcad, and Pascal.

Things to improve: I am hoping to gain real-life structural design experience. I am very excited to find out more about the sustainable technologies in modern homes.

What I want out of the project: Prove that everyone can take responsibilities, meet deadlines, and work together with people from different academic backgrounds. It is an excellent opportunity for one to demonstrate analytical and technical, as well as leadership and teamwork skills. I am hoping that at the end we will have not only a complete IPRO project, but also one that would be a solution to problems arising in everyday life.

Moreno, Saul
Major: Architecture **Year:** 5th Year

Strengths: Computer software: dreamweaver, adobe illustrator, photoshop, indesign, CAD. Presentation skills involving planning and organization, as well as overall graphic design. As well as analytical research skills and problem solving.

Things to improve: I would like to improve my speaking and writing skills. I have ideas but sometimes I can not find the right words to express myself.

What I want out of the project: I expect that after participating in the IPRO I well get a better understanding as to how publications work. I want to understand how I can begin to implement these tools into my projects and get my voice out there.

Roseen, Michael
Major: Architectural Eng **Year:** Senior

Strengths: I bring systematic, logical thinking to the table along with a background in structural and HVAC systems analysis.

Things to improve: I plan to use this opportunity to improve my ability to work well with a team, and to test my ability as a leader. Also, I\'d like to apply knowledge learned in the classroom to a real-world design problem.

What I want out of the project: I expect for this group to improve on the designs and concepts of preceding IPROs. I also expect to learn the extents of my knowledge in the field of architectural engineering.

Team Values Statement:

Desired Behaviors

a. Attitude of team members should be positive and take initiative as well as team members should treat each other with mutual respect.
b. No team members shall criticize or judge another teammate for his or her opinion.
c. Effective communication skills are very important for a team's success. These include expressive skills as well as listening skills. All team members are encouraged to engage in-group discussions and share opinions while respecting other individual's ideas.
d. The commitment that is developed due to the responsibility is a critical factor in the team's success. All team members are expected to take responsibility of completing the assigned tasks on time.
e. Team members are expected to come on a regular basis to scheduled meetings and meetings outside of class.

Addressing Behaviors

a. According to the codes of ethics the problems will be addressed properly.
b. Any issues are to be brought up for discussion at the beginning of each class meeting.
c. All members in the team will have a chance to discuss the problem as well as voting for the final decision.
d. Problems are preferred to be discussed in person rather than over the internet, because a member cannot be conveyed through typing and points may be misconstrued.

Background

1. Customer sponsers

• This is the third semester for the zero community ipro. Currently we do not have any sponsors.
• This ipro grew from the interest of surrounding Chicago municipalities. We have Evanson, IL as the potential customer for the project.

2. User problems

• A large part of the struggle of the design of this model community will be trying to reduce the amount of energy and resources consumed not only in the construction of the community, but also in the daily life of the future residence.

3. Science and Technology

• The first is passive systems which include designing around proper solar orientation, the use of sustainable materials, and the use of cross ventilation.

4. Historical precedents

• The community takes advantage of solar panels, geothermal heating and cooling, super insulation, high efficiency windows and heat recovery ventilation. These developments signify new ways of thinking when it comes to renewable energy and should begin to set the standard of new, developing areas.

5. Ethical issues

• Designing a community that is able to generate power from renuable sources on site means the community would not be as dependent on public companies like ComEd or GE. But the financial returns would not be optimal even with an independent power source.

6. Business or societal costs

• If our community was built, the members would have to put a fourth of the initial costs down for the house. Our goal is that the investors will ultimately be compensated by the money they save with all of these alternative energy sources instead of the traditional sources.

7. Implementation outline for solutions

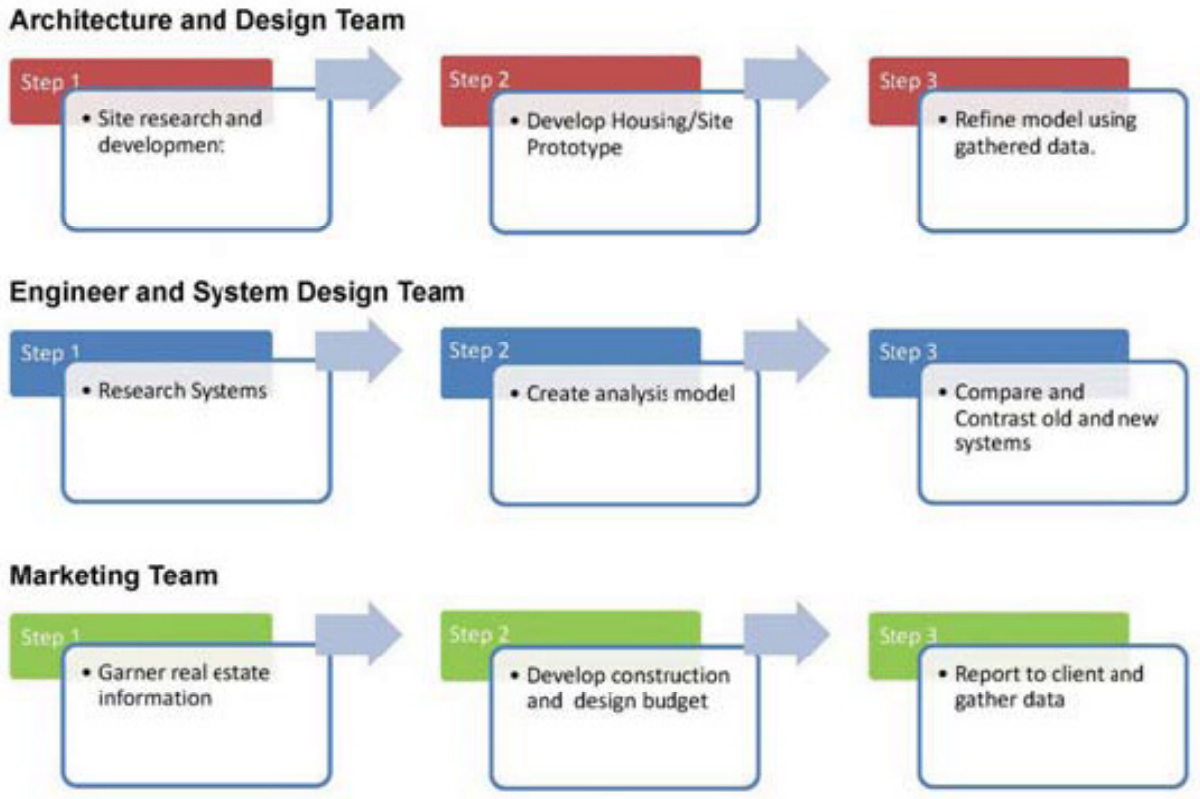
• Our design and conclusion will be presented first to the City of Evanston. We will try to give Evanston and ultimately other towns a clear picture of the initial costs of this development and the payoff when proper renewable energy sources are put in place.

8. Research about similar solutions

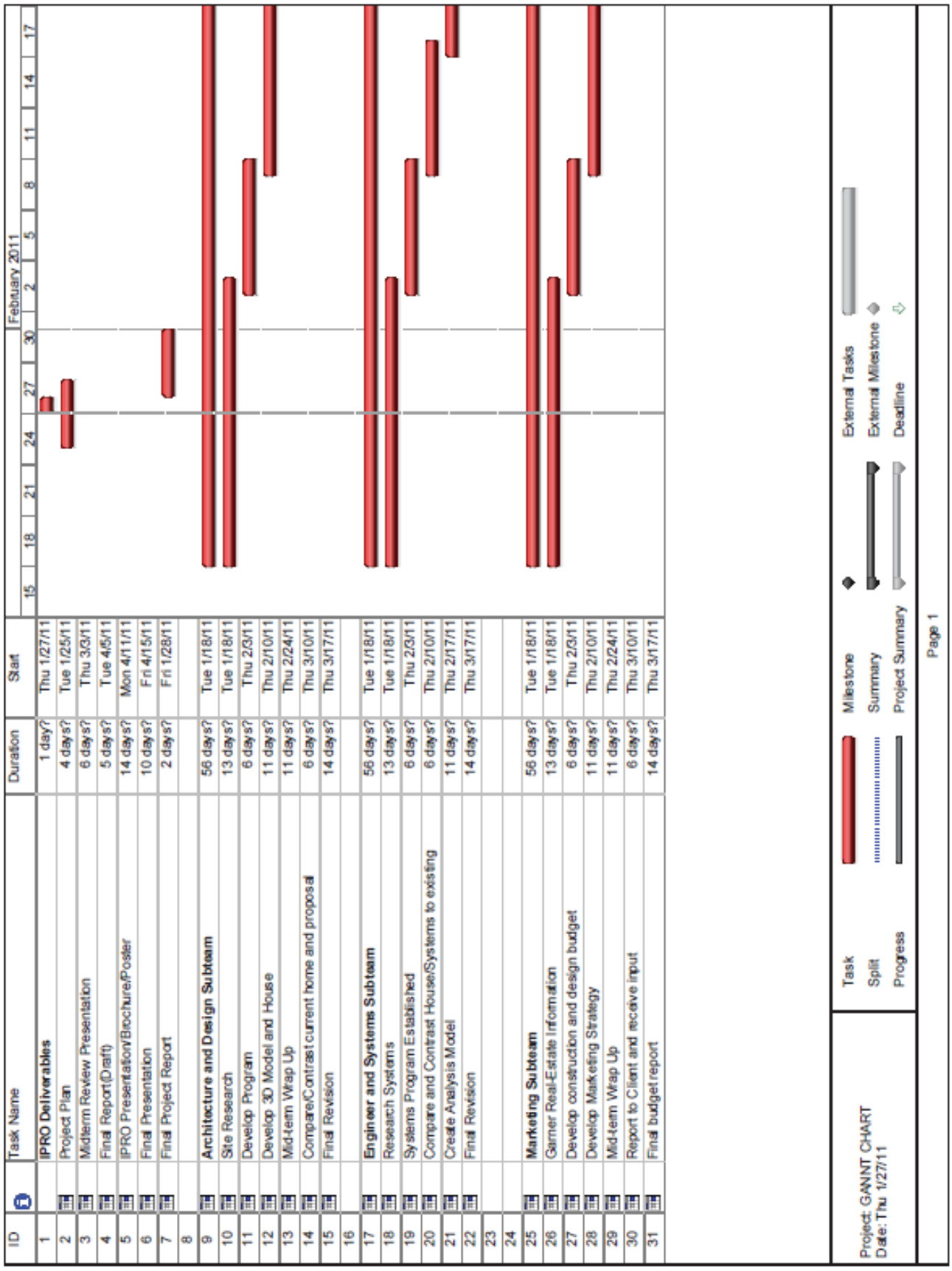
• Companies like “The house builders” and “Geo Home” have constructed many sustainable/ eco friendly homes and their house plans are also Energy Star certified. These companies have attracted many customers to build a green and energy efficient homes.

Project Methodology:

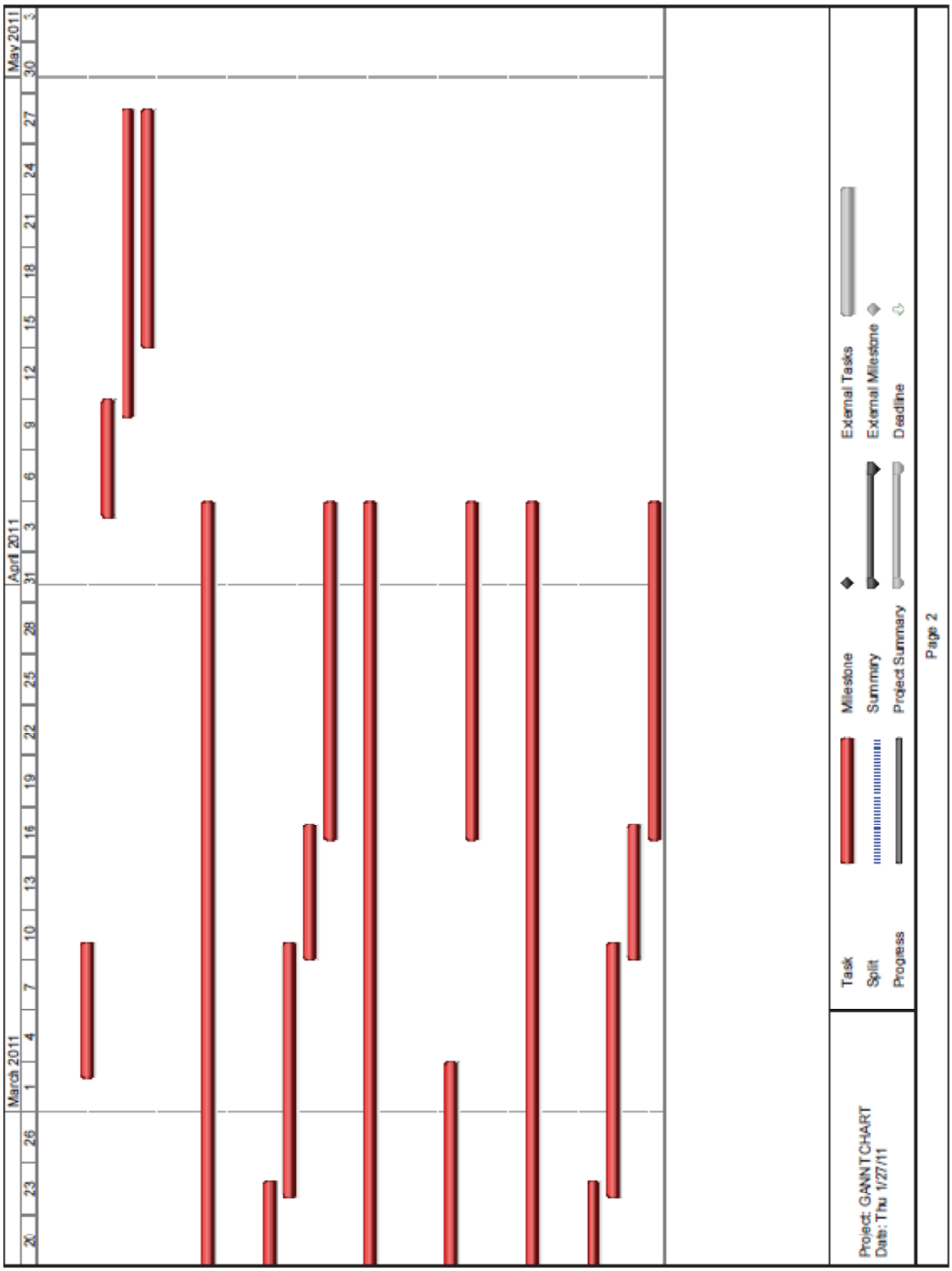
The team will be broken down into three separate groups which will report to one another over the course of the semester. The focus this semester will be to develop a zero-energy home for the city of Evanston. In order to do so we will take information the previous IPROs and further develop the business
and marketing aspect of the project. In order to accomplish this we will break into sub-teams and report to one another on a bi-weekly basis. Each sub-team will be responsible for its own documentation and progress, the sub-teams will work
closely with each other to ensure proper communication, thus preventing wasted or duplicated efforts. The Sub-team leaders are responsible for managing the progress of their respective sub-teams. Inadequate progress will be addressed by the entire team, as well as the project advisor, to create a productive solution to the problem.
The architectural and design team is responsible for developing the prototype are well as the site for the project. The Engineer and systems team is responsible for gathering and developing the information on the systems for the project. The marketing team is responsible developing the project and making it marketable for the city of Evanston.



Gannt Chart


ID
Task Name
Duration
Start
February 2011
15
18
21
24
27
30
2
5
8
11
14
17
1 IPRO Deliverables 1 day? Thu 1/27/11
2 Project Plan 4 days? Tue 1/25/11
3 Midterm Review Presentation 6 days? Thu 3/3/11
4 Final Report(Draft) 5 days? Tue 4/5/11
5 IPRO Presentation/Brochure/Poster 14 days? Mon 4/11/11
6 Final Presentation 10 days? Fri 4/15/11
7 Final Project Report 2 days? Fri 1/28/11
8
9 Architecture and Design Subteam 56 days? Tue 1/18/11
10 Site Research 13 days? Tue 1/18/11
11 Develop Program 6 days? Thu 2/3/11
12 Develop 3D Model and House 11 days? Thu 2/10/11
13 Mid-term Wrap Up 11 days? Thu 2/24/11
14 Compare/Contrast current home and proposal 6 days? Thu 3/10/11
15 Final Revision 14 days? Thu 3/17/11
16
17 Engineer and Systems Subteam 56 days? Tue 1/18/11
18 Research Systems 13 days? Tue 1/18/11
19 Systems Program Established 6 days? Thu 2/3/11
20 Compare and Contrast House/Systems to existing 6 days? Thu 2/10/11
21 Create Analysis Model 11 days? Thu 2/17/11
22 Final Revision 14 days? Thu 3/17/11
23
24
25 Marketing Subteam 56 days? Tue 1/18/11
26 Garner RealEstate Information 13 days? Tue 1/18/11
27 Develop construction and design budget 6 days? Thu 2/3/11
28 Develop Marketing Strategy 11 days? Thu 2/10/11
29 Mid-term Wrap Up 11 days? Thu 2/24/11
30 Report to Client and receive input 6 days? Thu 3/10/11
31 Final budget report 14 days? Thu 3/17/11
Project: GANNT CHART
Date: Thu 1/27/11
Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline
Page 1

Gannt Chart Continued



Expected Results

A. Provide details on expected activities involved in the project.

-Study the market in which we will submit our project to have a better idea of what types of clients we are looking for, and what our clients want.
-Research all of the possible components that would help our house be sustainable, and test/research their performance to know what components we should use to make our house more sustainable.
-Have a business proposal with the expected cost of the project, the profit, the payback time for the sustainable components of the house.
-Design different types of houses and select which one works better for our project.

B. Describe expected data from research or testing involved in the project

The data we expect to have from research will include the different types of components that area available in the market that will help our house be sustainable, we expect to have: the cost, performance, payback time, life time of the product, maintenance.

We will also make an effort to propose ideas that are not in the market yet, with this ideas we will investigate what are the expected results.

C. Define potential products resulting from research and testing.

The potential products that we are looking to find are products that will decrease the use of water, gas and electricity, with a goal to have a lower the bill in our house.

D. Define potential outputs to be produced through each of the project tasks.

The potential outputs that will be produced through each of the project tasks will have the purpose of having a house that will reduce the recourses that are used: electricity, water and gas with the purpose of reducing the cost of operating the house, and affect the environment the least possible.

E. Describe the expected results in terms of deliverables that will be produced by the project team, i.e., a working prototype, survey or focus group feedback, grant proposal, etc.)

Produce an efficient affordable residence that could be used as a prototype that can be used to help design the community of tomorrow. Accompanying this will be space and energy models as well as marketing research to statistically back up the team's findings.

F. Summarize the challenges, risks and assumptions that you can anticipate affecting your results.

Many of the risks and assumptions that we will have to make that could affect our results are that many of the products we might be using do not perform as well as they say they do, because of the different use the house has, the location, climate, etc.

G. Discuss how the expected results will be incorporated in a proposed solution or contribute to a solution process.

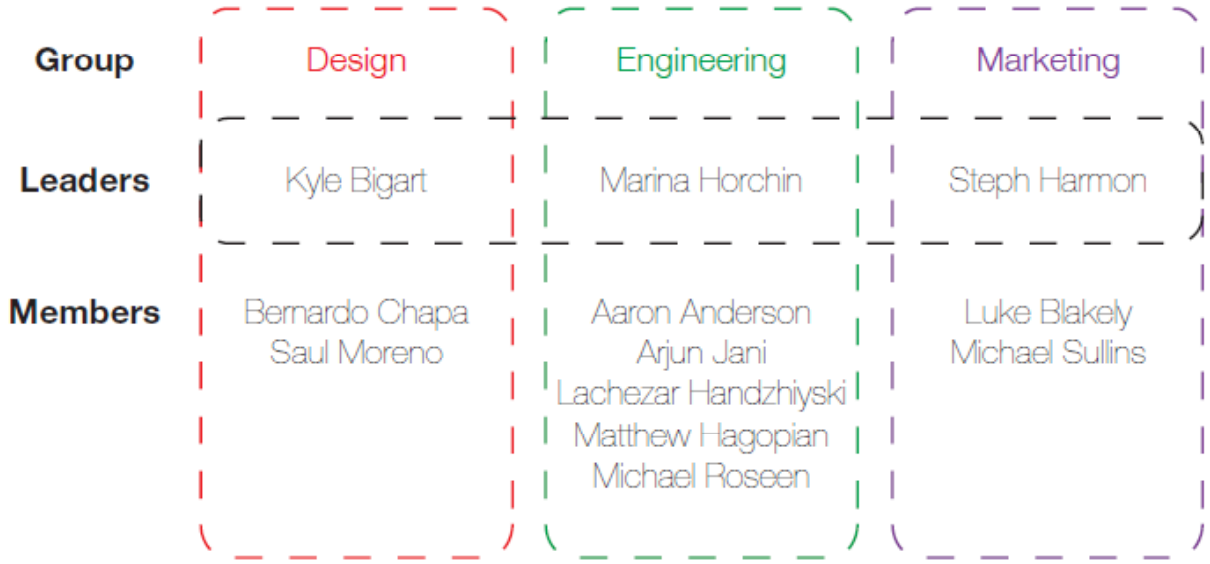
We will have a solution once we achieve a house design and performance that accommodates the market our clients are looking for.

Project Budget

Transportation:	$ Unknown
Architectural Models:	$ 200
Research Printing and Boards:	$ 150
Team Building Event Light event to promote fellowship:	$ 150
	Total= $ 500

Designation of Roles

We have chosen to break up in three different groups, design, engineering, and marketing. Each group will have a leader that will oversee their own individual small group. Group leaders will then keep in touch and work as a leading team.



Marketing:

The homes designed by IPRO 357 are targeted for a lot on the corner of Greenleaf and Dodge in West Evanston, area code 60202. Currently the lot is home to an auto shop, but the area was recently re-zoned by the city of Evanston for residential properties. In order for any project of this magnitude to be possible, the homes designed by IPRO 357 must be marketable to the surrounding area. Area demographics and market research was conducted, searching through available Census and real estate data.

West Evanston is considered by the city of Evanston as a low-income neighborhood, the average income per home in 2009 was $67,661 [3]. Roughly half of the homes in the area are owned, the other have are inhabited by renters, with 29.9% of current residents having lived at their respective homes for 5 years or more; however, the average time spent in a home is 2.74 years [1]. 70.28% of residences do not have children, while 50% of that population are married. The average age of residents is 36 years old [1]. 2009 Median sale prices of homes was around $270,000 with most homes around 50 years old [2]. Evanston as a whole is known for its great school systems and city parks, West Evanston is no exception with a park and award-winning elementary school within walking distance [4].

Taking this all into consideration, the team settled on a comfortable target buyer for the area: coined the Young Digerati. These individuals are a young, family mix (ages 25-40) that are well-educated and on the urban fringe, they are environmentally conscious and are both responsible and aware of their impact on the world around them [5]. The Young Digerati most likely do not have children or have yet to start their family, it is likely that they are currently renting homes or apartments and are looking to settling into an affordable home. These people will be looking to include as much technology in their homes as possible to keep up with the advancements of today's society, but they are also fiscally responsible so most likely will only want to include technology that useful, not excessive. The Young Digerati will also be drawn to the idea of living in a low-energy "green" home because of the long term benefits to both their personal finances and also the environment.

After deciding on a target demographic, our decision was further backed-up by a local professional, real estate agent Josie Vorda. Ms. Vorda was supportive of our vision of drawing current renters into purchasing an affordable home. She encouraged the team to look into recent home sales in the area for an idea of how to price the homes, and also what type of homes would best be sold (i.e. detached homes, townhomes, etc). Following her advice, case studies of recently purchased homes within a 5 block radius was done. Most of these homes were selling at the market average, but were previously sold for at least 20% more. For example, in November of 2006, 918 W. Grey was sold for $357,000 but in January of 2011 it was sold for a mere $185,000 [6]. Figure 1 shows the average price per square foot of homes in area code 60202 vs. Evanston as a whole. As seen in the graph, homes in the area are significantly lower than that of Evanston. The presents the perfect area for a project like ours because we can encourage residents from outside West Evanston to buy new technologically advanced homes, while also making the homes affordable for current residents.

The team decided that a comfortable price range would be $350-400,000 for attached, single-family homes. Although this is above the current market average, we decided that it would be a reasonable price for homes that are new, technologically advanced, and energy-efficient. Ms. Vorda was in agreement with this decision, citing that the housing market would most likely turn in our favor in the next 3-5 years.

As previously mentioned, IPRO 357 also looked to include new, technologically advanced products like home automation in the design. This option would take the marketability of the home one step further because not only is it affordable and low-energy, but it is desirable in the fact that it is easy to manage via a smartphone or computer. A survey of local residents was completed over the course of two days in March. Overall 93 individuals were surveyed, 55 of those people were in our target age-range. Individuals were asked "if you were to incorporate home automation into your house, what would you want it do (control)?" Figure 2 shows the results of this survey, showing the percentage of people that said they would want a specified category controlled by home automation. Figure 2 also grouped these results into what is typically included in "standard" home automation packages and those that are included in "optional" packages. These survey results will be a key aspect to design concepts outlined later in this report as we tried to design a home that lends itself to fully using all aspects of home automation.

Sources:

[1] http://www.epl.org/index.php?option=com_content&view=article&id=217&Itemid=330

[2] http://www.trulia.com/real_estate/60202-Evanston/

[3] http://www.city-data.com/city/Evanston-Illinois.html

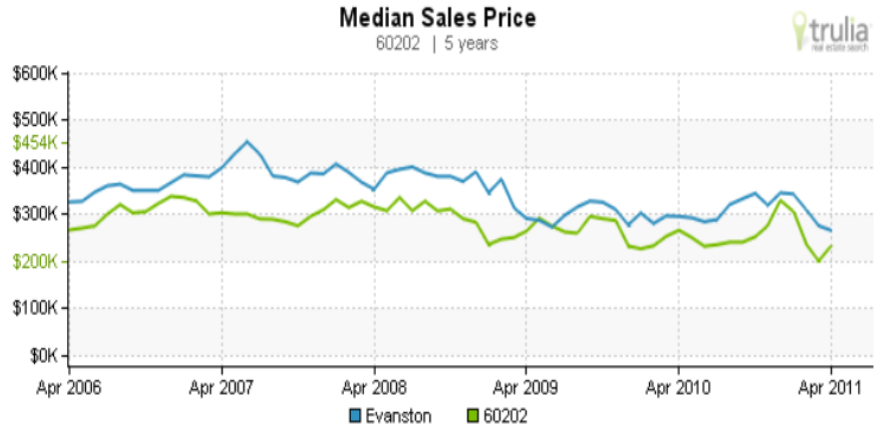
[4] http://www.cityofevanston.org/about/

[5] http://www.locallytype.com/2007/03/11/yelpcom-home-of-young-digerati-bohemian-mix-american-dreams/

[6] http://www.redfin.com/IL/Evanston/918-Grey-Ave-60202/home/13604667

Figures:

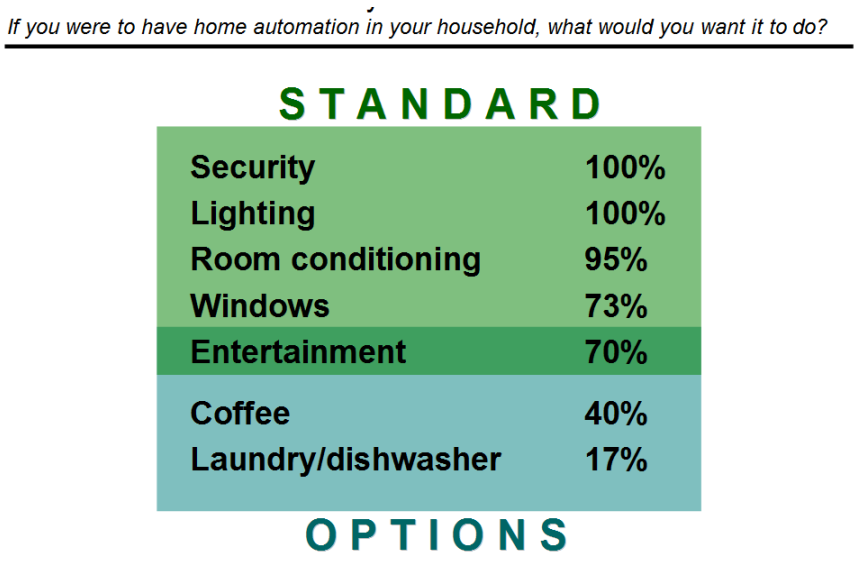
Figure 1: median price/sq.ft. for the city of Evanston and area code 60202.
http://www.trulia.com/real_estate/60202-Evanston/market-trends/



Home Automation Survey Conducted around the location.

94 People were asked about Home Automation

Figure 2: Home automation survey results.



Business:

Expanded to other neighborhoods.

At the early stage of this project we decided that we wanted to design a small community that could be placed in any similar sized lot anywhere in America. We did this because we do not want to limit ourselves to a small neighborhood. By making it possible to recreate this community across the nation we are making the investment much more attractive as it can be duplicated easily. We believed that we could reach more of the Young Degeratis with this strategy vs. Limiting ourselves to the Evanston area. The location was very diverse and the lot is surround by townhomes, a shopping complex, condos and a busy road with bus stations on two sides. This was an advantage to us because many lots in the national would have one of these feature nearby so prospect could associate with our product.

Proforma

The proforma is a tool that helps us collaborate all of the cost and figure out the return we expect from the project. We first had to gather some basic information, which included the scope of development, proposed development and price of the Lot. The information was collected by reviewing lot specifications, checking city code and reviewing previous groups work.

The hard cost consisted of all the demolition, construction and landscaping cost. They were split up into sections so that the various groups could collect data easily and we could present our cost in a simple and effective manner. The hard costs were calculated for each house and than multiplied by 12 to get the price for the whole project. Once all costs had been collected they were added to give a total hard cost price for the project. The soft cost included costs to purchase the land, marketing, insurance, soil testing and law fees. The soft cost also included a fee for the architects and developers involved in the project.

Next we decided how much we would price each of homes, based on both market research and how we thought the breakdown of amenities added to the value of each home. Now that we knew how much money would be made from the sale of the homes, the hard and soft costs were subtracted so we could figure out the project profit and rate of return (ROR), we formulated a financing plan for how best to pay for the entire project. We started by getting 100% from the banks went all the way to getting 100% from investors in 10% taken form one and added to the other. The difference between the options was the with the banks the interest rate would be 8% of lower, when considering the Investors they would expect 20% or more from this type of investment.

After all of these calculation and taking into account interest payments and ROR % we decided 70% form the banks & 30% from the investors would be the best option. With this option we have up to a 46% ROR to split between the investors and ourselves. This is the project profit once soft, hard costs and interest are all paid.

Cost analysis over time

The cost we used for the proforma were costs in todays construction environment. We did not take into consideration a timeline were we would be purchasing products at different time during the project. The soft costs were also all calculated without considering that most of them including testing/marketing and license fees take place until the houses were complete. The interest was calculated on a estimate that the project would take 18 month to complete and a further 8 months to sell all the property. We came up with these estimate based on the housing market picking up by 2015 when the project would be nearing its completion. We decided to sell our houses upfront and not offer a rent to own option. This was because we wanted to have the opportunity to pay the investors back as quickly as possible and not have to manage the properties/service renters and collect rent if we moved on to a similar project in a different part of the country.

Financing options

To decide were we would get the funding for this project we looked at the banks Vs. Investors. We wanted to consider both because we knew they both had pros and cons and needed to figure out the bets selection for our particular project.

When considering the banks we knew that it would be hard to secure a large loan in this economy. We also considered the state of the housing market and realized banks may be unwilling to invest in a development when they real estate agent have constructed and occupied homes listed for 12 plus months.

With investors they would compare our development investment with other places they can put their money and expect returns. We are competing with Banks, the stock market, government bonds and many more. With our category of investment we would be expected to offer a 20% or more rate of return on investment. But in the current economy we may be able to agree to an investment with a lower rate of return until the market picks back up.

After close review of the interest payments and rate of return we decided to ask the banks for 2.4 million and the investors for just over 1 million. With the money from investors we will pay the architects to complete the plans, get the necessary licenses and purchase the land. We will then go to the bank with our business plan and ask for the loan. We wanted to prove that we have the financial backing and have already invested in the project to give us a better chance of securing the loan.

Returns

With the investment ratio we decided upon, at the end of the project we will be left with 476,400 dollars. This could be a 46% rate of return considering the investment of just above 1 million. With the profit we would probably look to split this between the investors and developer to make sure both parties benefit from the project. All return are based on the project being complete after a 18 month period and all houses sold after 8 months.

Cost breakdown (intro to other sections)

The cost were broken up and handled by various groups, the business team collected all the soft cost, and the engineering a design team collected all the date for the Hard costs. The design team covered shell, exterior and interior design and the engineers handled all the other hard cost including, plumbing, electronics, home automation and HVAC.

SUMMARY

Scope of Development	Size of Lot	64,750	S.F
	Permitable Lot Coverage	40%	
	Permitable Square Footage	25,900	S.F
	No. of Allowable Units	12	
	Height Restriction	35	F
	Required Parking	24	
Proposed Development	No. of Residential Units	12	
	Total Residential Square Foot.	22,800	S.F

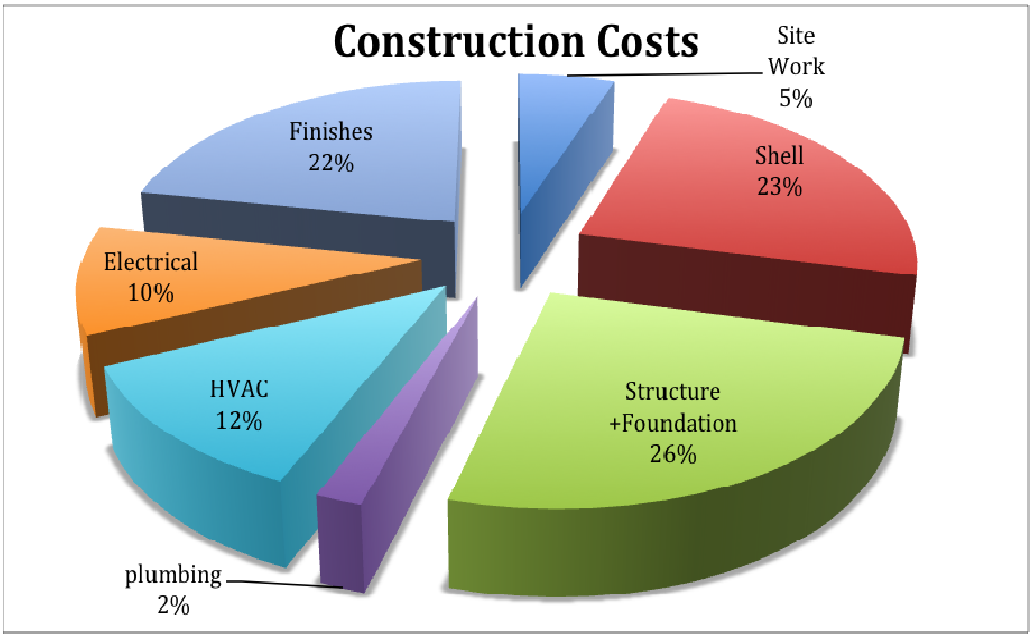
Prices of lots in area	S.F	Price	Price/ S.F
Medium	89298	$895,000.00	$10.02
Low	43560	$229,900.00	$5.28
High	101930	$1,695,000.00	$16.63
		Average Price / S.F	$10.64

SMAART Lot	64,750	$689,144.13	$10.64

No.	Unit Type	Units Size s.f	Unit Price	Price/S.F	Features
1	East 3 bed	1725	$370,000.00	214.49	3 bed center
2	East 3 bed	1725	$370,000.00	214.49	3 bed center
3	East 3 bed	1725	$370,000.00	214.49	3 bed center
East 3 bed	1725	$370,000.00	214.49	3 bed center	
5	East 3 bed	1725	$380,000.00	220.29	3 bed corner
6	East 3 bed	1725	$380,000.00	220.29	3 bed corner
7	West 2 bed	1712	$350,000.00	204.44	2 bed center
8	West 2 bed	1712	$350,000.00	204.44	2 bed center
9	West 2 bed	1712	$350,000.00	204.44	2 bed center
10	West 2 bed	1712	$350,000.00	204.44	2 bed center
11	West 2 bed	1712	$360,000.00	210.28	2 bed corner
12	West 2 bed	1712	$360,000.00	210.28	2 bed corner
TOTAL			**$4,360,000.00**		

Bank loan %	70%
Partner %	30%
total	**$3,478,431.45**
Sources	
General Partner Contribution:	$1,043,529.44

Construction Lender:	$2,434,902.02
Proceeds from Residential:	$4,360,000.00
Total	**$7,838,431.45**
Uses:	
Soft Costs: Land & Marketing	$1,044,666.21
Hard Costs: Construction	$2,433,765.24
Return of Bank Loan:	$2,434,902.02
bank Interest Payment:	$405,167.70
Return of Principal:	$1,043,529.44
Distribution of Profit:	$476,400.85
Total	**$7,838,431.45**
Returns	
Project Profit	$476,400.85
Rate of Return	46%



HARD COSTS

Revenue	**$4,360,000.00**
Expenses (soft cost)	
Lot	$689,144.13
Construction	$2,433,765.24
Lender Inspections	$15,000.00
Architecture	$61,301.00
Legal/Accounting	$11,779.50
Financing/Appraisal	$2,500.00
Title Insurance	$15,000.00
Insurance	$7,520.00
R.E. Taxes/Fees	$13,300.00
Marketing	$160,000.00
Survey/Testing	$5,650.00
Contingency	$5,000.03
Developer Fees	$58,471.56
Total	**$3,478,431.45**

Section	Item	2 BR	3 BR	Total(all units)
Site Work	Demolition	$3,840.00	$3,840.00	$46,080.00
	Paving	$3,465.00	$3,465.00	$41,580.00
	Landscaping	$3,212.00	$3,212.00	$38,544.00
	plant cost	$500.00	$500.00	$6,000.00
Shell	Water Proofing	$421.38	$521.50	$5,657.28
	Rain Screen	$4,084.18	$5,564.73	$57,893.46
	Exterior Windows	$11,780.00	$11,780.00	$141,360.00
	SIPS**	$21,063.00	$26,068.75	$282,790.50
	Doors	$5,600.00	$5,600.00	$67,200.00
	Stair Construction	$1,250.00	$1,250.00	$15,000.00
Struct+Fndn	Foundation	$7,870.00	$10,943.00	$112,878.00
	Structure	$31,179.00	$53,432.00	$507,666.00
Plumbing	Plumbing	$3,870.00	$3,870.00	$46,440.00
	Fire Protection	$2,187.50	$2,187.50	$26,250.00
HVAC	HVAC	$22,000.00	$22,000.00	$264,000.00
Electrical	Electrical	$12,500.00	$13,500.00	$156,000.00
	home auto	$7,000.00	$7,000.00	$84,000.00
Finishing	Painting	$1,500.00	$1,500.00	$18,000.00
	Tile	$6,000.00	$6,000.00	$72,000.00
	Floor Finishes	$11,250.00	$11,250.00	$135,000.00
	Appliances	$8,465.00	$8,465.00	$101,580.00
	Cabinets	$5,000.00	$5,000.00	$60,000.00
	Tops/Granite	$1,500.00	$1,500.00	$18,000.00
	Drywall	$8,066.00	$8,375.00	$98,646.00
	Stone Patio	$2,400.00	$2,800.00	$31,200.00
Total		**$183,603.06**	**$216,824.48**	**$2,433,765.24**

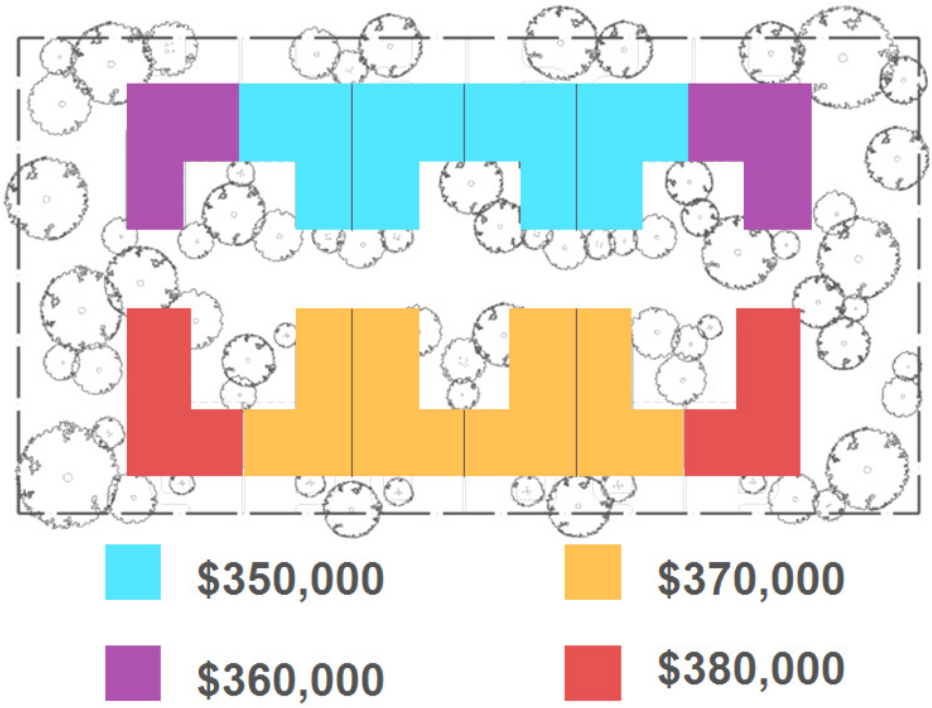
Site Work	$132,204.00
Shell	$569,901.24
Structure +Foundation	$620,544.00
plumbing	$46,440.00
HVAC	$290,250.00
Electrical	$240,000.00
Finishes	$534,426.00

	SMAART	Green Leaf	Green Class
Lot	$689,144.13	$1,000,000.00	$450,000.00
Site Preparation		$184,427.00	$254,310.42
Construction	$2,433,765.24	$1,618,552.00	$2,310,331.29
Lender Inspections	$15,000.00	$15,000.00	$15,000.00
Architecture	$61,301.00	$62,602.00	$60,000.00
Legal/Accounting	$11,779.50	$10,559.00	$13,000.00
Financing/Appraisal	$2,500.00	$2,500.00	$2,500.00
Title Insurance	$15,000.00	$15,000.00	$15,000.00
Insurance	$7,520.00	$7,040.00	$8,000.00
R.E. Taxes/Fees	$13,300.00	$13,300.00	$13,300.00
Marketing	$160,000.00	$170,000.00	$150,000.00
Survey/Testing	$5,650.00	$5,550.00	$5,750.00
Contingency	$5,000.03	$5,000.00	$5,000.05
Developer Fees	$58,471.56	$49,277.00	$67,666.11

Interest	$405,167.70	$56,317.00	$77,332.70
Total	**$3,883,599.15**	**$3,158,807.00**	**$3,369,857.87**

	SMAART	Green Leaf	Green Class
Hard Cost	$2,433,765.24	$1,618,552.00	$2,310,331.29
Soft Costs	$1,449,833.91	$1,540,255.00	$1,059,526.58
Total Costs	$3,883,599.15	$3,158,807.00	$3,369,857.87
S.F / House	1725	3542	1500
Total S.F	20700	24794	18000
Hard Price / S.F	$117.57	$65.28	$128.35
Soft Price / S.F	$70.04	$62.12	$58.86
Total Price / S.F	$187.61	$127.40	$187.21

Pricing picture:



Architecture:

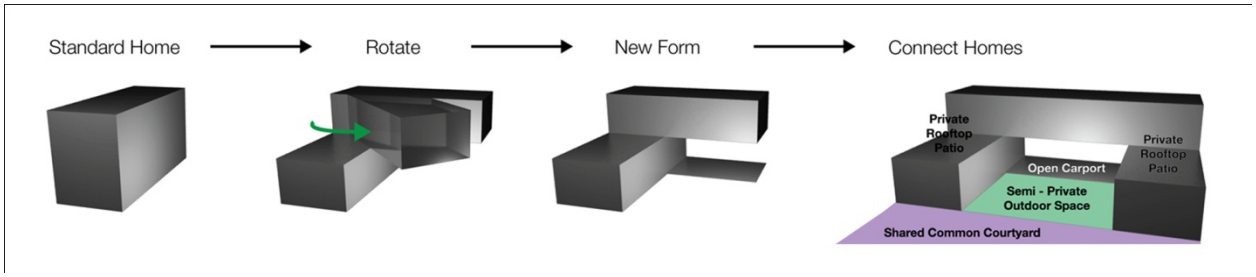
ARCHITECTURE

- Circulation

In understanding the project it was important to understand the type of circulation on the site. This ensures that we do not interrupt the flow that currently exists on the site. There is currently a bus stop on our site so we want to make sure that the layout favors enclosure, especially considering the fact that the bus stop is at the edge of the site. The site layout was influenced by a sense of enclosure from the general public and openness for the dwellers.

- Design and functionality.

The intention of the IPRO was not to only create sustainable house but to make the project marketable. Our team sought to design a home that would redefine the typical Evanston housing unit. The house relies on domonics in order for it to operate at its maximum efficency level.. The architecture is also shaped to allow for the creation of outdoor public spaces for its users. The diagram below explains the operations performed on the housing unit. A standard home was taken and the upper level was rotated. These operations were performed for each of the housing units. In the end phase they were all connected next to each other in order to create a carport at the lower level.

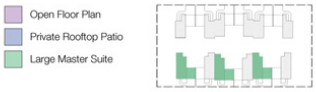


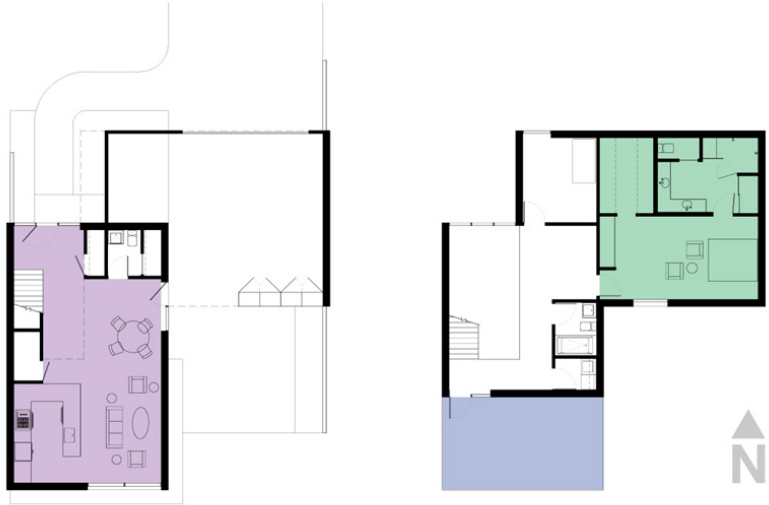
The IPRO focused on developing a housing configuration that would allow the housing modules to be replicated anywhere else. As a result we developed two housing typologies. A two and three bedroom unit, on site one can find individual units or mirrored units that share a common wall. The two bedroom units are placed on the north end of the lot. The three bedroom units are located on the southern side of the lot. The public spaces for both units are arranged in order so that they may receive maximum lighting from the southern sun. The following diagrams explain the programmatic configuration of each unit:

First Floor

Second Floor

3 BEDROOM UNIT

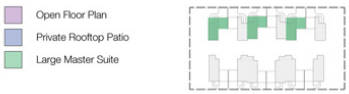




First Floor

Second Floor

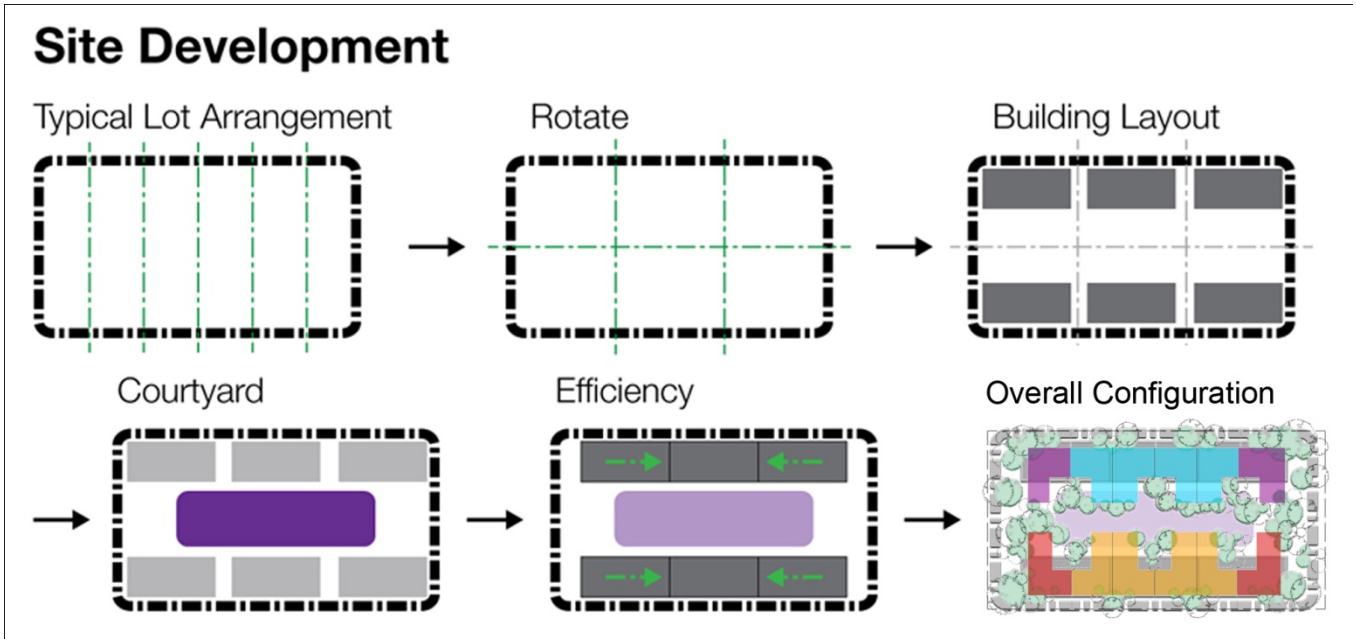
2 BEDROOM UNIT



- Design and code and zoning requirements

The site is located at the intersection of Dodge and Greenleaf. Due to the amount of activity that has taken place over the years the soils on the site have been identified to contain lead. In the initial process of the development the soil will be capped in order to allow the grounds to be redeveloped. Currently the area is zoned as a C1 (commercial). At the moment there is a push to rezone the area to an R4 (residential) district. Once the site has been rezoned the next step involves developing a layout on the site that could be replicated anywhere else.

The first response involved taking the typical Chicago lot and placing it on the site. This would ensure that the minimum amount of spacing requirements have been met. The next step involved rotating the Chicago typical lots. The rotation of the lots create more free space for the residents. Once the spaces have been allocated the buildings are placed along the periphery of the lot. This then creates a common court yard that can be shared by the residents. The intention of the housing units was not only to create an efficient home but to also reconfigure the preconceived notion of what a home is. In doing so there was a reduction in the building foot print and more open space was given back to the use



- Performance as a home and space

Our target audience are the digerati users. The digerati can be described as: young family mix, tech-savvy, urban fringe, highly educated, and ethnically mixed. The current site consists of a demographic that is not as tech savy. Current figures show that the majority of the people moving into the region are ethnically mixed as well as tech savvy. The architecture is designed for this specific audience. As a result the user has more control over the functionality and performance of the home through technology. Whereas before there was not as much control. The home gives the user a higher level of control. This result in lower energy consumption.

Spacious double height living rooms

- Uniqueness of the places.

With the design we are trying to accomplish a balance between experience, marketability, and low energy. For the experience we designed a house that our client would like to live in, with the marketability we have made a cost effective house that our client will be able to afford, and with low energy we have researched and tested multiple active and passive systems to get the best efficient systems for our house. All of these three components are made possible because of our design.

Beautiful, economical, and efficient homes

Terrace commodity, private areas to be with your family and friends.

- How is this superior to the competitors

Different from the previous IPRO, some issues we approached where the cost of the components that make up the house, there where some active systems that we were interested in, but they where disqualified because of their initial cost. We are superior that our competitors because we where able to design houses that where 350,000-400,000 dollars which is a real price since we made the construction estimate, and still considering the cost of the components use 10% less energy than our previous IPRO.

Structure and foundation:

Load Requirements:

The city of Evanston code references the International Building Code for all load requirements on buildings.

Live Load:

- Partition load 15 psf per IBC 2009 1607.5
- Residential load 40 psf per IBC 2009 Table 1607.1-27
- Garages 40 psf per table IBC 2009 1607.1-16; for vehicles carrying less than 9 passengers
- Stairs 40 psf IBC 2009 1607.1-35
- Garden roof 100psf IBC 2009 1607.1-29
- Roof, other 20psf IBC 2009 1607.1-29

Snow:

$\rho_f=0.7C_eC_tI_s\rho_g$	ASCE 7-10 7.3-1
C_e=0.9	ASCE 7-10 Table 7.2
C_t=1.0	ASCE 7-10 Table 7.3
OC II	ASCE 7-10 Table 1.5-1
I_s=1.0	ASCE 7-10 Table 1.5-2
ρ_g=30 psf	ASCE 7-10 Figure 7-1

ρ_f=0.9x0.7x30=18.9 psf

- use $\rho_m=20I_s$=20 psf ASCE 7-10 7.3.4

Wind:

Applicable to use IBC procedure per IBC 1609.1.1.1

V=90 mph	IBC 2009 Figure 1609
q_s=20.7 psf	IBC 2009 Table 1609.6.2 (1)
$P_{net}= q_sK_zC_{net}IK_{zt}$	IBC 2009 equation 16-34
Surface Roughness B	ASCE 7-10 6.5.6.2
Exposure B	ASCE 7-10 6.5.6.3
$K_z=2.01(z/z_g)^{2/\alpha}$	ASCE 7-10 Table 6.3
z_g=1200 ft	ASCE 7-10 Table 6.2
α=7	ASCE 7-10 Table 6.2

Assume z=40 ft – conservatively: K_z=0.761

K_{zt}=1	ASCE 7-10 6.5.7.2
I=1.0 – importance factor	
C_{net}=1.0 - conservatively	Table 1609.6.2(2)

- P_{net}=15.75 psf

Earthquake:

S_{ds}=0.2g	IBC 2009 Figure 1613.5(1)
S_{d1}=0.06g	IBC 2009 Figure 1613.5(2)
OC II→Seismic design category B	IBC 2009 Table 1613.5.6 1&2
Earthquake design not required per	IBC 2009 1613.1.1

Framing:

Floor system:

- 3-1/2" x 16" TimberStrand® LSL Beam (1.55E) @ 19.2" OC + ¾ in CDX plywood for recreational roofs
- 14" TJI® 560 @ 12" OC + ½ in CDX plywood for residential area

Design calculations and serviceability checks were done using iLevel Forte.

Stud Walls (interior):

- 3-1/2" x 9-1/4" TimberStrand® LSL Beam (1.55E) @ 16" OC under recreational roofs
- 1-1/2" x 5-1/2" 1.5E TimberStrand® LSL @ 16" OC under 2nd floor residential area

- 1-1/2" x 3-1/2" 1.3E TimberStrand® LSL @ 16" OC 2nd floor supporting the roof

SIP Walls:

Critical case—under garden roof:

Axial Load(ASD)=20+1150+230=1400 lb/ft

Conservatively use panel height of 16 feet to account for the depth of joists and steel beams (where applicable).

Allowable axial load (9-1/4" SIP; F.S.=3)=4200 lb/ft

Transverse load(ASD)=15.75 psf (wind)

Allowable transverse load (9-1/4" SIP; F.S.=3)=46 psf

1400/4200 + 15.75/46 = 0.676<<<1 OK! 9-1/4" SIPs are adequate

I contacted two SIP manufacturers to obtain allowable loads and pricing but neither responded. The design procedure and load specifications are from Technical Bulletin #4—premiersips.com

Previous calculations indicated that thicknesses greater than or equal to 5-1/2" also meet structural design requirements.

Roof Members:

- 1-3/4" x 11 1/4" TimberStrand® LSL Beam (1.55E) @ 16" OC

Headers under recreational roof:

- 5-1/2" x 9" 24F-V4 DF Glulam
- 5-1/2" x 9-1/2" 24F-V4 DF Glulam

Steel beams and columns:

Used where geometry or interior features (e.g. 2-story space, stairs) disallow the use of stud wall/sip making floor joist span unreasonable. Beam design based on full unbraced length. k=1 (braced frame) for column design. Member sizes determined from selection tables in the AISC Steel Construction, Manual 13th Edition.

- W14x43 beam: used critical span and load to calculate one member size for all locations—simpler construction process
- W8x31 column: HSS 4x4x1/8 is also adequate but to ensure for proper connections, the smallest W-shape was selected

Footing:

Mr. Jan Blok informed us that foundation needs to be designed at least 3 feet deep in order to be below the frost line for the Chicago area. Due to soil bearing capacity requirements and in order to allow for placement of 12-inch sips on top, the continuous footing was designed 18 inches wide. The footings for the steel columns were designed as 2.5x2.5 feet. Bearing capacities were checked according to Terzaghi and Vesic methods using the spreadsheets provided with the book Foundation Design by Donald P. Coduto.

SAP Model and hand calculations:

A SAP model would not be relevant for our design. Under gravity loads floors are considered simply supported. Under lateral loads finite element software has to be used to determine stresses but at least a 2D mesh needs to be generated in order to account for the continuous support by the foundation and the planar shape of the panels.

Hand calculations were done for the first phase of the project (concrete); for wood members hand calculations and using software are essentially the same thing as the software calculates shear, bending moment, and deflection based on the distributed load formulas $wL/2$, $wL^2/8$, and $5wL^4/384EI$ and checks the selected structural member values from load tables for meeting the requirements.

SIP Details from www.sips.org

FIGURE 1

WALL-TO-WALL PANEL CONNECTIONS

CORNER WALL

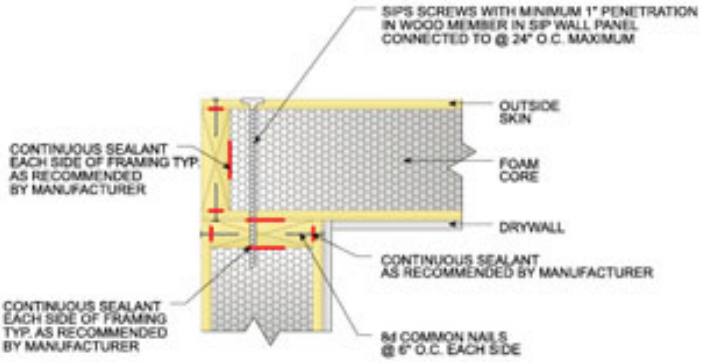
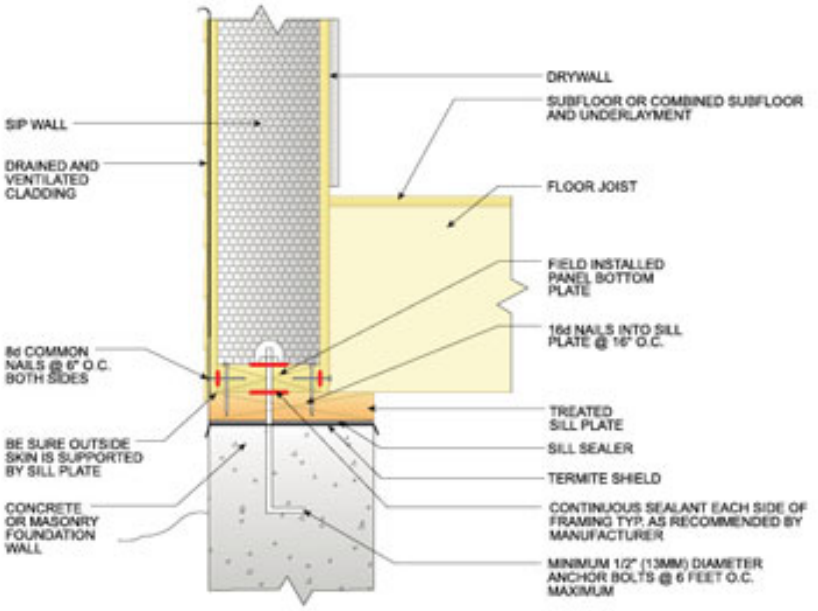


FIGURE 2

FOUNDATION CONNECTIONS

DETAIL A



www.sips.org

FIGURE 3

FOUNDATION CONNECTIONS

DETAIL B

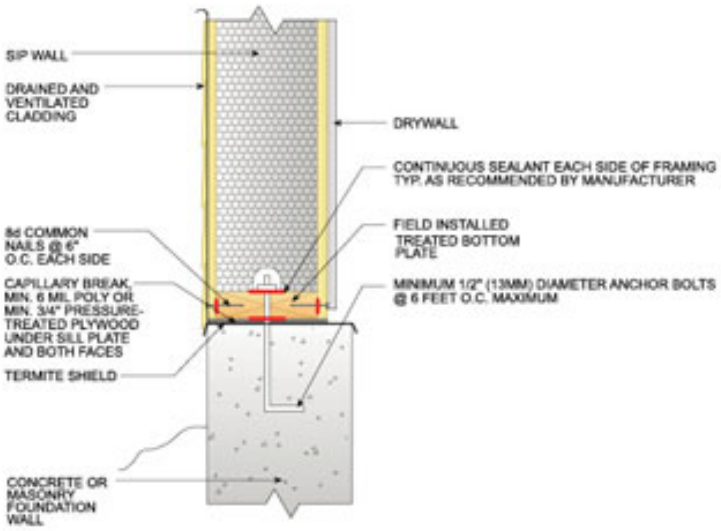


FIGURE 9

ROOF-TO-WALL PANEL CONNECTIONS

RIDGE DETAIL AT CANTILEVER

(LIMIT 2' OVERHANG)

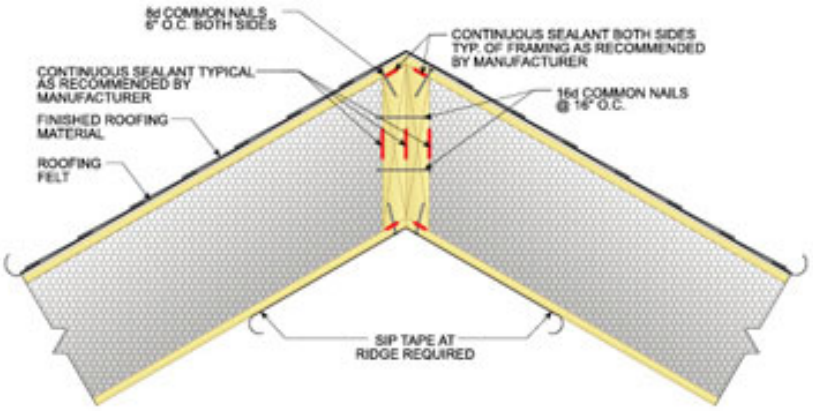


FIGURE 10

2ND FLOOR CONNECTION DETAILS

HANGING FLOOR

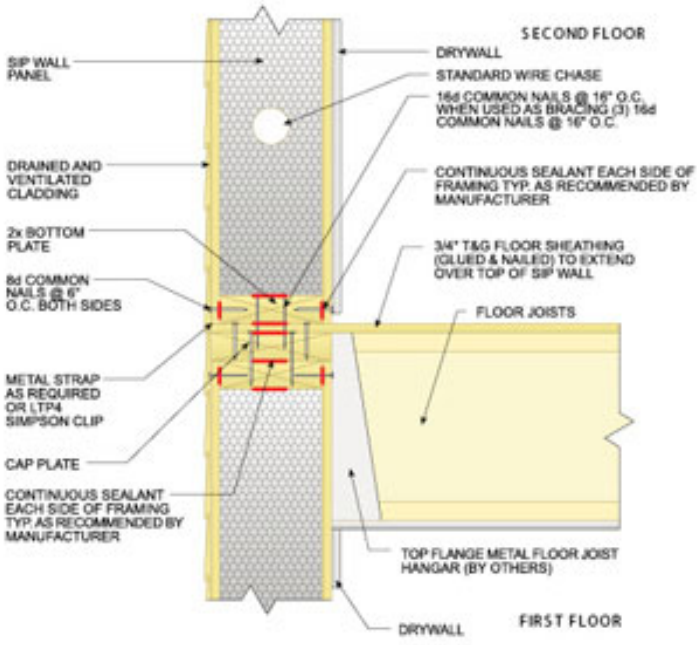


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FIGURE 21

WALL-TO-WALL VERTICAL PANEL CONNECTIONS

BLOCK SPLINE

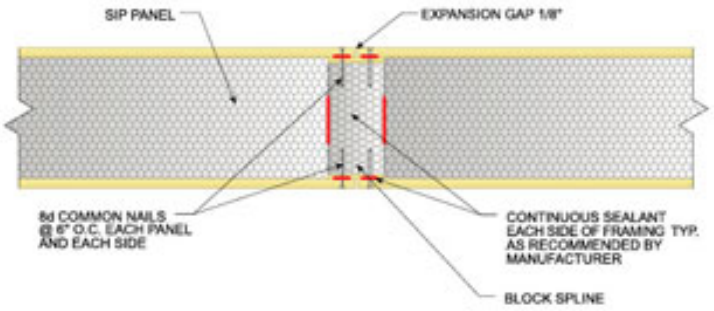
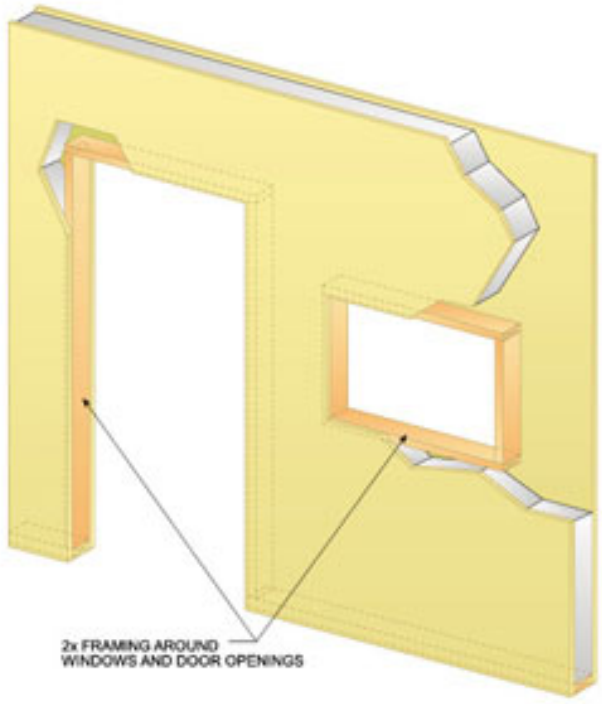


FIGURE 19

WALL OPENNINGS

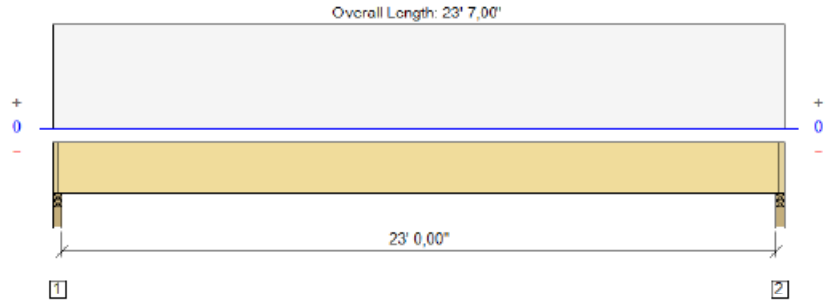
DOOR AND WINDOW FRAMING



www.sips.org

MEMBER REPORT *Level, Floor: Joist* **PASSED**

1 piece(s) 3 1/2" x 16" TimberStrand® LSL Beam (1.55E) @ 19.2" OC



All Dimensions Are Horizontal; Drawing is Conceptual

Design Results	Actual @ Location	Allowed	Result	LDF	Load Combination(Load Pattern)
Member Reaction (lbs)	2258 @ 2,50"	3347	Passed (67%)	--	1.0 D + 0.75 W + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	1822 @ 1' 7,50"	11573	Passed (16%)	1,00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	12022 @ 11' 9,50"	29305	Passed (41%)	1,00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0,578 @ 11' 9,50"	0,579	Passed (L/481)	--	1.0 D + 0.75 W + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0,642 @ 11' 9,50"	1,158	Passed (L/433)	--	1.0 D + 0.75 W + 0.75 L + 0.75 S (All Spans)
TJ-Pro™ Rating	49	45	Passed	--	--

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Bracing (Lu): All compression edges (top and bottom) must be braced at 23' 4,50" o/c unless detailed otherwise. Proper attachment and positioning of lateral bracing is required to achieve member stability.
- A 4% increase in the moment capacity has been added to account for repetitive member usage.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" iLevel® Edge Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: None

Supports	Bearing			Support Reactions (lbs)						Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Snow	Wind	Seismic	
1 - Stud wall - Spruce Pine Fir	3,50"	2,25"	1,52"	226	1887	0	377	472	0	1 1/4" Rim Board
2 - Stud wall - Spruce Pine Fir	3,50"	2,25"	1,52"	226	1887	0	377	472	0	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.

Loads	Location	Spacing	Dead (0,90)	Floor Live (1,00)	Roof Live (non-snow: 1,25)	Snow (1,15)	Wind (1,60)	Seismic (1,60)	Comments
1 - Uniform(PSF)	0 to 23' 7,00"	19,2"	12,0	100,0	0,0	20,0	25,0	0,0	Residential - Exterior Balconies
2 - Uniform(PSF)	0 to 23' 7,00"	19,2"	0,0	0,0	0,0	0,0	0,0	0,0	

iLEVEL® Notes

iLevel® warrants that the sizing of its products will be in accordance with iLevel® product design criteria and published design values. iLevel® expressly disclaims any other warranties related to the software. Refer to current iLevel® literature for installation details. (www.iLevel.com) Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. iLevel® products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards.

The product application, input design loads, dimensions and support information have been provided by Forte Software Operator

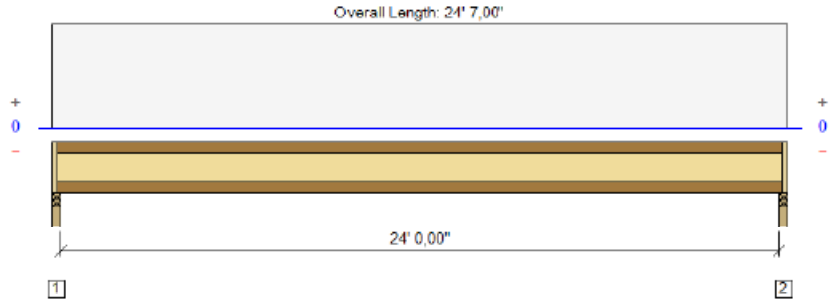
SUSTAINABLE FORESTRY INITIATIVE

Floor Recreational

iLevel Forte software

MEMBER REPORT *Level, Floor: Joist* **PASSED**

1 piece(s) 14" TJI® 560 @ 12" OC



All Dimensions Are Horizontal; Drawing is Conceptual

Design Results	Actual @ Location	Allowed	Result	LDF	Load Combination(Load Pattern)
Member Reaction (lbs)	634 @ 2,50"	1396	Passed (45%)	1,00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	624 @ 3,50"	2390	Passed (26%)	1,00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	3796 @ 12' 3,50"	11275	Passed (34%)	1,00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0,482 @ 12' 3,50"	0,604	Passed (L/601)	--	1.0 D + 0.75 W + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0,584 @ 12' 3,50"	1,208	Passed (L/496)	--	1.0 D + 0.75 W + 0.75 L + 0.75 S (All Spans)
TJ-Pro™ Rating	42	40	Passed	--	--

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Bracing (Lu): All compression edges (top and bottom) must be braced at 7' 6,32" o/c unless detailed otherwise. Proper attachment and positoning of lateral bracing is required to achieve member stability.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" iLevel® Edge Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: None

Supports	Bearing			Support Reactions (lbs)						Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Snow	Wind	Seismic	
1 - Stud wall - Spruce Pine Fir	3,50"	2,25"	--	148	492	0	246	194	0	1 1/4" Rim Board
2 - Stud wall - Spruce Pine Fir	3,50"	2,25"	--	148	492	0	246	194	0	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.

Loads	Location	Spacing	Dead (0,90)	Floor Live (1,00)	Roof Live (non-snow: 1,25)	Snow (1,15)	Wind (1,60)	Seismic (1,60)	Comments
1 - Uniform(PSF)	0 to 24' 7,00"	12,"	12,0	40,0	0,0	20,0	15,8	0,0	Residential - Living Areas

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The product application, input design loads, dimensions and support information have been provided by Forte Software Operator

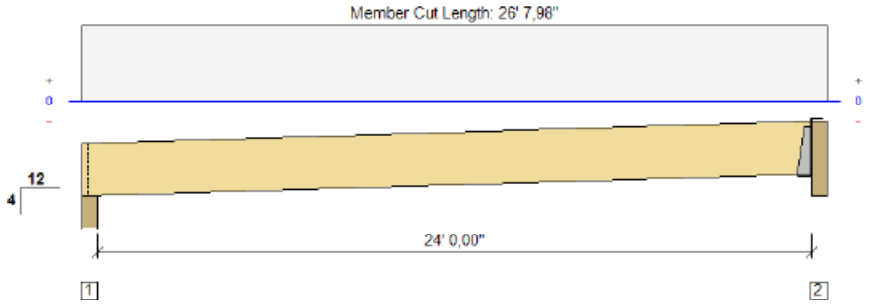
SUSTAINABLE FORESTRY INITIATIVE

Joist Second Floor

iLevel Forte software

MEMBER REPORT *roof, Roof: Joist* **PASSED**

1 piece(s) 1 3/4" x 11 1/4" TimberStrand® LSL Beam (1.55E) @ 16" OC



All Dimensions Are Horizontal; Drawing is Conceptual

Design Results	Actual @ Location	Allowed	Result	LDF	Load Combination(Load Pattern)
Member Reaction (lbs)	678 @ 5,00"	4463	Passed (15%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	607 @ 23' 7,33"	4679	Passed (13%)	1,15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	3945 @ 12' 5,50"	8605	Passed (46%)	1,15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0,889 @ 12' 5,50"	1,269	Passed (L/343)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	1,452 @ 12' 5,50"	1,692	Passed (L/210)	--	1.0 D + 1.0 S (All Spans)

System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC
Design Methodology : ASD
Member Pitch: 4/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Bracing (Lu): All compression edges (top and bottom) must be braced at 8' 6,22" o/c unless detailed otherwise. Proper attachment and positioning of lateral bracing is required to achieve member stability.
- A 4% increase in the moment capacity has been added to account for repetitive member usage.

Supports	Bearing			Support Reactions (lbs)						Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Snow	Wind	Seismic	
1 - Beveled Plate - Spruce Pine Fir	6,00"	6,00"	1,50"	263	0	332	415	0	0	Blocking
2 - 11 1/4" Beam - Spruce Pine Fir	6,00"	Hanger	Hanger	264	0	334	418	0	0	None

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Connector: Simpson Strong-Tie Connectors					
Support	Model	Top Nails	Face Nails	Member Nails	Accessories
2 - Top Mount Hanger	LBV1.81/11.25X D18	6-10d common	4-10d common	2-10d x 1-1/2	LSTA18 Strap

Loads	Location	Spacing	Dead (0,90)	Floor Live (1,00)	Roof Live (non-snow: 1,25)	Snow (1,15)	Wind (1,60)	Seismic (1,60)	Comments
1 - Uniform(PSF)	0 to 25' 0,00"	16,"	15,0	0,0	20,0	25,0	0,0	0,0	Snow

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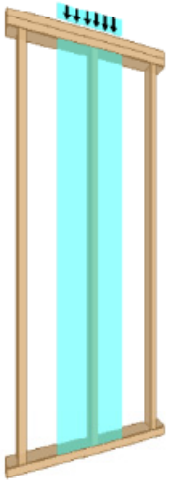
SUSTAINABLE FORESTRY INITIATIVE

Stud Wall Second Floor

SOLUTIONS REPORT *wall resid area, Wall: Stud* **PASSED**

Current Solution: 1 piece(s) 1 1/2" x 3 1/2" 1.3E TimberStrand® LSL @ 16" OC



Member Height: 11' 7,50" Wall Height: 12' 0,00" O.C. Spacing: 16,00"

Design Results	Actual	Allowed	Result	LDF
Slenderness	34	50	Passed (68%)	--
Compression (lbs)	772	2422	Passed (32%)	1,60
Plate Bearing (lbs)	772	2658	Passed (29%)	--
Lateral Reaction (lbs)	115	--	--	1,60
Lateral Shear (lbs)	109	2240	Passed (5%)	1,60
Lateral Moment (ft-lbs)	333 @ mid-span	801	Passed (42%)	1,60
Lateral Deflection (in)	0,82 @ mid-span	1,16	Passed (L/170)	--
Bending/Compression	0,63	1	Passed (63%)	1,60

System : Wall

Member Type : Stud

Building Code : IBC

Design Methodology : ASD

Drawing is Conceptual

Lateral Connections						
Support	**Plate Size**	**Plate Material**	**Connector**	**Type/Model**	**Quantity**	**Nailing**
Top	Dbl 2X	Hem Fir	Nails	8d x 2.5" Box (Toe)	2	
Base	2X	Hem Fir	Nails	8d x 2.5" Box (Toe)	2	

All Product Solutions			
Depth	**Series**	**Plies**	**Wood Volume**
3 1/2"	1 1/2" 1.3E TimberStrand® LSL	1	0,43
3 1/2"	1 1/2" 1.3E TimberStrand® LSL	2	0,85
3 1/2"	1 1/2" 1.3E TimberStrand® LSL	3	1,28
3 1/2"	1 1/2" 1.3E TimberStrand® LSL	4	1,71

The purpose of this report is for product comparison only. Load and support information necessary for professional design review is not displayed here. Please print an individual Member Report for submittal purposes.

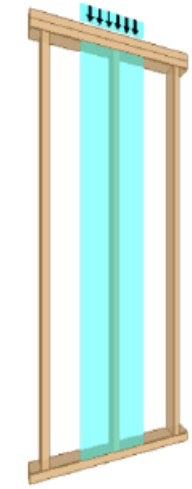
Stud Wall at Garden Roof

iLevel Forte software

MEMBER REPORT *wall, Wall: Stud* **PASSED**

1 piece(s) 3 1/2" x 9 1/4" TimberStrand® LSL Beam (1.55E) @ 16" OC

Wall Height: 10' 0,00" Member Height: 9' 7,50" O.C. Spacing: 16,00"



Drawing is Conceptual

Design Results	Actual	Allowed	Result	LDF	Load Combination
Slenderness	11	50	Passed (21%)	--	--
Compression (lbs)	1560	63128	Passed (2%)	1,00	1.0 D + 1.0 L
Plate Bearing (lbs)	1560	14517	Passed (11%)	--	1.0 D + 1.0 L
Lateral Reaction (lbs)	95	--	--	1,60	1.0 D + 1.0 W
Lateral Shear (lbs)	79	10705	Passed (1%)	1,60	1.0 D + 1.0 W
Lateral Moment (ft-lbs)	228 @ mid-span	16412	Passed (1%)	1,60	1.0 D + 1.0 W
Lateral Deflection (in)	0,01 @ mid-span	0,96	Passed (L/14163)	--	1.0 D + 1.0 W
Bending/Compression	0,02	1	Passed (2%)	1,60	1.0 D + 0.75 W + 0.75 L + 0.75 S

- Lateral deflection criteria: Wind (L/120)
- Axial load eccentricity for this design is 1/6 of applicable member side dimension.
- Applicable calculations are based on NDS 2005 methodology.
- A bearing area factor of 1.107143 has been applied to base plate bearing capacity.
- A 4% increase in the moment capacity has been added to account for repetitive member usage.
- Special detailing and installation procedures are necessary for large wall construction.

Supports	Type	Material
Top	Dbl 2X	Hem Fir
Base	2X	Hem Fir

Max Unbraced Length	Comments
1' 0,00"	

System : Wall

Member Type : Stud

Building Code : IBC

Design Methodology : ASD

Lateral Connections						
Supports	Plate Size	Plate Material	Connector	Type/Model	Quantity	Nailing
Top	Dbl 2X	Hem Fir	Nails	8d x 2.5" Box (Toe)	2	
Base	2X	Hem Fir	Nails	8d x 2.5" Box (Toe)	2	

Vertical Load	Spacing	Dead (0,90)	Floor Live (1,00)	Roof Live (non-snow: 1,25)	Snow (1,15)	Wind (1,60)	Seismic (1,60)	Comments
1 - Point(PLF)	16,00"	20,0	1150,0	0,0	230,0	25,0	0,0	

Lateral Load	Location	Spacing	Wind (1,60)	Comments
1 - Uniform(PSF)	Full Length	16,00"	14,7	

- ASCE/SEI 7-05 Sec. 6.5.12.4.1: Exposure Category (B), Mean Roof Height (30' 0,00"), Topographic Factor (1.0), Wind Directionality Factor (0.85), Basic Wind Speed (90 mph), Importance Factor (1.0), Occupancy Category (II), Hurricane Prone Region (No), Effective Wind Area determined using full member span and trib. width.
- 2009 IBC Table 1604.3, footnote f: Deflection checks are performed using 70% of this lateral wind load.

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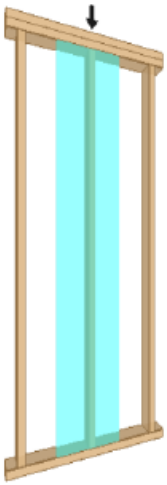
SUSTAINABLE FORESTRY INITIATIVE

Stud Wall at Residential Area Supporting Second Floor

iLevel Forte software

MEMBER REPORT *wall resid area, Wall: Stud* **PASSED**

1 piece(s) 1 1/2" x 5 1/2" 1.5E TimberStrand® LSL @ 16" OC



Drawing is Conceptual

Wall Height: 10' 0,00" Member Height: 9' 7,50" O.C. Spacing: 16,00"

Design Results	Actual	Allowed	Result	LDF	Load Combination
Slenderness	18	50	Passed (36%)	--	--
Compression (lbs)	560	13075	Passed (4%)	1,15	1.0 D + 0.75 L + 0.75 S
Plate Bearing (lbs)	579	4177	Passed (14%)	--	1.0 D + 0.75 W + 0.75 L + 0.75 S
Lateral Reaction (lbs)	97	--	--	1,60	1.0 D + 1.0 W
Lateral Shear (lbs)	88	3520	Passed (2%)	1,60	1.0 D + 1.0 W
Lateral Moment (ft-lbs)	234 @ mid-span	2491	Passed (9%)	1,60	1.0 D + 1.0 W
Lateral Deflection (in)	0,09 @ mid-span	0,96	Passed (L/1276)	--	1.0 D + 1.0 W
Bending/Compression	0,10	1	Passed (10%)	1,60	1.0 D + 1.0 W

- Lateral deflection criteria: Wind (L/120)
- Axial load eccentricity for this design is 1/6 of applicable member side dimension.
- Applicable calculations are based on NDS 2005 methodology.
- A bearing area factor of 1.25 has been applied to base plate bearing capacity.
- A 4% increase in the moment capacity has been added to account for repetitive member usage.

Supports	Type	Material
Top	Dbl 2X	Hem Fir
Base	2X	Hem Fir

Max Unbraced Length	Comments
1' 0,00"	

System : Wall
Member Type : Stud
Building Code : IBC
Design Methodology : ASD

Lateral Connections

Supports	Plate Size	Plate Material	Connector	Type/Model	Quantity	Nailing
Top	Dbl 2X	Hem Fir	Nails	8d x 2.5" Box (Toe)	2	
Base	2X	Hem Fir	Nails	8d x 2.5" Box (Toe)	2	

Vertical Load	Spacing	Dead (0,90)	Floor Live (1,00)	Roof Live (non-snow: 1,25)	Snow (1,15)	Wind (1,60)	Seismic (1,60)	Comments
1 - Point(lb)	N/A	20	480	240	240	25	0	

Lateral Load	Location	Spacing	Wind (1,60)	Comments
1 - Uniform(PSF)	Full Length	16,00"	15,1	

- ASCE/SEI 7-05 Sec. 6.5.12.4.1: Exposure Category (B), Mean Roof Height (33' 0,00"), Topographic Factor (1.0), Wind Directionality Factor (0.85), Basic Wind Speed (90 mph), Importance Factor (1.0), Occupancy Category (II), Hurricane Prone Region (No), Effective Wind Area determined using full member span and trib. width.
- 2009 IBC Table 1604.3, footnote f: Deflection checks are performed using 70% of this lateral wind load.

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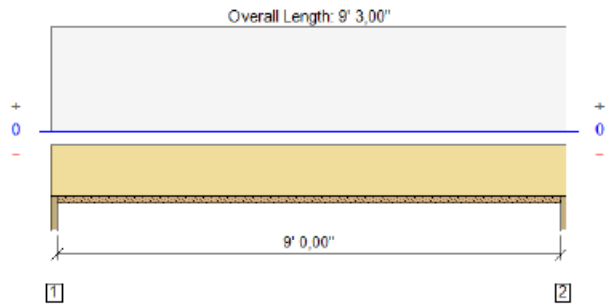
SUSTAINABLE FORESTRY INITIATIVE

iLevel Forte software

MEMBER REPORT *wall, Wall: Header2*

PASSED

1 piece(s) 5 1/2" x 9 1/2" 24F-V4 DF Glulam



All Dimensions Are Horizontal; Drawing is Conceptual

Design Results	Actual @ Location	Allowed	Result	LDF	Load Combination(Load Pattern)
Member Reaction (lbs)	5433 @ 0	5363	Passed (101%)	--	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	4356 @ 11,0C"	11539	Passed (38%)	1,25	1.0 D + 1.0 Lr (All Spans)
Pos Moment (Ft-lbs)	12564 @ 4' 7,50"	20682	Passed (61%)	1,25	1.0 D + 1.0 Lr (All Spans)
Live Load Defl. (in)	0,268 @ 4' 7,50"	0,308	Passed (L/414)	--	1.0 D + 1.0 Lr (All Spans)
Total Load Defl. (in)	0,274 @ 4' 7,50"	0,463	Passed (L/406)	--	1.0 D + 1.0 Lr (All Spans)

System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Bracing (Lu): All compression edges (top and bottom) must be braced at 9' 3,00" o/c unless detailed otherwise. Proper attachment and positioning of lateral bracing is required to achieve member stability.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 9' 3,00".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS 2005 methodology.

Supports	Bearing			Support Reactions (lbs)						Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Snow	Wind	Seismic	
1 - Trimmer - Spruce Pine Fir	1,50"	1,50"	1,52"	114	0	5319	93	115	0	None
2 - Trimmer - Spruce Pine Fir	1,50"	1,50"	1,52"	114	0	5319	93	115	0	None

Loads	Location	Tributary Width	Dead (0,90)	Floor Live (1,00)	Roof Live (non-snow: 1,25)	Snow (1,15)	Wind (1,60)	Seismic (1,60)	Comments
1 - Uniform(PSF)	0 to 9' 3,00"	1' 0,00"	12,0	0,0	1150,0	20,0	25,0	0,0	Residential - Living Areas

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SUSTAINABLE FORESTRY INITIATIVE

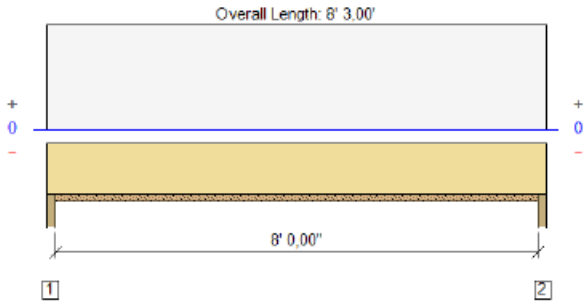
Wall Header Under Garden Roof Long

iLevel Forte software

MEMBER REPORT *wall, Wall: Header*

PASSED

1 piece(s) 5 1/2" x 9" 24F-V4 DF Glulam



All Dimensions Are Horizontal; Drawing is Conceptual

Design Results	Actual @ Location	Allowed	Result	LDF	Load Combination(Load Pattern)
Member Reaction (lbs)	4843 @ 0	5363	Passed (90%)	--	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	3816 @ 10,50"	10931	Passed (35%)	1,25	1.0 D + 1.0 Lr (All Spans)
Pos Moment (Ft-lbs)	9988 @ 4' 1,50"	18563	Passed (54%)	1,25	1.0 D + 1.0 Lr (All Spans)
Live Load Defl. (in)	0,199 @ 4' 1,50"	0,275	Passed (L/497)	--	1.0 D + 1.0 Lr (All Spans)
Total Load Defl. (in)	0,203 @ 4' 1,50"	0,412	Passed (L/487)	--	1.0 D + 1.0 Lr (All Spans)

System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Bracing (Lu): All compression edges (top and bottom) must be braced at 8' 3,00" o/c unless detailed otherwise. Proper attachment and positioning of lateral bracing is required to achieve member stability.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 8' 3,00".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS 2005 methodology.

Supports	Bearing			Support Reactions (lbs)						Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Snow	Wind	Seismic	
1 - Trimmer - Spruce Pine Fir	1,50"	1,50"	1,50"	99	0	4744	83	103	0	None
2 - Trimmer - Spruce Pine Fir	1,50"	1,50"	1,50"	99	0	4744	83	103	0	None

Loads	Location	Tributary Width	Dead (0,90)	Floor Live (1,00)	Roof Live (non-snow: 1,25)	Snow (1,15)	Wind (1,60)	Seismic (1,60)	Comments
1 - Uniform(PLF)	0 to 8' 3,00"	N/A	12,0	0,0	1150,0	20,0	25,0	0,0	Residential - Living Areas

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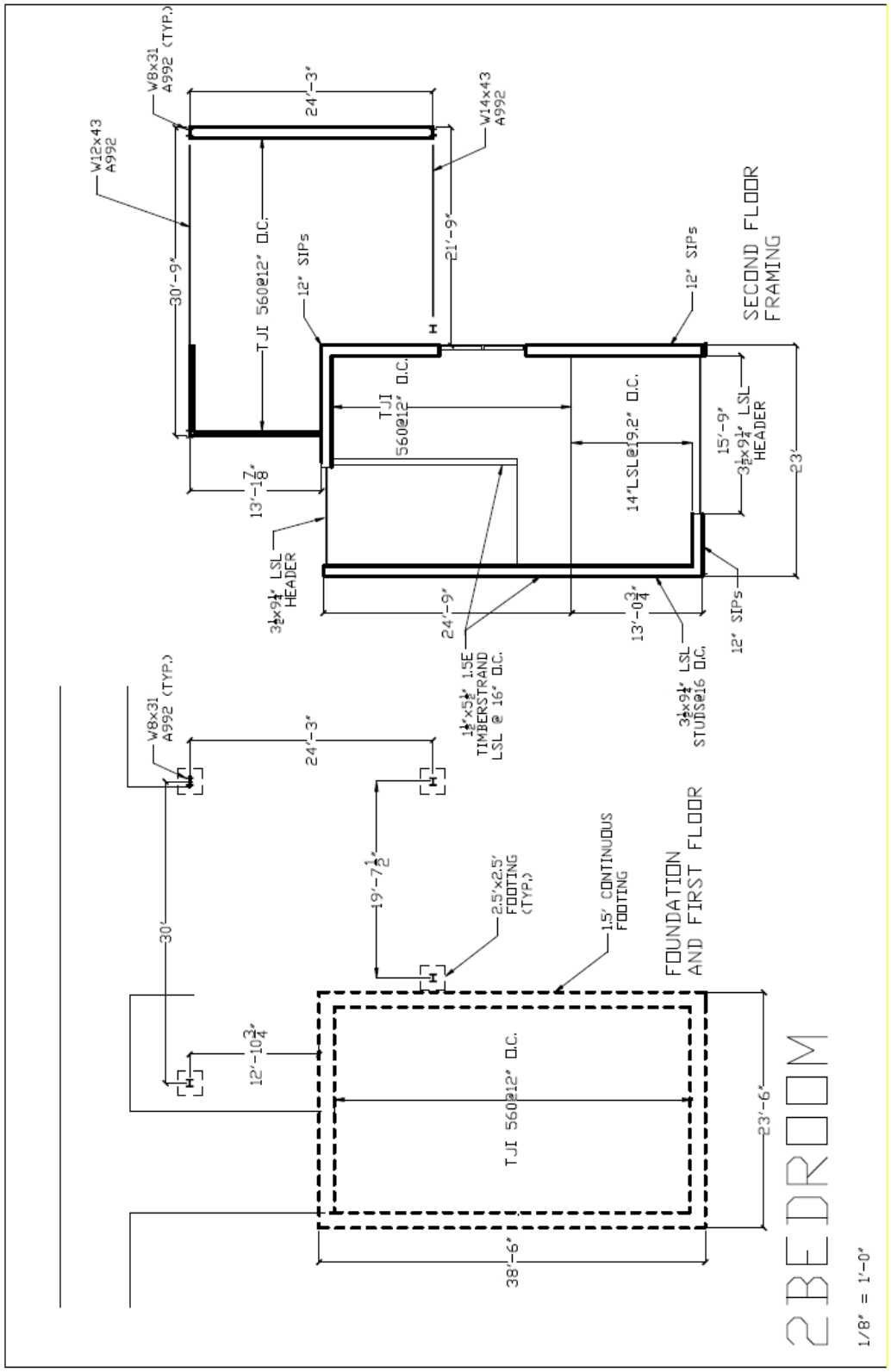
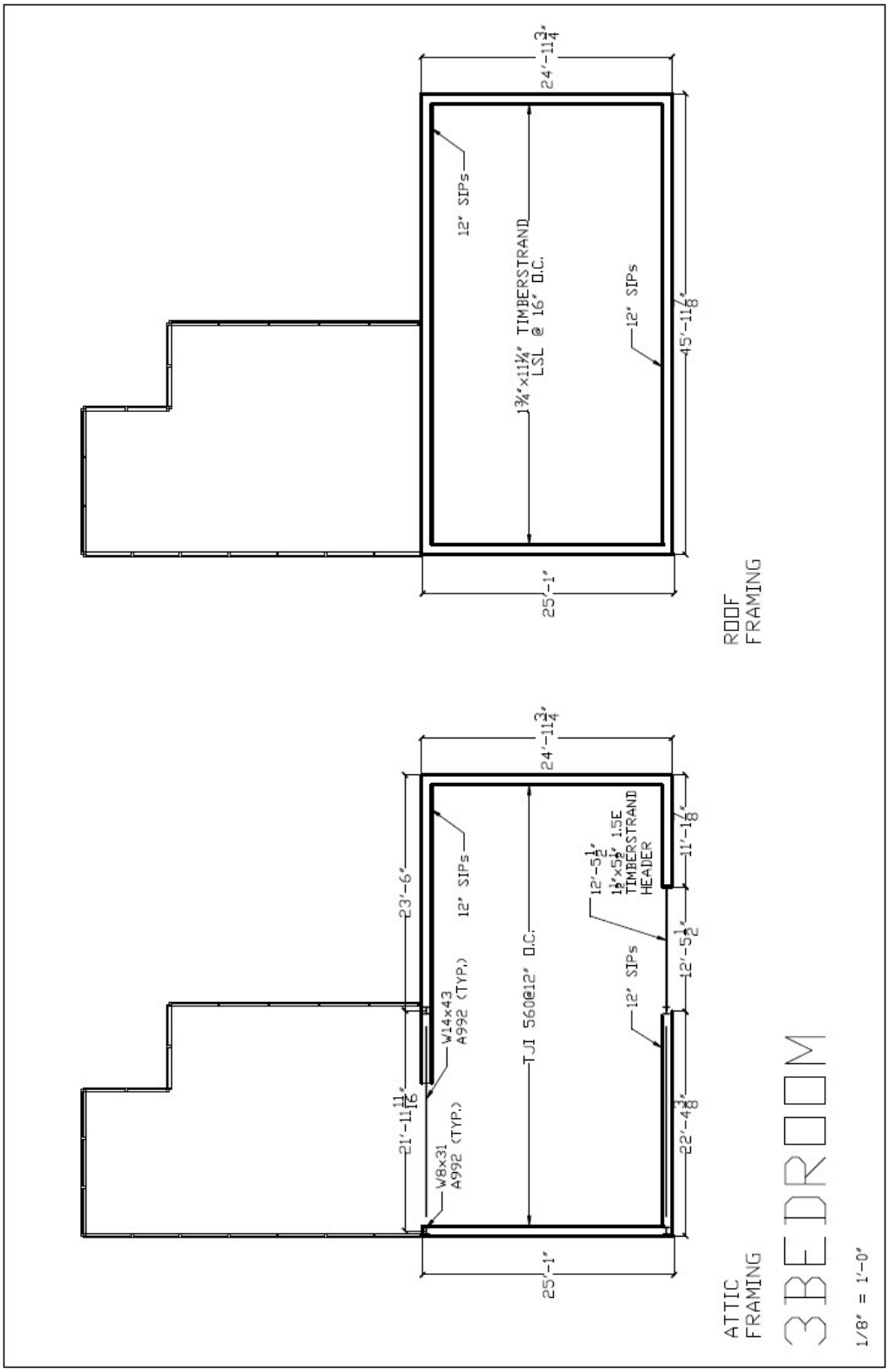
SUSTAINABLE FORESTRY INITIATIVE

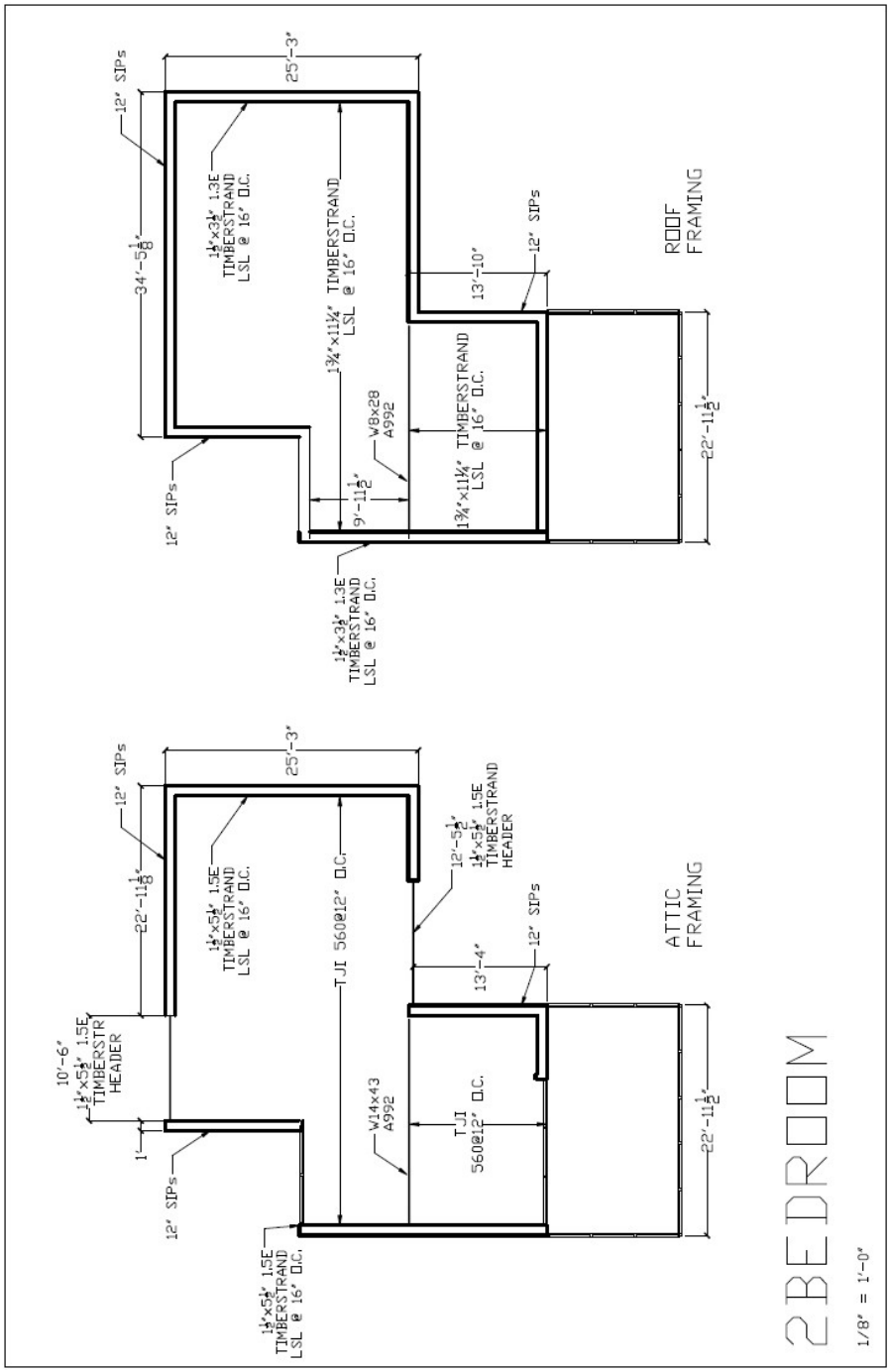
Wall Header Under Garden Roof



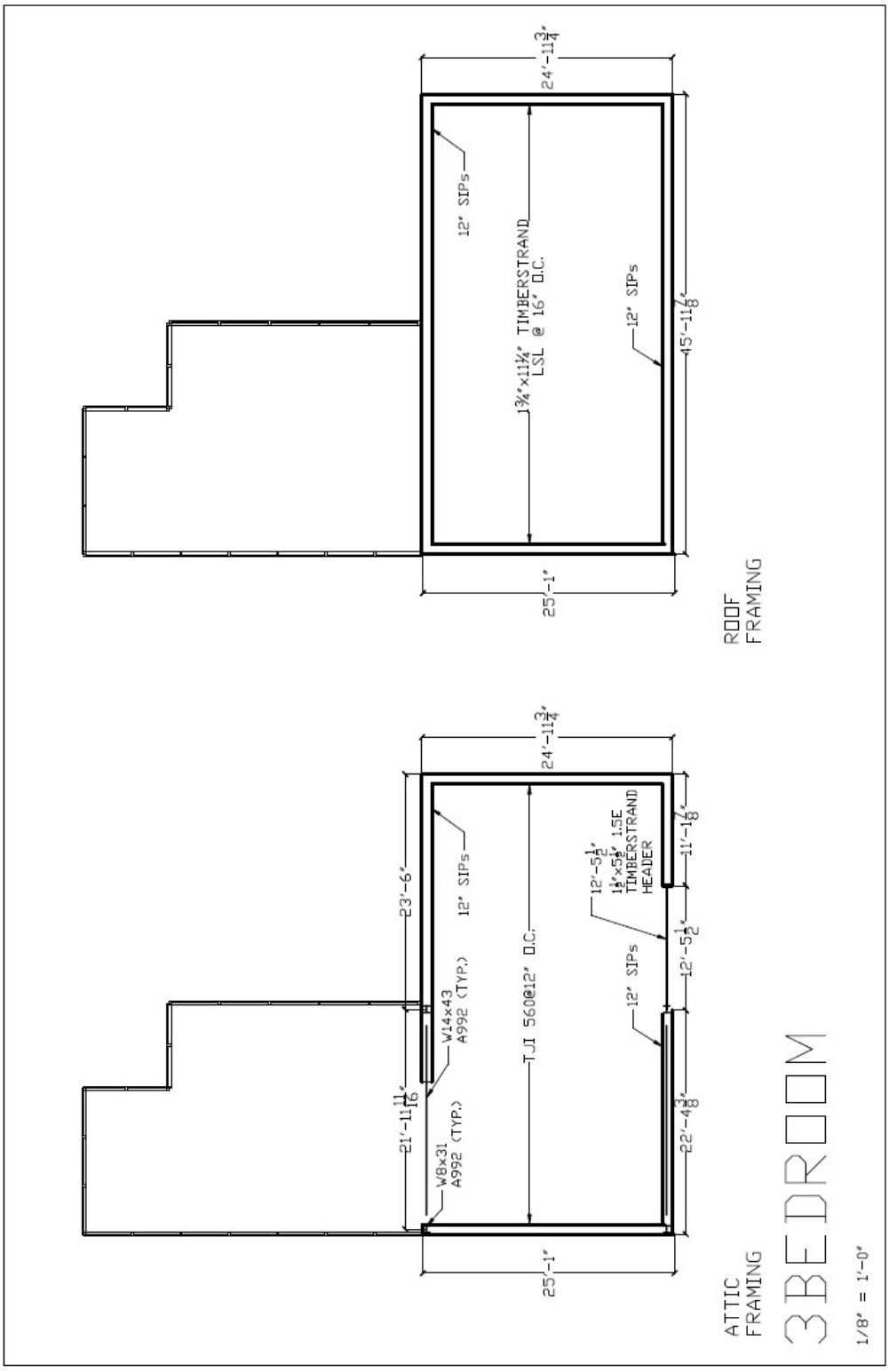
1st and 2nd Floor 2 Bed Drawing



1st and 2nd Floor 3 Bed Drawing



Attic and Roof 2 Bed Drawing



Attic and Roof 3 Bed Drawing

Engineering:

HVAC

Because the International Energy Conservation Code (IECC) standards were the desired goal, energy usage per year was reduced significantly compared to a standard home:

- For the envelope, SIPS with a total R-value of 45 were used, with careful installation methods detailed to achieve the least infiltration.
- All windows were low-E double pane, with a U-value of 0.33 BTU/h*ft^2*F, SHGC of 0.6
- Operable blinds were used when performing thermal modeling.
- Efficient use of CFL lighting was used.
- Home automation of the lighting and HVAC was estimated to save 11 MBTU per house per year.
- The GreenSun Panels installed in every home saved 11.7 MBTU per house per year.

	Mbtu/House per Year	% of Total	Yearly energy savings	kBtuh/SQFT/Year
Baseline	110.03	100%	**1001.30**	117
Envelope Design	26.33	24%	**239.63**	89
Glazing Features	16.93	15%	**154.05**	99
Operable Blinds	10.03	9%	**91.30**	115
Reduced Hot Water Demand/Fixtures	2.20	2%	**20.03**	105
Lights	2.20	2%	**20.03**	106
Natural Ventilation	5.50	5%	**50.07**	111.15
Domotics	11.00	10%	**100.13**	105.3
GreenSun Panels	11.70	10%	**106.47**	105.3
Total Saved	**85.20**	**77%**	**775.35**	**27**

The IECC baseline energy usage standards were beaten by 23% with the SMAART house design. The design also netted 122 LEED points, putting the homes into LEED Platinum classification.

Energy modeling was performed in IES-VE, with a final heating load of 28.8 kBTU/h and a final cooling load of 15.5 kBTU/h. The equipment selected to handle this load included the Carrier Infinity heat pump, model 25HNA9 with a small backup gas furnace for very low temperatures.

<*See Appendix C-HVAC for equipment spec sheets and load graphs*>

Plumbing

Low-flow toilets, faucets and shower heads were selected to reduce water usage. The fixtures were all by Kohler, and the toilets and shower heads all fall under the EPA Watersense water conservation program, making them 20% more efficient than average comparable products.

Flow rates (in gpm):

- Toilet (Model # K-3639) = 1.28
- Shower heads (Model # K-10240) = 1.75

Fire protection included an automated sprinkler and smoke detector system with HAI's Omni IIe automation system (see *Engineering – Home Automation* for description).

Electrical

All appliances in every home are EnergyStar rated, resulting in an average of 38.9% increased efficiency over typical comparable products.

Energy usage rates for appliances (in kWh/year):

- Dishwasher = 290
- Refrigerator = 476
- Dishwasher = 126
- Dryer = 800

<*See Appendix C-Electrical for model numbers*>

Acoustics

The walls for the entertainment space in all homes used one layer of QuietRock 510 acoustic drywall, acquiring an STC of 49.

<See Appendix C-Acoustics for STC report>

Home Automation

The home automation system chosen was the HAI Omni IIe, as all HAI systems integrate with the Carrier Infinity line of user control. The Omni IIe package contains lighting control, home security automation, fire protection automation, all utilizing touchscreen controls in the home and remote controls from a smartphone or computer anywhere. Additionally, buyers are able to optionally purchase the HAI Hi-Fi 2 entertainment automation system with an integrated speaker system.

The Omni IIe system was estimated to save 11 MBTU per house per year in total energy from lighting and HVAC automation.

Appendix C

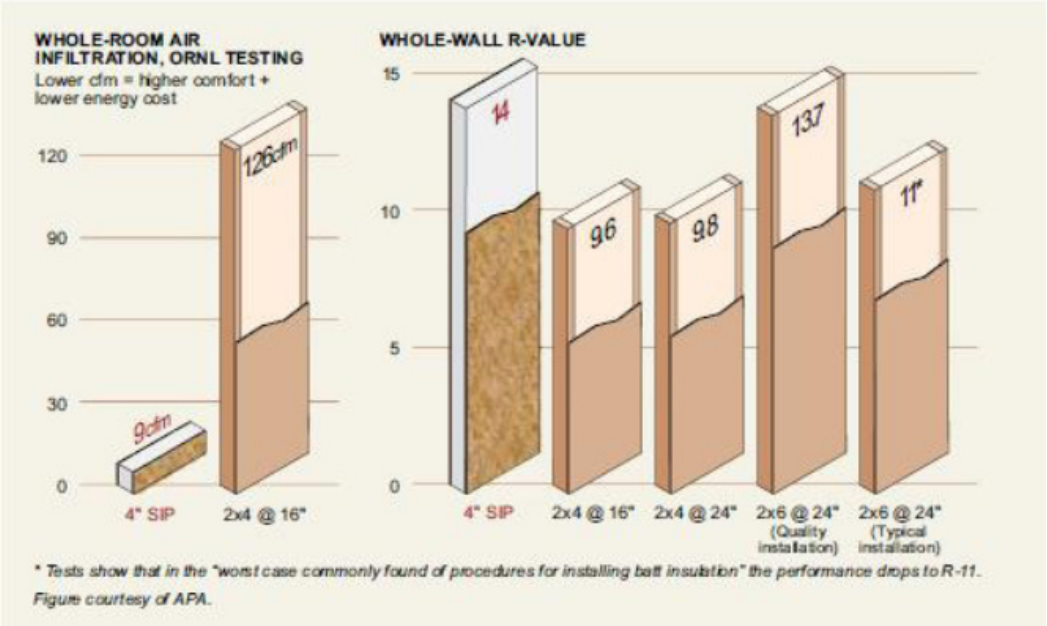
HVAC

SIP vs. Insulated Stud Walls Study

- Rigid foam insulation (used in SIPs) actually performs better than loose fiver glass insulation (convective currents- constant loop of energy loss) in colder temperatures

Rigid foam insulation	Fiberglass insulation
➔ At 75F R=3.5/in2 ➔ At 50F R=4.2/in2 ➔ At 35F R= 4.4/in2	➔ At 75F R=19 ➔ At -8F R=9

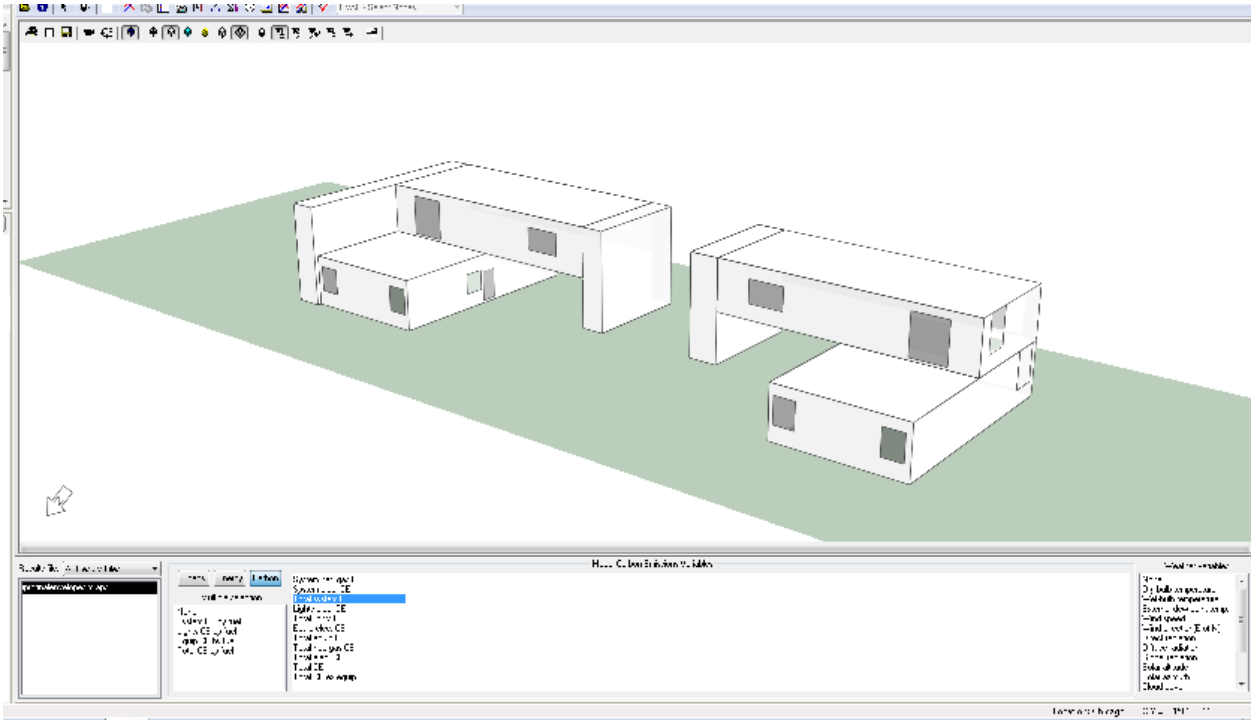
- Outside air leaking into the home, or air infiltration, is responsible for 40 percent of heat or cooling loss in the average home.
- Fiberglass insulation does not protect against air infiltration ➔ SIPS 5X times more air-tightness
- Thermal Bridging ➔ Lumber (Studs) is a very poor insulator and forms a bridge from the outside of the home to the inside of the home where heat can pass through by conduction.
- Field-installed insulation: Fiberglass must be installed between studs and cut to fit around window openings and wiring. Building with SIPs does not require any insulation to be installed in the field.



http://www.premiersips.com/product-resources/headers-beams/

http://www.raycore.com/

✓ Final Decision R=40



	Corner Units	Completely Attached Units
Above-grade thermal boundary gross wall area	2572.4	1929.3
Below-grade boundary wall area	900	900
Common wall area	214.4	856.8
AFL	1890	1890
FA	0.851112	0.81086874
F	0.923066	0.69247335
Allowed Fenestration Area	**222.7**	**159.2**
Percent of total Exterior Wall Area	**9%**	**8%**

AF = As x FA x F

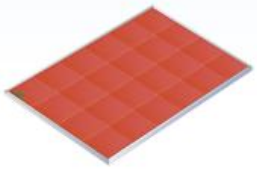
AF = Total fenestration area

AFL = Total floor area of directly conditioned space

FA = (Above-grade thermal boundary gross wall area) / (Above-grade boundary wall area + 0.5 x Below-grade boundary wall area)

F =(Above-grade thermal boundary wall area) / (Above-grade thermal boundary wall area + Common wall area)

GreenSun MK Series Panel



MK-I
Light weight with 12% efficiency panel based on about 1/5 of solar cells used in similar size.

MK-IIIQ (In development)
High efficiency panel, multi junction type, with estimated over 20% efficiency panel based on less than 1/10 of solar cells used in similar size.

Comparison	Grid Parity	Conventional Solar Panel 15%	GreenSun MK-I Panel 12%	GreenSun MK-IIIQ Panel 20%
Solar Panel Area	N/A	1M2	1M2	1M2
Total Wattage	N/A	150W	120W	200W
Total $/W	**$1.00/W**	**$2.10/W**	**$1.30/W**	**$0.80/W***

for Homes

LEED for Homes Simplified Project Checklist

Builder Name:	*IPRO357*
Project Team Leader (if different):	*Marina Khorkina*
Home Address (Street/City/State):	*Greenleaf & Dodge, Evanston, IL*

Project Description:

Building type: ***Single attached***
Project type: ***Custom***
# of bedrooms: ***3***
Floor area: ***1890***

Adjusted Certification Thresholds

Certified: ***45.0***
Gold: ***75.0***
Silver: ***60.0***
Platinum: ***90.0***

Project Point Total

Prelim: *81 + 5 maybe pts*
Final: *122*

Certification Level

Prelim: *Not Certified*
Final: *Platinum*

Final Credit Category Total Points

ID: 10	*SS: 21*	*EA: 36*	*EQ: 17*
LL: 10	*WE: 13*	*MR: 11.5*	*AE: 3*

date last updated :					Max	Project Points		
last updated by :					Points	Preliminary		Final
Innovation and Design Process (ID)			(No Minimum Points Required)		Max	Y/Pts	Maybe	No	Y/Pts
1. Integrated Project Planning		1.1	Preliminary Rating		Prereq				Y
		1.2	Integrated Project Team		1	1	0		1
		1.3	Professional Credentialed with Respect to LEED for Homes		1	1	0		1
		1.4	Design Charrette		1	1	0		1
		1.5	Building Orientation for Solar Design		1	1	0		1
2. Durability Management Process		2.1	Durability Planning		Prereq				Y
		2.2	Durability Management		Prereq				Y
		2.3	Third-Party Durability Management Verification		3	3	0		3
3.Innovative or Regional Design		3.1	Innovation #1 _____		1	0	1		1
		3.2	Innovation #2 _____		1	0	1		1
		3.3	Innovation #3 _____		1	0	1		1
		3.4	Innovation #4		1	0	0		0
				Sub-Total for ID Category:	**11**	7	3		**10**
Location and Linkages (LL)			(No Minimum Points Required)	*OR*	Max	Y/Pts	Maybe	No	Y/Pts
1. LEED ND		1	LEED for Neighborhood Development	**LL2-6**	10	10	0		
2. Site Selection		2	Site Selection		2	0	0		2
3. Preferred Locations		3.1	Edge Development	**LL 3.2**	1	0	0		1
		3.2	Infill		2	0	0		2
		3.3	Previously Developed		1	0	0		1
4. Infrastructure		4	Existing Infrastructure		1	0	0		1
5. Community Resources/ Transit		5.1	Basic Community Resources / Transit	**LL 5.2, 5.3**	1	0	0		1
		5.2	Extensive Community Resources / Transit	**LL 5.3**	2	0	0		2
		5.3	Outstanding Community Resources / Transit		3	0	0		3
6. Access to Open Space		6	Access to Open Space		1	0	0		1
				Sub-Total for LL Category:	**10**	10	0		**10**
Sustainable Sites (SS)			(Minimum of 5 SS Points Required)	*OR*	Max	Y/Pts	Maybe	No	Y/Pts
1. Site Stewardship		1.1	Erosion Controls During Construction		Prereq				Y
		1.2	Minimize Disturbed Area of Site		1	1	0		1
2. Landscaping		2.1	No Invasive Plants		Prereq				Y
		2.2	Basic Landscape Design	**SS 2.5**	2	2	0		2
		2.3	Limit Conventional Turf	**SS 2.5**	3	3	0		3
		2.4	Drought Tolerant Plants	**SS 2.5**	2	2	0		2
		2.5	Reduce Overall Irrigation Demand by at Least 20%		6	6	0		6
3. Local Heat Island Effects		3	Reduce Local Heat Island Effects		1	1	0		1
4. Surface Water Management		4.1	Permeable Lot		4	3	0		4
		4.2	Permanent Erosion Controls		1	1	0		1
		4.3	Management of Run-off from Roof		2	0	2		2
5. Nontoxic Pest Control		5	Pest Control Alternatives		2	2	0		2
6. Compact Development		6.1	Moderate Density	**SS 6.2, 6.3**	2	0	0		0
		6.2	High Density	**SS 6.3**	3	3	0		3
		6.3	Very High Density		4	0	0		0
				Sub-Total for SS Category:	**22**	18	2		**21**

					Max Points	Project Points Preliminary			Final
Water Efficiency (WE)			(Minimum of 3 WE Points Required)	*OR*	Max	Y/Pts	Maybe	No	Y/Pts
1. Water Reuse		1.1	Rainwater Harvesting System	**WE 1.3**	4	*3*	*0*		***3***
		1.2	Graywater Reuse System	**WE 1.3**	1	*0*	*0*		***0***
		1.3	Use of Municipal Recycled Water System		3	*0*	*0*		***0***
2. Irrigation System	☒	2.1	High Efficiency Irrigation System	**WE 2.3**	3	*3*	*0*		***3***
		2.2	Third Party Inspection	**WE 2.3**	1	*1*	*0*		***1***
	☒	2.3	Reduce Overall Irrigation Demand by at Least 45%		4	*0*	*0*		***4***
3. Indoor Water Use		3.1	High-Efficiency Fixtures and Fittings		3	*0*	*0*		***0***
		3.2	Very High Efficiency Fixtures and Fittings		6	*6*	*0*		***6***
				Sub-Total for WE Category:	***15***	*13*	*0*		***13***
Energy and Atmosphere (EA)			(Minimum of 0 EA Points Required)	*OR*	Max	Y/Pts	Maybe	No	Y/Pts
1. Optimize Energy Performance		1.1	Performance of ENERGY STAR for Homes		Prereq				***Y***
		1.2	Exceptional Energy Performance		34	*31*	*0*		***32***
7. Water Heating	☒	7.1	Efficient Hot Water Distribution		2	*2*	*0*		***2***
		7.2	Pipe Insulation		1	*0*	*0*		***1***
11. Residential Refrigerant Management		11.1	Refrigerant Charge Test		Prereq				***Y***
		11.2	Appropriate HVAC Refrigerants		1	*0*	*0*		***1***
				Sub-Total for EA Category:	***38***	*33*	*0*		***36***
Materials and Resources (MR)			(Minimum of 2 MR Points Required)	*OR*	Max	Y/Pts	Maybe	No	Y/Pts
1. Material-Efficient Framing		1.1	Framing Order Waste Factor Limit		Prereq				***Y***
		1.2	Detailed Framing Documents	**MR 1.5**	1	*0*	*0*		***0***
		1.3	Detailed Cut List and Lumber Order	**MR 1.5**	1	*0*	*0*		***0***
		1.4	Framing Efficiencies	**MR 1.5**	3	*0*	*0*		***0***
		1.5	Off-site Fabrication		4	*0*	*0*		***4***
2. Environmentally Preferable Products	☒	2.1	FSC Certified Tropical Wood		Prereq				***Y***
	☒	2.2	Environmentally Preferable Products		8	*0*	*0*		***5***
3. Waste Management		3.1	Construction Waste Management Planning		Prereq				***Y***
		3.2	Construction Waste Reduction		3	*0*	*0*		***2.5***
				Sub-Total for MR Category:	***16***	*0*	*0*		***12***
Indoor Environmental Quality (EQ)			(Minimum of 6 EQ Points Required)	*OR*	Max	Y/Pts	Maybe	No	Y/Pts
1. ENERGY STAR with IAP		1	ENERGY STAR with Indoor Air Package		13	*0*	*0*		***0***
2. Combustion Venting		2.1	Basic Combustion Venting Measures	**EQ 1**	Prereq				***Y***
		2.2	Enhanced Combustion Venting Measures	**EQ 1**	2	*0*	*0*		***2***
3. Moisture Control		3	Moisture Load Control	**EQ 1**	1	*0*	*0*		***1***
4. Outdoor Air Ventilation	☒	4.1	Basic Outdoor Air Ventilation	**EQ 1**	Prereq				***Y***
	☒	4.2	Enhanced Outdoor Air Ventilation		2	*0*	*0*		***0***
		4.3	Third-Party Performance Testing	**EQ 1**	1	*0*	*0*		***0***
5. Local Exhaust	☒	5.1	Basic Local Exhaust	**EQ 1**	Prereq				***Y***
		5.2	Enhanced Local Exhaust		1	*0*	*0*		***0***
		5.3	Third-Party Performance Testing		1	*0*	*0*		***1***
6. Distribution of Space Heating and Cooling	☒	6.1	Room-by-Room Load Calculations	**EQ 1**	Prereq				***Y***
		6.2	Return Air Flow / Room by Room Controls	**EQ 1**	1	*0*	*0*		***1***
		6.3	Third-Party Performance Test / Multiple Zones	**EQ 1**	2	*0*	*0*		***2***
7. Air Filtering		7.1	Good Filters	**EQ 1**	Prereq				***Y***
		7.2	Better Filters	**EQ 7.3**	1	*0*	*0*		***0***
		7.3	Best Filters		2	*0*	*0*		***2***
8. Contaminant Control	☒	8.1	Indoor Contaminant Control during Construction	**EQ 1**	1	*0*	*0*		***1***
		8.2	Indoor Contaminant Control		2	*0*	*0*		***2***
	☒	8.3	Preoccupancy Flush	**EQ 1**	1	*0*	*0*		***1***
9. Radon Protection	☒	9.1	Radon-Resistant Construction in High-Risk Areas	**EQ 1**	Prereq				***Y***
	☒	9.2	Radon-Resistant Construction in Moderate-Risk Areas	**EQ 1**	1	*0*	*0*		***1***
10. Garage Pollutant Protection		10.1	No HVAC in Garage	**EQ 1**	Prereq				***Y***
		10.2	Minimize Pollutants from Garage	**EQ 1, 10.4**	2	*0*	*0*		***0***
		10.3	Exhaust Fan in Garage	**EQ 1, 10.4**	1	*0*	*0*		***0***
		10.4	Detached Garage or No Garage	**EQ 1**	3	*0*	*0*		***3***
				Sub-Total for EQ Category:	***21***	*0*	*0*		***17***

Awareness and Education (AE)			(Minimum of 0 AE Points Required)	Max	Y/Pts	Maybe	No	Y/Pts
1. Education of the Homeowner or Tenant	☒	1.1	Basic Operations Training	Prereq				Y
	☒	1.2	Enhanced Training	1	0	0		1
		1.3	Public Awareness	1	0	0		1
2. Education of Building Manager	☒	2	Education of Building Manager	1	0	0		1
			Sub-Total for AE Category:	**3**	0	0		**3**

LEED for Homes Simplified Project Checklist

Addendum: Prescriptive Approach for Energy and Atmosphere (EA) Credits

Points cannot be earned in both the Prescriptive (below) and the Performance Approach (pg 2) of the EA section

Energy and Atmosphere (EA)			(No Minimum Points Required)	*OR*	Max Points Max	Project Points Preliminary Y/Pts	Maybe	No	Final Y/Pts
2. Insulation		2.1	Basic Insulation		Prereq				
		2.2	Enhanced Insulation		2	0	0		0
3. Air Infiltration		3.1	Reduced Envelope Leakage		Prereq				
		3.2	Greatly Reduced Envelope Leakage		2	0	0		0
		3.3	Minimal Envelope Leakage	**EA 3.2**	3	0	0		0
4. Windows		4.1	Good Windows		Prereq				
		4.2	Enhanced Windows		2	0	0		0
		4.3	Exceptional Windows	**EA 4.2**	3	0	0		0
5. Heating and Cooling Distribution System		5.1	Reduced Distribution Losses		Prereq				
		5.2	Greatly Reduced Distribution Losses		2	0	0		0
		5.3	Minimal Distribution Losses	**EA 5.2**	3	0	0		0
6. Space Heating and Cooling Equipment	☒	6.1	Good HVAC Design and Installation		Prereq				
		6.2	High-Efficiency HVAC		2	0	0		0
		6.3	Very High Efficiency HVAC	**EA 6.2**	4	0	0		0
7. Water Heating	☒	7.1	Efficient Hot Water Distribution		2	0	0		0
		7.2	Pipe Insulation		1	0	0		0
		7.3	Efficient Domestic Hot Water Equipment		3	0	0		0
8. Lighting		8.1	ENERGY STAR Lights		Prereq				
		8.2	Improved Lighting		2	0	0		0
		8.3	Advanced Lighting Package	**EA 8.2**	3	0	0		0
9. Appliances		9.1	High-Efficiency Appliances		2	0	0		0
		9.2	Water-Efficient Clothes Washer		1	0	0		0
10. Renewable Energy	☒	10	Renewable Energy System		10	0	0		0
11. Residential Refrigerant Management		11.1	Refrigerant Charge Test		Prereq				
		11.2	Appropriate HVAC Refrigerants		1	0	0		0
			Sub-Total for EA Category:		**38**	33	0		**36**

Electrical

Appliance Model Numbers:

- Kenmore Washer: 13973
- Kenmore Refrigerator: 71013
- Kenmore Washing Machine: 40272
- Kenmore Dryer: 80272

Acoustics

RIVERBANK ACOUSTICAL LABORATORIES

1512 S. BATAVIA AVENUE
GENEVA, ILLINOIS 60134

Alion Science and Technology

630/232-0104
FOUNDED 1918 BY
WALLACE CLEMENT SABINE

TEST REPORT

Quiet Solution, LLC — RAL™-TL07-021

23 January 2007 —

TEST RESULTS

Sound transmission loss values are tabulated at the eighteen standard frequencies. A graphic presentation of the data and additional information appear on the following pages. The precision of the TL test data is within the limits set by the ASTM Standard E90-04.

FREQ.	T.L.	C.L.	DEF.	FREQ.	T.L.	C.L.	DEF.
100	17	0.68		800	51	0.13	
125	27	0.47	6	1000	52	0.13	
160	33	0.58	3	1250	53	0.15	
200	35	0.66	4	1600	53	0.08	
250	40	0.28	2	2000	49	0.09	4
315	44	0.32	1	2500	50	0.09	3
400	45	0.31	3	3150	55	0.08	
500	48	0.20	1	4000	58	0.05	
630	49	0.21	1	5000	58	0.05	

STC=49

ABBREVIATION INDEX

FREQ. = FREQUENCY, HERTZ, (cps)
T.L. = TRANSMISSION LOSS, dB
C.L. = UNCERTAINTY IN dB, FOR A 95% CONFIDENCE LIMIT
DEF. = DEFICIENCIES, dB<STC CONTOUR (SUM OF DEF = 28)
STC = SOUND TRANSMISSION CLASS

Tested by _____ Approved by _____

Dean Victor
Senior Experimentalist

David L. Moyer
Laboratory Manager

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THE RESULTS REPORTED ABOVE APPLY ONLY TO THE SPECIFIC SAMPLE SUBMITTED FOR MEASUREMENT. NO RESPONSIBILITY IS ASSUMED FOR PERFORMANCE OF ANY OTHER SPECIMEN.

NVLAP Lab Code 100227-0

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Conclusion:

When designing a technologically advanced home that is energy efficient, spending a million+ dollars is quite easy. Sure the house may be low energy, and the experience may even be great, but the marketability will lack. The average consumer is not looking to spend such a fortune on their new home. The goal when designing is to create the "target home". This home sits in equilibrium between the three categories, "Marketability", "Experience", and "Energy Savings". Our home hit that target. Through the use of home automation systems and careful planning, our team was able to produce a model which saved lots of energy, was great to live in, and was still kept at about $360,000. That selling point was crucial to the success of the project. The area in Evanston where these homes would be build lies in a low to middle class neighborhood. By bringing the average consumer luxury and energy savings, while keeping the cost down, we were able to design a home which is both marketable and attractive to the average buyer.