I. Team Charter
   a. Team Members
      i. Steve Beck — sbeck@codallc.net
      ii. William Paschal — paschal@iit.edu
      iii. Mark Snyder — snyder@iit.edu
      iv. Jorge Rueda
      v. Namrata Hegde
      vi. Svetlana Semenova
      vii. Yao Xiao
      viii. Christopher Anglin
      ix. Samir Qaisar
      x. Woo Sung Shin
      xi. Joonggeun Yun
      xii. Samantha Prokop
   b. Team Purpose
      i. Our purpose is to study the design of sustainable residential housing model designed by the Inter-professional group in the fall of 2009 and determine the construction costs for the model. This along with the market analysis will set a baseline price for the average buyer of this home. Our goal is to redesign this model with the current economic market in mind and make this model of sustainable design marketable and economically feasible with use of more efficient designing and systems.
   c. Objectives
      i. Research economically viable sustainable methods for fulfilling the energy needs of a mixed use building in Evanston.
      ii. Conduct a market research of the average buyer and determine the baseline cost of this single family residential unit.
      iii. Develop a financial plan that summarizes cost analysis and building Performa.
      iv. Test our solution by comparing its energy consumption/costs with the average home of today.
      v. Present our solution clearly and truthfully as a catalyst for change in design and implementation of mixed use buildings.

II. Background
   a. Customer / Sponsor
      i. This is the second semester for the Zero CommunIITy iPro. At this time we do not have any official sponsors. However we do have architectural engineering professor William Paschal as our consultant from the CAEE department at IIT. Prof. Paschal will be acting as an informational resource for the team throughout the semester.
      ii. This IPRO grew from the interest of surrounding Chicago municipalities. Currently we have Evanston, IL as the potential customer for our project. We plan on presenting our research and ideas to individuals in the Planning Department of Evanston in hopes of influencing their approach to community planning and development.
   b. User problems

        i. A large part of the struggle in 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 residents. This may require pushing the envelope of commonly accepted ideas about the way communities are planned and inhabited, as well as challenging common ideas about life in an American suburban home.
    c. Science and technology
        i. The technologies can be divided into two categories. The first is passive systems, which include designing around proper solar orientation, the use of cross ventilation, the use of sustainable materials, etc. The next category, active systems, involves the use of technologies such as geothermal heat pumps, solar collectors, etc. We would like to confront this project by implementing various sustainable technologies available to develop sustainable lifestyles while maintaining a similar quality of life as is current common.
    d. Historical precedents
        i. Several communities around the world have been designed to be as efficient as possible. One of the first projects to only use energy produced from renewable sources was Beddington Zero Energy Development (BedZED). The houses in this community are orientated so they take advantage of solar gain, have triple glazed windows, and are highly insulated. Another great example of a zero community is located in New Platz, New York and is called the Green Acres. This community takes advantage of solar panels, geothermal heating and cooling, super insulation and high efficiency windows and heat recovery ventilation. Both of these developments signify new ways of thinking when it comes to renewable energy and should begin to set the standard for new, developing areas.
    e. Ethical issues
        i. Designing a community that is able to generate power from renewable sources on site means the community would not be as dependent on public companies like ComEd or General Electric, but the financial returns would not be optimal even with an independent power source.
    f. Business or societal costs
        i. If our community was built, the members would have to put forth the initial costs for the house, the land and any of the renewable energy sources that are put into place. Our goal is that the investors will ultimately be compensated by the money they save with all of the alternative energy sources instead of the traditional ones.
    g. Implementation outline for solutions
        i. Our design and conclusions will be presented first to the city of Evanston where we hope to influence the community to change some of their practices in energy use. We will try to give Evanston and ultimately other townships a clear picture of the initial costs of this development and the payoff when proper renewable energy sources are put in place.

III. Team Values statement

a. Desired behaviors
    i. Team members are expected to come to regularly scheduled meetings and meetings outside of class on time.
    ii. Attitude of team members should be proactive and take initiative as well as team members should treat another with mutual respect and fairness.
    iii. All members should take pride in learning from others, testing our abilities and boundaries, and willing to admit mistakes.
    iv. No team members shall criticize or judge another teammate for his or her opinion.
    v. All team members are expected to take responsibility of completing the assigned tasks on time. The commitment that is developed due to the responsibility is a critical factor in the team's success.
    vi. Effective communication skills are crucial 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.
    vii. Team members are encouraged to openly participate in team meetings. They should also take responsibility in helping the team reach its goals. All team members are required to actively participate in accomplishing the set goals.
    viii. All tasks should be completed with interest and excellence.
b. Addressing problems
    i. According to the ASCE, AIA, and IEEE code of ethics problems will be addressed properly.
    ii. Problems are preferred to be discussed in person rather than the Internet due to the fact that one cannot be conveyed through typing and points may be misconstrued.
    iii. Any issues are to be brought up for discussion at the beginning of each class meeting.
    iv. The subgroup leader should decide whether the problem should be dealt with as a group or one-on-one with the group leader. If the problem is of a major concern and affects the direction of the project itself, it should be resolved with the entire team in a professional manner.
    v. All team members will have an opportunity to discuss the problem as well as voting for the final say.

IV. Project Methodology
a. Work Breakdown Structure
    i. Problem Solving
        1. We will begin by familiarizing ourselves with the results of the previous IPRO, IPRO 323. This will allow us to make progress on the same goals that that IPRO had, rather than redoing what that team had already discovered.
        2. Research and observations will be done on the new site for this semester's IPRO. Since it is not the same site as the previous team's, this research will be used to make any amends to the

product of IPRO 323 that are necessary to suit our site, and to adhere to local codes and regulations.

3. Concurrently with the research and observations of the new site, the team will prepare an estimate for the construction of IPRO 323's design. This estimate will be of the shell of the house.
4. Separate from the construction estimate, an estimate of the installation and maintenance of the add-in systems will be completed, as well as the typical savings they will provide over the years.
5. A market analysis will be conducted of the Evanston area, the project location. This will include property values, as well as energy consumption. This information will be used to compare the cost of our home with the cost of homes typical in the area, and the feasibility of our project. This will also be used to find a balance between the cost of construction and the money saved on energy consumption.
6. The information gathered from the previous steps will be used to prepare a report and presentation of our findings to the people of Evanston. This will provide detail about the costs and savings that will be involved, their savings through the duration of a mortgage, and the payback time of the investment in passive systems.

ii. Team Structure

1. The team will have a group leader who is responsible for coordinating the efforts of the sub-groups.
    a. Group Leader: Jorge Rueda
2. There shall be four initial sub-groups, which may change as the project warrants. Each sub-group will be focused to a specific area of research and development. The four initial sub-groups and their leaders are as follows.
    a. Market analysis: Christopher Anglin
        i. This team will perform the analysis of the Evanston area, which includes property values, energy consumption and cost, and other related costs of living. Also, the projected costs and expenses for the life of the structure will be estimated.
    b. Building Systems: Svetlana Semenova
        i. This team will discover the costs associated with installing and maintaining the passive systems we are seeking to utilize, as well as researching any other possible systems that will help in our efforts.
    c. Construction Estimating: Jorge Rueda
        i. This team will complete the construction estimate of the structure, and update it as necessary throughout the duration of the project.
    d. Planning (Design): Namrata Hedge

i. This team will adjust and perfect the design of IPRO 323 to suit our site, following Evanston's codes and regulations. This team will also consider any proposed changes from the other teams and incorporate these changes into the design.

iii. Work Breakdown

1. IPRO 323 Research and site observations Weeks 1-3
    a. Identify IPRO 323's details and systems
    b. Visit site and evaluate feasibility of existing design
    c. Research differences in Evanston codes and Oak Park (original location) codes
2. Prepare project plan Weeks 2-3
    a. Submit by September 10th
3. Prepare construction estimate of existing design Weeks 3-6
    a. Conduct line item estimate of the existing design, excluding the passive systems.
    b. Determine method of estimating
    c. Perform item count
    d. Incorporate labor, overhead, and profit
    e. Make changes suggested by the design team, and update estimates
4. Estimate cost of installation and maintenance of passive systems. Weeks 3-6
    a. Estimate the cost and maintenance of existing system
    b. Estimate energy consumption of the structure
    c. Make any additional changes as suggested by the design team
5. Market analysis
   Weeks 3-6
    a. Research real estate in the Evanston area
    b. Research typical energy consumption for households in the area
6. Prepare midterm review presentation
   Weeks 7-8
7. Incorporate the work of all the teams and begin to perfect our design Weeks 9-14
    a. Using information from the estimates, determine which systems will be feasible and which will be better left out
    b. Adjust design once again, and update all estimates as necessary
    c. Once the adjustments and updates are completed, prepare a final floor plan and other visual models of the structure
    d. Prepare a final report with a final cost analysis, benefits of this type of household over others, and all necessary information for an interested buyer
    e. Prepare for final presentation

8. Prepare brochure and poster Week 15
    a. Due by November 29th
9. Prepare and practice final presentation Week 15-16
    a. Presentation to be given on December 2nd
10. Prepare final report Week 15-16
    a. Finalize by December 6th

iv. Expected Results
1. Expected Activities
    a. The project will require a construction cost estimate and a market value estimate.
    b. Adjusting the design of the building to bring construction costs down to achieve a faster return on investment.
    c. Performing a cost-benefit analysis showing that our project wins comparing to average house in Evanston, IL.
    d. Meeting with potential clients and discussing progress and future goals.
2. Expected Data
    a. We will establish a base line price for the shell of the building and create performance packages to add to the building.
    b. Reduce construction costs to maintain market viability.
    c. Research market value of the neighboring homes and a realistic price for the project in today's economy.
    d. Potential Products
    e. We will be employing already existing viable technologies that will be most cost effective with greatest benefits.
3. Potential Outputs
    a. A building that uses as little energy as possible for the competitive price.
    b. Deliverables
    c. Develop a prototype housing unit and different performance packages that can be added to it
    d. CAD drawing of our living space and any systems we choose to implement
    e. Cost estimate booklet
4. Challenges, Risks, and Assumptions
    a. The primary challenge of this project will be to calculate an accurate price for different technologies, methods, and materials and determine which ones deliver greatest benefits for the least amount of money. It is very hard to make an accurate estimate without a competed design.
    b. There is a substantial risk that the market that drives the prices of homes will not be able to bend and accept the project. Money today worth more than money in the future and there is a risk that the project might not convince

potential clients that investing money into the project originally will pay off later during the building's lifespan.

c. We assume that there is a better way for homes to be built and for communities to be structured. We believe we can create a community of homes that will be attractive and economically viable for potential consumers while pushing the envelope of existing sustainable practices to a new level.

v. Project Budget

1. For our project this semester, our budget will likely be small as most of the work we will be doing is research to determine if building a zero community is financially feasible for the current market. Our expenses will most likely be limited to obtaining and printing research materials and producing presentation materials for IPRO day. We may also have a very minor transportation expense when some members go and visit Evanston, where we will be using a site there for our project. As previously stated, most of these costs would be very moderate.