AC 2007-216: INDEPENDENT STUDENT DESIGN COMPETITIONS AND THE ASSESSMENT DILEMMA

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Independent Student Design Competitions and the Assessment Dilemma

Abstract
One of the most difficult assessment problems for faculty is student design competitions where only one or maybe two teams participate for independent study. Students are excited and focused on the possibility of winning. The faculty is usually concerned with process and assessment in the context of a project and program not of their design. The issues are multiplied when you combine the problems of team assessment with a small sample pool of participants. This paper presents a case study in process and assessment for a single team of four independent study students that entered the 2005-2006 Airport Security Circulation International Student Design Competition by the U.S. Department of Homeland Security and the Association of Collegiate Schools of Architecture. Team dynamics and potential pitfalls are discussed. This paper should have broad appeal for faculty looking to go beyond the traditional design studio and engage students in meaningful independent study.

Introduction

National design competitions always produce excitement and the chance for students to test their design ability in a more worldly, although structured academic setting. There are two important issues facing the mentoring faculty: (1) what exactly does one assess and, (2) how does one assess it? The first question of what to assess, is related to the quality of the design process used. Since faculty typically establish the design process or work plan for students, by default, they set the framework for what to assess. The second question of how to assess is more problematic and represents the very nature of the dilemma. This is because design assessment is based on several factors including: past experience with this type of problem, comparing several projects in context and measuring particular aspects of performance. All of these factors are usually very limited or unknown in independent student design competitions where only one solution is produced. This paper will offer a case study on these two important issues of what and how to assess from the experience of competing in an independent student design competition. It will map out a conceptual process, outline a work plan and challenge the reader about the dilemmas faced with assessment.

Mapping out a successful design process to solve a complex and unfamiliar architectural design competition program is difficult. This is because architectural design remains predominantly a craft oriented process. It relies heavily on experience, subjective decision making, multivariable selection, taste, ability, perspective and balance. Most of the architectural theory throughout history has struggled with this issue of getting this decision making process right; what and how much do we consider in the design process.[1]

Architectural design can be seen in terms of defining the means and ends to problem solving. The means is loosely defined as a dynamic and creative sequence of problem interpretation, initial starting strategies, contextual understanding, development, continual assessment and refinement. The ends are the correct solutions to the problem. The challenge is to try to design a means process that will result in a successful but yet unknown ends.[2] Since this is a learning activity for students, the means is not the shortest path but rather one the emphasizes a qualitative and comprehensive design experience.

Assessing a single design project usually creates a dilemma for faculty because design projects are typically graded holistically. In this case, holistically is defined a assessing the entire class comparatively in terms of good, better and best. How can we define what is, "good, better and best," when there is only one sample? There is also another is concept of holistic grading and it is one that is typically used in the humanities.[3] Holistic grading is a form of assessment used to evaluate an entire work that includes the interrelationship of the components and the process used rather than simply the summation of individual components or the final outcome.

The issue of how to assess an individual in a team has plagued faculty members for a very long time. Unless the faculty wants to manage a team there is no way for certain to know how much work each individual does on a joint project. Only the students will be in a position to manage and assess some aspects of the project and their peer's performance. The faculty member must come to accept that this not a shedding of responsibility but rather as a legitimate form of mature student learning and thinking that can take place in the academy.

This paper presents a narrative of this case study and should be taken as a craft discussion on teaching.[4] It will not present a scientifically test hypothesis or use text and control groups. It will present a conceptual framework and work plan to be used in a comprehensive design competition. It will focus on the design process used and the assessment tried as a case study and as a road map of ideas for faculty to use and modify. This paper will rely heavily on diagrams and charts giving the reader a clearer overview of the process and strategies used.

Background

In the spring of 2006, a group of four students approached me about entering one of the national design competitions to as a way gaining an additional design studio experience above and beyond the required design studios in the curriculum. We looked at several competitions and selected, for a number of timing and personal interest reasons, the 2005-2006 Airport Security Circulation International Student Design Competition by the U.S. Department of Homeland Security and the Association of Collegiate Schools of Architecture. A complete description of the competition along with the Program Brief can be found on the web at: https://www.acsa-arch.org/competitions/airport.aspx.

The students in this competition had the following characteristics: they were all very strong students in design studio, energetic and mature. All of the students in the team had taken Architectural Design I – IV, Construction Design, Site Design, History of Western Architecture and Architectural Theory[5] in an undergraduate pre-professional architectural technology program. Three of the four were working full or part time for an architectural firm and one student was a retired New York City police officer with twenty years experience. They also had a lot of individual self-confidence in their ability and thought they had a good chance as a group of winning. The group was diverse in their strengths and interests which was key (see Table 1: Initial Starting Strategies for diversity of student interests). They had some interest in the process but only as it was related to a strategy for winning; winning was the main goal for students. They also wanted to know up front how they would also be graded. Since the team would submit only one team solution, and there was no way to comparatively evaluate or measure it against other submissions, it was agreed that assessment would be based mainly on

the process by which they developed the design and not the actual design itself. A work plan was developed and is presented under, "The Work Plan: A Contract." It was purposely left vague as to how each would be individually assessed on the team but they were told that blind peer assessment may be used.[6]

Simple Design Process Models

The architectural design process can be diagrammed in many ways: linear, causal, circular, ideal values, without a connected path, etc. There is a fundamental problem with trying to develop a universal diagram, and it's two fold: one, diagrams are highly reductive and boxes and arrows cannot accurately relate to the complex or creative sub-processes within; and two, each type of design problem requires a different process with a different set of variables based on experience and intuition of the designer. With this in mind as designers, we use diagrams anyway for the same reason we use graphic diagrams to represent architecture in the design process: it gives meaning to us and provides a simple map for more complex ideas and thought. Two architectural design process diagrams are presented below. Each represents the relative importance of the process from the perspective of the designer. The first, Diagram 1, is a simple diagram of an introductory architectural design studio with the emphasis on formulating the idea, creatively developing a graphic diagram and the transformation of that diagram into architecture with a review process. The second, Diagram 2, is a simple diagram of a professional architectural design process with the emphasis on stages of the process. Diagram 1 represents primarily the schematic design phase and maybe part of the design development phase of Diagram 2. In a design studio setting the program is usually given and the construction documents are done in another course. This is also typical of nearly all academic and professional design competitions so Diagram 1 will form the basis for the competition design process.[7]

Diagram 1: Academic Architectural Design Studio Process:

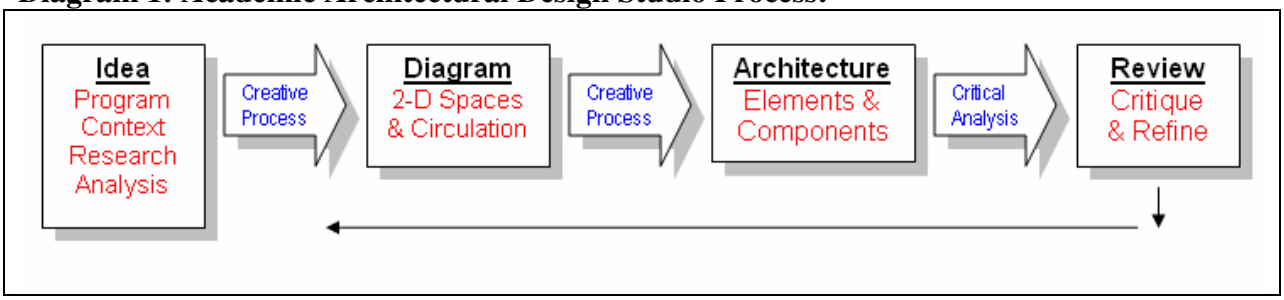
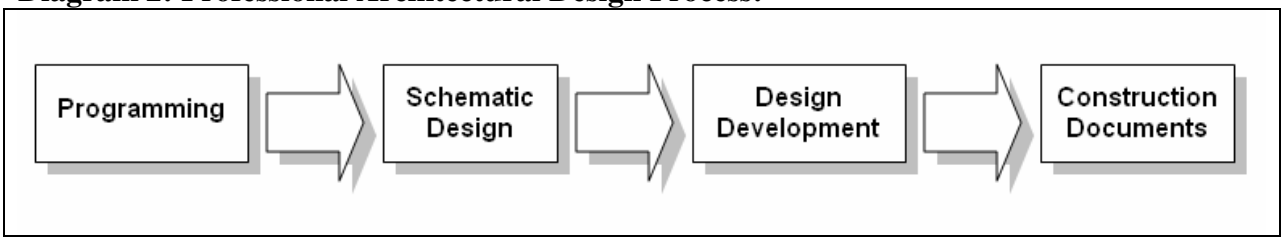


Diagram 2: Professional Architectural Design Process:

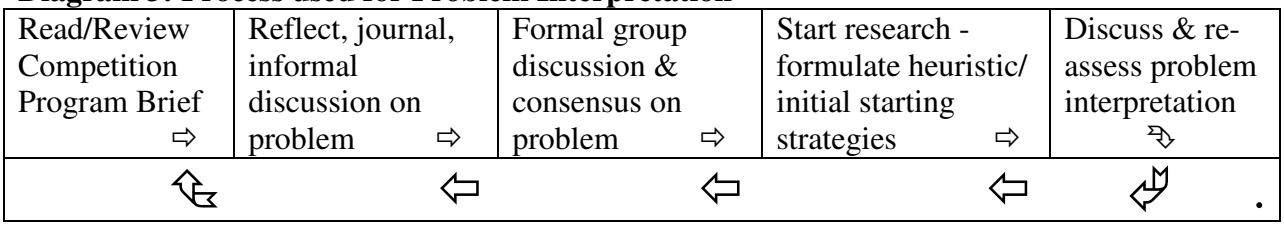


Problem Interpretation

One of the most critical components of starting the design process is problem interpretation. This aspect of the design process is highly intuitive and craft oriented because it's the very essence of where an idea starts. Typically, a designer is given an explicit list of programmatic requirements and a brief narrative.[8] From this, one formulates a sense of the problem, an idea, and the design directions to take to solve the problem. In the real world, the owner usually confirms the architect's sense of the problem and ideas. In a student design competition, this becomes a process of lonely soul searching of where to start because the mechanism of social confirmation is missing and their experience is limited.

How does a student start the process of problem interpretation? Coming to a sense of what the problem is really about is more than the sum of a list of function requirements. It involves many unseen and unknown variables that result in a guess of what direction to start. In many cases, a student's initial interpretation may be either naïve, too narrow or too limited based on their experience. In some cases they may not have any sense at all of the essence of the problem. One option is for a student to look at several initial starting strategies and use them as part of a multi-pronged dialectical strategy in formulating problem interpretation. The process used by students for problem interpretations is outlined in Diagram 3 below.

Diagram 3: Process used for Problem Interpretation



Initial Starting Strategies

One of the most difficult aspects of any design is the opening move, where to start, because of its impact on the solution to the design problem. It's not much different than the opening move of a chess game because it sets in motion a sequence of events. Theorist Peter Rowe argues that the initial ideas generated by the designer early in the conceptual process have a profound effect on the final building solution.[9] This is based on past experience (priori knowledge) and speculative formation of the idea (heuristic reasoning).[10] He's not arguing for a linear design process; rather to him it's a "co-mingling" of problem solving processes.

Rowe defines five types of heuristics, they are: (1) the use of anthropometric analogies, (2) the use of literal analogies, (3) the use of environmental relations, (4) the use of typologies, and (5) the use of formal languages.[11] Short definitions of each of these starting points of design are given based on his descriptions. These and are not meant to be inclusive, exclusive or exhaustive definitions, they are: An anthropometric analogy is used for designing the physical occupancy and feel of space; usually used by "naïve designers, with little or no experience with other forms of design." Literal analogies incorporate the use of forms, symbols, geometries that give meaning, narrative and spatial order to a design. Environmental relations start with the relationship between man, the environment and technology. Typologies are a heuristic starting point that relies on tried and true past solutions or prototypes where the designer does not have to

try to reinvent the wheel. It incorporates by past success many aspects of other heuristics. And finally, formal languages are sets of internal rules that create meaningful formal order such as the use of "classical languages" or specific stylistic rules.

These "ideal" heuristic starting points were used in the competition to help organize and focus each student's initial interest in problem interpretation, definition, and exploration for investigation. Table 1, below, shows each ideal heuristic starting point, a student's initials, the areas of the competition that relate heuristic and the background research initially started.

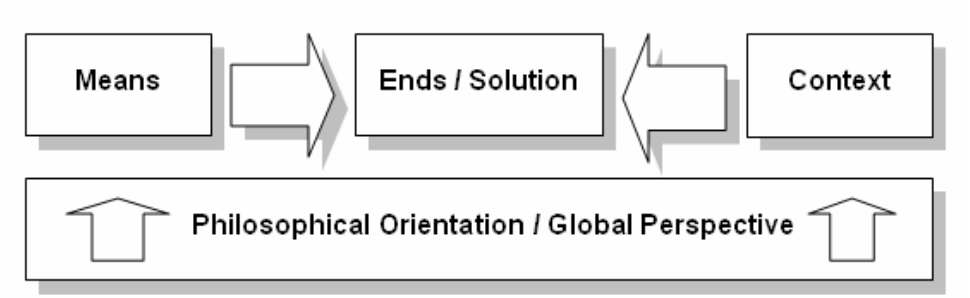
Table 1: Initial Starting Strategies

Ideal heuristic starting points (Peter Rowe)	**Student initials**	**Areas of competition design starting points and interest**	**Background research initially started**
Anthropometric analogies *(physical occupancy of space)*	LM & FS	Passive surveillance & active Security of spaces; Psychology of spaces	Interviews w/airport security; literature search, diagrams
Literal analogies *(forms, symbols, geometries with meaning)*	AB	Circulatory patterns; Security/ safety metaphors & forms	Literature search, idea generation, synthesis and drawing
Environmental relations *(man, environment and technology relationships)*	RM	Wind and sun orientation; Runway and site/town context	Site analysis, FAA codes & regulations, interviews
Typologies *(tried and true past solutions or prototypes)*	LM & FS	Past airport designs, security solutions and competitions	Literature search, web search
Formal languages *(classical language or other stylistic rules)*	AB	Deconstructivist language; fragmentation	Stylistic monograph survey, image search

Contextual Understanding

Contextual understanding is of parallel importance to the means by which one solves the problem. Christopher Alexander argues that design is form; form is the solution.[12] The solution is the ends as it relates to this discussion. The context defines the problem which leads us back to problem interpretation. Just as Rowe argues that the means or design process chosen defines the ends, Alexander argues that context defines the ends. The challenge for young designers is to try to balance both of these ideal theories with one's global perspectives such as sustainability, equality and other philosophical orientations. Diagram 4 shows the balance between the two ideal theories with one's underlying philosophical base. The difficulty with applying Alexander's theory fully to this competition was that the context could not be physically experienced by the designer and it was reduced to two dimensional diagrams and pictures.[13] In some aspects, this was a flaw in the competition itself.[14]

Diagram 4: Balance of Initial Starting Strategies and Contextual Understanding



The Work Plan: A Contract

The work plan below was developed in consultation with the four students on the team. It is presented in outline form here for clarity and it can be easily used as a guide for future reference.

Competition Design Process/Methodology

Preliminary Research and Background Material

Competition Guidelines

- Understand intent and essence of the project
  - Journal, discussion, consensus
- Set targets, calendar dates and weekly meeting times

Team Organizational Structure

- Elect a team captain
- Set standards for managing and compiling all information
- Establish communication and on-line discussion system

Investigative Background Research

Airport Design

- Historical progression of Airport Design
- Airport typologies and prototypes
- Other circulatory types of structures

Security Issues

- Recent developments in security
- Technical requirements of detection
- Psychological and behavioral security issues
- Circulatory control points

Architectural Theories and Macro Philosophies

- Approach and starting point
- Styles and philosophies
- Sustainability

Resources

- Literature search
- Interviews with Airport Managers
- Interviews with Security Specialists

Contextual Analysis

- Environmental factors (weather, sun, wind, noise, etc.)
- Connection with near by urban context
- Codes: Building, Zoning, FAA, Other regulations

Synthesis of Material

Conceptual Design

Formulation of Ideas

- Written narrative of ideas and reasoning
- 2-D pencil sketches and diagrams
- Discussion and assessment

Schematic Diagrams
- 3 dimensional drawings, simple plans and elevations
- Presentation of each students schematic design

Review of ideas and diagrams
- External review of ideas by architects, airport managers, security personnel
- Note strengths and weaknesses of each
- Select the best two ideas for preliminary design

Preliminary Design

Analysis & Reevaluation
- Preliminary Research and Background Material
- External comments
- Conduct additional research
- Synthesis of material

Develop preliminary designs
- Sketch and study models
- 3 dimensional drawings, simple plans and elevations
- Presentation of two preliminary designs

Review of ideas and diagrams
- External review of ideas by architects, airport managers, security personnel
- Note strengths and weaknesses of each
- Select the best preliminary design for development

Design Development

Analysis & Refinement
- External comments
- Conduct additional research
- Synthesis of material

Develop final design
- Develop final drawings
- Follow Competition Guidelines
- Presentation of two preliminary designs

Final Review of design
- External review of ideas by architects, airport managers, security personnel
- Note strengths and weaknesses
- Last minute refinements of design

Final Design & Presentation

Develop a theme, style and title for the design presentation
Prepare presentation boards per competition requirements
Strictly follow Competition Guidelines & Dates
Wait for results…

Team Dynamics

One of the drawbacks of having the team made up of good design students is individual over confidence and the potential for conflict; i.e., the ego problem. Midway into the competition there was an intense debate as to the conceptual direction of the project; it became very heated and personal and was carried on outside the weekly meetings. The conflict started with students LM and FS and eventually involved the entire group. It is interesting to note that they shared many of the same starting strategies and interests. One student (LM) disengaged and a few

weeks later officially withdrew from the course and competition. Although this went too far, it did help reinforce for me that the students really cared and were very invested in the project on many levels.

There were other tensions due to perceived unequal work loads and that was both highlighted and rectified by the use of the *On-line Student/Peer Evaluation of Team Members* assessment form (see Appendix). This peer assessment tool had its greatest impact on social behavior. Although designed as an evaluative tool, its application was very limited. It could only indicate who was the most productive in, "zero sum," terms and lacked the capacity to qualitatively measure or assign a grade. But it did give the perception to students that they had a voice in assessment, further investing them in the assessment process.

Assessment Dilemma

It may be difficult for a faculty member at first to accept the notion of unequal work on a team. It creates a dilemma of trying to be equal and fair when the students have unequal abilities and they themselves create unfair advantages just by taking on choice aspects and assignments of the project. Not everyone can be involved in all aspects of the design process on a team and certain students will have to take subordinate and unequal roles. The other dilemma the faculty faces is how to justify differing grades in the context of reinforcing the ideal concept of a teamwork and cohesion? Unless a student is noticeably underperforming it is difficult to give differing grades in this context. Most students who take on independent study and a national design competition usually give one hundred percent; that was the case here. Should they be graded differently if one student gives two hundred percent? What's the limit and what are we assessing and rewarding: one-upmanship?

The student submission is presented in the Appendix: Team Competition Drawing Submission. One can see by looking at the four - 20" x 30" boards that it is impossible to assess the work based on end product or solution as presented. It is also impossible to look the final submission and see or deduce the design process that was used and outlined above. The winners of the competition, whoever they were, may have used a poor and incomplete design process and by luck had a final solution that appealed to the jury for whatever reason.

Assessment Tools

There were several mechanisms use for assessment: (1) faculty notes of each student's activities from the prearranged weekly meetings such as research, interviews, airport visits, drawings, etc., (2) both team compiled portfolio/binders and individual folders/journals of student work, (3) the use of the *On-line Student/Peer Evaluation of Team Members* assessment form (as discussed above), (4) and the overall progress of the project. The most effective type of assessment tool was the faculty's notes of each student's activities for the week. This made the faculty actively engage in qualitatively assessing each student's performance and established a healthy routine for student productivity. The next most effective assessment tool was the overall progress of the project and the synergy it created for moving the project forward. This type of assessment can be characterized as a quantitative checklist; did they follow the agreed upon process or work plan. The use of individual journals and team portfolios was problematic because students just pack them with nearly everything they found. Unless one establishes a process for abstracting

information in advance and criteria for assessing that process, these journals and portfolios should be treated as low stakes idea repositories only.

Conclusion

As in most design case studies, the experiences learned here have value as a form of craft knowledge. This paper should act as a guide for future work that one can easily build on. The important points learned from this student competition are outlined here:

1. The means is more important than the ends. In this aspect, the final competition submission or jury's results have little value because the faculty usually cannot holistically compare projects and the teams may be uneven (undergraduate vs. graduate, two students vs. four, etc.). Establishing a comprehensive process also reinforces to students that it's not about winning or losing but rather how we play the game that really counts.
2. Student peer review is a limited resource for individual assessment on a team project but it has a large impact on social behavior. If students think they are being watched, they are likely to be more accountable and productive. This theory will be scientifically tested in a future paper.
3. A student's experience is broadened by the use of creating a number of diverse initial starting points because they get to see many options and can intuitively assess there effectiveness in the design process. This also requires the faculty to have a formal understanding of problem interpretation, speculative formation and prior knowledge of many of the design strategies and processes. It also has the added benefit of having the students' examine the problem from many sides that will not conflict with each student's "turf." Although it is not definitive, it many have contributed to the conflict earlier mentioned.
4. Because design competitions are usually highly speculative themselves and similar to singular prototype design, the faculty may have little assessment experience to draw from. Grading student work for the first time will seem highly subjective and possibly generous because they are given the benefit of the doubt. There is also a sense that the grades somehow take into account the risk that both the students and faculty took in accepting this challenge; each party is invested in being successful here.[15]

End Notes

[1] Anthony Antoniades presents a good overview of architectural theories in the *Poetics of Architecture: Theory of Design* (1992).

[2] Peter Rowe argues a similar means ends relationship in, "A Priori Knowledge and Heuristic Reasoning in Architectural Design," *Journal of Architectural Education*, 36:1 (Fall 1982), pp. 18-23.

[3] See Eric Pappas and Robert Hendricks article, "Holistic Grading in Science and Engineering," *Journal of Engineering Education,* (Oct. 2000) for definition and discussion of holistic grading in the humanities.

[4] Jean Francois Lyotard argues of the legitimacy of this type of knowledge in *The Postmodern Condition: a report on Knowledge* (1979).

[5] The Architectural theory course provided the students with a comprehensive survey of modern and post-modern theory readings, as well as perspectives on the design process. The course text used was *Classic Readings in Architecture / Jay M. Stein, Kent F. Spreckelmeyer [editors]* (1999).

[6] The use of social surveillance and uncertainty to produce social control is discussed in Max Weber's classic work in social theory titled, *Protestant ethic and the spirit of capitalism* (1958).

[7] The World Trade Center (WTC) Design Competition is an example of a professional competition that used an academic architectural design studio process model.

[8] A budgetary outline is typically not given for academic or design competitions unless the project has a strong underlying socioeconomic intent.

[9] Rowe. Ibid.

[10] Rowe uses the term priori knowledge and heuristic reasoning.

[11] Rowe. Ibid.
[12] Christopher Alexander first argues this relationship in *Notes on the Synthesis of Form* (1964) and later refined this theory in *A Pattern Language: Towns, Buldings, Construction* (1977).
[13] James Marston Fitch argues in "Experiential Context of the Aesthetic Process," *Journal of Architectural Education*, 41:2 (Winter 1988), pp. 4-9 that architecture must be experienced in its multidimensional totality, "totally submerged," and not in pictures alone.
[14] There was an underlying sense that one of the goals of the competition was to try to develop prototypical and universal ideas for future airport designs. This idea is problematic in the context of post modern thinking; Lyotard would argue for the value of particular solutions.
[15] I am suggesting here that the grades given may also contain a dimension of faculty self assessment.

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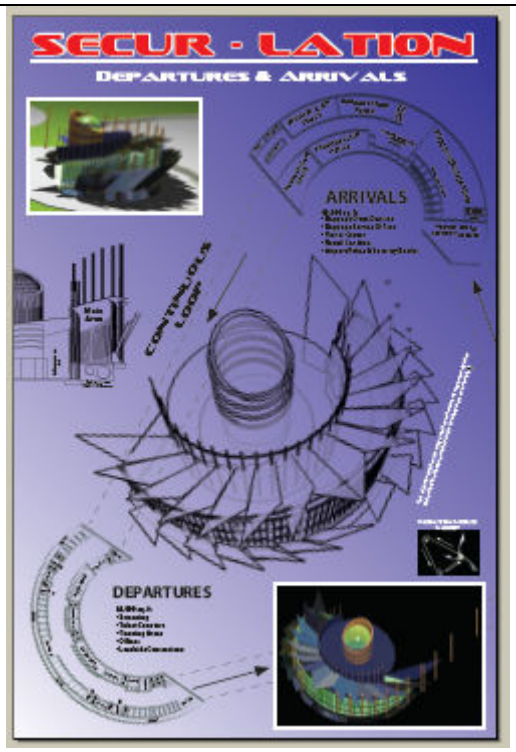
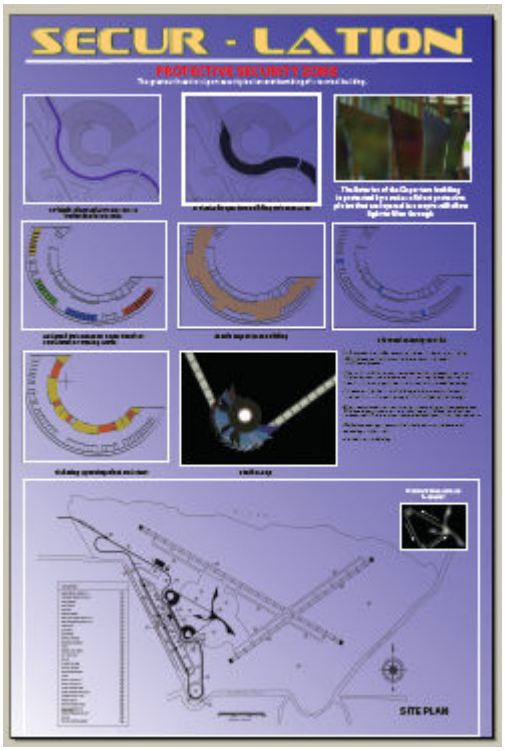
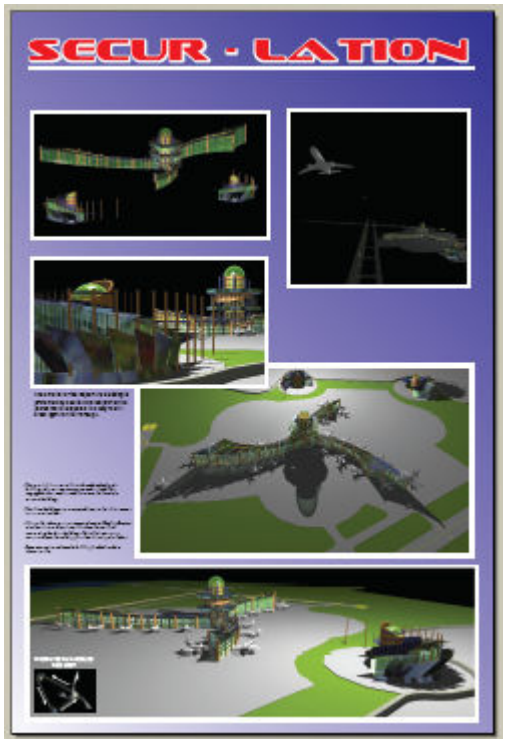
Appendix
Team Competition Drawing Submission







Student/Peer Evaluation of Team Members

Student Evaluator's Name:

Course Name:

Semester: , **Year:**

This is a peer evaluation survey; please maintain absolute privacy when completing this form. The instructor requires your honest evaluation to properly assess all student work. Please be aware that your individual evaluation will be kept in strict confidence. Thank you.

A. Team member:

	Poor				Excellent
1. How would you rate this person's overall contribution to the group?	1	2	3	4	5
2. How would you rate this person's completion of assigned tasks?	1	2	3	4	5
3. Would you choose to work on another assignment with this person?	1	2	3	4	5

B. Team member:

	Poor				Excellent
1. How would you rate this person's overall contribution to the group?	1	2	3	4	5
2. How would you rate this person's completion of assigned tasks?	1	2	3	4	5
3. Would you choose to work on another assignment with this person?	1	2	3	4	5

C. Team member:

	Poor				Excellent
1. How would you rate this person's overall contribution to the group?	1	2	3	4	5
2. How would you rate this person's completion of assigned tasks?	1	2	3	4	5
3. Would you choose to work on another assignment with this person?	1	2	3	4	5

Which student was the most productive in the team and why? (Please be specific)

General Comments? (Please be specific)

Please click the send button below to complete this survey.
Thank you.

Send | Clear the form