Structure
Spider & Suspension

The spider connects and supports the glass and transfers its load to the structure. When compared to mullion systems, the spiders hold the each glass panel by four single points, which minimizes the overall structure presence and enhances the volumetric transparency.
The weight of the glass is suspended from the beam and is transferred by the spiders. The truss resists horizontal loads (wind) only.
Transition --- from the transparent volume to the existing surroundings.

Glass meets Ground

The volume can meet the ground in a number of ways. Two possible approaches were studied: one places the glass wall on top of existing retaining wall (Figure 1); the other does not let the glass wall touch ground but leaves a gap in between, which will create a shadow line in the facade (Figure 2-1 through 2-4). The second option is preferred for two reasons: 1. It emphasizes the idea of suspension of the glass. 2. The gap between the glass and concrete ground plane creates a visual cushion between the two materials.

The sketch at left (Figure 2-4) shows the 3-dimensional piece of aluminum behind the glass.

The sketch at far left (Figure 2-3) shows how the glass wall meets the plaza and how the gap acts to separate the two materials.
Transition
Glass meets Ground

Section

Plan
Transition
Glass meets Roof

With the initial design (Figures 3 and 4), the topmost glass panel meets the roof glass at the axis of the beam (Figure 4). This alignment results in a large numbers of different prefabricated glass panels, which is undesirable. An improved design moves the joint in the glass skin slightly upward (Figure 6), so it meets the roof glass at the bottom edge of concrete parapet. This alignment results in fewer types of prefabricated glass (Figure 5).
Transition
Glass meets Roof

West Elevation
The existing corner condition in Cowgill Hall is a very important element for the building. The addition preserves this quality, while maintaining the volumetric quality of the proposed addition. The following alternatives were explored:

1. Wrap the Corner; existing structure is totally concealed from the plaza.

2. Leave the corner untouched; the atrium space is too small.

3. Leave a gap between the old and new.

The connection of the glass facade and the existing column also supports the idea of suspension, similar to the way in which the glass meets ground. A shadow line serves as a visual cushion between concrete and glass.
The final solution applies a piece of aluminum brake metal to fill the gap and to provide a visual cushion between the two materials.
Instead of being isolated on every horizontal floor, with concrete walls separating them from other students and outside, the transparent volume provides a vertical space. The purpose of rearranging the floor plans of the building is to relocate the studio areas to the south side of the building. Thus the atrium becomes a place where students can share thoughts, get inspiration and perhaps find a sense of belonging.
Space
Floor Plan Rearrangement

Third Floor

Fourth Floor

- Design Lab
- Lecture
- Office
- Other Supportive Space
The transparent volume becomes the center of studio life in Cowgill Hall. It is a place for exhibition, communication, meeting, entertainment and other student activities. The daylight, an active architectural element, plays an important role in this place.

After careful consideration of the structural system and the transition between the volume and the existing context, a maximum of transparency is achieved. Architecturally, the transparency blurred the boundary between inside and outside.
The transparent volume defines a new spatial quality of the plaza.
Concerned about sustainable issues and energy cost of the proposed addition to Cowgill Hall, the second part of this thesis is a deeper endeavor in literature review, technical feature research and design improvement of double glass facade to achieve environmental benefits in this specific case.

Starting from the definition of Double Glass Facade, the literature review covers four key topics: Design and Application of previous projects, Physical Characteristics, Material Properties and Cost Efficiency of double glass facade. Research on thesis topics not only demonstrates a solid base on design of the double glass system for Cowgill Hall Addition; but also provides a theoretical outline on this overall topic, which leads to a further development of design improvement.

The key parameters of performance of the Double Glass Facade are concluded as the result of literature review. The design improvement idea evolves from realizing the lack of consideration about outlet configuration of previous double glass facade design, which will affect the ventilation rate in the cavity - one of the key parameters to determine the performance of double glass facade.

The idea of adding wind shields in front of typical double glass outlet opening is proposed. By using computational fluid dynamic simulation, the proposed design improvement is tested in comparison with a typical configuration.

At the end of this second part of the thesis, the improved configuration is applied to the Cowgill Hall Addition, which answers the question asked at the beginning of this book: How can environmental benefits be achieved through this all-glass atrium?
Definition:
Double glass facades are typically constructed with three panes of glass, one double pane layer and the other single pane, separated by an air cavity. The air cavity depth ranges from a few inches to a few feet. The system typically has a shading element such as a roller shade or venetian blind in the cavity. The cavity in double glass facades is either naturally (Figure 7) or mechanically (Figure 8) ventilated. The naturally ventilated cavity has inlet and outlet openings to the outdoor air. Heated air in the cavity is removed by a stack effect. The mechanically assisted ventilation systems usually use an under-floor (Figure 8-2) or overhead (Figure 8-1) ventilation system to exhaust the cavity air to ensure good distribution of the fresh air. Air is forced into the cavity by mechanical devices.*