Arch 463
ECS
Fall 2003

Name_____

Quiz #4

"America's Original Double Skin"

For this problem you are an architectural technology historian. You've been asked to give a critique of the Hooker Chemical Building in Niagara Falls, NY, a climate with cold snowy winters and warm humid summers. The building, completed for $62/sqft in 1983, is celebrating 20 years of operation this year. It was published in *Progressive Architecture* in April 1983 as an example of energy conservation.

Your job is to comment on the strengths and weaknesses of the building and on how new knowledge and technology could be employed to improve it while retaining its look and design concepts. The text and illustrations that follow are from the *P/A* article.

East facade at night. Two-story lobby is central.

Prominently sited in the urban renewal landscape of Downtown Niagara Falls, the Hooker building has the freestanding Euclidean form and the sleek, ordered surfaces associated with the heyday of Modernism—and with the flood tide of energy consumption. In fact, Hooker is a remarkable adaptation of the Miesian curtain-walled form as a model of energy conservation.

When Cannon Design got this commission, back in 1978, it was clear that Hooker wanted a symbol of its commitment to reviving the core of Niagara Falls. The site was not only highly visible, but offered views of the Niagara River in three directions, so the architects sought an alternative to the constricted window areas then prescribed as a reaction to energy shortages. Assured of unobstructed solar access, they recognized that daylighted interiors offered opportunities for major energy savings, if only heat loss through the glass could be kept low. Pooling their own architecture and engineering skills with the talents of consulting firms (see Data), Cannon came up with a double-envelope scheme.

The key to the design is the 4-foot-wide void between an outer wall of green-tinted insulating glass and an inner wall of clear single glazing. Heat that builds up in this gap under sunny conditions can be vented at the roof. Louvers within the void are adjustable to keep out direct rays; they can be closed entirely at night to keep heat in. Daylight, dispersed by the louvers, provides ample illumination of the outer 15 feet of the office floors—44 percent of their usable area.

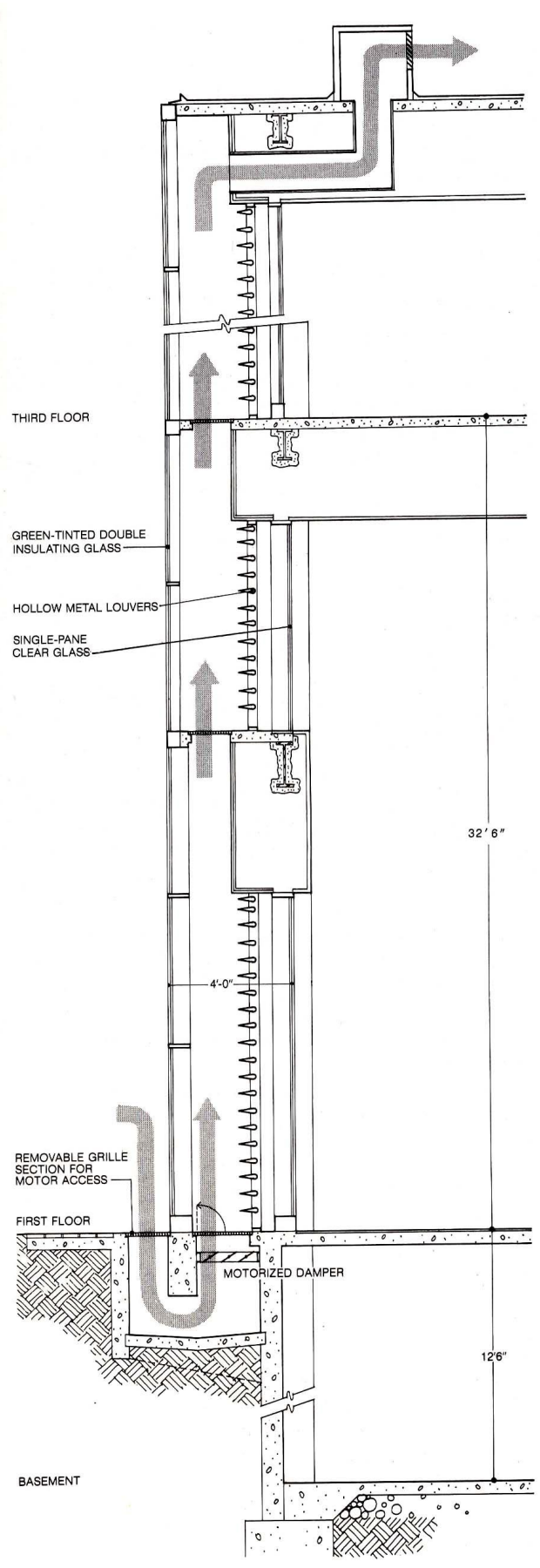
P/A's Energy Analysis of the building as designed (April 1980, p. 105) showed Hooker's heating load to be only about 2 percent of that for a "conventional" building of the same volume, and its cooling loads only about 19 percent. These remarkable savings were attributed in part to the virtual elimination of infiltration—a great advantage in this exposed location.

Energy performance of the building has been affected significantly by changes in use since the building was programmed (changes that also underscored the adaptability of the square, column-free floor layouts). The location here of a major computer installation, working around the clock, has doubled the building's demand for power (which is plentiful in Niagara Falls). The spread of the office day beyond the anticipated eight hours has increased the use of artificial lighting. The additional heat generated has eliminated the heating demand altogether; the gas-fired boiler has literally never been used for heat. And the louvers are never closed except during rare weekends when the computers are shut down *and* the weather is very cold.

As it is, only the louvers introduce some unaccustomed hardware. These off-the-shelf components, intended to control air in large ducts, span the 15 feet between columns and provide full shade at a vertical spacing of 8 inches, enough of a gap to afford an unobstructed view from close up; their airfoil sections have no aerodynamic use here, but turn out to be excellent for dispersing light. The louver system seems to present little distraction to workers inside, after the first couple of weeks.

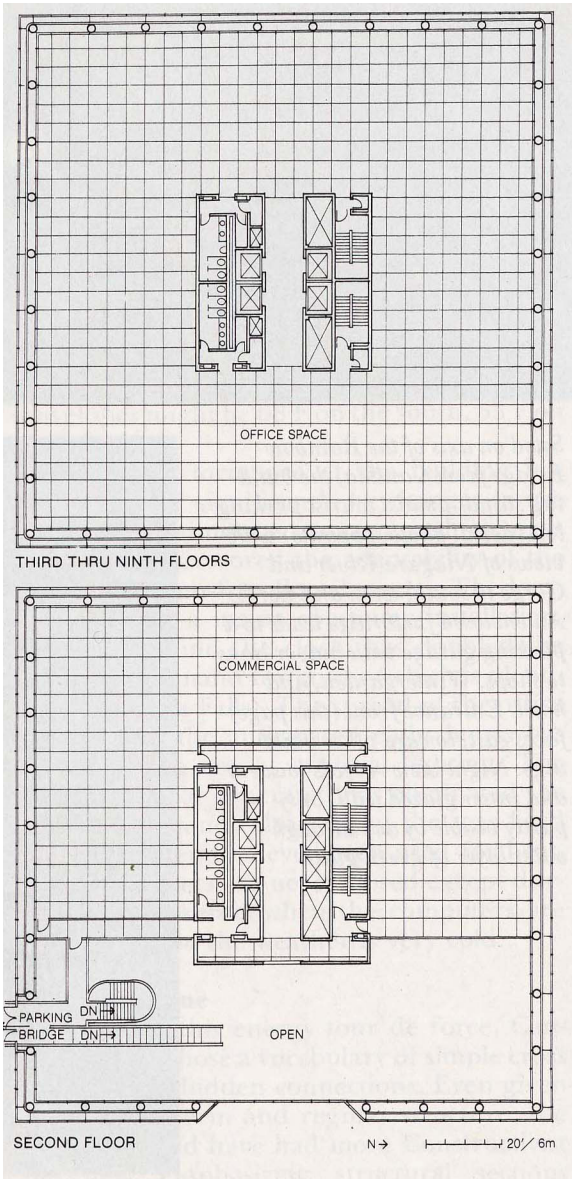
The green glass, which transmits 80 percent of visible light, has no noticeable effect on views or indoor colors. From outside, the greenish glass and the white grids on and behind it emphasize the transparency of the envelope: gray or bronze tones would have contrasted with the sky and looked more opaque.

Asked whether Cannon has considered the double envelope for subsequent projects, Cannon engineer Alan Sloan answers that it is "always under consideration, but it's not a panacea." For double-envelope to work, he explains, you need special circumstances—all present here: an open site, a commercial function, and infiltration as a major factor. Asked about the "payback" period for the double envelope, Sloan objects that the *concept* of payback fails to recognize offsetting savings such as, in this case, cutting the mechanical systems contract about in half. The building came in for less than the client's original budget, he says. "We paid no premium for the double envelope, so no payback is due."



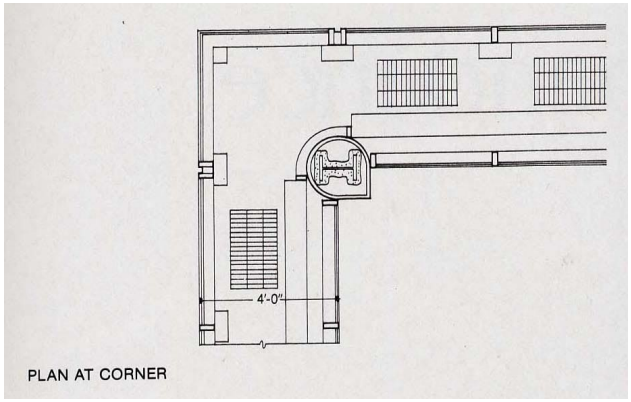
WALL SECTION

3 pts 1. Highlight three (3) things that you think are very successful in the design concept for the buliding and explain why.

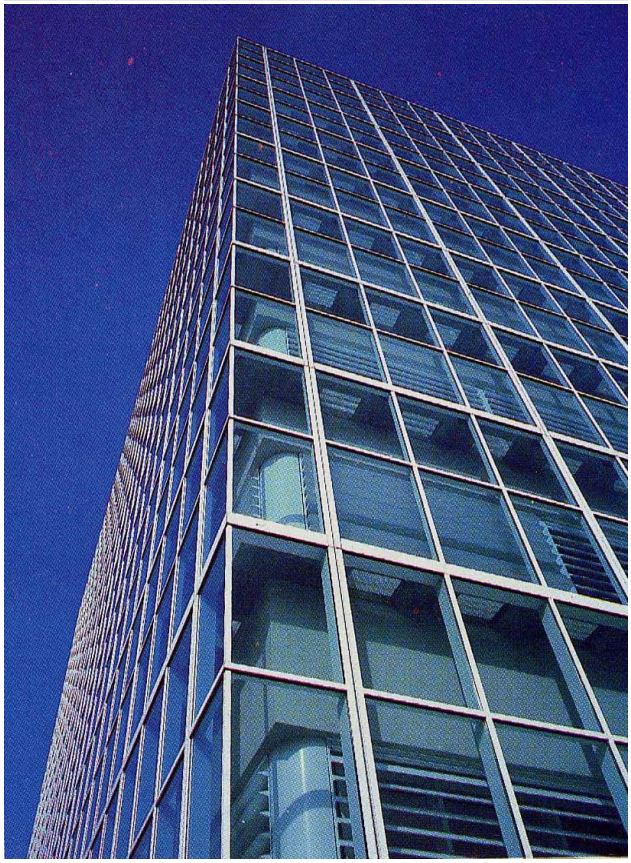


Lobby with two-story clear glazing to east.

3 pts 2. Given your ECS training, highlight three (3) things that you would have changed in the original design concept and explain why.



PLAN AT CORNER

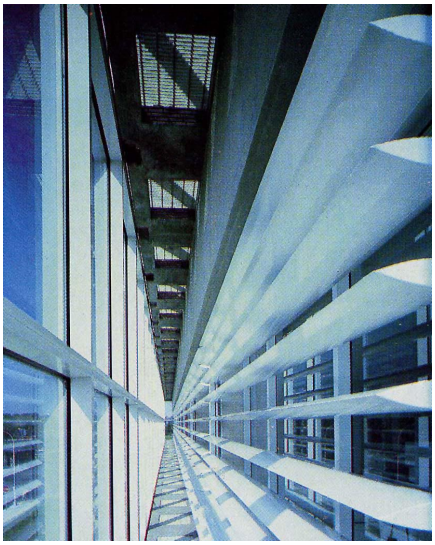


All four corners are identical.

4 pts

3. While retaining the building's look and design concept, **suggest** two (2) improvements that use technology not available in 1983 and **explain** how the building would be improved. Use sketches to clearly **illustrate** your ideas.

Corner offices may have louvers at different angles on different exposures, because they're controled by sun sensors.



The space between the skins.