

Exhibit 2

Reasons why the determinations outlined in Exhibit 1 should be reversed.

Code sections referenced below are from the 2015 New York State Building Code unless otherwise noted.

Similar documentation was filed with the City of Ithaca under my original “Title 19” complaint and with the DBSC Oversight Unit in my prior appeal.

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Introductory comments

Before being connected to Milstein Hall in 2011, Rand Hall was a 3-story Type IIB non-fireproofed steel frame building and E. Sibley Hall was a 3-story Type VB building (with non-fireproofed wood exterior bearing walls at the third floor). Since the two buildings were connected to 2-story Milstein Hall without fire walls (Figure 1), Rand-Milstein-Sibley Hall became a *single building* with Type VB construction.

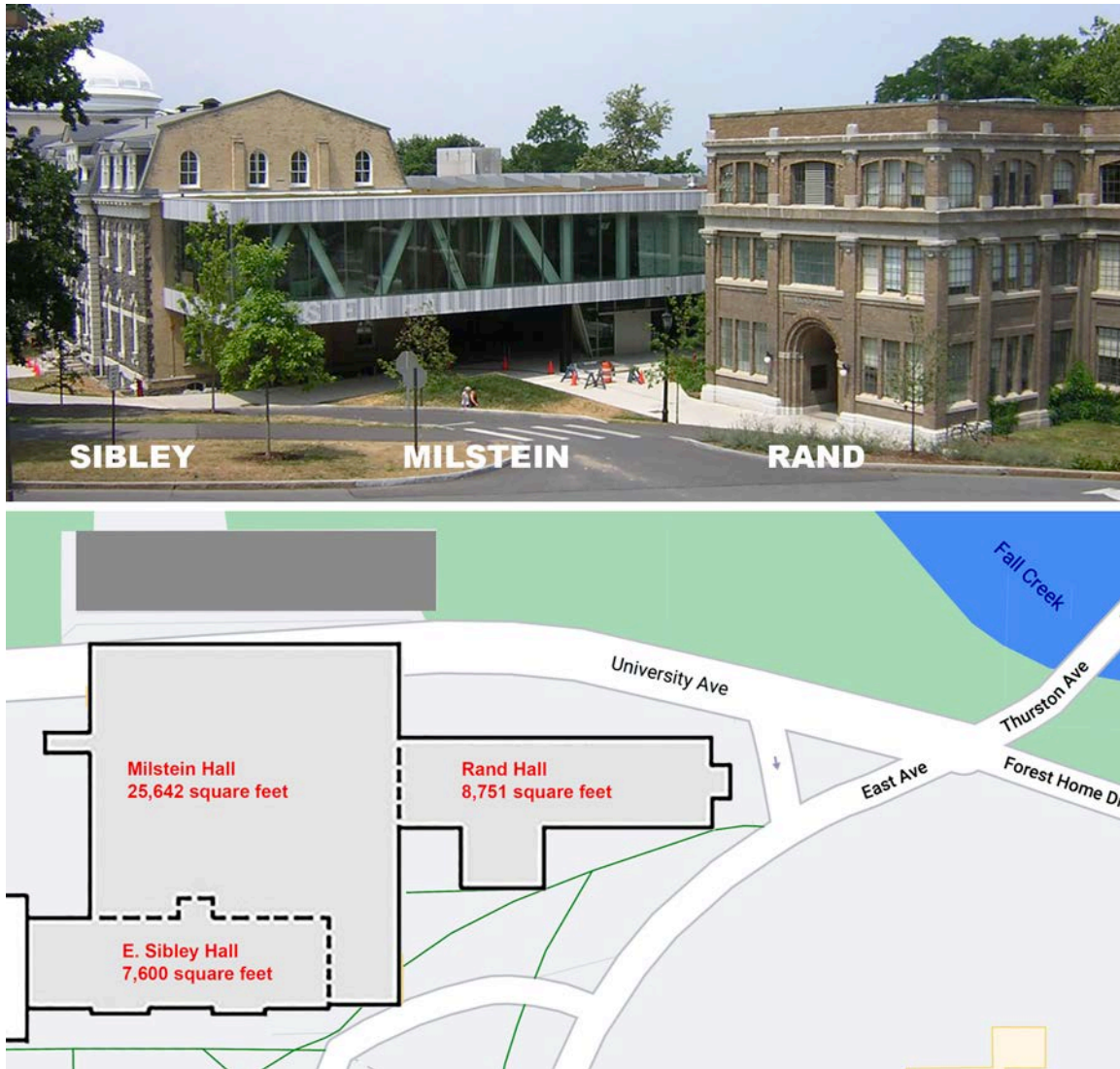


Figure 1. (a) View, from left to right, of interconnected Sibley, Milstein, and Rand Hall; and (b) second-floor plan showing net second-floor areas of Milstein, E. Sibley, and Rand Halls.

Prior code variances: In 2012, shortly after the construction of Milstein Hall, Cornell's Fine Arts Library was moved to the third floor of Rand Hall in violation of the New York State Building Code, which prohibits library (A-3) occupancies above the second floor of Type VB construction. After this violation was successfully challenged at a hearing of the Capital Region–Syracuse Board of Review on July 18, 2013 (Petition No. 2013-0250), Cornell applied for and received a code variance later in 2013, which allowed the library to remain on the third floor of the combined Rand-Milstein-Sibley Hall. Two subsequent code variances were granted in 2015 and 2016 based on the submission of preliminary, and

evolving, plans for a new Fine Arts Library in Rand Hall, still without a fire wall to separate Rand Hall from Milstein Hall. The code waivers granted by the three variances can be summarized as follows:

- The 2013 variance (Petition No. 2013-0456) permitted Rand Hall, with a library on the third floor (and potentially on the second floor), to exceed floor area and height limits for A-3 occupancies in Type VB construction.
- The 2015 variance (Petition No. 2015-0432) allowed 2-hour fire barriers, instead of a 3-hour fire wall, to effectively create a separate “Rand Hall” building with non-fireproofed steel (Type IIB) construction. The library spaces proposed at the time consisted of two stories, each with a mezzanine, so the building—including the first-floor F-1 shop occupancy—was still considered to be three stories high.
- The 2016 variance (Petition No. 2016-0269) allowed a proposed four-story A-3 occupancy in Type IIB construction, a smaller elevator not sized for an ambulance stretcher, and an alternate to standby power for atrium smoke control. The library space outside the bookstack floors (or “vertical opening” in code language) was reformulated as an “atrium” connecting stories two through four (with a single mezzanine within the fourth story), so the building—including the first-floor F-1 shop occupancy—was now considered to be four stories high. Various structural elements in the building were allowed to have no fireproofing, i.e., to remain as non-fireproofed Type IIB construction instead of being upgraded to Type IIA fireproofed construction as would have been required for an A-3 library occupancy in a four-story building.

Because the current Rand Hall library is substantially different from prior proposals for which these code variances were granted, those variances are no longer in effect. Specifically, the library as built contains, for the first time, a roof-top art gallery that more than doubles the library’s occupant load compared to all prior proposals. Furthermore, the current structure is a *five-story building* (although packaged as a four-story building with a mezzanine—see explanation of Violation #3 below), whereas prior proposals in 2013, 2015, and 2016 were for a three-story or four-story building. Unlike the as-built library, the four-story proposal permitted under the 2016 code variance had a mezzanine that conformed with the Chapter 2 mezzanine definition and with Section 505.2.1 area limits that require a mezzanine to be *between* the floor and ceiling of any story and *within* a room or space that is at least twice as big as the mezzanine floor.

New York State Code variances only apply to the *specific building proposal for which the variances were granted*—and cannot be interpreted to give implied approval to a different proposal. All three Rand Hall variances (Petition Nos. 2013-0456, 2015-0432, and 2016-0269) contain the following written disclaimer: “Furthermore, it should be noted that *the decision of the Board is limited to the specific building and application before it, as contained within the petition*, and should not be interpreted to give implied approval of any general plans or specifications presented in support of this application.” Since the library as built is substantially different from all prior schemes, the code variances that supported those prior schemes cannot be applied to the current building.

Atriums and mezzanines. Even though prior code variances—requested for prior versions of the Rand Hall library and shop—are not germane to the current proposal because the current as-built scheme is substantially different from all prior versions, it may be useful to compare the noncompliant use of what are called “atriums” and “mezzanines” in the *current* scheme with the use of atriums and mezzanines in prior versions for which variances were requested.

The proposal corresponding to the 2013 variance had neither an atrium nor a mezzanine, since it involved only a change of occupancy in the existing three-story building. However, the two subsequent proposals corresponding to the 2015 and 2016 variances both were substantial alterations of, *and additions to*, Rand Hall, each of which created *four* library levels above a first-floor shop occupancy.

In the 2015 scheme, based on the 2010 New York State Building Code, the four library levels were configured as two stories, each with a mezzanine. Because both mezzanine levels were *within* a double-height story, and because both mezzanine levels were within code area limits for sprinklered buildings, Rand Hall was properly defined as being three-stories in height, with 1 story of F-1 shop occupancy and two stories (each with a mezzanine) of A-3 library occupancy. The four library levels were all spatially connected with a “vertical opening,” but since these four levels consisted of only two *stories*, this vertical opening was in conformance with Section 707.2 exception 7 (“does not connect more than two stories”) of the 2010 New York State Building Code, and therefore did not need to have a shaft enclosure or be defined as an atrium.

In the 2016 scheme, based on the 2015 New York State Building Code, the four library levels were configured as three stories, with the top story containing a mezzanine within it. Because the mezzanine level was *within* the double-height portion of the top story, and also within code area limits for sprinklered buildings, Rand Hall was properly defined as being four-stories in height, with 1 story of F-1 shop occupancy and three stories (the top one with a mezzanine) consisting of A-3 library occupancy. Because there was a vertical opening connecting what were now *three* library stories, the vertical opening was properly defined as an atrium.

The current proposal, like the prior scheme, has four library levels connected by a vertical opening that is defined as an atrium, as well as an F-1 shop occupying the first story. The scheme differs from the 2016 variance proposal in that it no longer has a double-height fourth story in which a mezzanine can be placed. Rather, the atrium’s vertical opening now extends *through* the roof level, and a small fifth story is placed on the roof, with an exit access stairway connecting this new fifth story through the atrium to the fourth story below.

Relevant building code: The Fine Arts Library proposal counts not just as an “alteration” to Rand Hall, but primarily as an “addition.” This is because, per the definition of *addition* in Chapter 2 of both the 2015 Building Code and Existing Building Code of New York State, it is “an extension or increase in floor area, *number of stories*, or *height of a building* or structure.” Specifically, the building’s height has increased from approximately 43 feet above grade to approximately 55 feet above grade, and the number of stories has increased from 3 stories to either four stories (according to the architect’s drawings) or five stories (counting the roof-top bathrooms, elevator, and corridor as a fifth story rather than as a mezzanine within the fourth story). There is virtually nothing remaining of the original Rand Hall structure above the first story; it is true that exterior riveted steel columns are still embedded within the old brick exterior walls, but they have been reinforced with new steel columns that extend from the foundations up to the new roof structure and they are braced by an entirely new lateral-force-resisting system. Most of the existing third-floor and roof-level structural elements have been demolished, and all of the bookstack structural floors and supporting elements are entirely new, as is the main roof structure over the library stacks. Even existing footings in Rand Hall have been reinforced to accommodate increased structural loading. In effect, a new building has been inserted into the brick shell of the old building, leaving only the first story more or less intact.

As an addition, according to Section 1101.1 of the 2015 Existing Building Code, the building proposal “shall comply with the International Codes as adopted *for new construction*.” In fact, the construction documents for this project reference the Building Code for new construction, and not the Existing Building Code, so the question of which code governs the design of this project does not appear to be contested: as an addition, the proposal must conform to the 2015 Building Code (for new construction) of New York State.

Code violations

The Mui Ho Fine Arts Library in Rand Hall at Cornell University is in violation of the following provisions of the 2015 New York State Building Code:

Violation #1: Unenclosed egress stair in the atrium.

Relevant code sections: 1006.3; 1019.3; 1022; 1023.2; 1023.1; and 1023.3.

Explanation: “Exit Stair B” is an unenclosed exit stairway that extends from roof-top bathrooms and a roof-top art gallery down to the second-story atrium floor (see Exhibit 4). Such a means of egress component needs to be enclosed. However, the architects have alternatively used two lines of argument to challenge this requirement—one based on requirements for an unenclosed *interior exit stairway*, and the other based on requirements for an unenclosed *exit access stairway*. Both arguments are flawed, as was confirmed by code opinions from both the International Code Council and the New York State Division of Building Standards and Codes (see Exhibit 3).

The first argument suggests that Section 1023.2, exception 2, permits an *interior exit stairway* in an atrium to be constructed without enclosures consisting of fire barriers and/or horizontal assemblies. However, this exception applies only to the “construction” of an interior exit stairway and not to Section 1023.1 (General) or Section 1023.3 (Termination), which require that interior exit stairways shall “lead directly to the exterior of the building or shall be extended to the exterior of the building with an exit passageway” and “shall terminate at an exit discharge or a public way.” James Harding of the New York State Division of Building Standards and Codes, in an email to me dated Feb. 27, 2019 (Exhibit 3), explains why it is incorrect to call this type of stair an “unenclosed interior exit stairway.” He writes: “Thus, unless the stairway ends at an exit discharge or a public way, it must end at an enclosed exit element as described in the exception. This guarantees that the level of protection for occupants is not diminished along the exit path, which is required for all exits by Section 1022. There are two exceptions provided in section 1028 to the requirement that the exit discharge be to the exterior of the building, a lobby and a vestibule. Since both of these exceptions are for such areas at the level of exit discharge, they may not be applied to the situation described. A final consideration regarding this question is whether the atrium might also be classified as an enclosed exit element (stairway, ramp or passageway). No. Section 1022 also provides that an exit, ‘shall not be used for any purpose that interferes with its function as a means of egress.’ An atrium is provided for ambiance and other purposes as needed and would not be considered exclusively for use for exiting.” In fact, this particular atrium is designated by the architects as a *library reading room* (occupancy group A-3), with an area of 4,928 square feet and, per Table 1004.1.2, an occupant load factor of 50. In other words, it functions as an assembly space with 99 occupants.

The second argument is based on the fact that Section 1019.3 (line item #5) states that an *exit access stairway* in an atrium need not be “enclosed with a shaft enclosure constructed in accordance with Section 713.” However, Section 1006.3 states that “the path of egress travel to an exit shall not pass through more than one adjacent story.” Taking both sections together, it is clear that while shaft enclosures for exit access stairways are not required in atriums, such unenclosed exit access stairways cannot pass through more than one adjacent story, even in an atrium. James Harding of the New York State Division of Building Standards and Codes, in an email to me dated Feb. 27, 2019 (Exhibit 3), explains why it is incorrect to designate this type of stair an “exit access stairway.” He writes: “The requirements for exiting from all areas of a building are provided in chapter 10. Any portion of a building that serves as part of the required means of egress system must comply with all applicable provisions of chapter 10. Referring to Section 1006 for exit access, travel through more than one story of the building is prohibited.”

Violation #2: Inadequate number of plumbing fixtures in the roof-top bathrooms.

Relevant code sections: Table 1004.1.2, Table 2902.1, and Section 2902.2.2 of the New York State Building Code; Section 419.2 of the New York State Plumbing Code.

Explanation: The stated occupancy for the roof-top art gallery of 131 is found by using an incorrect gallery area of 911 square feet and an incorrect occupant load factor of 7 square feet per occupant (Figure 2). The *actual occupancy is 263*, based on an actual area of $67'-2-1/2" \times 20'-6"$ = 1,315 net square feet and an occupant load factor of 5. In this calculation, I have computed the gallery area by first subtracting 6 inches from the circulation zone edges and then subtracting 20 square feet for a utility enclosure on the north side of the gallery. This actual area includes the hypothetical egress pathways at the perimeter of the gallery space that are colored yellow on the architect's plans, sheet LSP-103 (Exhibit 4), apparently, and deceptively, to imply that they might represent something literally separated from the orange-colored main gallery space (Figure 2). In fact, the entire *actual* gallery area—i.e., both the orange and yellow zones drawn by the architects—must be accounted for when computing the occupancy of the space.

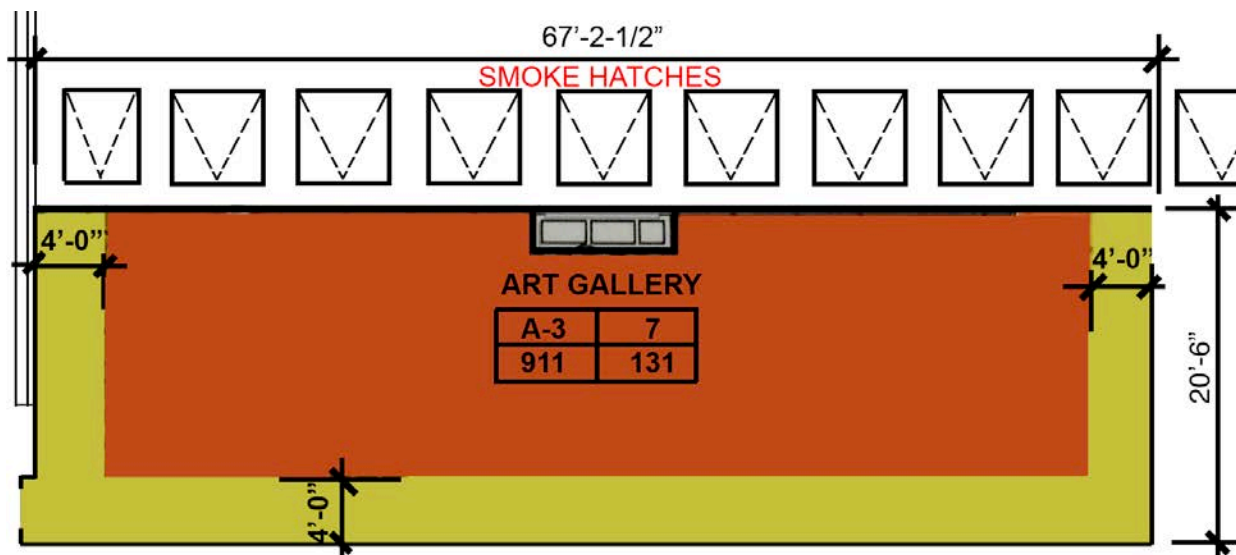


Figure 2. Portion of architect's roof plan showing the roof-top art gallery with fictitious circulation zones (colored yellow) that have been subtracted from the actual occupiable gallery area, along with a tabulation of occupancy group (A-3), occupancy load (7 occupants per square foot), gallery area (911 square feet), and number of occupants (131). Plan drawn by Jonathan Ochshorn based on architect's roof plan, sheet LSP-103. Colors, dimensions, and room data matrix appear in the original.

The architects inappropriately *subtracted* this yellow colored circulation pathway area from the actual gallery area and used the incorrect load factor of 7 to compute the fictitious values shown on sheet LSP-103, and reproduced in Figure 2, i.e., 911 square feet for the art gallery area and $911/7 = 131$ occupants. The architects, in their "Proposed Toilet facilities Calculations" shown on LSP-100 (Exhibit 4), use an even lower number: 93 occupants.

Note that the correct occupant load factor of 5 is for "standing space" (corresponding to the actual use of the space, and consistent with the occupant load factor used, for example, in the nearby Milstein Hall art gallery) whereas the occupant load factor of 7 is for "chairs only—not fixed" a factor which does not represent the actual use of the roof-top space (see Table 1004.1.2 reproduced in Figure 3).

**TABLE 1004.1.2
MAXIMUM FLOOR AREA ALLOWANCES PER OCCUPANT**

FUNCTION OF SPACE	OCCUPANT LOAD FACTOR ^a
Assembly without fixed seats	
Concentrated (chairs only-not fixed)	7 net
Standing space	5 net
Unconcentrated (tables and chairs)	15 net

Figure 3. Excerpt from Table 1004.1.2 of the New York State Building Code showing occupant load factors for assembly functions without fixed seats. The correct load factor of 5 is for “standing space.”

With an actual occupancy of 263 on the roof and 36 occupants on the fourth floor for a *total occupant load of 299*, the required number of plumbing fixtures, per Table 2902.1 of the New York State Building Code, is 2 WCs and 1 lav (male) and 3 WCs and 1 lav (female). The actual number of WCs provided (1 for males, 2 for females, as shown in LSP-100 reproduced in Exhibit 4) is therefore inadequate. Specifically, Note “a” for Table 2902.1 states that “fixtures shown are based on one fixture being the minimum required for the number of persons indicated or any fraction of the number of persons indicated. The number of occupants shall be determined by this code.” Section 2909.2.2 (Fixture calculations) states that “to determine the occupant load of each sex, the total occupant load shall be divided in half. ... Fractional numbers resulting from applying the fixture ratios of Table 2902.1 shall be rounded up to the next whole number.” With an actual occupant load of 299, the number of male or female occupants is 150. From Table 2902.1, the required number of male WCs (with up to 67% allowed to be replaced with urinals per Section 419.2 of the Plumbing Code) is 150/125 which rounds up to 2; and the required number of female WCs is 150/65 which rounds up to 3.

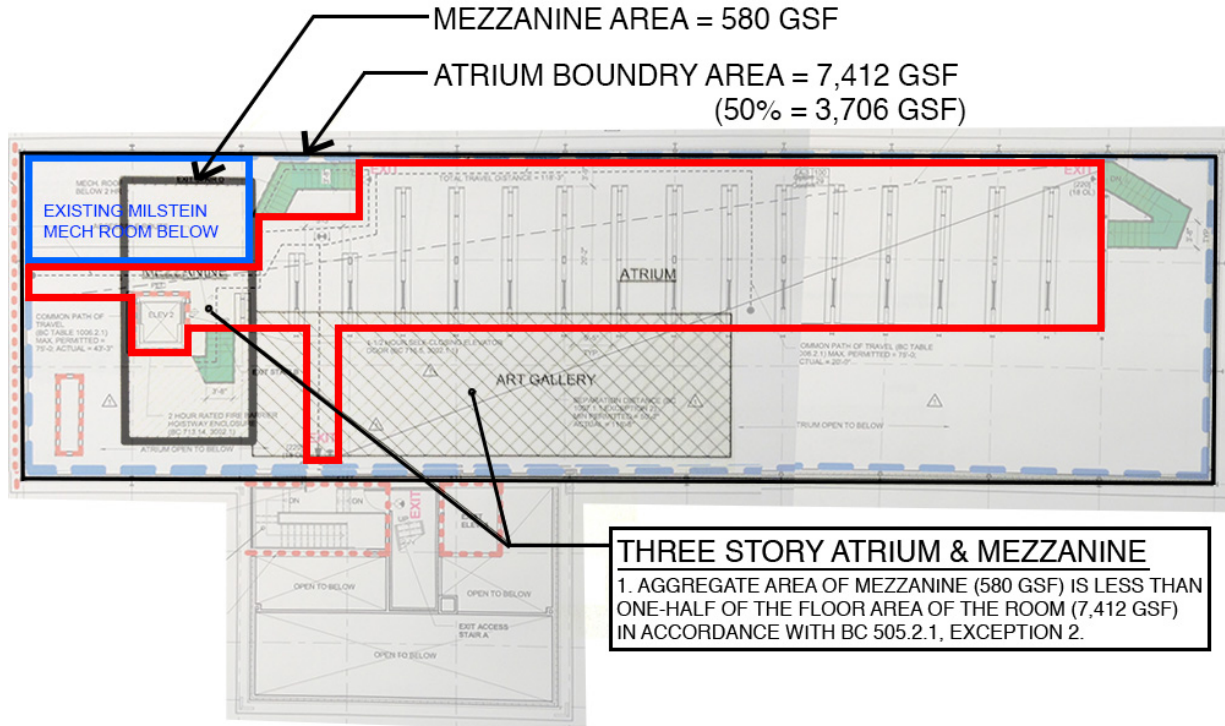
Violation #3: Fifth floor incorrectly labeled as mezzanine within the atrium.

Relevant code sections: Chapter 2 definitions of mezzanine and atrium; Sections 404.6, 505.2, 712, 1510.2, 1510.2.3, and 1510.8.2.

Explanation: The enclosed area on the roof, open to the atrium, is improperly classified as a mezzanine within the fourth story. Instead, it should be classified as a fifth story adjacent to an atrium. Because these roof-top spaces are adjacent to a vertical opening, their status is governed, in part, by Section 712 (Vertical Openings), which lists 16 options for compliance. Of these 16 options, only three are potentially relevant: 712.1.7 (Atriums), 712.1.11 (Mezzanine), and 712.1.12 (Exit access stairways and ramps). Section 712.1.12, as explained in the discussion of Violation #1, does not apply: James Harding of the New York State Division of Building Standards and Codes writes: “The requirements for exiting from all areas of a building are provided in chapter 10. Any portion of a building that serves as part of the required means of egress system must comply with all applicable provisions of chapter 10. Referring to Section 1006 for exit access, travel through more than one story of the building is prohibited.” Of the two remaining options, only Section 712.1.7, describing an atrium complying with Section 404, is applicable to the roof-top spaces. In other words, the roof-top spaces containing bathrooms, elevator, and corridor must be classified as a fifth story adjacent to an atrium.

The enclosed area on the roof cannot be classified as a mezzanine. To be a mezzanine, it would have to be “an intermediate level or levels *between the floor and ceiling* of any story,” as the definition in Chapter 2 of the code requires it to be. Instead, it is *on top of* the ceiling of the fourth floor. The explanation of the architects, forwarded to me in an email from the college’s Director of Facilities, Frank Parish, dated Jan. 25, 2019, states: “The enclosed area at the roof level is a mezzanine to the fourth floor. The fourth floor is open to and part of the atrium.” The architects write in their “Mezzanine diagram” on LSP-103 (Exhibit 4, reproduced below as Figure 4) that the “aggregate area of the mezzanine (580 GSF) is less than one-half the floor area of the room (7,412 GSF) in accordance with BC 505.2.1, exception 2.” This room of 7,412 GSF that is shown on the architect’s diagram is labeled as the “atrium” rather than as the fourth story, although the boundary shown for the 7,412 GSF corresponds

neither to the fourth story nor the atrium. This statement reveals two principal errors. First, a mezzanine *cannot be in an atrium*, since a mezzanine is “an intermediate level or levels *between the floor and ceiling of any story*,” and an atrium is not a “story”; rather, an atrium is an “*opening connecting two or more stories*.” Second, the roof-top enclosed spaces cannot be a mezzanine within a fourth-story room or space since there are no double-height fourth-story spaces in which a mezzanine could be placed.



2
LSP-103 1/16" = 1'-0"

MEZZANINE DIAGRAM

Figure 4. Mezzanine Diagram from sheet LSP-103 with the fourth-floor plan superimposed in order to clarify the relationship between the enclosed roof-top spaces (black rectangle) the fourth-floor bookstacks (bounded by a red line), and the third-floor mechanical room for Milstein Hall (bounded by a blue line). Text has been enlarged, red and blue boundaries added, and the 4th floor has been superimposed by the author. The black boundary line is in the original mezzanine diagram.

A schematic section through the roof-top enclosed space is shown in Figure 5 (left). This section clearly shows that there are no double height spaces in the fourth story within which a mezzanine could be placed. To be a mezzanine, the space would need to be configured within a double height space, as shown, for example, in the hypothetical section of Figure 5 (right). In other words, the architects are inappropriately using the *atrium* opening to demonstrate conformance with Section 505.2.1, rather than using an area within a fourth-floor room or space as the section requires. Both Figures 4 and 5 show that the story incorrectly labeled “mezzanine” (bounded by a black line in Figure 4) is only marginally *above* any fourth-floor room or space (bounded by a red line), and is not *between* the floor and ceiling of any fourth-floor room or space, as required by the code. The fourth story below the enclosed roof-top spaces is little more than a corridor, while the greater part of the enclosed roof-top spaces is directly above—not the fourth floor—but rather the ceiling of a third-story mechanical room. The exit access stairway (“Exit Stair B”) connecting the fifth-story roof-top spaces to the fourth story is *in the atrium*, not in any mezzanine, as can be clearly seen in Figure 5.

The original intent behind the definition of a mezzanine was to make special allowances for relatively small platforms or lofts *within larger rooms* with which they shared a “common atmosphere.” Mezzanines, in other words, are only possible within double-height spaces which can contain smaller raised floor levels within their confines. The fifth-floor bathrooms, elevators, and corridors are not within any fourth-floor room or space and therefore do not satisfy this basic criterion.



Figure 5. Schematic section through the as-built fifth-story roof-top enclosed spaces and atrium, which cannot be defined as a mezzanine (left); contrasted with a section showing a hypothetical example of a Code-compliant mezzanine within a fourth-floor room or space (right). Drawn by Jonathan Ochshorn.

By incorrectly defining the mezzanine as being within the atrium, the architects have unwittingly confirmed that it is the *atrium*, and not some fictitious mezzanine, that actually extends above the fourth-floor level in order to provide access to a roof-top story containing toilet rooms and an elevator, both of which have been made necessary by the addition of a roof-top art gallery with 263 occupants.

Furthermore, what the architects incorrectly call a rooftop “mezzanine” cannot be defined as a rooftop bulkhead/penthouse, and *must be counted as an additional story*, per Section 1510 (Rooftop structures) of the 2015 NYS Building Code.

First, the Code defines penthouses according to permitted uses, which consist of “the shelter of mechanical or electrical equipment, tanks, or vertical shaft openings in the roof assembly.” (1510.2.3) For the record, Section 1510.2.2 the 2018 IBC, recently adopted by NYS, extends the use limitations for penthouses to include elevators and related machinery. However, bathrooms are not permitted within penthouses in either the 2015 or 2018 versions of the IBC.

Second, the Code defines bulkheads, “used for the shelter of mechanical or electrical equipment or vertical shaft openings in the roof assembly,” according to the same permitted uses as penthouses (1510.8.2) and expressly states that such rooftop structures “used for any other purpose *shall be considered as an additional story of the building.*”

Since the rooftop structure in the Rand Hall project contains elevators and bathrooms, it cannot be counted as a penthouse/bulkhead, and must be considered as an additional story.

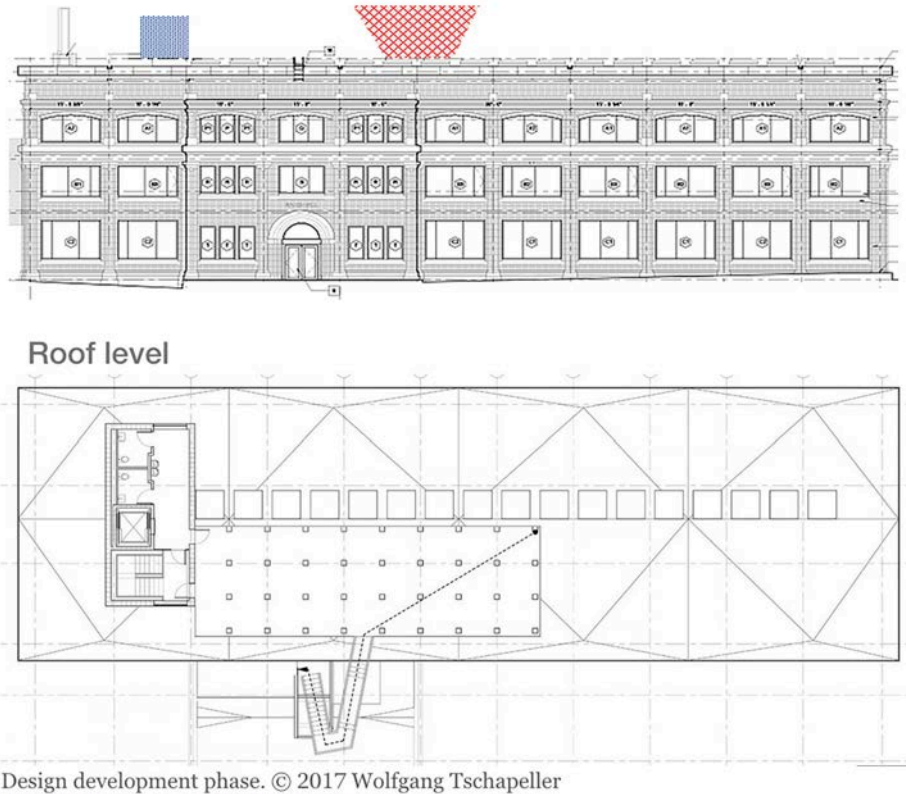
Following are code sections relevant to bulkheads and penthouses:

- *Section 1510.2 Penthouses.* Penthouses in compliance with Section 1510.2.1 through 1510.2.5 shall be considered as a portion of the story directly below the roof deck on which such penthouses are located. All other penthouses shall be considered as an additional story of the building.
- *Section 1510.2.3 Use limitations.* Penthouses shall not be used for purposes other than the shelter of mechanical or electrical equipment, tanks, or vertical shaft openings in the roof assembly.
- *Section 1510.8.2 Bulkheads.* Bulkheads used for the shelter of mechanical or electrical equipment or vertical shaft openings in the roof assembly shall comply with Section 1510.2 as penthouses. Bulkheads used for any other purpose shall be considered as an additional story of the building.

Even if Sections 712.1.7 (Atriums) and 712.1.11 (Mezzanine) were both plausible options for categorizing the vertical opening adjacent to the roof-top spaces, the Code requires that Section 712.1.7 (Atriums) govern, since it has more restrictive requirements than does Section 712.1.11 (Mezzanine): Section 102.1 states that “[w]here, in any specific case, different sections of this code specify different materials, methods of construction or other requirements, the most restrictive shall govern.”

There are two immediate code violations that follow logically from the mislabeling of the fifth story as a mezzanine within the fourth story. First, the part of the atrium that extends into the fifth story must be separated from the enclosed roof-top spaces with 1-hour fire barriers, since only three floors can be open to the atrium per Section 404.6, exception 3. Second, as explained in Violation #7, the entire building must be built with Type I construction, rather than with Type IIB or Type IIA construction.

While the fifth story is itself small—containing only bathrooms, an elevator, and a corridor—it provides access to a new unenclosed roof-top art gallery with 263 occupants, greatly increasing the total library occupancy compared to any of the prior versions for which variances were granted. It is also relevant to consider Cornell’s intentions for the outdoor roof-top art gallery, advertised on their website for the Mui Ho Fine Arts Library as well as in an exhibit in November 2017 called “Full Scale.” Cornell’s intention, made explicit in this exhibit and reinforced on the library homepage (reproduced in Figure 6) is that “every few years a new team of students builds a [roof-top] classroom as part of the ongoing research and collaboration in physical making that Cornell is so proud of, as Buckminster Fuller once built one of his geometric domes on the very same roof almost 70 years ago.”



Design development phase. © 2017 Wolfgang Tschapeller

Experimental pavilion roofscape.

Figure 6. (top) Cornell’s elevation of the Mui Ho Fine Arts Library shows roof-top pavilions intended to be built every few years; (bottom) Cornell’s schematic roof plan is labeled “Experimental pavilion roofscape,” explicitly indicating their intention to use the outdoor roof deck to support enclosed, occupiable spaces that would constitute a fifth story.

Pavilions, even if temporary (i.e., “erected for a period of less than 180 days”), still need to follow the requirements outlined in Section 3103, including conforming “to the structural strength, fire safety, means of egress, accessibility, light, ventilation and sanitary requirements of this code as necessary to ensure public health, safety and general welfare.” In any case, whether “temporary” or exceeding the 180-day time limit, such covered structures would count as part of a fifth-story, since they are *on top of* the roof, and could not possibly be designated as mezzanines *between* the floor and ceiling of the fourth story below, as the definition of a mezzanine in Chapter 2 of the code requires. The current scheme, in fact, contains sprinkler and utility hook-ups *at the roof level* in anticipation of these future enclosed pavilions. For this reason, a designation of the current fifth-story bathrooms, corridor, and elevator as a mezzanine within the fourth story is not only improper on its own merits, but by implicitly suggesting that the intended future roof-top pavilions will also count as fourth-story mezzanines, Cornell is effectively inviting the Ithaca Building Department to acknowledge and agree, in advance, to that noncompliant vision.

Violation #4: Lack of 1-hour fire-rated construction between the atrium and occupied roof.

Relevant code section: 404.6.

Explanation: Section 404.6 (Enclosure of atriums) states: “Atrium spaces shall be separated from adjacent spaces by a 1-hour fire barrier constructed in accordance with Section 707 or a horizontal assembly constructed in accordance with Section 711, or both.” The architects claim that an occupied atrium roof does not count as an “adjacent space” that requires 1-hour separation from the atrium below.

However, even though such a roof occupancy is not a “story,” it is still a “space” and the wording in the code section specifies that the atrium shall be separated from “adjacent spaces,” and not only from adjacent stories. James Harding of the New York State Division of Building Standards and Codes, in an email to me dated Feb. 27, 2019 (Exhibit 3), explains why it is incorrect to consider an occupied roof space as exempt from the atrium separation requirement. He writes: “Section [404.6] provides that the atrium be separated from adjacent spaces ... Though not explicitly stated, space in this context includes any area that may be occupied including the roof as described.”

The architects have also claimed that “in the case of Rand Hall, the variance issued permits Type IIB construction with additional sprinkler protection at the roof steel and deck.” Even if the code variances were still in effect, the 2016 variance that allowed non-fireproofed horizontal transfer girders was only granted with respect to construction classifications and fire-resistance rating requirements for various elements in order to permit non-fireproofed steel in a Type IIB building with A-3 occupancies on a fourth floor. It said nothing about the need to separate the atrium from all adjacent spaces with fire barriers and/or horizontal assemblies, since there were no roof-top occupancies proposed when the variance was granted in 2016. Therefore, it is incorrect to claim that the 2016 variance allows the roof-top occupancy to exist directly above the atrium with no fire separation.

In addition to providing a 1-hour horizontal assembly between the atrium and the roof gallery, the part of the atrium that extends into the fifth story (see Figure 7 below) must also be separated from the adjacent outdoor roof gallery by a 1-hour fire barrier.

Violation #5: Smoke control system does not protect building occupants.

Relevant code section: 909.

Explanation: Section 909.1 requires that the atrium smoke control system “provide a tenable environment for the evacuation or relocation of occupants.” The Atrium Smoke Control Report (Exhibit 5) prepared by GHD, Inc., dated August 7, 2017, and submitted to the City of Ithaca Building Division, *was not updated* to include the building’s occupied roof gallery with 263 occupants who, in the event of a fire, would need to egress directly through the smoke-filled upper levels of the building. This alone is sufficient cause to overturn the determinations made by the City of Ithaca and the DBSC Oversight Unit. Occupants exiting from the roof gallery during a fire event would primarily use Stair B, which is not only unenclosed as it enters the atrium below, but is interrupted by a long horizontal passage on the fourth story—also completely unenclosed—that leads to the continuation of unenclosed Stair B at the opposite end of the building, thereby exposing hundreds of occupants to the smoke that would tend to migrate precisely to this upper-level area. The Atrium Smoke Control Report draws a troubling conclusion about egress from the low-occupancy fourth story: “Fire location 1 represents the worst-case scenario in regards to smoke accumulation ... [T]he smoke layer forms enough to begin descending at approximately 240 seconds. Once the smoke layer develops it descends at an average rate of 0.06 meters per second. At approximately 250 seconds it can be observed that the *tenability limit for the top floor has been reached thus meaning that evacuation from the top floor must be accomplished before 250 seconds*. By comparing the egress times to the smoke layer descent, it can be determined that complete egress can be accomplished prior to the space becoming untenable to occupants.” [Exhibit 5] In other words, the entire viability of the smoke control system is based on the assumption that only 36 occupants are at or above the fourth floor and that these 36 occupants can exit the fourth floor within 250 seconds. However, the Atrium Smoke Control report does not consider the addition of 263 occupants exiting from the roof gallery who also must travel through this fourth floor space in order to reach the continuation of Stair B at the opposite side of the building. These occupants would certainly need substantially more time than the 250 seconds provided by this smoke control system.

The smoke exhaust system not only does *not* “provide a tenable environment” for emergency egress, but actually places occupants attempting to egress from the roof-top gallery directly in the path of toxic smoke and other exhaust products. This happens in two additional ways. First, many of the roof-top atrium smoke hatches are immediately adjacent to the occupied roof-top art gallery (see Figure 2 and Figure 8), so that smoke being exhausted through these hatches could blow directly onto roof-top

occupants. Second, since the atrium extends into the fifth floor (Figure 7), it will act as a primary smoke exhaust vent when the exit door from the roof-top art gallery is opened, even though this door is not labeled, or intended, as an exhaust vent. This smoke control system is entirely passive, with no mechanical exhaust; as a result, art gallery occupants attempting to exit through Exit Stair B will likely encounter toxic smoke emerging from the exit door, which is at the highest point in the atrium and therefore the most likely location for the hot smoke layer to migrate.

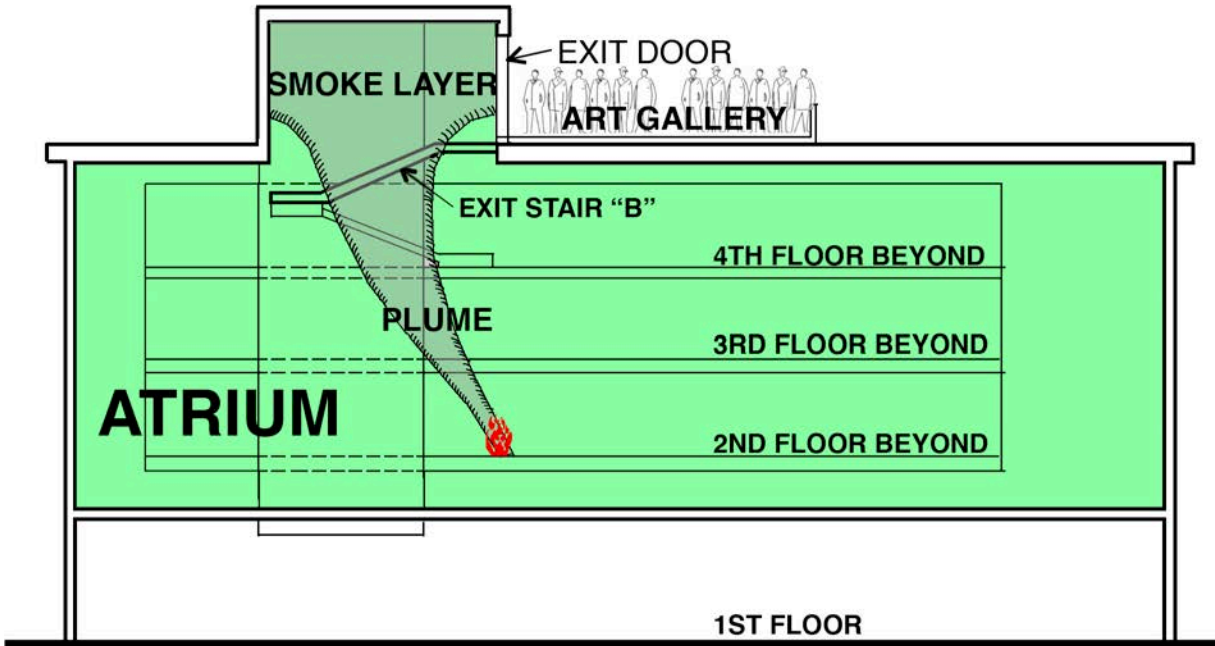


Figure 7. Schematic section through atrium showing how the smoke layer would migrate to the highest point of the atrium, directly in the path of egress from the roof-top art gallery through Exit Stair "B"

As described above, it is also uncertain, *since it wasn't part of the smoke control model*, what the time for evacuation from the roof gallery would be, and how that evacuation would take place with Exit Stair B potentially acting as a smoke exhaust vent at the highest point in the atrium. This is the stair that occupants would be most likely to use, since it is adjacent to the elevator which is the primary mode of entry *into* the roof-top gallery. In any case, it would certainly take far longer for all 263 occupants to egress from the roof-top art gallery than the 250 seconds that defines the "the tenability limit for the [fourth] floor" through which the roof gallery occupants must travel. Exit Stair B is not only unenclosed from the roof down to the second floor, but is also discontinuous, forcing those evacuating from the roof-top gallery using Exit Stair B to travel horizontally *through* the fourth floor—by now with the smoke layer making passage on this level untenable—before somehow continuing down Exit Stair B or D (both unenclosed) or across the fourth-floor bridge through the atrium space to enclosed Exit Stair A.

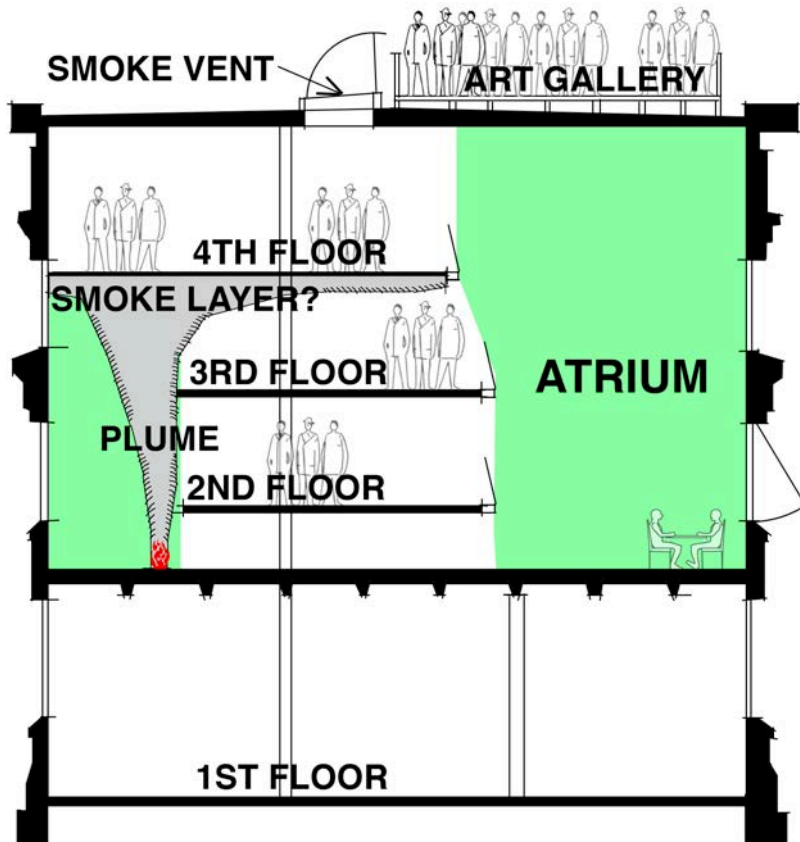


Figure 8. Schematic section through atrium illustrating scenario with fire location at north side of building that was not modeled in the smoke control report prepared for Cornell by GHD

The Atrium Smoke Control Report also does not mention whether the specific building geometry developed for the fire/smoke model takes into account the perforated (i.e., open) floor gratings and six-inch “flue space” under the bookstacks at each floor level. In fact, the requirements of Building Code Section 909.2—that documents must “include sufficient information and detail to adequately describe the elements of the design necessary for the proper implementation of the smoke control systems [and that] these documents shall be accompanied by sufficient information and analysis to demonstrate compliance with these provisions”—are not met, since much crucial information is missing, including the following:

- Description of *fire modeling* software, not just evacuation modeling software.
- Description of building model imported into the fire modeling software (e.g., what floor geometries are assumed; are perforated gratings on the library bookstack floors and floor openings under the bookstacks included in the model, etc.).
- Description of additional fire location scenarios on the *north* side of the atrium.
- Description of the atrium penetrating into the roof-top fifth story and implications for smoke control.
- Description of the occupied roof-top art gallery and egress/smoke calculations related to the roof-top gallery.

A close reading of the consultant’s smoke control report also reveals that, notwithstanding all the missing and incomplete information, a fire at location 3 remains problematic because “there essentially is too much open space with fire sprinklers not located directly in the fire/heat plume to cause sprinkler activation.”

Violation #6: Elevator too small for an ambulance stretcher.

Relevant code section: 3002.4

Explanation: A prior code variance, no longer applicable to as-built library (see “Introductory Comments” above) waived the requirement for an elevator big enough to accommodate ambulance stretchers. Section 3002.4 (Elevator car to accommodate ambulance stretcher) states that “where elevators are provided in buildings four or more stories above, or four or more stories below, grade plane, not fewer than one elevator shall be provided for fire department emergency access to all floors. The elevator car shall be of such a size and arrangement to accommodate an ambulance stretcher 24 inches by 84 inches (610 mm by 21345 mm) with not less than 5-inch (127 mm) radius corners, in the horizontal, open position...” The architects argued that this provision should be waived on the basis of a fourth-floor plan that had only about 36 occupants. With the addition of a roof-top art gallery, there are now *hundreds of additional occupants* above the fourth story, information that was not part of the 2016 variance request. The correct occupancy of the roof-top art gallery is *not* 131 or 93, as claimed, although this number is high enough to invalidate the argument made for a waiver of the ambulance stretcher code requirement. As stated above in Violation #2, the real occupancy of the art gallery is 263, based on an actual area of 1,315 square feet and an occupant load factor of 5. Thus, there are *299 occupants on the fourth-story or higher*, rather than the 36 occupants in prior versions of this project. Emergency medical technicians would therefore need to carry any injured or disabled occupant (i.e., any of the 263 occupants on the roof-top gallery) down four flights of stairs, putting all such occupants in danger while simultaneously violating the clear language in the New York State Building Code that is designed to protect health, safety and the general welfare.

Violation #7: Allowable story height exceeded for library occupancy without Type I construction.

Relevant code section: 504.4, Table 601.

Explanation: Without recourse to superseded variances, no longer applicable because the current building design is substantially different from prior designs for which variances were granted, the allowable height for an A-3 library occupancy in a sprinklered Type VB building is 2 stories (Figure 9). The current building, with new enclosed spaces on the roof, counts as a 5-story building (Figure 5) and so is noncompliant. Even if wood-framed Sibley Hall is entirely eliminated from consideration, the remaining hypothetical Milstein-Rand combined building, with Type IIB (non-fireproofed steel) construction, has an allowable height of 3 stories (Figure 9) and so remains noncompliant. Even if Rand Hall is considered to be a *separate sprinklered building* with Type IIB construction, the allowable height is still 3 stories and the building remains noncompliant. Even if the roof-top enclosed space is called a “mezzanine” (but see Violation #3 above) and Rand Hall is considered to be a separate sprinklered building, it would still be noncompliant, since the allowable height for a sprinklered Type IIB building is only 3 stories. Furthermore, the superseded code variances that permitted the building height to exceed 2 stories in 2013, and then to exceed 3 stories in 2015, were based on proposals that did not include a roof-top art gallery with hundreds of occupants (whether or not this level is improperly designated as a mezzanine).

**TABLE 504.4^{a, b}
ALLOWABLE NUMBER OF STORIES ABOVE GRADE PLANE**

OCCUPANCY CLASSIFICATION	TYPE OF CONSTRUCTION									
	SEE FOOTNOTES	TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
		A	B	A	B	A	B	HT	A	B
A-3	NS	UL	11	3	2	3	2	3	2	1
	S	UL	12	4	3	4	3	4	3	2

Figure 9. Excerpt from Table 504.4, 2015 New York State Building Code, showing allowable number of stories for A-3 (library) occupancies.

Examining Table 504.4 (Figure 9), it becomes clear why the architects have attempted to frame this 5-story building as a 4-story building. Even if they added a fire wall separating Rand from Milstein Hall *and* added 1-hour fireproofing to every element of the “primary structural frame” and to all of the “floor construction and associated secondary members”, the resulting Type IIA construction would still be noncompliant, since the allowable number of stories for an A-3 occupancy with Type IIA construction is only four. A five-story building with library occupancy *requires Type I construction*, and therefore requires 2-hour fire-ratings for the structural frame and floor construction (see Table 601, reproduced in Figure 10). The current proposal doesn’t even provide 1-hour fire-ratings for all of the structural frame and floor construction, nor does it provide a fire wall between Rand and Milstein Hall. Only by building a fire wall between Rand and Milstein Hall *and* upgrading the construction of Rand Hall to Type I can Rand Hall be considered a separate five-story building conforming to the requirements in Table 504.4.

TABLE 601
FIRE-RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS (HOURS)

BUILDING ELEMENT	TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
	A	B	A	B	A	B	HT	A	B
Primary structural frame ^f (see Section 202)	3 ^a	2 ^a	1	0	1	0	HT	1	0
Bearing walls									
Exterior ^{e, f}	3	2	1	0	2	2	2	1	0
Interior	3 ^a	2 ^a	1	0	1	0	1/HT	1	0
Nonbearing walls and partitions	See Table 602								
Exterior	See Table 602								
Nonbearing walls and partitions							See Section 602.4.6		
Interior ^d	0	0	0	0	0	0		0	0
Floor construction and associated secondary members (see Section 202)	2	2	1	0	1	0	HT	1	0
Roof construction and associated secondary members (see Section 202)	1 ^{1/2} ^b	1 ^{b, c}	1 ^{b, c}	0 ^c	1 ^{b, c}	0	HT	1 ^{b, c}	0

Figure 10. Table 601 shows that A-3 library occupancies in 5- or 6-story buildings requiring Type I construction need 2-hour fire-resistance ratings on structural frame and floor construction.

Violation #8: Allowable floor area is exceeded at the second story.

Relevant code sections: 506.2; 506.3.

Explanation: Without recourse to superseded variances, no longer applicable because the current building design is substantially different from prior designs for which variances were granted, Rand-Milstein-Sibley Hall is a single building with Type VB construction and an actual second-floor area of 41,993 square feet. Assuming a frontage factor of 0.57 (per Section 506.3), the allowable single-floor area for a sprinklered Type VB building governed by Occupancy Group A-3 is $18,000 + 0.57(6,000) = 21,420$ square feet, per Table 506.2 (Figure 11). Therefore, the allowable area is exceeded and the proposal is noncompliant. Even if wood-framed Sibley Hall is entirely eliminated from consideration, the remaining hypothetical Milstein-Rand combined building still has an actual second-floor area of $25,642 + 8,751 = 34,393$ square feet. Assuming the same frontage factor, and even “upgrading” the construction type to IIB (non-fireproofed steel frame), the allowable per-floor area of $28,500 + 0.57(9,500) = 33,915$ square feet is still exceeded by the actual area and so even this hypothetical combined building with reduced size and increased fire resistance remains noncompliant. Only by building a fire wall between Rand and Milstein

Hall can Rand Hall be considered a separate building with floor areas conforming to the requirements in Table 506.2.

TABLE 506.2^{a, b}
ALLOWABLE AREA FACTOR (A_t = NS, S1, S13R, or SM, as applicable) IN SQUARE FEET

OCCUPANCY CLASSIFICATION	SEE FOOTNOTES	TYPE OF CONSTRUCTION								
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
		A	B	A	B	A	B	HT	A	B
A-3	NS	UL	UL	15,500	9,500	14,000	9,500	15,000	11,500	6,000
	S1	UL	UL	62,000	38,000	56,000	38,000	60,000	46,000	24,000
	SM	UL	UL	46,500	28,500	42,000	28,500	45,000	34,500	18,000

Figure 11. Excerpt from Table 506.2, 2015 New York State Building Code, showing allowable single-floor area (excluding the frontage factor) for A-3 (library) occupancies.

Violation #9: Vertical openings in bookstack floors.

Relevant code sections: 712.

Explanation: Section 712 permits vertical openings in floor-ceiling assemblies only when they are “in accordance with one of the protection methods in Sections 712.1.1 through 712.1.16.” The three bookstack stories all have openings in their floor-ceiling assemblies, not only the “6-inch flues” below each bookstack, but also throughout the floor-ceiling construction. These levels do not provide assemblies that are “continuous without vertical openings” as required by Section 711.2.2, but rather consist of perforated (open) metal floor panels made with metal bars spaced one half inch apart (Figure 12). Section 712.1.9 (Two-story openings) states that “a vertical opening that is not used as one of the applications listed in this section shall be permitted if the opening ... does not connect more than two stories...” The bookstack floor perforations and larger openings under the bookstacks connect more than two stories and are therefore in violation of this section.

The fact that three bookstack stories are open to an atrium does not allow them to violate the requirements in Section 712 regulating vertical openings *between* stories. In fact, the whole point of fire-safe atrium design is to direct smoke—originating in an adjacent story that is open to the atrium—into the atrium space so that it can rise upwards through the atrium space and be safely exhausted at the atrium roof. The Rand Hall design, in contrast, does exactly the opposite: by having perforated, grated metal floors, in violation of Section 712, smoke will move literally *through the occupied floors*—which also serve as part of the exit access system—instead of directing smoke into the atrium where it can be safely exhausted. Yet even that simple requirement—to safely exhaust smoke through the atrium roof—is compromised in this building by placing occupied spaces on the roof immediately adjacent to the atrium smoke exhausts (see Violation #5).



Figure 12. Perforated floor panels violate basic principles of compartmentation by connecting more than two stories; larger “6-inch flue” openings also appear in each story under the bookstacks. Photo by Jonathan Ochshorn.