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## “The Bulk of the Best Visible Things’’: Judd’s Review of Twentieth Century Engineering at the Museum of Modern Art

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“Dams, roads, bridges, tunnels, storage buildings and various other useful structures comprise the bulk of the best visible things made in this century,” wrote Donald Judd in October 1964.<sup>1</sup> I was intrigued by Judd’s unequivocal statement that opened his review of the exhibition *Twentieth Century Engineering* that he had seen at New York’s Museum of Modern Art (MoMA).<sup>2</sup> The exhibition, curated by Arthur Drexler, director of the museum’s Department of Architecture and Design, featured photographs of nearly two hundred innovative structures designed during the previous half century. A number of exemplary images accompanied Judd’s review, including half-page reproductions of the geodesic dome designed by Buckminster Fuller for the Union Tank Car Company in Baton Rouge, Louisiana, and the barrel-vaulted Gold-Zack Plant in Gossau, Switzerland (fig. 1). Judd thought the former an “interesting building” and listed the latter among his favorite examples, which also included the Kitt Peak solar observatory tower in Arizona, the cooling tower in Carling, France (fig. 2), and the Theodor Heuss Bridge in Düsseldorf, Germany (fig. 3). He concluded his review stating that “most of the structures are spectacular.”<sup>3</sup>

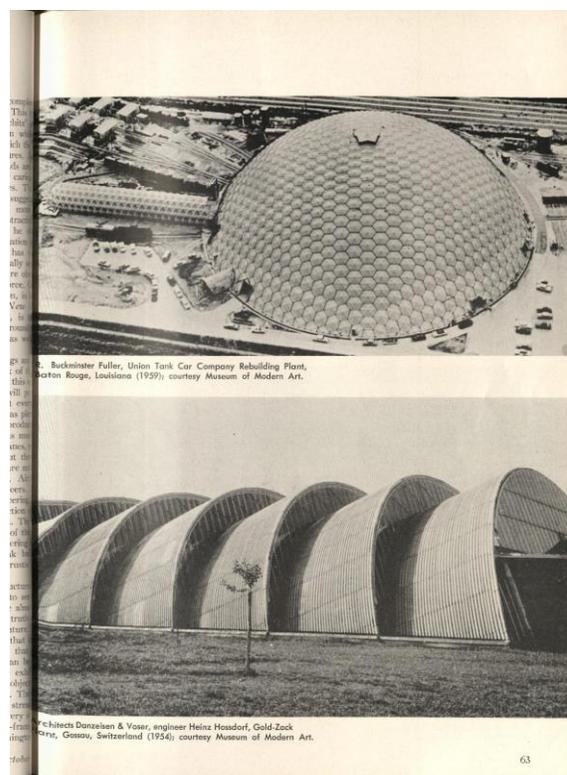


Fig. 1. Illustrations from Donald Judd, “Month in Review,” *Arts Magazine* 39, no. 1 (October 1964): 63, showing R. Buckminster Fuller, Union Tank Car Company Rebuilding Plant, Baton Rouge, LA, 1959 (top), and Danzeisen & Voser (architects), Heinz Hassdorf (engineer), Gold-Zack Plant, Gossau, Switzerland, 1954 (bottom)

Did Judd think of engineering structures as aesthetically more successful than works of art? What was the premise of the exhibition, and what objects did it feature? I bought a used copy of the exhibition catalogue, searched the MoMA exhibition records online, and then traveled to New York to comb through exhibition folders, hoping to find some answers. This article will address the exhibition curated by Drexler and analyze Judd’s review, proposing

that the structures and ideas presented in the exhibition became an important touchstone for Judd in the development of his art. While critics and scholars have emphasized the crucial role of industrial techniques and materials in the development of Judd's Minimal art, they have generally avoided assessing his work within the sociocultural context of engineering.<sup>4</sup>



Figs. 2, 3. Left: Entreprises de Génie Civil de Lens, Cooling tower, Carling, France, 1949. Photograph courtesy Museum of Modern Art, NY, digital image ©MoMA/Licensed by SCALA/Art Resource, NY. Right: Franz Schreier (Department of Bridge Construction, City of Düsseldorf), Fritz Leonhardt, Karl Schaechterle, and Louis Wintergerst (engineers), and Friedrich Tamms (architect), Theodor Heuss Bridge, Düsseldorf, Germany, 1957. Photograph courtesy Museum of Modern Art, NY, digital image ©MoMA/ Licensed by SCALA/Art Resource, NY

The exhibition *Twentieth Century Engineering* at MoMA has itself received scant scholarly attention, even though it was highly praised and popular at the time.<sup>5</sup> This neglect raises broader questions regarding the relationship between the fine and applied arts, the humanities and sciences, and the dearth of cross-disciplinary scholarship. The exhibition may be of renewed interest today because it exemplifies the intersection of various media and subfields, including engineering, sculpture, the built environment, exhibition design, and photography. It questions the reclusive trajectories of individual disciplines and their concomitant methodologies, and it points more specifically to a blind spot within historical considerations of Minimal art. Reexamining Judd's interest in *Twentieth Century Engineering*, and the impact it had on his practice, provides a framework to place his predilection for Minimalist forms within a larger context of contemporary visual and material culture. In his work, Judd employed industrial materials and techniques typical for twentieth-century engineering feats, but he also drew upon their social and cultural significance that played into the conception of the United States as a modern, progressive nation.<sup>6</sup>

### The MoMA Exhibition

For the exhibition *Twentieth Century Engineering*, Drexler selected 193 projects from across the world, which he organized according to eight functional types, focusing on dams in the first room, followed by spillways and tunnels, earthworks and canals, towers, domes and vaults, and concluding with bridges, viaducts, and roads.<sup>7</sup> Informative panels for each project were displayed around the perimeter walls of the gallery space (fig. 4). They included photographic images, plans, and sections, and specified details, such as location, names of engineers and architects, and structural and material facts highlighting innovative technical achievements. In addition, Drexler chose around sixty of what he considered the most outstanding projects, which he reproduced as large individual photographs that were hung on the central walls. There were ten photo murals among them, such as the enormous image of the Mohammad Reza Shah Pahlavi Dam, today known as the Dez Dam, which transported the monumental size typical of engineering feats into the gallery space (fig. 5). The large photographic pictures emphasized the visual appeal of the projects, so that the general public could appreciate them without the prerequisite of technical knowledge. The MoMA press release posited the installation as innovative within the museum’s history of exhibition design, explaining that “in effect two simultaneous exhibitions are on view; one for visitors with a general interest in the subject and one for specialists.”<sup>8</sup>



Figs. 4, 5. Left: Installation view of *Twentieth Century Engineering*, Museum of Modern Art, NY, 1964, showing room with bridges. Photograph by George Cserna, courtesy Museum of Modern Art, NY, digital image ©MoMA/Licensed by SCALA/Art Resource, NY. Right: Photomural of Mohammad Reza Shah Pahlavi Dam (Dez Dam), Iran, 1963, installed in *Twentieth Century Engineering*, Museum of Modern Art, NY, 1964, courtesy Museum of Modern Art, NY, digital image ©MoMA.

Drexler skillfully used the large photographic images to frame engineering structures as aesthetic objects. Presented in the contemplative atmosphere of the museum, removed from their functional context in the built environment, visitors could assess a dam or a bridge as a work of art, evaluating their visual forms, proportions, and compositions. In the introductory wall text preserved in the MoMA archive, Drexler articulated his aesthetic validation of the exhibited structures with terms appropriate for works of art. “Engineering,” he wrote, “produces individual masterpieces, as beautiful, for example, as the Santa Luzia Dam in Portugal, or the Theodor Heuss Bridge in Dusseldorf” [sic].<sup>9</sup> Drexler leveled the hierarchy between the fine arts and engineering, dispelling the perception that engineering is “an art in the craft sense only.”<sup>10</sup> Accordingly, he maintained that engineers

not only made rational but also individual, subjective choices. He elaborated by stating, "No matter how rigorously objective an engineer may be, he must still make some decisions independently of objective, demonstrable fact."<sup>11</sup>

In addition to arguing for the aesthetic, subjective quality of engineering feats, Drexler emphasized their significant roles for the wellbeing of society. "The problems engineers solve," he explained in the wall text, "cut across economics, politics, art and science, affecting the lives of all men—on this planet now and eventually somewhere else as well."<sup>12</sup> While Drexler did not explicitly state the social benefits of engineering feats, their impacts were implicit in their functions. The Pahlavi Dam generated hydroelectric power for thousands of Iranians and supplied irrigation water for the surrounding areas; Fuller's geodesic domes provided a structural system to quickly and economically build open and expansive spaces that could be adapted for a wide variety of purposes; and the Kitt Peak solar observatory tower, the most advanced telescope of the time, enabled scientists to explore the physical and chemical properties of the sun. Drexler understood engineering as a method of solving problems. It was, therefore, in his words, "among the most rewarding of the arts not only because it produces individual masterpieces, . . . but also because it is an art grounded in social responsibility."<sup>13</sup>

Despite his positive assessment of engineering structures, Drexler expressed awareness of concomitant problems. In his three-page essay for the catalogue, he chided engineers and architects for favoring monumental forms that disregard human needs. He stated that "it is this conflict between the traditional scale of houses and even cities, and the new scale of industrial buildings, highways, and dams that we have not yet resolved."<sup>14</sup> Giving the example of the cooling tower in Carling, France, with a height of 279 feet, Drexler pointed to the discrepancy of scale between the monumental tower and the houses seen in the photograph's background (fig. 2). He opined: "Small houses nearby, unhappily dwarfed, must finally seem to us a petty distraction, and we may imagine the landscape's equilibrium restored by removal of the houses rather than the towers."<sup>15</sup> Drexler's confounding suggestion to remove the homes of people—even if just as a hypothetical—exposes his predilection for aesthetic-formal over social and human concerns. Indeed, he thought, "Even engineering's worst offenses—superhighways, for example—are often intrinsically beautiful and suggest answers to some of the problems they now help to perpetuate." He concluded his essay suggesting that "today we lack the political and economic apparatus that would facilitate a truly responsible use of our technology. But it may be that a more skillful and humane use of engineering depends on a more knowledgeable response to its poetry."<sup>16</sup> Drexler pointed to the crucial role of industrial design in shaping the environment of people, but his assessment remained aloof from lived experiences, exemplifying what Felicity Scott criticized in her 2007 book *Architecture or Techno-Utopia* as a "problematic aestheticization of technology."<sup>17</sup>

How did the public respond to Drexler's exhibition and his proposition to solve social problems aesthetically? I searched for contemporary reviews to find that the press was favorably inclined. Architectural critic Ada Louise Huxtable, in a review in the *New York Times*, pronounced the exhibition "one of the most spectacular and significant shows in [the museum's] 35-year history."<sup>18</sup> In a second review she confirmed the importance of this "landmark exhibition," stating that "the museum makes it clear once and for all that 20th-century engineering is producing 20th-century monuments of lasting significance, and that the art of construction is the greatest art of our time."<sup>19</sup> Journals such as *Architectural Record*, *International Science and Technology*, and *Engineering News-Record* all lauded

the exhibition and featured numerous images. The review in *Industrial Design* complained that the exhibition was short on technical data, but the author was nonetheless impressed by the engineering feats represented.<sup>20</sup> After its successful reception in New York, the exhibition traveled to more than forty national and international venues, including the Massachusetts Institute of Technology, Flint Institute of Arts in Michigan, Portland Museum of Art (Maine), California Museum of Science and Industry in Los Angeles (now the California Science Center), and numerous locations in Europe.<sup>21</sup>

### Judd's Review

Judd also praised the exhibition, hailing the presented engineering structures as “some of the best in the world,” but he voiced a number of reservations.<sup>22</sup> As part of the Month in Review section that he regularly wrote for *Arts Magazine* during the early 1960s, his text addressed a contemporary art audience. How did Judd frame the relationship between art and engineering, and could the innovative examples that were featured in the exhibition provide models for contemporary artists? Judd recognized that engineering structures had enormous visual impact on the general public due to their large size and ubiquity. Comparing engineering structures to art, he assessed that the latter category of objects “is small in size and not as plentiful.”<sup>23</sup> While a small percentage of the population visited galleries and museums, Americans saw engineering structures on a daily basis without making a concerted effort; on their way to work, people navigated highway interchanges, drove over bridges, and passed large towers.<sup>24</sup>

Judd took note of the public impact of engineering but was also intrigued by the design process. He posited the engineer's attitude as producing a specifically contemporary expression. He explained: “It is hard not to see these projects as the last word in science. They are almost the only visible science and so are apparently the truth of the present and the beginning of that of the future.”<sup>25</sup> Dams, roads, and bridges were designed according to physical principles, such as gravity and weight, and the properties of materials—their densities and loadbearing capacities. As scientists made discoveries relating to new building methods and materials, these were incorporated into designs, producing larger and more durable structures capable of solving the issues facing modern society more efficiently and economically. Judd's notion of a “visible science” suggested that new materials and technical developments determined the forms of the best engineering structures. These objective and rational processes imbued the practice of industrial design with a contemporary, avant-garde quality that closely linked scientific and social progress with new aesthetic forms.

Like Drexler, Judd also emphasized the role of subjective preferences in engineering, stating that it is “not as objective as it appears; it's not all science; it's partly art.”<sup>26</sup> Judd supported this assessment by comparing different bridges showcased in *Twentieth Century Engineering*: “Maillart designs streamlined Arpish bridges; the new German bridges are very straight and angular.” While acknowledging that some of the design choices were due to local conditions—Robert Maillart's Schwandbach Bridge (1933) crossed a gorge in the Swiss mountains, whereas Friedrich Tamms built the Theodor Heuss Bridge for the flat banks of the Rhine River (fig. 3)—Judd concluded that the different appearances of these bridges indicated that engineers made individual aesthetic choices.

Judd appreciated the work of engineers, but he took care not to completely blur the boundary between art and non-art. He distinguished engineering structures from works of art in that, for the former, “their utility seems much more important. Their use is a fact, a solution to some problem, and this comes back to the adamantine factuality of science, even applied science.” He argued that art and non-art should not be separated, but to “make the distinctions ones of degree.”<sup>27</sup> In contrast to Drexler, who was intent on upending the hierarchy between fine art and engineering, Judd retained a minimal distinction. Directly after asserting that engineering structures “comprise the bulk of the best visible things” at the beginning of his review, he qualified his statement, explaining, “As long as this opinion is cast as a general statement, more people will probably agree to it than to any other statement about everything that can be seen.”<sup>28</sup> When assessing an engineering structure in specific, rather than general terms, or within a local situation—consider the example of the cooling tower in Carling, France—opinions as to the aesthetic and sociocultural value of a structure will differ drastically.

On a general, abstract level, Judd appreciated a design process that followed a functional ethos, resulting in technologically advanced structures that expressed social and aesthetic advancement. For example, he complained in his review that “none of the plain beauty of well-made things has ever gotten into New York’s housing projects.” He extended the value of such principles beyond the fields of engineering and architecture, to industrial design, exhibition design, and fine art. Judd opined that “even fairly well-designed things like some cars and buildings are too elegant, though genuinely so. . . . Excessive though genuine elegance also marred this exhibition, which, like most Museum of Modern Art shows, was overly dramatic, somewhat pretentious.”<sup>29</sup> By featuring functional engineering structures in one of the most prestigious contemporary art museums, apart from their gritty, quotidian, social context, *Twentieth Century Engineering* aestheticized its content.

### Minimal Art

Despite his complaints about the exhibition design, the ideas presented in *Twentieth Century Engineering* resonated with Judd’s thinking about avant-garde art. Did the exhibition impact the development of his Minimalist work? Judd initially built his box-like artworks with wood that he painted in cadmium red, incorporating an occasional asphalt pipe or metal grid. In early 1964, he started commissioning Bernstein Brothers Sheet Metal Specialties, a family-run shop around the corner from his studio at 53 East Nineteenth Street in Manhattan, to fabricate his works with galvanized iron.<sup>30</sup> While closely associated with industrialization, by the mid-1960s, galvanized iron was all but a novel material. After seeing *Twentieth Century Engineering*, Judd started using more contemporary materials, in particular steel and Plexiglas, as, for example, in his so-called turnbuckle boxes. For the third version in that series, which he completed in early 1965, Judd used stainless steel and transparent Plexiglas of a bright pink fluorescent color, conveying scientific innovation and progress through new industrial materials as well as through their shiny, visual qualities.<sup>31</sup> He was making science visible.

Judd also appropriated a construction technique that he encountered in *Twentieth Century Engineering*. His turnbuckle box is held together by parallel wires that run lengthwise from one short end of the box to the other. The wires have a turnbuckle mechanism that can be tightened to pull the steel plates inward, while the Plexiglas side panels exert a force in the opposite direction, giving the work its stability.<sup>32</sup> The collections manager and art handlers

at the Rachofsky Collection in Dallas, where one of Judd’s turnbuckle boxes is located, assembled the artwork for me to demonstrate this mechanism (fig. 6). The new cable-stayed bridges, such as the Theodor Heuss Bridge, were similarly based on the technique of force and counterforce. In contrast to suspension bridges, these new bridges did not require the main cables to be anchored to the riverbanks. Instead, the deck was suspended from the cable stretched over vertical steel pylons, which provided the counterforce to the gravitational pull of the deck. Engineers have used the technique of force and counterforce throughout history, but the new cable-stayed bridges relied on stronger and more lightweight materials so that the technique could be applied on such large scale.



Fig. 6. Collections manager and art handlers at The Rachofsky Collection, Dallas, TX, installing Donald Judd’s *Untitled* (DSS 83), 1966, made with yellow fluorescent Plexiglas, stainless steel, and steel cables, measuring 20 x 48 x 34 in. Photograph by author, 2016

It seems that Judd was intrigued by the efficiency of the technique, as well as the resulting minimal design. In his review, he mentioned the Theodor Heuss Bridge twice—first when comparing various bridges to assert that engineers make aesthetic choices, and then in the list of his favorite structures near the end of the text. His predilection for the cable-stayed bridge is further demonstrated in the 1975 reprint of the review in his *Complete Writings 1959–1975*, where he chose to include an image of the Theodor Heuss Bridge, along with an image of the Severin Bridge, another cable-stayed bridge that crosses the Rhine near Cologne. This was a rare and significant instance, since otherwise most articles contained in *Complete Writings* featured the same number of, if not fewer, images than appeared in the original publications.<sup>33</sup>

In addition to Judd, other artists and critics took inspiration from *Twentieth Century Engineering*. Lucy Lippard was a central figure who theorized Minimal art, and she may serve as a case in point. In 1964, when the exhibition was on view at MoMA, she worked part-time in the museum library. In a 1991 interview with James Meyer, Lippard recounted that the *Primary Structures* exhibition, which came to mark the first institutional group show of Minimal art, was developed in conversation between her and Kynaston McShine in early 1965, just a few months after the engineering exhibition. At the time, McShine was

curator at MoMA, and when offered a position at New York's Jewish Museum, he took the exhibition with him, showing it there in April 1966.<sup>34</sup> Lippard did not receive public credit for her involvement in *Primary Structures*, but the following year she was asked to write an essay for the catalogue accompanying *American Sculpture of the Sixties* at the Los Angeles County Museum of Art, in which she defined "primary structure" as "a non-sculptural sculpture, that is, a sculpture which rejects the history of sculpture as precedent in favor of the history of painting, and at times, of architecture and engineering."<sup>35</sup> Scholars conventionally have positioned Minimal art within the history of painting and have made formal comparisons to architecture and engineering, but they have neglected broader sociocultural implications. Judd's review of *Twentieth Century Engineering* proves generative ground for recuperating the cross-disciplinary interests that animated avant-garde art practices during the 1960s.

## Notes

<sup>1</sup> Donald Judd, "Month in Review," *Arts Magazine* 39, no. 1 (October 1964): 62; reprinted in Donald Judd, *Complete Writings 1959–1975*, ed. Kasper Koenig (Halifax: The Press of the Nova Scotia College of Art and Design in association with New York University Press, 1975), 137.

<sup>2</sup> *Twentieth Century Engineering*, June 30–September 13, 1964, exh. cat. (New York: Museum of Modern Art, 1964).

<sup>3</sup> Judd, "Month in Review," 64.

<sup>4</sup> A notable exception is Charles Reeve, "Cold Metal: Donald Judd's Hidden Historicity," *Art History* 15, no. 4 (December 1992): 486–504. The essays in the catalogue accompanying the forthcoming retrospective at MoMA were not yet available to the author. See Ann Temkin, ed., *Judd* (New York: Museum of Modern Art, 2020).

<sup>5</sup> Karen Stein is the only scholar known to me who has analyzed the *Twentieth Century Engineering* exhibition; she does so in the context of Judd's architectural theory and his writing style. See Karen Stein, "The Plain Beauty of Well-Made Things," in *The Writings of Donald Judd* (Marfa, TX: Chinati Foundation, 2009), 119–36. Mentions of the exhibition are also found in Alexander R. Bigman, "Architecture and Objecthood: Donald Judd's Renaissance Imaginary," *Oxford Art Journal* 40, no. 2 (August 2017): 283; and Felicity D. Scott, *Architecture or Techno-Utopia: Politics after Modernism* (Cambridge, MA: MIT Press, 2007), 82.

<sup>6</sup> For other studies that place Judd's work within contemporary sociocultural contexts, see Joshua Shannon, *The Disappearance of Objects: New York Art and the Rise of the Postmodern City* (New Haven: Yale University Press, 2009), 149–86; Robert Slifkin, "Judd's Credibility Gap," *American Art* 25, no. 2 (Summer 2011): 56–75; and Susanneh Bieber, "Going Back to Kansas City: The Origins of Judd's Minimal Art," *American Art* 33, no. 1 (Spring 2019): 92–111.

<sup>7</sup> "20th Century Engineering," press release no. 32, Museum of Modern Art, Tuesday, June 30, 1964, Museum Archives, Museum of Modern Art, New York (hereafter MoMA Archives), 1.

<sup>8</sup> "20th Century Engineering," press release no. 32, 2.

<sup>9</sup> "20th Century Engineering," main wall label, MoMA Exhibition Records, 744.6, MoMA Archives.

<sup>10</sup> "20th Century Engineering," MoMA press release no. 32, 2.

<sup>11</sup> "20th Century Engineering," MoMA press release no. 32, 3.

<sup>12</sup> "20th Century Engineering," MoMA press release no. 32, 3.

<sup>13</sup> "20th Century Engineering," MoMA press release no. 32, 3.

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- <sup>14</sup> Arthur Drexler, "Introduction," in *Twentieth Century Engineering* (New York: Museum of Modern Art, 1964), n.p.
- <sup>15</sup> Drexler, "Introduction." Drexler also asserted that the shape of the Carling tower was not appropriate for an auditorium, criticizing Le Corbusier's Assembly Hall at Chandigarh, India, which referenced not only the shape of such an industrial tower, made of reinforced concrete, but also its scale and material.
- <sup>16</sup> Drexler, "Introduction."
- <sup>17</sup> Scott, *Architecture or Techno-Utopia*, 82.
- <sup>18</sup> Ada Louise Huxtable, "Monumental Works of Man Are Depicted in Show at the New Wings Galleries: Modern Museum Assays Engineering," *New York Times*, June 30, 1964, 35.
- <sup>19</sup> Ada Louise Huxtable, "Dams, Domes and the Battle of Styles," *New York Times*, July 5, 1964, X 15.
- <sup>20</sup> "Significant Forms at Engineering Scale," *Architectural Record* 136 (September 1964): 16–17; Robert Colborn, "Review," *International Science and Technology* 33 (September 1964): 96; "Engineering Works Go on Show as Modern Art," *Engineering News-Record* 173 (July 23, 1964): 28–29; and "News: Disappointing Exhibit," *Industrial Design* 11, no. 7 (July 1964): 26.
- <sup>21</sup> The show traveled until 1974. See Museum of Modern Art exhibitions 744.14, 15, and 418. MoMA Archives.
- <sup>22</sup> Judd, "Month in Review," 62.
- <sup>23</sup> Judd, "Month in Review," 62.
- <sup>24</sup> Consumer objects rivaled the visual impact of engineering structures, but Judd quickly dismissed them as rarely being designed well. Tools fared a bit better in Judd's opinion, since they were made by engineers. Judd, "Month in Review," 62. See also Jennifer Jane Marshall, *Machine Art, 1934* (Chicago: University of Chicago Press, 2012).
- <sup>25</sup> Judd, "Month in Review," 62.
- <sup>26</sup> Judd, "Month in Review," 62.
- <sup>27</sup> Judd, "Month in Review," 64.
- <sup>28</sup> Judd, "Month in Review," 62.
- <sup>29</sup> Judd, "Month in Review," 64.
- <sup>30</sup> Shannon, *Disappearance of Objects*, 154–161, and Jeffrey Kopie, "Chronology," in *Donald Judd*, ed. Nicholas Serota (London: Tate, 2004), 250.
- <sup>31</sup> For the exact dates of fabrication, see entries for DSS 53, 54, and 58 in *Donald Judd: Catalogue Raisonné of Paintings, Objects and Wood Blocks, 1960–1974*, ed. Brydon Smith (Ottawa: National Gallery of Canada, 1975), 120, 121, and 124.
- <sup>32</sup> Bigman also links this technique to the cable-stayed bridges; see Bigman, "Architecture and Objecthood," 284.
- <sup>33</sup> Judd, "Month in Review," in *Complete Writings*, 138.
- <sup>34</sup> Lucy Lippard interviewed by James Meyer, December 2, 1991, and confirmed in interview with McShine, in James Meyer, *Minimalism: Art and Polemics in the Sixties* (New Haven: Yale University Press, 2001), 22, 273 (fn.25). See also Lee Sorensen, ed., "Lippard, Lucy R.," *Dictionary of Art Historians*, retrieved March 8, 2019, <http://www.arthistorians.info/lippardl>.
- <sup>35</sup> Lucy R. Lippard, "As Painting is to Sculpture: A Changing Ratio," in *American Sculpture of the Sixties*, ed. Maurice Tuchman (Los Angeles: Los Angeles County Museum, 1967), 31. See also my forthcoming article, "Technology, Engineering, and Feminism: The Hidden Depths of Judy Chicago's Minimal Art," to be published in *Art Journal* in spring 2021.