



EXTERIOR VIEW

# PLIS / REPLIS

Exhibition: Pommery #9 - La Fabrique Sonore, (2011.09 - 2012.04)  
 Location: Domaine Pommery, Reims, France  
 Site area: 189 m<sup>2</sup> ( Height: 13 m )  
 Material(s): Alupanel (Aluminium Composite Panel)

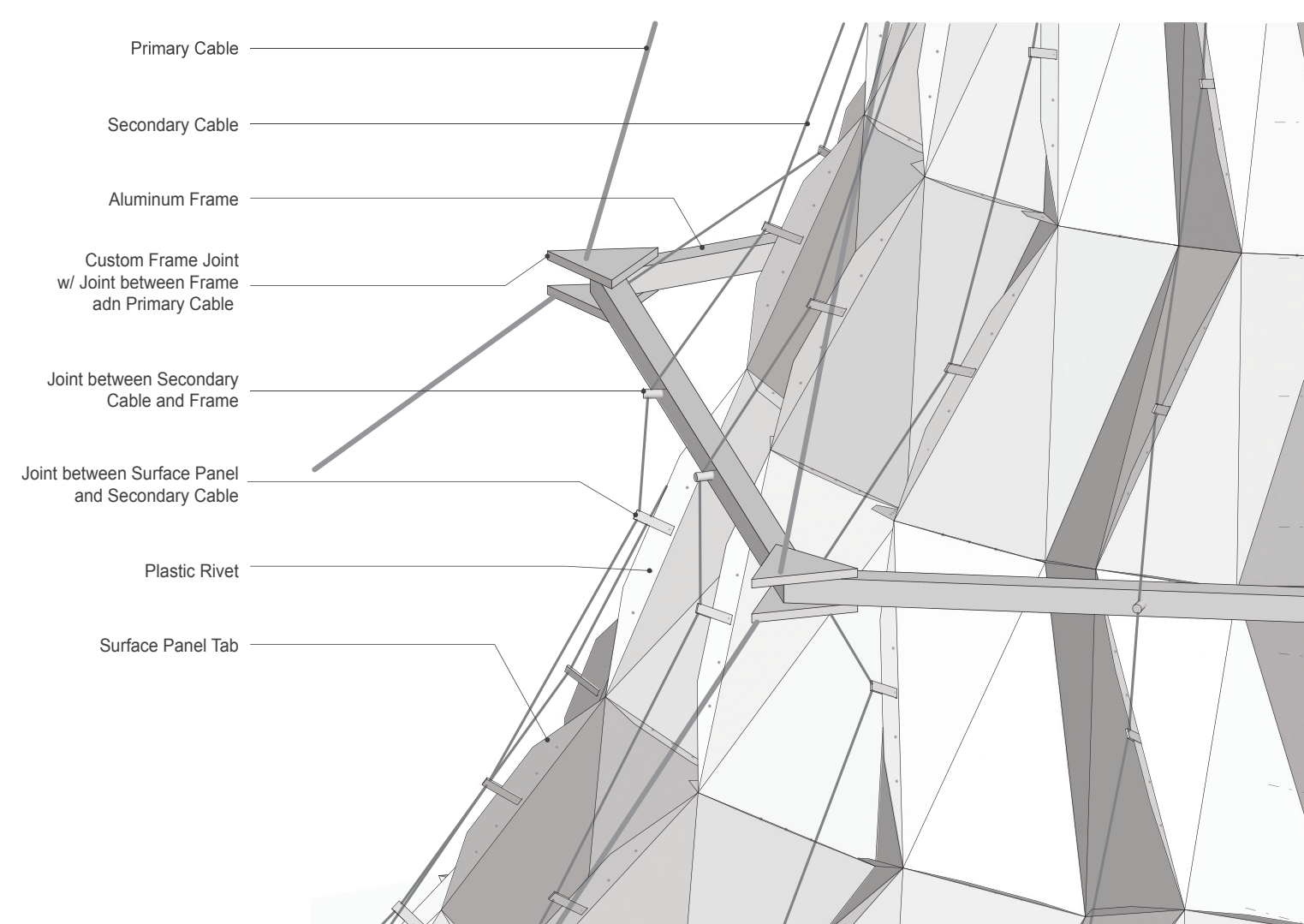
ACADIA 2012 : Synthetic Digital Ecologies  
 < Energy, form, structures, performance modeling, simulation and prototyping >

"The Baroque refers not to an essence but rather to an operative function, to a trait. It endlessly produces folds. [...] Moving along two infinities, as if infinity were composed of two stages or floors: the pleats of matter and the folds in the soul. [...] the lower floor, pierced with windows, and the upper floor, blind, and closed, but on the other hand resonating as if it were a musical salon translating the visible movements below into sounds up above."

- Gilles Deleuze from "The Fold: Leibniz and the Baroque", 1992 ["Le pli: Leibniz et le Baroque", 1988]

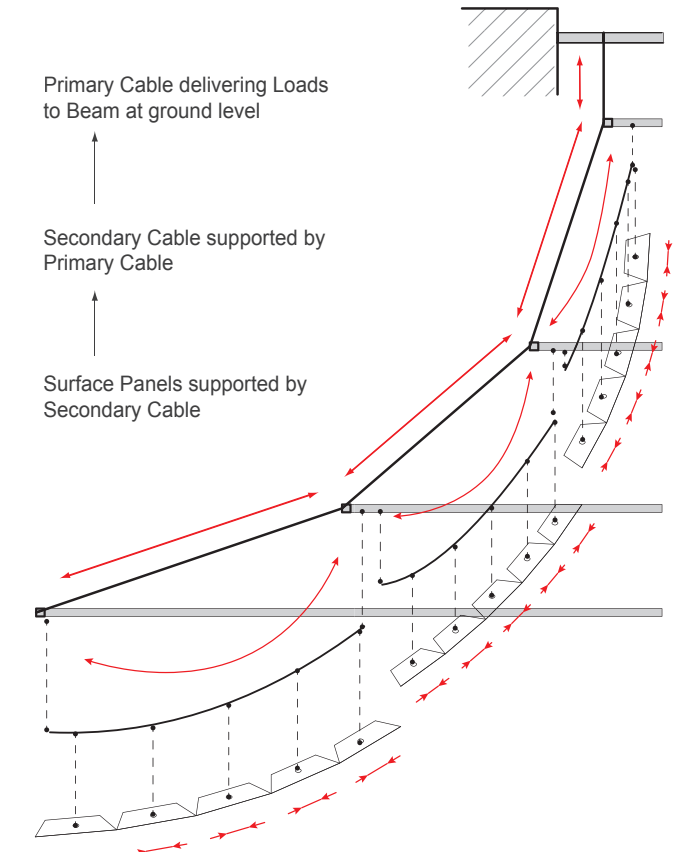
The fold, as a multi-layered metaphor for the relationship between mind and matter, inspires plis/replis. The installation is made up of a highly geometric, folded and suspended structure that amplifies the experiences and metaphors of champagne. The primary structure, a 10 x 10 x 12m cone suspended in a pyramid-shaped underground cave – one of the largest "crayères" of Vranken-Pommery's 18km long underground system of corridors and caves dating back to Roman times. This architectural augmentation of the space also serves as a functional loud-speaker. A glass platform suspended at the focal point within the cone holds a vessel filled with champagne. Using the actual sounds of effervescence picked up by a special microphone immersed in the champagne vessel, a real-time analysis/synthesis audio system creates a continually evolving sound environment, diffused downward from above.

The architectural design of this work combines ancient paper folding techniques with contemporary computer-aided-design and manufacturing processes. Plis/Replis attempts to create an internal space that is perceptually separated from the external space. The form is generated through a digital parametric process that allowed us to design, fabricate and assemble this suspended 345 cubic-meter structure from 285 flat sheets of aluminum/polyethylene composite, precisely folded 2,535 times. The structure amplifies a 600W co-axial speaker-driver in order to create a uniquely rich and immersive acoustic environment for the visitors standing beneath the cone.

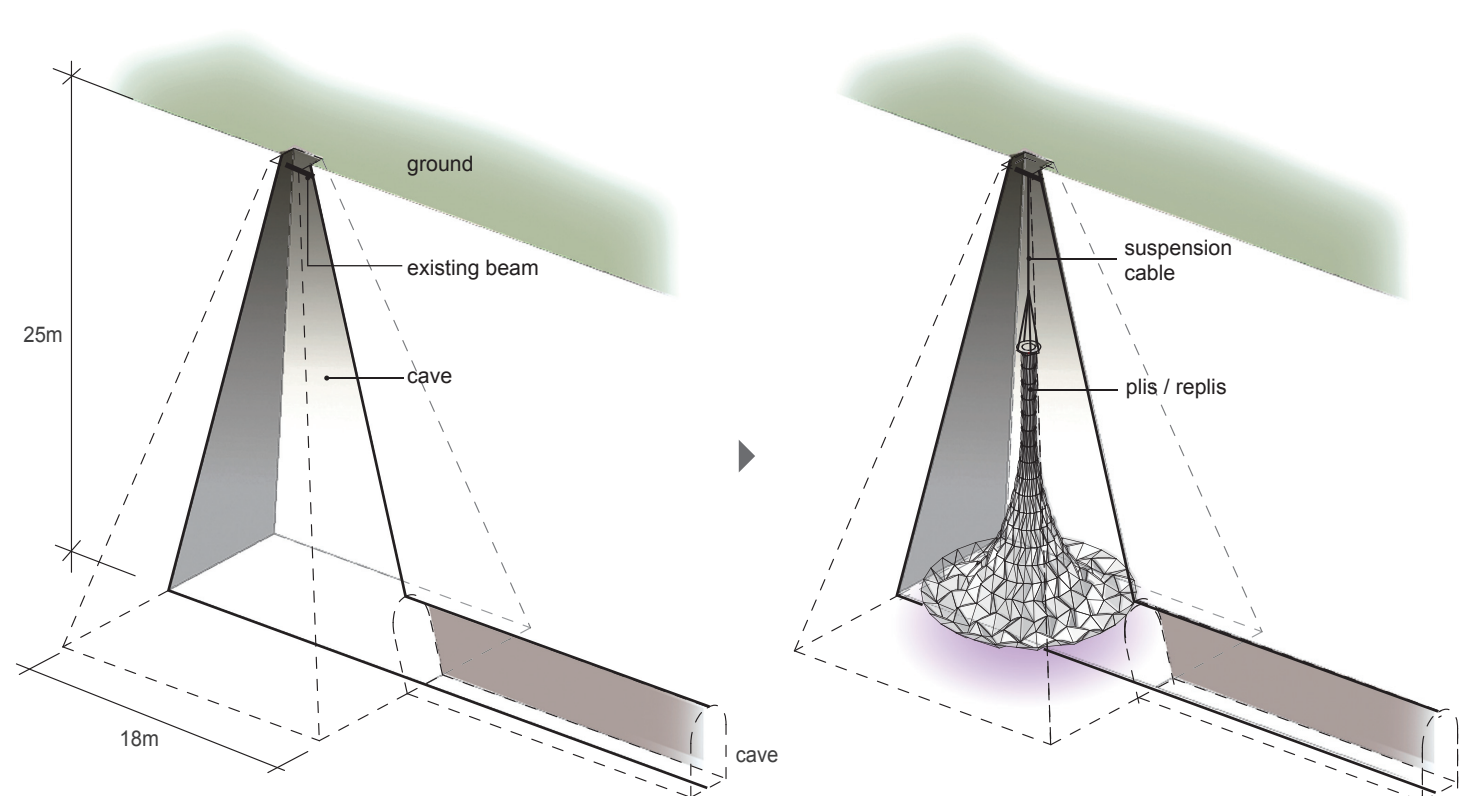


ASSEMBLY DETAILS

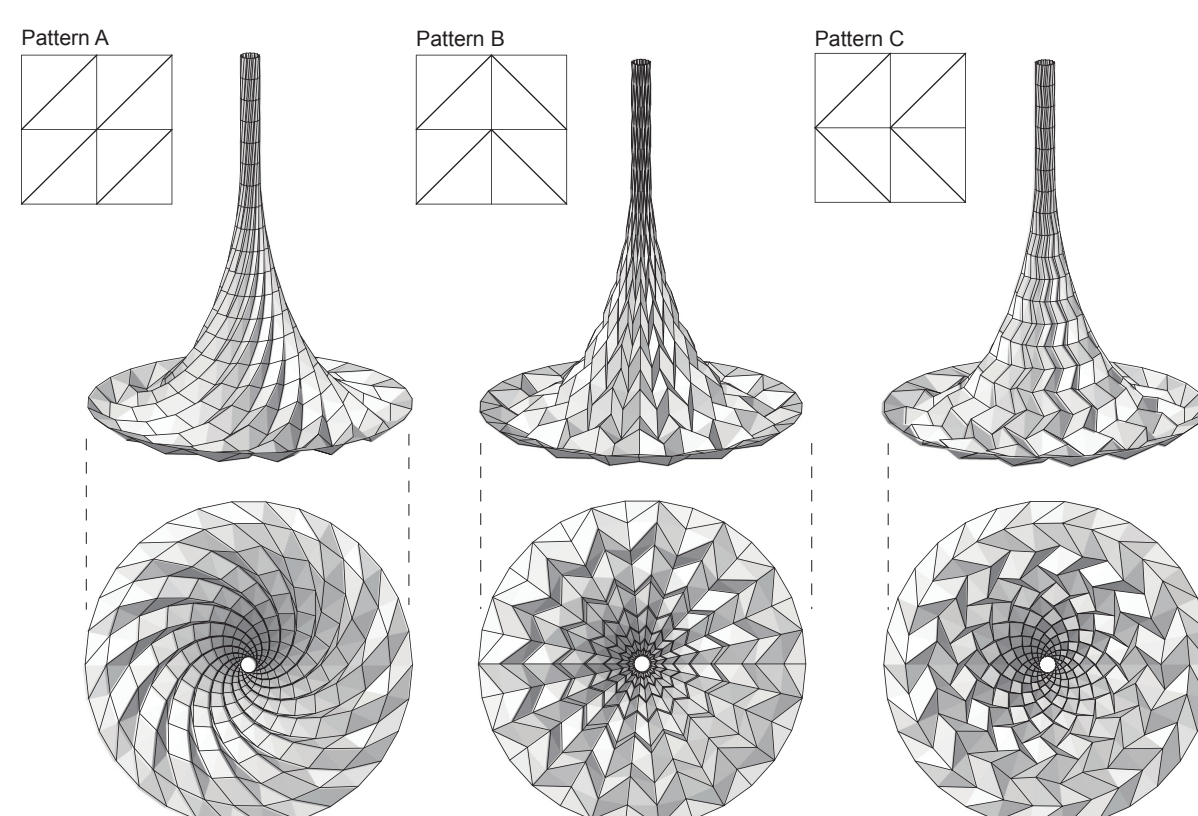
The Primary Cable System is functioning under tension and support the aluminum frames; Secondary cables pull surface panels towards the aluminum frames. The Interior Folded Surfaces are functioning under compression. The folds in the surface function structurally and cause each panel to push its adjacent panels towards the aluminum frames above and below.



STRUCTURE



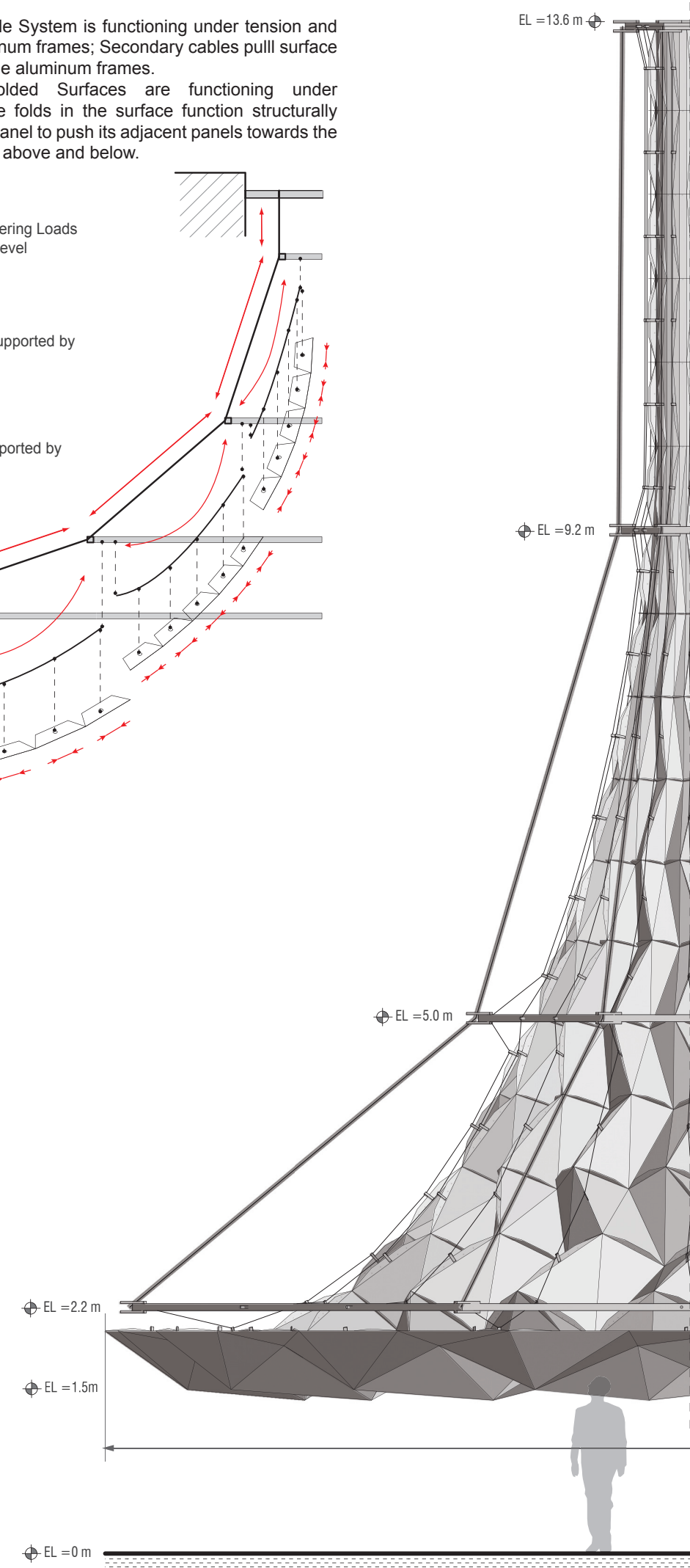
SITE



FOLD PATTERN STUDY

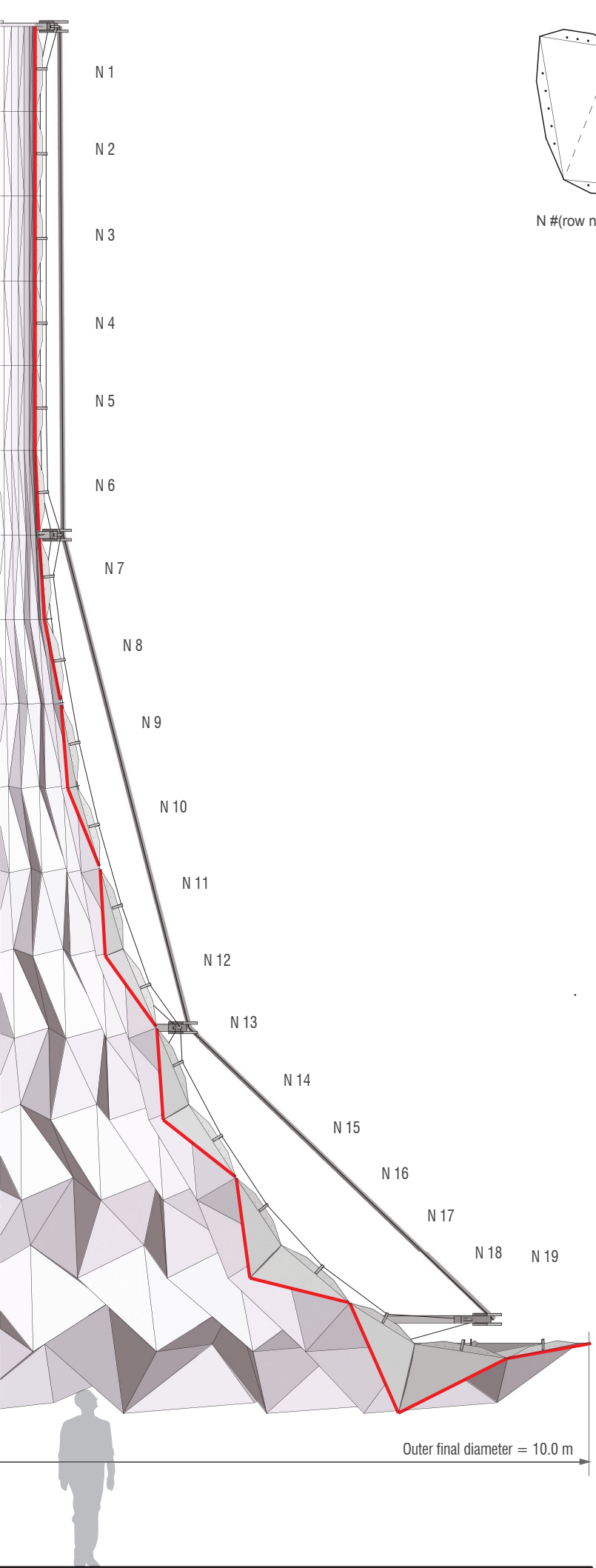
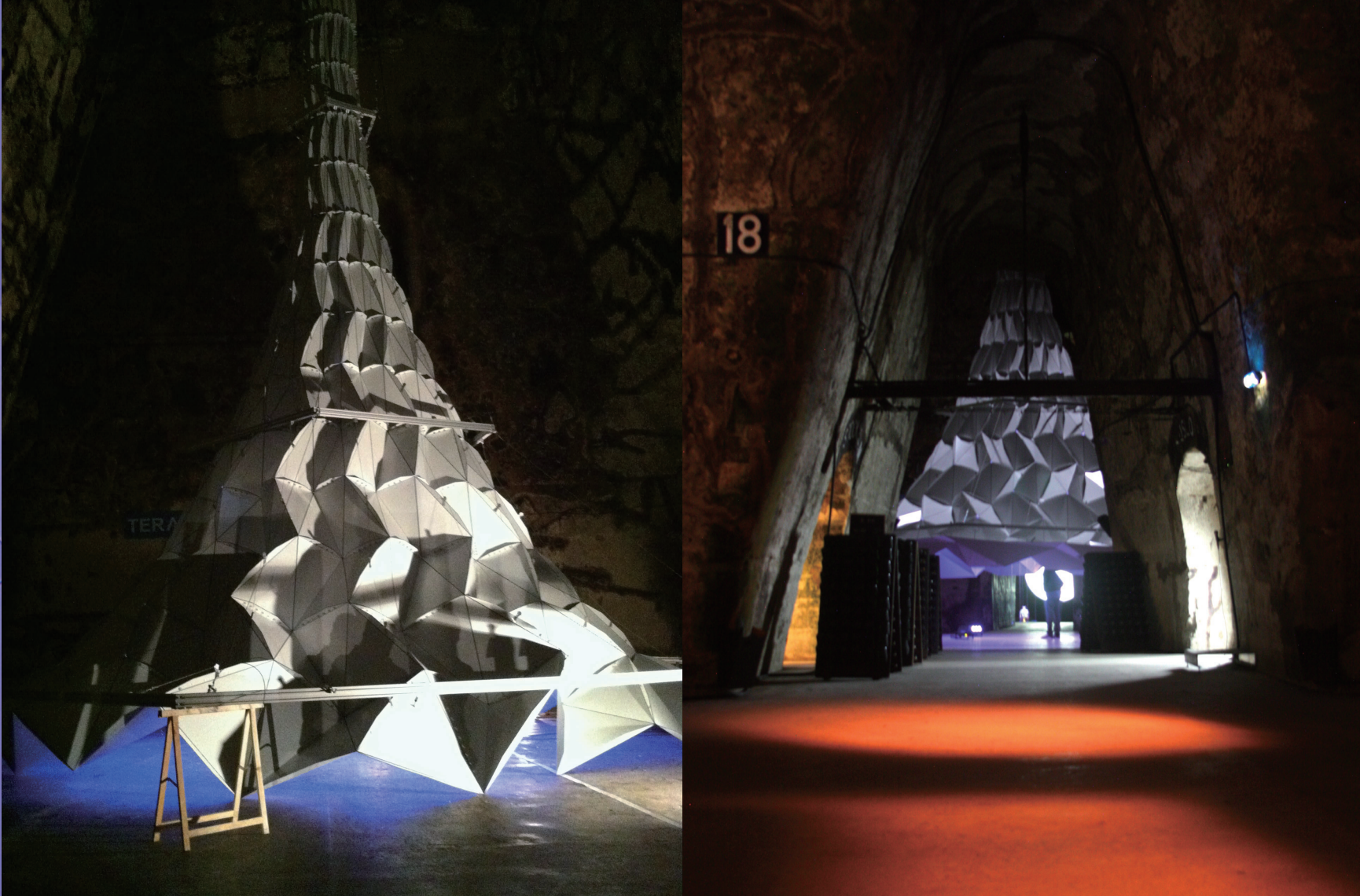
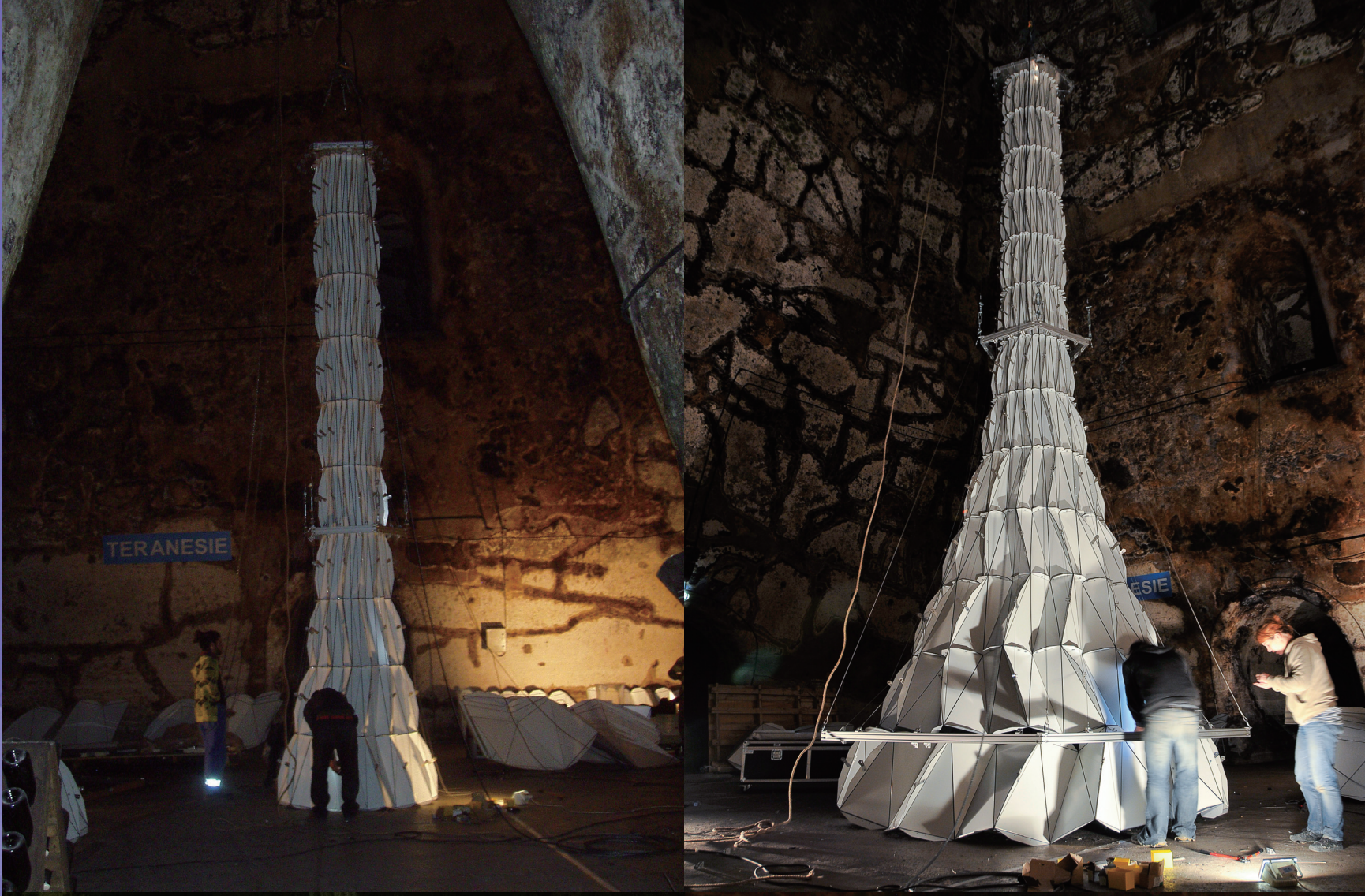
With the structure's bottom suspended at 150cm above ground, the cone creates an immersivespace that perceptually isolates the visitor from the outside world. This effect was emphasized by the avoidance of perceivable radial symmetry or segmentation in the internal folding patterns (e.g. folding pattern B); Analogously, the affect was further emphasized by greater variation in light/shade patterns produced by the inside folds. Virtual lighting studies with dynamic light sources for the three considered options showed this variation to be most notable infolding pattern C. This pattern also helps to create rich and diverse acoustic reflections whilst avoiding flutter echoes and phasing problems which could occur with other folding patterns.

ELEVATION

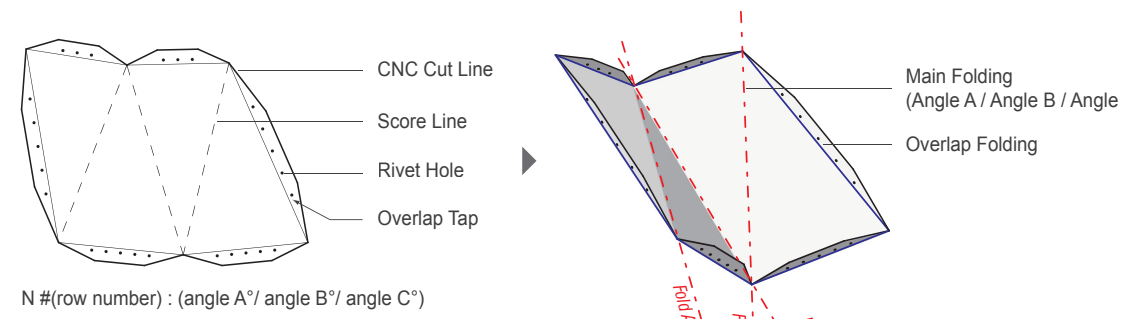




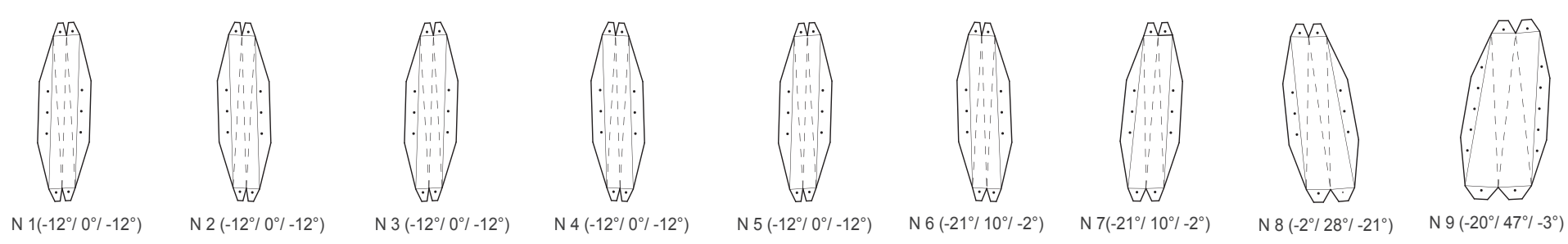
INTERIOR VIEW



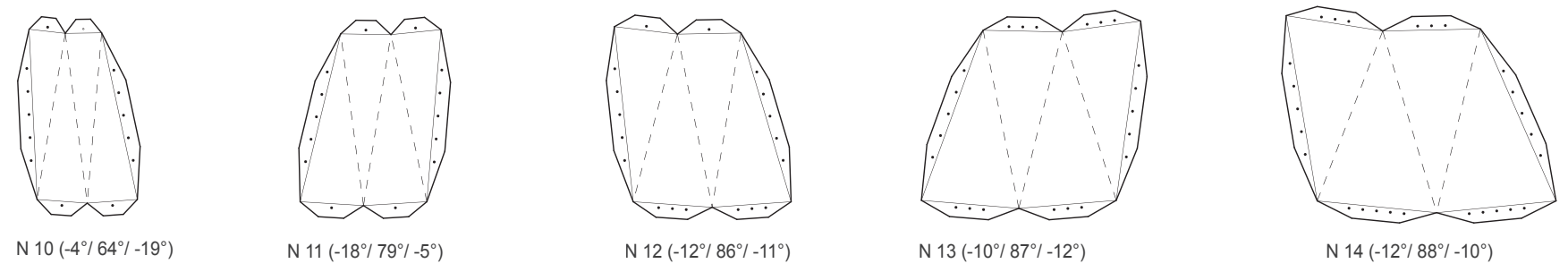
SECTION



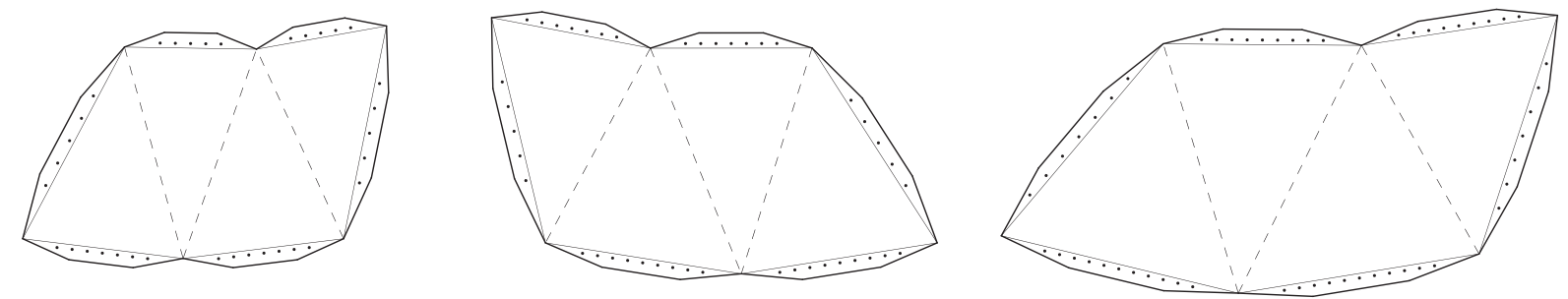
N#(row number) : (angle A' / angle B' / angle C')



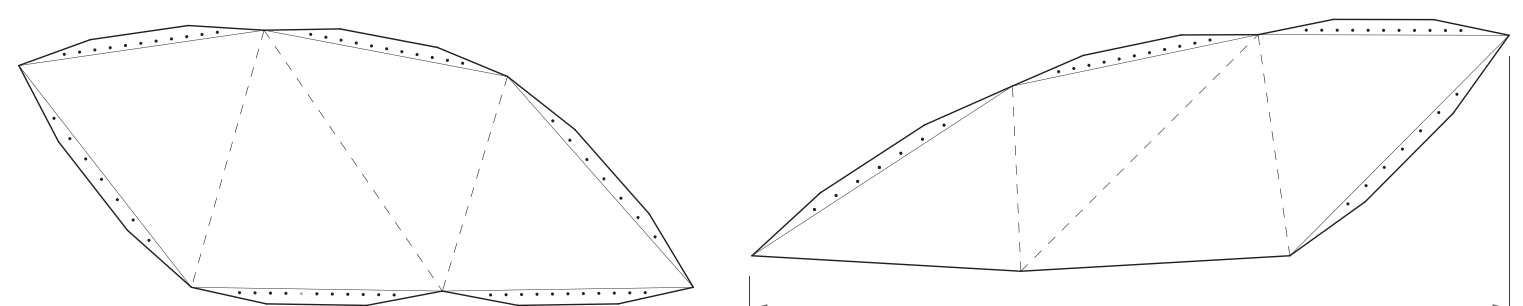
N 1 (-12' / 0' / -12') N 2 (-12' / 0' / -12') N 3 (-12' / 0' / -12') N 4 (-12' / 0' / -12') N 5 (-12' / 0' / -12') N 6 (-2' / 10' / -2') N 7 (-2' / 10' / -2') N 8 (-2' / 28' / -2') N 9 (-20' / 47' / -3')



N 10 (-4' / 64' / -19') N 11 (-18' / 79' / -5') N 12 (-12' / 86' / -11') N 13 (-10' / 87' / -12') N 14 (-12' / 88' / -10')



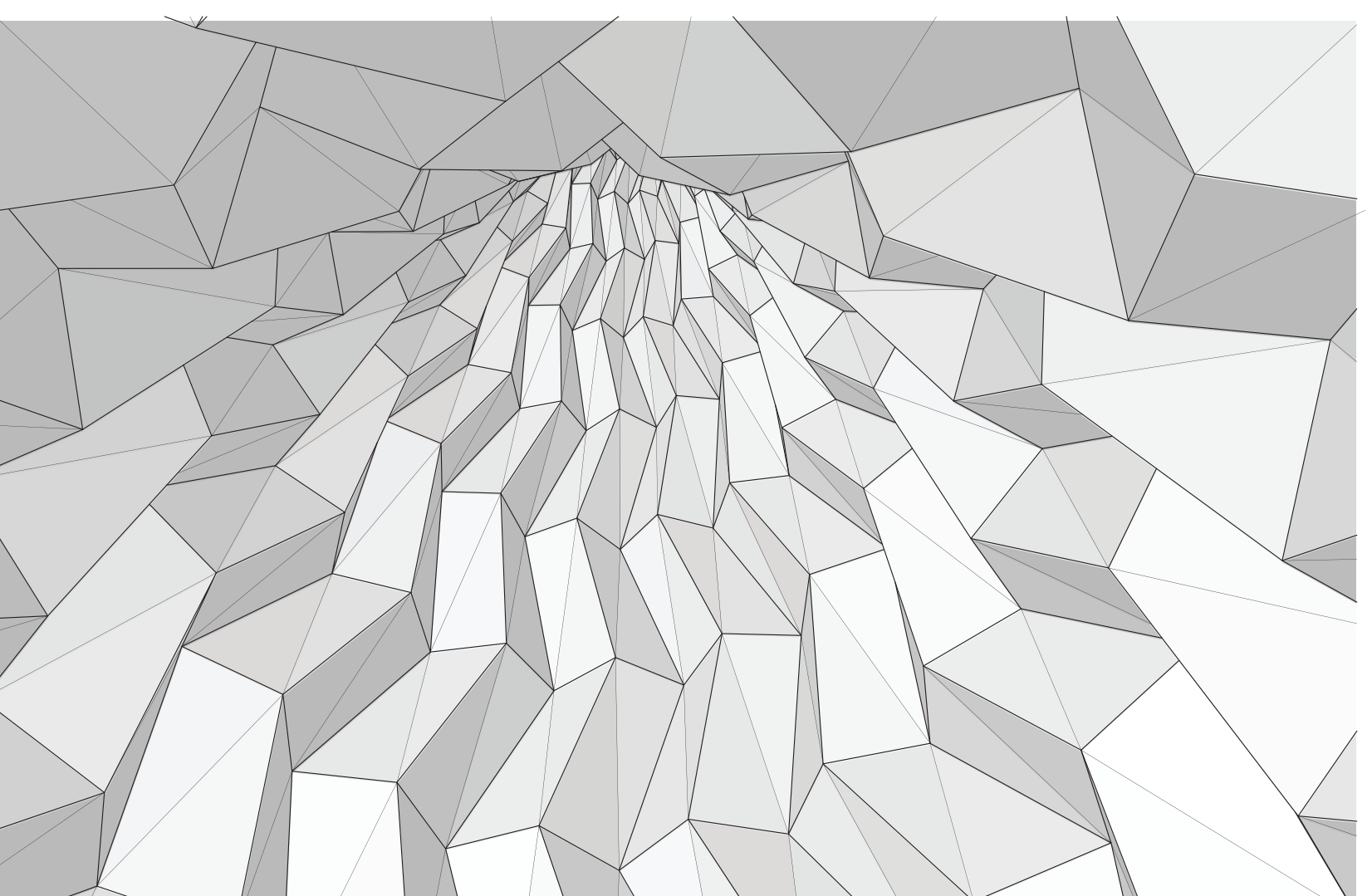
N 15 (-9' / 89' / -13') N 16 (-9' / 94' / -15') N 17 (-16' / 98' / -6')



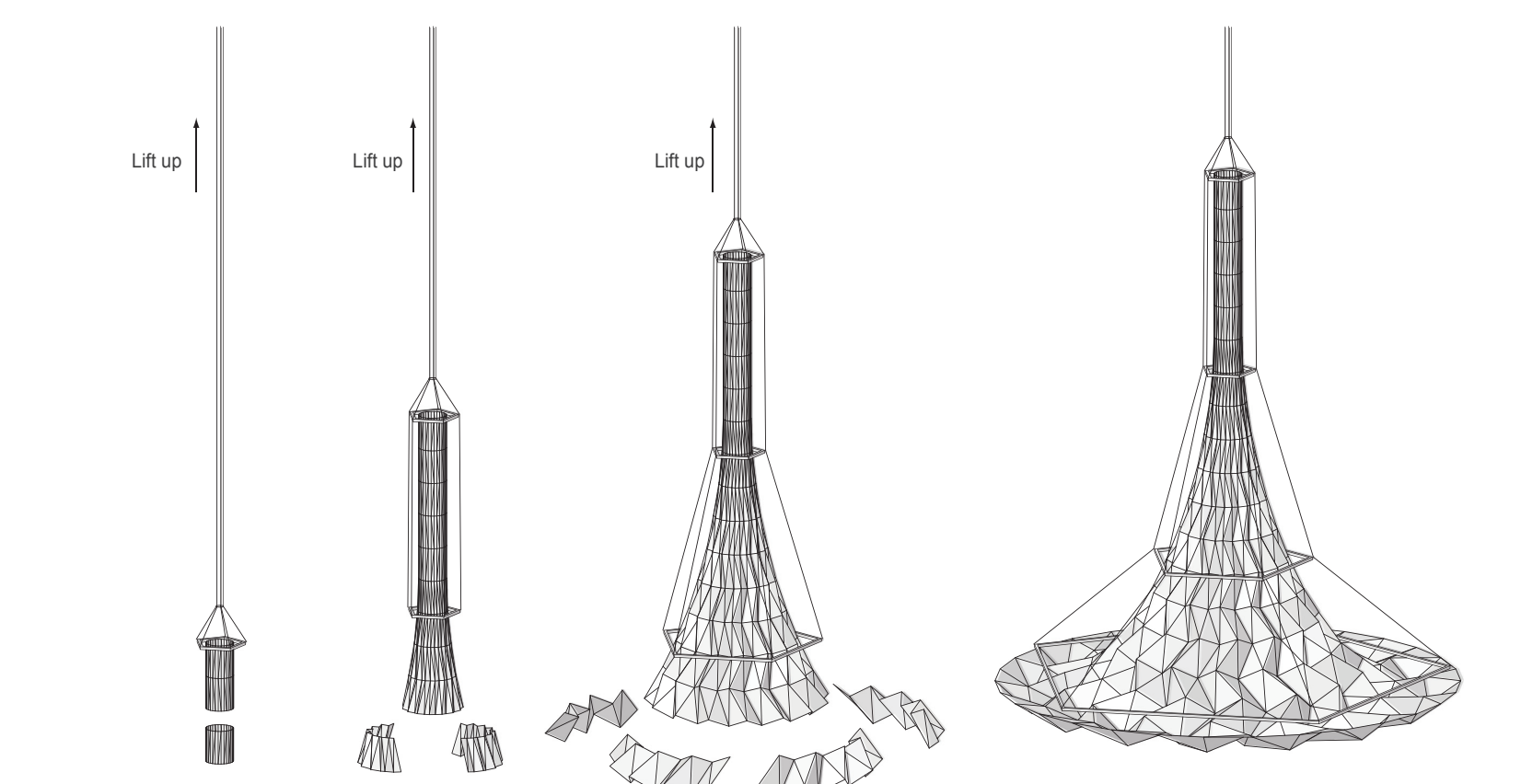
N 18 (13' / 84' / -27') N 19 (-20' / 35' / -25') Length of largest surface unit = 3.0 m

FABRICATION (19 types x 15 = total 285 pieces)

All panels were scored and cut out of 3 x 1.5 x 0.003 m "alupanel" sheets on a CNC router. Alupanel is an aluminium composite of two 0.3 mm Aluminium sheets, sandwiching a 3mm Polyethylene core, and weighs only 3.4 kg/m<sup>2</sup>. Part-way cuts with a V-shaped router bit allowed us to precisely fold this rigid material along designed paths. The cut panels were shipped flat inside the original 3 x 1.5 m sheets. All sheets were pre-folded onsite before assembly; the smaller vertical layers were pre-assembled into cylindrical segments, while the larger layers were assembled one sheet at a time. The structure was built layer-by-layer from the top down, with the entire assembly raised incrementally after the addition of each layer. A network of four parallel pentagonal aluminium frames maintains the overall form of the cone, and allows it to be suspended from a series of primary and secondary steel cables.



INTERIOR



INSTALLATION