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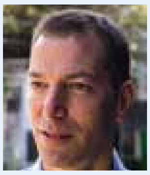
New Tower Typology: Optimizing Workspaces and the Public Realm



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Asa Bruno is Director and co-founder of Ron Arad Architects, having joined the studio in 2000 and becoming a Director in 2007. The award-winning practice has completed projects such as the Maserati Showroom in Modena (Italy), Yohji Yamamoto Flagship Store in Tokyo, the Design Museum Holon in Israel, the Mediacité Centre in Belgium, and ToHA 1—the LEED-Platinum-certified first phase of a prestigious office development in Tel Aviv. The practice is currently building a state-of-the-art cancer center, and is developing its competition-winning design for the UK Holocaust Memorial in London, as part of the larger project team.

Abstract

Tel Aviv, widely recognized as the largest tech hub outside of Silicon Valley, is in the grip of unprecedented urban development. Despite having only 500,000 inhabitants, it is home to the R&D facilities of giants such as Microsoft, IBM, Intel and Google, and thus any development must meet the challenges of vehicular congestion perpetuated by a large commuter population. Most importantly, it must lead the way in reducing the environmental impact that large developments bring, while also giving a focus to placemaking to ensure viable returns to the public realm. The ToHA project, occupies a 1.8-hectare central site with its two office towers (28 and 70 stories) situated within generous landscaped public space. The completed and LEED Platinum-certified 28-story, 55,742 square-meter first tower, fuses traditional, regional passive environmental approaches with state-of-the-art energy-saving and intelligent façade systems. Goals and a vision for the 70-story second phase of the project illustrate its aims for decades to come.

Keywords: Adaptability, Environment, Human Comfort, MEP, Public Space, Sculptural

The city of Tel Aviv is widely recognized as the largest tech hub outside of Silicon Valley. It is Israel's second most populous city and has in recent years been in the grip of unprecedented urban and infrastructural development. This includes the introduction of a mass-transit light railway (MTLR) network, currently under construction, and a new Metro system which has recently been approved for development by the National Infrastructures Committee. Tel Aviv lies along a sweeping Mediterranean coastline to the west and is otherwise flanked by neighboring cities to the north, east and south.

Albeit a relatively young city—just over a century old—it is also embracing something of a renaissance and rediscovery of its founding architectural assets, through the refurbishment and conservation of its central heartland, the UNESCO World Cultural Heritage Site known as White City. This refers to a collection of over 4,000 buildings built in the form of the Bauhaus or International Style in the 1930s largely by German-Jewish architects fleeing Europe. This central core of the city is strictly protected for conservation helping push new office development upwards, mainly along the transportation arteries that form Tel Aviv's eastern flank, where height restrictions have been relaxed in recent years.

The city is the main beneficiary of Israel's increased focus on education in computer science and engineering, which greatly influenced the substantial daily inflow of young professional commuters. Despite having fewer than 500,000 inhabitants, these commuters help the Tel-Aviv metropolitan area double in size on a daily basis (Presman & Arnon 2006). The country's spending on civil research and development is one of the highest in the world (4.2 percent of GDP in 2013). It ranks within the top five innovative countries on the Bloomberg Innovation Index, has the most non-US Nasdaq-listed companies in the world, and has for comparison 140 scientists and tech professionals per 10,000 employees—one of the highest ratios in the world, and nearly twice as many as in the United States or Japan (Senor & Singer 2011).

It is therefore not surprising that Tel Aviv's largely liberal and secular character, and Mediterranean culture have been immensely attractive to younger people who are able to benefit from the work/life balance on offer. This, in combination with a highly entrepreneurial regulatory environment, has helped make it home to the R&D facilities of tech giants such as Microsoft, IBM, Intel and Google, and function as a greenhouse for start-ups. While such companies tended a decade or two ago to base their operations in out-of-town campuses, they recognize that their now younger core employees (in the 24–35 age range) prefer the city to the suburbs.

Any significant office development catering to such firms must therefore adeptly meet the challenges of vehicular congestion perpetuated by a large commuter population and make extensive use of the technological advances affecting work environments, from connectivity and adaptability to changing needs, worker amenities and comfort. Most importantly, it must lead the way in substantially reducing the environmental impact that large developments bring with them during construction, and throughout their lifetime. The municipality of Tel Aviv is also right to demand that developers engage in genuine place-making and ensure viable returns for the city, the immediate public realm it occupies, and its residents at large.

These challenges, while described here in the context of a specific project, are universal in their relevance and importance, and question how existing typologies of sizeable office developments can lead to innovative solutions which rewards a wide range of stakeholders. These vary from the developers themselves, to regulators and city planners, investors, workers and city-dwellers in regular contact with large structures that are placed in cities and expected to thrive for many decades.

ToHA, derived from the name of the smaller of three streets flanking the site—Totseret Ha-Aretz (meaning "made in Israel" or "locally made")—is a large-scale office development. It is the first joint venture between Amot and Gav-Yam, two of the largest real-estate investment and development companies in the country. The two have managed to secure a rarely available central metropolitan site, conveniently located some 180 meters away from Tel Aviv's largest train station. This greatly helps meet the challenges of vehicular congestion perpetuated by the large commuter population in the region. A further adjacent Metro station and two MTLR stops nearby will significantly enhance public transport access to the project when they open.

The 1.8-hectare site (approximately 4.5 acres), unified from seven separate parcels, was originally granted permission by the planning department for developing 150,000 square meters (1,614,586 square feet) of employment area, later expanded to 200,000 square meters (2,150,000 square feet).

Ron Arad Architects were commissioned in 2010 to conduct a feasibility study for various possible office development typologies for the site, with the declared wish to also explore less conventional volumetric arrangements on the site. It is a testament to the clients' foresight that while risk-averse and careful, especially in the context of a joint venture and the large permitted development volume, they had seen the significant potential of doing something very different within this key

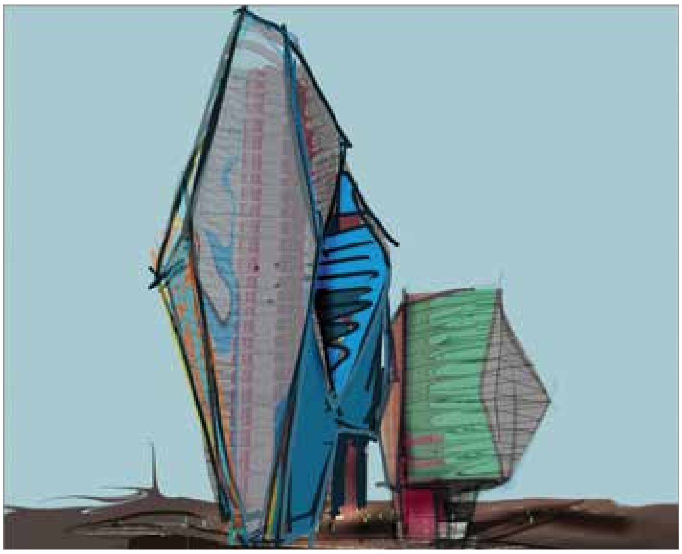

Figure 1. Original concept development sketches. © Ron Arad Architects

location. The recognition of just how rare a site this is, and how much support the municipality would be likely to offer in providing speedy and flexible permitting, had also made it doubly important that the project deliver on its promise to reward a wider public.

Prior to engagement with the more traditional aspects of the scope (which would look at volumetric variations, core strategies, circulation diagrams, gross/net ratios and lease spans), the architects encouraged the clients to evaluate many factors relating to the particulars of a wider context.

This included studies of local demographics and socio-economic setting, circulation patterns among the large residential population around the site, varying levels of privacy, security and personal space and how these can be protected in and around large-scale projects. The architects also looked at the effect of large volumes on the permeability of movement through the site, construction phasing strategies and their impact on the easing of traffic and circulation, and sustainability in the broadest sense of the term. This was followed by a discussion about environmental factors in terms of solar and wind impact, regional seismic activity, pedestrian and vehicular access, and connectivity to municipal infrastructure. Several weeks later, the architects presented their ideas, which began crystallizing around one central theme: The upside-down tower (see Figure 1).

This was initially expressed as a notion of a top-heavy structure resting on smaller, narrower "legs." A tower that is as wide as it is tall; broad and meandering, rather than extruded in form. These gestures would enable the team to place the lion's share of the mechanical plant within the lower legs and liberate the expansive roof so it provides a generous amenity space, including terraces and restaurants. With the exception of a cooling-tower at the upper eastern end of the building, it was proposed that air handling units (AHUs), generators, pumps and transformers would be placed away from the merciless

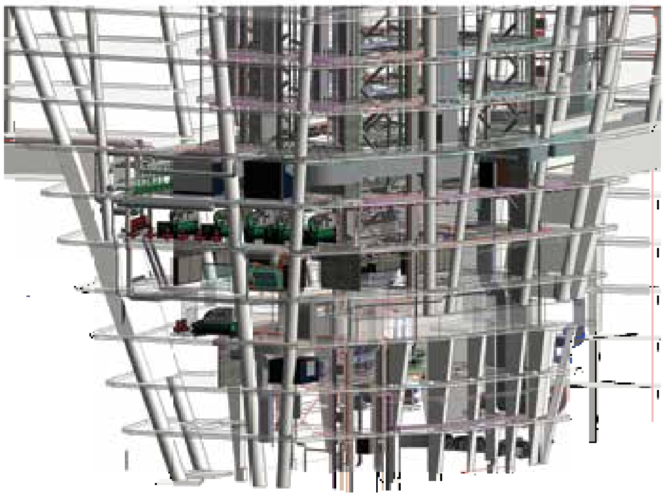

Figure 2. Perspective of the mechanical plant core. © Ron Arad Architects

middle-eastern sun, in well-ventilated, fully-shaded lower floors. This protection also helps reduce the demand from the technical plant equipment, both in size and capacity (see Figure 2).

The architects used references from the natural world that help explain form-efficiency in adverse environments and described their study in quasi-geological terms. Words such as shaping, erosion, crevasses and hollows, lent themselves readily to the megalith or iceberg analogy.

The study was concluded with a suggestion of how such a strategy would reward the city by creating a generous landscaped public space on the ground. By reducing the first building's footprint below 1,400 square meters (15,000 square feet), with a publicly accessible rooftop of over 2,200 square meters (24,000 square feet), the development effectively gives the city more area back than has been taken away from it. It was decided that future phases of the project would follow a similar strategy.

The proposed strategy would also "democratize" the workspace, and challenge the hegemony of higher office levels, or corner offices. It would look at placing large floor plates above the mechanical legs, upgrading even the lowest office level to a better aspect, some 30 meters above street level.

The client, expecting more of a varied study of oblong forms and initially confused by this notion was, however, thoroughly intrigued. The architects were commissioned shortly after to conduct a follow-up study, in greater detail, of the implications their proposed strategy would have on the construction program and costs. A small team of select consultants was assembled to support this second study, including MEP and structural engineers, façade consultant, environmental consultant and a market analyst.

Drawbacks were measured against advantages. The former included the extensive additional façade area catering to the lateral form, the need for multiple cores to serve circulation and service runs, and the likely added cost of ambitious structural acrobatics. The latter included clear environmental benefits, reduced mechanical plant costs, major municipal and local resident buy-in, and very importantly—significant benefits to workplace quality, amenities and comfort.

The consultant team could hardly conceal the enthusiasm they shared with the architects in having the opportunity to explore such a proposal more seriously. After another month of deliberation, the clients made the decision to move forward with the design process, with the caveat that key engineering aspects of the design would be assessed by an international consultancy along the way. Initial structure, MEP, environmental ,and façade consultancy services were thus provided by a leading London-based consultancy alongside the equivalent services locally.

Following a lengthy and costly site purchase and unification process, it was important for the clients to tightly control the forecast financial outlay, and phasing the project intelligently was prioritized. It was decided that the first phase of the project would utilize approximately 30–35 percent of the permitted development volume, providing approximately 55,000 square meters (600,000 square feet) of office space. This decision enabled the clients to more cautiously explore their own partnership in terms of planning, execution and returns on investment, without fully extending themselves to the larger project commitment. For the purpose of obtaining statutory approvals, the Concept Design stage therefore concentrated on arranging two masses on the site in such a way as to allow an independent first phase to thrive regardless of its being joined or not by a taller tower at a later stage.

The scheme evolved on the basis of two towers, 28-stories and 70-stories high, and approximately 55,000 square meters (600,000 square feet) and 140,000 square meters (1,500,000 square feet) in area respectively. The two buildings are elevated upon slim core structures within a densely planted landscape. This challenges the prevalence of tower-over-commercial-podium model, minimizing the volumetric and visual impact on the ground plane and promoting a more comfortable and spacious circulation experience than is usually possible in similarly dense and large developments.

ToHA 1, the first phase tower, occupies an L-shaped portion of the eastern edge of the site. This arrangement responds to parcel orientation and statutory constraints, but also enjoys the structural stability offered by the triangle inscribed by its three legs, or cores.

The initial monolithic volume proposed for the tower underwent a rigorous modeling exercise, during which iterative formal adjustments reflected detailed environmental and operational input. This included solar incidence mapping,

Figure 3. Project overview and RWDI wind-tunnel test model. © Ron Arad Architects

Figure 4. The central atrium penetrates the entire height of the southern wing. © Ron Arad Architects, courtesy of Asa Bruno

reflectivity studies, wind tunnel testing, and mechanical systems analysis (see Figure 3).

The building gradually took the form of two hewn prismatic masses, connected by a raised 20-story volume bridging the east and west cores, creating a dramatic arch some seven stories above the ground. The similar gap between the central and south cores was enclosed by two seven-story-high glazed cable net façade, inclined in keeping with the building's outward and upward expansion. Their inclination also serves to shed, through reflectivity and selective fritting, a considerable quantity of early morning or late afternoon sunlight.

In parallel, the architects introduced a generous atrium which penetrates the entire 105-meter (344-foot) height of the wider southern wing of the building, bringing natural daylight to every desk in every office (see Figure 4). This enabled the team to better address the clients' requirement for generous and flexible floor plates of 2,300 square meters to 3,000 square meters (25,000 to 32,000 square feet), divisible among up to seven different tenants. This request was based on the clients' historic experience of the majority of tenants wishing to lease 370- to 470-square-meter (4,000- to 5,000-square-foot) offices. Eventually this proved unnecessary for this project, as the smallest office leased is an entire 25,000-square-foot floor.

This was helped by sharing circulation and mechanical loading between a primary core (central) and two auxiliary cores (south and east). The architects also introduced a gentle taper to the elevator lobbies in the central core, so that upon exiting a lift anywhere in the building, workers and guests are drawn towards the atrium and its cascade of natural daylight. This also brings coherence for orientation purposes for first-time visitors to the building. The atrium would eventually play a key role in cooling down the building's thermal mass through natural flow night flushing. It also encourages visual interaction between the different tenant companies across the void. This kind of "neighborly" interaction is often impossible to facilitate in traditional tower construction, and the presence of a vertical "streetscape" within the building has been hailed by workers in the building as a great success since its opening (see Figure 5).

Level 7, the location for mechanical and structural transfer across the three cores, was now seen as the tide mark between mechanical floors and public entrances below, and the office accommodation above, and was articulated in two distinct ways. Below the tide mark, permeable panels would allow the building to "breathe"—providing fresh air intake for basement parking and offices alike. These were detailed with cross-mounted panels, creating an "X" pattern. This woven-like arrangement was calculated to allow the required airflow, and provides a coherent, non-mechanical aesthetic to the first seven floors of the building (see Figure 6).

Above the tide mark, the façade's multiple facets are articulated as a stepped arrangement, accentuated through the use of slab extensions, or shelves, which protrude beyond the glazed façade. These fuse a traditional regional passive environmental approach with the results of an analysis of innovative material use. They were designed on the basis of solar incidence, glare and daylight factor simulations (CIBSE 2012) to extend as little or as far as necessary (ranging between 500 and 2,000 millimeters or 20 and 80 inches) in order to maximize passive self-shading of the building during the warmest periods of the year. By 11:00 am on a hot August day, over 60 percent of the east- and south-facing façades are in shade, due to this solution (see Figure 7).

The "shelves" are clad in Dekton, an innovative highly dense, adhesive-free, inert and non-porous cladding material made using particle sintering technology (PST). This is the largest project ever to utilize this material, and it was chosen both for its structural and metamorphic qualities, as for its mineral aesthetic, which offers a thinner, stronger and more environmentally-sustainable alternative to stone despite being made entirely out of stone powder (Cosentino 2014) (see Figure 8).

The simulations helped demarcate which facets of the overall façade required further attention in order to ensure a predominantly daylit appearance in deeper lease spans (in excess of 10 meters in some areas), restriction of thermal gain within the offices, and reduction of the discomfort zone below one meter of the façade to ensure a comfortable and efficient use of the leased areas. The latter was achieved by using an energy-saving and responsive double-skin façade system. This was developed in collaboration with the chosen façade contractor Aluminum Construction, then tested and certified at the IFC Rosenheim lab in Germany. As well as containing an integrated reflective blind, the system incorporates an automated air inlet system, which periodically pumps air into the glazed cavity through small air inlets diffused at low velocities to the entire width of the module. Warm air exits the top of the module through outlet openings (see Figure 9).

Additionally, recently publicized high-profile developments around the world, in which the ill-effects of concentrated reflected sunlight on neighboring properties led to costly compensation and post-completion façade adjustment, encouraged the client to request a reflectivity analysis of the proposed façade. The results were very positive, and the "shelves" were demonstrably beneficial in cutting down adverse reflections, especially along the south and east façades. Their positive role was further endorsed by wind tunnel testing, which demonstrated their mitigating effect on downdraft and turbulence; and rainwater-free discharge simulation, which showed the benefits of a serrated façade over a smooth faceted one for reducing pooling and flooding in sudden downpours.

Figure 5. Central atrium looking up. © Ron Arad Architects, courtesy of: Asa Bruno

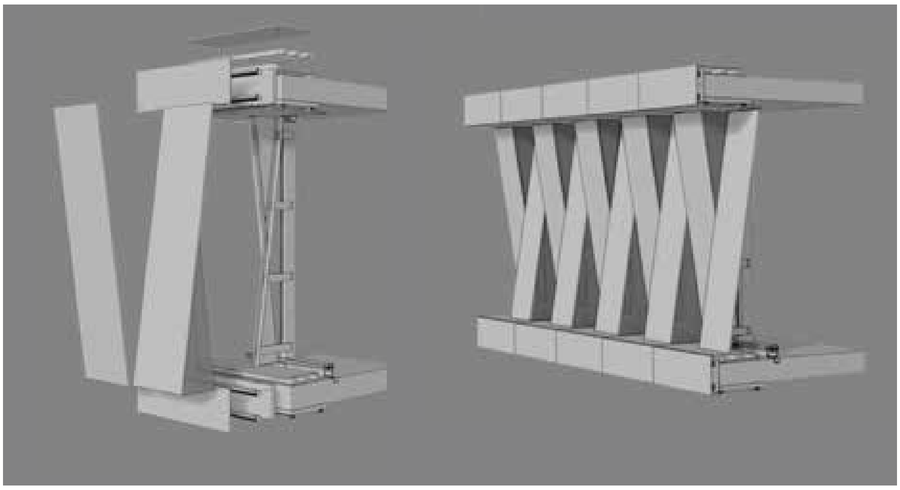

Figure 6. The ventilating "X"-panel. © Asa Bruno

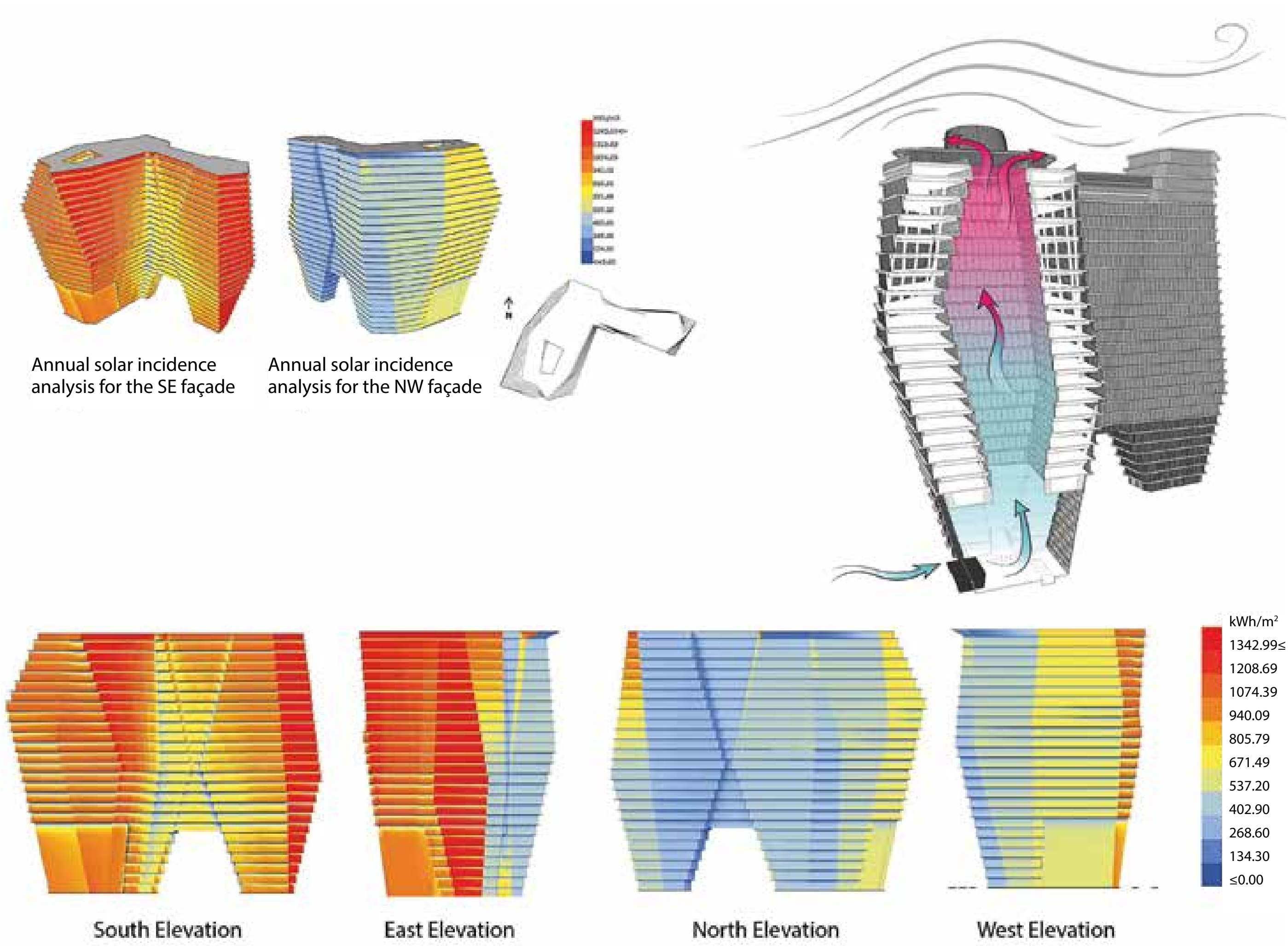

Figure 7. Solar incidence analysis and night flushing diagram. © Buro Happold/Alfa Sustainable Projects

Figure 8. Façade "shelves" detail on ToHA, Tel Aviv. © Asa Bruno

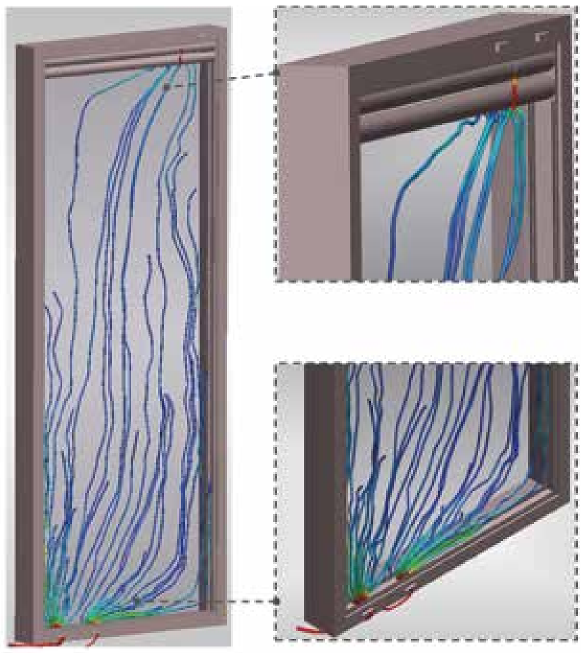

Figure 9. Double-skin façade unit analysis. © Aluminum Construction

The tower's myriad glazed corners are treated in narrow panes of darker glass, both as an echo of the internal structural column cage, and as an accent that highlights transitions between a facet and its neighbor (see Figure 10).

It would not be an overstatement to say that landscaping is a crucial partner in the success of this development. Both the municipality and the clients' commercial arm have initially pushed for the inclusion of a robust retail façade along the site boundaries. The design team, alongside a determined and experienced team of international and local landscape architects, strove to convince the clients to adopt a more fluid, informal and naturalistic approach to the generous landscape. This would contrast well with the large mass of the building, and complement its angular geometry with a softer, wilder backdrop. The planting of over 400 trees, and a sequence of ponds, walkways and breakout spaces provide an immediate and immersive antidote to the eight-lane highway flanking the site's southern boundary. The architects also introduced a modest internal garden within the lobby, where a further clump of trees adds to the visual continuity of the landscape passing through the building (see Figure 11).

Another central feature to the scheme that ties the building to the landscape is the south leg, or southern core. The narrowest of the three cores is structurally intrinsic, but solely contains mechanical shafts, emergency escape routes and subterranean parking access lifts. As such, it is a 30-meter-tall windowless edifice, and due to its far-reaching visibility from the main road, it felt appropriate to treat it as a special element which would signify the project from afar. It is detailed in patinated brass cladding panels, in a pattern which both echoes the building's 3.8-meter vertical grid, yet corrupts it with playful diagonals borrowed from the building's overarching prismatic volumes. The effect is sculptural in nature and anchors the building's south façade firmly in the landscape (see Figure 12).

The ToHA 1 building was completed in early 2019, and its success can already be measured in several domains. It was fully leased some eight months ahead of completion, the majority of the building taken up by three firms. The combination of several factors has led to the project being awarded LEED Platinum certification in May 2019. Broadly, these have included the high level of development density, community connectivity and access to alternative transportation means. More specific factors include the benefits of a 30 percent increase in natural ventilation and atrium night cooling, retention of 93.8 percent daylight and 94.2 percent open views through the advanced double-skin façade system, high-efficiency water cooled chillers, HVAC condensation water reuse and extensive use of recycled materials. The project has also obtained full marks for its overall water efficiency (reduction in water use of over 50 percent, water-efficient landscaping and use of innovative wastewater technologies).

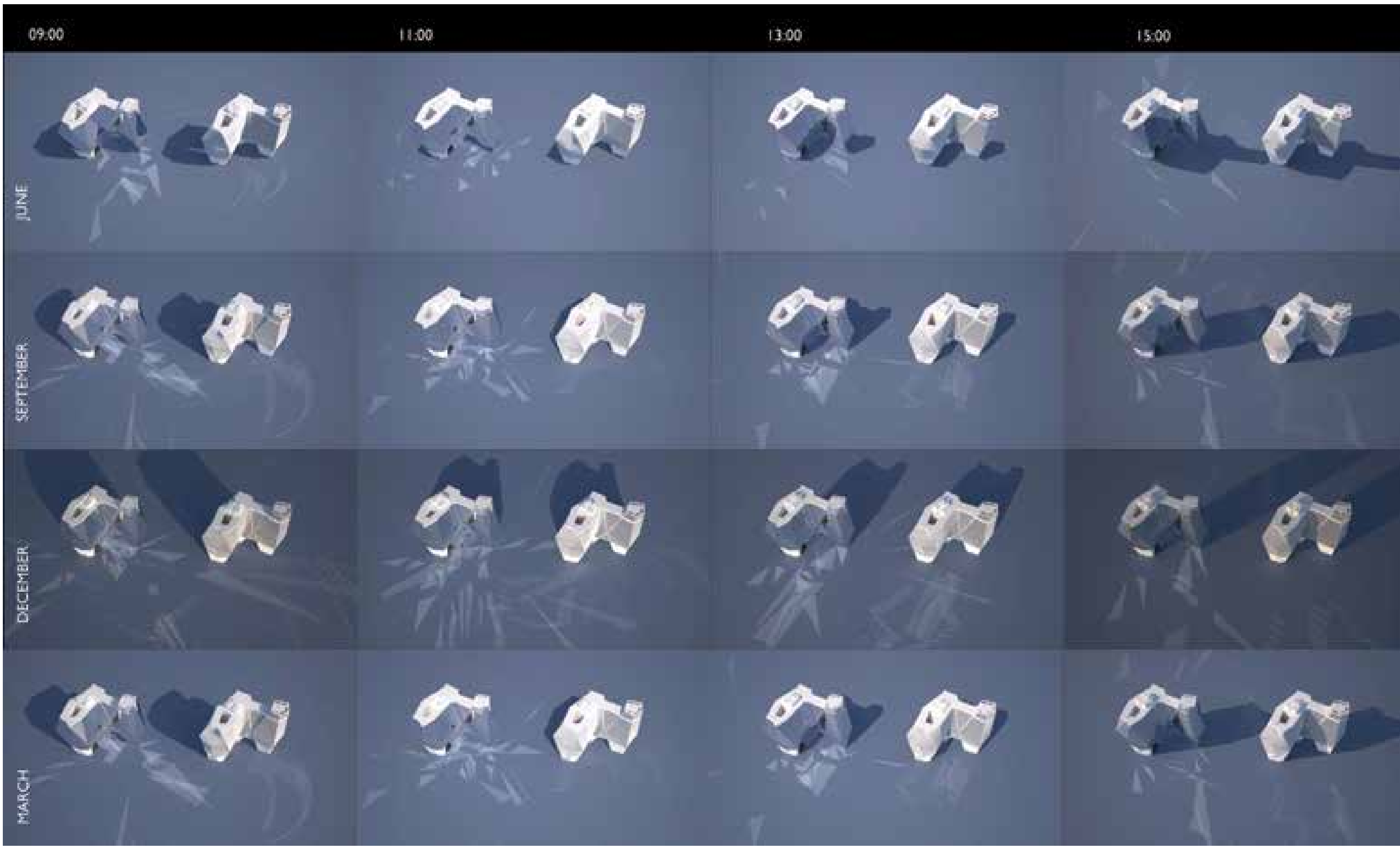

Figure 10. Reflectivity and shading analysis. © Ron Arad Architects

Figure 11. ToHA landscaping at the ground plane. © Ron Arad Architects, courtesy of Asa Bruno

The building is now the subject of academic and technical interest by local and international environmental construction groups. It has been well-received by local residents, and warmly embraced by the approximately 4,000 professionals who come to work within it every day, and who use the gardens at its base every lunchtime, as do clouds of Ring-Necked Parakeets, Myna birds and migrating geese.

Preliminary design work has now commenced on the taller second phase building which will occupy the north-western corner of the site and will connect to the roof terraces of ToHA 1 tower via a dramatic sky-bridge, some 100 meters (328 feet) above street level.

Similar to its smaller neighbor, the 70-story, 140,000-square-meter (1,500,000-square-foot) ToHA 2 tower will draw upon the technical, environmental and architectural features which have been successfully tested and implemented in ToHA 1, and will similarly enjoy the interplay between traditional passive solar energy design, and a state-of-the-art façade based on the technological and material advances over the decade to come.

Figure 12. South "leg" cladding. © Ron Arad Architects, courtesy of Asa Bruno

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