Skybridges: Bringing the Horizontal into the Vertical Realm

Interim Report
October 2019

Research Team

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1. **Kick-Off Meeting, 19 October 2018**

The kick-off meeting of the research project was held in Dubai at the 2018 CTBUH Conference on October 19, 2018. Prior to this, the CTBUH team worked on the organization of the meeting and the preparation of documents needed for the research agreement to be delivered to thyssenkrupp Elevator (TKE). Through a targeted call for participation, attendees of the Steering Committee meeting were derived from CTBUH’s network of experts in the fields of architecture, structural engineering, urban design, interiors, MEP engineering, and related fields, particularly those who had experience in either researching or designing, constructing or operating skybridges.

CTBUH delivered a primer presentation on skybridges to date, based on the research undertaken by Dr. Antony Wood in the pursuit of his PhD in 2007, and updated by CTBUH researchers to the present day. The presentation also proposed a classification system for the upcoming research. TKE presented the MULTI ropeless, multi-directional elevator system, which is expected to significantly change the way that people experience skybridges, and how skybridges are designed and incorporated into developments and cities. The group then discussed research parameters and next steps for the Steering Committee.

**CTBUH representatives:**
- **Antony Wood**, CTBUH CEO, Chicago
- **Peng Du**, CTBUH China Office Director and Vice President of Academic Affairs, Chicago
- **Daniel Safarik**, CTBUH Editor, Chicago
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**TKE representatives:**
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2. Engagement with the Steering Committee

In January 2019, the CTBUH team actively engaged the Steering Committee to help structure the project’s lines of inquiry. The central document of interest was a sample case study format, that would be used as the template for the eventual work product, envisioned to be a CTBUH Technical Guide in the guise of prior editions, such as *The Space Between: Urban Places, Public Spaces & Tall Buildings*, and *The Space Within: Skyspaces in Tall Buildings*. Feedback was received from numerous participants, which resulted in the overall structure of the Case Study section.

In March 2019, the CTBUH team circulated a second document to the Steering Committee, asking to help refine research criteria and objectives, in particular, measurement criteria and calculation methodologies that had been developed in consultation with an Illinois Institute of Technology (IIT) seminar course taught by Dr. Du [see section 3]. The feedback was again incorporated into the master document.

3. Skybridges: A History and a View to the Near Future – March 2019

A paper on the history and near-term prospects of skybridges, representing a distillation of the research conducted by Dr. Wood in support of his PhD, and updated to reflect current developments, was published in the *International Journal of High-Rise Buildings* [see attachment]. This paper will serve as the base document for the introductory chapter in the Technical Guide, and the broader research it represents can potentially serve as a base for a wider-ranging academic publication on skybridges and three-dimensional cities in the longer term.

4. IIT Seminar Course: TALKING TALL: January – May 2019

A research-based seminar course was conducted in support of the Skybridges project at the Illinois Institute of Technology (IIT), entitled “TALKING TALL.” Led by CTBUH China Office Director and Vice President of Academic Affairs Dr. Peng Du, with teaching support from Daniel Safarik, CTBUH Editor and Jason Gabel, CTBUH Director, Research & Thought Leadership, the course addressed the design, operational and management aspects of skybridges in multi-building complexes around the world. The student work culminated in preliminary research on the case studies of skybridge projects around the world that will form the core of the forthcoming Skybridges Technical Guide.

5. Skybridge Case Study Visit: New York City, 22-23 March 2019

Dr. Du, Safarik and the students traveled to New York City for two days of presentations, workshops, and meetings with architecture firms involved in the design of significant horizontal spaces at height, as well as an onsite investigation of the American Copper Buildings, a two-tower development connected by a skybridge, completed in 2017. The group visited the offices of SHoP Architects, Kohn Pedersen Fox Associates and Bjarke Ingels Group, where excellent presentations of 3-D vertical urbanism were given. A copy of the report can be found on the CTBUH Web Site and as an attachment.
6. **Skybridge Case Study Development: May-August 2019**

During the summer of 2019, CTBUH obtained and analyzed further drawings, images, and data around skybridges, engaging in dialogue with project stakeholders. These were then synthesized into standardized graphics for ease of comparison across case studies. The data from each of the skybridge case study projects was then compiled into a master data file.

7. **Skybridge Case Study Visit: Tencent Seafront Towers, Shenzhen, 15 July 2019**

The CTBUH Skybridges Research Team visited Tencent Seafront Towers, Shenzhen, the headquarters of one of China’s leading software companies. The researchers toured the “Health Link,” the intermediate skybridge connecting the two office towers, which contains a running track, gym, coffee shop, ping-pong and billiards tables, and a full-size basketball court, all between 96 and 120 meters above ground.
8. **Skybridge Case Study Visit: Raffles City Chongqing, Chongqing, 16 July 2019**

In China’s fast-growing central-western city Chongqing, the Raffles City project was still under construction at the time of the visit. This proved beneficial in many ways, as the incredible engineering behind what is planned to become both the world’s longest and highest skybridge, the Conservatory, was on full display. Led by colleagues from Moshe Safdie Architects and CapitaLand, the team was able to view such technologies as dampers, where the skybridge connects with the roof of supporting towers beneath, a sliding gasket that allows the bridge and connecting towers to move independently as much as 500 mm in each direction, and a special elevator for hauling the full-sized trees up to the Conservatory. The trees weigh as much as 4 metric tons, and are delivered with root balls intact. The visitors were able to assess the project from every angle, including the catwalk atop the skybridge, and from a viewing point from across the Changjiang River, where the eight-tower complex dominates the skyline.

The second stop on the four-city Asia tour was Chongqing, where the research team was able to view many aspects of the Raffles City project under construction, including structural details that would ultimately be covered by finishes.

9. **Skybridge Case Study Visit + Skybridges Symposium: Linked Hybrid, Beijing, 18 July 2019**

At Linked Hybrid, Beijing, the tour was kindly conducted by Modern Land, the project’s developer, taking the group through five of the project’s eight skybridges, with programs ranging from auditorium, to gymnasium with pool, to an art museum. The research visit on 18 July coincided with a half-day Skybridges Symposium, supported by Modern Land, thyssenkrupp and co-produced by CTBUH and AIA Shanghai/Beijing, featuring the architects, engineers and owner/developers of many significant horizontally-linked tower projects in China and elsewhere. The conference agenda and report are included as attachments.

Presentations included:

- *Welcoming address*: Dr. Peng Du, CTBUH Vice President of Academic Affairs & China Office Coordinator; Yin Chen, Executive Director & Chief Technical Officer, Modern Land; AIA Shanghai | Beijing Representative
- *Urban Arms – Explorations on Inhabitable Bridges*: Roberto Bannura, Partner, Steven Holl Architects
- *Positive Thoughts on Urban Upgrading*: Yufei Han, Vice President & Research and Development Department General Manager, Modern Land
The research team visited several of the eight skybridges in the Linked Hybrid, Beijing, which were devoted to highly differentiated uses, including café, art museum, gym, pool, coffee shop, and auditorium.

The half-day Skybridges Symposium at Linked Hybrid, Beijing, featuring speakers from a wide range of firms involved in the design of 3-D mega-projects with skybridges, drew more than 100 people to the Linked Hybrid auditorium, itself located in a skybridge.
10. Skybridge Case Study Visit: Petronas Towers, Kuala Lumpur, 22 July 2019

Perhaps the world’s most recognizable skybridge is that which links the twin Petronas Towers at the Kuala Lumpur City Centre (KLCC) in Malaysia. Though it has been 15 years since the Petronas Towers were the world’s tallest buildings, the shine has never come off the structures, figuratively or literally. The impeccably maintained, chrome-clad towers are a brilliant sight on the “KL” skyline and are a ubiquitous national symbol of pride for Malaysia, as testified by the appearance of Petronas Towers-branded souvenirs virtually everywhere. Kindly hosted by CTBUH Fellow Hashimah Hashim, Executive Director of KLCC Projeks Sdn Bhd, the team was able to visit both levels of the skybridge on a day when it was closed to the public, and also accessed adjacent areas, such as the exclusive Malaysian Petroleum Club. The researchers also saw a comprehensive set of training videos for Petronas Towers’ operations and maintenance teams.

*A report on all four Asian project visits is submitted as an attachment.*
11. **List of Attachments (in Appendix)**

1. IJHRB Paper: Skybridges: A History and a View to the Near Future
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6. Proposed cover of Skybridges Technical Guide
Skybridges: A History and a View to the Near Future

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Abstract

As many architects and visionaries have shown over a period spanning more than a century, the re-creation of the urban realm in the sky through connections between buildings at height has a vast potential for the enrichment of our cities. To many it seems nonsensical that, although the 20th and now 21st century, have clearly seen a push towards greater height and urban density in our major urban centers, the ground-pavement level remains almost exclusively the sole physical plane of connection. As the world rapidly urbanizes, greater thought needs to be expended on how horizontal space can be developed at height. This paper briefly describes the history, present classifications and uses, and potential future development potential of skybridges between tall buildings.

Keywords: Skybridge, Tall buildings, Development, Vertical transportation, Urban habitat

1. Introduction

The purpose of this project is to succinctly capture the development history of the skybridge, as well as put forward a set of principles for future development. The CTBUH believes it is likely we will see more skybridges, and more horizontal development at height between tall buildings, but there is no guarantee that these will be of high quality unless we begin to seriously analyze how well the existing spaces function, and learn from them. This research therefore marks an important milestone in the development of an urban space that has persisted through utopian visions and emerged as a practical, point solution in isolated cases, but now is emerging as a major design typology. We seek to provide a framework for better understanding the skybridge, and improving upon it.

The authors have received an 18-month research grant from thyssenkrupp to undertake a study of the potential use cases for skybridges in future three-dimensional cities, particularly in respect to their potential as transportation corridors in a future that anticipates the arrival of ropeless elevators capable of traveling horizontally. This paper relates to the initial scope of research, which includes a definition and historical evaluation of the typology.

2. Definitions

In general, a skybridge is defined as “a primarily enclosed space linking two (or more) buildings at height.” “Enclosed means that the path of travel within the skybridge is surrounded by built planes (openable and/or static) on all sides. “Linking between buildings refers to the bridge being physically connected and supported in its entirety between two or more separate buildings. “At height means that no part of the bridge touches the ground. Generally, though not exclusively, this paper focuses on structures that are at least six full floors above grade, so as to distinguish them from typical pedestrian overpasses over roadways, canals and railways seen all over the world. Some exceptions to the above definitions may be made for illustrative examples of trends and special circumstances.

In the preliminary research, the authors have identified four general types of structure that can be classed as ‘skybridges;” however, two of these will be selected for more expanded analysis during the course of the research project. All typologies are discussed here in brief.

2.1. Enclosed Circulation

An “enclosed circulation” skybridge primarily exists only to transfer pedestrians from one building to another. It will typically be enclosed in glass and be covered with a roof, and minimally decorated or furnished. It is likely the most common form of skybridge, as it practically serves the goal of passing from point A to point B without having to descend to ground level to pass between two buildings (see Fig. 1).

2.2. Enclosed Programmatic

An “enclosed programmatic” skybridge has all the characteristics of the “enclosed circulation” skybridge, but has some kind of distinct program that draws people to the space for a reason beyond passing from one building to another. This can include common-use areas for occupants of the two buildings that adjoin the skybridge, such
as gyms, recreation rooms, lounges, restaurants, etc., or other extensions of attached buildings’ programs, such as office or residential space (see Fig. 2).

2.3. Skyplanes (Rooftops, Roofdecks, etc.)

“Skyplanes” are occupiable, horizontal structures which may either extend between two or more buildings, or extend past the perimeters of two or more buildings, at the level of the attached buildings’ rooftops, or slightly above (see Fig. 3). These can be circulation-only footbridges, or they can be elaborately programmed with plantings, swimming pools, recreational equipment, amphitheaters, etc.

2.4. Building-as-Skybridge

In this configuration, the overall mass of a single building forms from at least two vertical towers and at least
one horizontal bar into a frame; the horizontal element of this frame is not readily distinguishable from the vertical elements. Typically, the horizontal and vertical elements will be several floors or window frames across or deep. Essentially, the combination of horizontal and vertical elements makes the composition appear or act as a single building, as opposed to two or more buildings connected by a third piece (see Fig. 4).

3. A Brief History of the Skybridge

3.1. Early Skyscrapers and the Machine Age

Within 25 years of the appearance of the first skyscraper as a building form in Chicago in the latter part of the 19th century (Condit, 1952), cities of the future began to be sketched as dense agglomerates of skyscrapers, inhabited by teeming masses of people and vehicles. The precursor to these urban visions was the seminal image created by the American folk artist Erastus Salisbury Field for the Philadelphia Centennial Exhibition in 1876, entitled “Historical Monument of the American Republic”. Here, numerous classically-inspired towers reach into the sky, connected at their tops by an aerial railway network of skybridges upon which balloon-stack locomotives travel.

The painting had a clear influence on visionaries to follow. The work of the American artist-planner Charles R. Lamb and his delineator Vernon Howe Bailey, specifically their 1908 “Streets High in the Air” illustrations (see Fig. 5), show the same set-back blocks and orthogonal skybridges as in Field’s earlier work, and the Visionary City project of the same year by William Robinson Leigh pre-dates the start of spectacular science fiction cinematography by at least 20 years.

The most influential urban visionary work of the early
20th Century was that commissioned by Moses King, who embarked on a series of books which would become one of the defining texts of the early 20th Century American city – “Kings Views of New York”. The first of these books – which primarily recorded, both photographically and statistically, buildings, monuments and views in the city – was published in 1896, with subsequent updated publications in 1903, 1905, 1908, 1911 and 1915. Subject to so frequent updates, the series of books became a living record of the rapidly evolving city and skyline.

It thus seemed natural then – given the process of recording the evolution of the city – that King would want to pre-empt what the future held and thus, in two later editions (1908 and 1911), King commissioned visionary images of what the city could become, perhaps as a “taster” for the next installment of the publication. For these, he commissioned two architect-illustrators. In the 1908 edition, entitled “King’s Dream of New York”, King commissioned Harry M. Pettit to produce an image of the “Cosmopolis of the Future,” which served as the Frontispiece image.

The early skybridge-sky city portrayals came about as a direct response to very real urban issues which were pressing at the time. Primary of these urban issues was the impact that both tall buildings and increased vehicular traffic were having on the ground floor urban condition; tall buildings were increasingly growing in height and over-crowding the street, and the conflict between pedestrian and vehicular traffic was increasing. The reoccurring themes in all the early futuristic visions evolved as a response to these problems; both the stepped-back, tiered skyscraper and the multilevel circulation system. The stepped-back skyscraper was seen as a way to preserve light and air on congested, over-developed New York streets, and the multilevel circulation system a practical organizational tool to handle the vast number of new vehicles and people flooding into the city.

A response to the problems posed by both greater urban density and increased vehicular traffic thus became a key driver behind the early proposition of the skybridge. Transport, in all its myriad forms, became a key element in the early visions. As an insight into the relationship between people, transport and skybridges in these early visions, the two King’s Views of New York frontispieces of 1908 and 1911 are worthy of further comment. These images mark the defining moment of the skybridge-sky city idea, consumed into the public conscience and reproduced many times since their origin. Though separated by only three years, the worlds portrayed are markedly different. In 1908 Pettit, despite a sky populated by huge airships, portrays an urban world dominated by people; pedestrians throng the elevated sidewalks at the ground plane and the skybridges link between buildings and the balconies / rooftop terraces of the buildings themselves (see Fig. 6). Though vehicles are present, they are predominantly tram and train in nature (also seemingly carrying throngs of people on the roof of the latter), with only a few automobiles present.

Three years later, Richard Rummell (taking Pettit’s image-field as his starting point), portrays a world dominated by transport, almost devoid of pedestrians. Whereas the skybridges of Pettit’s image carry pedestrians on two levels (within the bridge and on the roof), Rummell’s skybridges seem primarily to support vast rail networks, with stations slung out along the skybridge routes. It is a similar story at the ground plane, where the elevated pedestrian thoroughfares of Pettit have been dominated by an elevated rail system, sandwiching trams and automobiles below at the ground plane. Even the pedestrian balconies and rooftop terraces have been swept away and the sky has become dominated by bi-planes. This three-fold action; reduction of pedestrians, dominance of trains and replace-
ment of airships with bi-planes, has introduced an element of speed to Rummell’s urban depiction that is not present in Pettit’s. Though the level of activity is perhaps higher in Pettit’s panorama, Rummell hints at a world where transport and mechanization has taken over. In this quest to portray the dominance of transport systems, Rummell has introduced many more strata of skybridges than Pettit portrayed. We can identify perhaps three or four higher levels in Pettit’s image; a clear common circulation route linking several buildings at the 16th/17th floor level, a similar network at the 25th/26th floor level, and perhaps a further two levels implied in the distance, as the building heights increase. This is reflective of the increasing impact transport and vehicles were having on both the contemporary city and the conscience of its inhabitants.

Instrumental in the practical studies, and detailed proposals of, multilevel transport routes in the early 20th century American city was the architect Harvey Wiley Corbett. Corbett was both an urban visionary and staunch defender of the skyscraper city (Willis, 1986, p.159). Much of his career was dedicated to finding solutions to the urban problems of traffic and pedestrian circulation, and the multilevel city became a consistent theme in his work. Greatly influenced by the earlier renderings of Charles R. Lamb, Corbett elaborated on Lamb’s idea in 1913 with his “City of the Future”, published in the seminal journal Scientific American [see Fig. 7]. Now, however, instead of concentrating on the upper levels of the city, Corbett focused on the classification of traffic flow at street level and below. Two pedestrian walkways were superimposed above three levels for automobile traffic, a subway and a goods railway.

3.2. The Skybridge, Urban Planning and Transportation Nexus

Between 1921-29, the Regional Plan of New York and its Environs (Johnson, 1995) invited a number of external experts to create specific proposals for future developments in Manhattan. Corbett served on the architect’s advisory committee for this panel, and presented an ambitious plan for the separation of vehicular and pedestrian traffic, based largely on reformulations of his earlier differential traffic level studies. These new plans were revised and illustrated in collaboration with the delineator Hugh Ferriss [see Fig. 7]. The plan included a sidewalk raised a story above street traffic, bridging the streets and connecting all buildings in a continuous pedestrian promenade. Differing options were portrayed for these promenades, some with the pedestrian walkways cantilevered out over the street, others with them recessed into “arcades” under the buildings above.
The relationship between vehicular traffic and the potential of multilevel circulation in New York is something that has endured for many decades beyond the early proposals of the 1920s. Even as late as 1969, the Regional Plan Association of New York – as a sequel to its 1929 Regional Plan 40 years previously (Johnson, 1995) – included a series of skybridge linked towers as part of its “Urban Design Manhattan” manifesto for the Second Regional Plan for the New York Metropolitan Region (Okamoto & Williams, 1969). This “access tree” arrangement for a cluster of office towers (with residential above) the size of three Rockefeller Centers, accommodating 120,000 office workers [see Fig. 8], attempted to solve the growing problems of inefficient circulation, a poor underground travel environment for most mass-transit commuters, the creation of an urban ‘slab city’ above ground and the very real problems of pedestrian-car conflict. “skywalks” were proposed between buildings at every 10th floor, to provide flexibility in expanding horizontally as well as vertically.

Hugh Ferriss’ contribution to the development of both the skyscraper and the American city is immense, not only through his various collaborations with Harvey Wiley Corbett, but through his rich, Piranesi-esque charcoal illustrations of skyscrapers and the publication of them in his seminal book “The Metropolis of Tomorrow” published in...
1929 (Ferriss, 1929).

It is in the second part of the book – “Projected Trends” – that Ferriss gives most prominence to the possibilities of the skybridge, showing several images of buildings connected at height [see Fig. 9]. These images draw on the worsening traffic situation and consequential traffic-zoning studies conducted earlier with Wiley Corbett, but elevate them to another dimension, with façade-hugging automobiles crowding the horizontal surfaces offered by each building setback.

Ferriss’ publication of “The Metropolis of Tomorrow” in 1929 coincided with the Wall Street Crash and the 1930s economic depression that followed, which shook the commercial foundation of the American skyscraper city. Although Ferriss and others continued to produce a number of one-off visions of future cities incorporating skybridges during the 1930s, the intensity of proposals in the first three decades of the 20th century was never re-captured in America. It was left to Europe, and other parts of the world, to take up the challenge of the Sky City.

3.3. Pre-War Europe and the Skybridge

There had been some modest work on the multilevel city proposed in Europe as a response to the growing traffic problem prior to the reprinting of Corbett’s seminal image (in France in particular: Eugene Henard’s 1910 “City of the Future” and Louis Bonner’s 1913 “Multilevel boulevard in Paris”) but nothing on the scale of the American visions. That, however, was about to change. Corbett’s image was also reprinted in L’Illustrazione Italiana, Italy, and Vokrug Sveta, Russia, in 1913, where it was to have an influence beyond France - on the Italian Futurists and the Russian Constructivists.

The Futurists, and Antonio Sant Elia in particular, were fundamental in moving the possibilities of the vertical modernist city forward in Europe. They were especially interested in the power, force and motion of machinery, combined with a fascination for speed, and the images emanating from America very much appealed to them.

Of all the early Futurist work, it is perhaps Sant Elia’s La Citta Nuova (The New City) scheme of 1912-14 that best shows the incorporation of skybridges [see Fig. 10]. This highly industrialized and mechanized city of the future is created as a vast, multilevel system of skyscrapers, factories, power stations and transport systems, interconnected by terraces, walkways and skybridges. Like the contemporary work in America, the towers themselves follow a stepped profile (though more incremental) and there are several levels for circulation to separate vehicular and pedestrian traffic.

Sant Elia (who was killed during the First World War in 1916) had an immense impact on other young avant-garde architects of the Futurist movement, for example, Mario Chiattone who proposed several “Elia-esque” urban schemes, amongst which Costruzioni Per Una Metropoli Moderna (Buildings for a Modern Metropolis) is perhaps the most powerful. Here, rows of streamlined skyscrapers are linked by steel suspension bridges above vehicular traffic.

Several of the Russian Constructivists incorporated variants of skybridges in their designs. El Lissitzky designed the cover to Richard Neutra’s 1930 book Amerika showing notional high-level bridges, but it was his earlier collaboration with the Dutch rationalist Mart Stam on the proposal
for the Russian state archive for literature building in Moscow, the Wolkenbugel (Cloud Strip) which most radically suggested alternatives to vertical skyscraper form [see Fig. 11].

The Wolkenbugel design included two towers connected at the top through a horizontal bridge, straddling the intersection of a Moscow boulevard. The bridging nature of the building thus grew out of a practical consideration of site. This project became one of the first indications towards creating the three-dimensional city in Russia; a forerunner of later international “floorplate-skybridge” buildings such as the Umeda Sky Building. Similarly, Ivan Illich Leonidov’s 1929-30 project for the House of Industry shows a tower block with detached lift core connected at strategic levels through skybridges, almost 40 years before Erno Goldfinger realized a similar vision with his Trellick Tower in London.

Constructivism turned out to be a short-lived, but influential, movement in Russian history. Lenin passed away, and was replaced by the party secretary Josef Stalin, who put an end to the movement with his Five-Year Plan based on cutting down Western influences and concentrating on developments within the country. Theoretical ideas were considered taboo.


Of all the architects/urbanists working in Europe in the first half of the 20th century, it was perhaps Auguste Perret who most explicitly proposed the skybridge as a distinct architectural element. Perret’s visionary research had circulated in the Parisian press for the first two decades of the twentieth century (making him contemporary with the work of Lamb and Corbett in the US, and predating Sant Elia, see (Bacon, 2001, p.10), but it wasn’t until 1922 that his work actually began to be seriously published. The first of these theoretical projects was the Ville Tours (Tower City) scheme of 1922-32 [see Fig. 12].

From this one can deduce that Perret’s primary motivation in proposing skybridges was to make circulation more efficient between two towers. He planned his city with towers sitting on top of columns, leaving the ground level clear for heavy vehicular flow (a theme consistent with the contemporary work in America). With the pre-dominant pedestrian urban realm elevated 10 to 20 meters above the vehicular level, the towers were also further connected by skybridges approximately 60 meters above ground level. More so than even the earlier work emanating from America, one can see clearly the idea behind the skybridge in the Ville Tours scheme. Further, there is a very clear link to later realised skyscraper-skybridge projects, not least the Petronas Towers.

Perret’s L’Avenue des Maisons-Tours (Avenue of Residential Towers) in 1923 was directly influenced by the Ville Tours proposals and shows an avenue of approximately 40-story residential towers, linked together by skybridges at a common level – sat on top of reinforced concrete plinths rising 10 stories from ground level. Perret later pushed these ideas even further, proposing a ring of linked skyscrapers around Paris, as well as a 20-kilometer-long, 250-meter-wide “Voie triomphale” boulevard near the forest of Saint-Germain, lined by one-hundred 60-story towers (Britton, 2001).

Auguste Perret’s sky-city vision was very influential on Le Corbusier. And, although Le Corbusier did not take his first trip to America until 1935, no European architect wrote more passionately or polemically during the 1920s.
and 1930s than Le Corbusier about the American landscape, its skyscrapers and city plans, as well as its icons of machine age modernity (Bacon, 2001, p.3). Le Corbusier was thus well aware of the fantastical future city proposals on both sides of the Atlantic which, in turn, influenced his own urban propositions.

The first of Le Corbusier’s grand urban-scale visions was his Contemporary City of Three Million Inhabitants exhibited at the Salon d’Automne in 1922 [see Fig. 13] (Abalos & Herreros, 2003). In this, Le Corbusier rejected Perret’s pedestrian bridges spanning from tower to tower at height as being “Futurisme bien dangereux” (possibly very dangerous) and instead portrayed a city of dispersed, 60-story cruciform-shaped towers within a green urban plane. To achieve this green urban space, Le Corbusier elevated the urban roads above the green spaces which were joined at their ends by a peripheral highway system that bypassed the city altogether. In the center of the plan, he concentrated a multilevel transportation hub consisting of depots for buses and trains, highway intersections and – in an echo of Sant Elia’s 1914 Stazione d’Aeroplani scheme – an elevated urban airport.

Le Corbusier’s later urban schemes – and most notably his proposals for cities in South America (Montevidéo, Buenos Aires, Rio de Janeiro and Sao Paolo, following a visit there in 1929) and North Africa (Algiers) show a marked development of this vertical segregation of pedestrian and vehicular traffic. Here, super-elevated highways are formed on the roofs of the tower blocks.

This is perhaps the most marked difference between Le Corbusier’s vision of the skybridge city and the work of most others in the field – his placement of the automobile over the pedestrian at height. Most of the urban visionaries working with the idea of skybridges to date had used them predominantly for pedestrian circulation, with vehicular traffic confined to the ground plane (Ferriss’ Crowding Towers and Overhead Traffic Ways proposals being rare exceptions, but, in Le Corbusier’s schemes, the bridges high in the sky accommodated vehicular traffic, with the ground plane reclaimed by pedestrians. Although this has obvious benefits for the higher environmental quality of the ground plane for the urban pedestrian (green, free from traffic), it was hardly practical – connection of the elevated highway into the suburban ground road system, the logistics of physical incorporation and access from vehicle to building being but three of the considerable problems created.

3.4. Built Realizations Post-WWII

The first significant example of a skybridge at high-level in the post-war period is the 1960 National Congress Secretariat, Brasilia by Oscar Niemeyer [see Fig. 14]. Part of Niemeyer’s grand vision for the Modernist capital of Brasilia, the 28-story twin Secretariat towers sit at the end of a monumental axis atop the podium building which house the Senate and the Chamber of the Deputies (Underwood, 1994). The two towers – with their three-story skybridge form spanning the eleventh-thirteenth stories – forms a framed termination to the grand axial urban view.

Though 30 years later than the Wrigley skybridge, the functional purpose of the skybridge was essentially the same; to create a more efficient circulation route for office workers from one tower to the other, without having to travel to the base of the tower, exit one tower and re-enter the adjoining tower (for more detailed information on the interface between this particular skybridge and tower cir-

calculation system, see Chapter 4.0: Skybridges - Implications).

These projects, and Niemeyer in particular, have continued to exert a skybridge-influence in other parts of South America up to the current day. The 2005 El Faro residential towers in Buenos Aires – the tallest towers in Argentina when completed at 160 meters and 47 floors – take advantage of four separate levels of skybridges, including an extended communal relaxation / reading room at the uppermost level [see Fig. 14].

Given the strength of theoretical “city of the future” work incorporating skybridges and elevated networks through the Japanese Metabolist movement in the 1960s, it is not surprising that perhaps the most significant examples of built skybridges today occur in East Asia. In Japan alone, there are numerous seminal examples, the earliest being the three sets of single-story skybridges linking the two towers of the 1968-71 Kajima Corporation Headquarters Building in Tokyo, at the eighth, 12th and 16th of 21 floors [see Fig. 15].

Perhaps the most significant example of skybridge use in Japan is Hiroshi Hara’s 1993 Umeda Sky Building in Osaka, which was originally envisaged as a single element in his interconnected Sky City vision. Here the two 40-story office towers are connected by skybridges in three forms; at level 22 a 6-meter-wide steel-framed bridge links horizontally between the two towers, between levels 34 and 38, “flying” escalators form a diagonal bridge and, at levels 38 to 40, the floor plate itself forms the physical link.

Skybridges are also a recurring element in the work of Nikken Sekkei architects of Japan (Bognar, 2000). The most high-profile use of an external skybridge in their work to date is in the 1994 St. Luke’s Garden complex [see Fig. 15]. Here the twin towers comprise a multi-purpose complex complementing St. Luke’s International Hospital; the taller tower contains rental offices and a sky restaurant on the 47th floor, whilst the shorter tower provides 175 residential units for hospital patients and a hotel with its own atrium for hospital visitors in the highest seven levels. The skybridge connects the office tower to this hotel atrium at the 32nd floor, thus making the hotel amenities available to office workers without having to exit the building at the ground floor and re-enter the second tower.

If the upper-level floorplate bridge of the Umeda Sky Building can be accepted as a form of skybridge, then there is a rich vein of “buildings-as-skybridge” in existence which can be interpreted similarly. Perhaps the first – and grandest – of these is the 1989 Arc De La Defense in Paris by Otto Von Spreckelson [see Fig. 15] and a clear line of development can be seen up to Rem Koolhaas” / OMA’s CCTV Building in Beijing [see Fig. 3].

There are other variants of the skybridge-as-floorplate concepts, such as the “skybridge as skygarden” concept where, unlike the arch-shaped buildings portrayed previously, the skybridges are often as wide as the floorplate, but occur lower down the building, often at multiple levels and are usually open in nature (non-enclosed). Again, the best examples of these exist in Asia, including Kris Yao’s 1995 Sky City Tower, Taipei and Kenzo Tange’s 1996 Fuji TV Building, Tokyo. In the case of Yao’s Sky City Tower, the 34-story, mixed-use development includes a pair of residential towers accommodating family units which are connected at the 5th, 14th and 24th levels with “skygardens” [see Fig. 17]. Similarly, Tange’s Fuji TV Building creates a series of skygardens, but now for an office environment.

More standard tower-and-skybridge arrangements can be found throughout southeast Asia. The most famous of
these is of course Cesar Pelli’s 1997 Petronas Towers, Kuala Lumpur [see Fig. 18], but there are also significant examples increasingly being realized in other areas. This is especially true of China, which is witnessing unprecedented urban growth as it copes with massive rural-to-urban migration of its population. The embrace of the tall building as an element in new Chinese cities has been enthusiastic, from Guangzhou in the south to Beijing in the north, and the skybridge – often as an iconic rather than functional device – is increasingly being realized. C.Y. Lee’s 1997 Yuda World Trade Centre in Zhengzhou is a good example of a tower and skybridge arrangement in China. Here the 30-story office towers are actually linked by two skybridges; at the 15th level sitting above the glass atrium, and at the 30th level as a free-standing bridge element. Obermeyer’s 2002 CLD Forum Building in Beijing is also a good example (Zaknic et al., 1998). Here the two-story skybridge at the 18th/19th story links the two office towers which exist above a low-level primary school.


Perhaps not surprisingly given the origins of the theoretical skybridge in late 19th century America and Europe, there are several post-war precedents in America. Post-war skybridges of significance in the US include the 1969 Peachtree Center, Atlanta by Edwards & Portman [see Fig. 19] and the 1983 UN Plaza Building, New York by Dinkeloo & Roche. The Peachtree Center high-level skybridge links two 27-story office towers and is one element in a lower-level urban network of skybridges that spans throughout the Peachtree complex. Dinkeloo & Roche’s UN Plaza skybridges connect, at the second and tenth levels, the lower office floors within these 39-story towers, which also contain a hotel in the upper portion. The higher-level bridge (at the tenth floor) is effectively positioned at the mid-height of the office function, to expedite circulation of employers between the two linked areas.

4. The Contemporary State of the Art – Skybridges since 2000

Since 2000, there have been some significant advances in the typology, with a notable prevalence towards multi-story skybridges that span nearly every floor between two buildings or are contained within the building envelope;
for example, ABB Arkitekten’s 2003 BOCOM Financial Tower, Shanghai and Mario Botta’s 2003 Kyobo Tower, Seoul [see Fig. 20]. The Kyobo Tower is an interesting case study since, as well as the lower-level enclosed corridor-skybridges, it contains a separate, larger skybridge at an upper level. This skybridge provides functional space rather than circulation however, creating an elevated lounge which can be accessed from both towers at either end.

Massimiliano Fuksas’ 2001 Vienna Twin Towers project [see Fig. 21] has five sets of multiple skybridges connecting the two towers on approximately 60% of its levels. Even this “40% void” between skybridges creates a very differing aesthetic effect than the “every floor” skybridges of Botta’s Kyobo.

Murphy/Jahn’s 2003 Highlight Towers [see Fig. 1] set a strong precedent. The two Highlight towers’ skybridges, which exist in two-story form at the 10th and 11th floors, and in one-story form at the 20th floor, are interesting, as Murphy/Jahn envisaged them as “clip-on” elements that can be added or taken away. This introduces a potential for both mobility and flexibility with the skybridge that has not been suggested prior. Michel & Partners 1994 Belgacom office towers in Brussels [see Fig. 22] are linked by a skybridge at the 26th of 28 floors, once again to expedite circulation of employees from one tower to another.

The final region of the world to examine the built examples of skybridges is the Middle East, and Dubai in particular. Perhaps not surprising given the incredible rate of tall building construction there in the headlong quest to create an instant “developed” city – the superlatives of construction in Dubai are numerous; world’s tallest building, world’s largest mall, world’s longest indoor ski run, etc. These superlatives are extended to the 2003 Marriott Apartments, Dubai [see Fig. 23], with a 73-meter-long skybridge, which, like many others around the world, actually serves a very practical purpose; to link the communal facilities at the 19th of the 20 stories of these executive apartments for the benefit of occupants of both towers.

5. Implications for the Future of the Urban Form

As many architects and visionaries have shown over a period spanning more than a century (from the early 20th Century “King’s Views of New York” to virtually all “urban vision” science-fiction cinematography, see Wood, 2003), the re-creation of the urban realm in the sky through connections between buildings at height has a vast potential for the enrichment of our cities. To many it seems nonsensical that, though the twenty-first century has clearly seen
a push towards greater height and urban density in our major urban centers, the ground-pavement level remains almost exclusively the sole physical plane of connection. Additionally, one of the major failings of tall buildings in architectural terms is that most are designed as stand-alone icons superimposed on – rather than integrated into


Figure 23. Marriott Executive Apartments, Dubai (source: Wood).
— the urban fabric. Despite the often significant vertical height of these buildings, very few of them connect to the city (or each other) at any level other than the ground plane, and often the very objective of the project brief is to “stand out,” rather than to “fit in.”

If cities concentrate perhaps ten or a hundred times more people at a given location through building tall, there is also a need to replicate the facilities that exist at the ground plane up in the sky, including the parks and the sidewalks, the schools and the hospitals, and other public/civic functions. The ground plane should be considered as a duplicable layer of the city which needs to be replicated — at least in part — at strategic horizons within and between buildings in the sky; not as a replacement of the ground plane but as an addition to it. Every tall building would then need to be considered as a vital element in an overall, three-dimensional urban framework, rather than as a stand-alone icon superimposed on a two-dimensional urban plan.

Though this idea might seem a fantastical proposition, skybridges are increasingly being realized — albeit in a piecemeal way — in cities around the world. Fig. 24 illustrates some of the more significant examples in recent years. There is perhaps also a reason that, of the seven final entries for the World Trade Center Tower competition, five of them proposed some form of direct linkages between towers (see Wood & Oldfield, 2005).

6. Conclusion / Next Steps

The authors will be undertaking the aforementioned research project, which is planned to conclude in mid-2020, at which time, several publications will bring this discussion up-to-date, and provide a new generation of informed speculation on the future of the skybridge, in the context of the three-dimensional city vision. The planned approach is as follows:

**Assessment of the current state of the art.** Through examination of built, under-design and under-construction skybridges around the world, the research project will seek common characteristics and identify best practices in design, construction, and operation of skybridges in a tall-building setting.

**Development of design guidelines / future potential.** Based on the assessment of the challenges and existing solutions articulated in the previous section, the research aims to develop a preliminary set of guidelines for future developers of skybridges, taking into account technological changes such as horizontal elevators, and urban changes that embrace skybridges more fully as part of the cityscape.

- What are the main challenges / barriers to the incorporation of skybridges in tall buildings — physically, logistically and operationally — and how can these challenges be overcome?
- What are sensible design considerations / recommendations, as first steps towards the incorporation of

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**Figure 24.** Many of the official and unofficial competition entries for the World Trade Center tower replacements proposed connections between towers at height, (A) Foster + Partners, (B) SOM, (C) Richard Meier et al., (D) Foreign Office Architects, (E) United Architects, (F) THINK Team (G) CoOp Himmelblau (H) Richard Dattner (Source: Stephens, 2004).
skybridges in tall building design?

• What benefits could skybridges bring to our current and future urban centers?

Research Methodology

- Literature Review. Initial work will focus on studying: Existing peer-reviewed journal papers, news articles, historical archives, etc.; Existing performance data on vertical transportation, people flow, foot traffic, etc.; and photos.

- Engagement with Design and Building Operations Teams. The researchers will use the extensive CTBUH network to develop contacts and dialogue with the design and building operations teams of the chosen case study buildings. Interviews and feedback from these parties would be incorporated into the overall research.

- On-Site Study. Clearly, the best way to understand a space is to research it in person, and to analyze it using a systematic set of principles and criteria. Visit activities will include:
  
  • Observance of usage patterns / dwell time in the space at different hours
  • On-site user / property manager / maintenance engineer surveys or interviews
  • Vertical-to-horizontal transportation traffic patterns
  • Survey of security and fire-suppression/isolation systems and methodology

Through these activities, the authors believe that a clear vision of an integrated 3D city will emerge, incorporating skybridges in a way that has been foreseen a century and more ago, but has not been realized to date due to limitations of technology, political will, and economic and demographic pressures. With many megalopolises continuing to rise at or near a sea level that itself is bound to rise due to climate change, informed, advanced thinking about cities as three-dimensional propositions with options for connecting people and services at height, it seems the realization of these visions cannot come too soon.

Acknowledgements

The authors would like to recognize the generous sponsorship of thyssenkrupp for the CTBUH research project “Skybridges: Bringing the Horizontal into the Vertical Realm.”

References


NEW YORK CITY – An important aspect of the CTBUH Research Project “Skybridges: Bringing the Horizontal into the Vertical Realm,” kindly supported by thyssenkrupp, is the collaboration with the Illinois Institute of Technology (IIT) College of Architecture, in the form of a research-based seminar course entitled “Talking TALL.” Led by CTBUH China Office Director and Academic Coordinator Dr. Peng Du, with teaching support from Daniel Safarik, CTBUH Editor and Jason Gabel, CTBUH Communications Manager, the course addresses the design, operational and management aspects of skybridges in multi-building complexes around the world.

As part of the research agenda and course program, Dr. Du, Safarik and the students traveled to New York City for two days of presentations, workshops, and meetings with architecture firms involved in the design of significant horizontal spaces at height, as well as an onsite investigation of the American Copper Buildings, a two-tower development connected by a skybridge, completed in 2017. The project received the Best Tall Building Americas 2018 award from CTBUH.

The group first visited Kohn Pedersen Fox Associates (KPF), where Elie Gamburg, director, gave a tour of the office and a presentation on several of the projects KPF has designed with significant horizontal elements at height over the past decade, including the Shanghai World Financial Center; Hysan Place, Hong Kong; Concord Cityplace Parade, Toronto; and the Royal Atlantis, the Palm, hotel in Dubai. Gamburg outlined both the technical aspects of skybridge construction, such as “strand-jacking” or lifting skybridges by rope into position; as well as the philosophical design approach to skybridges as part of a design trajectory that extends back through thousands of years of place-making, to Chinese palace architecture.
of Cultural Projects Ayumi Sugiyama. Attendees were able to tour the upper and lower floors of the skybridge, which contain a lounge and a swimming pool, respectively, as well as ancillary areas within the connected buildings. The program includes meeting/all-purpose rooms, a rentable large kitchen and dining area, a juice bar, a hammam/sauna, and two-story gym with rock-climbing wall. The skybridge plays several important roles, Sugiyama said. In addition to providing an exciting gathering place for residents, it also allowed the twin towers to have mechanical equipment consolidated on only one of the two rooftops, leaving the other open for a roof deck. As the project is in east Murray Hill, an area with fewer amenities within walking distance than a typical Manhattan neighborhood, it was important to the client to provide extensive common space and amenities within the complex.

One of the advantages of living on the eastern edge of Midtown Manhattan is across-the-street connectivity to ferry services, which in some cases represent the fastest way from point A to B around the five boroughs. The journey from 34th Street and FDR Drive to Fulton Landing in Brooklyn took the group past a number of familiar landmarks, as well as some new ones, such as the Domino Sugar Plant Redevelopment, which features two “building-as-skybridge” residential towers.

Upon arriving in Brooklyn, the group made its way along cobbled streets and past old warehouses to the new offices of Bjarke Ingels Group (BIG), which has an entire floor of a massive building that formerly stored furniture. The students got the opportunity to see the eclectically decorated BIG offices, which includes a materials library with furniture and fixture lines as well as buildings. They were also given presentations from the project leads behind The Spiral, VIA 57 WEST, and The XI, New York; the Amager Bakke Waste-to-Energy Plant in Copenhagen; the Miami Produce Center and Grove at Grand Bay in South Florida; and Telus Sky and Vancouver House in Calgary and Vancouver, respectively.

CTBUH would like to express its gratitude to thyssenkrupp for supporting the research and travel; and to KPF, SHoP and BIG for providing an enriching experience for the researchers.
Skybridges: Bringing the Horizontal into the Vertical Realm

¥ 300.00 - ¥ 500.00 (US$43 – $72)

📅 Thursday, 18 July 2019
⏰ 1:30 pm – 6:30 pm
📍 Beijing, China

Details

(view page in Chinese)

As many architects and visionaries have shown over a period spanning more than a century, the re-creation of the urban realm in the sky through connections between buildings at height has a vast potential for the enrichment of our cities. As the world rapidly urbanizes, greater thought needs to be expended on how horizontal space can be developed at height. Today, new transportation technology, and structural engineering practices seem to put horizontal habitat in the sky within reach. But cultural, organizational, and jurisdictional obstacles remain. To overcome these, a solid case needs to be made for the extensive benefits of skybridges in a much wider application than has been seen historically.

Join CTBUH for a special half-day Symposium at one of the world's most significant skybridge-linked projects, Beijing's Linked Hybrid, the recipient of the CTBUH 10 Year Award in 2019, kindly hosted by Modern Land. Presentations will be given by some of the leading practitioners of skybridge projects around the world, and some of the enabling technologies that will take 3-D cities to the next level in the near future. Hear from the CTBUH research team engaged in an 18-month research project, kindly sponsored by thyssenkrupp, to determine the state of the art in skybridges and sketch a future vision of how these remarkable structures can add a new dimension to vertical urbanism.

Please note, four AIA Continuing Education Credits will be provided. If you have any questions, please contact china@ctbuh.org
Program

Hosted by Jiaqi Qu, Associate Director, CTBUH China Office

1:30 – 1:40 pm: Welcoming address – CTBUH Vice President of Academic Affairs Dr. Peng Du; Yin Chen, Executive Director & Chief Technical Officer, Modern Land; AIA Shanghai | Beijing Representative Carlos Gomez, Founder & Principal, CRG Architects

1:40 – 1:55 pm: Skybridges: State of the Art – Daniel Safarik, Coordinator & Editor, Communications, CTBUH

1:55 – 2:20 pm: Urban Arms – Explorations on Inhabitable Bridges – Roberto Bannura, Partner, Steven Holl Architects

2:20 – 2:45 pm: The Positive Thoughts on Urban Upgrading – Yufei Han, Vice President & Research and Development Department General Manager, Modern Land

2:45 – 3:10 pm: MULTI: Innovative Elevator Technology for Horizontal & Vertical Urban Connectivity – Ian Smith, Vice President, Special Projects, Thyssenkrupp Elevator AG Asia Pacific Office

Hosted by Carlos Gomez, Founder & Principal, CRG Architects, representing AIA Shanghai | Beijing

3:10 – 3:30 pm: Coffee break
Beijing Skybridges Symposium, 18 July 2019: Agenda

3:30 – 3:55 pm: SkyBridges: Connectivity – Satoshi Ohashi, Director, Zaha Hadid Architects

3:55 – 4:20 pm: Sky Connection: A Changing Concept of Placemaking – Yong Ding, Director (Shanghai), Kohn Pedersen Fox Associates

4:20 – 4:55 pm: Horizon of verticality – Yen Liu, Vice President, CallisonRTKL

4:55 – 5:20 pm: The multi-dimensional tall buildings – Dr. Peng Liu, Director, Arup

5:20 – 5:30 pm: Closing Remarks

5:30 – 6:30 pm: Tour of Linked Hybrid

Event Host:

Research Sponsor:

Supporting Partner:
BEIJING – There could hardly have been a more appropriate venue for the half-day CTBUH Skybridges Symposium than the auditorium of Linked Hybrid, situated in one of the eight skybridges linking the 10-tower complex together. And, by all indications, the topic and speakers drew great interest, as a capacity crowd of more than 100 were in attendance to hear a half-day program of speakers with significant involvement in developing 3-D cities of the future.

Kindly hosted by Modern Land, the developer of Linked Hybrid, and staged by CTBUH and AIA Shanghai, the symposium was driven by the 18-month research project, “Bringing the Horizontal Into the Vertical Realm,” funded by thyssenkrupp. The outstanding mixed-use complex is one of approximately two dozen case studies from around world that demonstrate the state of the art in connecting buildings and cities on planes above the ground, which will ultimately be analyzed and published in an upcoming CTBUH Technical Guide.

Welcoming speeches were given by Yin Chen, Executive Director & Chief Technical Officer, Modern Land, and AIA Shanghai | Beijing Representative Carlos Gomez, Founder & Principal, CRG Architects Carlos Gomez.
CTBUH Vice President of Academic Affairs and China Office Director Peng Du, introduced the 3-D city concept with a stage-setting presentation, followed by Daniel Safarik, CTBUH Communications Coordinator and Editor, who provided attendees with an update on the research project.

Roberto Bannura, Partner, Steven Holl Architects, placed the synthesis of the Linked Hybrid project in context by showing 40 years of work by his firm and its founder, Steven Holl, who had always been interested in the urban implications of habitable bridge structures.

Yufei Han, Vice President & Research and Development Department General Manager, Modern Land, shared his thoughts on the reasoning behind developing Linked Hybrid as a kind of intentional community that would be comprehensive and yet inviting to the greater city, referring to its inspiration by the 1910 Henri Matisse painting, Dance.

A practical discussion of the urban and logistical problems that could be aided by skybridges was presented by Ian Smith, Vice President, Special Projects, thyssenkrupp Elevator, Asia-Pacific Office. The industrial concern has developed a linear-induction ropeless elevator called MULTI, which presents a potential for linking buildings across greater distances than would be possible with walking-only skybridges, and integrating tall building transportation systems more seamlessly with land- and air-based transportation, as well as being a practical space- and energy-saving strategy for tall buildings.

Satoshi Ohashi, Director, Zaha Hadid Architects, presented the firm's work as part of a broader story about connectivity, focusing on skybridge-linked complexes such as Galaxy SOHO, Beijing; Sky SOHO, Shanghai; and the soon-to-be-completed Li Ze SOHO, which will have a soaring atrium bridged by internal skybridges.

Yong Ding, Director, Shanghai, Kohn Pedersen Fox Associates, spoke of the firm's work using horizontal connections at height as a way of placemaking, both in the sense of creating gateways for cities and for new kinds of occupiable habitat, evidenced by projects such as Royal Atlantis, Dubai; Concord Cityplace Parade, Toronto; and Hangzhou Xizi International Center.

Discussing the concept, Horizons of Verticality, Yen Liu, Vice President, CallisonRTKL, made the case that projects such as the Xi'An Grand Hyatt, Taihe Chang'an Center and Dashang Yantai Harbor City mixed-use projects fused and inverted properties of visibility and accessibility in novel ways that support better urban spaces.

The practical reality of constructing such incredible projects as Raffles City Chongqing and Gate to Hangzhou was presented by Peng Liu, Director, Arup, who detailed some of the structural engineering innovations that have, and will continue to facilitate highly connected vertical cities.

The afternoon, punctuated by a tea break with CTBUH-branded pastries, concluded with a tour of the Linked Hybrid project.

CTBUH would like to thank its host, Modern Land; co-producer AIA Shanghai, and research sponsor thyssenkrupp for making this event possible and successful.
Skybridges Research Team Visits Four Major Projects in China, Malaysia

July 31, 2019

SHENZHEN, CHONGQING, BEIJING and KUALA LUMPUR – Three researchers from the CTBUH Skybridges Research Team visited four key skybridge-linked projects in the Chinese cities of Shenzhen, Chongqing, and Beijing, and the Malaysian capital Kuala Lumpur. The journey was part of the 18-month research project “Skybridges: Bringing the Horizontal Into the Vertical Realm,” kindly funded by thyssenkrupp and launched at the 2018 CTBUH International Conference in Dubai.

The team, consisting of Dr. Peng Du, CTBUH Vice President of Academic Affairs and Director of the CTBUH China Office; Daniel Safarik, Communications Coordinator and Editor; and Zachary Zuspan, Research Assistant, visited Tencent Seafront Towers in Shenzhen; Raffles City Chongqing; Linked Hybrid in Beijing; and Petronas Towers in Kuala Lumpur. The aim of the research was to confirm and compare the physical experience of the skybridges in these projects, against the impressions the team already had developed through analysis of photos, renderings, and drawings.

At each project, the team received a warm welcome and informative
tour from the owner-developer and/or design teams. At Tencent Seafront Towers, the headquarters of one of China's leading software companies, the researchers toured the “Health Link,” the intermediate skybridge connecting the two office towers, which contains a running track, gym, coffee shop, ping-pong and billiards tables, and a full-size basketball court, all between 96 and 120 meters above ground.

In China's fast-growing central-western city Chongqing, the Raffles City project was still under construction at the time of the visit. This proved beneficial in many ways, as the incredible engineering behind what is planned to become both the world's longest and highest skybridge, the Conservatory, was on full display. Led by colleagues from Moshe Safdie Architects and CapitaLand, the team was able to view such technologies as dampers, where the skybridge connects with the roof of supporting towers beneath, a sliding gasket that allows the bridge and connecting towers to move independently as much as 500 mm in each direction, and a special elevator for hauling the full-sized trees up to the Conservatory. The trees weigh as much as 4 metric tons, and are delivered with root balls intact. The visitors were able to assess the project from every angle, including the catwalk atop the skybridge, and from a viewing point from across the Changjiang River, where the 8-tower complex dominates the skyline.

At Linked Hybrid, Beijing, the tour was kindly conducted by Modern Land, the project's developer, taking the group through five of the project's eight skybridges, with programs ranging from auditorium, to gymnasium with pool, to an art museum. The research visit on July 18 coincided with a half-day Skybridges Symposium, supported by Modern Land, thyssenkrupp and co-produced by CTBUH and AIA Shanghai / Beijing, featuring the architects, engineers and owner/developers of many significant horizontally-linked tower projects in China and elsewhere.

The final visit was to what is perhaps the world's most recognizable skybridge, that which links the twin Petronas Towers at the Kuala Lumpur City Centre (KLCC) in Malaysia. Though it has been 15 years since the Petronas Towers were the world's tallest buildings, the shine has never come off the structures, figuratively or literally. The impeccably maintained, chrome-clad towers are a brilliant sight on the “KL” skyline and are a ubiquitous national symbol of pride for Malaysia, as testified by the appearance of Petronas Towers-branded souvenirs virtually everywhere. Kindly hosted by CTBUH Fellow Hashimah Hashim, Executive Director of KLCC Projeks Sdn Bhd, the team was able to visit both levels of the skybridge on a day when it was closed to the public, and also accessed adjacent areas, such as the exclusive Malaysian Petroleum Club. The researchers also saw a comprehensive set of training videos for Petronas Towers' operations and maintenance teams.
Skybridges: Bringing the Horizontal into the Vertical Realm

A CTBUH Research Project