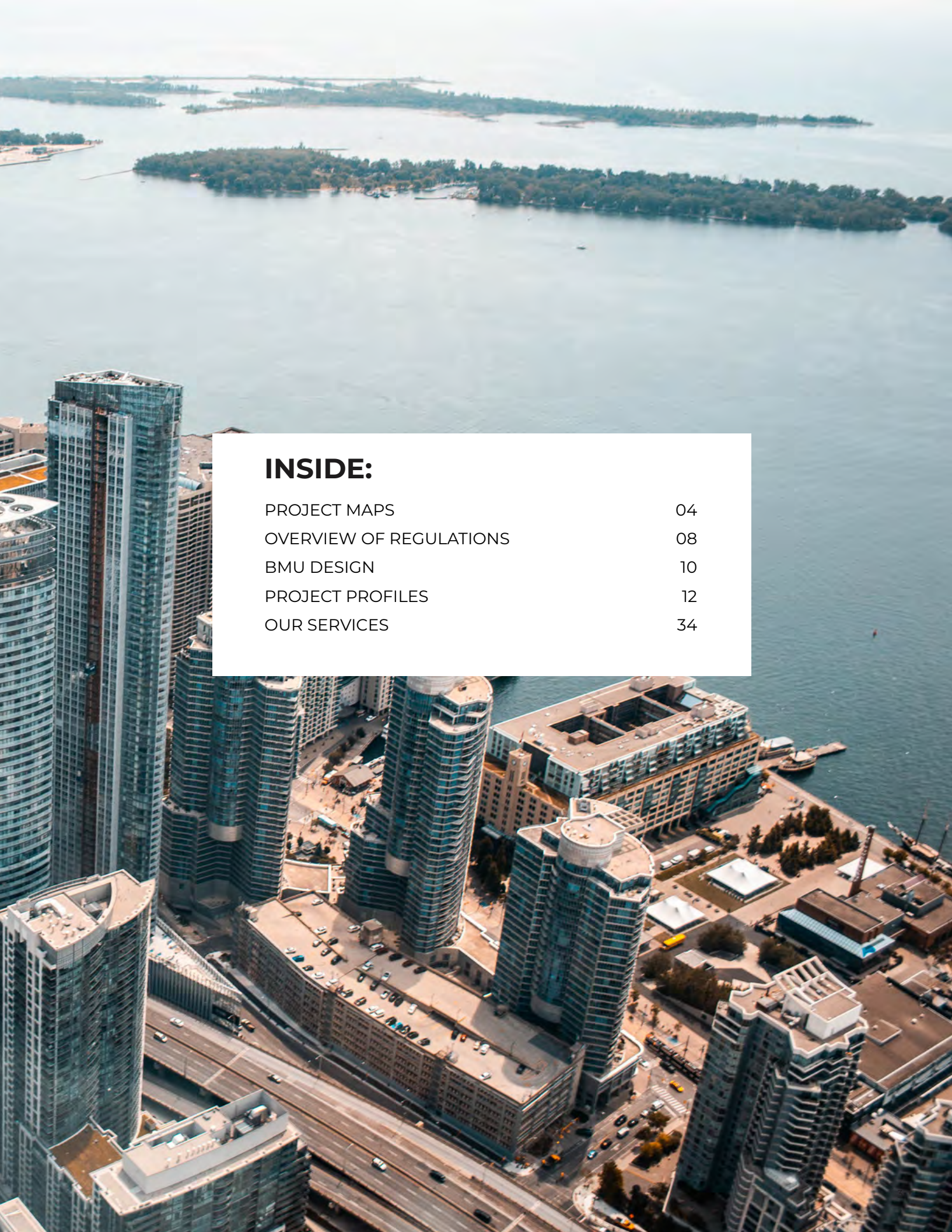
PROBEL

SAFETY SYSTEMS ENGINEERED FOR LIFE

2021 Edition

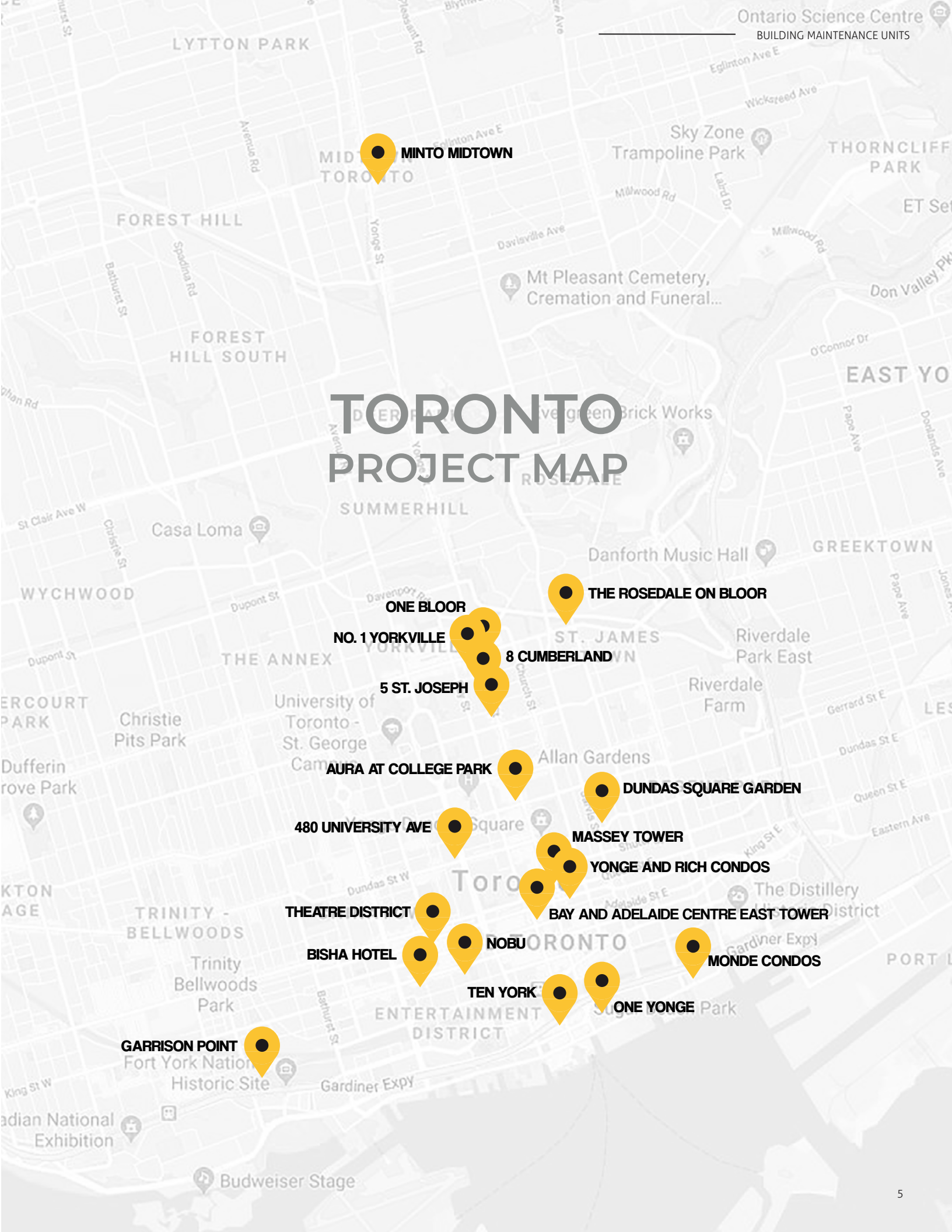
BUILDING MAINTENANCE UNITS (ROOFCARS)


MARSH & MCLENNAN
COMPANIES



INSIDE:

TORONTO
PROJECT MAP



NORTH AMERICA PROJECT MAP

TORONTO

- THE ROSEDALE ON BLOOR
- ONE BLOOR
- YONGE AND RICH CONDOS
- ONE YONGE
- DUNDAS SQUARE GARDEN
- MONDE CONDOS
- NOBU
- NO. 1 YORKVILLE
- 8 CUMBERLAND
- 5 ST. JOSEPH
- TEN YORK
- 480 UNIVERSITY AVE
- AURA AT COLLEGE PARK
- MASSEY TOWER
- BAY AND ADELAIDE CENTRE EAST TOWER
- THEATRE DISTRICT
- BISHA HOTEL
- GARRISON POINT
- MINTO MIDTOWN

VAUGHAN

- TRANSIT CITY TOWERS 1 -3

CALGARY

- THE BOW ENCANA

MISSISSAUGA

- M CITY 1 AND 2

PORTLAND

- ATWATER PLACE

CHICAGO

- 111 WEST WACKER DR.

VIRGINIA BEACH

- VIRGINIA BEACH TOWERS

PHOENIX

- CENTREPOINT CONDOS

LAS VEGAS

- TRUMP INTERNATIONAL HOTEL AND TOWER
- PLANET HOLLYWOOD TOWERS
- ENCORE AT WYNN LAS VEGAS
- COSMOPOLITAN RESORT CASINO TOWER 2

REGULATIONS

ONTARIO BUILDING CODE

ONTARIO BUILDING CODE STATES BUILDINGS OVER 8 M (26 FT) REQUIRE SUSPENDED MAINTENANCE AND WINDOW CLEANING SYSTEMS THAT CONFORM TO CAN/CSA-Z91

4.4.4. ANCHOR SYSTEMS ON BUILDING EXTERIOR

4.4.4.1. ANCHOR SYSTEMS ON BUILDING EXTERIOR

(1) Where suspended maintenance and window cleaning are intended to be carried out on the exterior of a building described in Article 1.1.2.2 of Division A, anchor systems shall be provided where any portion of the roof is more than 8 m above adjacent ground level.

(2) Except as provided in Sentence (3), the anchor systems in Sentence (1) shall be designed, installed and tested in conformance with CAN/CSA-Z91, “Health and Safety Code for Suspended Equipment Operations”.

(3) Other anchor systems may be used where such systems provide equal level of safety.

(4) The anchor system material shall be made of stainless steel, or other corrosion resistant base material, or from steel that is hot dipped galvanized, in accordance with CAN/CSA-G164-M, “Hot Dip Galvanizing of Irregularly Shaped Articles”.

CANADIAN STANDARDS ASSOCIATION

CAN/CSA-Z91 REQUIRES ALL SUPER TALL BUILDINGS OVER 150 M (492 FT) REQUIRE A BUILDING MAINTENANCE UNIT (ROOF CAR)

CSA Z91-17 - HEALTH AND SAFETY CODE FOR SUSPENDED EQUIPMENT OPERATIONS

6.5.6.10.2 DAVITS - RESTRICTED HEIGHT

Davit systems shall not be used if the suspension height exceeds 150 m (492 ft). Note: Roof-level hoists and roof cars are recommended on buildings over this height. Use of outrigger systems for suspension heights in excess of 150 m (492 ft) should be restricted to during construction or renovation when the system has been engineered.

* In some instances Building Maintenance Units may also be required when the building height is less than 150 m (492 ft) do to complex or unique architectural features that cannot be accessed using conventional rigging techniques such as Davit Arm Systems.

BMU DESIGN

BMUS ARE CUSTOM MADE

Each BMU is custom made to address the suspended façade access needs of each building. For example, stage length is determined to ensure the stage fits around the façade and is able to service all areas including overhangs. Maximum reach depends on several factors such as whether the BMU is stationary or on a track, how complicated the façade is and more. In order to service overhangs and/or difficult to reach areas on the façade, many BMUs are designed with an approach cradle.

The machine itself can come in many different sizes and weights and is able to fit a variety of budgets. Tall buildings are clearly not only the future of Toronto, but the rest of the GTA as well; thus, it's our proiority to ensure BMUs are more accessible and super tall buildings are simpler to maintain.

STANDARD BMU DESIGN CHARACTERISTICS

While each BMU is custom, there are certain design elements that we think should be industry standard and ensure to include in each BMU. They are as follows:

- **Soft Rope System**

In modern buildings with complex architectural features, the BMU needs to have provisions to allow the suspended platform to move in / out, sideways or rotate at some angle while making a drop. This is achieved by providing the BMU with specialised pantograph or suspended access machinery to provide this movement. Conventional stabilization system involves tying in the suspension ropes to the stabilization button on the building face to prevent swaying of platform and does not allow platform to move during a drop. To overcome this constraint BMUs are provided with soft rope stabilization system which has independent drive mechanism mounted on the platform for its nylon rope which is used to tie to the building face for stabilization. Since the soft rope is part of the platform, paying out the soft rope through its clutch-controlled drive mechanism allows for movement of platform during mid drops while keeping it always stabilized.

- **Standoffs (for approach cradles)**

When BMU is provided with specialised pantograph or suspended access machinery along with soft rope stabilization to allow platform to move during mid-drop, the tension in the soft rope wraps around the building feature and imposes load on that feature. Where these features are not able to withstand the imposed loads, stand off brackets/redirectors can be provided to prevent this imposition of loads on the feature. This system includes a fixed bracket provided at every such location on the building and a portable redirector. The portable redirector would require suite access to set it up on the balcony/terrace or railing. In some cases this portable redirector can also be carried by the person in the platform to rig and set up under the balcony terraces while making a drop.

- **Material Hoist System**

Though BMUs are primarily used to access the exterior building façade to clean the window glass, this ability to access the façade can also be used for maintenance function such as caulking, sealing, repair work, stucco finishing, bulb replacement of building signs and other architectural lightning on the building or other similar function Where required BMUs can be provided with hook point with suitable capacity which enables the maintenance crew to bring and rig their own hoist to this hook. Where required the BMUs can also be provided with a material hoist which can be used to lift suitable materials for building maintenance.

- **Glass Hoist System**

Glass handling units are specialised brackets with suction cups and hanging points which are used to hoist and maneuver the glass frame in the intended position during replacement processes. This allows for access both from outside and inside the building for proper installation and sealing. Hook points or material hoist system provided on a BMU are used to rig glass handling units for glass replacement. This glass handling unit is provided by the glass replacement maintenance crew.

ONE BLOOR ST. EAST

PROJECT PROFILE

Competing to be one of the tallest residential towers in Canada, One Bloor stands at a whopping 75 storeys. With a façade unlike any other, it is hard to miss this new residential development; located in Toronto at Yonge and Bloor Streets, with close to 800 units.

DESCRIPTION

Location: Yonge and Bloor

Developer: Great Gulf

Property Management: Balance P. M.

Year: 2017

Storeys: 75

Number of Units: 789

TECHNICAL CHALLENGES

> Hide BMU (roof car) in parked position

> Reach areas under balconies

> Stabilize platform to irregularly spaced, changing locations of balcony posts

> Move roof car jib while stabilized to approach difficult to reach areas

> Balance telescopic beam, while suspended on 6 wire ropes

OUR SOLUTION

> Stationary BMU (roof car)

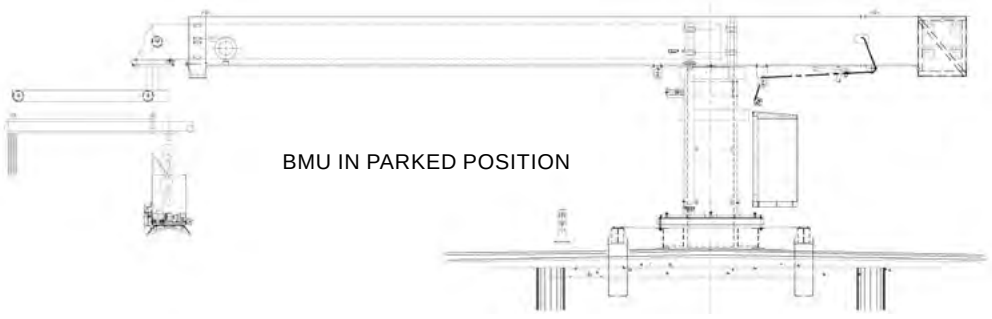
> Approximate lifting height of 260 m (853 ft)

> 2 stage telescopic jib, maximum reach: 25.5 m (84 ft)

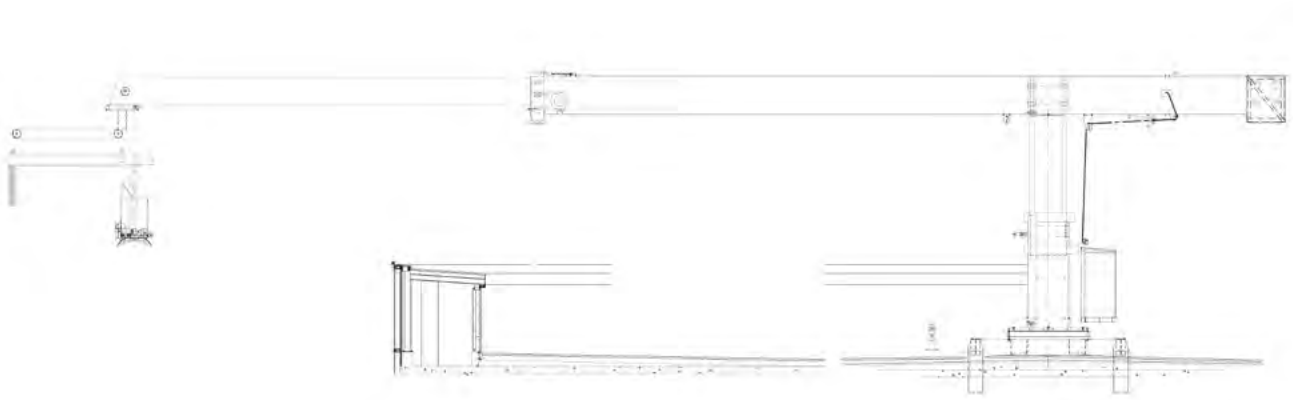
> Telescopic mast height: 3.5 m to 6 m

> Material hoist with a capacity of 400 kg

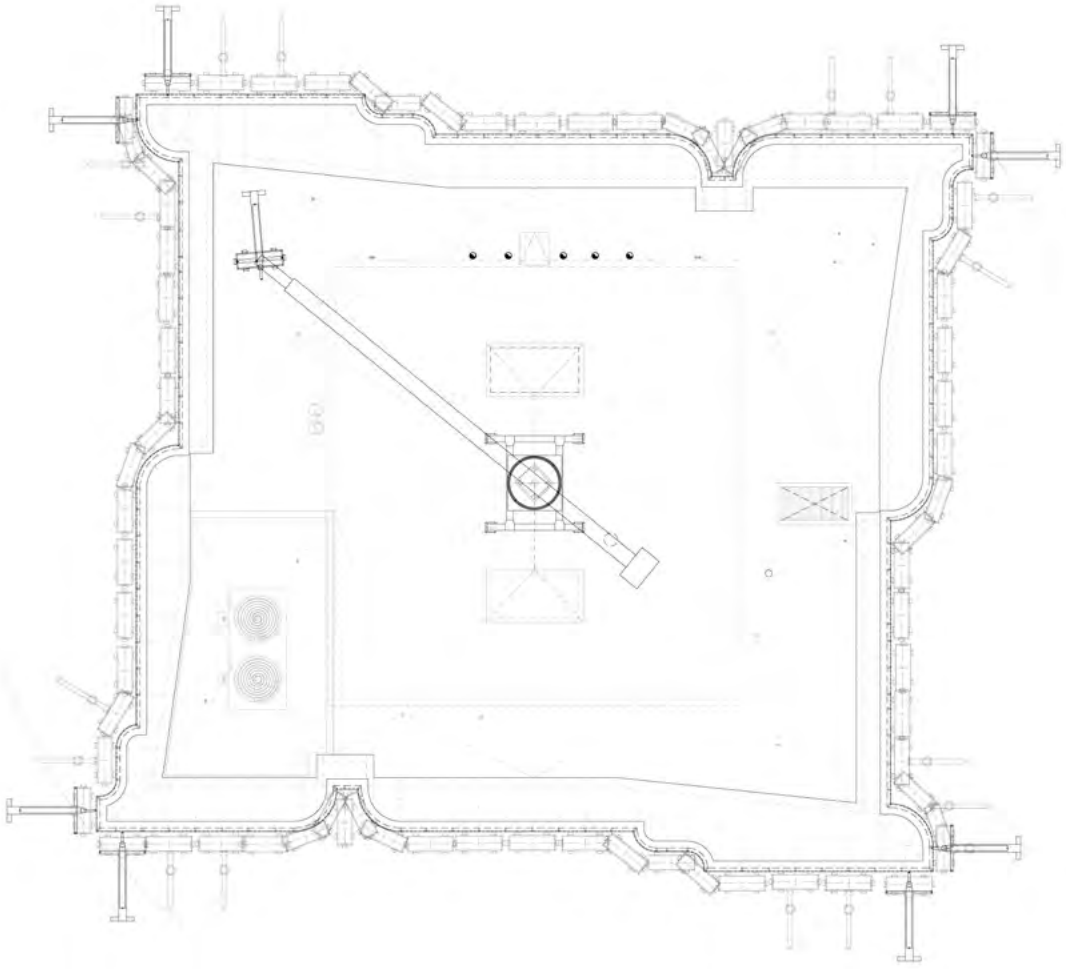
> Platform length: 2.1 m, attached to suspended telescopic beam, suspended on 6 wire ropes (1.8 m reach) c/w counterweight and soft rope restraint system



BMU IN PARKED POSITION



BMU IN PARKED POSITION WITH SUSPENDED BOOM



BMU LAYOUT AT ROOF LEVEL

AURA AT COLLEGE PARK

PROJECT PROFILE

Standing at 78 storeys above the Toronto skyline, located at the corner of Yonge and Gerrard Streets, is Aura, Canada's tallest residential building. Aura sits on a three-storey solid granite and glass podium that features various retailers. Aura is home to some of the most breathtaking views in the city because of the building's height.

DESCRIPTION

Location: Yonge and Gerrard

Developer: Canderal Stoneridge

Property Management: Crossbridge Condominium Services

Year: 2015

Storeys: 78

Number Of Units: 995

TECHNICAL CHALLENGES

> Combination of long telescopic and luffing BMU (roof car) jib

> Reach over very high roof parapet walls

> Exchange of different size of platforms - change spreader bar sheaves locations

> Exchange stabilization systems of the upper (narrow) to lower (wide) tower

OUR SOLUTION

> Stationary BMU (roof car)

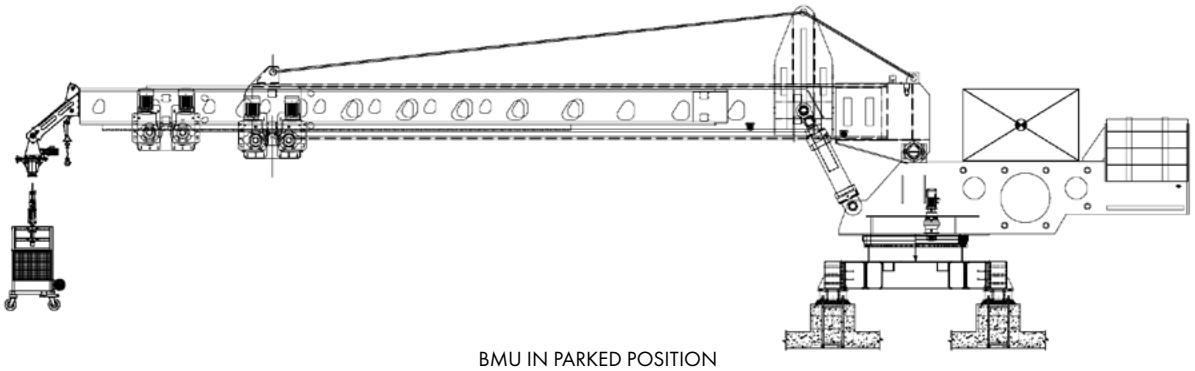
> Approximate lifting height of 260 m (853 ft)

> 2 stage telescopic jib, maximum reach: 25.5 m (84 ft)

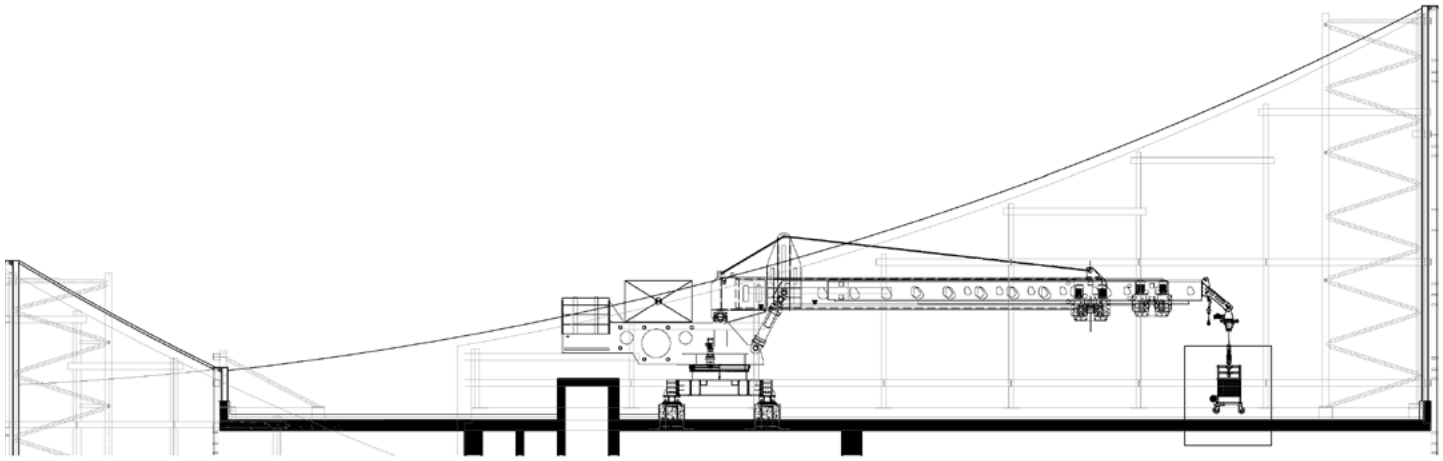
> Telescopic mast height: 3.5 m to 6 m

> Material hoist with a capacity of 400 kg

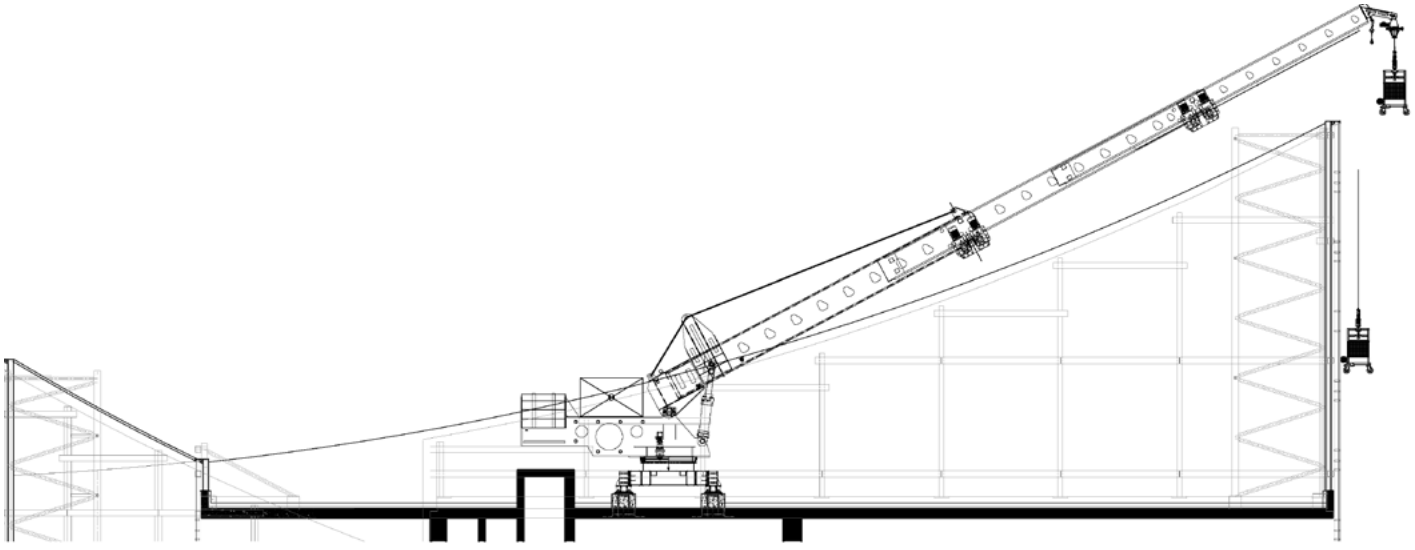
> Platform length: 2.1 m, attached to suspended telescopic beam, suspended on 6 wire ropes (1.8 m reach) c/w counterweight and soft rope restraint system



BMU IN PARKED POSITION



THROUGH THE BUILDING - BMU IN PARKED POSITION



THROUGH THE BUILDING - BMU IN OPERATION

MONDE CONDOS

PROJECT PROFILE

Developed by Great Gulf, Monde Condominiums was expected to be completed by 2018. Located in the sought after waterfront community of Toronto, Monde stands over 43 storeys tall at 5 Lower Sherbourne Street. Inspired by nature, intelligent living and versatile space, Monde promises to deliver superior layouts and spaces for its residents.

DESCRIPTION

Location: Bonnycastle and Queens Quay

Developer: Great Gulf

Property Management: Great Gulf Residences

Year: 2018

Storeys: 44*

Number of Units: 516

TECHNICAL CHALLENGES

> Complicated building architecture with changing balcony locations

> Custom platform with one central and two pivoting satellite platforms

> Reach areas under balconies

> Stabilize platform to irregularly spaced, changing locations of balcony posts

> Move roof car jib while stabilized to approach difficult to reach areas

> Balance custom platform configurations, while suspended on 6 wire ropes

OUR SOLUTION

> Stationary BMU (roof car)

> Approximate lifting height of 154 m (505 ft)

> 5 stage telescopic jib, maximum reach: 36.1 m (119 ft)

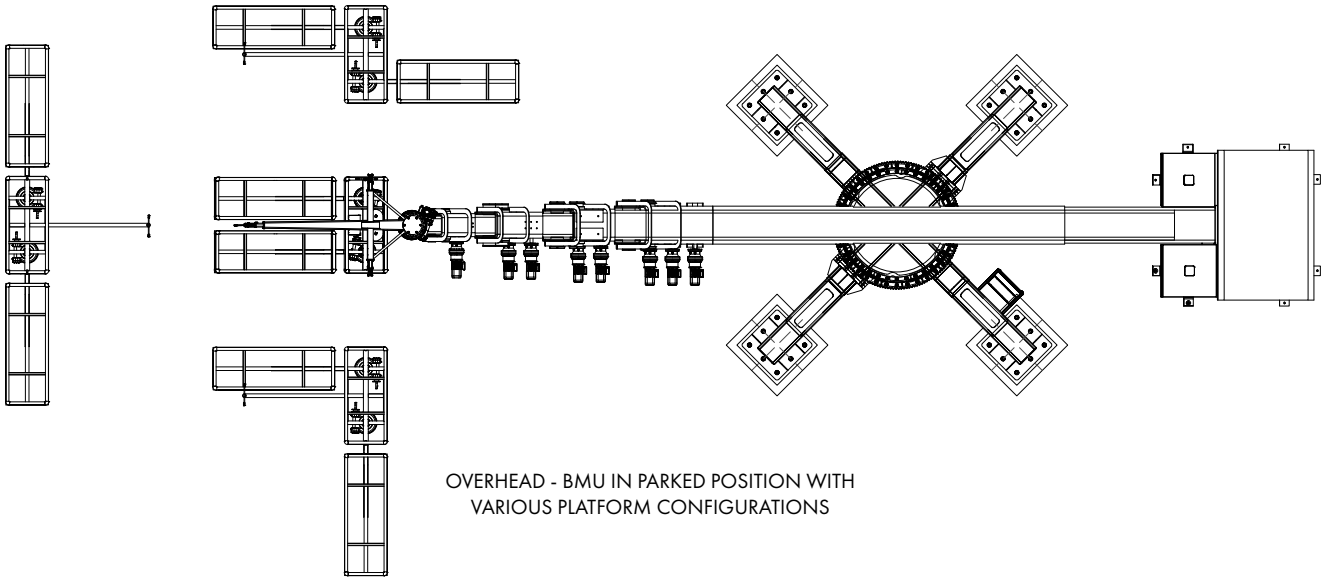
> Fixed mast height: 1.2 m (4 ft)

> Anchor point for material hoist with a capacity of 250 kg

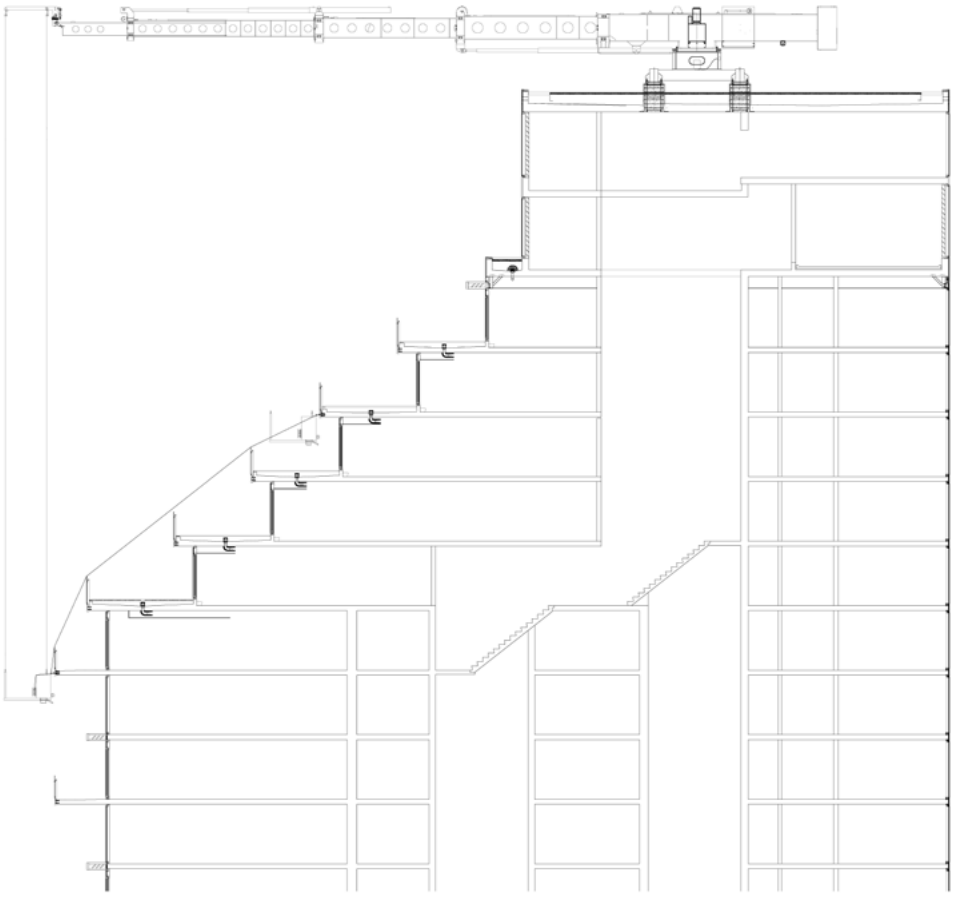
> Custom platform, one central and two pivoting satellite platforms suspended on 6 wire ropes with 6 possible platform configurations

> Dimensions vary from 1.65 m to 6 m, soft rope restraint system

> Podium is also fitted with a Davit Arm System



OVERHEAD - BMU IN PARKED POSITION WITH
VARIOUS PLATFORM CONFIGURATIONS



BMU IN OPERATION - AT DROP

TEN YORK
PROJECT PROFILE

Expected to be completed by 2019, Ten York is located in the waterfront neighborhood of Toronto; suites ranging from 582 to 3858 square feet, with many different layouts and exposures. Residents that choose Ten York as their home will be delighted by their waterfront views of Lake Ontario.

DESCRIPTION

Location: Harbour and York

Developer: Tridel

Property Management: Del Property Management

Year: 2019

Storeys: 65

Number of Units: 725

TECHNICAL CHALLENGES

> Combination of long telescopic and luffing BMU (roof car) jib

> Boom out roof car jib while stabilized to approach lower portion of the building

OUR SOLUTION

> Stationary BMU (roof car)

> Approximate lifting height of 230 m (755 ft)

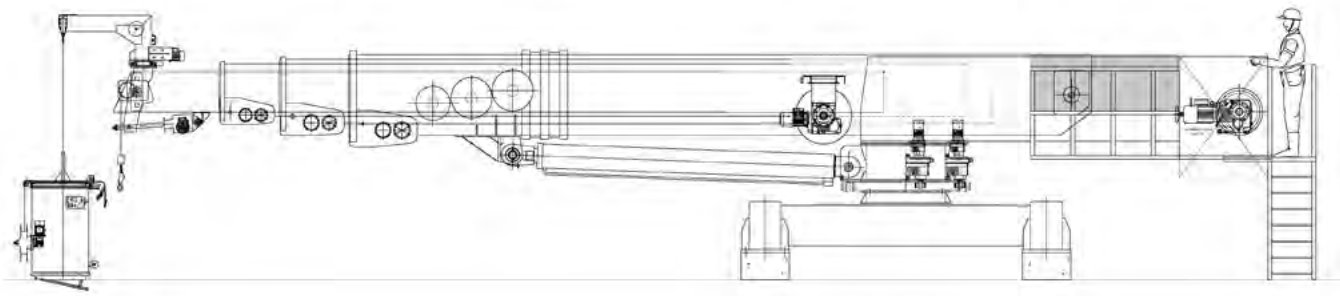
> 4 stage telescopic jib, maximum reach: 26.5 m (87 ft)

> Maximum luffing angle: 200

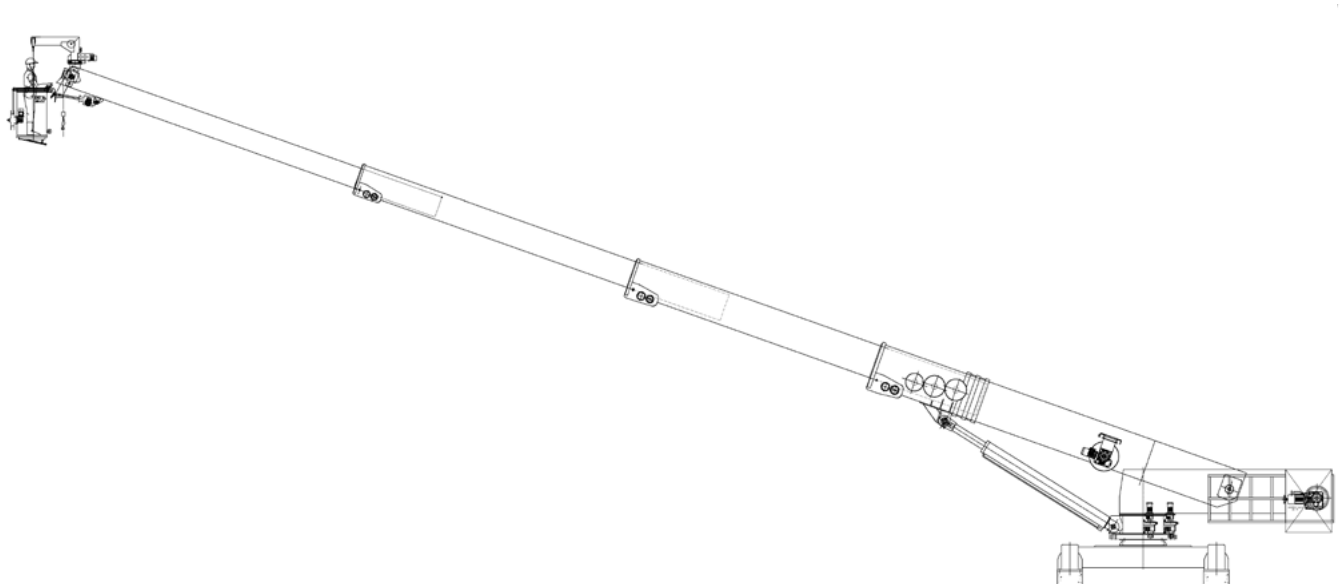
> Fixed mast height: 0.8 m (3 ft)

> Material hoist with a capacity of 412 kg

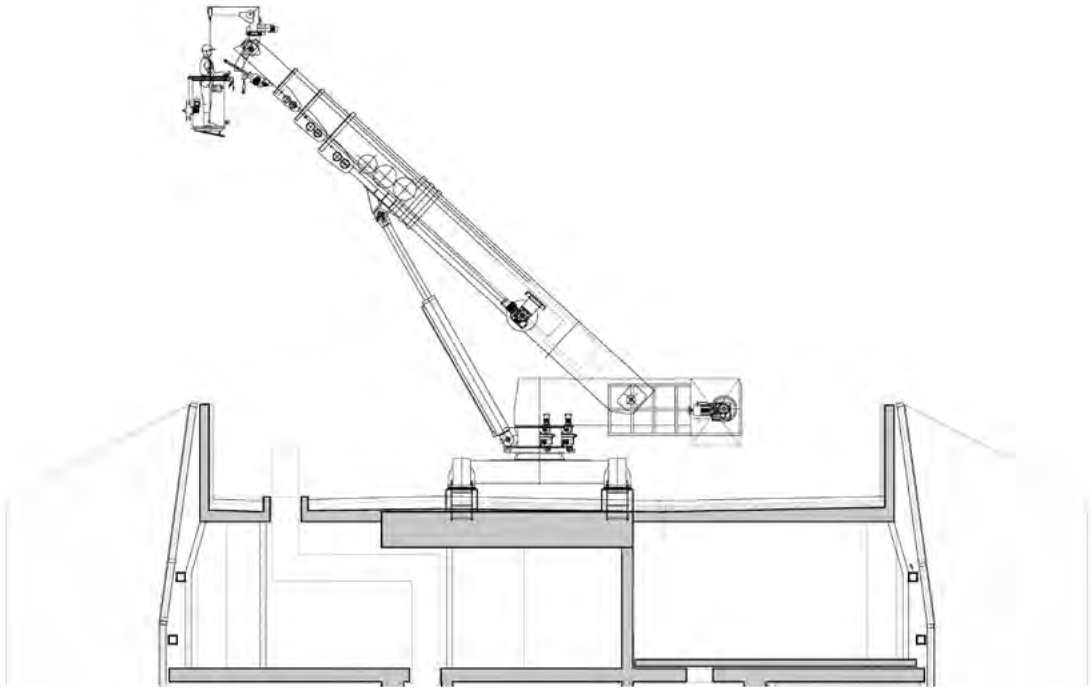
> Standard platform length: 2.5 m, soft rope restraint system



BMU IN PARKED POSITION



BMU IN OPERATION WITH SUSPENDED BOOM



ROOFTOP VIEW - BMU IN OPERATION

NOBU RESIDENCES

PROJECT PROFILE

Located in Toronto's Entertainment District, the Nobu Residences are set to change Mercer Street with two 45 storey towers and a podium featuring luxury condos, a restaurant and hotel. The towers' unique silhouettes featuring black aluminum framing and tinted bronze windows bring something new to the Toronto skyline. Construction is set to be completed in 2022.

DESCRIPTION

Location: 15 Mercer St. Toronto ON

Year: 2022

Architects: Teeple, Turner Fleischer

Storeys: 45

Developer: Madison Group, Westdale Properties

Number of Units: 700

TECHNICAL CHALLENGES

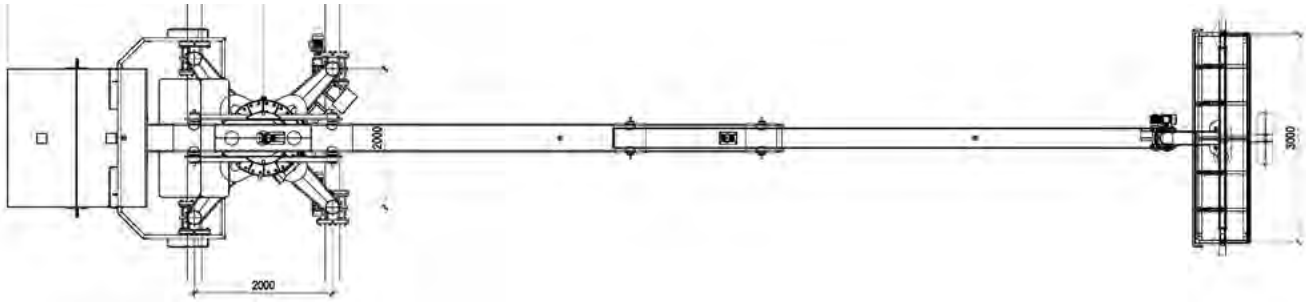
> Both towers designed with a shifting façade. This creates several overhangs.

OUR SOLUTION

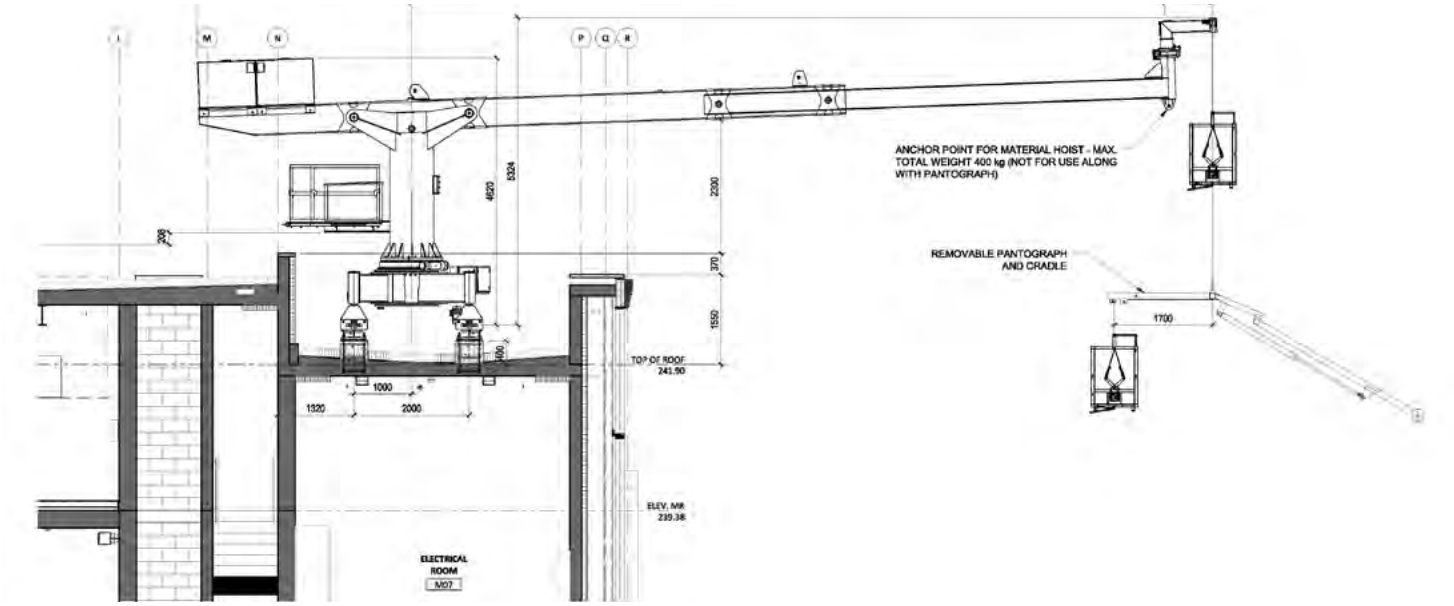
> BMU designed for each tower with approach cradle that approaches 1.7m inwards

> Custom standoffs provided for overhangs to keep lines off façade

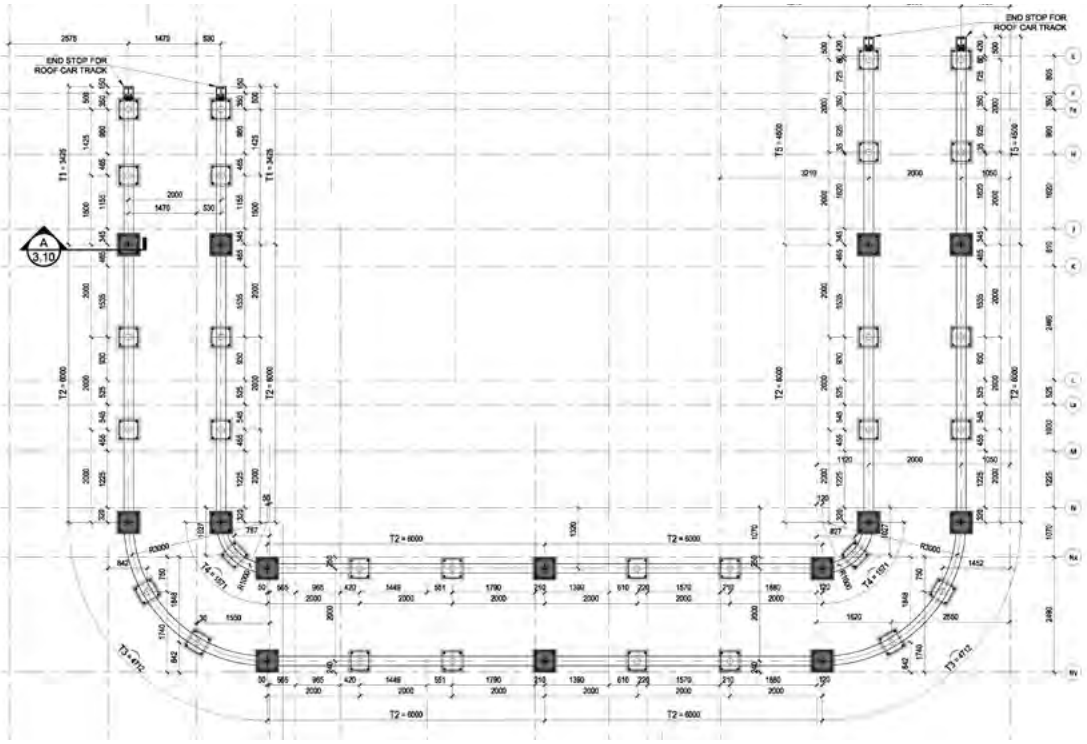
> Each BMU on U shaped track



BMU IN WORKING POSITION



BMU IN OPERATION WITH SUSPENDED BOOM



ROOFTOP VIEW - TRACK SYSTEM

TRANSIT CITY 1-3

PROJECT PROFILE

This trio of towers is Phase 1 of the Transit City development in Vaughan. Located near the subway station, these condos are set to change the Vaughan Metropolitan Centre skyline. Each tower is 55 storeys tall and combined boast 1,752 residential units and 1,385 parking spaces. Towers 1 and 2 are complete as of 2020, Tower 3 is set for completion in 2021.

DESCRIPTION

Location: Portage Pkwy at Millway Ave, Vaughan, ON

Architects: Diamond Schmitt

Developer: CentreCourt, SmartCentres REIT

Builder: Multiplex Construction

Property Management: Maple Ridge Community Management

Year: 2021

Storeys: 55, 55, 55

Number of Units: 1700

TECHNICAL CHALLENGES

> Towers 1 and 2 are connected by the same podium

> Need to keep arm reach minimal and ensure BMU is not visible in parked position.

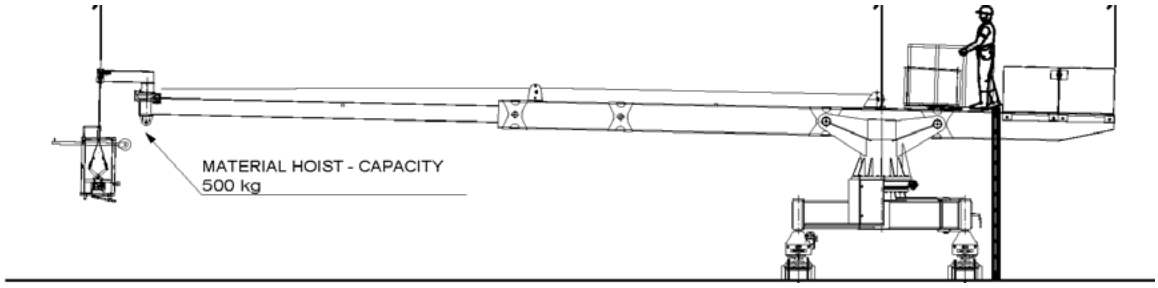
OUR SOLUTION

> Towers 1-3 BMUs each have 14.5m reach with a 2m stage (or cradle)

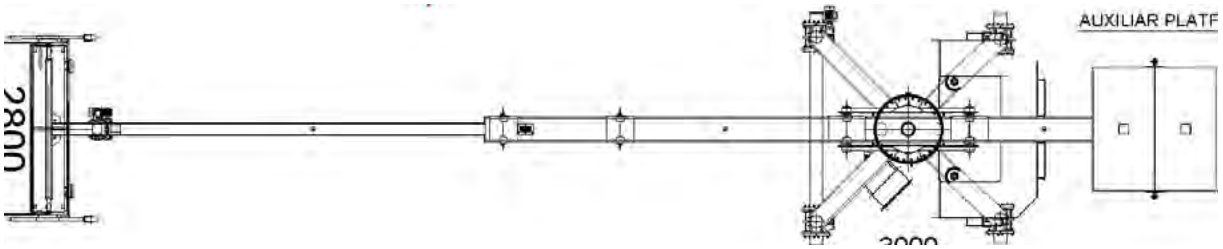
> No approach cradle required for all 3 towers

> Towers 1 and 2: BMU track down the centre to help keep machine reach at a minimum

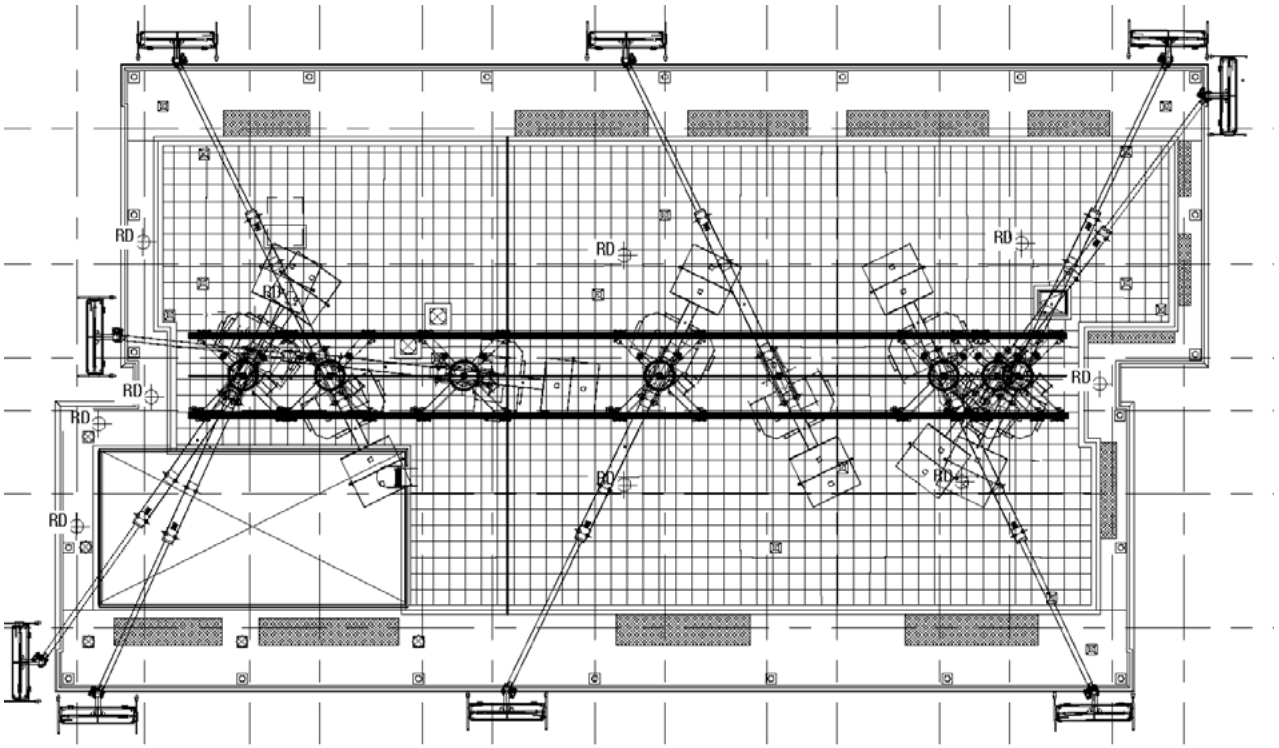
> Tower 3: U shaped track



TOWER 1 & 2 BMU IN WORKING POSITION



TOWER 1 & 2 BMU PLAN VIEW



TOWER 1 ROOFTOP VIEW - TRACK SYSTEM

TRANSIT CITY 4-5

PROJECT PROFILE

These towers make up the East Block and final phase of the Transit City development including Tower 6 (also known as the West Tower and at 35 storeys tall does not require a BMU). Tower 4 (East Tower) and Tower 5 (North Tower) both require a BMU standing at 50 and 45 storeys tall. Much like the other Transit City Towers, 4 and 5 feature a sleek modern design with glass balconies and about 500 units each.

DESCRIPTION

Location: 175 Millway Avenue, Vaughan, ON Canada

Developer: SmartCentres REIT, CentreCourt, SmartREIT

Architects: Diamond Schmitt

Year: 2022

Storeys: 50, 45

Number of Units: 566, 565

TECHNICAL CHALLENGES

> East Tower: multiple roof levels; need to ensure there is fall protection on all the other roof levels

OUR SOLUTION

East tower:

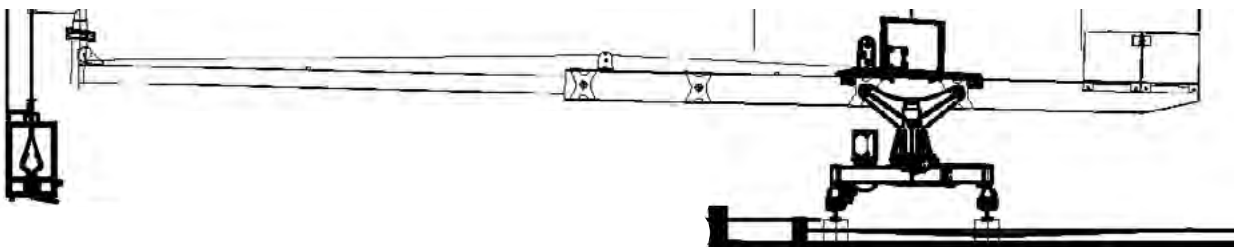
> Small track with 19m reach and 2m stage

> Small track to minimize required reach and reduce BMU visibility from roof

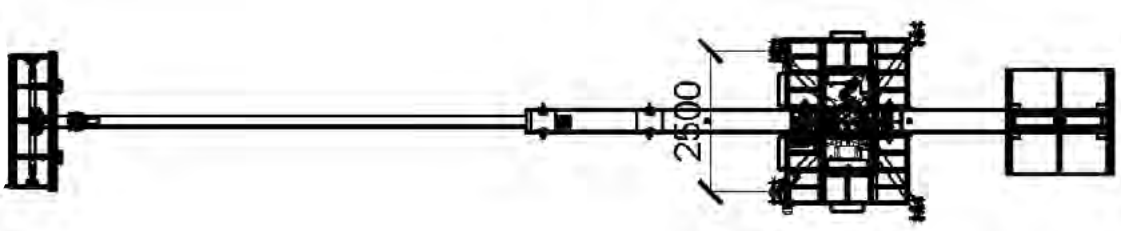
> Land on 7th level podium; longest reach of all transit city towers

North tower:

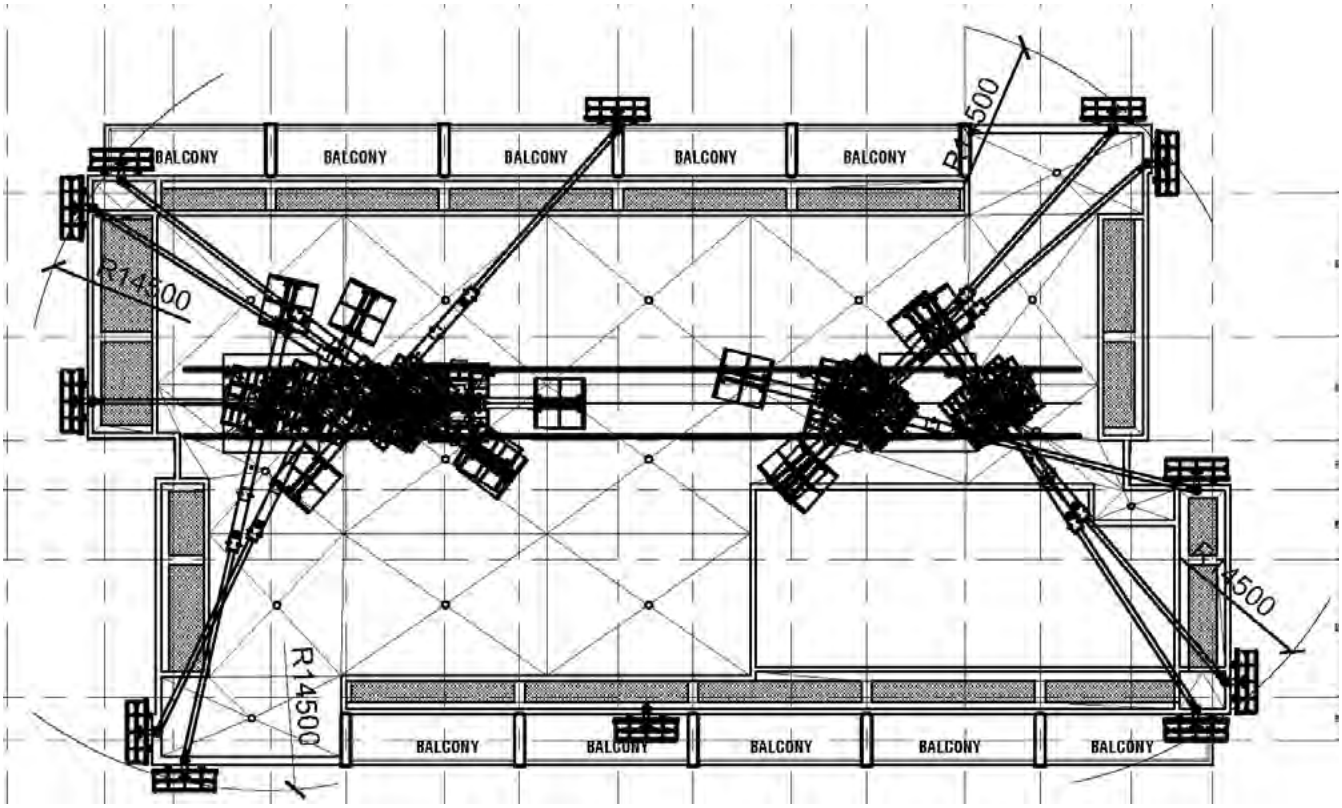
> Centre track, longer; 14.5m reach 2.3 m stage



TOWER 4 BMU IN WORKING POSITION



TOWER 4 BMU PLAN VIEW



TOWER 4 ROOFTOP VIEW - TRACK SYSTEM

55 CHARLES
PROJECT PROFILE

55 Charles by MOD Developments is located in Toronto's Bloor Yorkville area and will stand 48 storeys tall. Designed by Architects Alliance, the building features a unique geometric building block design and will hold 551 units. It is set to be completed by 2023.

DESCRIPTION

Location: 55 Charles St. East, Toronto ON

Developer: MOD Developments

Architects: Architects Alliance

Year: 2023

Storeys: 50

Number of Units: 641

TECHNICAL CHALLENGES

> Shifting façade creates several overhangs across the façade

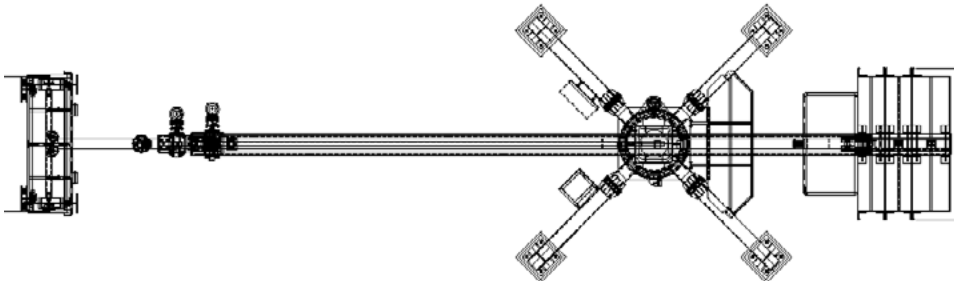
OUR SOLUTION

> Stationary BMU

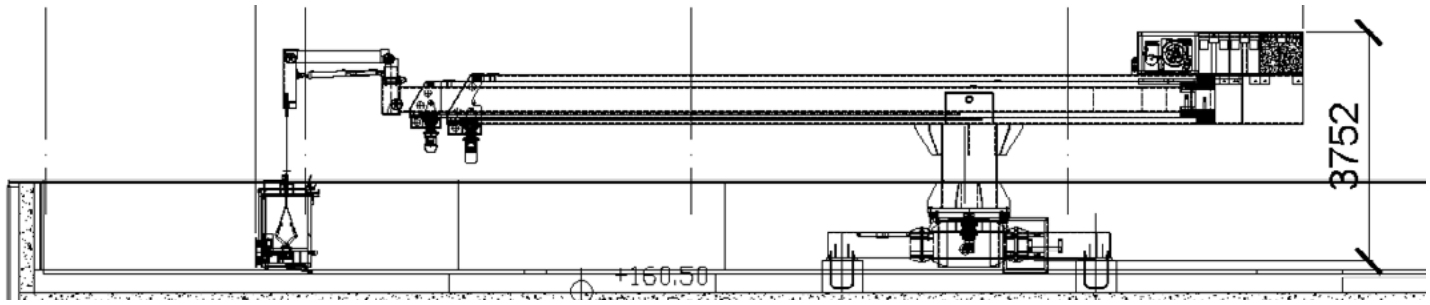
> 27m maximum reach

> 2.5m stage with 1.5m maximum approach inwards

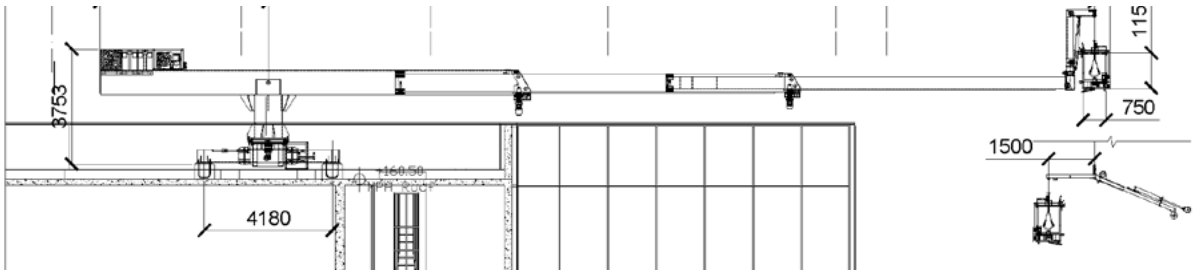
> In order to keep lines off the façade when the cradles approaches inward, custom stand offs are provided for overhangs.



PLAN VIEW OF BMU IN PARKED POSITION



BMU IN PARKED POSITION



BMU IN OPERATION WITH SUSPENDED BOOM

PLAN VIEW OF BMU IN OPERATION

PARKSIDE VILLAGE – BLOCK 1E

PROJECT PROFILE

These 2 towers are some of the latest additions to Mississauga's changing skyline. Developed by Amacon and designed by Turner Fleischer, the buildings stand at 50 and 38 storeys tall with a shared brickwork podium. The towers themselves have balconies at every level and stand 160m and 126.69m. BMUs are required for drops 150m or higher, so we provided a BMU solution for Tower 1 only.

DESCRIPTION

Location: 430 Square One Drive & 4130 Parkside Village Drive, Mississauga, ON

Developer: Amacon

Architects: Turner Fleischer

Year: 2023

Storeys: 50, 38

Number of Units: 601, 424

TECHNICAL CHALLENGES

> Open to below areas on roof

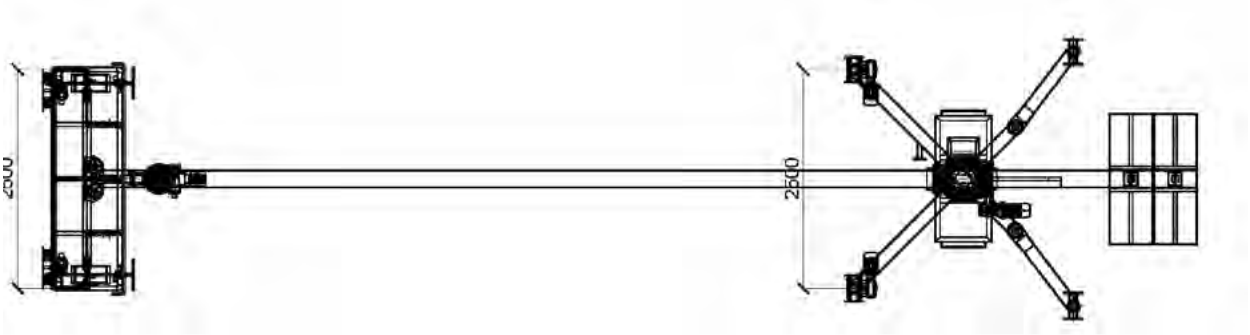
OUR SOLUTION

> 10m reach

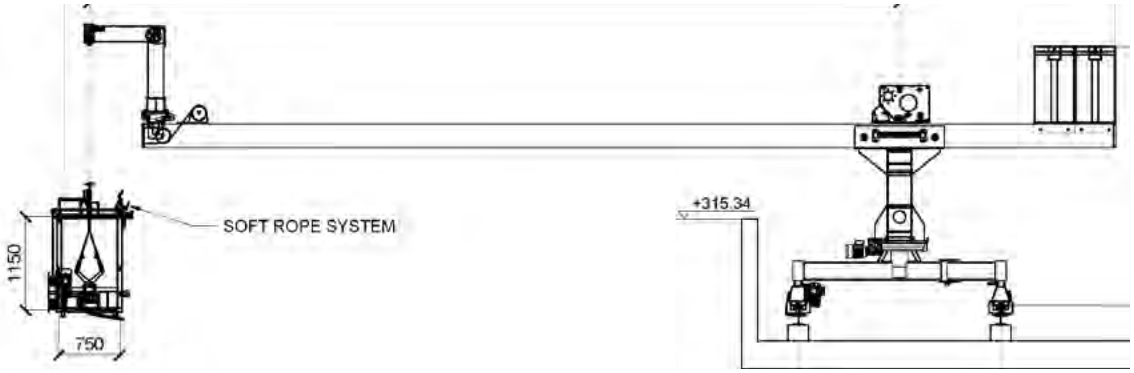
> 2.5m long stage

> Track system around perimeter

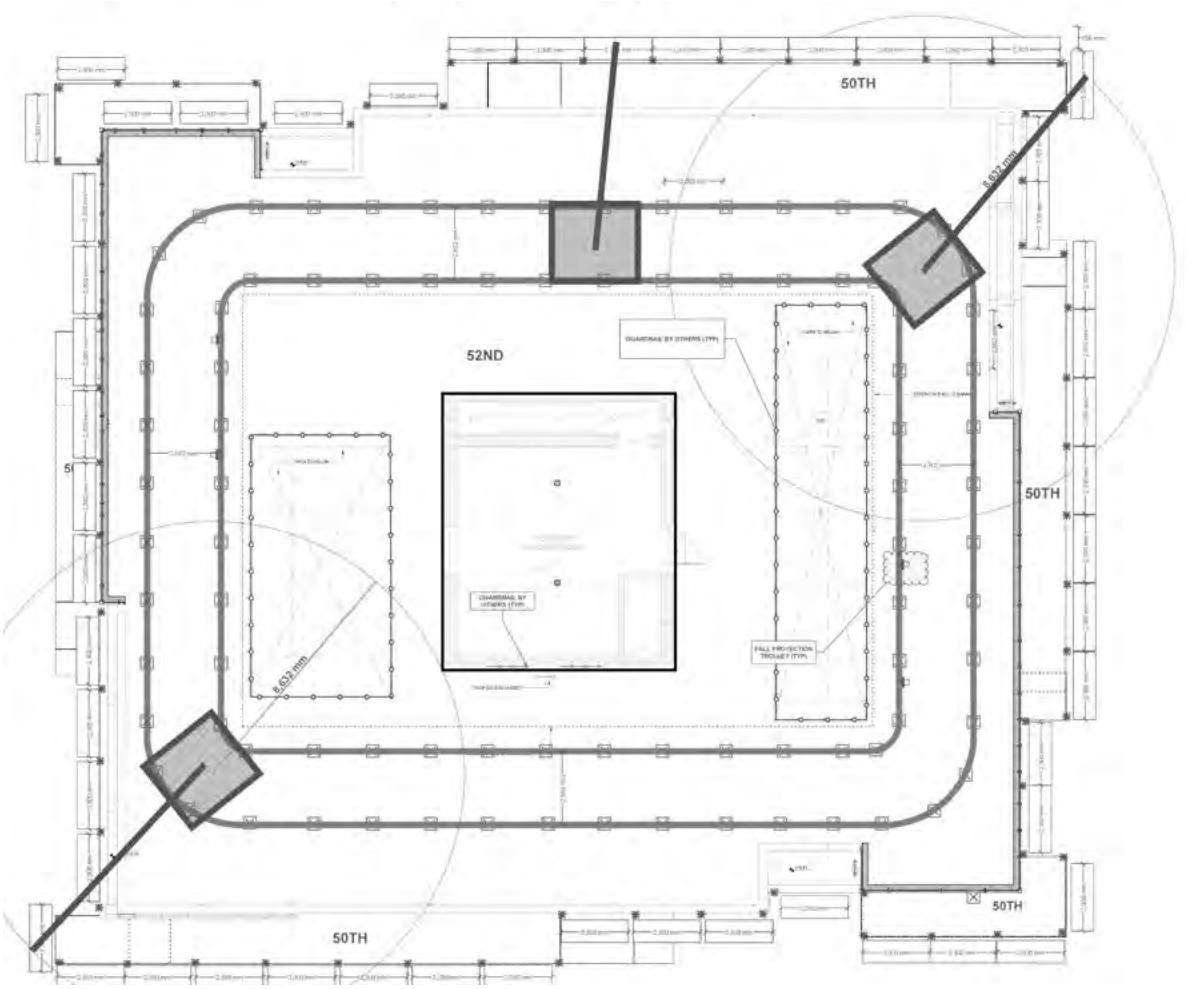
> Track system also designed to be used as tie off points during construction. This is to limit BMU use during construction.



BMU IN PARKED POSITION



BMU IN OPERATION WITH SUSPENDED BOOM



ROOFTOP VIEW - TRACK SYSTEM

THEATRE DISTRICT

PROJECT PROFILE

Designed by Quadrangle, these 2 towers on Adelaide and Widmer Streets in Toronto stand 49 and 48 storeys tall. The North Tower holds the Riu Plaza Hotel in the bottom 28 storeys while the upper portion is residential suites. Each tower sits on top of a 10-storey podium. Construction is scheduled to be complete in 2021.

DESCRIPTION

Location: 8-30 Widmer Street, Toronto, ON

Developer: Plaza

Architects: Quadrangle

Year: 2021

Storeys: 49, 48

Number of Units: 646

TECHNICAL CHALLENGES

> Several roof levels

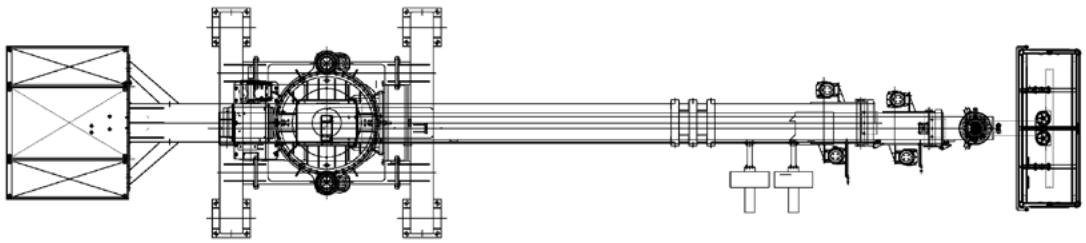
> Open to below areas on roof

OUR SOLUTION

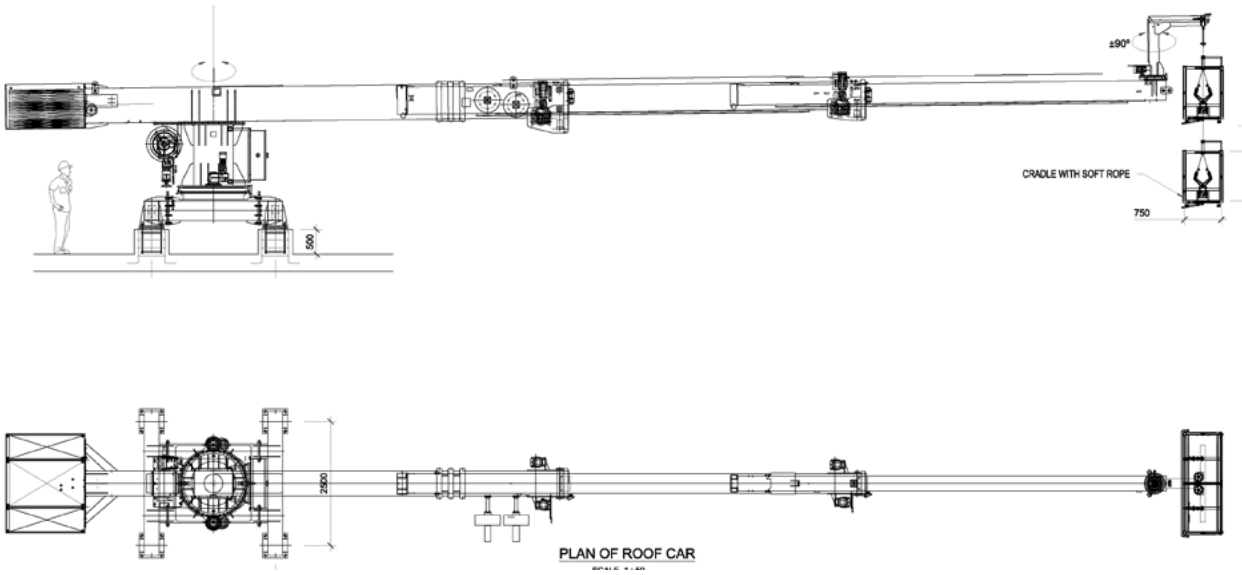
> Each tower has a custom BMU with an 20m approximate reach.

> Stationary BMUs

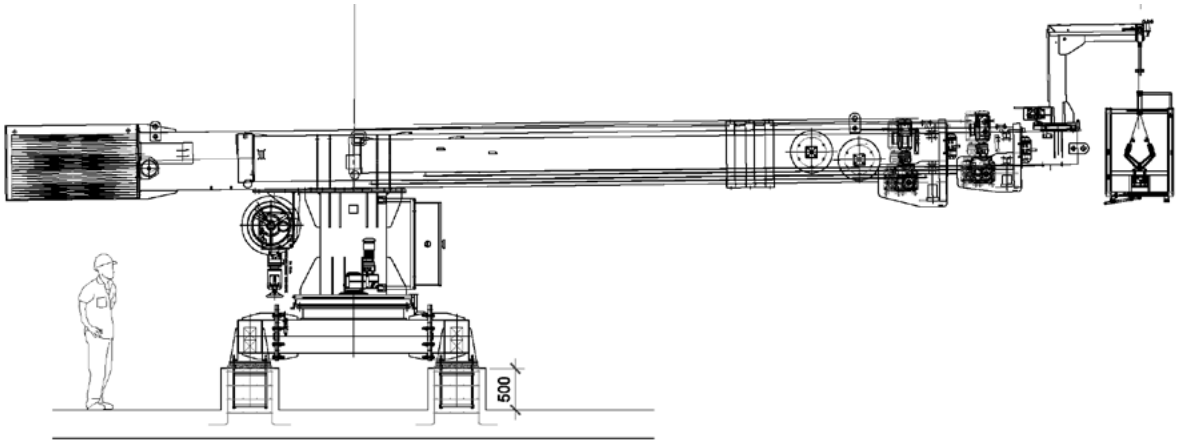
> 2m stages



PLAN VIEW OF BMU IN PARKED POSITION



BMU IN WORKING POSITION



BMU FULLY RETRACTED

120 CHURCH STREET

PROJECT PROFILE

This mixed-use development is proposed for the southwest corner of Richmond Street East and Church Street. The tower will stand 45 storeys tall and is designed by Turner Fleischer and Teeple Architects. 120 Church is still in the pre-construction phase and project completion date has yet to be announced. At this time, construction is set to commence early 2022 at the latest.

DESCRIPTION

Location: 120 Church Street, Toronto, ON

Developer: Madison Group

Architects: Turner Fleischer, Teeple

Year: TBD

Storeys: 45

Number of Units: 497

TECHNICAL CHALLENGES

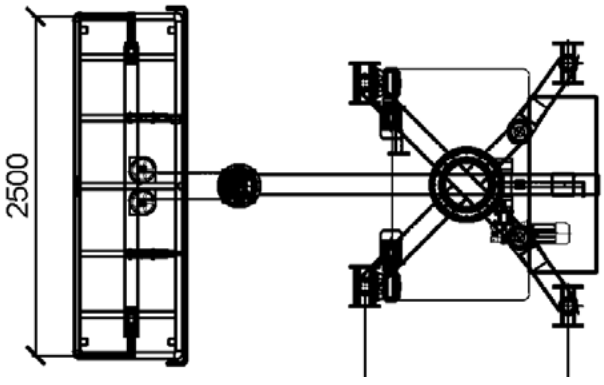
> Limited budget

OUR SOLUTION

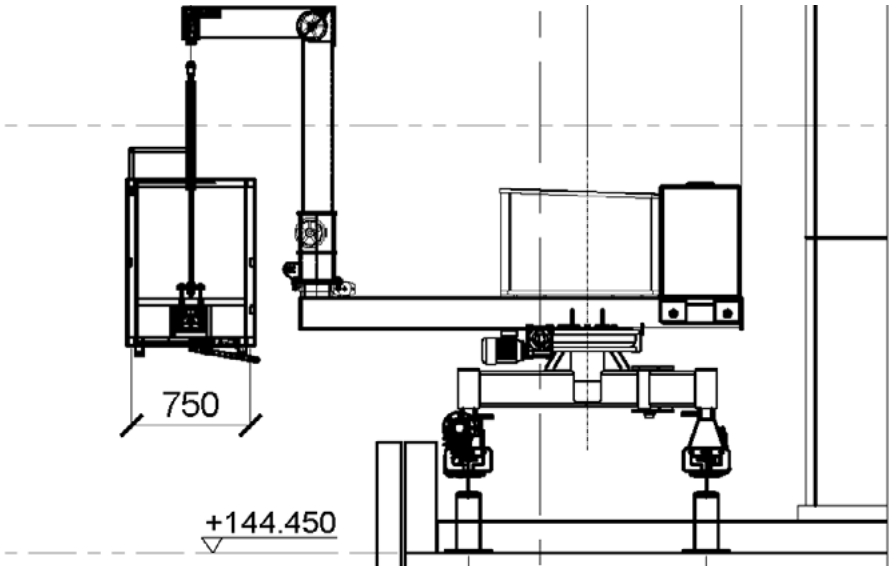
> ECO BMU – a custom small 2.5m (approx.) reach roofcar

> Perimeter track

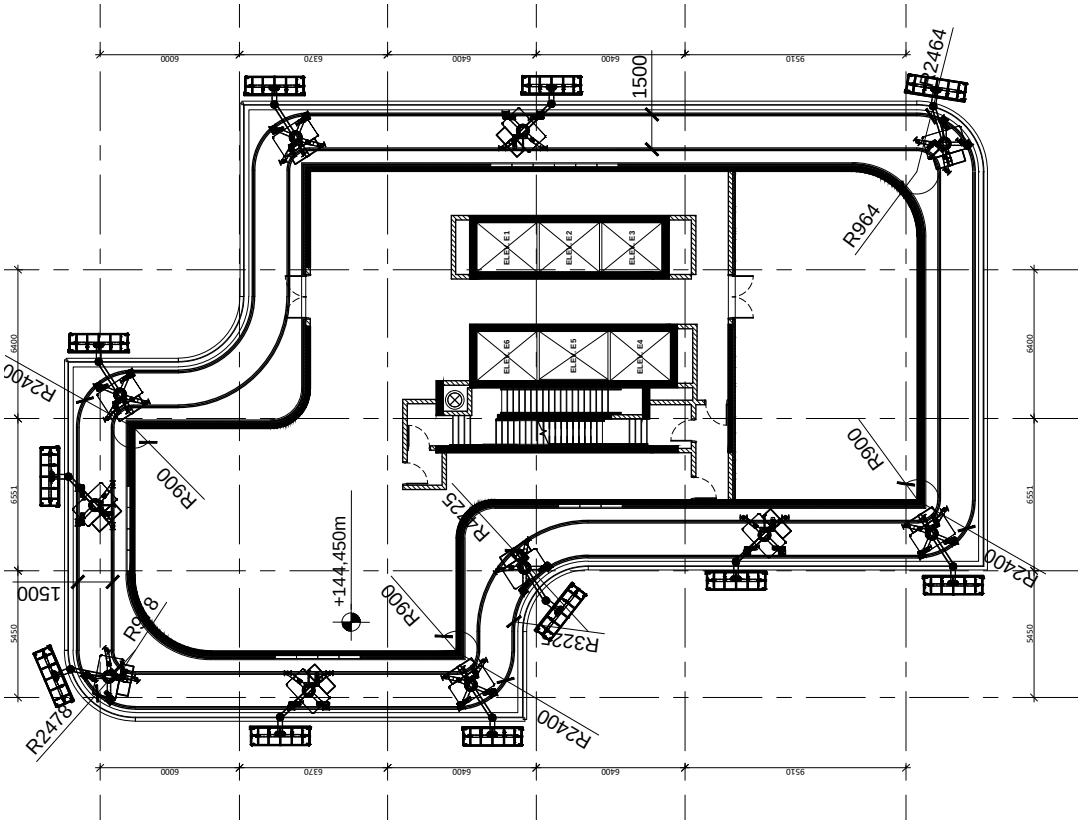
> 2.5m stage



PLAN VIEW OF BMU IN WORKING POSITION



BMU IN WORKING POSITION



ROOFTOP VIEW - TRACK SYSTEM

SERVICES

BMU MAINTENANCE SERVICES

ANNUAL SERVICE OF THE MACHINE, WHICH INCLUDES:

> Inspection of all structural components

> Tightening of structural bolts where required

> Lubrication/re > greasing of all bearings and friction components

> Check electrical systems

> Inspect drive system, telescopic jib, slew bearing, top beam slew gear, etc. (applicable to different types of BMU)

> Identify any components needing attention/repairs

> Full functional test

> Inspection of track/pedestal where applicable

> Check plc program

> Test/check main hoist, motor breaks and over speed brakes

PRE-WASH SERVICE WHICH INCLUDES:

> Visual inspection of machine and track (if applicable)

> Full operational test of all system components

> Over the side functional test (if required)

> Repairs as required

In general, most BMUs are serviced twice a year. The annual service is completed in the spring, and the Pre-Wash service is completed in the fall or before the next scheduled window cleaning. If window cleaning is done once, the BMU will only require the annual service.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