



LERCH BATES

Building Insight

**TRANSBAY TRANSIT CENTER
SAN FRANCISCO, CALIFORNIA**

**FAÇADE ACCESS
GLASS AWNING FAÇADE MAINTENANCE CYCLE TIME REPORT**

MAY 31, 2013

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TABLE OF CONTENTS

SECTION I – FAÇADE MAINTENANCE CYCLE TIME REPORT 1

 A. INTRODUCTION 1

 B. DATA 1

 C. CRITERIA..... 1

 D. FAÇADE ACCESS CONSTRAINTS 1

 E. DISCUSSION 2

 F. EQUIPMENT DESIGN 2

 G. RECOMMENDATION..... 4

APPENDIX A – INFORMATION ON TYPICAL SELF-PROPELLED AERIAL WORK PLATFORMS 5

APPENDIX B – INFORMATION ON GROUND-BASED AERIAL WORK PLATFORMS 7

APPENDIX C – INFORMATION ON WATER-FED EXTENSION POLES 15

APPENDIX D – FAÇADE MAINTENANCE CYCLE TIME ANALYSIS 17

APPENDIX E – FAÇADE ACCESS DRAWINGS 19

SECTION I – FAÇADE MAINTENANCE CYCLE TIME REPORT

A. INTRODUCTION

The purpose of this report is to present the design criteria for the façade access systems recommended by Lerch Bates for maintenance of the Glass Awning and Light Column/Skylight areas of the Transbay Transit Center project to be built in San Francisco, California. Also included in this report are the results of our Façade Maintenance Cycle Time (FMCT) analysis for the systems recommended.

B. DATA

Location: San Francisco, California

Tenancy: Transbay Joint Powers Authority Transit Center

Floors: Four Levels: Grade, Second Level, Bus Deck Level, Roof Park Level.

Height: East: Grade to Roof Park Level: 64'-9"
West: Grade to Roof Park Level: 74'-9"

C. CRITERIA

The initial Façade Maintenance Cycle Time (FMCT) criteria are set as follows:

Glass Awning – Exterior	45.0 days
Glass Awning – Interior	45.0 days
Light Column/Skylights – Exterior	20.0 days
Light Column/Skylights – Interior	30.0 days

Analysis of recommended system shows estimated FMCT results as follows:

Glass Awning – Exterior	43.7 days
Glass Awning – Interior	47.8 days
Light Column/Skylights – Exterior	19.0 days
Light Column/Skylights – Interior	32.0 days

NOTE: The number of days used in this report is an estimate and is based on the assumption that maintenance personnel have clear access to the building to carry out their work.

D. FAÇADE ACCESS CONSTRAINTS

The main façade access constraints on this project are:

1. Curvilinear glass awning surrounds the structure.
2. Glass awning is open to the elements and contains gaps at various locations along the enclosure.



3. Limited access to the three skylights because of restricted space and extensive support structure.
4. Transit Center “roof top” will be a public park
5. Transit Center is a high traffic area.

E. DISCUSSION

The drawings used for this report were the 50% Construction drawings dated December 20, 2010. In this report we will recommend façade access systems for the glass awning and Light Column features of the project. We will also identify the pros and cons of the systems recommended and provide an estimate of the Façade Maintenance Cycle Times (FMCT) for the exterior and interior of the glass awning and the Light Column/Skylights.

The façade access systems’ intended use is building maintenance which includes window washing, caulking, glazing, glass replacement, lighting maintenance and fall prevention. The buildings’ glass awning and Light Column/Skylights are composed of glass panels and will require a high degree of hand contact to maintain properly.

In response to Program Management Program Control (PMPC) concern about the gaps in the Awning glazing, we interviewed a number of window cleaning companies. They did not believe these gaps would pose problems for building maintenance personnel. They recommended the glass be cleaned to with water-fed extension poles and reverse osmosis treated water.

For the purpose of this report we assume the façade maintenance program will be conducted on a bi-annual interval.

F. EQUIPMENT DESIGN

Design Approach

The design team’s primary objective in designing the façade access system for the Transbay Transit project was to insure the health and safety of the building maintenance personnel, maximize the efficiency of the system, preserve key elements of the building design, and provide low cost solutions while maintaining flexibility for management of the building maintenance program.

The design team has explored a number of options including traditional “roof-mounted” powered suspended façade access systems. Also, in response to PMPC requests of the design team to explore robotic systems for use on the glass awning, Lerch Bates has completed a brief investigation of these systems. This investigation included interviews with peer consultants and manufacturers of various robotic systems.

The consultants that we interviewed are listed here and are all experts in the field of façade access equipment design:

1. WSP Buildings, London UK, Head of the Façade Access Department.
2. ASME, “A120 Committee on Safety Requirements for Powered Platforms and Traveling Ladders and Gantries for Building Maintenance” President and Principal of his own California-based façade access consulting company.
3. iFH Ingenieruburo Felka-Hoffman für Fördertechnik, Munich, Germany, Principal.



The three points that were consistent among these peer consultants were that, first, robotic systems are not addressed in any of the current façade access industry codes and standards. Second, regardless of the degree of reliability or effectiveness of a robotic system they cannot replace humans where building maintenance is concerned; i.e. robotic systems require redundant façade access systems to meet long term maintenance needs. Lastly, none of these experts could provide us with a single reference of a project that either they were involved in or knew of that has a working robotic system.

The manufacturers we investigated are listed below:

1. Fraunhofer Institute for Factory Operation and Automation IFF, Magdeburg, Germany.
2. SERBOT GmbH, Oberdorf, Switzerland.
3. TAW Weisse International GmbH, Hamburg, Germany.
4. GLAFA GmbH, Hamburg, Germany (affiliated with TAW Weisse).

The very limited data from the manufacturers of these systems essentially confirmed the second point raised above that these robotic systems require redundant façade access equipment to operate effectively and that the building must also be designed in order to integrate them for use. Both of which would increase the cost of the building structure.

Based on our investigation, we believe that these systems are limited in number and therefore untested. We also believe they would have a higher first cost than more widely used systems and that they lack industry scrutiny with respect to health and safety matters. It is therefore our opinion that these systems are not suited for the project nor would they meet the façade access system criteria established by the design team. We would not recommend them for this project.

Glass Awning Exterior (Ground to Roof Park Level)

For all building maintenance activities we recommend using standard ground-based, self-propelled articulating booms with maximum working heights of up to 70'-0" to access the exterior of the building's glass awning. For window cleaning we recommend using water-fed extension poles and reverse osmosis water.

Glass Awning Interior – Lower Half (Ground to Bus Deck Level)

For all building maintenance activities we recommend standard ground-based, self-propelled articulating booms with maximum working heights of up to 50'-0" to access the lower half of the building's interior glass awning. For window cleaning we recommend using water-fed extension poles and reverse osmosis water.

Glass Awning Interior – Upper Half (Bus Deck Level to Roof Park Level)

For window cleaning we recommend water-fed extension poles with a maximum working length of approximately 30'-0" and reverse osmosis water to clean the upper half of the building's interior glass awning. For other building maintenance activities we recommend ground-based, self-propelled articulating booms and scissor lifts with a maximum working height of approximately 50'-0" to access the upper half of the building's interior glass awning.



Awning Gaps and the Potential Effects on Cleaning

In response to PMPC's concern about the effects of the ¾" gaps in the Glass Awning, Lerch Bates interviewed three building maintenance companies, one in the Seattle area and two in the San Francisco area. In all three cases, the principals interviewed did not believe this design feature would cause any problems with the window cleaning operation. The two primary reasons given were that the volume of water used during glass cleaning is relatively low and any bleed over from one side to the other would be resolved (cleaned) on the side of the "last pass" cleaning.

Light Column/Skylights – Exterior

We recommend building maintenance personnel use water-fed extension poles with a maximum working length of approximately 40'-0" and reverse osmosis water to clean the Light Column/Skylights' exterior glass. For building maintenance activities on Skylight No. 2 (Grid 23) we recommend building maintenance personnel utilize a continuous personal fall arrest system integrated into the skylight glass exterior to enable direct access to the skylight surface.

Light Column/Skylights – Interior

For all building maintenance activities we recommend using a ground-based, self-propelled articulating boom with maximum working height of up to 110'-0" to access the interior of the Light Column/Skylights' interior skylight glass.

Pros:

- Equipment provides 100% access to the building façades, interior light column/skylights, and awning surfaces for the full range of building maintenance activities.
- Complies with all national codes and standards.
- Good efficiency; meets FMCT criteria.
- Standard equipment can be leased or purchased in the local market.
- Owner has high flexibility in determining the number of machines required for maintenance needs.

Cons:

- Management of street and pedestrian walkway closures will be necessary.
- If equipment is purchased by the Owner, then storage of the equipment will be necessary.
- Storage of equipment under the bus ramp in a secure area.

G. RECOMMENDATION

In making our recommendation we took into account three key factors: health and safety of the maintenance personnel, complexity of the building design, and efficiency and cost of the building maintenance program.

In order to design the façade access equipment with minimum impact to the building design, provide a safe working environment, and meet the FMCT criteria, we recommend the use of a range of standard ground-based self-propelled aerial work platforms. These systems are readily available in the San Francisco area and can be purchased or rented at the Owner's discretion.

APPENDIX A –
INFORMATION ON TYPICAL
SELF-PROPELLED AERIAL WORK PLATFORMS



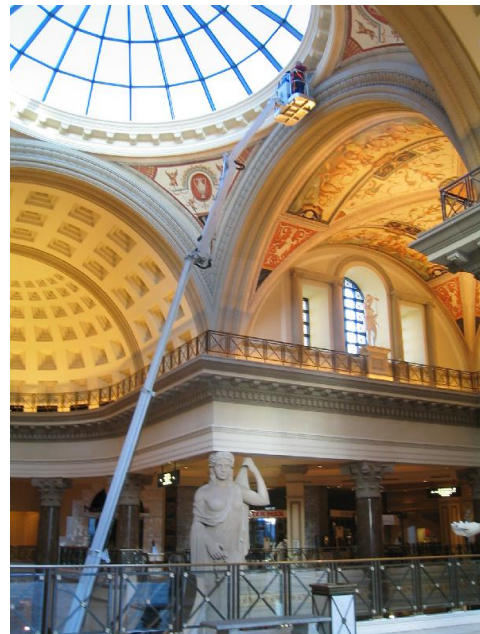
Typical self-propelled articulating boom



Typical self-propelled articulating boom in parked position at the San Francisco International Airport Bart



Typical articulating aerial work platform in retracted position



Typical articulating aerial work platform in working position

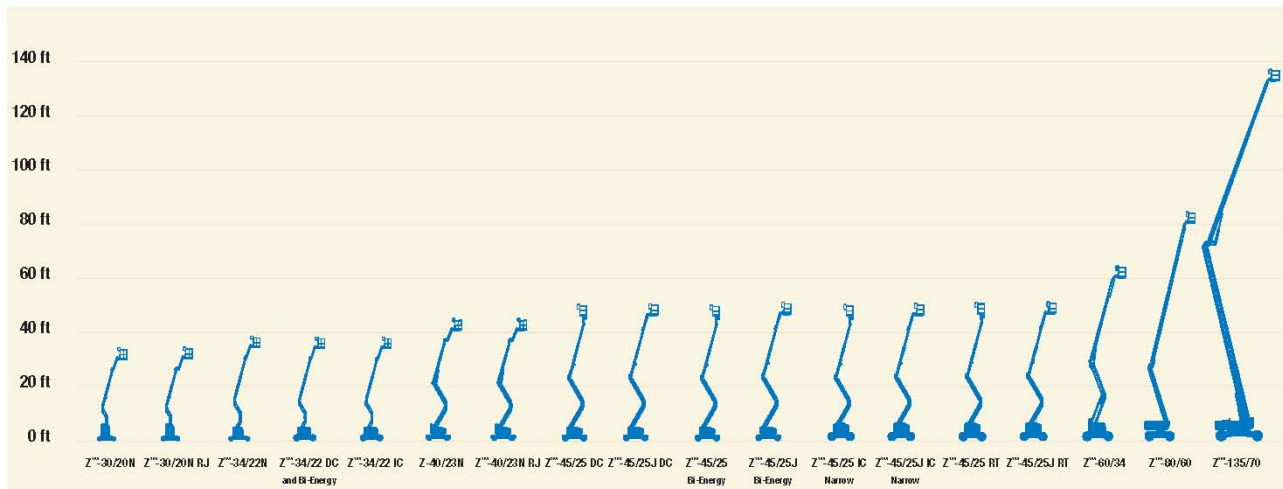
APPENDIX B –
INFORMATION ON GROUND-BASED AERIAL WORK PLATFORMS



SPECIFICATIONS ARTICULATING Z™-BOOMS

MODEL	WORKING HEIGHT		WIDTH		HORIZONTAL REACH		UP & OVER CLEARANCE		LIFT CAPACITY	
	US	Metric	US	Metric	US	Metric	US	Metric	US	Metric
NARROW ARTICULATING Z™-BOOMS										
Z™-30/20N	36 ft	11.14 m	3 ft 11 in	1.19 m	21 ft 5 in	6.53 m	12 ft 8 in	3.86 m	500 lbs	227 kg
Z™-30/20N RJ	35 ft 2 in	10.89 m	3 ft 11 in	1.19 m	20 ft 6 in	6.25 m	12 ft 8 in	3.86 m	500 lbs	227 kg
Z™-34/22N	40 ft 6 in	12.52 m	4 ft 10 in	1.47 m	22 ft 3 in	6.78 m	15 ft 2 in	4.62 m	500 lbs	227 kg
Z™-40/23N	46 ft 5 in	14.32 m	4 ft 11 in	1.50 m	22 ft 8 in	6.91 m	21 ft 3 in	6.48 m	500 lbs	227 kg
Z™-40/23N RJ	46 ft 5 in	14.32 m	4 ft 11 in	1.50 m	22 ft 8 in	6.91 m	21 ft 3 in	6.48 m	500 lbs	227 kg
DC AND BI-ENERGY ARTICULATING Z™-BOOMS										
Z™-34/22 DC	40 ft 6 in	12.52 m	5 ft 8 in	1.73 m	22 ft 3 in	6.78 m	15 ft	4.57 m	500 lbs	227 kg
Z™-34/22 BI-ENERGY	40 ft 6 in	12.52 m	5 ft 8 in	1.73 m	22 ft 3 in	6.78 m	15 ft	4.57 m	500 lbs	227 kg
Z™-45/25 DC	51 ft 6 in	15.87 m	5 ft 10.3 in	1.79 m	25 ft	7.62 m	23 ft 1 in	7.04 m	500 lbs	227 kg
Z™-45/25J DC	51 ft 8 in	15.92 m	5 ft 10.3 in	1.79 m	25 ft 1 in	7.65 m	22 ft 1 in	6.73 m	500 lbs	227 kg
Z™-45/25 BI-ENERGY	51 ft 6 in	15.87 m	5 ft 10.3 in	1.79 m	25 ft	7.62 m	23 ft 1 in	7.04 m	500 lbs	227 kg
Z™-45/25J BI-ENERGY	51 ft 8 in	15.92 m	5 ft 10.3 in	1.79 m	25 ft 1 in	7.65 m	22 ft 1 in	6.73 m	500 lbs	227 kg
ENGINE-POWERED ARTICULATING Z™-BOOMS										
Z™-34/22 IC (2 WD)	40 ft 6 in	12.52 m	5 ft 8 in	1.73 m	22 ft 3 in	6.78 m	14 ft 11 in	4.55 m	500 lbs	227 kg
Z™-34/22 IC (4 WD)	40 ft 10 in	12.62 m	6 ft 1 in	1.85 m	22 ft 3 in	6.78 m	15 ft	4.57 m	500 lbs	227 kg
Z™-45/25 IC NARROW	51 ft 6 in	15.87 m	5 ft 10.3 in	1.79 m	25 ft	7.62 m	23 ft 1 in	7.04 m	500 lbs	227 kg
Z™-45/25J IC NARROW	51 ft 9 in	15.94 m	5 ft 10.3 in	1.79 m	25 ft 1 in	7.65 m	22 ft 1 in	6.73 m	500 lbs	227 kg
Z™-45/25 RT	51 ft 11 in	16.00 m	7 ft 6 in	2.29 m	25 ft	7.62 m	23 ft 6 in	7.16 m	500 lbs	227 kg
Z™-45/25J RT	52 ft 2 in	16.07 m	7 ft 6 in	2.29 m	25 ft 1 in	7.65 m	23 ft 6 in	7.16 m	500 lbs	227 kg
Z™-60/34	66 ft 4 in	20.39 m	8 ft 1 in	2.46 m	36 ft 3 in	11.05 m	27 ft	8.23 m	500 lbs	227 kg
Z™-80/60	86 ft	26.38 m	8 ft 2 in	2.49 m	60 ft	18.29 m	29 ft	8.83 m	500 lbs	227 kg
Z™-135/70	141 ft	43.15 m	8 ft 1 in*	2.46 m*	69 ft 9 in	21.26 m	75 ft 6 in	23.01 m	600 lbs	272 kg

*Axes retracted



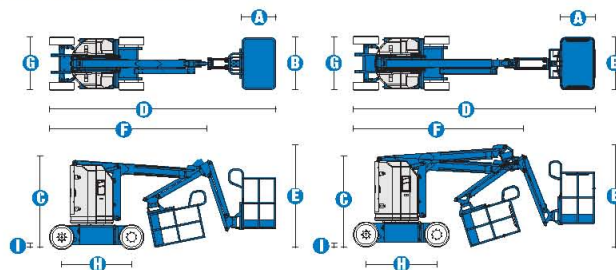


SELF-PROPELLED ARTICULATING BOOMS

Z™-30/20N & Z™-30/20N RJ



Specifications



MODELS	Z™-30/20N		Z™-30/20N RJ	
MEASUREMENTS	US	Metric	US	Metric
Working height maximum*	36 ft	11.14 m	35 ft 2 in	10.89 m
Platform height maximum	30 ft	9.14 m	29 ft 2 in	8.89 m
Horizontal reach maximum	21 ft 5 in	6.53 m	20 ft 6 in	6.25 m
Up and over clearance maximum	12 ft 8 in	3.86 m	12 ft 8 in	3.86 m
A Platform length	2 ft 6 in	.76 m	2 ft 6 in	.76 m
B Platform width	3 ft 11 in	1.19 m	3 ft 11 in	1.19 m
C Height - stowed	6 ft 6.5 in	2 m	6 ft 6.5 in	2 m
D Length - stowed	16 ft 9 in	5.11 m	17 ft 5 in	5.31 m
E Storage height	6 ft 10 in	2.08 m	7 ft 4 in	2.24 m
F Storage length	11 ft 6 in	3.5 m	12 ft	3.66 m
G Width	3 ft 11 in	1.19 m	3 ft 11 in	1.19 m
H Wheelbase	5 ft 3 in	1.60 m	5 ft 3 in	1.60 m
I Ground clearance - center	3.5 in	.09 m	3.5 in	.09 m

PRODUCTIVITY

Lift capacity	500 lbs	227 kg	500 lbs	227 kg
Platform rotation	180°		180°	
Vertical jib rotation	139°		139°	
Horizontal jib rotation	—		180°	
Turntable rotation	355° non-continuous		355° non-continuous	
Turntable tailswing	zero		zero	
Drive speed - stowed	3.0 mph	4.8 km/h	3.0 mph	4.8 km/h
Drive speed - raised**	0.68 mph	1.1 km/h	0.68 mph	1.1 km/h
Gradeability - stowed***	35%		35%	
Turning radius - inside	5 ft 5 in	1.65 m	5 ft 5 in	1.65 m
Turning radius - outside	10 ft 7 in	3.23 m	10 ft 7 in	3.23 m
Controls	24 V DC proportional		24 V DC proportional	
Tires - solid non-marking	22x7x17.75 in	.56x.18x.45 m	22x7x17.75 in	.56x.18x.45 m

POWER

Power source	48 V DC (eight 6 V batteries 350 Ah capacity)	48 V DC (eight 6 V batteries 350 Ah capacity)
Auxiliary power unit	24 V DC	24 V DC
Hydraulic tank capacity	4 gal	15.1 L

WEIGHT****

	14,170 lbs	6,427 kg	14,220 lbs	6,450 kg
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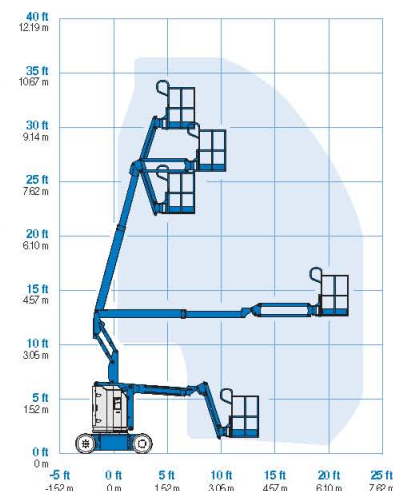
STANDARDS COMPLIANCE

ANSI A92.5, CSA B354.4, CE Compliance, AS 1418.10

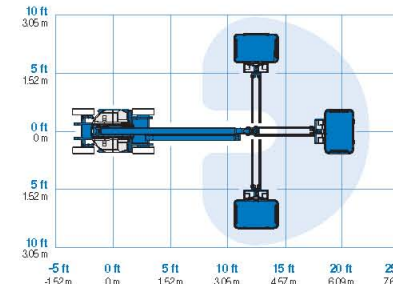
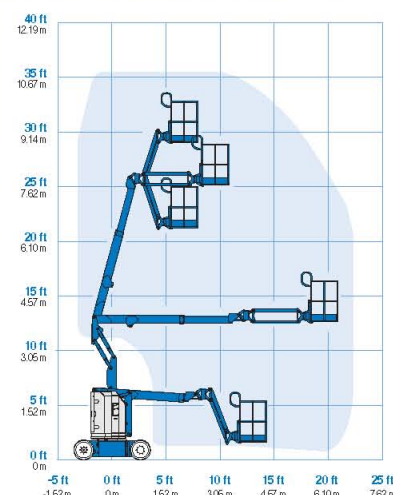
* The metric equivalent of working height adds 2 m to platform height. U.S. adds 6 ft to platform height.
 ** In lift mode (platform raised), the machine is designed to operate on firm, level surfaces only.
 *** Gradeability applies to driving on slopes. See operator's manual for details regarding slope ratings.
 **** Weight will vary depending on options and/or country standards.

www.genieindustries.com

RANGE OF MOTION Z™-30/20N



RANGE OF MOTION Z™-30/20N RJ





SELF-PROPELLED ARTICULATING BOOMS Z™-30/20N & Z™-30/20N RJ

Features

EASILY CONFIGURED TO MEET YOUR NEEDS

PLATFORM

- Steel 3 ft 10 in (1.17 m) (standard)

JIB OPTIONS

- 4 ft (1.22 m) jib boom
- 4 ft (1.22 m) horizontal rotating jib boom

POWER

- 48 V DC power source

DRIVE

- 2WD

TIRE

- Solid rubber non-marking

STANDARD FEATURES

MEASUREMENTS

Z™-30/20N

- 36 ft (11.14 m) working height
- 21 ft 5 in (6.53 m) horizontal reach
- 12 ft 8 in (3.86 m) up and over clearance
- Up to 500 lb (227 kg) lift capacity

Z™-30/20N RJ

- 35 ft 2 in (10.89 m) working height
- 20 ft 6 in (6.25 m) horizontal reach
- 12 ft 8 in (3.86 m) up and over clearance
- Up to 500 lb (227 kg) lift capacity

PRODUCTIVITY

- 4 ft (1.22 m) jib boom with 139° working range
- Self-leveling platform
- Hydraulic platform rotation
- Fully proportional controls
- Thumb rocker steer
- Drive enable
- AC power cord to platform
- Horn
- Hour meter
- Tilt alarm
- Descent & travel alarms
- 365° non-continuous turntable rotation
- Zero tailswing and front arm swing
- Sep-Ex drive system

POWER

- 48 V DC deep cycle battery pack
- 24 V DC auxiliary power
- Universal 30A battery smart charger



OPTIONS & ACCESSORIES

PRODUCTIVITY

- Platform swing gate
- Half-mesh platform inserts with swing gate
- Air line to platform
- Deluxe aircraft protection package (Z30N only)**
- Fire resistant hydraulic oil
- Biodegradable hydraulic oil
- Tool tray
- Fluorescent tube caddy
- Pipe cradle (pair)
- Flashing beacon
- Platform work lights
- Lockable platform control box cover
- Front driving lights

POWER

- EE UL583 Fire Protection rating
- Battery charge indicator (BCI)
- Low voltage interrupt with BCI
- 800 watt 120VAC power inverter
- Retained key selector switch

**Reduces platform load capacity to 440 lbs.

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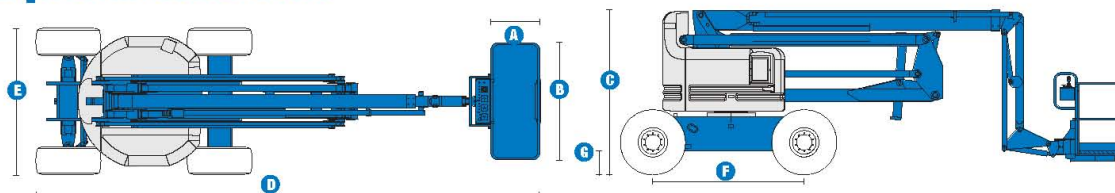


SELF-PROPELLED ARTICULATING BOOMS

Z™-60/34



Specifications



MODEL	Z™-60/34	
MEASUREMENTS	US	Metric
Working height maximum*	66 ft 4 in	20.39 m
Platform height maximum	60 ft 4 in	18.39 m
Horizontal reach maximum	36 ft 3 in	11.05 m
Up and over clearance maximum	27 ft	8.23 m
A Platform length - 8 ft / 6 ft model	3 ft / 2 ft 6 in	.91 m / .76 m
B Platform width - 8 ft / 6 ft model	8 ft / 6 ft	2.44 m / 1.83 m
C Height - stowed	8 ft 10 in	2.69 m
D Length - stowed	26 ft 9 in	8.15 m
E Width	8 ft 1 in	2.46 m
F Wheelbase	8 ft 3 in	2.51 m
G Ground clearance - center	1 ft 4 in	.41 m

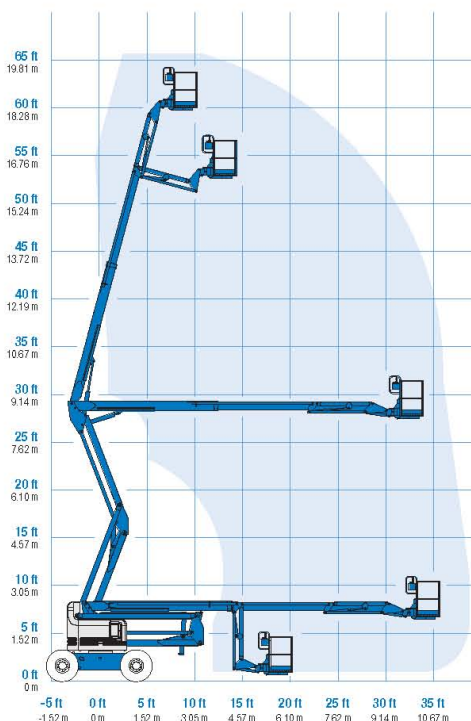
PRODUCTIVITY		
Lift capacity	500 lbs	227 kg
Platform rotation	180°	
Vertical jib rotation	90°	
Turntable rotation	360° continuous	
Turntable tailswing	zero	
Drive speed - stowed	3.0 mph	4.8 km/h
Drive speed - raised**	0.68 mph	1.1 km/h
Gradeability - 2WD - stowed***	25%	25%
Gradeability - 4WD - stowed***	40%	40%
Turning radius - inside	10 ft	3.04 m
Turning radius - outside	19 ft 11 in	6.07 m
Controls	12V DC proportional	
Tires	385/65 D19.5, 12 ply	

POWER		
Power source	Ford DSG-423 4-cylinder gas/LPG 75 hp (56 kW) Deutz D2011L03i 3-cylinder diesel 48 hp (35.8 kW) Perkins 404D-22 4-cylinder diesel 51 hp (38.0 kW)	
Auxiliary power unit	12V DC	
Hydraulic tank capacity	45 gal	170.3 L
Fuel tank capacity	20 gal	75.7 L

WEIGHT***		
	22,520 lbs	10,215 kg

STANDARDS COMPLIANCE ANSI A92.5, CSA B354.4, CE Compliance, AS 1418.10

RANGE OF MOTION Z™-60/34



* The metric equivalent of working height adds 2 m to platform height. U.S. adds 6 ft to platform height.
 ** In lift mode (platform raised), the machine is designed to operate on firm, level surfaces only.
 *** Gradeability applies to driving on slopes. See operators manual for details regarding slope ratings.
 **** Weight will vary depending on options and/or country standards.



SELF-PROPELLED ARTICULATING BOOMS

Z™-60/34

Features

EASILY CONFIGURED TO MEET YOUR NEEDS

PLATFORM OPTIONS

- Steel 8 ft (2.44 m) (standard)
- Steel 6 ft (1.83 m)
- Steel 6 or 8 ft (1.83 or 2.44 m) tri-entry
- Steel 4 ft (1.22 m)**
- Steel 5 ft (1.52 m)**

JIB

- 6 ft (1.83 m) jib boom

POWER OPTIONS

- Ford gas/LPG 75 hp (55 kW)
- Deutz diesel 48 hp (35.8 kW)
- Perkins diesel 51 hp (38 kW)

DRIVE OPTIONS

- 2WD
- 4WD

AXLE OPTIONS

- Active oscillation (standard on 4WD)
- Non-oscillating

TIRE OPTIONS

- Rough terrain air-filled (standard)
- Rough terrain foam-filled
- High flotation air-filled
- Sealant treated air-filled

STANDARD FEATURES

MEASUREMENTS

- 65 ft 4 in (20.39 m) working height
- 35 ft 3 in (11.05 m) horizontal reach
- 27 ft (8.23 m) up and over clearance
- Up to 500 lb (227 kg) lift capacity

PRODUCTIVITY

- Self-leveling platform
- Hydraulic platform rotation
- Fully proportional controls
- Drive enable
- AC power cord to platform
- Horn
- Hour meter
- Tilt alarm
- Descent alarm
- 360° continuous turntable rotation
- Locking turntable covers
- Zero tailswing
- Positive traction drive
- 2 speed wheel motors

POWER

- All engines are emissions compliant
- 12V DC auxiliary power
- Engine protection package
- Anti-restart engine protection
- Auto engine fault shutdown
- Intake air heater (Deutz engine)



OPTIONS & ACCESSORIES

PRODUCTIVITY

- Platform swing gate
- Half mesh platform inserts with swing gate
- Platform top auxiliary rail
- Arc Pro 275™ Heavy-Duty Welder package
- Welder Ready package
- Weld leads to platform
- Hydraulic oil cooler
- Air line to platform
- Fire resistant hydraulic oil
- Biodegradable hydraulic oil
- Deluxe aircraft protection package
- Basic hostile environment kit
- Deluxe hostile environment kit
- Thumb rocker steer
- Tool tray
- Fluorescent tube caddy
- Pipe cradle (pair)
- Alarm package
- Panel cradle package*
- Platform work lights
- Front driving lights
- Lockable platform control box covers

POWER

- Engine gauge package
- AC generator packages (110V/60Hz, 3000W or 220V/50Hz, 2500W)
- Cold Weather Packages
- Arctic Packages
- Diesel scrubber/spark arrestor
- Diesel spark arrestor muffler
- LPG tank 33.5 lb (15.19 kg) capacity
- Additional LPG carrier with tank
- Retained key selector switch

* Available on select models

** Not available on CE machines

Genie United States

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ReachMaster

ReachMaster Falcon FS105*Photo: ReachMaster Falcon*

When you need considerable work height combined with limited or narrow access and maybe even surface pressure restrictions, *nothing* outperforms the **new** Falcon series from **REACHMASTER**. In a field dominated by traditional boom lifts, the Falcon series sets a new standard for compact, flexible and light aerial work platform design. Now available in 11 models from 75 - 155 ft, the all-new **Falcon FS105** is the latest lift in the series, reaching a stunning 105 ft work height. And still capable of passing through a door opening a mere 2.6 feet wide and 6.6 feet high.

Once again positioning itself as the technological market leader, the Falcon FS series is the first and only compact lift to be equipped with a new **double** 20 ft jib (2 x 10 ft) and optional automatic setting of outriggers. The lift can be driven in folded position from the basket as well as outriggers can be set automatically, also from the basket.

The new design is not only elegant, but also makes it the most user-friendly and safe unit in its class. Standard features include our world-renowned, automatic safety- and stability system, which provides maximum safety as well as our unique multi-position outrigger system, which allows for set-up on uneven surfaces.

REACHMASTER INC.

1416 D STONEHOLLOW DRIVE ■ KINGWOOD, TX 77339

TOLL-FREE: 1-866-358-7088 ■ PHONE: 281 - 358 - 7088 ■ FAX: 281 - 359- 3500 ■ E-MAIL: usa@reachmaster.comwww.reachmaster.com



Technical data ReachMaster Falcon FS105

Standard equipment

Working height:	105 feet
Basket height:	99 feet
Turret rotation:	375°
Double jib arm:	2x180°
Jib arm (2x3 m.):	20 ft
Basket (aluminium):	(W x L : 2.6 ft x 4.2 ft)
Basket load:	440 lbs
Rotating basket (optional)	2x90°

Measurements (Transport position):

Total height:	6.5 feet
Total length:	22.9 feet
Total width:	2.6 feet
Gradability (standard drive):	5°/10%*
Weight approx.	8.700 lbs*

* Depending on optional equipment.

Standard performance and features

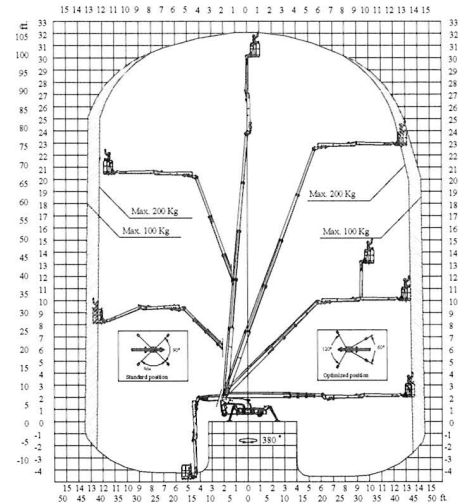
- Access through 2.6 ft wide x 6.6 ft high door openings.
- Working height up to 105 ft.
- 110V chargeable battery power system.
- Self-propelled electro hydraulic drive system, operational from pedestrian handle.
- Full hydraulic jib arm system with individual movements. The two jibarms ensures maximum flexibility to enable working over, below, and behind obstacles.
- 375° turret rotation, with integrated stop.
- Individual setting of outriggers controlled by hydraulic valve.
- The hydraulic/manual outriggers can be leveled on a slope of 8,5°.
- Due to it's unique outrigger design, the ReachMaster Falcon can self-load onto trucks or trailers.
- 200° double jib arm (20 ft.)
- Proportional control of all functions via joysticks, operated from inside the basket.
- Automatic safety and stability system.
- Electronic checking of the power system.
- Manual pump system for lowering the basket in case of emergency.

Optional equipment

For customers with special wishes a wide range of options are available

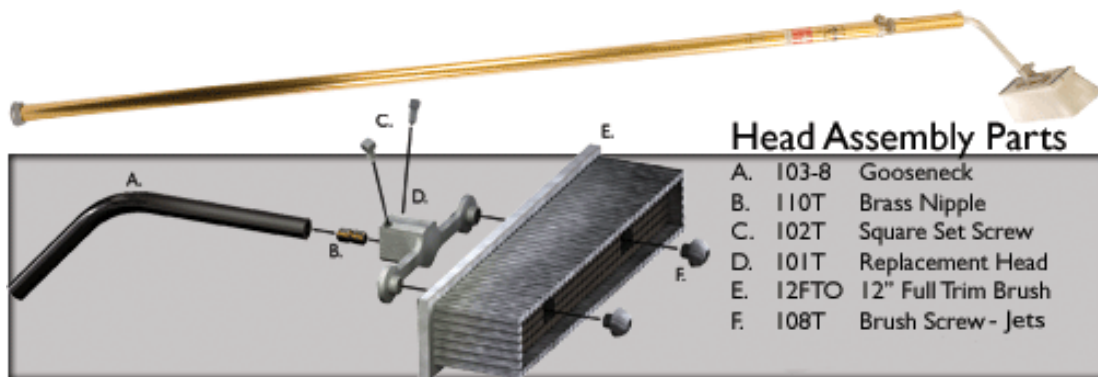
- Electrical automatic outrigger setting up of the ReachMaster Falcon from basket.
- Chassis steering from inside basket.
- Petrol (low noise) generator (2600W), enables you to work without a 110V mains power supply.
- 2x90° hydraulic rotating basket.
- 2-wheel drive system (Gradability up to 10°/18%).
- 3-wheel drive system (Gradability up to 15°/26%)(min. width 3 ft).
- 360° continuous turret rotation.
- Outriggers with knee joint.
- 110 V power supply in the basket.
- Diesel-powered system for both lift and chassis movements.
- Special colour according to customer request.
- Twin wheel for low ground pressure allows driving on sensitive floorings such as marble.
- White non-marking tyres.
- Basket in various sizes (WxL: 2.6 x 2.6 or 2.6 x 6.6 ft).

Reach diagram ReachMaster Falcon FS105





APPENDIX C –
INFORMATION ON WATER-FED EXTENSION POLES



Typical water-fed pole with brush



Typical water-fed pole in operation.



APPENDIX D –
FAÇADE MAINTENANCE CYCLE TIME ANALYSIS



CLEANING CALCULATIONS					
Input Variables	Glass Awning Exterior	Glass Awning Lower Interior	Glass Awning Upper Interior	Light Column/Skylight Interior	Light Column/Skylight Exterior
Number of Maintenance Personnel	2	2	2	1	1
Work Platform Dimensions	8'-0" x 30" x 42"		N/A	N/A	3'-0" x 30" x 42"
Maximum Lifting Height ¹	66'-4" ¹	36" ²	N/A	N/A	105'-0"
Initial Setup Times	30 min.	30 min.	15 min.	15 min.	15 min.
Hoisting Speed	35 ft./min.	35 ft./min.	N/A	N/A	35 ft./min.
Estimated Cleaning Speed per Man	550 ft²/hour	550 ft²/hour	550 ft²/hour	550 ft²/hour	550 ft²/hour
CALCULATED RESULTS					
Number of Work Platform Drops	364	350	N/A	N/A	N/A
Lifting Time (maximum height)	1.6 min.	0.8 min.	N/A	2.1 min.	N/A
Cleaning Time per Drop (average)	51.3 min.	28.0 min.	N/A	35.0 min.	N/A
	0.9 hours	0.5 hours	N/A	0.6 hours	N/A
Total Cleaning Time	311.0 hours	163.1 hours	289.0 hours	237.7 hours	136.0 hours
	36.6 days	19.2 days	18.1 days	28.0 days	16.0 days
Total Setup Time	60.7 hours	53.3 hours	30.6 hours	34.4 hours	25.5 hours
	7.1 days	6.9 days	3.6 days	4.0 days	3.0 days
FMCT	43.7 days	26.1 days	21.7 days ³	32.0 days	19.0 days
		47.8 days			

NOTE: The façade maintenance cycle times used in this report are based on Lerch Bates' experience in the industry and are intended to be estimates only.

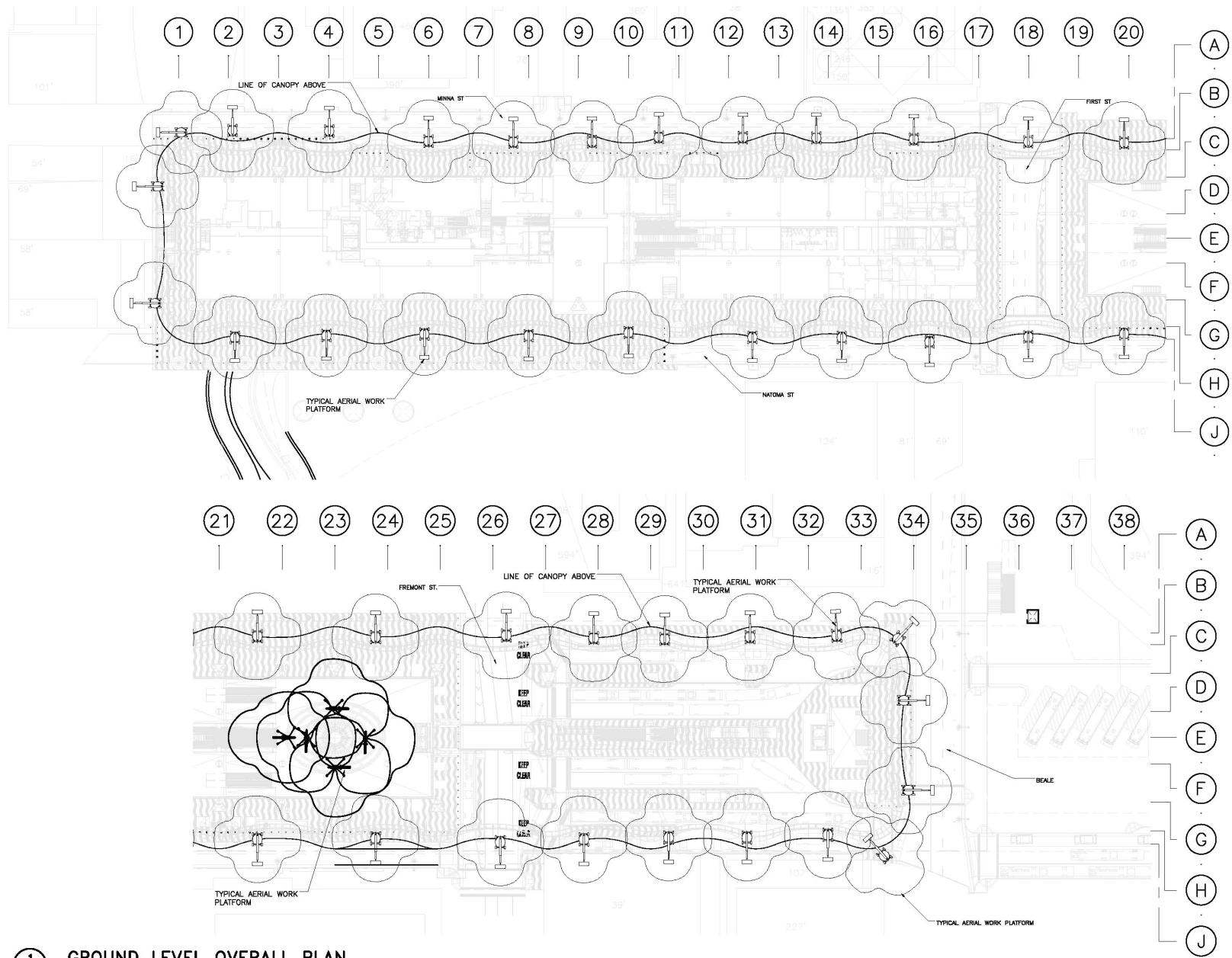
¹ Genie Self-propelled Articulating Boom, Model Z-60/34 or equivalent.

² Genie Self-propelled Articulating Boom, Model Z-30/20N or equivalent.

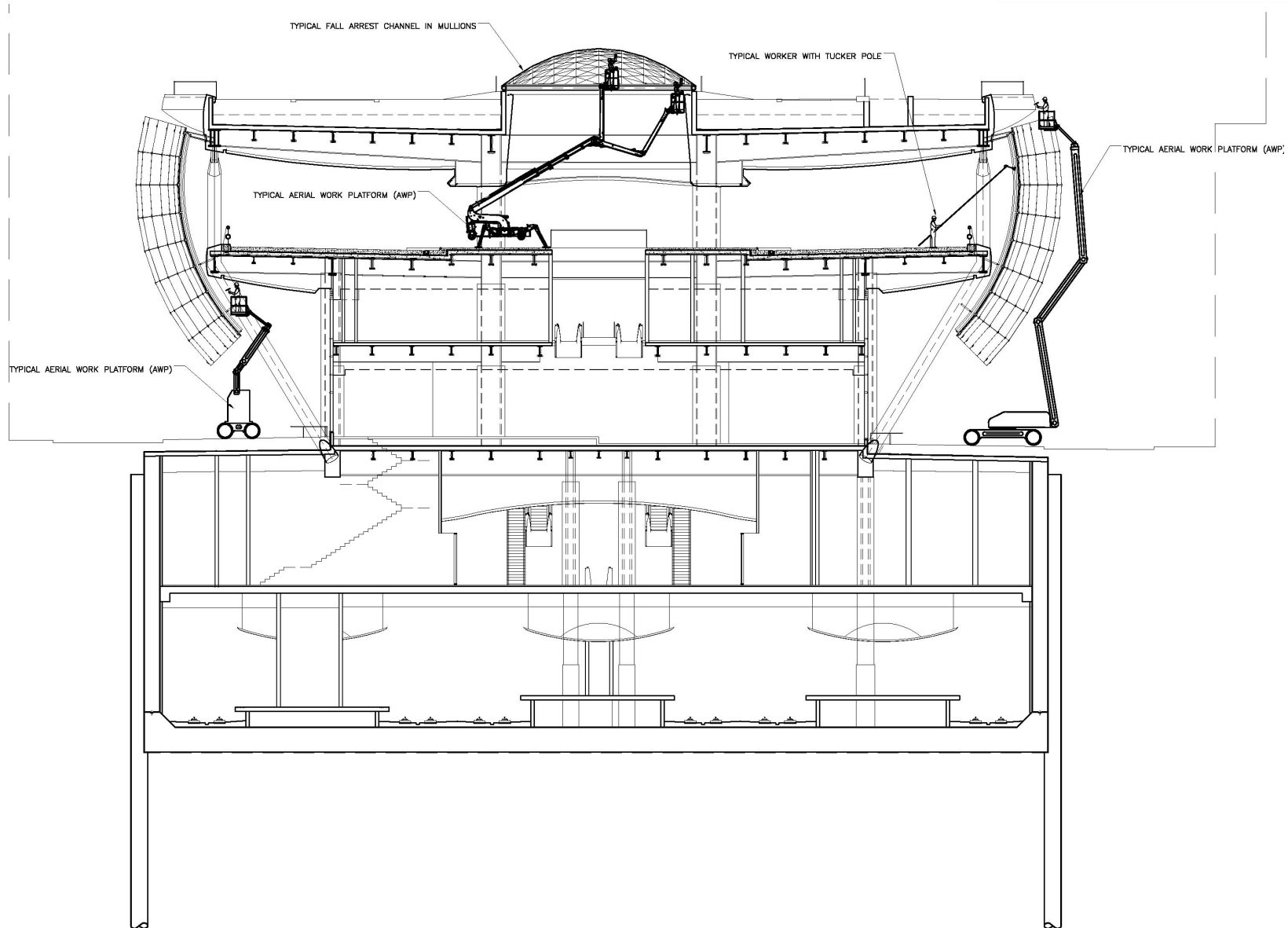
³ FMCT assumes glass cleaning with water-fed poles and reverse osmosis treated water.



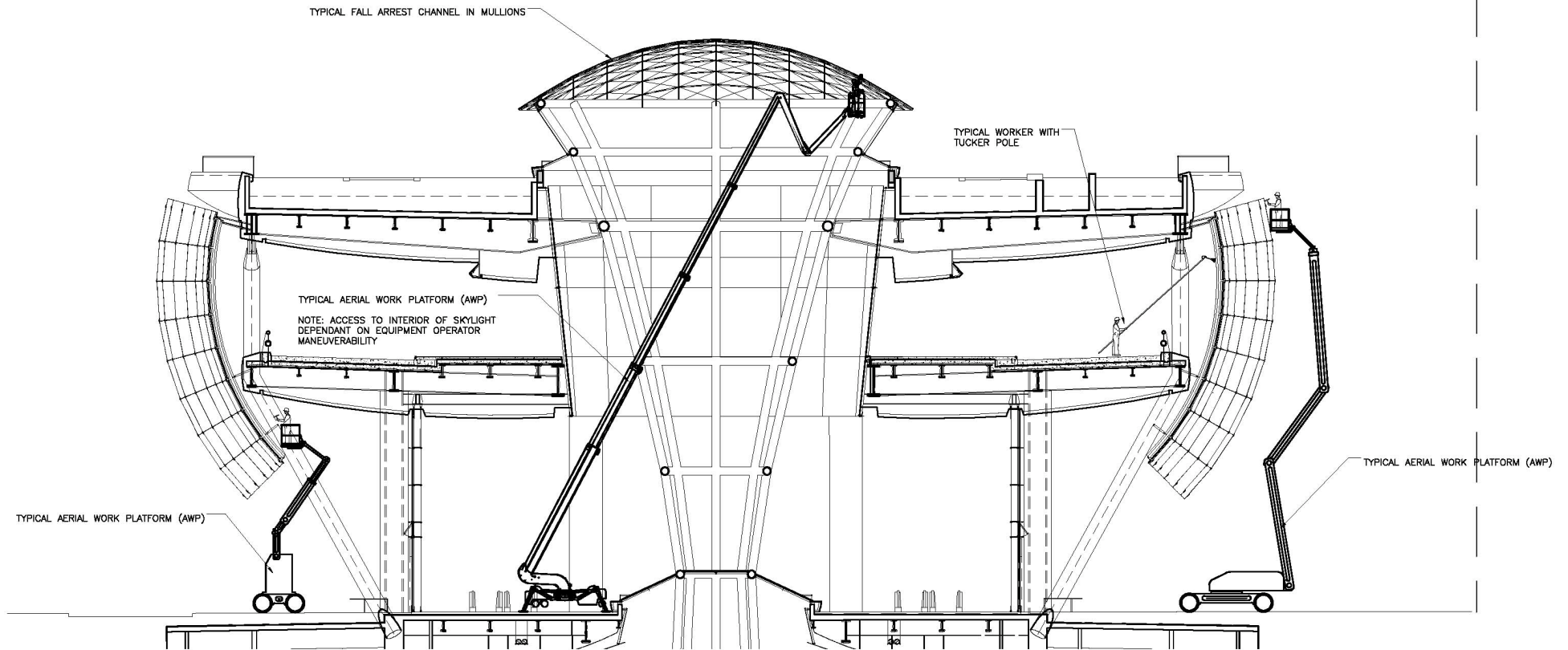
APPENDIX E –
FAÇADE ACCESS DRAWINGS



1 GROUND LEVEL OVERALL PLAN
SCALE: 1/32"=1'-0"



1 BUILDING SECTION @ GRIDLINE 11
SCALE: 1/8"=1'-0"



1 BUILDING SECTION @ GRIDLINE 23
 SCALE: 1/8" = 1'-0"

