

## Memorandum

To: Harold Finger

From: Wayne Johnson

Date: 8 July 2021

TTPP REF: 20396

CC: Ben Finger, George Karavanas, Santi Botross

**RE: 55 BAY STREET, DOUBLE BAY  
RESPONSE TO COUNCIL RECOMMENDATIONS**

Haden Group have requested The Transport Planning Partnership (TTPP) to undertake a review of the proposed access arrangements at 55 Bay Street as part of a development application (DA 40/2021/1) that was submitted to Woollahra Council in January 2021.

The proposed development at 55 Bay Street, Double Bay includes two tandem car stackers (four off-street car parking spaces in total) which would require a car to reverse from the car stacker onto Bay Street.

Council have provided the following comments to the submitted DA:

*1. Access Driveway, Car Stacker and Queuing Analysis -*

- a. Vehicles are required to reverse out of the property, which cannot be supported, as per E1.10.6 of Council's DCP. Council's Traffic Engineers raises concerns on its adverse impacts on traffic flow efficiency and safety, given its location within high pedestrian activity area of Double Bay Centre;*
  - b. Over one (1) vehicle is identified to wait to be serviced by the proposed car stackers under the 98<sup>th</sup> percentile queue with no provision of on-site waiting area;*
  - c. The tandem design of car stackers creates even more conflicts and exacerbates the abovementioned traffic conditions.*
-

The Woollahra Council Development Control Plan (DCP - E1 Parking and Access) specifies the following:

#### **E1.10.6 Driveways and access points**

- *The design of driveways and access points, except for dwelling houses, is to be such that vehicle entry and exit from a site, onto a public road, is made by driving in a forward direction, unless otherwise required by Council.*

In the design development of the proposal, a number of "forward in forward out" access arrangements were investigated. However, these options resulted in multiple design issues which affected the ultimate design of the proposed development; namely:

- *Provision of a turntable would result in the majority of the ground floor retail being lost.*
- *Provision of an underground car park would result in the entire ground floor retail being lost.*

In light of the above, TTPP has undertaken a safety review of the proposed access arrangement (which is as per the currently approved site access arrangement for the existing site).

### **Vehicular Movements Across Driveway**

The existing development has approval for a loading dock which is 8m in length. Access to the loading dock is provided off Bay Street via a "forward in reverse out" arrangement. As such, the approved loading dock currently requires a vehicle to reverse across the property boundary line when exiting the site.

The Woollahra Council DCP states the following:

#### **E1.14.2 Location and design of loading bays**

- *Vehicles will generally be required to enter and exit the site in a forward direction.*

The above statement suggests that there may be situations where a vehicle would not enter and exit in a forward motion. In the case of the subject site, the existing 3m wide driveway could only facilitate forward in reverse out movements. Notably, this was acceptable under the existing approval.

In addition, the existing loading dock was previously approved based on the layout where pedestrian sight triangle requirements as per AS2890.1 are not provided. The existing layout is shown in Figure 1, which involves a heavy vehicle reversing from the loading dock.

**Figure 1: View to Bay Street from within Existing Loading Dock**



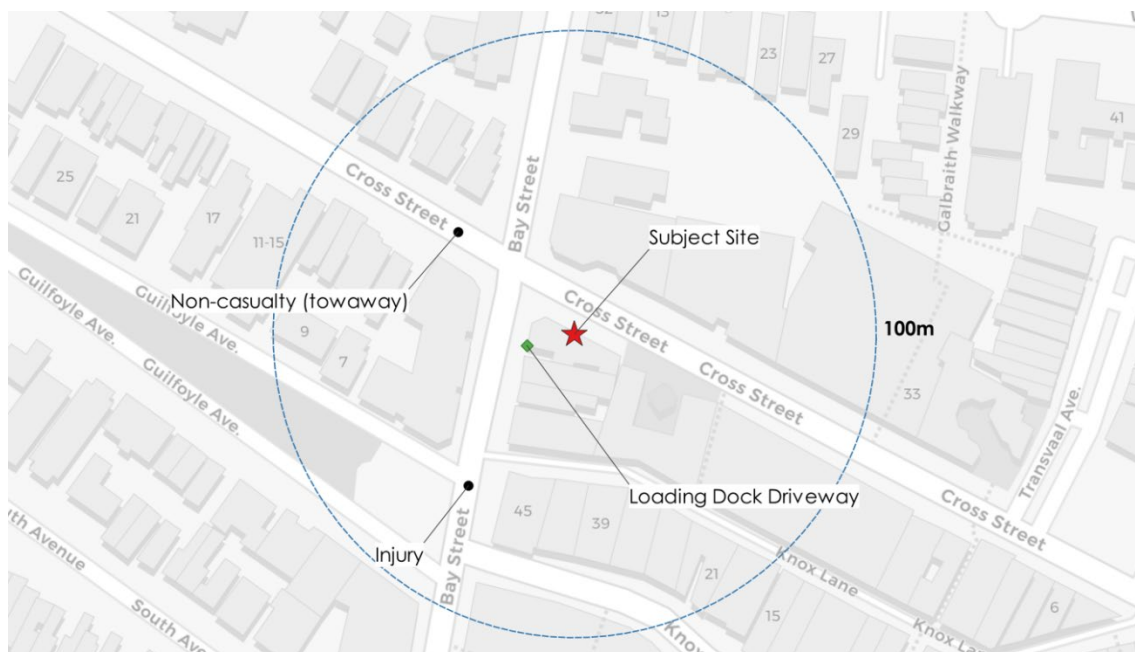
Source: The Transport Planning Partnership, photo taken 17/06/2021

Unlike the proposed development site access arrangement, the approved loading dock does not provide any vehicle-pedestrian conflict mitigation measures such as traffic lights, warning signage or convex mirrors which would reduce the perceived pedestrian safety risks. Furthermore, a heavy vehicle would have greater difficulty reversing out of the loading dock in comparison to a regular car i.e. moving a heavier vehicle requires the driver to find a larger gap in pedestrian flow and traffic stream. A typical delivery vehicle (delivery van) requires approximately 2/3 of the vehicle to reverse across the property boundary line before sightlines to pedestrians from within the loading dock can be achieved. Consequently, a delivery driver is less likely to observe a pedestrian on Bay Street than if a passenger car reverses across the property boundary.

## Crash Data

Historic crash data has been obtained from Transport for NSW for the area surrounding the subject site to identify whether there are any existing safety concerns. The data has been obtained for the most recent five-year period from 2016 to 2021. From the incidents recorded within 100m of the site there were a total of two crashes; one crash occurred on Cross Street while the other crash occurred on Bay Street south of Knox Lane. Notably, the crashes occurred some distance away from the site access as shown in Figure 2. There has been no recorded vehicle and pedestrian incidents at the site access driveway.

**Figure 2: Crash History Data**



Data Source: Transport for NSW, data extraction date 21/06/21

## Traffic Volumes and Travel Speed

To gain an appreciation of existing traffic volumes and travel speeds on Bay Street, automatic tube counters were installed on Bay Street just to the north and south of the site access driveway. Data was collected across a five-day period between 10-15 June 2021.

Traffic flows recorded in the northbound and southbound directions between 7am-7pm are presented in Table 1. The hourly traffic profile for each surveyed day is shown in Figure 3.

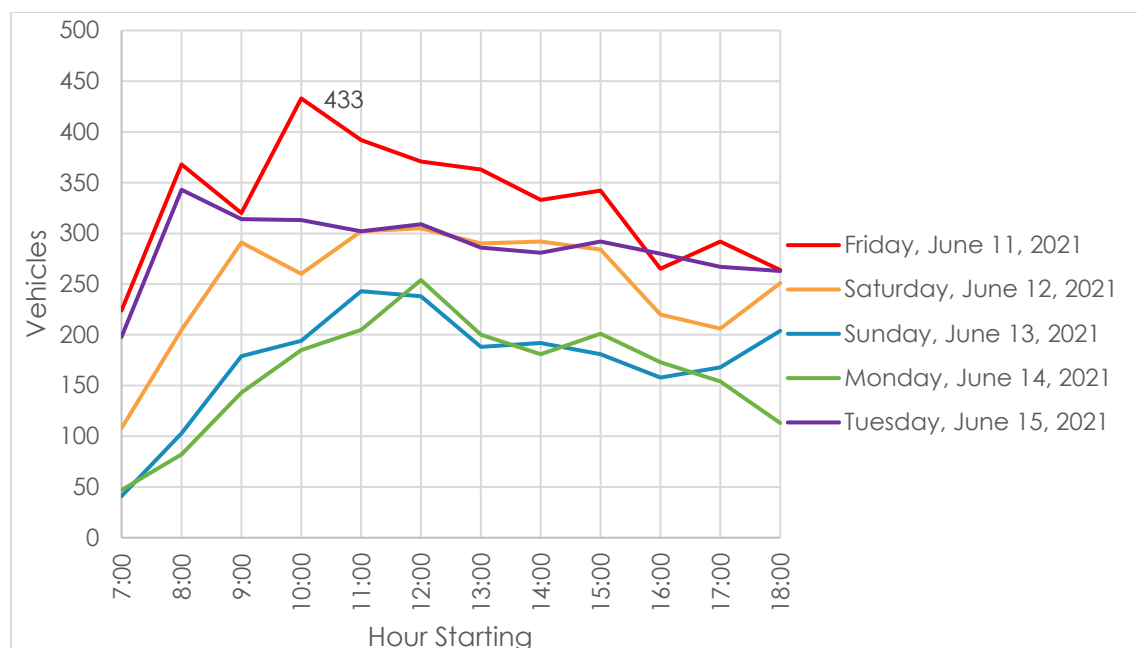
**Table 1: Bay Street Traffic Flow by Direction**

Date	Northbound Vehicles	Southbound Vehicles	Both Directions
Friday 11/6/21	2,001	1,966	<b>3,967</b>
Saturday 12/6/21	1,522	1,492	<b>3,014</b>
Sunday 13/6/21	1,088	1,001	<b>2,089</b>
Monday 14/6/21*	991	947	<b>1,938</b>
Tuesday 15/6/21	1,762	1,686	<b>3,448</b>

Notes:

\* Queen's Birthday public holiday fell on Monday 14/6/21.

**Figure 3: Bay Street Traffic Flow Hourly Profile**



Within the Sydney Metropolitan, typical weekday road network peak periods occur sometime between 7am-9am and 4pm-6pm. On Saturday, the peak period generally occurs sometime between 11am-1pm.

From the survey data, the commuter peak periods in the vicinity of the site have been identified as 8am-9am and 4pm-5pm. Also, the Saturday peak period occurs between 12pm-1pm. The peak hourly traffic flows on Bay Street are summarised as follows:

- Weekday commuter peak periods (average of Friday and Tuesday):
  - AM peak: 356 vehicles per hour
  - PM peak: 273 vehicles per hour.
- Saturday peak period: 305 vehicles per hour.

As assessed in the Traffic and Parking Impact Assessment, on-site parking would be used by employees of the proposed development. Therefore, vehicle trips generated by the proposed development would be anticipated during the typical commuter peak periods. Generally speaking, there would be 4 inbound movements in the AM peak period and 4 outbound movements in the PM peak period. It is noted that in the inter-peak periods some additional trips may occur during the day.

From Figure 3, the busiest hour of any of the surveyed days occurred between 11am-12pm (on Friday) during which there are 433 vehicles per hour. The proposed development would be unlikely to generate vehicle trips at such time.

The posted speed limit in the Double Bay town centre, which includes Bay Street is 50 km/h. The 85<sup>th</sup> percentile travel speed recorded in the northbound and southbound directions are 29.6 km/h and 21.0 km/h, respectively.

In addition, the traffic survey results indicate that 99% of vehicles moving in the northbound direction travel at a speed less than 40 km/h while in the southbound direction 99% of vehicles travel less than 30 km/h.

Travel speeds recorded on Bay Street in the vicinity of the site are presented in Figure 4.

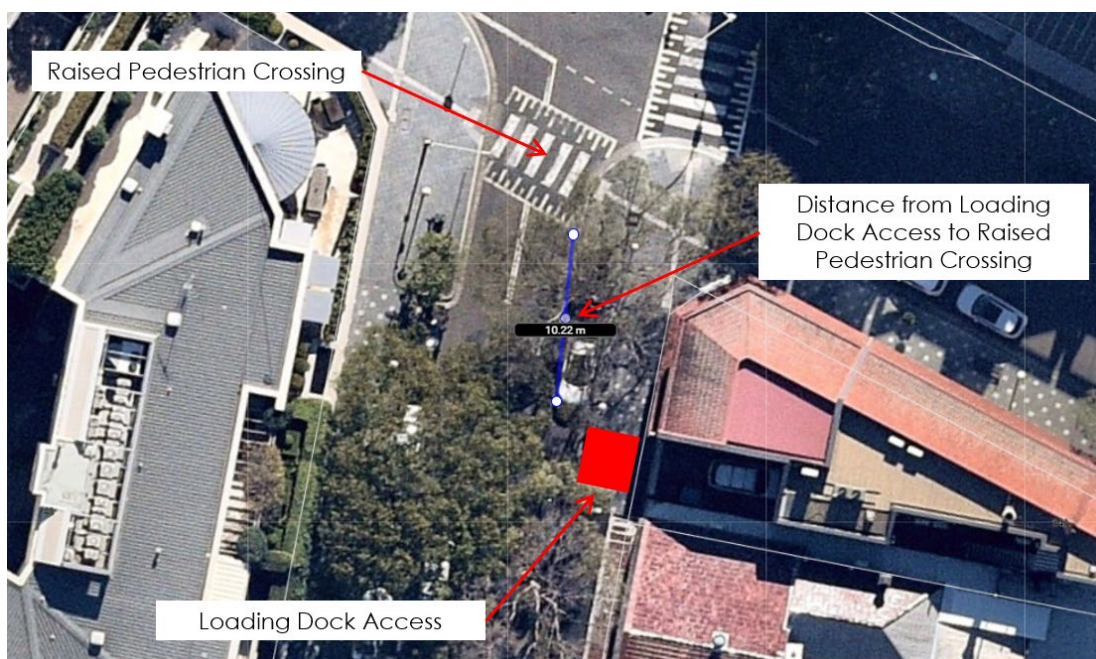


**Figure 4: Bay Street Travel Speeds**



Low travel speeds in the area are partly attributed to the two raised pedestrian crossings at the intersection of Bay Street-Cross Street. The raised pedestrian crossings function as a traffic calming measure, reducing travel speed and inherently increasing drivers' alertness to their surroundings. The raised pedestrian crossing on Bay Street is located only 10 m away from the site access driveway which is shown in Figure 5.

**Figure 5: Nearby Traffic Calming**



## Existing Vehicle and Pedestrian Movements at Site Access Driveway

The existing development is currently approved for a loading dock. Notwithstanding this, the loading area is currently used as a tandem car space with two vehicles regularly parking within the loading area.

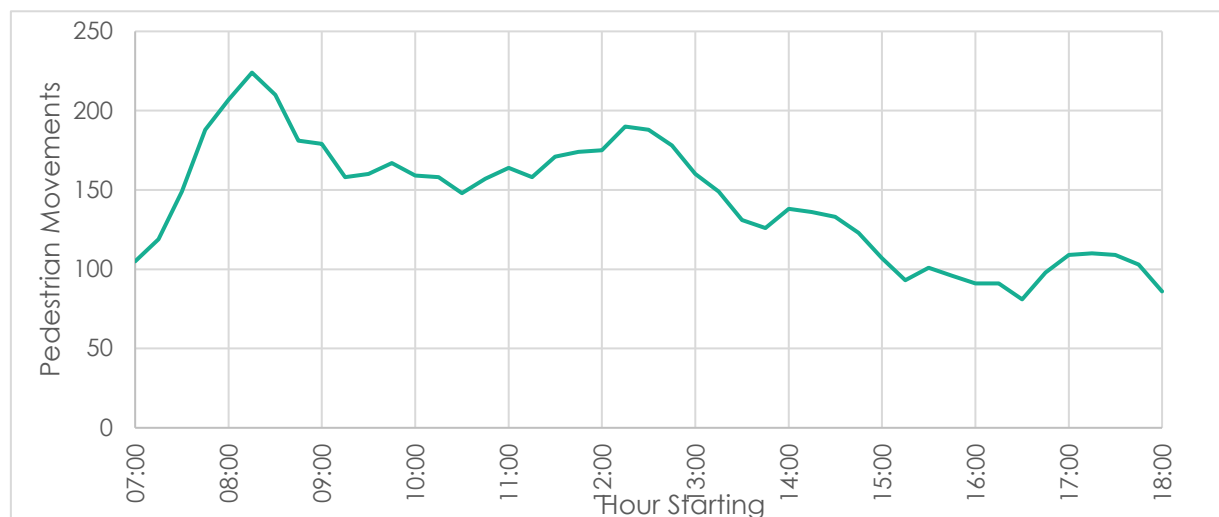
A traffic survey of the site access driveway was undertaken on Thursday 10<sup>th</sup> of June 2021 between 7am-7pm. The survey recorded 4 vehicle movements (2 two-way movements) across the survey period. These movements occurred between 5:30pm-6:30pm.

A key finding of the traffic surveys was that there is illegal parking that occurs in the site access driveway that is unrelated to the subject site. The illegal parking is a result of drivers attending nearby shops and temporarily parking within the loading dock driveway. Photographic evidence of the illegal parking provided in Attachment One.

Despite there being greater vehicular activity in the site access driveway (not generated by the subject site itself), there are no reported vehicle or pedestrian incidents at this location.

The traffic survey also recorded pedestrian movements across the site access driveway during the survey period. The survey data indicates that the peak hour for pedestrian movements occurs between 8:15am - 9:15am when there are 224 movements. Similarly, in the evening peak period, there are 110 movements recorded between 5:15pm – 6:15pm. The pedestrian survey results are presented in Figure 6.

**Figure 6: Pedestrian Movements**



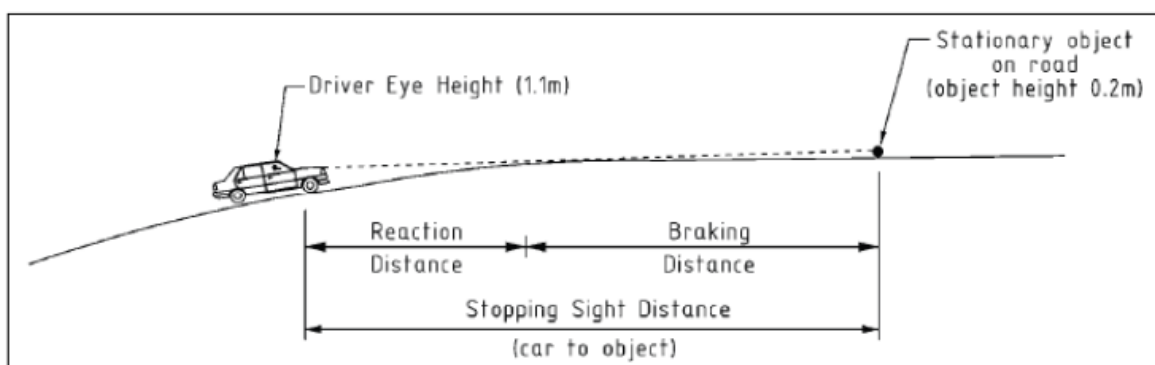
Notably, cars accessing the proposed development would be expected to enter the car stackers in the AM peak period; this would occur as a forward in movement. Cars would exit the car park in the PM peak period (by reversing out from the car stacker) which is when pedestrian volumes would be approximately 50% less than in the AM peak period. As it currently happens, there are 4 reversing movements that occur in the PM peak period.



## Stopping Stop Distance

The stopping sight distance is used to calculate the distance required to stop safely to an observed unexpected object. The concept is shown in Figure 7.

**Figure 7: Car Stopping Sight Distance**



Source: Based on Austroads (2003).

The 'RMS Road Design Guide – Part 3: Geometric Design' sets out the formula to calculate the Safe Stopping Distance (SSD) below:

$$SSD = \frac{R_T V}{3.6} + \frac{V^2}{254(d + 0.01a)}$$

$R_T$  = reaction time (sec)  
 $V$  = operating speed (km/h)  
 $d$  = coefficient of deceleration (longitudinal friction factor)  
 $a$  = longitudinal grade (% , + for upgrades and - for downgrades).

In regard of the above, the required stopping distances as defined by the Austroads design guidelines are shown in Table 2.

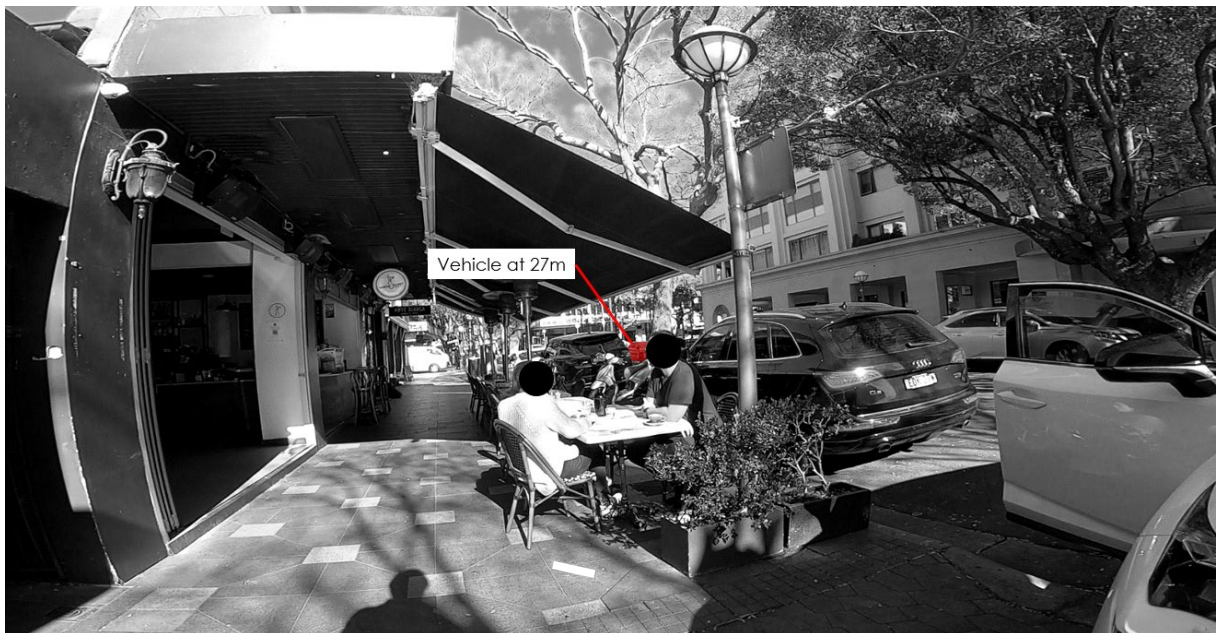
**Table 2: Stopping Sight Distance**

Design Speed (km/hr)	Austroads Guide to Road Design Absolute Minimum Values* (d=0.46)		Austroads Guide to Road Design Desirable Minimum Values* (d=0.36)	
	RT = 1.5 secs	RT = 2.0 secs	RT = 1.5 secs	RT = 2.0 secs
20	12	15	13	15
25	16	19	17	21
30	20	24	22	27

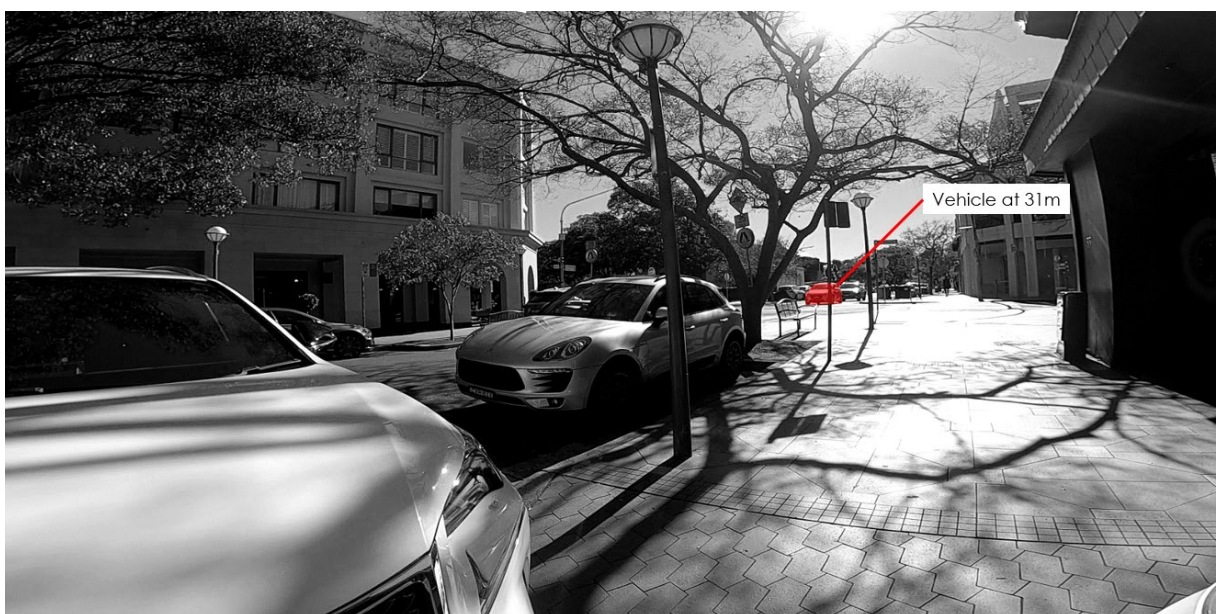
\*These values are only suitable for use in very constrained locations eg lower volume roads, lower speed urban roads

The observed sight distances from the driveway of 55 Bay Street (from driver eye-level) towards traffic approaching from the south and north are shown in Figure 8 and Figure 9.

**Figure 8: 55 Bay Street, Double Bay – Sight Distance to the south**



**Figure 9: 55 Bay St, Double Bay – Sight Distance to the north**



Given the 85<sup>th</sup> percentile travel speeds on Bay Street northbound and southbound are 21.0 km/hr and 29.6 km/hr respectively, both the absolute and desirable minimum safe stopping distances are satisfied.

## Car Park Operation Plan

A vehicle crossover is provided via a single lane driveway via Bay Street. The approved loading bay currently operates as two car parking spaces in tandem. The proposed car stackers would operate such that spaces are not allocated to a specific vehicle, thereby creating greater efficiencies and reduced wait times for cars seeking to access the car park.

Vehicle queuing mitigation measures proposed as part of the future site access include the following:

- All on-site parking would be used by employees of the development i.e. regular users. It is noted that tenants would not be allocated a specific parking space which makes for the most efficient operation of the car stackers i.e. each approaching car will enter the next available space. Thus, there would not be any unnecessary queuing by cars while they wait for the car stacker.
- Users of the on-site parking spaces would be inducted/ trained on how to use the car lift mechanism.
- When not in use, the car lift would sit idle in the “default position” where it is ready to immediately accept a car upon arrival. This would be achieved by the previous person to park onsite (i.e. they would park and then adjust the lift to a position such that the next car can park without having to move the lift prior).
- Cars entering the car stacker will have priority over cars exiting, as would be programmed within the car stacker mechanism. Employees would also be informed of said operation to avoid any potential queuing outside of the site.
- When the car stacker is in use by a car exiting the car park, a traffic signal proposed at the access driveway would flash orange to indicate that the car stacker is in use.

**Figure 10: Vehicle Exiting Warning Light**



- Should this occur, the approaching car would drive around the block (as shown by the routes in Attachment Two). A green signal would indicate that the car lift is not in use and that a car may enter.
- Vehicles would reverse into the southbound travel lane only.
- The use of a convex mirror would help alert drivers reversing out of the site of any nearby pedestrians.

### Potential Queuing at Site Access Driveway

The proposed car lift system would utilise the U-10 and U-20 car lifts which are manufactured by Klaus Multiparking. The specifications of each car lift are provided on the product datasheet which is contained in Attachment Three. An animation showing the U-20 car lift in operation is provided at the following link: <https://www.youtube.com/watch?v=W7-du9Btww0>

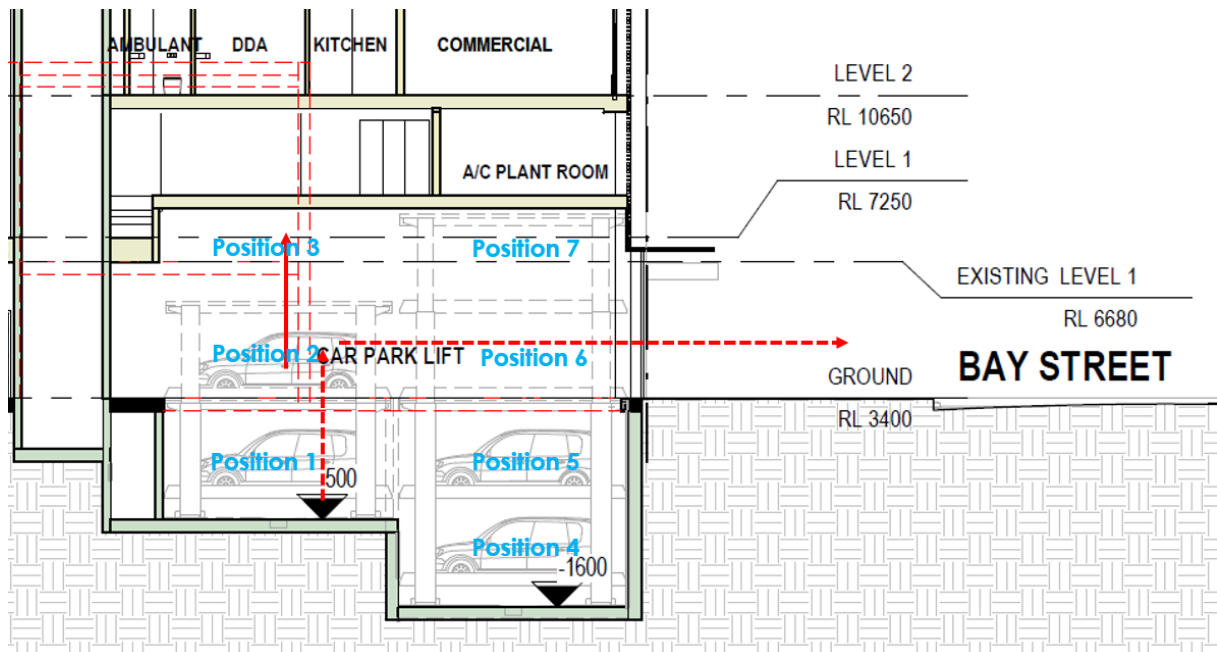
As advised by the car lift manufacturer the duration of operation for both car lift units is 30 seconds per movement per level. This would mean durations as follows:

- for the U-10 unit having one vacant space in Position 3 (Figure 11: ): 30 seconds up, 30 seconds down.
- for the U-20 unit having two vacant spaces in Position 6 and Position 7: 60 seconds total up, 60 seconds total down for two levels.

For the proposed U-20 car lift operation, the following assumptions have been used to estimate the service rate of the car park lifts:

- Lift Run = Position 4 up to Position 6 (vehicle received), then down to Position 5 (next vehicle received) = 60 seconds + 30 seconds = 90 seconds total (worst case scenario)
- Lift service rate: 40 vehicles / hour.

**Figure 11: Tandem Car Stacker Operation**



In the “worst case” scenario, each car space would generate one inbound vehicle trip in the AM peak period. The likelihood of various queuing possibilities under the “worst case” scenario are as follows:

- Case 1: Car lift available and no car waiting to enter = 90% likelihood
- Case 2: Car Lift occupied by a car (and no car waiting to enter) = 9% likelihood
- Case 3: Car Lift occupied by a car and one car waiting to enter = 0.9% likelihood
- Case 4: Car Lift occupied by a car and two cars waiting to enter = 0.1% likelihood
- Case 5: Car Lift occupied by a car and three cars waiting to enter = 0.0% likelihood.

From the above scenarios, the likelihood of a queue of one car at the car park access would be 0.9%. The likelihood of a queue with two cars at the access would be 0.1%. The likelihood of a queue with three cars would be zero. Therefore, the likelihood of any type of queue is the sum of those cases i.e. 1.0%.

On a typical day, there would be 4 inbound movements in the AM peak period, and the AM peak occurs one time each business day. Therefore, an event with a 1.0% probability would occur once every 100 business days. With five business days per week, a queuing event would occur once every 20 weeks which is minor and infrequent.

The chance of any queuing scenario occurring is less than 2% which satisfies the AS2890.1 requirement of Section 3.5:



*“When determining the amount of vehicle storage required, queue lengths shall be calculated by applying conventional queuing theory to estimated mean arrival rates during normal peak periods, and mean service rates under continuous demand, determined as closely as possible from observing the operation of similar facilities. The storage area shall be designed to accommodate the 98th percentile queue under such conditions”.*

## Conclusion

The proposed development at 55 Bay Street, Double Bay includes two tandem car stackers (four off-street car parking spaces in total) which would require a car to reverse from the car stacker onto Bay Street.

Concerns relating to the development included:

- **Vehicles requiring to reverse over the property line to exit the site.**

As has been shown in this letter, the occurrence of vehicles reversing across the property line is a behaviour which currently exists and functions without problem. Additionally, crash history data for the last five years has shown that no traffic related incidents have occurred at or near the driveway to the site on Bay Street.

- **The presence of 1 vehicle needing to wait to be serviced by the proposed stackers.**

The presence of one vehicle waiting at the site driveway to use the stackers while another vehicle is being serviced by the stackers occurs 0.9% of the time. The lift would either not be in use or be in use by 1 vehicle 99% of the time. As such, this likelihood satisfies the requirements of AS2890.1 Section 3.5 which requires the 98<sup>th</sup> percentile queue to be stored within the site. It should be noted that a vehicle waiting to use the stackers would be positioned at the site driveway in similar fashion to the vehicles shown in Attachment 1.

- **Design of stackers would create more conflicts and exacerbate the previous 2 concerns.**

The intended operation of the stackers would be conveyed to employees at the subject site. Generally speaking, the same four vehicles would make use of the stackers on a day-to-day basis ensuring that familiarity with its intended operation would be achieved quickly. Notwithstanding the above, the tandem stacker arrangement would allow any vehicle parked within the site to exit at will without requiring another vehicle to leave.

As such, this letter demonstrates the operation of the proposed site as well as any required mitigation measures, to facilitate the operation of the development.

# Attachment One

**Illegal Parking within Site Access Driveway**

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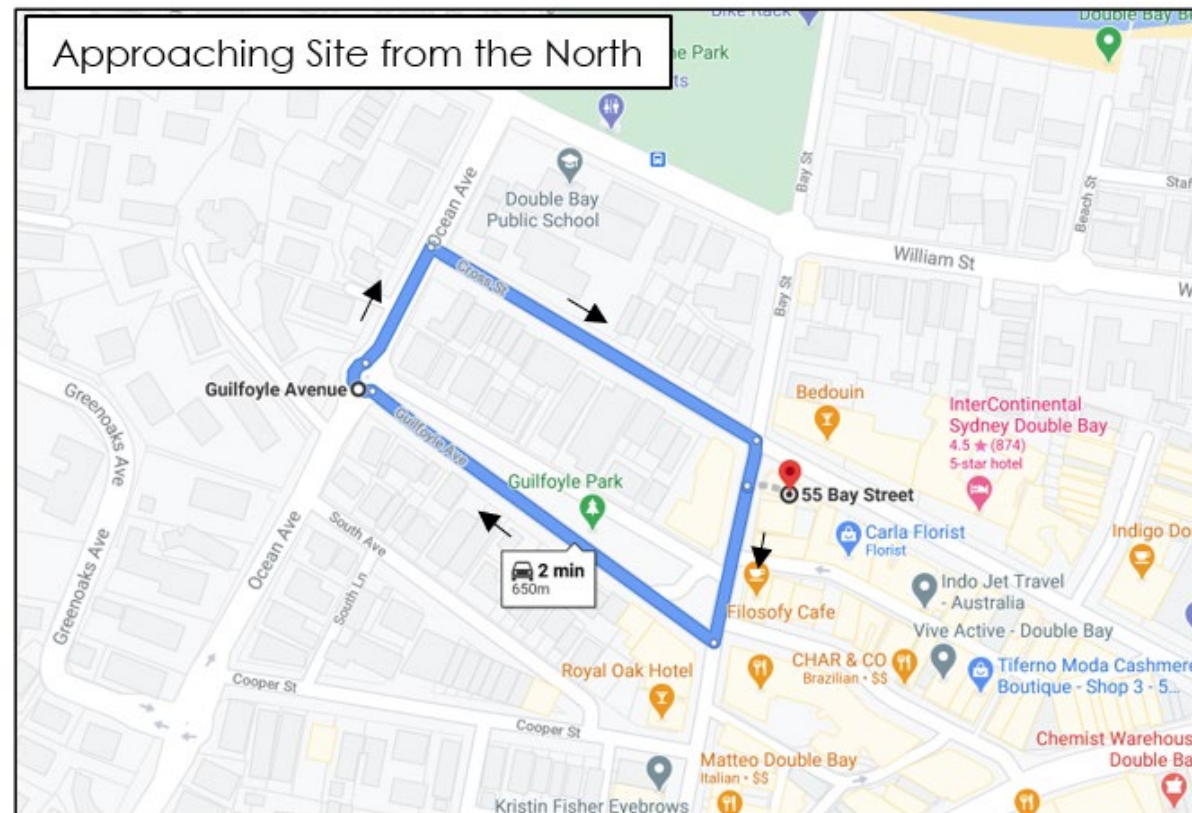
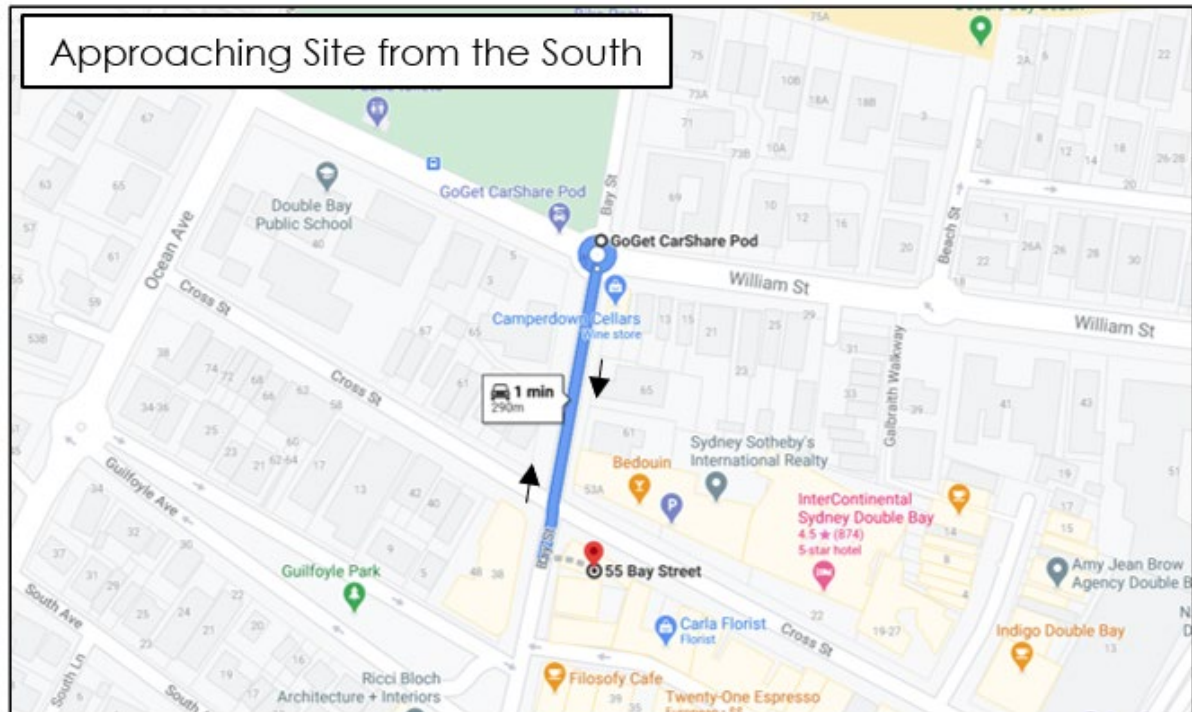


# Attachment Two

**Around the Block Detour**

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# Attachment Three

## Klaus Multiparking U-10 Car Lift and U-20 Car Lift Specifications

Page 1	Section
Dimensions	Car data
Page 2	Width dimensions
Page 3	Approach Load plan
Page 4	Pit Paving
Page 5	Electrical installation Technical data
Page 6	Tec. data To be performed by the customer
Page 7	Description

**KLAUS Multiparking GmbH**  
Hermann-Krum-Straße 2  
D-88319 Aitrach  
Fon +49 (0) 75 65 508-0  
Fax +49 (0) 75 65 508-88  
info@multiparking.com  
www.multiparking.com

PRODUCT DATA

multi

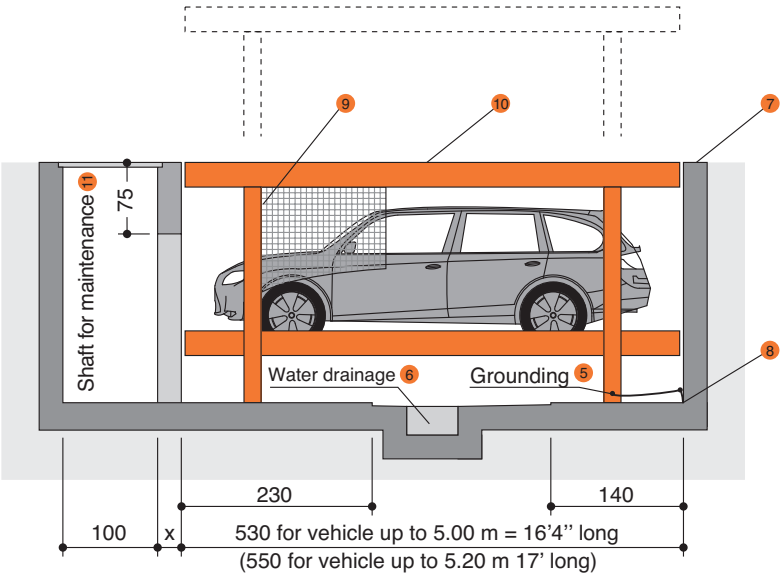
base

U10 EB

2000 kg

/

2600 kg



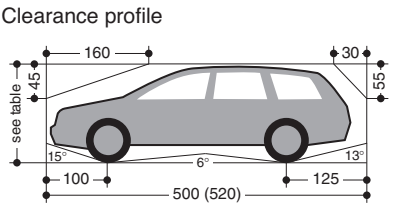
Dimensions

All space requirements are minimum finished dimensions.  
Tolerances for space requirements  $\pm 3$ .  
Dimensions in cm.  
EB (single platform) = 1 + 1 vehicles

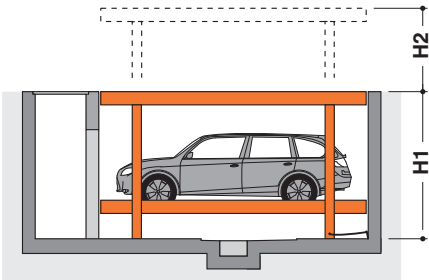
Suitable for

Standard passenger cars:  
Limousine, station wagon, SUV, van  
according to clearance and maximal surface load.

	Standard	Special
width	190 cm	190 cm
weight	max. 2000 kg	max. 2600 kg
wheel load	max. 500 kg	max. 650 kg



U10 EB



Type	H1	H2	car height
U10 EB-250	250	210	165
U10 EB-285	285	245	200

- 1

Standard type

2

Special system: maximum load for extra charge.

3

To follow the minimum finished dimensions, make sure to consider the tolerances according to VOB, part C (DIN 18330 and 18331) and the DIN 18202.

4

Car width for platform width 230 cm. If wider platforms are used it is also possible to park wider cars.

5

Potential equalization from foundation grounding connection to system (provided by the customer).

6

Slope with drainage channel and sump see page 3.

7

In compliance with DIN EN 14010, 10 cm wide yellow-black markings compliant to ISO 3864 must be applied by the customer to the edge of the pit in the entry area to mark the danger zone (see „load plan“ page 4).

8

At the transition section between pit floor and walls no hollow mouldings/coves are possible. If hollow mouldings/coves are required, the systems must be designed smaller or the pits accordingly wider.
- 9

If necessary, protective gratings are installed at the back area

10

The upper platform is a frame construction. Flooring can be provided by the customer (e.g. soil/turf, sandbed/turfblock, sandbed/marble, etc.). Maximum weight of customer coating 250 kg/m².  
  
The upper platform is at ground level and is traversible when in lowered position (vehicle load: 2600 kg maximum, wheel load: 650 kg maximum). On special conditions the upper platform may be used as parking space.

11

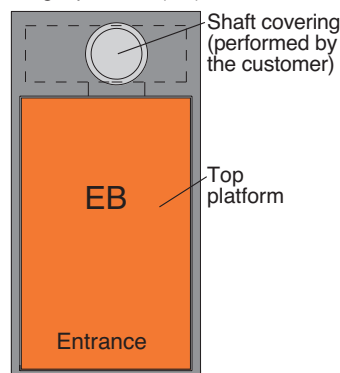
A separate maintenance manhole must be installed by the customer (with manhole cover, ladder and a connecting passage to the pit). A save maintenance access with a door has to be provided by the customer – please contact KLAUS Multiparking. The hydraulic power unit and ventilation system are also housed in the maintenance manhole
- !

After operation, the system must always be run into the lowest final position (key interlock).

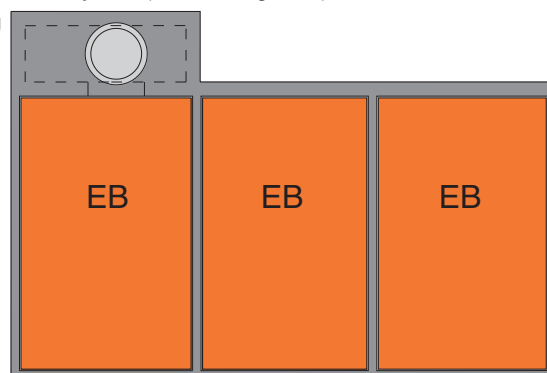
## Width dimensions

### Top view closed pit

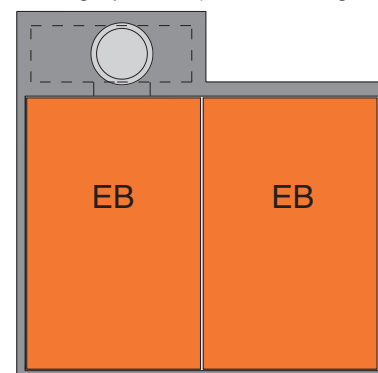
Single platform (EB)



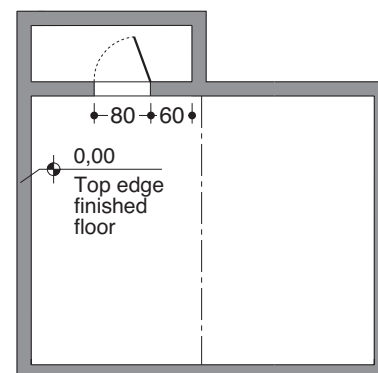
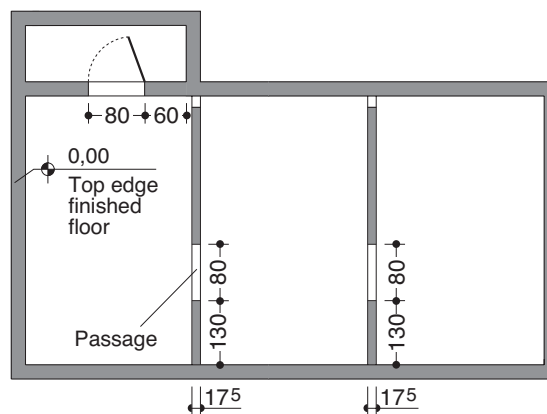
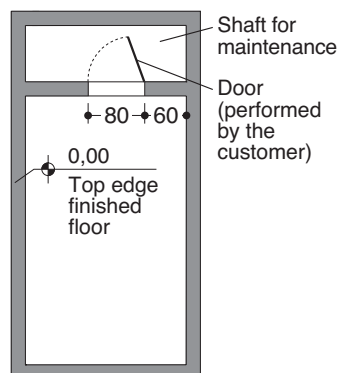
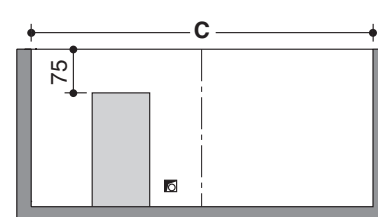
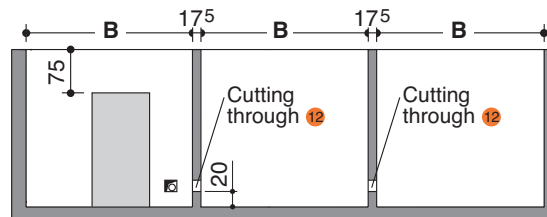
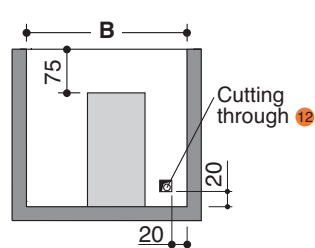
Serial system (with dividing walls)



2 x single platform (without dividing wall)



### Pit dimensions



Pit dimension B	Usable platform width parking levels	Usable platform width top platform	Pit dimension C	Usable platform width parking levels	Usable platform width top platform
275	230	270	550	2 x 230	2 x 270
285	240	280	570	2 x 240	2 x 280
295	250	290	590	2 x 250	2 x 290
305	260	300	610	2 x 260	2 x 300
315	270	310	630	2 x 270	2 x 310



All sidewalls must be in a rectangular angel. Max. tolerances are 1 cm!

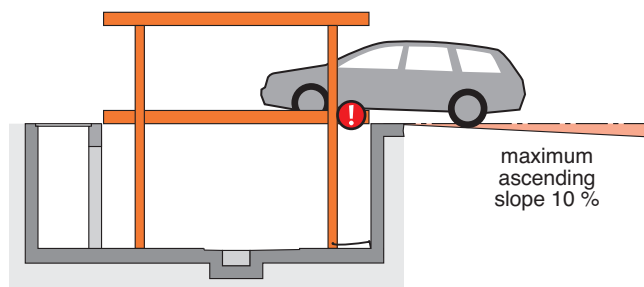
Warning: If the side or backside is freely accessible these areas must be safeguarded (safety fences, safety grids, marking etc.). Measures to be taken according to project.


End parking spaces are generally more difficult to drive into. Therefore we recommended for end parking spaces our wider platforms. Parking on standard width platforms with larger vehicles may make getting into and out of the vehicle difficult. This depends on type of vehicle, approach and above all on the individual driver's skill.

For vehicle widths larger 190 cm a platform width of 270 cm is required in order to enable the driver to get in and out of the car on one side.

<sup>12</sup> For dividing walls: cutting through 15 x 15 cm.

Diagram illustrating a car on a descending slope. The car is positioned on a road with a maximum descending slope of 3%. A height sensor is shown above the car, indicating the measurement point for the height sensor.



 The illustrated maximum approach angles must not be exceeded. Incorrect approach angles will cause serious manoeuvring & positioning problems on the parking system for which the local agency of KLAUS Multiparking accepts no responsibility.

Section


Entrance

F1

F2

min. 18"

Upper platform with sheet metal plates				Upper platform with stone layer			
usable platform width	F1	F2	15	usable platform width	F1	F2	
EB 2000 kg	+51	+25		EB 2000 kg	+57	+28	
EB 2600 kg	+54	+27		EB 2600 kg	+60	+30	

 Units are dowelled to the floor. Drilling depth: approx. 15 cm.  
Floor and walls below the drive-in level are to be made of concrete (quality minimum C20/25)!

13 Dimension B see page 2

14 Marking compliant to ISO 3864 (colors used in this illustration are not ISO 3864 compliant)

15 All forces in kN

16 The loading capacity of the base plate must be proved by a structural engineer. Possibly stronger base plate could be necessary.



Page 1  
Section  
Dimensions  
Car data

Page 2  
Width  
dimensions

Page 3  
Approach  
Load plan

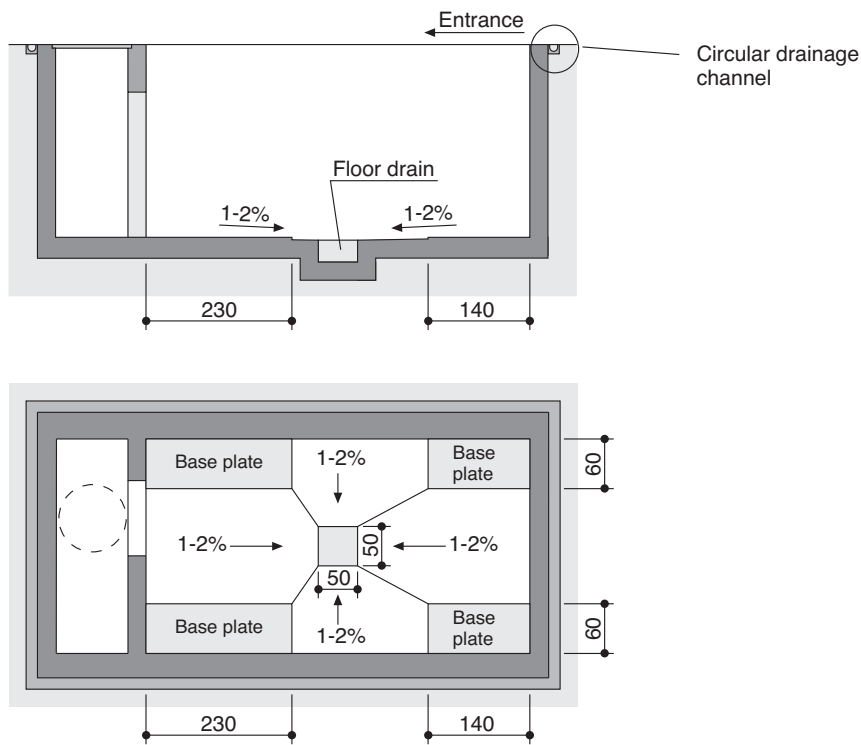
Page 4  
Pit  
Paving

Page 5  
Electrical  
installation  
Technical  
data

Page 6  
Tec. data  
To be performed by the  
customer

Page 7  
Description

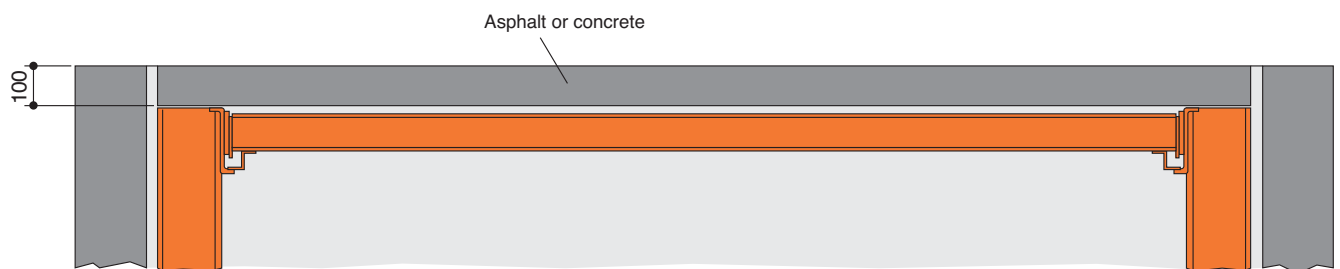
## Pit edge/Drainage



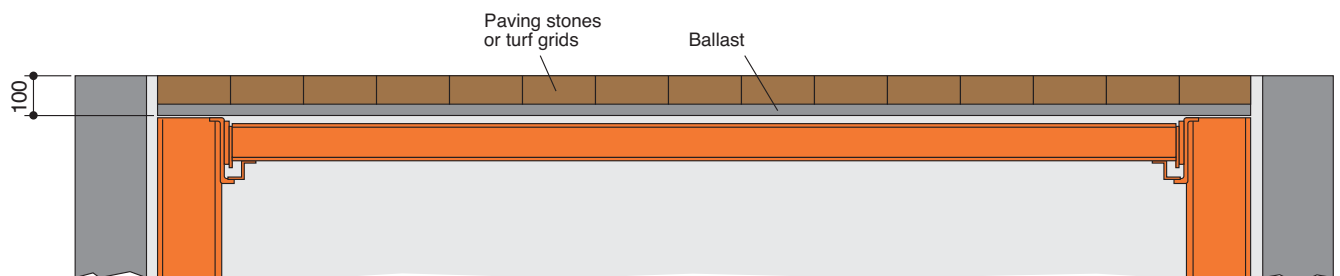
## On-site coating of the uppermost platform

Maximum weight of customer coating 250 kg/m<sup>2</sup>.

### Coating with asphalt or concrete

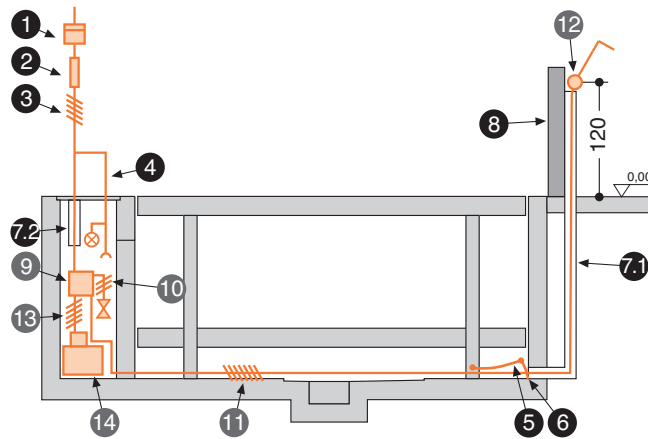


### Coating with paving stones or turf grids



## Electrical installation

### Installation diagram



### Electrical data (to be performed by the customer)

No.	Quantity	Description	Position	Frequency
1	1	Electricity meter	in the supply line	
2	1	Main fuse: 3 x fuse 20 A (slow) or circuit breaker 3 x 20 A (trigger characteristic K or C)	in the supply line	1 per unit
3	1	Supply line (3 PH + N + PE) with marked wire and protective conductor: 5 x 2.5 mm <sup>2</sup>	to main switch	1 per unit
4	1	Separate supply line (230 V) with lighting and power outlet	from supply line into the shaft	1 per system
5	every 10 m	Foundation earth connector	corner pit floor	
6	1	Equipotential bonding in accordance with DIN EN 60204 from foundation earth connector to the system		1 per system
7.1	1	Empty pipe DN 40 with taut wire	base pit to operating device	1 per system
7.2	1	Empty pipe DN 40 with taut wire	supply line to hydraulic unit	1 per system
8	1	Stand for operating device		1 per system

### Electrical data (included in delivery of KLAUS Multiparking)

No.	Description
9	Control box with lockable main switch
10	Control line 3 x 0.75 mm <sup>2</sup> (PH + N + PE)
11	Control line 7 x 1 mm <sup>2</sup> with marked wire and protective conductor
12	Operating device
13	Control line 4 x 2.5 mm <sup>2</sup> with marked wire and protective conductor
14	Hydraulic unit 5.2 kW with three-phase current, 230/400 V, 50 Hz

## Technical data

### Field of application

By default, the system can only be used for a fixed number of users. If required, would you please contact us.

### Units

Low-noise power units mounted to rubber-bonded-to metal mountings are installed. Nevertheless we recommend that parking system's garage be built separately from the dwelling.

### Available documents

- maintenance offer/contract
- declaration of conformity

### Building application documents

According to LBO and GaVo (garage regulations) the Multiparking systems are subject to approval. For the building application please submit this data sheet.

### Corrosion protection

See separate sheet regarding corrosion protection.

### Care

To avoid damages resulting from corrosion, make sure to follow our cleaning and care instructions and to provide good ventilation of your garage.

### Safety grids

If the permissible drop opening is exceeded, safety grids are to be mounted on the systems. If there are traffic routes next to or behind the installations, barriers compliant to DIN EN ISO 13857 must be installed by the customer. Barriers must also be in place during construction.

### Environmental conditions

Environmental conditions for the area of multiparking systems: Temperature range -10 to +40° C. Relative humidity 50% at a maximum outside temperature of +40° C. If lifting or lowering times are specified, they refer to an environmental temperature of +10° C and with the system set up directly next to the hydraulic unit. At lower temperatures or with longer hydraulic lines, these times increase.

### CE Certification

The systems offered correspond to DIN EN 14010 and the EC Machinery Directive 2006/42/EG.

## Technical data

### Sound insulation

According to DIN 4109 (Sound insulation in buildings), para. 4, annotation 4, KLAUS Multiparkings are part of the building services (garage systems).

#### Normal sound insulation:

DIN 4109, para. 4, Sound insulation against noises from building services.

Table 4 in para. 4.1 contains the permissible sound level values emitted from building services for personal living and working areas. According to line 2 the maximum sound level in personal living and working areas must not exceed 30 dB (A).

*Noises created by users are not subject to the requirements (see table 4, DIN 4109).*

The following measures are to be taken to comply with this value:

- Sound protection package according to offer/order (KLAUS Multiparking GmbH)
- Minimum sound insulation of building  $R'_W = 57$  dB (to be provided by customer)

#### Increased sound insulation (special agreement):

Draft DIN 4109-10, Information on planning and execution, proposals for increased sound insulation.

Agreement: Maximum sound level in personal living and working areas 25 dB (A). *Noises created by users are not subject to the requirements (see table 4, DIN 4109).*

The following measures are to be taken to comply with this value:

- Sound protection package according to offer/order (KLAUS Multiparking GmbH)
- Minimum sound insulation of building  $R'_W = 62$  dB (to be provided by customer)

Note: User noises are noises created by individual users in our Multiparking systems. These can be noises from accessing the platforms, slamming of vehicle doors, motor and brake noises.

## To be performed by the customer

### Safety fences

Any constraints that may be necessary according to DIN EN ISO 13857 in order to provide protection for the park pits for pathways directly in front, next to or behind the unit. This is also valid during construction. Safety grids on the systems are, if necessary, optionally available against surcharge.

### Numbering of parking spaces

Consecutive numbering of parking spaces.

### Building services

Any required lighting, ventilation, fire extinguishing and fire alarm systems as well as clarification and compliance with the relevant regulatory requirements.

### Drainage

In the middle of the pit a floor drain with connection to the cable network or a pump sump is to be provided. The water is to be drained with a pump to be provided by the customer. From the pit corners/bearing surface of the lifting columns an incline to the floor drain/pump sump is necessary.

For reasons of environmental protection we recommend to paint the pit floor, and to provide oil and petrol separators in the connections to the public sewage network.

To divert large amounts of water from the court area, we recommend that the customer install a water drainage channel around the periphery of the pit.

### Marking

In compliance with DIN EN 14010, 10 cm wide yellow-black markings compliant to ISO 3864 must be applied by the customer to the edge of the pit in the entry area to mark the danger zone.

### Wall cuttings

Any necessary wall cuttings according to page 2.

### Operating device

The customer must provide a cable duct (Helfamin-tube) from pit floor to operating device. The location of the control element must be specified according to the project (control stand, house wall, etc.).

### Installing vertical columns

In general, a crane must be supplied by the customer for installation of the telescope columns.

Hook clearance min. 400 cm over access level, crane load approx. 700 kg.

### Electrical supply to the main switch / Foundation earth connector

Suitable electrical supply to the main switch must be provided by the customer during installation. The functionality can be monitored on site by our fitters together with the electrician. If this cannot be done during installation for some reason for which the customer is responsible, the customer must commission an electrician at their own expense and risk.

In accordance with DIN EN 60204 (Safety of Machinery. Electrical Equipment), grounding of the steel structure is necessary, provided by the customer (distance between grounding max. 10 m).

### Maintenance manhole

A separate maintenance manhole with manhole cover, ladder and a connecting passage to the pit must be installed by the customer. In multiple systems, a shared maintenance manhole may be sufficient, depending on the project.

### Lighting

The customer must comply with DIN 67528 »Artificial lighting of parking areas and parking houses« for the parking structure lighting. The intensity of illumination in the pit and in the maintenance manhole must be min. 80 Lux.

### Ventilation

To achieve a constant exchange of air, reduce humidity, prevent condensation, and reduce vehicle moisture (due to rain, snow, ice, etc.), it is recommended that the customer consult specialized engineers for heating, ventilation, and climate control and install a ventilation system. This will reduce or prevent the hazard of corrosion and its attendant failures.

### If the following are not included in the quotation, they will also have to be provided / paid for by the customer:

- Mounting of contactor and terminal box to the wall valve, complete wiring of all elements in accordance with the circuit diagram
- Costs for final technical approval by an authorized body
- Main switch
- Control line from main switch to hydraulic unit

### Coating on the uppermost platform

On-site coating of the uppermost platform according to sectional drawing on page 2 (maximum weight of customer coating 250 kg/m<sup>2</sup>).

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Description

## Description Single platform (EB)

### General description:

Multiparking system providing independent parking spaces for 1 car (EB). On special conditions the upper platform may be used as parking space.

Dimensions are in accordance with the underlying dimensions of parking pit, height and width.

The parking bays are accessed horizontally (installation deviation  $\pm 1\%$ ).

Vehicles are positioned on each parking space using wheel stops on the right side (adjust according to operating instructions).

Operation via operating device with key interlock using master keys.

Operating instructions are attached to each operator's stand.

### Multiparking system consisting of:

- 2 telescopic lifting columns at rear with hydraulic cylinder (mounted to the floor)
- 2 telescopic lifting columns at front (mounted to the floor)
- 1 upper platform (for floor coating to be provided by the customer, e.g. sand layer/stone layer, please KLAUS Multiparking). Maximum weight of customer coating 250 kg/m<sup>2</sup>
- Optional design with platform sheet metal plates from KLAUS Multiparking, against surcharge.
- 2 lower platforms
- 1 mechanic synchronization control system (to ensure synchronous operation of the hydraulic cylinders while lowering and lifting the platform)
- 2 hydraulic cylinders
- Dowels, screws, connecting elements, bolts, etc.
- The platforms and parking spaces are end-to-end accessible for parking!

### Upper platform consisting of:

- Covering plates
- Side members
- Cross members
- Tray for customer coating, optional platform sheet metal plates from KLAUS Multiparking
- Screws, nuts

### Lower platforms consisting of:

- Platform base sections
- Adjustable wheel stops
- Cantled access plates
- Side members
- Cross members
- Screws, nuts, washers, distance tubes, etc.

### Hydraulic system consisting of:

- Hydraulic cylinder
- Magnetic valve
- Hydraulic conduits
- Screwed joints
- High-pressure hoses
- Installation material

### Electric system consisting of:

- Operating device (Emergency Stop, lock, 1 master key per parking space)
- Control box with lockable main switch

### Hydraulic unit consisting of:

- Hydraulic power unit (low-noise, installed onto a console with a rubber-bonded-to-metal mounting)
- Hydraulic oil reservoir
- Oil filling
- Internal geared wheel pump
- Pump holder
- Clutch
- 3-phase-AC-motor
- Contactor (with thermal overcurrent relay and control fuse)
- Test manometer
- Pressure relief valve
- Hydraulic hoses (which reduce noise transmission onto the hydraulic pipe)

## We reserve the right to change this specification without further notice

KLAUS Multiparking reserves the right in the course of technical progress to use newer or other technologies, systems, processes, procedures or standards in the fulfillment of their obligations other than those originally offered provided the customer derives no disadvantage from their so doing.

### Dimensions

All space requirements are minimum finished dimensions.

Tolerances for space requirements +3<sub>0</sub>.<sup>3</sup>  
Dimensions in cm.

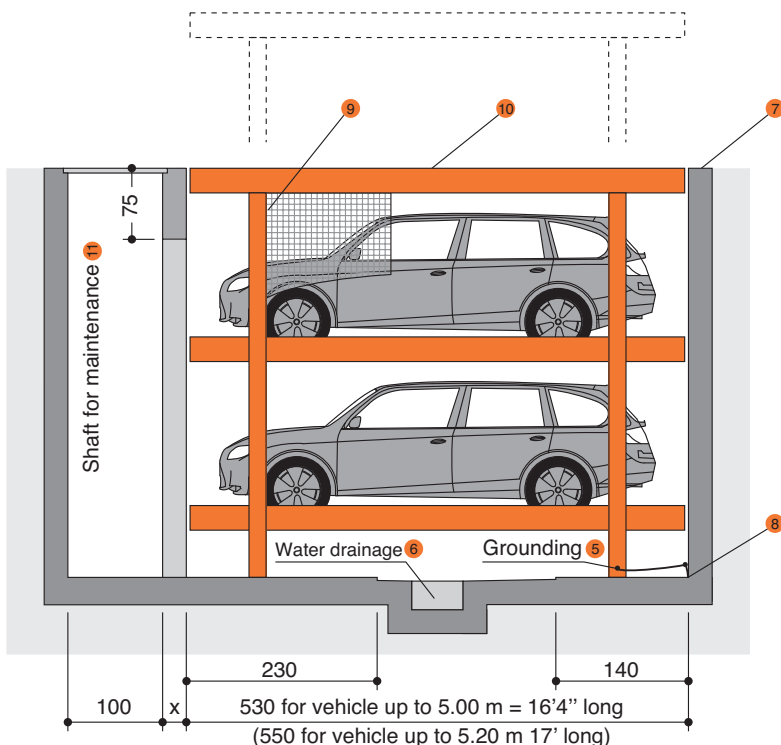
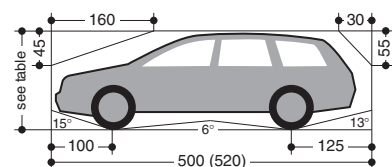
EB (single platform) = 2 + 1 vehicles

### Suitable for

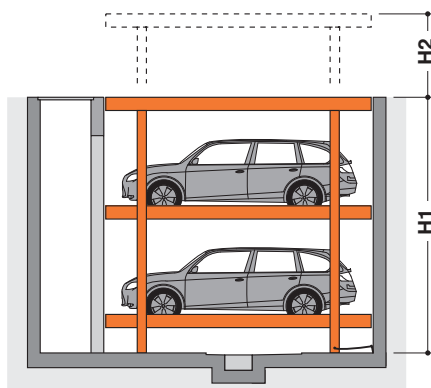
Standard passenger cars:  
Limousine, station wagon, SUV, van  
according to clearance and maximal  
surface load.

	Standard	Special <sup>2</sup>
width	190 cm <sup>4</sup>	190 cm <sup>4</sup>
weight	max. 2000 kg	max. 2600 kg
wheel load	max. 500 kg	max. 650 kg

### Clearance profile



### U20 EB



Type	H1	H2	car height
U20 EB-425	425	385	165
U20 EB-495	495	455	200

- 1 Standard type
- 2 Special system: maximum load for extra charge.
- 3 To follow the minimum finished dimensions, make sure to consider the tolerances according to VOB, part C (DIN 18330 and 18331) and the DIN 18202.
- 4 Car width for platform width 230 cm. If wider platforms are used it is also possible to park wider cars.
- 5 Potential equalization from foundation grounding connection to system (provided by the customer).
- 6 Slope with drainage channel and sump see page 3.
- 7 In compliance with DIN EN 14010, 10 cm wide yellow-black markings compliant to ISO 3864 must be applied by the customer to the edge of the pit in the entry area to mark the danger zone (see „load plan“ page 4).
- 8 At the transition section between pit floor and walls no hollow mouldings/coves are possible. If hollow mouldings/coves are required, the systems must be designed smaller or the pits accordingly wider.

- 9 If necessary, protective gratings are installed at the back area
- 10 The upper platform is a frame construction. Flooring can be provided by the customer (e.g. soil/turf, sandbed/turfblock, sandbed/marble, etc.). Maximum weight of customer coating 250 kg/m<sup>2</sup>.  
The upper platform is at ground level and is traversable when in lowered position (vehicle load: 2600 kg maximum, wheel load: 650 kg maximum). On special conditions the upper platform may be used as parking space.
- 11 A separate maintenance manhole must be installed by the customer (with manhole cover, ladder and a connecting passage to the pit). A save maintenance access with a door has to be provided by the customer – please contact KLAUS Multiparking. The hydraulic power unit and ventilation system are also housed in the maintenance manhole

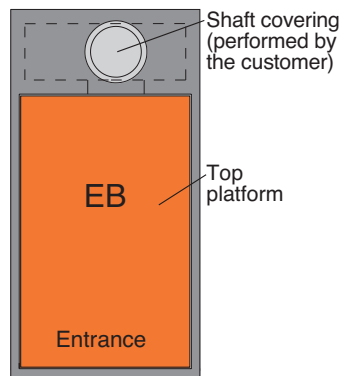
! After operation, the system must always be run into the lowest final position (key interlock).



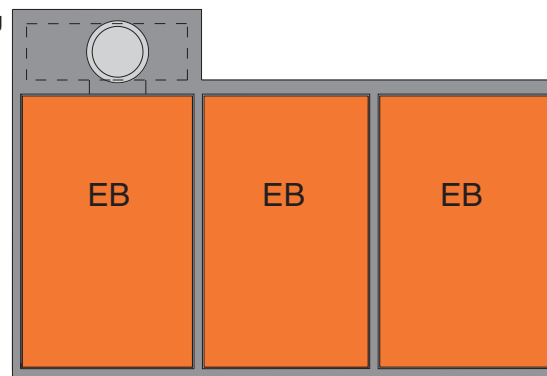
## Width dimensions

### Top view closed pit

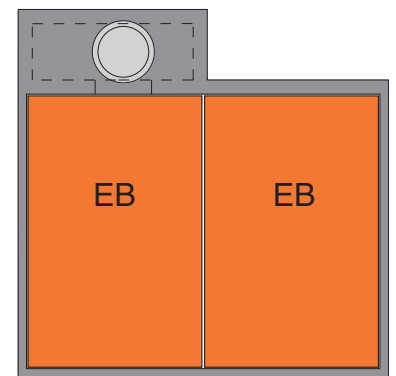
Single platform (EB)



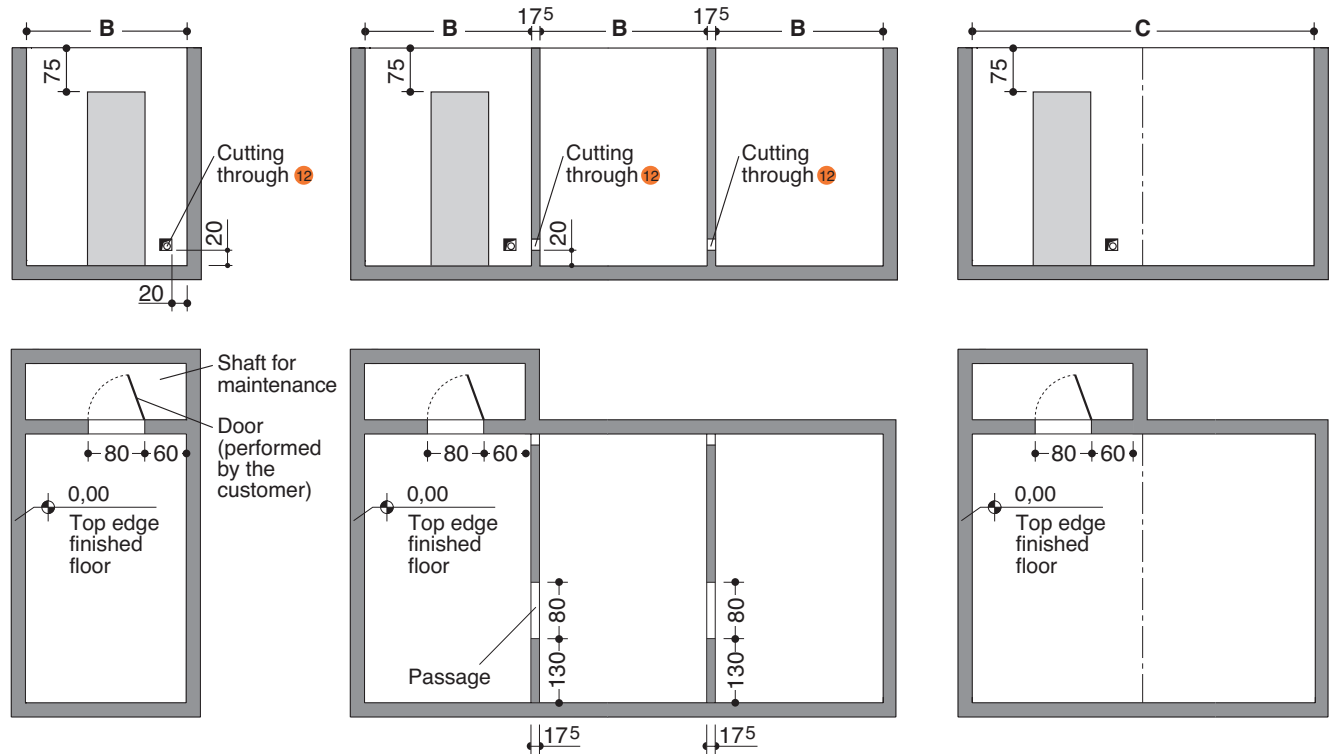
Serial system (with dividing walls)



2 x single platform (without dividing wall)



### Pit dimensions



Pit dimension B	Usable platform width parking levels	Usable platform width top platform	Pit dimension C	Usable platform width parking levels	Usable platform width top platform
275	230	270	550	2 x 230	2 x 270
285	240	280	570	2 x 240	2 x 280
295	250	290	590	2 x 250	2 x 290
305	260	300	610	2 x 260	2 x 300
315	270	310	630	2 x 270	2 x 310



All sidewalls must be in a rectangular angel. Max. tolerances are 1 cm!

Warning: If the side or backside is freely accessible these areas must be safeguarded (safety fences, safety grids, marking etc.). Measures to be taken according to project.

End parking spaces are generally more difficult to drive into. Therefore we recommended for end parking spaces our wider platforms. Parking on standard width platforms with larger vehicles may make getting into and out of the vehicle difficult. This depends on type of vehicle, approach and above all on the individual driver's skill.

For vehicle widths larger 190 cm a platform width of 270 cm is required in order to enable the driver to get in and out of the car on one side.

<sup>12</sup> For dividing walls: cutting through 15 x 15 cm.

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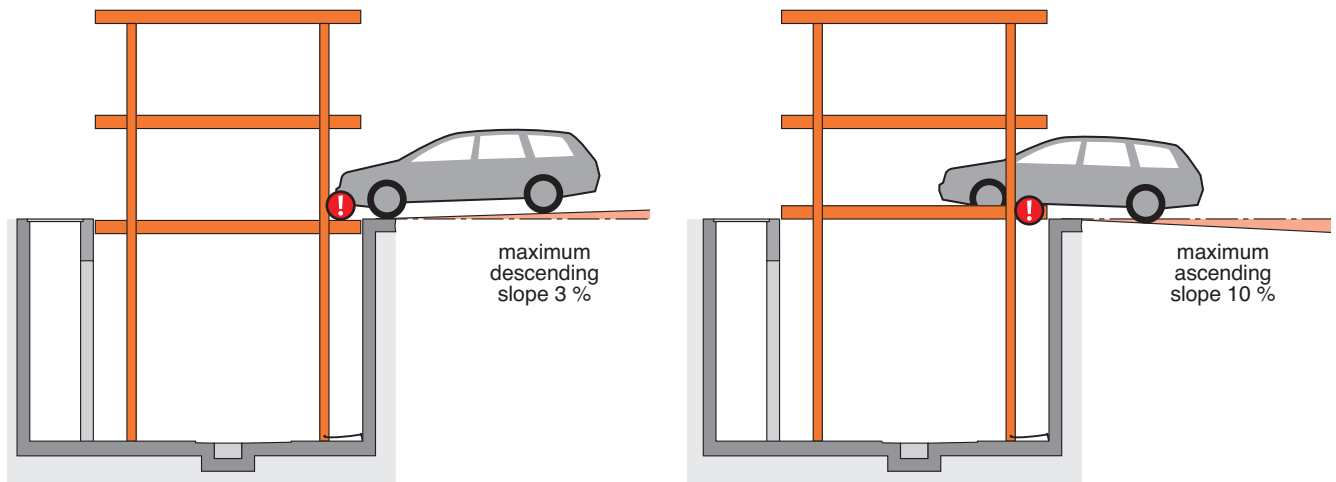
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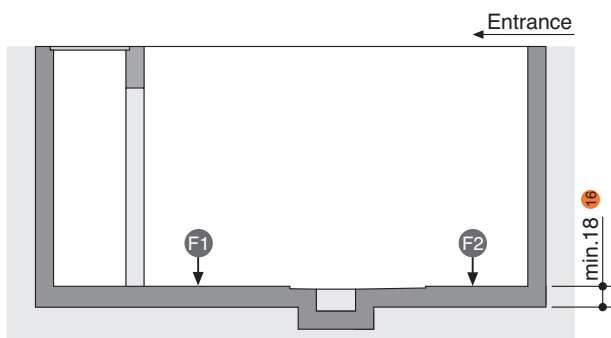
## Approach



**!** The illustrated maximum approach angles must not be exceeded. Incorrect approach angles will cause serious manoeuvring & positioning problems on the parking system for which the local agency of KLAUS Multiparking accepts no responsibility.

## Load plan

### Section



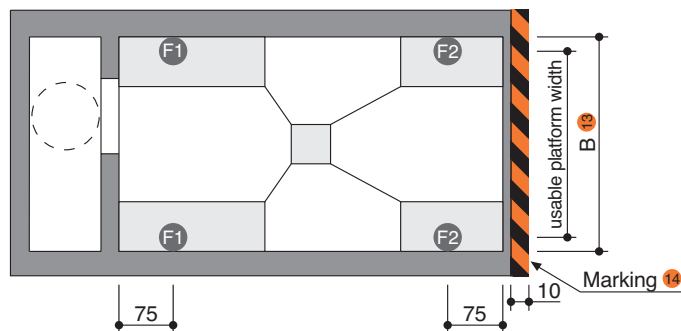
### U20 EB

Upper platform with sheet metal plates

Upper platform with stone layer

usable platform width	F1	F2	<sup>15</sup>	usable platform width	F1	F2
EB 2000 kg	+68	+34		EB 2000 kg	+74	+37
EB 2600 kg	+74	+37		EB 2600 kg	+80	+40

### Top view



**!** Units are dowelled to the floor. Drilling depth: approx. 15 cm.  
Floor and walls below the drive-in level are to be made of concrete (quality minimum C20/25)!

<sup>13</sup> Dimension B see page 2

<sup>14</sup> Marking compliant to ISO 3864 (colors used in this illustration are not ISO 3864 compliant)

<sup>15</sup> All forces in kN

<sup>16</sup> The loading capacity of the base plate must be proved by a structural engineer. Possibly stronger base plate could be necessary.

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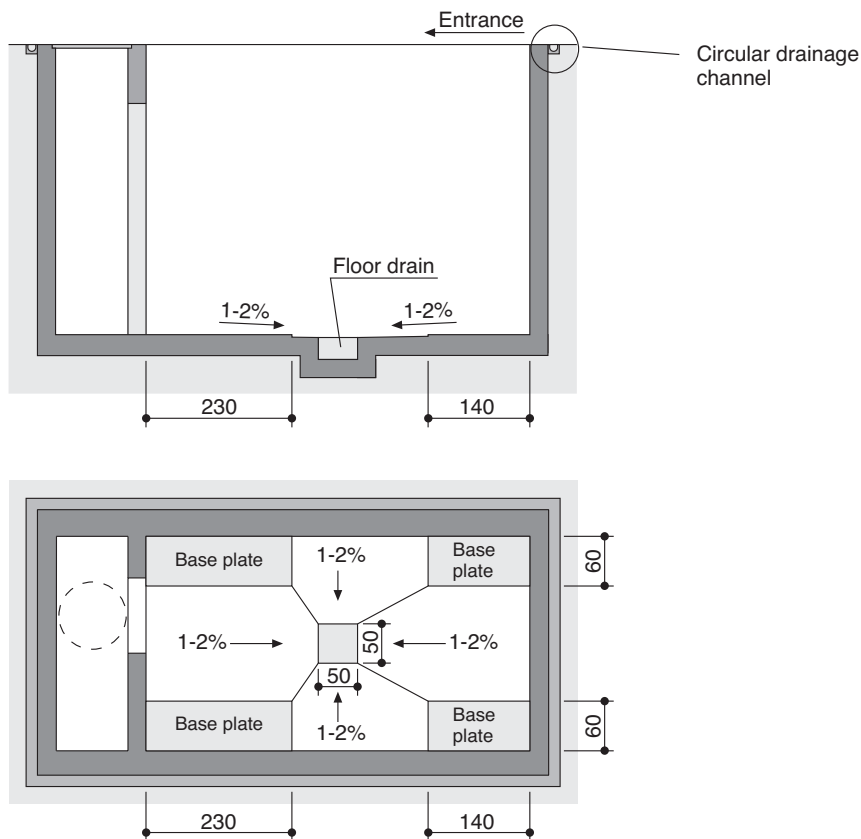
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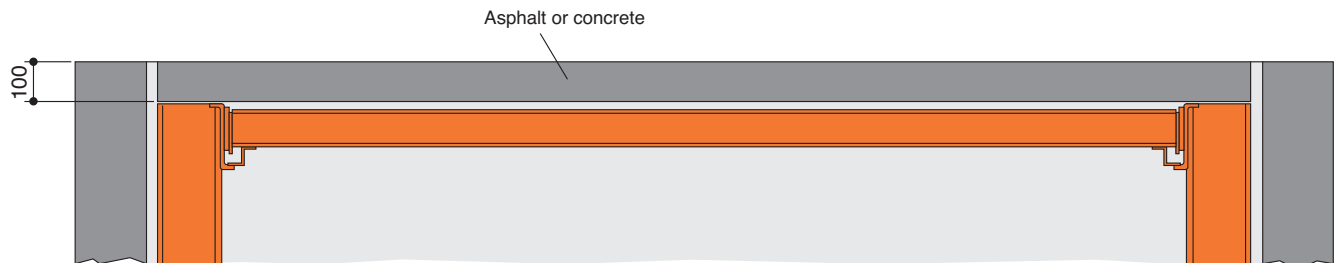
## Pit edge/Drainage



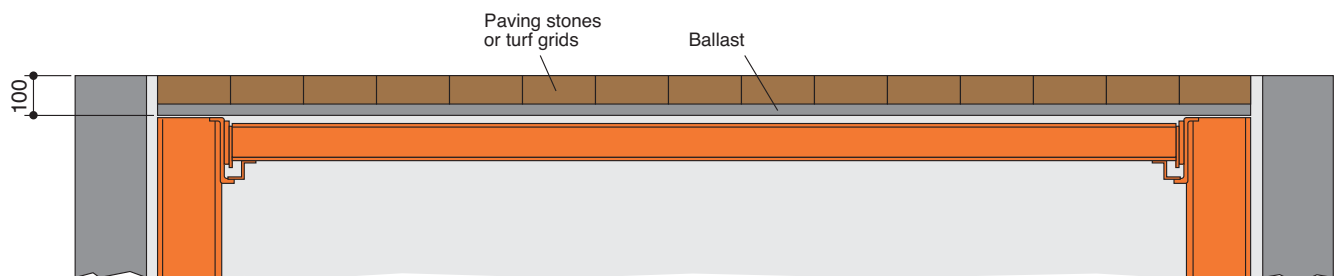
## On-site coating of the uppermost platform

Maximum weight of customer coating 250 kg/m<sup>2</sup>.

### Coating with asphalt or concrete

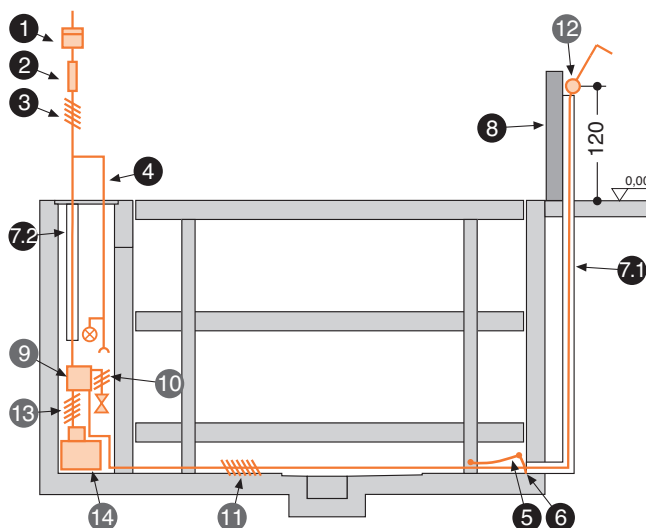


### Coating with paving stones or turf grids



## Electrical installation

### Installation diagram



### Electrical data (to be performed by the customer)

No.	Quantity	Description	Position	Frequency
1	1	Electricity meter	in the supply line	
2	1	Main fuse: 3 x fuse 25 A (slow) or circuit breaker 3 x 25 A (trigger characteristic K or C)	in the supply line	1 per unit
3	1	Supply line (3 PH + N + PE) with marked wire and protective conductor: 5 x 4 mm <sup>2</sup>	to main switch	1 per unit
4	1	Separate supply line (230 V) with lighting and power outlet	from supply line into the shaft	1 per system
5	every 10 m	Foundation earth connector	corner pit floor	
6	1	Equipotential bonding in accordance with DIN EN 60204 from foundation earth connector to the system		1 per system
7.1	1	Empty pipe DN 40 with taut wire	base pit to operating device	1 per system
7.2	1	Empty pipe DN 40 with taut wire	supply line to hydraulic unit	1 per system
8	1	Stand for operating device		1 per system

### Electrical data (included in delivery of KLAUS Multiparking)

No.	Description
9	Control box with lockable main switch
10	Control line 3 x 0.75 mm <sup>2</sup> (PH + N + PE)
11	Control line 7 x 1 mm <sup>2</sup> with marked wire and protective conductor
12	Operating device
13	Control line 4 x 2.5 mm <sup>2</sup> with marked wire and protective conductor
14	Hydraulic unit 7.5 kW with three-phase current, 230/400 V, 50 Hz

## Technical data

### Field of application

By default, the system can only be used for a fixed number of users. If required, would you please contact us.

### Units

Low-noise power units mounted to rubber-bonded-to metal mountings are installed. Nevertheless we recommend that parking system's garage be built separately from the dwelling.

### Available documents

- maintenance offer/contract
- declaration of conformity

### Building application documents

According to LBO and GaVo (garage regulations) the Multiparking systems are subject to approval. For the building application please submit this data sheet.

### Corrosion protection

See separate sheet regarding corrosion protection.

### Care

To avoid damages resulting from corrosion, make sure to follow our cleaning and care instructions and to provide good ventilation of your garage.

### Safety grids

If the permissible drop opening is exceeded, safety grids are to be mounted on the systems. If there are traffic routes next to or behind the installations, barriers compliant to DIN EN ISO 13857 must be installed by the customer. Barriers must also be in place during construction.

### Environmental conditions

Environmental conditions for the area of multiparking systems: Temperature range –10 to +40° C. Relative humidity 50% at a maximum outside temperature of +40° C. If lifting or lowering times are specified, they refer to an environmental temperature of +10° C and with the system set up directly next to the hydraulic unit. At lower temperatures or with longer hydraulic lines, these times increase.

### CE Certification

The systems offered correspond to DIN EN 14010 and the EC Machinery Directive 2006/42/EG.

## Technical data

### Sound insulation

According to DIN 4109 (Sound insulation in buildings), para. 4, annotation 4, KLAUS Multiparkers are part of the building services (garage systems).

#### Normal sound insulation:

DIN 4109, para. 4, Sound insulation against noises from building services.

Table 4 in para. 4.1 contains the permissible sound level values emitted from building services for personal living and working areas. According to line 2 the maximum sound level in personal living and working areas must not exceed 30 dB (A).

*Noises created by users are not subject to the requirements (see table 4, DIN 4109).*

The following measures are to be taken to comply with this value:

- Sound protection package according to offer/order (KLAUS Multiparking GmbH)
- Minimum sound insulation of building  $R'_W = 57$  dB (to be provided by customer)

#### Increased sound insulation (special agreement):

Draft DIN 4109-10, Information on planning and execution, proposals for increased sound insulation.

Agreement: Maximum sound level in personal living and working areas 25 dB (A). *Noises created by users are not subject to the requirements (see table 4, DIN 4109).*

The following measures are to be taken to comply with this value:

- Sound protection package according to offer/order (KLAUS Multiparking GmbH)
- Minimum sound insulation of building  $R'_W = 62$  dB (to be provided by customer)

Note: User noises are noises created by individual users in our Multiparking systems. These can be noises from accessing the platforms, slamming of vehicle doors, motor and brake noises.

## To be performed by the customer

### Safety fences

Any constraints that may be necessary according to DIN EN ISO 13857 in order to provide protection for the park pits for pathways directly in front, next to or behind the unit. This is also valid during construction. Safety grids on the systems are, if necessary, optionally available against surcharge.

### Numbering of parking spaces

Consecutive numbering of parking spaces.

### Building services

Any required lighting, ventilation, fire extinguishing and fire alarm systems as well as clarification and compliance with the relevant regulatory requirements.

### Drainage

In the middle of the pit a floor drain with connection to the cable network or a pump sump is to be provided. The water is to be drained with a pump to be provided by the customer. From the pit corners/bearing surface of the lifting columns an incline to the floor drain/pump sump is necessary.

For reasons of environmental protection we recommend to paint the pit floor, and to provide oil and petrol separators in the connections to the public sewage network.

To divert large amounts of water from the court area, we recommend that the customer install a water drainage channel around the periphery of the pit.

### Marking

In compliance with DIN EN 14010, 10 cm wide yellow-black markings compliant to ISO 3864 must be applied by the customer to the edge of the pit in the entry area to mark the danger zone.

### Wall cuttings

Any necessary wall cuttings according to page 2.

### Operating device

The customer must provide a cable duct (Helfamin-tube) from pit floor to operating device. The location of the control element must be specified according to the project (control stand, house wall, etc.).

### Installing vertical columns

In general, a crane must be supplied by the customer for installation of the telescope columns.

Hook clearance min. 700 cm over access level, crane load approx. 1400 kg.

### Electrical supply to the main switch / Foundation earth connector

Suitable electrical supply to the main switch must be provided by the customer during installation. The functionality can be monitored on site by our fitters together with the electrician. If this cannot be done during installation for some reason for which the customer is responsible, the customer must commission an electrician at their own expense and risk.

In accordance with DIN EN 60204 (Safety of Machinery. Electrical Equipment), grounding of the steel structure is necessary, provided by the customer (distance between grounding max. 10 m).

### Maintenance manhole

A separate maintenance manhole with manhole cover, ladder and a connecting passage to the pit must be installed by the customer. In multiple systems, a shared maintenance manhole may be sufficient, depending on the project.

### Lighting

The customer must comply with DIN 67528 »Artificial lighting of parking areas and parking houses« for the parking structure lighting. The intensity of illumination in the pit and in the maintenance manhole must be min. 80 Lux.

### Ventilation

To achieve a constant exchange of air, reduce humidity, prevent condensation, and reduce vehicle moisture (due to rain, snow, ice, etc.), it is recommended that the customer consult specialized engineers for heating, ventilation, and climate control and install a ventilation system. This will reduce or prevent the hazard of corrosion and its attendant failures.

**If the following are not included in the quotation, they will also have to be provided / paid for by the customer:**

- Mounting of contactor and terminal box to the wall valve, complete wiring of all elements in accordance with the circuit diagram
- Costs for final technical approval by an authorized body
- Main switch
- Control line from main switch to hydraulic unit

### Coating on the uppermost platform

On-site coating of the uppermost platform according to sectional drawing on page 2 (maximum weight of customer coating 250 kg/m<sup>2</sup>).



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Description

## Description Single platform (EB)

### General description:

Multiparking system providing independent parking spaces for 2 cars (EB) one on top of the other each. On special conditions the upper platform may be used as parking space.

Dimensions are in accordance with the underlying dimensions of parking pit, height and width.

The parking bays are accessed horizontally (installation deviation  $\pm 1\%$ ).

Vehicles are positioned on each parking space using wheel stops on the right side (adjust according to operating instructions).

Operation via operating device with key interlock using master keys.

Operating instructions are attached to each operator's stand.

### Multiparking system consisting of:

- 2 telescopic lifting columns at rear with hydraulic cylinder (mounted to the floor)
- 2 telescopic lifting columns at front (mounted to the floor)
- 1 upper platform (for floor coating to be provided by the customer, e.g. sand layer/stone layer, please KLAUS Multiparking). Maximum weight of customer coating 250 kg/m<sup>2</sup>  
Optional design with platform sheet metal plates from KLAUS Multiparking, against surcharge.
- 2 lower platforms
- 1 mechanic synchronization control system (to ensure synchronous operation of the hydraulic cylinders while lowering and lifting the platform)
- 2 hydraulic cylinders
- Dowels, screws, connecting elements, bolts, etc.
- The platforms and parking spaces are end-to-end accessible for parking!

### Upper platform consisting of:

- Covering plates
- Side members
- Cross members
- Tray for customer coating, optional platform sheet metal plates from KLAUS Multiparking
- Screws, nuts

### Lower platforms consisting of:

- Platform base sections
- Adjustable wheel stops
- Cantled access plates
- Side members
- Cross members
- Screws, nuts, washers, distance tubes, etc.

### Hydraulic system consisting of:

- Hydraulic cylinder
- Magnetic valve
- Hydraulic conduits
- Screwed joints
- High-pressure hoses
- Installation material

### Electric system consisting of:

- Operating device (Emergency Stop, lock, 1 master key per parking space)
- Control box with lockable main switch

### Hydraulic unit consisting of:

- Hydraulic power unit (low-noise, installed onto a console with a rubber-bonded-to-metal mounting)
- Hydraulic oil reservoir
- Oil filling
- Internal geared wheel pump
- Pump holder
- Clutch
- 3-phase-AC-motor
- Contactor (with thermal overcurrent relay and control fuse)
- Test manometer
- Pressure relief valve
- Hydraulic hoses (which reduce noise transmission onto the hydraulic pipe)

## We reserve the right to change this specification without further notice

KLAUS Multiparking reserves the right in the course of technical progress to use newer or other technologies, systems, processes, procedures or standards in the fulfillment of their obligations other than those originally offered provided the customer derives no disadvantage from their so doing.