CES 650

Compulsory Ethiopian Standard

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Off-Streetsurfaceparking-Requirements

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Foreword

This Ethiopian Standard has been prepared by the Technical Committee for Building Structures and Elements of Buildings (TC 42) approved by the National Standardization Council and published by the Institute of Ethiopian Standards (IES) .

In preparing the working draft, relevant technical information source documents including recommendations based on research findings have been presented to IES by the Addis Ababa City Government Transport Programs Management Office (TPMO).

Acknowledgement is made to TPMO for its efficient and effective collaboration with IES and for its unreserved effort in achieving the desired outcome, developing this standard.

Off-Street surface parking- Requirements

1. Scope

This Ethiopian Standard specifies minimum requirements for design, efficiency, quality, safety, accessibility, reliability and provision of sustainable service of off-street parking for 85th percentile vehicle size (4.7 m X1.9 m) of light duty vehicles.

This Standard sets out the minimum requirements for the design and layout of off-street parking facilities, including multi-storey car parks for motor cars, light vans and motorcycles. It includes access and egress requirements for both public and private car parks, and car parking on domestic properties.

2. Normative references

The following Ethiopian Standards contain provisions, which through reference in the text constitute provisions of this Ethiopian Standard. At the time of publication, the editions indicated were valid.

ES EN 1990, Conformity to Basics of structural design
ES EN 1997-1 and ES EN 1997-1-2, Conformity to Geotechnical design

ES EN 1991-1-1, ES EN 1991-1-2, ES EN 1991-1-3, ES EN 1991-1-4, ES EN 1991-1-5, ES EN

1991-1-6, ES EN 1991-1-7, Conformity to actions on structure from part

1-7. ES EN 1992-1-1, ES EN 1992-1-2, Conformity to Design of

concrete structures ES EN 1993-1-1, ES EN 1993-1-3, Conformity to

Design of steel structures

ES EN 1994-1-1, Conformity to Design of composite steel and concrete

structures ES EN 1996-1-1, ES EN 1996-1-2, Conformity to Design of

masonry structures ES EN 1995-1-1, Conformity to Design of timber

structures

ES EN 1998-1-1, Conformity to Design of structures for earthquake

resistance ES 3965, Conformity to Design Occupational health and

safety

ES 3962, Mechanical ventilation and air conditioning in

buildings ES 3961, Ethiopian Building Code Standard for

electrical works ES 3964, Fire precaution during building

construction design work ES 3960, Conformity to Plumbing

services of buildings with.

Es xxx Traffic sign and marking typeface

3. Terms and definitions

For the purpose of this Ethiopian standard the following terms and definition shall apply

3.1 light duty vehicle

any motorized vehicles whose size is not more than 5.3 X 2.36 X 2.083 meter.

3.2 Off- street surface parking

a car parking located out of the drive way.

3.3 Parking bay

a space (parking space) designated for the parking of one motor vehicle.

3.4 Parking area

an area set aside or designated for the parking of three or more motor vehicles.

3.5 Decorative fence wall.

4. General Requirements

4.1.1. Off-street surface parking shall have clearly defined boundary.

4.1.2. Off-street surface parking shall be built for a minimum service life of 30 years.

4.1.3. Off-street surface par king shall be designed with careful consideration for safety, security, easy of accessibility reliability, durability, stability, maintainability, aesthetic, environmental friendly and service efficiency.

4.1.4. Off-street surface parking shall be safe, secure attractive, comfortable and accessible and for all users and operators including children, elderly and persons with disabilities.

4.1.5. Off-street surface parking entrance shall be accessible without backing into or otherwise re entering a public right-of-way.

4.1.6. There shall not be any obstruction that can affects safety of vehicles at the entrance, exit and circulation area of off-street surface parking.

4.1.7. Off- street surface par king s hall be free of obstacle which causes hindrance to visibility at its entrance and exit.

4.1.8. Off-street surface parking areas shall provide suitable maneuvering room.

4.1.9. Parking bay shall be accessible for persons with disability.

4.1.10. Off-street surface parking layouts shall consider safe passage of emergency situation

4.1.11. Any additional off- street surface parking facilities an d accessories shall not affect visibility and operation.

4.1.12. Off-street surface par king areas s hall b e c lean, neat and have proper drainage system.

4.1.13. Off- street surface parking area shall be entertaining and maintain natural greenness with plants and kept beautiful.

4.1.14. Off- street surface parking shall have a system that can traceability including user's vehicle by their parking bay.

4.1.15. Off- street surface parking shall have efficient system for fee collection

4.1.16. Clear an d visible off- street surface par king signage and markings s hall be installed

4.1.17. Off-street surface par king areas adjoining designated Property s hall have architecturally treated decorative fence wall.

4.1.18. Off-street surface parking shall have appropriate management with effective monitoring and controlling mechanism.

4.1.19. Parking building shall have appropriate power supply for all loads and illumination level throughout parking building facilities.

4.1.20. Illumination of off-street surface parking areas shall not cause inconvenience and produce harmful effect to the neighboring right of way.

4.1.21. Off-street surface parking area shall have fire protection system.

4.1.22. Off-street surface parking shall comply with Electromagnet Compatibility (EMC).

5 Parking bay layout

5.1. Location

5.1.1. Parking bay shall be located at least 6 meter away from vehicular entrance.

5.1.2. The space between two consecutive parallel parking bays shall be 2.4 meter.

5.1.3. Off-street surface parking with more than 20 parking bays shall have a minimum 1 square meter of permanent landscaping for every 28 square meter of parking bay area.

5.1.4. For improved maneuverability; off street Surface parking bay's width adjacent to solid structures (e.g. fence or wall) shall be increased by 1m.

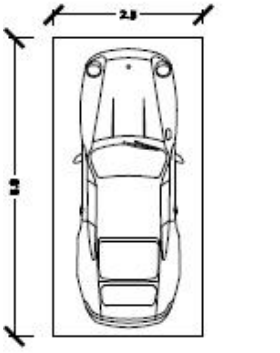
5.1.5. Off street Surface parking bay shall full fill the requirement in Table 1

Table 1off street surface parking bay size requirements

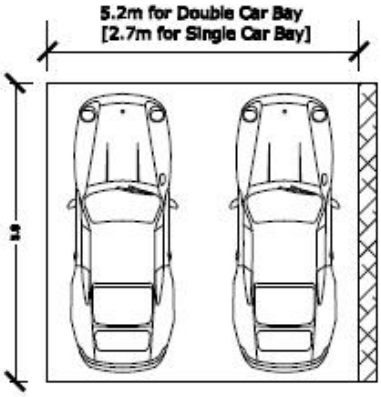
Obstruction	Single ca r bay (LXW) minimum size	Double car bay (L X W) minimum size
No	5.0 x 2.5	-
One side	5.0 X 2.8	5.0 X 5.2
Both side	5.0 X 3.1	5.0 X 5.7

Note: Any large element above 170mm such as columns, walls or ducts constitutes an obstruction.

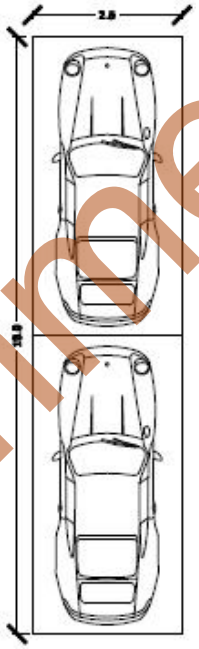
Car parking bay dimension



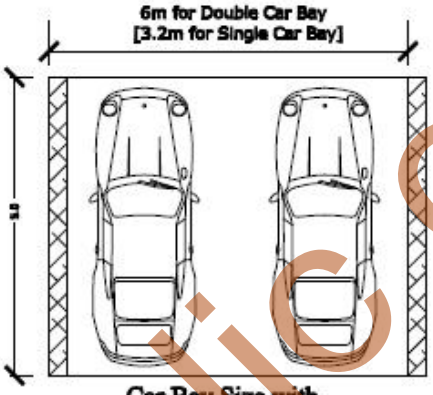
Car Bay Size without obstruction to either side



Car Bay Size with obstruction on one side



Car Bay Size for Parallel Parking



Car Bay Size with obstruction on both side

5.2. Pedestrian and Vehicular Circulation

5.2.1. Vehicular circulation patterns shall be as simple as possible to eliminate potential confusion in utilizing the circulation area.

5.2.2. A minimum of 1.5meter foot path shall be provided within of f-street surface parking area.

5.2.3. Pedestrian circulation patterns shall be as short and continuous as possible to avoid “short cuts”.

5.2.4. Circulation systems shall minimize conflicts between vehicular and pedestrian traffic.

5.2.5. Pedestrian circulation shall take precedence over vehicular circulation at crossings of driveway within the off street surface parking area.

5.3. Landscape layout

5.3.1. Landscaping of off-street surface parking shall be integrated with other parking area Facilities.

5.3.2. Off-street surface par king area shall include guard post and toilet in accordance with Ethiopian Building Code Standards

5.3.3. A minimum of 3.5% of the net area of all surface par king areas shall be landscaped.

5.3.4. All landscaped areas and walkways shall be bordered by a continuous concrete or other equivalent material curb of at least 35 cm high with 20 c m buried portion and 20 cm wide.

5.3.5. Continuous concrete or other equivalent curbing at least 35 cm high with 20 cm buried portion and 20 cm wide shall be provided at least 1 meter from any wall, fence, property line or structure w here par king and /or d rive aisles are located adjacent thereto.

5.3.6. A minimum of 0 .5 meter cl ear z one to trees from foot path edge shall be provided within off-street surface parking area.

5.3.7. Off-street surface parking facilities shall be permanently maintained, free of litter and debris.

5.4. Parking bay Layout

5.4.1. Off-street surface parking areas shall have a grade between 2% and 5% slope.

5.4.2. Driveways shall have no grades exceeding 8% slope.

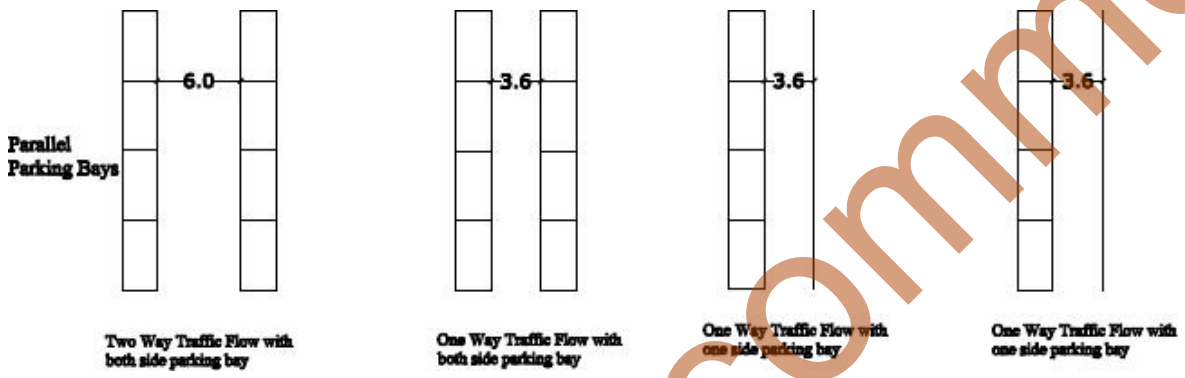
5.4.3. Aisle widths shall full fill the requirement specified in the Table 2 below.

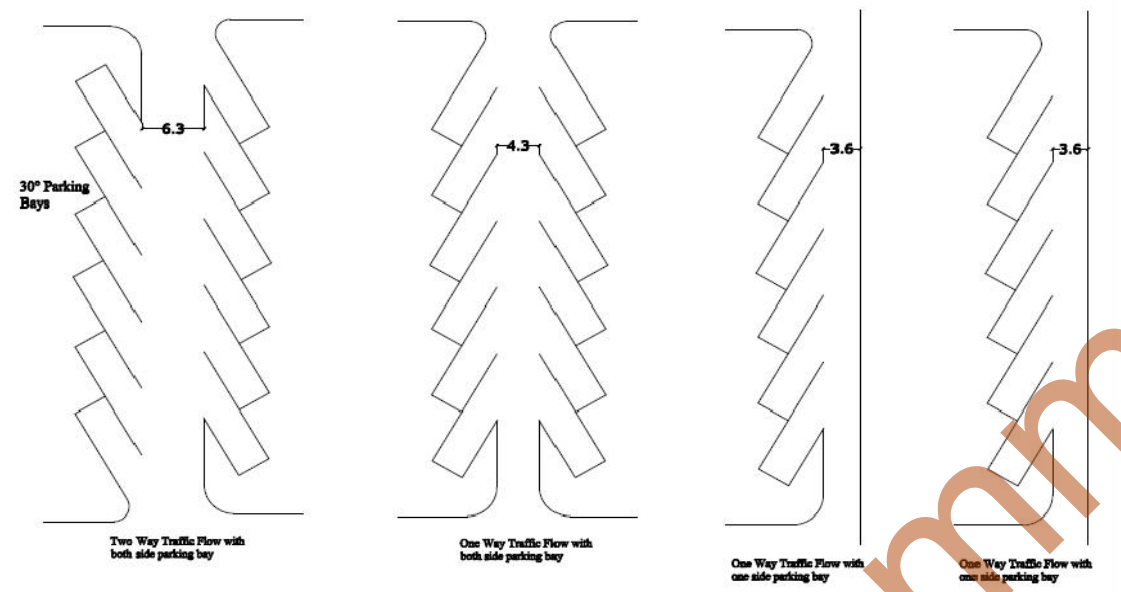
Table 2: off-street surface parking aisle minimum width

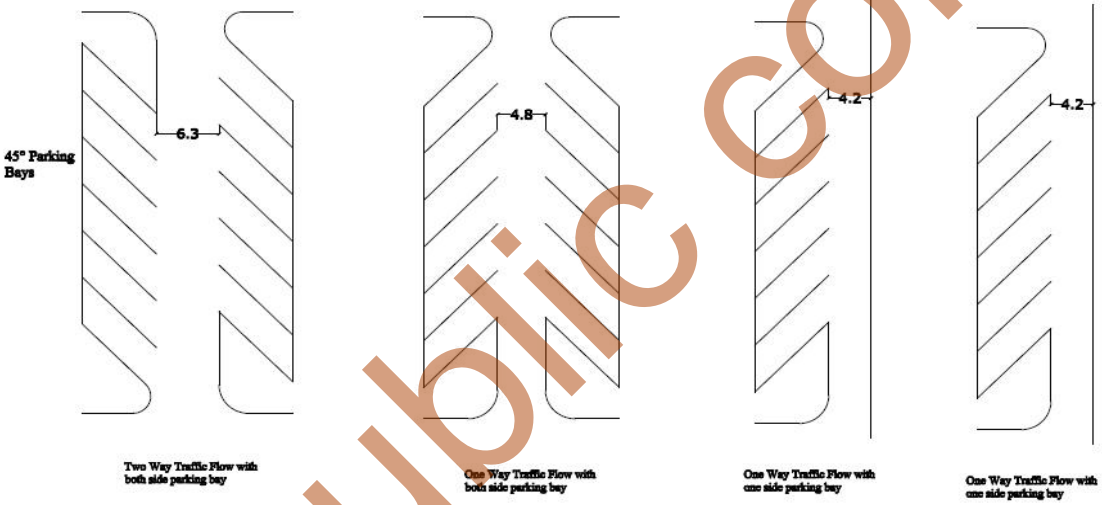
Parked driveway side	Traffic f low direction	Parking angle (Degree)	Aisle Width(m)
Bays on Both side	One way	parallel	3.6
		30	4.2
		45	4.8
		60	4.8
		90	6.0
	Two way	parallel	6.0
		30	6.3
		45	6.3
		60	6.6
		90	6.6
Bays on one side	One way	parallel	3.6
		30	3.6
		45	4.2
		60	4.8

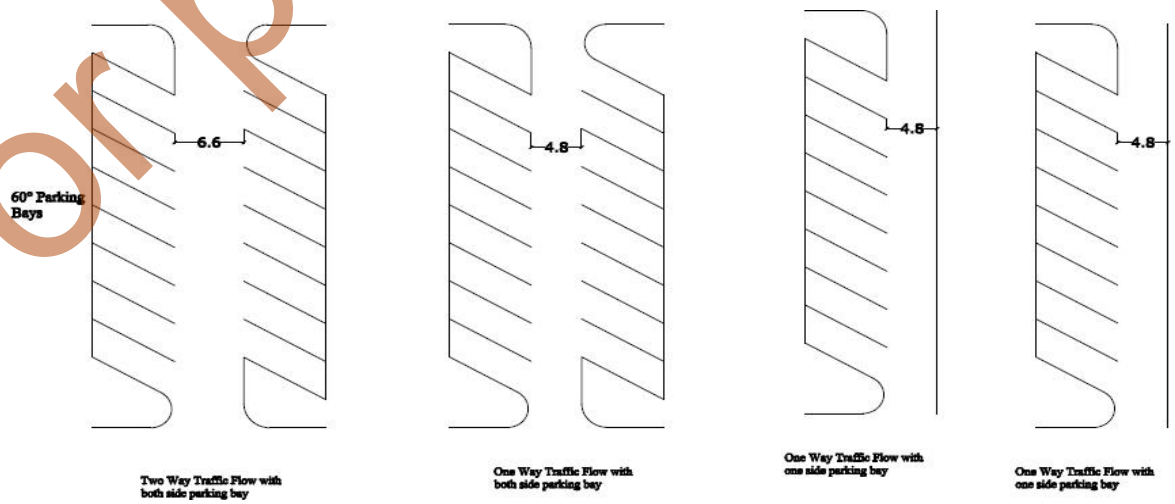
		90	6.0
	Two way	Parallel	6.0
		30	6.3
		45	6.3
		60	6.6
		90	6.6

4.1.1. Parking Bay Arrangement and dimensions shall be according to Fig 2 below









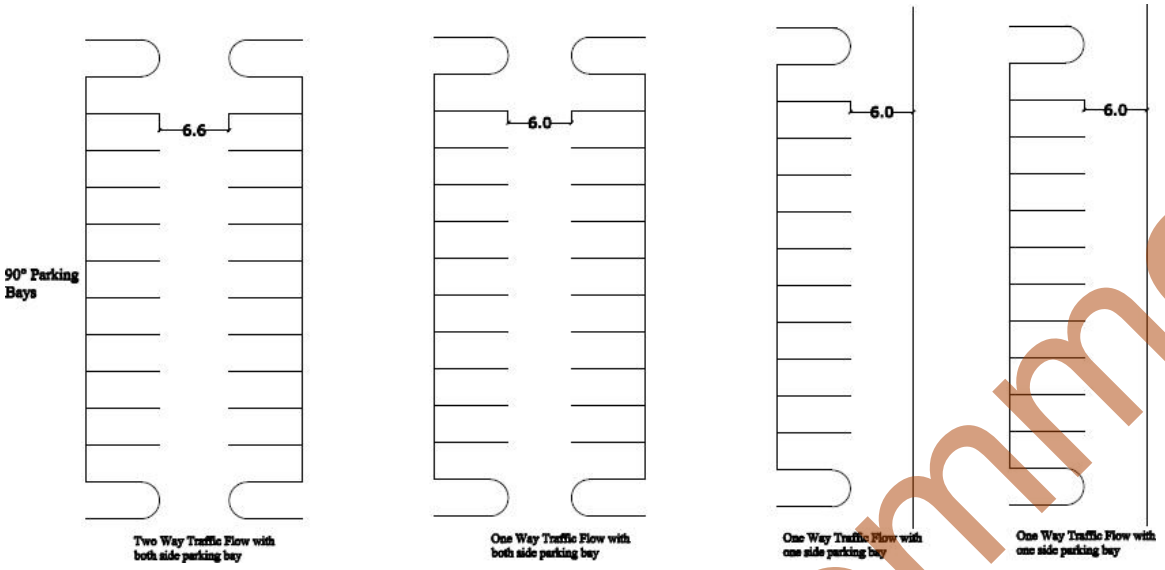


FIGURE 2: Off-street parking layout

6 Parking facilities

6.1. Safety

6.1.1.1. Conformity to Design Occupational health and safety with ES 3965:2015

6.1.2. Off street Surface parking shall provide accessible emergency exit.

6.1.3. Off-street surface par king area security operation shall be assisted with surveillance system.

6.1.4. Off-street surface parking shall use barrier gate at the entry and exit of the vehicle.

6.1.5. Fire protection system shall be installed in comply with ES 3964:2015.

6.1.6. Shall have emergency alarm system together with a buzzer.

6.2. Traffic signs and markings

6.2.1. Off-street surface parking's foot paths, approach lanes, and maneuvering areas shall be cl early marked with directional arrows and lines to facilitate traffic movement.

6.2.2. Marking material shall be according to Esxxxx.

6.2.3. Car par king bay for Persons with disability shall be marked either 'persons

with disability' or with a wheelchair marking.

6.3. Lighting and Electrical of off-street surface par king shall full fill the following requirements:

6.3.1. All lighting for off-street surface parking area shall be renewable and should have photo-sensor system.

6.3.2. All par king building area shall be provided with exterior lighting and maintain a minimum a minimum illumination level as specified in the corresponding Ethiopian standard for Electrical work, ES 3961:2015.

6.3.3. Off-street surface parking area shall use energy efficient lighting.

6.3.4. Any artificial illumination including security lighting shall be directed away from adjoining properties and public rights-of-way.

6.3.5. Metal halide or any other appropriate l amps should be used in off- street surface parking area.

6.3.6. Light pole and tree locations shall not adversely impact upon the other.

6.3.7. Power shall be of three and / or single phases in accordance with the Ethiopian Building Code Standard for electrical works ES 3961:2015, with backup diesel generator and should use solar cells where needed.

6.3.8. Off-street surface parking s hall use appropriate electric cabling specified in accordance with the Ethiopian Building Code Standard for electrical works ES 3961:2015.

6.3.9. Off-street surface par king shall use appropriate electric protective devices and earthing systems specified in accordance with the Ethiopian Building Code Standard for electrical works ES 3961:2015.

6.3.10. Off-street surface parking shall use luminaries specified in accordance with the Ethiopian Building Code Standard for electrical works ES 3961:2015.

6.4. Surface

6.4.1. All driveways and parking ar eas shall be su rfaced with suitable material that has a capacity of withstanding structural load of 4 tones.

6.5. Drainage

6.5.1. All driveways and parking areas shall have suitable drainage system that can drain out storm water and dispose it to appropriate destined end point.

6.5.2. Surface water run-off from paved areas (except paths) shall not drain directly on to trees and shrubs.

6.5.3. Subsoil drainage shall be provided for all trees and shrubs.

6.5.4. Off-street surface parking underground pipes shall be Poly vinyl chloride (PVC), polypropylene, steel reinforced concrete pipes or any other appropriate materials.

6.6. Parking lane for disables

6.6.1. A single par king bay width for per sons with disabilities within Off-street surface parking shall be a minimum of 3.3m.

6.6.2. Parking bays provision and accessibility to persons with disabilities within Off-street surface parking shall be as specified in 3: below.

Table 3: Parking bay requirements for persons with disabilities

Total No. of Car Parking bay	Required No. of Accessible Car Parking bay
1-50	1
51-150	2
151-250	3
251-350	4
351-450	5
Above 450	6

6.7. Controlling and monitoring system

Parking shall have the following for monitoring and controlling of parking cars

6.7.1. Off-street parking shall have car bay detecting systems.

6.7.2. There shall be a monitoring system of off-street parking that is operated and centrally managed.

6.7.3. Toll collection area should be positioned in the entry and exit of off-street parking facilities and be well illuminated.

6.7.4. Off-street parking payment system can be in the form of credit card, prepaid card, contactless card, coin/note, ticketing or other appropriate technology.

7 Design considerations

7.1. Design coordination

The layout design of an off-street car park shall consider the entire facility, including parking modules, circulation roadways, access driveways and, if necessary, frontage road access, as an integrated and

co-ordinated design. Provision for traffic within a parking facility shall take into account the following:

7.1.1. The need for traffic to move to and from the frontage road with minimum disruption to through traffic and maximum pedestrian safety.

7.1.2. Provision of adequate capacity in circulation roadways and parking aisles to handle peak period movements.

7.1.3. Arrangement of internal roadways to avoid, as far as practicable, conflicts between intersecting streams of circulating traffic.

7.1.4. Provision of minimum length travel paths between entry/exit points and parking spaces.

7.1.5. Safe treatment of points of conflict with pedestrians and other road users.

7.1.6. Provision of parking spaces and accessible pedestrian paths for people with disabilities

7.2. Parking angle

Parking angles used in off-street car parks shall be as follows:

7.2.1. 90 degree angle parking

Parking aisles for 90 degree parking shall be designed for two-way movement even though one-way movement may need to be imposed in some instances.

NOTE: 90 degree parking will in most cases be found to be the most efficient use of space in a large area.

7.2.2. 30, 45 or 60 degree angle parking

Where space is limited or does not lend itself to 90 degree parking, 30, 45 or 60 degree parking may be used instead.

Aisles serving such spaces shall be one-way (except where parallel parking is allowed on one side, with forward entry into the spaces only.

NOTE: Such arrangements can have advantages for high turnover parking provided drivers are discouraged from entering aisles the wrong way and reversing into parking spaces.

7.2.3. Parallel parking

Parallel parking shall be provided as specified below

7.2.3.1. Parallel parking in parking aisles

Where parallel parking is to be provided on one or both sides of a parking aisle the following shall apply:

a) Parallel parking one or both sides, one-way or two-way aisle

i. Layout requirements for parallel parking on one or both sides of a one-way aisle shall be as set out in Figure 2.5.

ii. Where the aisle is two-way but parking is on one side only, its width shall be increased by 3.0 m minimum.

iii. Where parallel parking is provided on both sides of a two-way aisle, the aisle widths shown in Figure 2.5 shall be provided on each side of the aisle centre-line.

iv. For parallel parking on both sides of a one-way aisle the aisle width shall be at least twice that shown in Figure 2.5.

b) Parallel parking one side, angle parking the other, one-way or two-way aisle
Requirements shall be as follows:

(i) Angle parking space depths shall be as shown for dimension C on Figure 2.2.

(ii) Parallel parking space dimensions shall be as shown on Figure 2.5.

(iii) Aisle width shall be that shown on Figure 2.2 plus a further 0.5 m.

(iv) Steps shall be taken to discourage reverse-in parking where the angle parking angle is other than 90 degrees.

NOTE: Suitable steps might include making the aisle one-way or signposting the angle parking spaces as front-in only

7.3. Parking aisle length

7.3.1. If a parking aisle exceeds 100 m in length, (i.e. more than about 40 × 90 degree parking spaces on either side) traffic control devices such as speed humps (see Clause 4.9) shall be placed along the parking aisle to control vehicle speeds. Where vehicle negotiation of such devices may lead to structural damage, compliance with this requirement may be waived.

NOTE: To limit traffic volumes and consequent congestion in parking aisles to acceptable levels it is good practice not to have parking aisles provide access for circulating traffic to other parking aisles where those aisles together have more than 50 parking spaces for a Class 3 or 3A facility, 75 for a Class 2 facility or 100 for a Class 1 or 1A facility. Circulation roadways should be provided in lieu.

7.4. Physical controls

7.4.1. General

The need for the following physical controls shall be considered:

(a) Kerbs—on one or more sides of a parking space to protect pedestrian walkways, landscaped areas, and any other non-trafficable areas generally at or just above pavement level, from encroachment.

(b) Vehicles may be allowed to park overhanging a kerb at the rear of a parking space, provided that—

i. the kerb is not more than 150 mm high;

ii. the area up to 1.2 m behind the kerb does not slope up from the kerb; and

iii. the walkway behind the kerb would not be obstructed.

(c) Barriers—to contain vehicles at the edges of platforms or decks, or to prevent encroachment onto pedestrian facilities.

(d) Barriers shall be constructed to prevent vehicles from running over the edge of a raised platform or deck of a multi-storey car park including the perimeter of all decks above ground level.

(e) They are required wherever the drop from the edge of the deck to a lower level exceeds 600 mm. At drops between 150 mm and 600 mm, wheel stops (see Clause 2.4.5.4) shall be provided. Barriers shall comply with the following requirements:

i. They shall be designed structurally for the loading requirements of AS/NZS 1170.1.

ii. If at the end of a parking space, they shall be at least 1.3 m high so that drivers of cars backing into the space can see the barrier above the rear of the car.

NOTE: The upper portion of such a barrier may be a light structure provided for sighting purposes only.

iii. They shall not be made from brickwork, unreinforced concrete or other materials likely to shatter on impact.

(f) Wheel stops—to limit the travel of vehicles when manoeuvring into a parking space.

(g) Wheel stops shall be between 90 and 100 mm in height, and 1650 ±50 mm in width.

(h) If wheel stops are provided to restrain vehicle contact with a kerb higher than 150 mm or a wall, a further 200 mm shall be added to the wheel stop distance

NOTE: Wheel stops should be avoided in any situation where they may be in the path of pedestrians or wheelchairs moving to or from parked vehicles, or crossing a car park for any other purpose. (d) Other protective devices—to prevent damage to structural elements or other unwanted vehicle encroachment.

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INSTITUTE OF ETHIOPIAN STANDARDS

Organization and Objectives

The Institute of Ethiopian Standards (IES) is the national standards body of Ethiopia. IES is re-named by the proclamation number 1263/2021, from Ethiopian Standards Agency (ESA) to Institute of Ethiopian standards, with the mandate given by the regulation Number, 193/2010 and proclamation number, 1263/2021.

IES's objectives are:

- Develop Ethiopian standards and establish a system that enable to check whether goods and service are in compliance with the required standards,
- Facilitate the country's technology transfer through the use of standards,
- Develop national standards for local products and services so as to make them competitive in the international market.
- Conduct standards related research and provide training and technical support.

Ethiopian Standards

The Ethiopian Standards are developed by national technical committees which are composed of different stakeholders consisting of educational and research institutes, governmental organizations, certification, inspection, and testing organizations, regulatory bodies, consumer association etc. The requirements and/ or recommendations contained in Ethiopian Standards are consensus based that reflects the interest of the TC representatives and also of comments received from the public and other sources. Ethiopian Standards are approved by the National Standardization Council and are kept under continuous review after publication and updated regularly to take account of latest scientific and technological changes.

Orders for all Ethiopian Standards, International Standard and ASTM standards, including electronic versions, should be addressed to the Documentation and Publication Team at the Head office and Branch (Liaisons) offices). A catalogue of Ethiopian Standards is also available freely and can be accessed from our website.

 International Involvement IES, representing Ethiopia, is a member of the International Organization for Standardization (ISO), International Electro-technical Commission (IEC) and Codex Alimentarius Commission (CODEX). It also maintains close working relations with the American Society for Testing and Materials (ASTM). It is a founding member of the African Regional Organization for standardization (ARSO).

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