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Indian Standard

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स्मार्ट कम्युनिटी इन्फ्रास्ट्रक्चर — शहर में पार्किंग स्थल के आवंटन के लिए स्मार्ट परिवहन पर मार्गदर्शन

Smart Community Infrastructure — Guidance on Smart Transportation for Allocation of Parking Lots in Cities

ICS 13.020.20

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुरशाह ज़फर मार्ग, नई दिल्ली – 110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI-110002
www.bis.gov.in www.standardsbis.in

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FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Smart Cities Sectional Committee had been approved by the Civil Engineering Division Council.

Every city has similar experiences or city issues, especially cities having a large area and those rapidly developed or being developed in a short time, such as difficulty in easily finding vacant parking lots when trying to park a car in a city. Although spaces for parking are limited in a city, the more popular and common it is for people to buy, own and drive a car, the larger the number of cars is. One of the reasons must be the reduction of car prices in recent years. Furthermore, people basically want to move by themselves at their convenience to anywhere they need or like to go. This background allows people to use a car more casually to commute to work places, visit places when it is necessary to go and enjoy driving.

The limited number of parking lots in a city should be shared by more vehicles. Actually, as concerned, the low availability ratio of parking lots has caused unexpected city issues besides the direct issue of difficulty in finding vacant parking lots in cities. It has resulted in taking drivers longer time to find vacant parking lots. This fact means that they consume more fuel. To successfully find such parking lots, drivers' attention is caught up while looking causing collision accidents to happen more often. Such incidents and slow driving while looking for vacant parking lots bring about traffic congestion. In addition, staying inside a city by driving a car at a low speed results in the vehicle emitting more pollutants, particulate matters (PMs) and greenhouse gases into the air with the atmosphere becoming much more polluted. In any event, there is nothing good about shortage of parking lots and the low availability ratio thereof in a city. Citizens, including drivers and public road neighbours, are justly irritated with such a situation.

Requirements and functional aspects for smart parking lots in cities, suggests ideal parking lot facilities and outlines technical aspects regarding unoccupied parking space, parking space reservation, vehicle automatic access control, self-service parking fee payment and vehicle reverse search, based on how to enhance conventional parking lot services.

Normally, a city has its own area available for living and business. However, the area of parking lots is limited, especially in the case with matured cities. Easy measures to overcome this city issue will be to increase the availability ratio of parking lots by effectively allocating and reallocating parking lots to more vehicles. With the use of Information and Communication Technologies (ICT), data sharing systems have also been organized and practically used which help in parking management. By using information exchange networks, information on which parking lots are vacant or occupied, until what time they are available or occupied, where they are located and so on, is easily collected and shared. This enables effective allocation of parking lots to drivers, who want to park their vehicles, resulting in solving such city issues.

From the viewpoint of investments in city development, construction should be planned, designed, arranged and performed with limited scale budget. To dig up and activate unrecognized or unused/unoffered parking lots is still a realistic and easy way to increase the total capacity of parking lots in a city without additional construction thereof. This strategy leads to avoiding unnecessary parking lot construction that calls for capital costs.

This standard describes the concept of smart transportation to efficiently allocate parking lots to drivers in cities and outlines the services, which is supported by the data exchange and sharing platforms. This standard also aims at satisfying some Sustainable Development Goals by United Nations, especially Goal 3 'Good health and well-being', Goal 7 'Affordable and clean energy', Goal 8 'Decent work and economic growth', Goal 9 'Industry, innovation and infrastructure', Goal 11 'Sustainable cities and communities', Goal 12 'Responsible consumption and production', Goal 13 'Climate action' and Goal 15 'Life on land'.

In the preparation of this standard, the assistance has been derived from ISO/DIS 37163 'Smart community infrastructures — Guidance on smart transportation for parking lot allocation in cities'.

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Indian Standard

SMART COMMUNITY INFRASTRUCTURE — GUIDANCE ON SMART TRANSPORTATION FOR ALLOCATION OF PARKING LOTS IN CITIES

1 SCOPE

1.1 This standard describes how to organize smart transportation to allocate parking lots to drivers in cities. It is intended to apply to cities, especially those having shortage or low availability of parking lots.

1.2 This smart transportation still aims at creating solution to the city issue of difficulty for drivers in finding vacant parking lots in a short time, by which other solutions to traffic accidents and congestion, energy consumption, air pollution as well as noise and vibration can be mitigated.

1.3 This standard describes concept, goals and procedures of smart transportation for parking lots allocation in smart cities.

2 REFERENCES

The following standards contain provisions which, through reference in this text, constitute the provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of these standards.

IS No.	*Title*
17000 : 2019	Sustainable development of habitats — Indicators
IS 17457 : 2020	Sustainable development of habitats — Vocabulary
IS 17451 : 2020	Smart community infrastructures — Best practices for transportation — Guidelines

3 TERMS AND DEFINITIONS

For the purpose of this standard, the terms and definitions given in IS 17457, IS 17451 and the following shall apply.

3.1 Parking Lot — The area to park all kinds of vehicles allowed to run on public roads.

NOTE — Normally, the vehicles listed in IS 17451, namely, buses, trucks, motorcycles, automobiles, IPT including three-wheelers and e-rickshaws and non-motorized transports including manual rickshaws and bicycles as well as vehicles or systems and their additional instruments assisting mobility-impaired persons (for example, scooters, segways).

3.2 Parking Lot Owner — A person or an organization which possesses and offers parking lots.

3.3 Driver — A person who operates a vehicle when parking in a parking lot.

3.4 Parking Lot Allocation — An action to suggest vacant parking lots to drivers by finding the best match of drivers' requests or preference on parking with availability of parking lot vacancy currently existing or expected in the immediate future.

NOTE — Drivers' requests include access routes from current places, preferable places to park, preferable time to start parking, parking duration, the number of vehicles to be parked and vehicle's characteristics, limits of parking fees payable and payment manners.

3.5 Parking Lot Allocation System — An arrangement for parking lot allocation by using data bases to exchange and share information including parking lot allocation, parking time recording, navigation to parking lots and suggestions on parking fee payment procedures and necessary services.

4 CONCEPT OF SMART TRANSPORTATION FOR PARKING LOT ALLOCATION

4.1 General

4.1.1 This section describes the general criteria required for smart transportation to allocate parking lots in cities. To solve the city issue of difficulties for drivers in finding vacant parking lots, the allocation should be organized and performed to provide them more opportunities to find vacant parking lots and choices to meet their requests and preference to park. This procedure increases parking lot availability ratios in a city. Parking lot availability ratios in a city should be increased for following reasons:

a) To provide greater absolute number of parking lots to citizens; and

b) To offer parking lots to citizens more frequently.

4.1.2 To ensure the performance of smart transportation, smart transportation has,

a) high security for drivers' and parking lot owners' identification and privacy, parking fee payment, data transfer, avoidance of illegal smart transportation users' violence; and

b) terminal-to-terminal communication that is, decentralized to achieve fast procedures and reduce organization, operation and maintenance costs while still securing high security.

4.1.3 The additional effects by smart transportation will be expected by facilitating the parking lot allocation as listed below:

a) Invitation of more visitors to a city from outside thereof;

b) Activation and introduction of business into a city by receiving more vehicles in a city;

c) Reduction of the number of vehicle collisions and traffic accidents;

d) Reduction of traffic congestion;

e) Improvement of the atmospheric environment (for example, depression of greenhouse gas, carbon monoxide, NOx/SOx, hydrocarbon, lead compound and PM emissions);

f) Provision of a good environment to public road neighbours (for example, noise and vibration reduction); and

g) Offer of ease to citizens (for example, relief of irritation to drivers and public road neighbours).

These advantages would also be additionally brought about besides solution to the target city issue of difficulties for drivers in finding vacant parking lots. Thus, this smart transportation has possibility to comprehensively relieve such city issues.

4.1.4 There is a variety in the kinds of vehicles that are headed for their individual destinations at different locations in a city. The establishment of safe and steady data exchange and sharing platforms is a key to successfully organize parking lot allocation services. Through communication based on the network, information required to immediately allocate parking lots appropriately to drivers is processed and shared among drivers and parking lot owners joining a parking lot allocation system. Drivers' requests should best match the conditions of parking lots that are currently vacant or will be available in the time frame requested or preferred by drivers.

4.1.5 To support the communication and data sharing, instruments and equipment should also steadily work, which are detectors or sensors, telecommunication devices, signboards, displays and so on. To ensure the communication, data sharing and convenience for drivers, the services for parking lot allocation should satisfy the conditions below:

a) Communication directly from terminal to terminal;

NOTE — 'Terminal' means an end equipment or instrument used by holders for communication (for example, mobile phones, interphones, tablets, PCs, POS).

b) Communication without time lag (for example, less number of processing steps for users' identification);

c) Traceable communication;

d) Offers of large selections on parking lots; and

e) Easy management of the services.

4.2 Applicable City Issues and Expected Advantages

The criteria for smart transportation described in this standard are appropriate to address the city issue of difficulties for drivers in finding vacant parking lots in a city. As expected in **4.1**, by introducing smart transportation, other advantages would also be brought besides solution of the difficulty. The advantages can be the targets that smart transportation aims at but should not be the top priorities or intention to introduce smart transportation, because they are not directly solved thereby.

5 PLANNING TO IMPLEMENT SMART TRANSPORTATION

To properly implement smart transportation for allocation of parking lots in a city and have it perform successfully as planned, the parameters listed below should be confirmed in advance:

a) Traffic patterns in the target city/region;

b) Traffic volume in the target city/region;

c) Traffic capacity on the public road in the target city/region;

d) Number of currently existing parking lots available;

e) Location of currently existing parking lots available;

f) Area or capacity of currently existing parking lots available;

g) Number of parking lots planned;

h) Location of parking lots planned;

j) Capacity of parking lots planned;

k) Mass limits of parking lots allowed;

m) Dimension limits of parking lots allowed (for example, clearance); and

n) Payment methods for parking lots available.

6 ADOPTION OF SMART TRANSPORTATION FOR PARKING LOT ALLOCATION

6.1 Objectives

As mentioned in **4.2**, smart transportation described in this standard can help directly address the issue of difficulties for drivers in finding vacant parking lots in a city. The adoption and implementation of this smart transportation should be performed by following **6.3**.

6.2 Target Vehicles

All vehicles that can be parked in parking lots in cities.

6.3 Procedure to Adopt Smart Transportation

6.3.1 *General*

Smart transportation for allocation of parking lots can be adopted into a city by following the procedure designated in **6.3.2** to **6.3.8**.

6.3.2 *Data to be Collected*

To allocate parking lots to drivers, basic information is needed for the arrangement. The contents of the information to be collected are listed below:

a) *Parking Lots*
   1) Parking lot location;
   2) Parking lot formation or structures (for example, on the ground, underground, inside a building, on a bridge, on a public road);
   3) Parking lot sizes or capacity (that is, sizes or capacities large enough for common private cars, buses and trucks);
   4) Allowable parking time (for example, 15 min, 30 min, 1 h, half a day, one full day, one week, one month, half a year, one year);
   5) Parking service time frame (for example, only during day time, even at night, overnight);
   6) Parking frequency (for example, just one time, temporally for a limited period, regular interval use);
   7) Parking lot ownership (for example, public, exemption, private, shared);
   8) Parking lot facilities (for example, roofed, power-rechargeable, refuelable, car washing services-availability);
   9) Map of the area serviced with smart transportation; and
   10) Parking fees (for example, amounts, discount/ cooperative programs).

b) *Drivers*
   1) Driver's gender;
   2) Driver's age;
   3) Driver's specific conditions (for example, disabilities, with babies or small children);
   4) Driver's current location;
   5) Driver's destinations;
   6) Driver's vehicle characteristics (for example, common private cars, buses, trucks);
   7) Requested or expected parking time duration (for example, 15 min, 30 min, 1 h, half a day, one full day, one week, one month, half a year, one year); and
   8) Driver-preferable payment procedures (for example, in cash, credit card, through bank transfer).

c) *Others* — Current weather conditions on the way to the parking lot and at the place thereof (for example, sunny/cloudy/rainy/snowy, wind speed, wind directions, humidity, visibility, and specific weather condition).

6.3.3 *Data Collection*

To collect data designated in **6.3.2**, the instruments and equipment listed below should be installed and operated:

a) Car sensors in parking lots (for example, car existing/absence, parking lot vacancy/occupancy);
b) Monitors for security in parking lots;
c) Traffic congestion monitors (for example, on the way to the parking lot, areas around the parking lot);
d) Air pollution sensors (for example, SOx/NOx, carbon monoxide, PMs);
e) Atmospheric condition sensors (for example, ambient temperature, humidity);
f) Weather monitors (for example, rain/snow fall, wind speed and direction, illumination);
g) Software to collect the data and process (for example, data collection, data transfer, data processing, parking charge, parking fee collection);
h) Apps (for example, for drivers, for parking lot owners, for traffic departments, for related and additional services); and
j) User survey.

6.3.4 *Data Transfer*

To transfer to parking lot allocation system databases, drivers and parking lot owners the data of information collected in accordance with **6.3.2** and **6.3.3**, the communication shall be organized by securing requirements and functions listed below:

a) *Between parking lot owners and parking lot allocation databases*
   1) Mobile or smart phones;
   2) Apps applicable to mobile and smart phones;
   3) Security gateways (for example, identified authentication, data encryption, access control and restriction);

4) Internet; and
5) Offline communication (for example, local area networks, ad-hoc networks, near-field communication).

b) *Between drivers and parking lot allocation databases*
1) Mobile or smart phones;
2) Apps applicable to mobile and smart phones;
3) Security gateways (for example, identified authentication, data encryption, access control and restriction);
4) Internet;
5) Offline communication (for example, local area networks, ad-hoc networks, near-field communication); and
6) Identification and tracking using tags (for example, radio-frequency identification, ultra high frequency).

6.3.5 *Information Provided to Drivers*

In order to help drivers choose a parking lots from options best matching their requests or preference by considering where, what time and how long to park their vehicles, the information listed below should be provided to drivers:

a) Location of the parking lot;
b) Available time frame of the parking lot (for example, from what time to what time or to which day);
c) Allowable parking time in the parking lot (for example, 30 min, 1 h, half a day, one day, one week, one month, half a year, one year);
d) Access routes to the parking lot;
e) Time taken to drive to the parking lot from the driver's current location;
f) Parking fees of the parking lot (for example, per hour, day, week, month or year);
g) Available day and time in the parking lot (for example, workdays, weekend/holidays, daytime or night);
h) Road conditions on the way to/around the parking lot (for example, congestion degrees, weather condition, accident occurrences, road work implemented);
j) Additional information helpful to drivers (for example, shops, restaurants, public bathrooms, gas stations);
k) Parking fee payment manners (for example, in cash only at a site, credit cards acceptable, bank transfer applicable, on-/off-line payment).

6.3.6 *Allocation of Parking Lots*

To successfully allocate parking lots to drivers, the conditions to compare their requests or preference and parking lot availability are listed below. The option suggested to drivers on the best matched parking lot will be kept until the confirmation of the parking lot reservation.

a) *Drivers' requests or preference*
1) Current place;
2) Preferable places to park;
3) Preferable time to start parking;
4) Parking duration (for example, for how many minutes, hours or days);
5) The number of vehicles to be parked (for example, only one vehicle, more than one vehicle);
6) Vehicle's characteristics (for example, common personal-use cars, common-size cars but for business, bus, truck); and
7) Parking fee payment manners (for example, in cash only at a site, credit cards acceptable, bank transfer applicable, on-/off-line payment).

b) *Parking-lot-offered services*
1) Location;
2) Number of parking lots available;
3) Available parking time frames (for example, from what time to what time);
4) Available parking duration (for example, less than 30 min, 1 h, couple of hours, half a day, one full day, a few days, one week, two weeks, one month, half a year, one year);
5) Additional services in parking lots (for example, power rechargers, gas stations, bathrooms, convenience stores);
6) Available facilities around the parking lots (for example, shops, restaurants, banks/ATMs, hospitals/clinics, stations, bus stops, ferry terminals, airports, hotels, post offices, police departments);
7) Parking lot security (for example, guards watching, no guards working, TV monitors enforced);
8) Parking costs; and
9) Parking fee payment manners (for example, in cash only at a site, credit cards acceptable, bank transfer, on-/off-line payment).

c) *Designated uses*
1) dedicated space and lane markers identified as "no parking/no stopping" to allow for access by emergency vehicles (for example, fire apparatus, rescue vehicles, police cars, ambulances); and
2) dedicated spaces and related signage to identify dedicated parking space for disabled drivers.

6.3.7 *Collection of Parking Fees*

To collect parking fees, the instruments and equipment listed below should be installed and operated:

a) Barrier gates;
b) Signboards/displays to notify drivers of the parking fee amount estimated or determined;
c) Signboards/displays to notify drivers of remaining time allowed for parking;
d) Signboards/displays to instruct the manner to pay parking fees; and
e) Instruments to collect parking fees (for example, for cash, for e- or digital money, receipt printers, automated payment system).

6.3.8 *Provision of Information Helpful to Parking Lot Allocation Management*

To properly manage a system for parking lot allocation and organize it, the information listed below should be provided:

a) Illegally parked vehicles (for example, over-time parking, over-size parking, parking fee evasion);
b) Vehicles not registered with parking lot allocation services;
c) Parking fee arrearages;
d) Frequent users (for example, discount, priorities for the next reservation);
e) Current instruments and equipment conditions; and
f) Instrument and equipment maintenance states and records.

7 DATA EXCHANGE AND SHARING MANAGEMENT

To properly manage and operate parking allocation systems with data exchange and sharing platforms and networks, all the data collected as per **5**, **6.3.2** and **6.3.8** should be safely stored and fairly and exactly processed. The data to be transferred as per **6.3.3**, **6.3.4** and **6.3.5** should be safely and steadily carried out.

8 DATA SECURITY CONTROL WITH SMART TRANSPORTATION

8.1 To organize smart transportation for allocation of parking lots in cities and protect private or personal information from use for other purposes besides parking lot allocation system management, all information collected, used, exchanged and shared shall be protected from illegal or unauthorized access, especially by or for actions listed below.

a) Information duplication;
b) Pretention;
c) Taming;
d) Information repudiation; and
e) Privacy protection.

In contrast, drivers legally registered with parking lot allocation systems by using an app are accessible to authenticated information on parking lots.

8.2 Based on the security, drivers' personal information identified can be combined/related to an authenticated vehicle information through registration with an app. The information shall be encrypted and authenticated to protect from illegal access that includes intention and action to disclose privacy. Access to the information shall also be limited.

8.3 Smart transportation should work for citizens who keenly request their privacy protection in any transportation services. In smart transportation, data security control should be performed to achieve the requirements below:

a) High security (for example, privacy protection);
b) Fast procedures and processing (for example, effective allocation of parking lots, quick parking lot fee payment to avoid congestion at the exit); and
c) Low cost for organization, operation and maintenance (for example, durability performance).

To meet the requirements for smart transportation, decentralized or terminal-to-terminal communication should be adopted therein.

8.4 Privacy and Data Protection

In order to prevent personal privacy disclosure, only authorized security organizations can access databases according to measures established to protect users' privacy.

9 MAINTENANCE OF THE QUALITY OF SMART TRANSPORTATION FOR PARKING LOT ALLOCATION

9.1 General

To assure the performance of smart transportation for allocation of parking lots and confirm the effectiveness thereof, the parameters given in **9.2** shall be observed periodically. If the effectiveness of smart transportation is not confirmed or not clear, modify the current services by smart transportation by changing the parameters described in **5** and **6**, where possible and reasonable.

As described above, the conditions where any smart transportation has been installed or adopted and is being operated would be changed. Thus, to successfully organize and operate smart transportation to solve target city issues and to keep the effectiveness for a long time, the quality maintenance of smart transportation is indispensable.

9.2 Parameters to be Observed

To ensure that the performance of smart transportation is effectively organized, observe any changes in the following parameters:

a) Time in average taken to park a car in the target city/area after starting looking for vacant parking lots;

b) Absolute number of parking lots available in the target city/area;

c) Number of parking lots available per unit time in the target city/area (for example, hour, day, week, month, year);

d) Parking lot availability ratio in the target city/area;

NOTE — For reference, parameters listed below can be monitored which would indicate advantages obtainable indirectly through smart transportation, as expected in **4.1**.

e) Number of visitors from outside of the target city/area;

f) Indicators on economy in the target city/area;

g) Number of vehicle collisions and traffic accidents occurring in the target city/area;

h) Indicators on traffic congestion in the target city/area;

j) Indicators on atmospheric pollution in the target city/area (for example, greenhouse gases, carbon monoxide, nox/sox, hydrocarbons, lead compounds and pms);

k) Indicators on the environment, except atmospheric pollution, which are designated in IS 17000; and

m) Indicators on ease for citizens, which are designated in IS 17000.

9.3 Modification of Smart Transportation

When identifying unwanted changes in the value of the parameters designated in **9.2**, modify the conditions of smart transportation given in **6.3**, where possible. To correct transportation conditions, analyze any unexpected or irregular occurrences in operation and services of smart transportation. Modify the irregular conditions of the smart transportation system in case the irregular conditions are not acceptable.

Mapping the parameters observed by following **9.2** would give information on changes in parking lot utilization in the target city/area that is helpful in planning and improving further traffic management.

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Smart Cities Sectional Committee, CED 59

Organization	*Representative(s)*
In Personal Capacity (*G -1602, Pioneer Park, Sector – 61, Gurugram-122001*)	Dr Sudhir Krishna (***Chairman***)
AECOM India Pvt Ltd, Gurugram	Shri Pawan Kumar Jaipuriar Shri Arvind Agrawal (*Alternate*)
AFCONS Infrastructure Limited, New Delhi	Representative
Ahmedabad Municipal Corporation, Ahmedabad	Representative
All India Institute of Local Self Government, Mumbai	Shri Advait Aundhkar
Bhubaneshwar Smart City Limited, Bhubaneshwar	Representative
Building Materials and Technology Promotion Council, New Delhi	Shri J. K. Prasad
Builders Association of India, New Delhi	Shri Dharmesh Awasthi Shri Arun Sahai (*Alternate*)
Central Statistics Office, Ministry of Statistics and Programme Implementation, New Delhi	Representative
Cochin Smart City Limited, Kochi	Representative
Confederation of Indian Industry, New Delhi	Shri Virender Singh
Confederation of Real Estate Developers' Association of India, New Delhi	Representative
Corporation of Chennai, Chennai	Shri B. V. Babu Shri S. Sudhakar (*Alternate*)
Delhi Development Authority, New Delhi	Shrimati Leenu Sehgal Shrimati Manju Paul (*Alternate*)
Delhi-Mumbai Industrial Corridor Development Corporation Ltd, Mumbai	Chairman
Department of Telecommunication, Ministry of Communications, New Delhi	Shri Sanjay Kumar Shri Director (NT-III) (*Alternate*)
Federation of Indian Chambers of Commerce & Industry, New Delhi	Shri Jayant Kohale
Greater Vishakhapatnam Smart City Corporation Limited, Vishakhapatnam	Representative
Gujarat International Finance Tec-City Company Ltd, Ghandinagar	Shri Loveleen Garg
Guwahati Municipal Corporation, Guwahati	Representative
Indian Concrete Institute, Chennai	Shri K. P. Abraham
Indian Green Building Congress, New Delhi	Ms Sheetal Rakheja
Indian Institute of Remote Sensing, Dehradun	Representative
Indian Institute of Technology Kharagpur, Kharagpur	Prof Uttam K. Banerjee
Institute of Town Planners, India, New Delhi	Shri B. C. Datta Prof Kulshreshtha (*Alternate*)
Jabalpur Smart City Limited, Jabalpur	Representative
Jammu Municipal Corporation, Jammu	Representative

Organization	*Representative(s)*
Karki Associates, New Delhi	Shri Rajnish Karki
Ministry of Commerce & Industry, New Delhi	Shri Sudhanshu Pandey
Ministry of Electronics & Information Technology, New Delhi	Ms Kavita Bhatia Shri Mayank (*Alternate*)
Ministry of Consumer Affairs, Food & Public Distribution, New Delhi	Director (BIS) Under Secretary (BIS) (*Alternate*)
Ministry of Drinking Water & Sanitation, New Delhi	Shri D. Rajshekhar Shri G. Balasubramaniyam (*Alternate*)
Ministry of Earth Sciences, New Delhi	Dr M. Mohapatra Dr O. P. Mishra (*Alternate*)
Ministry of Housing & Urban Affairs, New Delhi	Shri Kunal Kumar
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Ministry of Panchayati Raj, New Delhi	Joint Secretary
Ministry of Power, New Delhi	Secretary
Ministry of Rural Development, New Delhi	Representative
Ministry of Statistics & Programme Implementation, New Delhi	Shri K. S. Rejimon
Ministry of Tourism, New Delhi	Dr Ravi Kant Bhatnagar
Ministry of Transport, New Delhi	Representative
Ministry of Water Resources, River Development & Ganga Rejuvenation, New Delhi	Shri R. K. Jain Shri G. C. Pati (*Alternate*)
Narnix Technolabs Pvt Ltd, New Delhi	Shri N. Kishore Narang
National Association of Software & Services Companies, Noida	Shri Manojit Bose Ms Rama Vedashree (*Alternate*)
National Real Estate Development Council, New Delhi	Shri Navin Raheja Brig R. R. Singh (*Alternate*)
National Remote Sensing Centre, Hyderabad	Dr K. Venugopal Dr Muralikrishnan (*Alternate*)
North East Space Application Centre, Umiam, Shillong	Representative
Office of the Registrar General & Census Commissioner, New Delhi	Representative
Ranchi Municipal Corporation, Ranchi	Representative
Saviram Engineering Consultants Pvt Ltd, Noida	Shri Girish Mishra
School of Planning and Architecture, New Delhi	Dr Vinay Maitri Dr Sanjukkta S. Bhaduri (*Alternate*)
Shillong Smart City Limited, Shillong	Representative
Smart Cities Next, New Delhi	Shri Debashish Roy
Sulabh International Social Service Organization, New Delhi	Prof K. J. Nath Dr N. B. Mazumdar (*Alternate*)
Surat Smart City Development Limited, Surat	Representative
Survey of India, Dehradun	Representative
Svayam National Centre for Inclusive Environment, New Delhi	Shri Subhash Chandra Vashishth Shri J. M. Syal (*Alternate*)

Organization	*Representative(s)*
Town and Country Planning Organization, New Delhi	Shri R. Srinivas Shri Nitin Kumar Azad (*Alternate*)
Udaipur Smart City Limited, Udaipur	Representative
Unified Traffic & Transportation Infrastructure (P. & Engg.) Centre, New Delhi	Shrimati Manju Paul Shri Manish Verma (*Alternate*)
University of Delhi, New Delhi	Dr C. R. Babu
Urban Development Department, Town & Country Planning Branch, Kolkata	Shri Satanu Prasad Kar Ms Sandhyatra Saha (*Alternate*)
Urban Governance, Administrative Staff College of India, Hyderabad	Prof Srinivas Chary Vedala
V. V. Giri National Labour Institute, Noida	Representative
WRI India, New Delhi	Ms Prerna V. Mehta
In personal capacity (*B-399, 2nd Floor, Meera Bagh, Paschim Vihar, New Delhi 110063*)	Shri Satish Kumar
In personal capacity (*Apartment No. 3203, Verona Cliff Avenue, Hiranandani Gardens, Powai Mumbai 400076*)	Shri V. Suresh
In personal capacity (*1/5 Shabd Pratap Asharam, Lashkar, Gwalior 474012*)	Shri S. P. Bansal
In personal capacity (*374, Sector 28, Noida*)	Dr Sandeep Garg
In personal capacity (*L/109, Sarita Vihar, New Delhi 110076*)	Shri Ashok Khurana
BIS Directorate General	Shri Sanjay Pant, Scientist 'F' and Head (Civil Engineering) [Representing Director General (*Ex-officio*)]

Member Secretary

Shri Abhishek Pal
Scientist 'C' (Civil Engineering), BIS

Smart Cities Working Group, CED 59/WG

Organization	*Representative(s)*
In Personal Capacity (*G-1602, Pioneer Park, Sector 61, Gurugram-122 001*)	Dr Sudhir Krishna (***Convener***)
Gujarat International Finance Tec-City Limited, Gandhinagar	Shri Lovleen K. Garg
Indian Institute of Technology Delhi, New Delhi	Dr Somnath Mitra
Ministry of Housing and Urban Affairs, New Delhi	Shri Sampath Kumar S.
School of Planning & Architecture, New Delhi	Prof Sanjukkta Bhaduri
Smart Cities Next, New Delhi	Shri Debashish Roy
Town and Country Planning Organization, New Delhi	Shri R. Srinivas Shri Sudeep Roy (*Alternate*)
WRI India, New Delhi	Ms Prerna V. Mehta
In personal capacity (*374, Sector 28, Noida*)	Shri Sandeep Garg

(*Continued from second cover*)

This standard is a part of the series of Indian Standards being formulated on sustainable development of habitats including on smart cities. In fact, smartness acts as an accelerator to the sustainable development which is the ultimate objective, hence the various concepts and standards relating to smart cities being evolved including this standard should be understood from the same consideration.

An Indian Standard IS 17000 : 2019 'Sustainable development of habitats — Indicators' has since been published.

The composition of the Committee responsible for formulation of this standard is given in Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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