सत्यमेव जयते

ROLL OUT OF SMALL CELLS FOR 5G NETWORK BY LEVERAGING STREET FURNITURE

- to Facilitate a Standard Approach for the Proliferation of Dense Small Cell Infrastructure

ISO 9001:2015

Committee Report
No: TEC 81001:2022

GOVERNMENT OF INDIA
MINISTRY OF COMMUNICATIONS
DEPARTMENT OF TELECOMMUNICATIONS
TELECOMMUNICATION ENGINEERING CENTRE

Release: 1.0

March, 2022

सत्यमेव जयते

ROLL OUT OF SMALL CELLS FOR 5G NETWORK BY LEVERAGING STREET FURNITURE

Document Number	TEC 81001:2022; Release 1.0
Document Name	Rollout of Small Cells for 5G Network by leveraging Street Furniture
Date	Monday, 28th March 2022
Objective	Rollout of Small Cells for 5G Network by leveraging Street Furniture to Facilitate a Standard Approach for the Proliferation of Dense Small Cell Infrastructure

ISO 9001:2015

GOVERNMENT OF INDIA
MINISTRY OF COMMUNICATIONS
DEPARTMENT OF TELECOMMUNICATIONS
TELECOMMUNICATION ENGINEERING CENTRE

के राजारमन, आई.ए.एस.
सचिव
K. Rajaraman, I.A.S.
Secretary

सत्यमेव जयते

भारत सरकार
संचार मंत्रालय
दूरसंचार विभाग
Government of India
Ministry of Communications
Department of Telecommunications

MESSAGE

I am extremely happy to note that the Telecommunication Engineering Centre (TEC) is publishing a report on "Rollout of Small Cells for 5G Networks by leveraging Street Furniture".

Small cells are a critical component of 5G networks, helping to deliver the micro capacity and coverage. 5G small cells wi ll **enable the network to extend coverage and to deliver lower latency, and also serve more users while maintaining multi-gigabit performance.** 5G is poised to change the way humans live, and would enable us to control our surroundings as well as the various social and economic sectors which operate around us.

This report is a good initiative and will certainly help various stakeholders to take preparatory steps in their respective sectors for hassle-free rollout/ expansion of the 5G network.

I appreciate the efforts put in by the Telecommunication Engineering Centre in bringing out this report. I wish them success in all their endeavours.

(K. Rajaraman)

संचार भवन, 20, अशोका रोड, नई दिल्ली–110001/ Sanchar Bhawan, 20, Ashoka Road, New Delhi - 110 001 Tel.: 011-23719898 Fax : 01 1 -23711514, E-mail : secy-dot@nic.in

ए.के. तिवारी
सदस्य (टेक्नोलॉजी)
A K Tiwari
Member (Technology)

सत्यमेव जयते

भारत सरकार
संचार मंत्रालय
दूरसंचार विभाग
Government of India
Ministry of Communications
Department of Telecommunications

MESSAGE

I am pleased to note that the Telecommunication Engineering Centre (TEC) is bringing out a report on ROLL OUT OF SMALL CELLS FOR 5G NETWORK BY LEVERAGING STREET FURNITURE.

The ability to deliver multi-gigabit per second is where 5G small cells can really help alleviate issues of densification so that multi-gigabit throughput can be maintained in user-dense applications. In the 5G era, 5G small cells wi ll enable the network to extend coverage and to deliver lower latency, and also serve more users while maintaining multi-gigabit performance. Small cells will also deliver cost-effective capacity and coverage, indoors and outdoors.

This Technical Report will help in the proliferation of seamless 5G networks by leveraging the availability of street furniture in urban areas. This is an opportunity for India not only to keep pace with the world but also to march ahead in development of specifications for street infrastructure in 5G small cells.

I appreciate the efforts of Telecommunication Engineering Centre, especially its FN Division for bringing out this well awaited technical report on small cell street furniture in a very lucid manner. I wish them success in all their endeavours.

(A K Tiwari)
Member (Technology)
16.03.2022

अशोक कुमार मित्तल
सदस्य (सेवाएं)
ASHOK KUMAR MITTAL
Member (Services)

सत्यमेव जयते

भारत सरकार
संचार मंत्रालय
दूरसंचार विभाग
Government of India
Ministry of Communications
Department of Telecommunications

MESSAGE

I am happy to note that the Telecommunication Engineering Centre (TEC) is bringing out a technical report on ROLL OUT OF SMALL CELLS FOR 5G ETWORK BY LEVERAGING STREET FURNITURE .

Today's mobile users want faster data speeds and more reliable service. The next generation of wireless networks-5G-promises to deliver that, and much more. As the number of mobile users and their demand for data rises, 5G will have to handle far more traffic at much higher speeds than do the base stations that make up today 's cellular networks . Need for improvement in efficiency in various socio-economic sectors has been felt for a long time and to this effect, the proliferation and densification of 5G small cells will give an impetus in this direction through a safe and secure high speed digital communications infrastructure services.

This technical report on small cell street furniture by TEC is a good step in this direction and will certainly help various stakeholders to take preparatory steps in their respective sectors for expansion of the 5G network.

(Ashok Kumar Mittal)
Member (Services)
16.03.2022

दीपा त्यागी
वरिष्ठ उपनिदेशक
Deepa Tyagi
Sr. Deputy Director General
Tele: 23320252 Fax: 23329088
e-mail : srddg.tec@gov.in
www.tec.gov.in

सत्यमेव जयते

भारत सरकार
संचार मंत्रालय
दूरसंचार विभाग
Government of India
Ministry of Communications
Department of Telecommunications
Telecommunication Engineering Centre

MESSAGE

TEC is a technical body representing the interest of the Department of Telecom, Government of India. It provides technical support to DoT and prepares specifications and standards for Telecom network equipment, services and interoperability. TEC has also been mandated to interact with multilateral agencies like ITU, APT, ETSI, IEEE etc. for standardisation.

TEC proactively takes up development of specifications & standards based on studies and on interaction with concerned stakeholders. Development of specifications & standards is a transparent process with active participation of stakeholders. Certification of telecom products as per Essential Requirements is also one of its major activities under MTCTE, which has been mandated by the Government of India.

5G networks offer the potential to transform industrial sectors and deliver significant social and economic benefits in India. With the next generation networks expected to be rolled out in the country soon, the industry would need higher quantum of antennas and small cells that may fall within a range of ten meters to several hundred metres and are mostly marked by short ranges. The need for small cells will become even more critical in 5G networks due to the introduction of higher spectrum bands, which necessitate denser network deployments to support larger traffic volumes per unit area.

Towards achieving this objective, TEC in consultation with stake-holders from government, industry, and sector-users, took up study of the need and challenges in rolling out street infrastructure and small cells for 5G. A committee was formed under the chairmanship of Deputy Director General (Future Networks) to facilitate a standard approach for the proliferation of Dense Small Cell Infrastructure, keeping in mind the best global practices.

This report titled "Rollout of Small Cells for 5G Network by Leveraging Street Furniture" by TEC is a good step in this direction and will certainly help concerned stakeholders to take preparatory steps in establishing 5G infrastructure in the country.

I express my sincere thanks to all the members of the committee as well as all the contributors from industry whose enthusiastic support and untiring efforts have made it possible to bring out this report timely.

23/3/2022

(Deepa Tyagi)

आर. के. सक्सेना
भारत सरकार के बेतार सलाहकार
R. K. Saxena
Wireless Advisor to the Government of India
Tel. 23755444
Fax: 23372141
E-mail : wawpc@nic.in

सत्यमेव जयते

भारत सरकार
संचार मंत्रालय
दूरसंचार विभाग
Government of India
Ministry of Communications
Department of Telecommunications
Telecommunication Engineering Centre

MESSAGE

I am extremely happy to note that the Telecommunication Engineering Centre (TEC) is publishing a report on Rollout of Small Cells for 5G Networks by leveraging Street Furniture.

5G is the fifth generation of cellular networks with speeds up to 100 times faster than 4G. 5G is creating never-before-seen opportun ities for people and businesses due to faster connectivity speeds, ultra-low latency and greater bandwidth in advancing societies, transformi ng industries and dramatically enhancing day-to-day experiences. Services that we used to see as futuristic , such as e-health, e-educations, connected vehicles and traffic systems and advanced mobile cloud gaming have arrived, where 5G could play a significant role. With 5G technology, we can help create smart cities with a smarter, safer and more sustainable future. It has been the constant endeavour of WPC Wing to make available adequate interference free Radio spectrum in the low, medium and high frequency bands and Simplified SACFA procedures for 5G Small Cells towards development and fast roll out of 5G mobile telecom services in the country and make it a big success.

This report on 5G Small Cells by leveraging street furniture will lead to the densification of small cells and further help in the cellular infrastructure to keep pace with the growing demand for enhanced communication bandwidth and throughput.

I congratulate TEC in bringing out this report which I am sure will benefit all the stakeholders and the public at large.

R. K. Saxena
IRRS

PREFACE

5G is different from 4G in the sense that previous generations of cellular infrastructure like 4G can no longer keep pace with the growing demand for large bandwidth and throughput in order to achieve high speed data transmission.The macro towers that have been serving fourth-generation long-term evolution (4G LTE) in the 2100 MHz band are not capable enough to connect to the rapidly growing number of devices that each user is simultaneously utilizing.The next generation of cellular technology i.e. 5G, represents a paradigm shift for cellular infrastructure. With the advent of 5G, there will be a requirement to deploy Low Power Base Stations (LPBTS) with 5G radios often called "small cells".These 5G Small Cells operate on higher frequency spectrum bands in the range, FR1 band (sub 6 GHz) and FR2 band (mm Wave) that necessitate denser network deployments to support larger traffic volumes per unit area. The number of 5G small cells will therefore be huge in number as compared to the previous generation of 4G base station towers. These 5G small cells have limited coverage of tens/hundreds of meters and are mostly marked by short ranges and may however vary significantly depending on their use cases.

Considering the need for densification of the network, these small cells will be deployed on various types of street furniture such as poles, street lights, traffic lights, bus stop shelter, advertisement hoardings, billboards, etc. due to their low weight and small size.

It is imperative that standards/ policy for roll out of street infrastructure and small cells in 5G to facilitate a standard approach for the proliferation of Dense Small Cell Infrastructure in country to unlock potential of existing national assets like street furniture be formulated. That is why a committee has been constituted by the Secretary (Telecom) & Chairman Digital Communication Commission.

ACKNOWLEDGEMENT

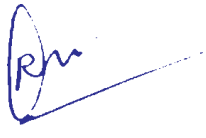
A lot of effort has been made during the preparation of this report. The stakeholders from different organizations with varied interests, policy bindings and obligations, were kind and gracious enough to understand the need to come up on a common platform for formulating a standard approach for the proliferation and densification of networks by deploying small cells by utilizing the already available street furniture assets in the national interest. During the course of the preparation and review of the draft report there were invaluable contributions and also constructive criticism made by the stakeholders. It would not have been possible to bring out this report without the support and help of all the stakeholders who were a part of the committee. We would like to extend our sincere thanks and gratitude to all of them for sparing their time and providing their valuable inputs and comments during the several rounds of discussions and meetings, due to which this report could be brought out in a very timely manner.

Our thanks and appreciations go to Shri Vikram Tiwathia, DDG (COAI), Shri S. Gopalan, DDG Kerala LSA, DIPA, MoHUA, Ministry of Power, Central Electricity Authority, NOKIA, Ericsson, and Qualcomm who have willingly helped with their valuable inputs and also for reviewing the report. Our sincere acknowledgement also goes to Future Network (FN) Division of TEC, DDG (SRI) DoT, DDG(AS) DoT, JWA WPC DoT, DDG/Mission Director (National Broadband Mission), DDG(MT) TEC, DDG(R) TEC and NDMC.

The Committee held several round of discussions and meetings and had extensive consultations with concerned stakeholders like COAI, DIPA, NDMC, Ministry of Power, TCPO, MoHUA, Kerala LSA, TEC, OEMs (Nokia, Ericsson, Qualcomm), and inputs provided by stakeholders were discussed in detail during the preparation of the Report.

We are highly indebted to Smt. Deepa Tyagi, Sr. DDG & Head, TEC for her guidance, support and constant supervision as well as for providing necessary inputs which has enabled us in finalizing the report in a timely manner.

The report has been prepared based on the inputs received from the stakeholders and keeping in mind the best global practices. I sincerely hope this report will help in facilitating a standard approach for the proliferation of Small Cells by utilizing street furniture and related infrastructure assets that will facilitate network densification which is essential for the deployment of 5G in the country.



Rajeev Kumar Tyagi
DDG (Future Networks), TEC

CONTENTS

1. INTRODUCTION

1.1 With the advent of 5G, there will be a requirement to deploy Low Power Base Transceiver Stations (LPBTS) with 5G radios often called "small cells" due to network elements working on higher frequency spectrum bands that necessitate denser network deployments to support larger traffic volumes per unit area. A small cell is a cellular base station that transmits & receives 3GPP-defined Radio Frequency (RF) signals with small power and small form factor. In most cases, it services a small coverage area ranging from ten meters to several hundred meters in contrast to a typical mobile macro cell that might have a range of up to several tens of kilometers.

1.2 Various types of street furniture such as poles (street lights, electricity, traffic lights), advertisement hoardings, bus shelters and towers have been identified by TRAI as suitable national assets for deploying small cells[6].

1.3 To have a harmonious and transparent approach for formulation of requisite policy/ standard for deployment of small cell infrastructure, a committee was constituted by Secretary (Telecom), Department of Telecommunications, vide TEC Letter no 01-12/2021-FN/TEC dated 22.12.2021.

The ToR (Terms of Reference) for this committee are as below:

a) Standards are not limited to poles, side walls, hoardings, bus shelters, traffic signals/ lights, metro rails structures, electric poles, roadsides/ campus infrastructure.

b) Include the guidelines on minimum height of lower radiating part of Antenna and minimum distance to areas accessible to the general public.

c) Any other aspects necessary to enable standardization of street infrastructure for the proliferation of Dense Small Cell Infrastructure.

2. BACKGROUND

2.1 Previous generations of cellular infrastructure can no longer keep pace with the growing demand for communication (data transmission) bandwidth and throughput. The macro towers that have been serving 4G LTE networks cannot connect to the rapidly growing number of devices that users are simultaneously utilizing.The next generation of cellular technology, 5G, represents a paradigm shift for cellular infrastructure.

2.2 As the roll-out of 5G continues, more and more radios need to be deployed and networks will need to be densified.The Macro radios provide excellent coverage and high capacity. However, in some cases, for example dense-urban locations dominated by tall buildings, providing the necessary coverage can be challenging. Similarly, where there are high numbers of mobile-users, such as busy city-centers and transportation hubs, providing enough capacity needs from a single radio can also be challenging. In these cases, outdoor small cells are ideal solutions for improved coverage.These solutions include micro remote radio heads and high-capacity 5G millimeter wave radios. Around 80% of mobile broadband traffic originates from mobile users located indoors. However, ensuring good indoor coverage can also be a challenge, especially as the higher frequencies used by 5G are more prone to signal propagation limitations than previous generations of mobile technology.To help overcome this, it is essential to consider indoor small cells as a deployment option.

2.3 Mobile operators will look to small cell deployment technology to add data capacity in areas of traffic congestion. This dense small cell network increases both the radios per subscriber and provides subscribers improved signal quality for more efficient data transfer.The shorter distance between radio sites also helps overcome the short signal reach of higher frequency 5G radio spectrum. As a result, small cells are becoming the leading solution in growing the data capacity of the network

Small cells are therefore required in the 5G network due to the following reasons:

a) Offloading: The Macro site of the area is getting congested and is unable to serve the entire community of the area.

b) Capacity Enhancement: The macro site serving the building/ area is unable to meet the capacity requirements of some parts of the building/ spot.

c) Low Coverage of Signal: Higher spectrum band.

d) Indoor Coverage: In building solutions are essential for indoor coverage including basements, underground metro tunnels etc.

2.4 Various small cell product types exist generally depending on, among other attributes, their targeted coverage range (transmit power) and provided capacity. These small cell variants include (but are not limited to) femtocells, picocells and microcells/ metrocells – broadly increasing in cell range from femtocells (the smallest) to metrocells (the largest) as summarized below:

- **Femtocells**: A low-power, short range, self-contained small cells. Initially used to describe consumer small cell units intended for residential homes, the term has expanded to encompass higher capacity units for enterprise, rural and metropolitan areas.
- **Picocells:** Typically used to describe low power compact base stations, used in enterprise or public indoor areas, the term is sometimes used to encompass outdoor small cells as well.
- **Microcells:** Typically used to describe an outdoor short-range base station aimed at enhancing coverage for both indoor and outdoor users where macro coverage is insufficient. Occasionally installed indoors to provide coverage and capacity in areas above the scope of a picocells.
- **Metrocells**: A recent term used to describe small cell technologies designed for high capacity metropolitan areas. Such devices are typically installed on building walls or street furniture (e.g. lampposts). This category can include technologies such as femtocells, picocells and microcells where they meet these deployment criteria.

3. SMALL CELL DEPLOYMENT SCENARIOS AND USE CASES

Small cells generally support two lower coverage range base station classes defined by 3GPP [TS38.104] which also determine the RF performance:

a) Medium-range base stations (derived from microcell scenarios) for outdoor small cell deployment.

b) Local area base stations (derived from Pico cell scenarios) for indoor small cells.

Small cells will play a critical role in a number of use cases in the 5G network. Some of use cases of Small Cells are given below:

3.1 Large venues such as sports complexes or concert halls where thousands of users need to connect within an enclosed area. In order to ensure all users, maintain network coverage with good throughput, 5G small cells can be deployed in these facilities and surrounding areas to provide extra capacity so that the influx of users doesn't exhaust the network.

3.2 Another use case is cellular vehicle-to-everything (C-V2X) enabling communications between vehicles and between the car and infrastructure. Both capabilities are necessary for autonomous automobiles. 5G small cells can be used to build infrastructure that can handle massive communications needed for this application where human lives can be at stake.

3.3 In smart cities, 5G small cells can be attached to traffic posts or light posts to enable better coverage in metropolitan areas to ensure the network coverage is there with the necessary throughput for smart city initiatives, analytics and intelligence.

3.4 5G small cells can support residential or business network needs. In a smaller community of users, that doesn't justify the capital costs for a macrocell deployment, a 5G small cell is a great alternative. Placing a 5G small cell near residential buildings or homes, can ensure throughput is not degraded due to lack of coverage.

4. FUNCTIONAL AND TECHNICAL REQUIREMENTS

4.1 SMALL CELL HEIGHT CONSIDERATION

4.1.1 The Indian telecom network is witnessing introduction of Low Power Base Transceiver Station (LP-BTS) having Effective Radiated Isotropic Power (EIRP) limited to 100 W. These BTSs, also called micro BTS, are likely to be placed both indoors and outdoors and mounted on walls, rooftops, and on the various street furniture such as roadside electric/telecom poles, bus stop shelters, etc. Since such BTSs are small in size and radiate lower power vis-a-vis macro BTSs, they require different treatment from the point of view of compliance requirements for EMF exposure limits already laid down by the Department of Telecommunications (DoT). The audit requirement for these types of BTS is regulated as Simplified Assessment Criteria (SAC).

The cell site should comply with TEC standard TEC 13019:2021, as may be amended from time to time.

4.1.2 A format of the report to be filed for base station site based upon compliance by Simplified Assessment Procedure Criteria on TEC adoption of ITU-T Recommendation K.100 is placed at ***Appendix– F (1).***

4.1.3 Restriction on minimum height of lowest radiating part of Antenna and minimum distance to areas accessible to general public in the main lobe direction for Low Power Base Station (EIRP d”100 Watts) is placed at ***Appendix- F (2).***

4.2 TECHNICAL SPECIFICATIONS INCLUDING PHYSICAL DIMENSIONS, WEIGHT OF DIFFERENT CONFIGURATIONS

Typical configurations including weight, power consumption and dimensions are as given below:

4.3 RF FREQUENCIES OF OPERATION

Small cell facilities shall only transmit or receive frequencies that are licensed/ to be licensed by the Department of Telecommunications as defined by 3GPP

TYPE OF SMALL CELL	COVERAGE RADIUS	POWER CONSUM-PTION	TRANSMIT POWER PER CARRIER PER TRANSMIT PA	NUMBER OF USERS (APPROX.)	BACKHAUL TYPE	WEIGHT APPROX.	TEMP.
Indoor cells	10 – 50 m	50 – 100 W	100 – 250 mW	8 – 16	Wired, fiber	< 2 kg	+5 C to +40 C (indoor)
Pico cells	100 - 200 m	60 – 150 W	250 mW – 5 W	32 – 100	Wired, Fiber, Microwave	5 – 12 Kg	-40 C to +55 C (outdoor) +5 C to +40 C (indoor)
Micro cells	200 m – 1000 m	100 – 500 W	5W – 20W	200	Wired, fiber, Microwave	5 – 20 Kg	-40 to +55 C
Street micro	250 m – 2500 m	200 - 500 W	20W	200 – 400	Wired, fiber, Microwave	6 – 20 Kg	-40 to +55 C
High band mm wave	100 – 1000 m	200 – 500 W	Total EIRP: 53 – 62 dBm	32 – 200	Wired, fiber	6 – 15 Kg	-40 to +55 C
Base band unit	NA	50 – 400 W	Processing unit	Configurable	Wired, fiber, Microwave	5 – 20 Kg	0 – 55 degree

Source: Ericsson

[TS38.104], which are divided into the FR1 (sub-6 GHz) and FR2 (millimeter wave or mmW) bands.

4.4 BACKHAUL CONNECTIVITY – OFC, MICROWAVE ETC.

5G is expected to provide "4A- anytime, anywhere, anyone, anything" connectivity, which will take mobile data speeds to new limits and will support an immense increase in connections. However, a good 5G network cannot be expected unless a high capacity backhaul is in place.

Any of the following backhaul connectivity shall be available for Small Cell:

4.4.1 Optical Fiber: Today's backhaul relies either on optical fibre or microwave radio links. Fibre has limitless capacity but pulling fibre to every cell site is practically not feasible due to cost, time and logistical challenges.

4.4.2 Microwave: In comparison to fibre, microwaves are cheaper and scalable options and can be deployed quickly. Moreover, the capacity of microwave links has evolved gradually over the years to meet the demand of the new generations of networks. Throughputs of 1-10 Gbps in microwave backhaul are now a reality.

4.4.3 E & V Band Links: Conventionally, microwave backhaul has used frequencies from the range of 6GHz to 42GHz. Regulators world over are opening higher frequency bands, such as V-band (60GHz) and E-band (70/80GHz) to satisfy the high-capacity access and backhaul requirements of future networks.

4.4.4 Access Integrated Backbone (IAB): IAB is an important Rel-16 feature in 5G New Radio (NR) that enables rapid and cost-effective millimeter wave (mm Wave) deployments through self-backhauling in the same spectrum. Wireless self-backhauling uses the same wireless channel for coverage and backhaul connectivity to other base stations, which leads to greater performance, more efficient use of spectrum resources and lowers equipment costs, while also reducing the reliance on the availability of wired backhaul at each access node location.

4.5 RF PATTERN REQUIREMENTS

Directional or Omni-directional: A directional antenna, could be mounted atop or below the top of a street furniture structure, while an Omni-directional antenna, would preferably be on the top because Omni-directional antenna requires 360-degree radiation pattern in most cases so that there is no structural blockage of the RF emission.

Directional Antenna

Omini-directional Antenna

Source: WIA

4.6 POWER SUPPLY AND BATTERY BACKUP REQUIREMENTS

Street furniture assets to be used in a Small Cell network shall have power supply and it shall consume low power.

In addition to the conventional power supply system (A.C / D.C sources), the Small cell site shall have a fall back mechanism to work on battery backup (preferably Li-ion)/ suitable solar based power solution in the absence of conventional AC supply.

There shall be proper arrangements for cooling and heat dissipation requirements.

4.6.1 Both Radio and Baseband require DC -48V supply. Hence Battery and Power-plant will be required to convert from AC supply. Indoor/Outdoor Power Pack (PP) and Batteries (preferably Li-ion) shall be used as per site requirements.

4.7 WIND SPEED/ WIND LOAD

The street furniture as used for the placement of Small Cell, shall be able to withstand a predefined applicable wind velocity in that area under maximum permissible loading.

4.8 NOISE

The Small Cell site shall not create noise greater than 65 dBA measured at 25 feet from the device location[7].

5. DIFFERENT SCENARIOS OF SMALL CELL DEPLOYMENT ON STREET FURNITURE[1]

a) Small cell placed on streetlight

b) Radiocommunications equipment on street road gantry

c) Small cell on street road signage

d) Installation on Bus Shelter

6. RECOMMENDATIONS

Inputs from stakeholders are available at Annexure-A. Based on inputs and discussions/ deliberations, the following are the recommendations of the committee:

1. LOW POWER SMALL CELL SPECIFICATIONS

Minimum height of lowest radiating part of antenna & minimum distance to areas accessible to general public in the main lobe direction for Low Power BTS (LPBTS) shall be as per TEC specifications No.TEC 13019:2021 applicable for up to 100W.

The Simplified Assessment Procedure criteria based on ITU-T Recommendation K.100 (TEC Reference No.TEC 13019:2021) which defines antenna installation criteria such as mounting height, main lobe direction and distance to other ambient sources is available for frequencies from 400 MHz up to 2000 MHz only (EIRPd"100 Watts).

In order to accommodate higher EIRP and to include frequencies > 2GHz, the Simplified Assessment Procedure criteria needs to be considered for revision. While doing so, the units for EIRP in Annexure (F1) and Annexure - F (2) shall be maintained same to avoid confusion. However, such high EIRP small cells may require EMR testing / audit. "

The 5G Small Cells would come at higher frequencies and separate criteria is required for FR1 and FR2 Bands in view of the much higher path loss at higher frequencies. Due to this higher path loss, the EIRP required is higher while the actual received power is much lower in areas of public access.

2. ONE-TIME APPROVAL AND ONE-TIME PERMISSION

Municipal Corporations, PWD, Central agencies [DISCOMs, Ministry of Defense (Cantonment Board), MoCA (Airport Authority of India - Airports), Metro Authority (Metro Stations/Pillars), MoHUA, CPWD, Department of Post] need to provide approvals/ permissions in reasonable time period w.r.t. deployment of small cells. Also, there is a need for a bulk/one-time approval for the small cells by the agencies. All infrastructure owning agencies shall be required to have their web portal for processing online applications for small cell deployment cases and their disposal.

SOME STATES ALREADY HAVE ROW PORTALS. LSAs MAY COORDINATE WITH INFRASTRUCTURE PROVIDING AGENCIES IN THEIR AREAS AND HELP THEM TO DEVELOP THEIR WEB PORTALS OR USE STATES' ROW PORTALS, IF NOT DONE YET.

3. UNIFORM ROW RULES

There should be a uniform implementation of RoW rules across states, union territories and municipal bodies. The Indian Telegraph Right of Way Rules 2016, should be amended to incorporate provisions for small cells on Street Furniture on the following issues:

a) Applications must be acted on no later than 60 days for requests to collocate equipment and 90 days for other requests.

b) Fees must be publicly disclosed, competitively neutral, technology neutral, non-discriminatory and based on actual and direct costs (including, for example, costs for maintenance and inspections).

c) Permits must be approved or denied on publicly available criteria that are reasonable, objective, and non-discriminatory.

d) Small cell applications may be denied or regulated for objective and reasonable structural engineering standards, safety requirements or aesthetic or concealment requirements.

e) There is a need to look into a common power consumption bill for a large number of small cell sites which are going to be installed on street furniture. A lot of effort will be wasted if a bill is issued on a pole by pole basis.

f) Both street level and in-building requirements: Any policy w.r.t. small cell deployment should consider both street level and the in-building coverage and requirements.

g) Infrastructure sharing should be encouraged on an open access basis to all mobile network operators who are active in that location. This is similar to the Small-Cell-as-a-Service (ScaaS) cited by TRAI.

h) There is a need to bring all State EBs on common platform for uniformity in process.

i) The permission process has to be one time. ROW for Areal Fiber laying/ installation of small cells should done on a one-time basis by the concerned authorities across the complete city.

j) Load calculation cannot be done for every pole on which a small cell is to be deployed. It is suggested that power department needs to make a one-time calculation for each type of pole and come up with a model depending upon the

pole size/dimension and give approval.

k) To speed up the approval process, for site locations, where electricity authorities, metro rail corporations or other government organizations are permitting installations of small cells & telecom infrastructure, further permission from Municipal Corporation and local bodies need not be mandated.

l) There shall be Grid availability for electrical power supply by electricity boards for small cells.

m) RoW rules should allow Aerial Fiber on TSP owned poles and Energy Board (EB) poles.

n) RoW rules should do away with the collection of all charges/ minimize charges levied per KM.

o) DISCOMs should permit TSPs use of existing/upcoming EB Poles/Electricity Poles or install their own poles to carry out Aerial Fibre cabling.

4. MORE INITIATIVES REQUIRED BY DISCOMS

Initiative like one taken by the KSEB w.r.t. deployment of the small cells and the aerial fiber on their electricity poles need to be explored across the country with other DISCOMs as well.

Any state electricity board offering their infrastructure should consider the requirement of providing their assets in a manner that all licensees have an equal opportunity for installation of small cell infrastructure. For e.g., if the feasibility of the asset of an EB is only able to accommodate 1 TSPs, they should consider giving 1 out of 4 poles to each TSP, if there are 4 applicant TSPs.

SIMILAR PILOTS AS BEING DONE WITH KSEB ALSO NEED TO BE INITIATED WITH OTHER DISCOMS BY DIFFERENT LSAs.

5. IN-BUILDING COVERAGE AND CAPACITY

MOHUA has released recommendations on provisions for In-Building Solutions for Telecom Infrastructure as Addendum to Model Building Bye-Laws- 2016. The recommendations are given in **Annexure-A (V)**

GIS based Master Plan is being prepared under MoHUA which maps the alignment of utility poles. This will facilitate the location for installation of small cells. A number of

cities are now going for drone based mapping. It will help in quickly accessing where the small cell infra can be located.

6. POWER REQUIREMENTS

Power supply must be made available continuously for the small cells.There should be arrangements for providing backup supply provision at the street furniture sites.

Table at clause 4.2 shows the multiple small-cell deployment options along with Technical details like output power, tech supported, weight, power consumptions, etc. Actual power consumption depends upon the actual scenario & solution to be deployed.

Uninterrupted stable AC/DC power would be required along with power supply on poles for deployment of communication equipment.

For AC products: On- Line UPS is required with back up as per need of TSP.

For DC products: Power **solutions** with rectifier and Li ON battery with back-up as per need of TSP.

Typical weights in dimensions of different parts of power supply are as below:

	Weight	Dimension WxDxH in mm
Power Plant w/o rectifier	13Kg	447x395x128.7
Rectifier	3.9Kg	placed insde PP
Battery Bank	29.5Kg	447x395x128.7
DCDB	5.9Kg	447x395x128.7

Source: NOKIA

Typical 4-6 hrs. of power back-up has to be considered depending upon the EB availability & TSP requirements.

7. SECURITY ASPECT

Security aspects was also considered by the Committee as the theft of the Telecom Infrastructure i.e. batteries, cable, fibre etc. are quite prevalent.

Causing damage to telecom property may considered to be included under cognizable offense.

8. ACCESS AND BACKHAUL REQUIREMENTS

The committee recognizes the importance of the Access and Backhaul requirements for deployment of small cells for 5G services. And the committee noted the options that can be used for small cells i.e. Fiber and E & V band (fiber in the air). Early allocation of E & V bands to TSPs for access and backhaul purposes to augment capacities and improve site planning is recommended.

9. SACFA CLEARANCE

The requirement of SACFA clearance for LP-BTS small cells shall be as per the recommendation of the Committee constituted by Secretary (T) on simplification of SACFA Clearance process for small cells, placed at **Annexure-B**.

10. COMMON DUCT

Provisions for having common duct in the green field projects such as Greater Noida, Raipur etc. need to be ensured. All smart city projects can be mandated to have such features.

11. BROADBAND READINESS INDEX (BRI OF STATES/UTS

DoT may bring out an annual Broadband Readiness Index (BRI) report to promote competition amongst States/UTs to develop their digital infrastructure.

12. DESIGN OF NEW STREET INFRASTRUCTURE

Some of the Smart cities (Vizag, Bhopal), NDMC have been deploying well designed street furniture where in small cells installation has been facilitated/is in-built. It is recommended that all smart cities where it is planned to install new/replace old street infrastructure should ab- initio have these design to have plug and play capability to install small cell radios and power supply.

It is recommended that a Hackathon be conducted for the design of small cells and street furniture in the Indian environment. This may involve the Smart Cities also. A budget of INR 10 crores may be considered for this work.

13. KSEB ELECTRIC POLE

Pre-stressed Cement Concrete (PSC) poles are predominantly used for drawing the network. 9m poles with designed working load of 200 kg is used for HT lines and 8m poles with designed working load of 140 kg is widely used for drawing LT lines. KSEB is also procuring 8m poles with designed working load of 200 kg. Earlier 7 m poles were also used for constructing LT service lines, but mostly along private properties. 7m poles are not used since the last few years.

MINIMUM CLEARANCES REQUIRED:

a) Minimum ground clearance (distance from ground level to lowest conductor / cable) required is 3.05 m along the street and 5.8m across the street.

b) Minimum Clearance required between a communication cable and electric line / between an HT & LT line is 1.2m.

c) Minimum clearance required between two conductors is 30 cm.

d) In PSC poles, the top most cross arm (the structure where conductors are mounted) will be placed at 25 to 80 cm from top of the pole.

Effective Height at which the Top of Telecom Equipment can be installed

In normal case the available height on 8m pole will be 4.1m (if Double Circuit LT feeder is present) to 4.4m (LT single circuit; in 9m pole with single circuit HT & LT feeder, available height will be 4.2m)

Items	Airtel (Nokia HPSC)	JIO (AIRSPAN-Airspeed 1035)	VI (Nokia FWEA)	Worldshore Networks (WiFi AP –)
Pole type PSC	8m	8m	9m	8m
Lowest wire ^ GL	6m	6.5m	6m	6.2m
Height of Antenna	4.6m	5m	4.3m	4
Power of Small cell	20W/200W	79W/300W	5W/100W	10W/<100W (PoE)
Cell coverage	100m	250m	100m	70m
RRH +Eqp. Weight	14+14+2kg	10+40kg	3+10kg	1.5kg
FOS before loading SC	12.55	7.92	9.21	7.2
FOS after loading SC	6.05	4.42	4.62	4.98
Minimum FOS	2.5			
Compliance to DoT EMR	PD-3.097/1000	PD-13.98/1000	PD- 11.02/900	
Serving Band	2300 MHz	2300 MHz	1800 MHz	2.4GHz/5gHz
Communication cables	1-5 nos of optical fibre cables, 2-5 nos TV cables			

Proof of Concept (PoC) based upon the test results carried out by TSPs/OEMs in Kerala LSA

Pole height	Working Load of EC	Normal Height Available for SC	Req. Antenna Height in 5G- OEM	Req. Antenna Height in 5G for 250m coverage- TSP	3.5 GHz eqp. Weight in kg	26 GHz eqp. Weight in kg
9m PSC, HT	200Kg	4.2m	6-15m	9m	RU=12	RU=10
8m PSC, LT	140/200 Kg	4.1- 4.4m			BBU=10	BBU=10
7m PSC, LT	140 Kg				MW=5	MW=5
11m- 14m special cases	140/200 K				OFC=2	OFC=2
4m CCTV Poles	much less				PSU=40	PSU=40
3-9m SL Poles	much less				2-3 RU will be needed	2-3 RU will be needed
Power Requirement					Per Radio-100W, DU/BBU-300W	

Height, weight and power requirement for 5G small cell based upon the PoC carried out by TSPs/OEMs in Kerala LSA

Wind load aspect has not yet been decided by KSEB and is presently under consideration.

14. The smart cell equipment design has to match with the design of the poles so that it looks aesthetic.

15. GPS tracking of the small cell infra may be considered by TSPs in order to prevent theft.

16. Wind Speed/ Wing load: Pole/Street furniture should be able to support city as well as telecom standards in India, such as wind load, climate, aesthetic etc.

17. There should be a Standard Operating Procedure for Installation as well as carrying out Maintenance of the small sell equipment installed on the street furniture without causing disturbance to the other utilities already present.

18. OTHER GENERAL REQUIREMENTS

a) **AESTHETICS:** In all cases, the placement of small cells should be consistent with existing structures and aesthetics, in harmony with the surroundings, and as unobtrusive as possible. For example, in areas with decorative light poles, small cells on light poles must be consistent with the existing decorative light poles, calling for a design that is comparable in scale and incorporates the design characteristics of those poles.

b) **INTERNAL INSTALLS:** The camouflaging material (to cover RF equipment) should have RF transparency with minimum attenuation covering all the radio frequency bands available in India.The antenna shall be contained in a cantenna which a structural, weatherproof enclosure that protects an antenna, and any other equipment shall be contained in an equipment cabinet, unless the visual impact can otherwise be camouflaged by its location on the pole.

c) **EXTERNAL SHROUDING:** The antenna shall be contained in a cantenna and any other equipment shall be contained in an equipment cabinet, unless the visual impact can otherwise be reduced by its location on the pole.

d) **HARDWARE ATTACHMENT:** All hardware attachments should be hidden. Welding onto existing equipment is not permitted.

e) **COLOR:** All equipment should be painted to match pole aesthetics.The paint material (to cover the RF section) should comply with RF /Telecom requirements.

f) **CABLES:** All cables should be clearly labeled for future identification.

g) **CANTENNAS:** Cantenna must be mounted directly on top of the pole, unless a side arm installation is required by a pole owner.

7. FURTHER CHALLENGES

a) It is mentioned that 5G cells would require a DC power supply of 48V for which a battery system would also be installed along with each cell at base of the pole. Hence, LT supply to each 5G unit cell has to be provided by the local DISCOMs. The release of such a large number of power connections to all cells need the intervention of the respective state regulatory commission for billing purposes. The respective State commission would have to decide whether the collective load of all 5G cells in one area may be treated as one connection or each cell would be treated as a separate electricity connection.

b) In case DISCOMs take up the replacement of OH lines into UG cables in future, questions on the responsibility for relocation may arise. Further, responsibilities for damage/vandalism, if any of 5G cells would need to be delineated.

c) Stability issues such as Electric poles strength to bear the load as well as possibilities of toppling of the poles would depend on the overall offsets, weight and envelope of the 5G Cell infrastructure. Therefore, COAI may provide suitable envelope, max offsets and maximum weights possible so that the stability of poles can be adjusted.

d) It is suggested by Ministry of Power that a task force composed of officers of DOT, COAI and CEA may look into the matter of regulations and stability of electric poles comprehensively before decisions of installation of 5G Infrastructure are taken by the Ministry of Power.

e) It may be difficult to get permission for aerial cable in the NDMC area.

APPENDIX –F (1)

Compliance by Simplified Assessment Procedure Criteria based on TEC adoption of ITU-T Recommendation K.100. Simplified assessment procedures to be used for single transmitter are provided to identify a base station which is known to be in compliance with relevant exposure limits without the necessity of following the general or comprehensive exposure assessment processes. This is relevant, for example because of the low power transmitted or because of the position of the antennas of base station with respect to the public.

The simplified assessment procedures are based on knowledge of the equivalent isotropic radiated power (EIRP), and depending on the EIRP level, antenna installation characteristics such as mounting height, main lobe direction and distance to other ambient sources.

FORMAT FOR SIMPLIFIED ASSESSMENT PROCEDURE FOR SELF CERTIFICATION AS PER ITU-T RECOMMENDATION K.100

SITE DATA & TECHNICAL PARAMETERS
(Applicable only if no other Base Station within 5 * Dm)

Name of TSP :

Name of the Base Station :

Base Station ID :

SR. NO.	ITEM	UNITS	SITE DATA
1	Site ID		
2	Date of Commissioning		
3	Address		
4	Lat / Long (minimum 5 decimal places)	Deg	
5	Make and model of Antenna/Base Station		
6	System Technology (GSM/CDMA/UMTS/LTE-FDD/TDD)		
7	Base Channel Frequencies (BCCH) (GSM) / CPICH / PBCH and Center Frequency (UMTS/LTE)	(MHz)	
8	Max No. of Carriers in the sector (For GSM) / MIMO configuration (For LTE)		
9	Antenna Tilt	Deg	
10	Antenna Gain	dBi	
11	Tx Power	(dBm)	

SR. NO.	ITEM	UNITS	SITE DATA
12	EIRP	(dBm)	
13	Pole/wall Height	(m)	
14	Height of lowest part of radiating antenna(s) from public accessible area	(m)	
15	Computed value of Hm #	(m)	
16	Computed value of Dm #	(m)	

In case of EIRP > 2 Watts and d" 100 Watts, the Hm and Dm values as per Table in Appendix-F(2)

It is to certify that no other RF sources with EIRP above 100 W is located within a distance of 5 Dm metres in the main lobe direction.

Signature of authorized representative of TSP
Name, Designation and Date:

APPENDIX-F (2)

Restriction on minimum height of lowest radiating part of Antenna and minimum distance to areas accessible to general public in the main lobe direction for Low Power Base Station (EIRP <100 Watts).

Sr. No.	EIRP (in Watts)	Minimum Height(in metres) as per different Antenna Tilts in degrees				Minimum Distance (in metres) for publically accessible area in the main lobe direction	Minimum Distance (in metres) for other Emitters (≥ 10 Watts) in the main lobe direction
		0°	5°	10°	15°		
1	≤2	No specific criteria. According to [ITU-T K.52] emitters with a maximum EIRP of 2 W or less are inherently compliant					
2	≤10	2.5	2.7	2.8	3.0	1.9	9
3	≤20	2.8	3.0	3.2	3.4	2.6	13
4	≤30	2.9	3.2	3.5	3.7	3.2	16
5	≤40	3.1	3.4	3.7	4.0	3.7	19
6	≤50	3.2	3.5	3.9	4.2	4.2	21
7	≤60	3.3	3.7	4.1	4.4	4.6	23
8	≤70	3.4	3.8	4.2	4.6	4.9	25
9	≤80	3.5	4.0	4.4	4.8	5.3	26
10	≤90	3.6	4.1	4.5	4.9	5.6	28
11	≤100	3.7	4.2	4.7	5.1	5.9	29

For frequencies between 400 MHz and 2000 MHz:

$$H_m = \max\begin{cases} 2 + \sqrt{\dfrac{EIRP \cdot 2000\, A_{sl}}{f\pi}} \\ 2 + \sqrt{\dfrac{2000 \cdot EIRP}{f\pi}}\sin(\alpha + 1.1290_{bw}) \end{cases}$$

$$D_m = \sqrt{\frac{EIRP \cdot 2000}{f\pi}}$$

Where:

f	is the frequency, in megahertz, of operation of the Base Station.
Asl	is the side lobe suppression value
a	is the downtilt in radians (both electrical and mechanical)
qbw	is the vertical half power beamwidth in radians.

A realistic choice of parameters for sector-coverage antennas (qbw = p/12, a = p/12, and Asl = 0.05).

ANNEXURE-A

(I) COAI INPUTS ON SMALL CELLS

BACKGROUND

With the advent of 5G, there will be requirement to deploy Low Power Base Stations (LPBTS)[1] with 5G radios often called "small cells" due to network elements working on higher frequency spectrum bands, which have limited coverage. Considering the need for densification of the network, TRAI has identified various types of street furniture such as poles (- street lights, electricity, traffic lights), advertisement hoardings, bus shelters and towers as suitable national assets for deploying small cells. Some of Industry inputs on the Issue are as given below:

1) TYPE OF 5G SMALL CELLS - INTEGRATED EQPT/ DISTRIBUTED ANTENNA FOR SMALL CELLS:

a) Small cells provide a small radio footprint, which can range from 10 meters within urban and in-building locations to 2 km for a rural location.

b) Picocells and microcells can also have a range of a few hundred meters to a few kilometers, but they differ from femtocells in that they do not always have self-organizing and self-management capabilities.

Type of Small Cell	Coverage Radius	Indoor Outdoor	Transmit Power	Number of Users	Backhaul Type	Cost
Femtocells	30 - 165 ft 10 - 50 m	Indoor	100 mW 20 dBm	8 - 16	Wired, Fiber	Low
Picocells	330 - 820 ft 100 - 250 m	Indoor Outdoor	250 mW 24 dBm	32 - 64	Wired, Fiber	Low
Microcells	1600 - 8000 ft 500 - 2500 m	Outdoor	2000 - 5000 mW 33 - 37 dBm	200	Wired, Fiber, Microwave	Medium

Small cells are available for a wide range of air interfaces including GSM, CDMA2000, TD-SCDMA, W-CDMA, LTE, WiMax and 5G.

2) WHY SMALL CELLS

a) **Offloading:** The Macro site of the area is getting congested and is unable to serve the entire community of the area.

b) **Capacity used:** Shared Capacity: - The site serving the building/area is unable to meet the capacity of the part of the building/spot.

c) **Low Coverage of Signal**: Higher spectrum band.

d) **Indoor Coverage:** In building solution essential for indoor coverage including basement

3) TECHNICAL SPECIFICATIONS INCLUDING PHYSICAL DIMENSIONS, WEIGHT OF DIFFERENT CONFIGURATIONS

The key configurations including weight, power consumption and dimensions are as given below:

S No	Type	Output Power	Weight	Power consumption Typical	Power Supply	Dimensions	Temp
1	mm Wave	55dBm EIRP	10Kg	210W	85 - 265VAC -40.5 -57VDC	325x270x115MM	-40 to +55 C
2	Micro RRH	4x5 W - 4x20 W	6kg – 12 Kg	110W	80-276 VAC -40-57VDC	295X270X55MM 245X345X130MM	-40 to +55 C
3	Flexi Zone Micro	2 x 5 W	6kg - 7kg	84W - 125W	90-264VAC	247x327x120MM	-40 to +55 C
4	Flexi Zone Mini Macro Base band	2 x 20 W	12Kg	285 W	90-264VAC	220x380x162MM	-40 to +55 C
5	ASOE	NA	10Kg	200W	-48VDC	482.5x50x463MM	-40 to +55 C

Source: Nokia

4) BACKHAUL CONNECTIVITY – OFC, MICROWAVE, ETC

a) 5G is expected to provide "4A- anytime, anywhere, anyone, anything" connectivity, which will take mobile data speeds to new limits and will support an immense increase in connections. However, a good 5G network cannot be expected unless a high capacity backhaul is not in place.

b) **Optical fiber:** Today's backhaul relies either on optical fibre or microwave radio links. Fibre has limitless capacity but pulling fibre to every cell site is practically not feasible due to cost, time and logistical challenges.

c) **Microwave:** In comparison to fibre, microwave is cheaper, scalable option and can be deployed quickly. Moreover, capacity of microwave link has evolved gradually over the years to meet the demand of the new generations of networks. Throughputs of 1-10 Gbps in microwave backhaul are now a reality.

d) **E & V band:** Conventionally, microwave backhaul has used frequencies from the range of 6GHz to 42GHz. Regulators world over are opening higher frequency bands, such as V-band (60GHz) and E-band (70/80GHz) to satisfy the high-capacity backhaul requirements of future networks. According to Ericsson, E-band will satisfy the high-capacity demands of today's networks. Moreover, it will be suitable during the coming years when 5G is rolled out.

Thus, it is suggested that E & V band (which provides capacity akin to fiber in the air) should be allocated for the backhaul services for Small Cells.

5) HEIGHT & POWER FOR DIFFERENT FREQUENCY VIS A VIS COVERAGE – TSP REQUIREMENTS

Please refer to the height and power specification's issued by DoT pertaining to Low Power BTS. Link: *https://tec.gov.in/public/pdf/Whatsnew/Low%20Power%20BTS.pdf*

Further, following are some of the requirements highlighted by our member TSPs w.r.t deployment of the Small Cells on the Poles:

a) **HEIGHT:** At least 9-meter AGL (antenna height above ground level) is required to cover 250m cell radius of 5G coverage. But KSEB poles are having height from 9-12 meter. Also, adequate separation should be maintained between HT lines and the radio equipment.

b) **WEIGHT/DIMENSIONS:** One 5G Radio with Clip-on antenna weighs around 12 kg. This will require 2-3 Radios to cover a location. Additionally, one Baseband will be required at the base of the Tower which will be around 23 kg

ITEM	WIDTH(MM)	HEIGHT(MM)	DEPTH(MM)
5G Radio	245	295	110
Baseband	487	354	605

Baseband

5G Radio

c) **POWER:** Both Radio and Baseband require DC -48V supply. Hence Battery (2 Hrs backup, 150 AH/4*12V) and Power-plant will be required to convert from AC supply. PP and Batteries totally weighs around 30 kg. This can be mounted at base of Electric Pole

Per Radio Power: 200W, BBU Power: 300W

6) REGULATIONS FOR USE OF STREET FURNITURE / ELECTRIC POSTS – INTERNATIONAL PRACTICES

Internationally, a lot of work is being done to address the small cell deployment related issues and foster 5G development. Some of the best practices are as given below:

a) **HONG KONG**: As facilitating measures for 5G deployment, Office of the Communications Authority, Hong Kong, issued guidelines on the use of street furniture such as sheltered bus stops, public payphone kiosks and smart lampposts for installation of 5G Radio Base Stations in 2019-2020.

b) **JAPAN:** In Japan, operators are permitted to install 5G base stations on 208,000 traffic lights across the country. [2] Moreover, the Japanese government has proposed that the costs of using the traffic lights for 5G deployments be shared between operators and local administrations.

c) **EU:** In 2020, the EU Commission released its implementing regulation on small-area wireless access points. The Regulation provides for the following:

i) Specifies the physical and technical characteristics of small cells for 5G networks;
ii) Aims to help simplify and accelerate 5G network installations, which should be facilitated through a permit-exempt deployment regime, while ensuring that national authorities keep oversight.
iii) Lays out the specifications for a coherent and integrated installation, while providing national authorities with the means to oversee deployment of small cells.
iv) Provides that small antenna should be exempted from any individual town planning permit or other individual prior permits.
v) Allows for broader national measures in support of straightforward small cell deployment.

d) **EGYPT:** In Egypt, no building permits are required for small cell deployments. The only regulatory approval required after installation is the measurement of RF exposure. This occurs only once for the lifetime of the site whereas for a macro cell inspections are conducted at least every two years.

e) **SINGAPORE:** The Singapore regulator Infocomm Media Development Authority (IMDA) provides a Code of Practice for Info-communication Facilities in Buildings (COPIF) specifying the duties of building owners and developers to provide adequate space, facilities, and access for telecom licensees to provide their services. These are typically a) the rooftop spaces reserved for telecom equipment to be provided to network operators by building developers and owners at no additional cost.

f) **UK:** The UK's Electronic Communications Code facilitates operators' access to macro and small cell infrastructure on public and private land.

g) **AUSTRALIA:** In Australia, the Australian Communications and Media Authority (ACMA) and the Department of Communications have put policies to facilitate small cell deployments including reductions in planning requirements for small cell deployments in the public space, and the removal of barriers between license types to facilitate the re-allocation of incumbent spectrum holders.

h) **UNITED STATES OF AMERICA:** In 2018, the FCC issued guidelines which covers fees, aesthetics, and shot clocks requirements etc. Under this state/local fees were rationalized and state and local governments have 60 days to decide applications for existing infrastructure and 90 days for all other small cell wireless applications.

7) DEPLOYMENT OF AERIAL FIBER:

a) WHY AERIAL?

i) Cost-effective solution in rural or low-density areas.

ii) Ground may be undulating, rocky or both, making burying cable more difficult.

iii) Aerial cable is typically faster and less expensive to deploy than digging Environment challenges like lack of an underground telecom duct network.

iv) Enables the re-use of existing poles, which helps to reduce installation costs and speeds up deployments.

b) KEY AERIAL FIBER DEPLOYMENT CONSIDERATION

i) To make an amendment in the existing State RoW rules to include Aerial Fiber on TSP owned poles and Energy Board (EB) poles.

ii) Do away with the collection of all charges/ minimize charges levied per KM.

iii) To issue necessary directions to DISCOMs to permit TSPs use of existing/ upcoming EB Poles/Electricity Poles or install their own' poles to carry OFC/ Aerial cabling

iv) To rationalize the charges for laying of Aerial OFC as INR 100/- per pole per annum in Urban areas and INR 50/- per pole per annum in Rural areas.

8) ENSURING COMPLIANCE WITH EMR GUIDELINES CONSERVATIVE RF-EMF EXPOSURE LIMITS

The requirement for compliance assessment of small cells in terms of RF-EMF exposure limits may present one of the most significant barriers for rapid and sustainable network densification. This is due to the relatively larger number of small cell sites (both outdoor

and indoor) that may need to undergo the assessment.Typically, small cells have a relatively small coverage footprint and operate with aggressive interference management and energy saving mechanisms (e.g. putting idle small cells to sleep). All these factors mean that small cells usually operate well below their peak transmit powers. Therefore, RM-EMF compliance boundaries typically evaluated based on peak transmit powers create overly conservative RF-EMF limits that constrain the density of small cell deployments. For facilitating the network densification, we suggest that the EMF exposure levels recently reviewed and issued by ICNIRP in 2020 be adopted in India.

9) CHALLENGES W.R.T DEPLOYMENT OF SMALL CELLS

Operational and Technical Challenges

a) There should be adequate separation between electric HT lines and radio equipment to avoid magnetic interference.This can lower the AGL requirement

b) Maintenance of radio at tower top will be difficult due to the danger of HT electric lines

c) Batteries are prone to theft as its exposed to public roads

d) Poles cannot be shared with multiple operators due to the loading requirements

RoW related Rules

a) The present rules on right of way are silent on small cell deployment and access to street furniture.

b) Lack of availability of backhaul.There is a shortage of adequate backhaul and at reasonable costs which throws up significant challenges in deployment.

c) Lack of electrical power supply. Permits from electricity boards are a challenge. Additionally, street furniture needs power back-ups.

d) Non-uniform implementation of RoW rules by states and municipal bodies.The RoW rules have yet to be implemented by all states, union territories and municipal bodies. Many of them continue to impose their own costs and approval frameworks which are on the higher side.

e) High RoW Related Charges for using the Street Furniture, deployment of Small cells and fibre. High restoration Charges

f) Challenging to get access to adequate street furniture for deployment.

g) Online Portal is yet not available in all the States, leading to delays.

h) Restrictions on installation of towers/Small cells near educational institutes, hospitals, airports, Defense establishments, religious places etc.

i) Lack of support from enforcement agencies like police dept. in dealing with public issues including EMF exposure concerns.

j) Permissions from several authorities including electricity, gas, sewerage, Railways, NHAI, forest authority causing delays and cost inefficiencies.

k) Permission/ approvals are kept pending, which can result in coercive action like demolition/ sealing.

l) Many States still not having enabling provisions for using the Street Furniture such as EB/LT Poles, Street Light Poles etc.

10) INDUSTRY SUGGESTIONS

To conclude, the following suggestions may be considered in light of the above discussions, to facilitate deployment of small cells in India:

a) Adopting simplified and streamlined procedures for building/street furniture permits for small cells based on size, installation requirements and radio characteristics.

b) Updating the Right of Way Rules, 2016 to include deployment of small cells.

c) Ensuring uniform implementation of the Right of Way Rules, 2016 by all the states and union territories by all street assets owning entities/authorities, local bodies, PSUs.

d) Reducing admin and other Charges for small cells deployment and for laying the OFC.

e) Designing guidelines to facilitate the acquisition of new sites and greater transparency on available assets such as towers, buildings and other structures.

f) Granting easy access and one-time permission to existing street furniture assets such as traffic lights, bus stops, street lamps, EB Power supply etc.

g) State electricity boards /distribution companies to ease permits for usage of their poles for deployment.

h) There should be close to Zero Month Rental for any Govt Infrastructure, Street Poles, Municipality Roof top, Govt Offices Roof Top, Police Stations Roof Tops etc.

i) Exempting small cell installations from location registration requirements unless necessary for other reasons.

j) Implementing uniformity in grant of access to public spaces/ structures for installing small cells across state and the local bodies.

k) Facilitating deployment of backhaul and at lower costs.

l) Ensuring access to spectrum and provision of adequate spectrum bands for backhaul with wider channel sizes in millimeter wave (e.g. E & V Band) to augment capacities and improve site planning.

We would hereby like to provide some of the key Documents for the consideration of the Committee:

i) Ericsson site Solutions for Network Densification.

ii) Ramboll Tower Camouflage Solutions

iii) Nokia Small Cell Deployment Solution

iv) Note on Policy Support Requirements for Small Cell Deployments for Broadband Network by Cell Densification Using Existing Street Furniture

v) Paper on The Role of Street Furniture in Expanding Mobile Broadband

vi) Small Cell Infrastructure Guidelines - Best Practices

vii) Small Cell Forum Forecast – 2021

FURTHER SUGGESTIONS FROM COAI

a) There is a need to have clarity in the definition under which category of BTSs will "small cells" fall. Currently as per regulatory provisions there are three types of BTS:-

i) Inherently compliant: BTS which are EIRP<=2W and no reporting is required.

ii) Low Power BTS (LPBTS):Those which have EIRP > 2 W till 100W and compliance is to be done as per SAC (Simplified Assessment Criterion): Small Cells will mostly fall under this segment.

iii) BTS:The normal BTSs

b) NW DENSIFICATION TO BE TECHNOLOGY NEUTRAL: Suggestion for Correction in Convening Order.The convening order says,"Small cells in 5G to facilitate a standard approach for the proliferation of Dense Small Cell Infrastructure".The Small cells for densification of NW will be technology neutral and it will be a mix of technologies - 4G and 5G. We should not convey that the small cells are restricted to 5G technology.This will help preclude any other interpretation at a later stage.There will be no "standard approach" for deployment, this will be market and demand driven. We can recommend measures to facilitate and catalyze the pace of network densification.

c) **INDOORS AND OUTDOOR DEPLOYMENTS:** The deployment of small cells will be done both outdoors and indoors. In outdoors the physical assets of existing street furniture should be made available for use in a convenient manner. Similarly, suitable measures for making places inside buildings, shopping arcades/mall, airport terminals, bus terminals, cinema houses etc be made available. Consider rating of buildings for broadband coverage, like BEE ratings for energy. This will encourage indoor deployments and encouraging market forces to assess buildings for digital facilities.

d) **CONDUCT OF HACKATHON FOR DESIGN OF SMALL CELL AND MODERN STREET FURNITURE:** Suggest that Hackathon be conducted for the design of small cells and street furniture for the design of these in the Indian environment. This may involve the Smart Cities also. A budget of INR 10 crores be proposed for this.

e) **Measuring Effectiveness of NW Densification:** Home grown apps like TRAI Analytical Apps may be used for measuring and reporting the effectiveness of measures taken with an emphasis on Smart Cities on a periodical basis.

f) ICNIRP 2020 Guidelines need to be adopted: As per GSMA policy Review Globally, 137 countries apply the international limit (ICNIRP 1998 or ICNIRP 2020).

The GSMA Report on "Paving the way for 5G readiness in India: A guide for effective policymaking on small cell deployment is a good resource for Policy planning. This is available at https://www.gsma.com/asia-pacific/latest-resources/

(II) DIPA INPUTS ON SMALL CELLS

SMALL CELLS: A Small Cell is a miniature Radio Access Point (AP) or wireless Base Station with a low radio frequency (RF) power output, footprint and range that helps in improving boosting coverage in various areas.

With 5G focusing on not just enhanced speed and capacity but also on ultra-low latency, Small Cells will help efficiently enable the same in hyper dense areas and as per the application requirements providing scalability at low cost. While the Macro Cell towers transmit strong signals across large distances, small cells will boost coverage in densely developed environments.This approach will help deliver enhanced end-user experiences by strengthening data transfer speeds and negating the need for devices to compete for bandwidth.

TYPES OF DEPLOYMENT

Indoor

i) Short range Small Cells for Indoor Residential use

ii) Basements and In-Building Solution in Private Networks

Outdoor

i) Street Furniture like light poles, streetlights, bus stops, billboards, and water towers

ii) Flyover and Metro Pillars

iii) Smart Poles

5G & SMALL CELLS

i) There were 99 countries and 14,643 cities worldwide with 5G deployments at the end of Q3 2020.The US had the most cities with 5G deployments at the end of Q3 2020 with 7,583.

ii) 5G networks offer the potential to transform industrial sectors and deliver significant social and economic benefits in India.

iii) Over the period 2023–2040, it is forecasted that 5G technologies will make an overall contribution of approx. $450 billion to the Indian economy (0.6% of GDP by 2040).

iv) The manufacturing sector is set to benefit the most from 5G applications (accounting for 20% of the total benefit), followed by retail (12%) and ICT (11%).

v) 5G enabled digitalization revenue potential in India will be above USD 27 billion by 2026.

vi) Global small cell market is expected to reach a valuation of around $3,495 million by 2025, recording a compound annual growth rate (CAGR) of over 37.2 per cent between 2019 and 2025.

vii) Number of indoor small cell deployments is expected to reach 5.6 million globally by 2025, significantly higher than outdoor small cell deployments, which are expected to reach 2.76 million during the same period.

BENEFITS OF DEPLOYING SMALLS CELLS FOR 5G CONNECTIVITY

i) With 5G coming with a highly promising speed and data rate and 100X increase in site capacities not being feasible, the coverage of the Base Stations and the possible distance travelled by the signal will be reduced highly effecting the reach of the network. Smalls Cells will improve coverage in high density and low signal areas insuring network connectivity everywhere.

ii) With eMBB and mMTC capabilities built-in, 5G small cells can connect a large number of devices on a single private network, meeting capacity demands for wireless connectivity.

iii) Enhancing the coverage in various areas and as per case requirements, Small Cells will support a higher number of users simultaneously facilitating a low-cost deployment.

iv) Coverage through Small Cells can be managed as per requirements. Customized coverage can be established for private networks as needed by deploying small cells accordingly.

v) Unlike Wi-Fi access points, 5G small cells are built on 3GPP mobile technology, ensuring seamless hand-off between small cells with no connectivity loss.

vi) Deploying their own private network with 5G small cells, private enterprises are able to keep all data on the premise rather than sending it through a public network or cloud.

vii) 5G small cells can be deployed in licensed, shared, unlicensed or locally licensed spectrum, providing enterprises with a variety of deployment options for their private network.

viii) Due to their low power operation capability, the Small Cells will require less power for their functions.

ix) Being small in size, Small Cells are easy to install and handle.

BENEFITS OF USING ELECTRICITY POLES FOR 5G

Street furniture refers to objects in public spaces that can house small-cell units in boxes and are considered visually commonplace and acceptable to the public with a power source for the wireless equipment to function.

i) Usage of Public Infrastructure like Electricity Poles for Aerial OFC

ii) Street Furniture providing power backup and coverage

With the cost of deployment rising every day, Small Cell deployment on Electricity Poles tends to provide various benefits.

i) Better Quality of Services (QoS)

ii) Expanding network coverage

iii) Going closer to the consumers

iv) Access at reasonable cost would increase cost savings

v) Smoothen 5G rollout by reducing a major hurdle

SMALL CELL DEPLOYMENT – CURRENT SCENARIO

i) TSP/IPs develop the light weight infrastructure capable of handling 1T deployments

ii) Limited ROW availability for deployment of small cells and aerial fibre on street furniture (utilities/street light poles)

iii) Majority of DISCOMs and municipal bodies are reluctant to lease poles (public infrastructure) for Small Cell and Aerial OFC deployment

iv) TSPs/IPs acquire the right of usage of street furniture from concerned authorities (wherever allowed) and upgrade the infrastructure to support small cells.

DEPLOYMENTS ACROSS INDIA

ISSUES IN USING ELECTRICITY POLES FOR SMALL CELL DEPLOYMENT

Being the optimal solution for 5G coverage for various cases, Small Cells face certain bottlenecks as well that will need to be managed to maintain network quality and connectivity at all times. Some of the issues at hand here are as follows:

- Permission from DISCOMs and Municipal Bodies
- RoW Policy streamlining at State/UT levels
- Need of LT EB connection at utility poles for powering up small cells
- Resistance from DISCOMs in allowing use of electric poles
- Limited Height availability to deploy Small Cell and Aerial OFC
- Regularization and uniformity of high rental demands
- Restrictions imposed by Resident Welfare Associations (RWAs)

GLOBAL BEST PRACTICES

UNITED STATES OF AMERICA

"Shot Clock" Order: Deemed approval provision for all 5G Infra including Small Cells": 60-day shot clock during which an application must be addressed ensuring the efficient

use of previously approved structures to support new antennas and technology upgrades. If not addressed within 60 days, application is deemed granted.

Review Exemptions – No Artificial Restrictions Regarding Land etc: All small cell installations have had to be reviewed under both the National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA), which were devised for large towers. FCC order exempts most small cells from NEPA and NHPA review.

Small Cell Order – Rationalization of Fee and Timelines: Designed to remove various state and local barriers that would prevent 5G providers from accessing existing facilities for installation of small cells. Limit the fees imposed for accessing public ROW and shortened timelines for approving permit applications.

OTMR Order - One-Touch Make-Ready Provision for Fast Deployment

OTMR process gives an entity seeking to attach to a utility pole the choice

- Perform all work necessary to prepare the pole for its facilities
- Follow the current practice where each attacher performs the necessary make-ready work on its own facilities
- Developed a "5G FAST" plan to make auctioning high-band spectrum a priority

SINGAPORE

Easy access to various locations for the deployment of small cells

- Issue - Access to commercial and non-commercial locations for the deployment of small cells
- Rationalization of High cost of Small Cell deployment due to large scale deployment coupled with spectrum constraints in the initial years of 5G deployment
- Policy - Code of Practice for Info-communications Facilities in Buildings ("COPIF")
- Objective - Provide for the use of space and facilities in buildings and tunnels for 5G infrastructure deployment.
  a) Has required "mobile
  b) Installation spaces"— typically rooftop spaces reserved for telecommunication equipment be provided to network operators by building developers and owners free of charge.

GERMANY

DigiNetz Act - Legal provision to promote Public Infrastructure sharing

- Increased use of the possibilities of co-use of passive infrastructures

- Co-use of public supply infrastructures for fibre optics
- Co-deployment of fibre optics within the framework of public road construction schemes
- Use of public carrier infrastructures to install micro or pico cells

Other Reforms - Ease of doing business

- Standardized licensing procedures for the timely provision of these infrastructures with the municipal authorities
- Technical security requirements for using these carrier structures to be defined in the working group of the Federal Government and the federal states
- Optimizing approval and decision-making processes at the local authority and Federal Network Agency

COLUMBIA

Cross Sector Infrastructure Sharing

- Infrastructure sharing between different sectors is a permitted practice through Article 22 of Law 1341 of 2009.
- Commission for the Regulation of Communications (CRC) regulates the conditions through which infrastructure of other sectors can be used in communication services.

MEXICO

Right of Way (Regulatory provisions for facilitating Small Cell deployment)

The Energy Regulatory Commission issues the necessary provisions to allow access to the facilities and rights of way pertaining to the national electric system to public service providers acting in other industries, such as telecommunication services.

STAKEHOLDER DEPARTMENT/AUTHORITY OWNING RESPECTIVE STREET FURNITURE/ ALIGNMENT

- DISCOMs - Electricity Department
- Ministry of Defence, Cantonment Board – Cantonment Area
- MoCA, Airport Authority of India - Airports
- MAHUA, respective Metro Authority – Metro Stations/Pillars
- MAHUA, PWD/CPWD - Street Poles/Lights
- Department of Post - Post Office

(III) MINISTRY OF POWER INPUTS

a) The required clearances of the cell from power lines for signal interference to be provided and should be as per CEA Safety regulations.

b) It is mentioned that 5G cells would require a DC power supply of 48V for which a battery system would also be installed along with each cell at base of the pole. Hence, LT supply to each 5G unit cell has to be provided by the local DISCOMs. The release of such a large number of power connections to all cells need the intervention of the respective state regulatory commission for billing purposes. The respective State commission would have to decide whether the collective load of all 5G cells in one area may be treated as one connection or each cell would be treated as a separate electricity connection.

c) In case DISCOMs take up the replacement of OH lines into UG cables in future, questions on the responsibility for relocation may arise. Further, responsibilities for damage/vandalism, if any of 5G cells would need to be delineated.

d) Stability issues such as Electric poles strength to bear the load as well as possibilities of toppling of the poles would depend on the overall offsets, weight and envelope of the 5G Cell infrastructure. Therefore, DOT and COAI may have to provide suitable envelope, max offsets and maximum weights possible so that the stability of poles can be adjusted.

e) It is suggested that a task force composed of Officials of DOT, COAI and CEA may look into the matter of Regulations and stability of electric poles comprehensively before decisions of installation of 5G Infrastructure are taken by the Ministry of Power.

(IV) CENTRAL ELECTRICITY AUTHORITY, MINISTRY OF POWER INPUTS ON THE VARIOUS STANDARDS TYPES OF ELECTRICAL POLES SUCH AS METAL, PRE-FAB, CEMENT ETC ALONG WITH DIMENSIONS AND LOAD BEARING SPECIFICATIONS

ELECTRIC POLES IN DISTRIBUTION SECTOR

There are different types of poles used in the distribution system depending on the voltage, load bearing capacity, location, cost, importance of load including maintenance cost in mind.The pole may be:

a) Wooden,

b) PCC pole,

c) Reinforced concrete poles,

d) Rail pole/ H beam

e) Steel tubular pole,

f) Fabricated steel structure etc.

The design of the pole may be H-beam, I-beam, spun type or tube type depending upon the requirement.

WOODEN POLE

The wooden poles were used in earlier times and now a days are not used generally by Discoms in India. If proper maintenance and treatment are done on the wood, the wooden pole last for a long period.The major disadvantage is their low strength, increased risk of fires, areas of high concentration of bugs, which decrease the durability of the material. Therefore, wooden poles are rarely used now.

Wooden poles are classified into seven different classes based on breaking load capacity (Refer table 3 of IS 5613 part 1 sec 1).The dimension of poles shall be as per table 1 of IS 876:1992.

CONCRETE POLE: There are two types of concrete poles:

i) PCC Poles- Plain Cement Concrete

ii) RCC Poles- Reinforced Cement Concrete

PCC POLES

At present PCC poles are used in 11 KV and LT lines to a large scale.These type of poles are costlier than a wooden pole but cheaper than a steel pole.This kind of poles have a

longer life and the maintenance cost is negligible.The strength of the PCC Pole is much more than that of a wooden pole but less than that of a steel pole.The only disadvantages of this pole are, it is very heavy and breakable.

The design and Dimension of PCC poles used for overhead lines shall be as given in IS 1678-1978.The minimum overall length of poles shall be 6m and subsequent length shall be steps of 0.5m.

RCC POLES

In this type of poles, rods are used to increase the strength of the pole. The tensile strength of the pole is high.These type of poles are used up to 33 kV.These are mostly used at diversions, endpoints and start points.The cost of the RCC pole is more compared to the PCC pole.

The strength and Dimension of RCC pole shall be as given in IS 785-1964. Length of these poles vary from 6m to 9m.

RAIL POLES

Rail pole has high mechanical strength; therefore, the life span of the rail pole is more.The weight of the rail pole is more, therefore the cost of transportation, loading and unloading are more.This type of poles can be used up to 33 kV.The cost of rail pole is high and the installation cost is also more. The length may vary from 9 to 12 m. Rail pole used in overhead line are of generally four sizes:

i) 30 kg per metre
ii) 37 kg per metre
iii) 45 kg per metre
iv) 52 kg per metre

STEEL TUBULAR POLES

The load bearing capacity is much more in steel tubular pole in comparison to that of concrete or rail pole. If proper maintenance is done, these poles last for longer period. Length of these poles vary from 9m to 16m.These poles are of different sizes for bearing different load capacities.These are of two types:

a) **STEPPED POLE:** Stepped pole are made from one length of tube, seamless or welded, the diameter being reduced in parallel steps by passing the tubes through series of dies.

b) **SWAGGED POLE:** Swaged poles shall be made of seamless or welded tubes of suitable lengths swaged and joined together. No circumferential joints shall be permitted

in the individual tube lengths of the poles. If welded tubes are used, they shall have one longitudinal weld seam only; and the longitudinal welds shall be staggered at each swaged joint.

The specification of the above poles shall be as per IS 2713 Part I.

Further, based on the strength of poles, there are two types of poles i.e. poles made of high strength steel only (tensile strength 540 MPa or 55 kgf/mm2) and poles made of mild steel (tensile strength 410 MPa or 42 kgf/mm2). The overall length may vary from 7m to 16m.

The dimensions and load bearing capacity of 410 MPa tensile strength pole is as per table 1 & 2 of IS 2713 Part II and tensile strength 540 MPa pole is as per table 1 & 2 of IS 2713 Part III. The overall length may vary from 7m to 16m.

FABRICATED STEEL STRUCTURE

The factor of safety of the fabricated steel structure is equivalent or better than that of steel tubular poles. Pieces of steel are put together to form different structures that are usually of predefined sizes and shapes depending upon the requirement.

Table: Type of pole, load bearing capacity and dimension

S. No.	Type of Pole	Load Bearing Capacity	Dimensions
1	Wooden Pole	Classified into Seven different classes as per table 3 of IS 5613-1-1 and IS 876.	Length may vary from 6 to 14m. Other Design parameters as per Table 1 of IS 876-1992.
2	RCC Poles	As per design	Length may vary from 6-9m. Design parameters shall be as per IS 785-1998.
3	PCC Poles	As per design parameters shall be as per IS 1678-1978	Length may vary from 6 to 17m. Design
4	Steel Tubular Poles	Based on tensile strength of steel, it comes in two category 410MPa and 540MPa. Load bearing capacity of 410 MPa tensile strength pole is as per table 1 & 2 of IS 2713 Part II and tensile strength of 540 MPa pole is as per table 1 & 2 of IS 2713 Part III.	Length may vary from 7m to 16m. Design parameters shall be as per IS 2713 part 2 & 3.
5	Rail Poles	Comes in four category based on strength of steel.	The length may vary from 9 to 12 m.
6	Fabricated steel structure	As per design	As per design

(V) MOHUA INPUTS ON IN BUILDING SOLUTIONS FOR SMALL CELLS

1. Introduction: Communication System

Data growth is exploding globally and in India as per Nokia MBiT 2021 Report, the average monthly data usage per user in India has increased almost 17 times over the past 5 years. Covid 19 has further pushed data consumption with people staying indoors. Government has facilitated Work from Home (WFH) guidelines with a Work from Anywhere (within India) permitted. Home consumption of data has therefore grown exponentially through 2020. According to the Tower and Infrastructure Providers Association, almost 85% data traffic and 70% voice traffic is now generated indoors.

The World Bank has clearly demonstrated that every 10% increase in broadband penetration leads to nearly 1.40% increase in GDP growth rate. While that is a global average, even the India specific study by the reputed quasi-Government research agency, ICRIER, has shown that every 10% increase in internet traffic delivers 3.1% increase in GDP per capita and a 10% increase in investment in Telecom Infrastructure will increase GDP by 3.3% The entire consumer pull today is focused on data and broadband now with the new digital services providing voice services free with the data services. Video and app-based services are driving the demand for broadband with Apps for e-commerce, e-healthcare etc. in everyday use. It is very clear that internet traffic and Apps are contributing to GDP growth and for this to grow even further, conventional connectivity needs to be replaced with duct-sharing and fibre especially, which is an essential requirement In-Building as much as it is for FTTx and Tower Fiberization.

{Note - "Service Provider": an agency that provides any type of telecom / IT services in a building complex, as per scope defined by DOT i.e. TSP / ISP / IP1 etc.}

A broad variety of Information Communication Technology (ICT) systems are expected to be installed in buildings. In order to facilitate proper cabling and installation /up gradation of ICT systems and their cost effectiveness and maintenance, adequate physical infrastructure is required within buildings. This infrastructure will include common ducts, cable riser systems, conduits, cable trays and utility closets etc. among other things. The same can also be retrofitted into existing buildings wherever possible and feasible and must be designed in all new, re-developed and renovated structures. This section describes the general and specific requirements of such an ICT infrastructure in Building specially in respect of cabling aspects.

Communication systems are general utility in much the same way as water, power, gas, cable TV & CCTV/Security. Unlike traditional communication systems which are constantly evolving, the recommended Digital infrastructure has to be designed to be flexible enough

to accommodate a variety of ICT systems and emerging technologies and be future proof for the next 25-30 years. Space and power is required for installation of common ducts, optical fibre, small cells, antennas, smart sensors etc, space, power and earthing is required for electronic equipment installation for supporting the various digital technologies of now and the future. Most communication utilities can share the same space since the physical topology and wiring requirements are similar and no significant power is present in the cables. However, in some cases state-of-the – art communication cabling or equipment will involve new or more specific requirements for utility spaces such as:

- Cable routing layout and cable length restrictions between Work-Space and utility closet.
- Bending radius and working clearance requirements for different cable types, e.g. Fiber optic cables, Cat-6 Cables and co-axial cables
- Isolated power circuits for permanent communication equipment,
- Protection, Safety, Grounding and environmental requirements of communication equipment.

2. Emerging Technologies in Telecommunication Services

The technologies used for telecommunications have changed greatly and over the past few years and particularly during the pandemic, India has experienced a massive surge in indoor voice and data consumption. According to the Tower and Infrastructure Providers Association, almost 85% data traffic and 70% voice traffic is now generated indoors. Telecommunication network architecture is changing to meet new requirements for a number of services/applications viz. 5G, massive Internet of things, Artificial Intelligence etc.

Choosing efficient and cost-effective and fast-deployment technologies such as wired and wireless networks will improve accessibility. Based on type of building and profile of customers in the buildings, the needs of wired and wireless may vary. Further, the architecture of the information and communication infrastructure is changing to accommodate the requirements of a growing number of ICT-enabled services/applications (broadband, IP, mobile, multimedia, surveillance, IoT etc.)

In line with the changing market needs, the Digital Service Providers (TSPs)/ISPs/IP-1'shave been scaling up the deployment of in-building solutions (IBS) and FTTx, covering active and/or passive infrastructure. Further, industry stakeholders are putting greater emphasis on sharing in-building infrastructure to save opex and capex, as well as to avoid the duplication of infrastructure deployment.

Moving forward, the humungous growth of data traffic riding on the use of the digital infrastructure during the pandemic and with the new WFH (Work-from-Home) and work-

from-anywhere paradigms and with the emergence of 5G are expected to create huge opportunities for extension of ubiquitous, reliable and high speed digital infrastructure into the homes and inside residential buildings, and lead to huge growth of shared in-Building Solutions sites.

Theoretically, wireless services can be provided from outside the building. However, there are appreciable losses in signal strength when it penetrates building walls. While all wireless services can suffer from poor in-building coverage, this problem is particularly pronounced for the high-speed services. These services require a much better signal quality than their voice counterpart. Therefore, in order to improve in-building coverage and to offer better-quality high-speed data services, there is a definite need to install in- building solutions (IBS) for augmenting the wireless-based voice and data services. This is equally true for installing 5G and WiFi hotspots along with Fibre to x(FTTX) distribution network of Fiber and Cat-6 Cables for seamless data connectivity.

Provisioning of telecom services and broadcasting services viz Cable TV, DTH and Security Services viz. CCTV Cameras and futuristic services viz IoT based sensors would require suitable wireline connectivity inside the buildings inside buildings are not confined to wireless medium only. Wireline services through cables such as copper cables, optical fibre cables (OFC), LAN Cat-6 cables are also equally important for having uninterrupted connectivity. Also, for services such as Cable TV, DTH and Smart Devices Solutions (IoT), suitable cabling within building premises is a pre- requisite and for that, shared duct space across the building riser and floors is critical to achieve the flexibility in the future.

Improved IBS coverage MNOs / Network operators should be allowed to install such appropriate instruments as provided by licensor/ Regulator from time to time.

3. Policy Efforts

The proliferation of in-building connectivity has become a key component of government policies. The National Digital Communications Policy, 2018 proposes to make the installation of telecom infrastructure and associated cabling and in-building solutions mandatory in all commercial, residential and official buildings (including government buildings) by amending the National Building Code of India with the help of the Bureau of Indian Standards.

The Government has been taking a number of steps for promoting the sharing of in-building infrastructure, in line with TRAI recommendations.

a. In October 2019, the Digital Communications Commission (DCC) approved in-building access and sharing of infrastructure among TSPs, thereby allowing them to share infrastructure and, in the process, curbing TSPs' monopoly to install infrastructure through exclusive contracts with the owners/builders.

b. In November 2019, the Department of Telecommunications issued an advisory to encourage all TSPs/IP-1s to share their in-building infrastructure such as systems, optical fibre, other cables, ducts and boosters on government premises and other public places such as airports, railway stations, bus terminals and hospitals.

The government's policy and regulatory push coupled with the everexpanding data usage has propelled TSPs/IP-1s to scale up the deployment of IBS. There is an urgent requirement to allow TSPs/IP-1s to own active built and manage active infrastructure in addition to passive infrastructure to help them cater to the ever-increasing data demand.

Bureau of Indian Standards (BIS) has framed National Building Code of India under which provision of Common Telecom Infrastructure (CTI) housed inside the buildings for convenient provision of telecom services has been envisaged.

Making cities smarter: Ministry of Housing and Urban Affairs led Smart Cities Mission is another key driver that is encouraging the adoption of in-building solutions (IBS) and FTTx/IP networks covering Fiber and LAN cables. Since, the success of the mission relies on the underlying digital communications infrastructure, the cities identified under this programme have mandated to install common infrastructure inside buildings to enable seamless connectivity. To this end, certain smart cities have started collaborating with infrastructure providers to scale up the deployment of IBS and Fiber network. Moving forward, IBS and FTTx/IP networks covering Fiber and LAN cables should be included as one of the key parameters in the selection of smart cities for granting financial assistance.

4. In- Building and Gated Buildings Solutions

It is important to ensure quality telecom services inside a building – in residential, multi-story building, commercial complex, hotel or airport, police/Government offices/buildings etc. It is also essential for Telecommunication Service Providers/IP-1s to work on sharing of telecom infrastructure which may be made mandatory as they extend the services in the buildings.

Telecom Service Providers/IP-1s require a non-discriminatory and unhindered access inside the building / along the premises to install the telecom infrastructure or lay their cables.

At present, mobile operators and the building owner or building developer or Resident Welfare Associations (RWA) enter into commercial agreements for inbuilding deployment. Building owners or building developers delay the negotiations or request exorbitant rents — slowing down the speed of deployment. The Urban Local Body /Urban Development Authority may intervene in this regard wherein commercial agreements are insisted upon. TSPs/IP-1s should be given legal rights and permissions to use the Common Telecom Infrastructure (CTI) within the premises of Building / Gated Society free of charge or for

a standardized nominal charge just like other essential services like water electricity and/ or gas. Provision of CTI in a building should not be deemed as a revenue source in any way, much as the water and electricity utilities are not. Sufficient space should be provided within the premises to install telecom services by MNOs/ network operators.

The issue is not limited to sharing of IBS/ Distributed Antenna System (DAS) systems only, but TSP should get access to all telecom infrastructures including Fiber Cable and LAN cables for provision of wired and wireless network, other telecom/ICT and IoT services.

It is important for telecom service providers to provide mobile coverage / network presence/ high speed connectivity inside big residential / commercial complexes to improve QoS of their networks. It may not be practical to install individual in-building infrastructure by TSPs/IP-1s as this will result in not only duplication of network resources but will also entail huge avoidable cost. It may also be not advisable to lay down cables again and again on the same land / building by several TSPs/IP-1s.

5. Incorporation in State /UT Building Bye Laws

The buildings are to be constructed in such a way that they are 'Digital Infrastructure deployment' / 'Digital Connectivity' ready. There should be provision of telecom ducts / common pathways / runways (digital access paths) to reach to the accessible parts of the buildings. The common ducts /digital access paths to access buildings from outside should invariably be part of the CTI, which could be used by TSPs/IP-1s for laying/deploying digital infrastructure including cables. While approving the building plans, it has to be ensured that plan for creation of CTI including the common duct to access the common space used as telecom room inside the building is also prepared and separate set of drawings showing the inter / intra connectivity access to the building with distribution network need to be furnished.

Occupancy-cum-Completion certificate to a building to be granted only after ensuring that the CTI as per the prescribed standards is in place and an undertaking by the Architect or Engineer to be insisted to certify that building has ensured common access to all digital infrastructure to all Service providers in accordance with plan of creation of CTI. Provision of visit from Department of Telecom (DoT) / TRAI officials along-with joint inspection with TSPs - who may suggest any relevant modification in the plan to be ensured.

As part of Building Bye-Laws, the builder/RWA should be mandated to ensure that

i) While preparing the building plans, there is a need to mandate to have properly demarcated sections within buildings and on rooftops for housing BroadBand / digital connectivity infrastructure / antenna. These areas should have access to power supply for reliable, always-on services.

ii) Access to building as well as CTI facilities inside the building should be available on a fair, transparent and non- discriminatory manner to all Service Providers /IP1's.

iii) The Service Providers / IP1's should have unrestricted access for maintenance work.

iv) The permission to in-building access and/or CTI facilities inside the building should not be seen as a source of revenue generation for builder(s)/RWA(s) but as a means for facilitating penetration of broadband access and thereby helping in socio-economic growth of all the residents.

v) Charges (rentals/power rates etc.) levied to the TSPs/IP-1s should be fair, transparent and non-discriminatory and should be on residential rates.

Suitable provision for the creation of Common Telecom Infrastructure (CTI) inside the newly constructed public places like Airports, commercial complexes and residential complexes, be incorporated in State/UT Building Bye Laws.

6. At Layout Level

While developing Greenfield cities/towns, the layout plans should clearly indicate the telecom as Utility infrastructure lines. Standards followed for Utility planning shall be published and work shall be done by the respective department for bringing in the standardization of the utility coding and sequences. The placement and sequence of above- and below-ground utilities at the appropriate location in the right-of-way to be ensured for unconstrained movement as well as easy access for maintenance. Telecommunication cables should be placed in a duct that can be accessed at frequent service points with sufficient spare capacity to enable scaling and future expansion, and empty pipes (large size hume pipes / HDPE pipes) should be laid before planting trees in order to accommodate additional infrastructure.

Digital Readiness Rating of Buildings / Society in line to the GREEN ratings shall be created where the existing and new buildings shall be rated on standardized parameters such as; but not limited to; Digital Infrastructure access, provisions for Emerging Technologies, Maintenance and Operational ease to TSPs / IPv1, Quality of Wireless Services, Quality / Interchangeability ease of Wireline Services till each Unit Security, redundancy and Expandability of the digital infrastructure etc. A detailed rating parameters and calculation mechanism of Points / Stars shall be devised and benchmarked for all new / retrofitting of buildings/ societies.

Digital Asset repository which will ensure Proper planning and mapping of utilities through GIS is necessary especially when the alignments of telecommunication cables are identified. Design criteria and standards Utilities should meet the following criteria:

- Telecommunication cables should ideally be placed below the parking area or service lane, which may be dug up easily without causing major inconvenience. Where this is not possible, the cables may be placed at the outer edge of the right-of-way.
- There is a need to reduce conflicts with pedestrian movements is to place telecom boxes in easements just off the right-of-way. Where this is not possible, they should be placed within parking or landscaping areas. If cables have to be located in the pedestrian path, a space of at least 2m should be maintained for the through movement of pedestrians. Telecom boxes should never constrain the width of a cycle track.
- In order to minimize disruptions, cables should be installed with proper maintenance infrastructure.

7. Other procedures for setting up In-Building Solution (IBS)/ Fiber Networks

(1) There is a need to promote installation of In-Building Solution (IBS) / Smart Connectivity infrastructure, where there is a poor connectivity in terms of weak signal strength inside the office, shopping mall, hospitals, multi-story building, education institutions and the objective has to be to strengthen quality of service of the voice & data of mobile and Fiber broadband network and access to digital services being offered by TSP and IP1's

A) Procedures of obtaining IBS-NOC during plan approval and completion

a) While submitting the proposed Building plan seeking approval from the relevant sanctioning Authority, applicant shall also submit

   i. A complete Service Plan for IBS-infrastructure along with required specifications (in consultation with, and certified by a credible Telecom Networking hardware-consultant)

   ii. An undertaking that such IBS Infrastructure, when constructed shall be available for sharing by various TSPs/IP-Is.

   iii. Such Service Plan (IBS) shall be forwarded by the concerned Local Authority to the Telecom Enforcement Resource and Monitoring (TERM) cell of the State (external NOC agency) – for approval NOC.

   iv. During the Joint Site Inspection of the completed building structure the TERM cell shall undertake inspection of the constructed/installed IBS infrastructure – for issuance of NOC for OCC.

b) The Local Authority shall liaise with the TERM cell as per its relevant online/offline process of communication to seek the relevant NOCs within the specified time as per the Service Charter/ Service Guarantee Act and rules in place. Separate communication from the applicant shall be needed to secure the IBS NOC.

B) Provision of IBS components in building premises: (as per NBC 2016)

Entrance Facilities (EF) /Lead-in conduits: (clause 3.1.4, of Part 8: Sec 6) min. 1.2m x 1.83m space to be allocated for each TSP adjacent to the EF.

Underground conduits/pipes to MDF room: min 100mm dia encased conduits.

Main Distribution Frame (MDF)/Equipment Room(ER):

(Clause 3.1.2, Part 8: Sec 6)

- Prescribed size with L:W ratio between 1:1 to 2:1
- Appropriate ventilation of MDF room
- proper Lighting for vision of equipments,
- located at a level above from the Natural Ground lvl to avoid incidence of flooding

Electric distribution panels, isolaters, sockets and earthing as per specific requirements w.r.t the area proposed for coverage (DUs/ service subscribers)

Telecommunications Room (TR) at each building block unless provided with MDF room:

(all provisions of space to be as per clause 3.1.3.2, Part 8: Sec 6)

Appropriate nos. of Service/Telecom risers (vertical shafts) for all multi-storeyed buildings w.r.t the area proposed for coverage (DUs/ service subscribers):

- of appropriate nos and size (width & depth) to accommodate cable trays
- with of access door at each floor.

Telecommunications Enclosures (TE) at each floor of a block or TR

(clause 3.1.5, Part 8: Sec 6)

Telecom Media and Connecting Hardware (TE): (clause 3.2, Part 8: Sec 6)

Various cabling system and trays: (clause 3.2.4, Part 8: Sec 6)

Wireless systems: (clause 3.2.5, Part 8: Sec 6)

Backbone Cabling Media Distribution and Bldg. pathways

(clause 3.3, Part 8: Sec 6)

Horizontal Cabling Media Distribution and Bldg. pathways

(Clause 3.4, Part 8: Sec 6)

IBS installation spaces: area for rooms or systems (e.g. antennas, base stations, remote units, power distribution boxes etc.) to be provided as per requirements w.r.t the area proposed for coverage/ no. of proposed users (as per clause 3.1.3.2, Part 8: Sec 6, table stated below)

1 Telecom room space norm for buildings with Built-up area >465 sqmt

S.N.	Area to be covered by IBS	Size of Telecom Room (all dimension in m)
1	Upto 465 sqmt	3.0 x 2.4
2	465.0 sqmt to 930.0 sqmt	3.0 x 3.4
3	More than 930.0 sqmt	Additional TR required with same space norms

Space requirements for smaller buildings with Built-up area

S.N.	Area to be covered by IBS	Size of Telecom Room (all dimension in m)
1	Upto 93.0 sqmt	Wall cabinets, self-contained enclosed cabinets.
2	93.0 sqmt to 465.0 sqm	Shallow Room (0.6 x 2.6)
		Walk-in Room (1.3 x 1.3)

IBS installation spaces, so provided, should be:

- not susceptible to flooding
- not exposed to water, moisture, fumes, gases or dust
- able to withstand designed equipment load (to be specified in design)
- located away from any vibrations to avoid dislocation/dislodgement

For any other necessary detailing of building components and service installations with respect to common Telecom/Digital connectivity Infrastructure, architects/ developers and other service consultants involved in preparing building and service drawings may refer Part 8 – Section 6: Information and Communication Enabled Installations of Volume 2 of the National Building Code, 2016

(2) Mode of deployment of In-Building, FTTx/IP Solution: There shall be various mode of deployment of In Building solutions such as: The possible modes are deployment by a neutral host infrastructure provider or build and managed by mobile operator and sharing with other service providers on nondiscriminatory basis. The In-Build Solutions (IBS), FTTx/IP Solutions can also be deployed by TSPs/ IPs. Moreover, if TSP/ IP1 requires to install optical fiber for connecting In-Building Solution (IBS)/ Distributed Antenna System (DAS) nodes/ FTTx solutions, RoW/ permissions should be granted by the road owning agency through online mode (if same is working seamlessly) or offline mode till online system is established. For deploying indoor

solutions these companies should have deemed permissions from the premises owners for installation of Distribution Network within the utility shafts / common spaces with provisions for common / shared Points of Interconnect for Connectivity to individual units. Moreover, if the TSP/IP requires to install optical fiber for connecting In-Building Solution (IBS) / Distributed Antenna System (DAS) nodes , FTTx/IP Solutions . for which RoW / permissions should be granted by the road owning agency through online mode.

(3) Permissibility:The IBS, FTTx/IP component being small equipment can be installed on any type of land/building/utility pole and shall be exempted from obtaining the permission for installation of these components from the respective Urban Local Body/Urban Development Authority butshould get permission from the Administrative Authority of the concerned premises.

(4) Procedure for submitting application for obtaining clearance:TSP/ IP-1 will apply to the administrative authority of the building/ head of the office with layout diagram for implementing IBS in the building as mentioned in the RoW Rules 2016 or State notified RoW Policy

(5) Fees: No fee will be charged for IBS/ FTTx Network. However, charges may be levied for power (as per Industry tariffs), fixtures, etc. provided by building owners to TSP/ IP-1s as per actuals.

(6) Access and Distribution Fiber and IP/LAN networks for connectivity for the Shopping Malls, Multi-Storey Residential Buildings, Cooperative Housing Societies, Residential Welfare Association and Commercial Buildings to be planned and deployed by TSP/IP-1s as per standard requirement of providing high bandwidth and adequate indoor coverage to each unit/apartment in these complexes.

References:

a) Telecom Regulatory Authority of India (2011): Recommendations on Telecommunications Infrastructure Policy.

b) Telecom Regulatory Authority of India (2017): Recommendations on InBuilding Access by Telecom Service Providers.

c) Uttar Pradesh Expressways Industrial Development Authority (2018): Guidelines for Applicants for ducting & laying of optical fiber.

ANNEXURE-B

Report of the Committee constituted for formulating "SACFA clearance process for 5G Small Cells" Report of the Committee Constituted for formulating the SACFA clearance process with minimum compliance burden for 5G Small cells to be installed on existing street infrastructure/furniture

1. Constitution of the Committee

1.1 A Committee with the approval of the Secretary (T) has been constituted vide OM No. K-19014/01/2022-CFA dated 08.02.2022for formulating the SACFA clearance process with minimum compliance burden for 5G Small cells to be installed on existing street infrastructure/furniture.

The composition of the Committee is as below:

i)	Shri R K Saxena, WA	– Chairman
ii)	Shri Gulab Chand, JWA(WPC HQ)	– Member
iii)	Shri Rajeev Tyagi, DDG(FN),TEC	– Member
iv)	Shri A.K. Meena, ED(ATM),AAI	–Member
v)	Shri Col. Pushpendra Mair, Director(JCES)	– Member
vi)	Smt. M.Revathi, Sr.DWA(COP)	– Member
vii)	Shri L D Meghwal, Sr.DWA(SACFA)	- Member(Convener)

2. Terms and Reference of the Committee

2.1 The Committee was to provide recommendations for formulating the SACFA clearance process with minimum compliance burden for 5G Small cells to be installed on existing street infrastructure/furniture.

3. Background

3.1 To achieve the Digital India objectives, timely deployment of 5G in India is the need of the hour. The Auction for 5G Spectrum is expected to be conducted by mid of this year and it will be followed by deployment of 5G Infrastructure. To deliver the promise of 5G in various frequency bands, there is a need of network densification, for which small cells are inevitable.

3.2 Mobile operators are expected to use "Small Cells" having range from ten meters to several hundred meters to extend their service coverage and increase the network capacity. These will help in serving more users, particularly in densely populated areas. Small cells can be mounted on existing buildings and street furniture such as bus shelters, lamp posts, utility poles, electricity poles, etc. Page 2 of 4

3.3 Deployment of "Small Cells" is expected to go up heavily, increasing the need for a favourable regulatory regime. There is an increasing demand to deploy these small cells on the existing street infrastructure. The department has also formed a committee under TEC to formulate standards/policy for roll out of street infrastructure and small cells in 5G to facilitate a standard approach for the proliferation of Dense Small Cell Infrastructure.

3.4 Further, to simplify the SACFA clearance procedure and compliance burden on the industry during deployment of 5G small cells, the department considered that the issue needs to be deliberated with AAI, JCES and TEC while formulating SACFA clearance procedures for small cells.

4. Existing SACFA Clearance Procedure

4.1 Presently, the installation of towers (BTS) is being cleared on the basis of pre-defined criteria and for sites which do not meet the criteria are being circulated to the members of the SACFA Secretariat i.e. JCES and AAI.

4.1.1 Criteria based clearances: There are four auto settled criteria for processing SACFA cases:

a) 7/40 Sites falling	=>7 Km and having height =<40m (w.r.t. AMSL of site and airport
b) ARP 20/100 Sites falling	=>20 Km and having height =<100m (w.r.t. AMSL of site and airport)
c) VFR 20/150 Sites falling	>20 Km and having height <150m (AGL w.r.t. VFR airports
d) IFR 56/150 Sites falling	>56 Km and having height <150m (AGL w.r.t. IFR airports
e) Exemption	Towers installed 3m above the rooftop of the existing authorized buildings
f) Addl. Antenna	RF Antenna installed on existing SACFA cleared towers

4.1.2 Clearances through circulation: AAI is processing all the SACFA cases and conveys their NOC through their NOCAS system. JCES processes cases through web interface in Saral Sanchar portal.

4.2 Keeping in line with the Ease of Doing Business, the entire process is end-to-end online as well as paperless with time bound clearances.

5. Deliberations in the Committee

5.1 The first meeting of the Committee was held on 09.02.2022 to deliberate the issue. The existing SACFA Clearance procedure was placed before the committee. Page 3 of 4

5.2 The 5G Spectrum Auction is proposed to take place in mid of this year. To facilitate faster roll-out, industry has requested for exemption from the SACFA Clearance process both in terms of application and the processing fees.

5.3 As per Radio Regulations, every station has to be licensed (WOL). Such technical parameters are required to meet different national as well as International obligations provisioned in Radio Regulations of ITU-R. It is also necessary to ensure interference free coexistence of different in-band/adjacent band services.

5.4 However, in this regard, it is pertinent to mention that TSP networks have been exempted from the necessary requirement of obtaining Wireless Operating License (WOL). The exemption was granted as a special dispensation citing that SACFA clearances contain all the necessary details required for this purpose; therefore, WOL may not be required.

5.5 Taking into consideration the facts mentioned above as well as the requirements of the industry for the faster and seamless roll out of 5G services in the country, during the meeting, WPC Wing has proposed that SACFA Clearance for small cells may be considered on Registration basis through the SaralSanchar Portal at a reduced fee as compared to the SACFA Clearance presently being issued. The TSPs will be required to provide an undertaking that the top height of the antenna of such small cell shall be below the height of the existing street furniture/ existing structure.

5.6 AAI has pointed out that since the deployment of small cells is being considered on existing street infrastructure, they will not pose any flight hazard. Therefore, the process of SACFA Clearance for such cases can be done away with.

5.7 JCES has also mentioned that while further examination of such cases is not necessary; however, a database of such installations may be made accessible. JCES was also of

the opinion that the fee is an administrative matter and the decision regarding the same may be taken by WPC Wing.

5.8 JCES has also stressed on the need for a deterrence mechanism both for the SACFA Clearance of small cells as well as the SACFA Clearances obtained through self-declaration vide O.M. No. K-19013/13/2005-CFA dated 06.10.2021. The appropriate penalties need to be imposed on applicants violating the norms.

5.9 Further, TEC has said that since the range, height and radiated power of such small cells is less they may not pose any flight hazard. The proposed process of simplification of SACFA procedure is in line with the objective of facilitating the proliferation of Small Cell Infrastructure.

6. RECOMMENDATIONS

Keeping in view the high density of small cells and the fact that they will be deployed on existing street infrastructure, the Committee recommends:

6.1 The requirement for formal application for SACFA processing may be done away with for such small cells having power output (i.e. EIRP) of such LP-BTS antenna is < 100W;

however, the TSPs rolling out these small cells (outdoor only) namely Microcells, Picocells and Femtocells which can be installed on window sills or street furniture/ existing structure, shall register the details of such sites, along with their geo-coordinates and technical parameters in the Saral Sanchar Portal.

6.2 Acknowledgement of such registration can be downloaded by TSPs instantly, provided;

an undertaking (inbuilt in the registration application) by TSPs with regard to height of such antenna stating that the top height of the antenna of such small cell shall be below the height of the existing street furniture/ existing structure is submitted.

6.3 The appropriate penalty be imposed as per the extant rules, in case of violating undertaking and submitting wrong declaration.

GLOSSARY

LPBTS:	Low Power Base Transceiver Stations
RF:	Radio Frequency
TEC:	Telecommunication Engineering Centre
DoT:	Department of Telecommunications
4G LTE:	Fourth-Generation Long-Term Evolution
C-V2X:	Cellular Vehicle-to-Everything
EIRP:	Effective Radiated Isotropic Power
SAC:	Simplified Assessment Criteria
ITU:	International Telecommunication Union
5G NR:	5G New Radio
ICNIRP:	International Commission on Non-Ionizing Radiation Protection
EMF:	Electromagnetic fields
WHO:	World Health Organization
MoHUA:	Ministry of Housing and Urban Affairs
RoW:	Right of Way
ScaaS:	Small-Cell-as-a-Service
TRAI:	Telecom Regulatory Authority of India
TSP:	Telecom Service Provider
EB:	Electricity Board
KSEB:	Kerala State Electricity Board
Li ON:	Lithium-ion
SACFA:	Standing Advisory Committee on Radio Frequency Allocations
WPC:	Wireless Planning and Coordination
BRI:	Broadband Readiness Index
COAI:	Cellular Operators Association of India
NDMC:	New Delhi Municipal Council
5G:	Fifth Generation

REFERENCES

1. Installation of communications network facilities on street furniture, Malaysian Technical Standard Forum Bhd, MTSFB067_2019.

2. Test Procedure for Measurement of Electromagnetic Fields from Base Station Antenna, No:TEC/TP/EMF/001/04.JUN 2018 and TEC 13019:2021

3. The Role of Street Furniture in Expanding Mobile Broadband, Wireless Infrastructure Associations

4. Inputs from Stakeholders like DIPA/ Nokia/ Ericsson/ Qualcomm/ MoHUA

5. Provo City Power Small Cell Infrastructure Design Standards

6. https://www.trai.gov.in/sites/default/files/CP_19052021.pdf

7. https://www.cityofnapa.org/DocumentCenter/View/5875/Napa-Small-Cell-Technical-and-Aesthetic-Guidelines-PDF

8. Effects of Mobile Radiation, Report by Lok Sabha Secretariat, New Delhi, June 2016.

9. Provisions for in building solutions for Telecom Infrastructure, Addendum to Model Building by Laws-2016 published by Ministry of Housing and Urban Affairs (MoHUA), Govt of India.

10. https://www.icnirp.org/en/differences

11. https://www.gsma.com/asia-pacific/wp-content/uploads/2022/01/Small-Cell-Report.pdf

12. https://trai.gov.in/sites/default/files/White_Paper_22022019_0.pdf

13. “Guidelines on the Use of Sheltered Bus Stops for the Installation of Radio Base Stations for Provision of Public Mobile Services”: https://www.coms- auth.hk/filemanager/statement/en/upload/552/gn112020.pdf

14. GSMA Report on Small Cells in India: https://www.gsma.com/asia-pacific/latest-resources/https://www.slc.gov/engineering/small-cell-infrastructure-design-standards/

Photo: Crown Castle

ISO 9001:2015

GOVERNMENT OF INDIA
MINISTRY OF COMMUNICATIONS
DEPARTMENT OF TELECOMMUNICATIONS
TELECOMMUNICATION ENGINEERING CENTRE