

**Review of the National Building Code 2016
vis-à-vis Accessibility Standards for Persons
with Disabilities**

By

Diversity and Equal Opportunity Centre (DEOC)

For

**National Centre for Promotion of Employment for Disabled
People (NCPEDP)**

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Context

The National Building Code (NBC) contains administrative regulations, development control rules and general building requirements like, stipulations regarding materials, structural design and construction, fire safety requirements and building services. It is published by the Bureau of Indian Standards (BIS) which is under the Department of Consumer Affairs, Ministry of Consumer Affairs, Food and Public Distribution. The NBC was first published in 1970 and then revised in 1983, 2005 and finally in 2016 (Third Revision).

NBC 2005 had an Annexure in Part 3, titled, 'Special Requirement for Planning of Public Buildings Meant for Use of Physically Challenged.' In the first paragraph of this Annexure, it was mentioned that the provisions apply to all buildings and facilities used by the public and that they apply to temporary and emergency conditions as well. However, in spite of these clear statements, the Annexure was ignored by architects and builders. The other Parts of NBC 2005 did not mention accessibility or provide any reference to this Annexure. Based on several study reports, most architects, builders, contractors and other professionals in the construction business were not even aware of this Annexure in NBC. Moreover, the accessibility standards given in the Annexure were neither comprehensive nor of a high standard. It was comprehensively rejected by the accessibility experts. Though several other guidelines for accessibility for built environment were formulated by the Ministry of Urban Development, for example, the CPWD Guidelines, Harmonised Guidelines, and so on. These guidelines are hardly being used by construction professionals.

When this matter was raised by a Member in the meeting of National Committee on Rights of Persons with Disabilities (NCRPD) in September 2015, National Centre for Promotion of Employment for Disabled People (NCPEDP) immediately took up the matter with the BIS and discovered that the revision of NBC was underway.

Since NBC is a national instrument for regulating building construction activities across the country, NCPEDP felt that it was extremely important that it covers accessibility standards in a comprehensive manner. NCPEDP did not want to lose

this opportunity and took it up very strongly with the BIS. It felt that if this opportunity were to be lost, civil society would have to wait for ten or more years for the next revision to take place before the accessibility standards were upgraded.

NCPEDP gathered detailed information from BIS regarding the work taking place for revising the NBC. As per the information gathered, BIS had constituted a National Building Code Sectional Committee, CED 46, under the Chairmanship of Padmashri Dr. H.C. Visvesvaraya, Former Vice Chancellor, University of Roorkee, an eminent Civil Engineer and an expert in the area of building technology. The Committee had developed Wide Circulation Drafts (WCD) for the various Chapters which were being circulated widely for feedback/comments (August 2015). There were specific deadlines for each chapter with 24th December 2015 being the very last deadline for submitting comments.

Upon looking at the draft chapters (WCD), NCPEDP realised that accessibility standards were covered only in Part 3 with other chapters having no mention of accessibility standards just like in NBC 2005. NCPEDP then promptly wrote to the BIS stating that the revised NBC should follow the universal design approach and should integrate accessibility into the various relevant chapters. Initially BIS was adamant, saying that it was not possible to change their approach. However, NCPEDP then clearly pointed out the contradictions that existed in the document between what was given in the various chapters and the accessibility standards in the Annexure. It was emphasised that a more holistic way forward was to have the accessibility standards explicitly stated in all the relevant chapters along with giving suitable cross references to the specific clause in Part 3 for appropriate details. These suggestions were not considered. The issue was then escalated by NCPEDP to the Minister of Social Justice and Empowerment (MSJE), Minister of Consumer Affairs, Food & Public Distribution and later to the Prime Minister's Office.

Simultaneously, without wasting any time, NCPEDP also commissioned the review of the WCDs to Diversity and Equal Opportunity Centre (DEOC) and AccessAbility, both of which are organisations specialising in the area of accessibility. Though the time allotted for the review was not enough to do a thorough study, however, each

draft chapter (WCD) was diligently reviewed and detailed recommendations were submitted to BIS, in the prescribed format, within the deadline for most of the chapters.

Subsequently, several meetings with the BIS were facilitated by the MSJE and the PMO's office and the time allotted to submit all the recommendations was extended to 31st March 2016. An assurance was also given stating that the recommendations will be considered while preparing the final document.

NBC 2016 was launched on the occasion of World Consumer Rights Day 2017 by the Department of Consumers Affairs, Ministry of Consumer Affairs, Food & Public Distribution on 15th March 2017. It is published in two Volumes - Volume 1 and 2. It has 12 Parts.

NCPEDP commissioned the review of NBC 2016 to DEOC to see if the recommendations have been included. This Report includes the findings of the review undertaken.

NBC 2016 has taken into consideration most of our recommendations pertaining to accessibility. In the 'Foreword', it has been mentioned that, "*The major changes incorporated in this third revision of the Code are as follows: Requirements for accessibility in buildings and built environment for persons with disabilities and the elderly have been thoroughly revised and updated.*" (e)

Part 0: Integrated Approach – Prerequisite for Applying Provisions of the Code

This Part provides the prerequisites for an integrated approach that involves team approach, planning, designing and development, operation and maintenance, and which includes the periodic validation of buildings by competent professionals.

Recommendations that have been included

1. In the 'Foreword', it has been stated that, "*The significant modifications incorporated in this revision include the following: Accessibility and universal*

design for ensuring barrier free environment for persons with disabilities has been emphasized by further reinforcing the provisions to this effect appropriately."

2. Under the section, 'Team Approach', 20 specialists were listed in the WCD - architects, civil engineers, electrical engineers, interior designers, security system specialists, acoustics specialists, health, safety and environment specialists, sustainability specialists, etc. We had recommended that, in the list of professionals in the team, 'accessibility and universal design specialist' should be added. This has been accepted. The Team approach in NBC 2016 includes, 'Accessibility and universal design specialist' (Clause 4.1)
3. Under the section, 'Operation. Maintenance Decommissioning and Deconstruction', we had recommended adding periodic accessibility audits. This has also been accepted. In NBC 2016, it is mentioned that, "*The operation and maintenance team shall be responsible for preparation/application of operation and maintenance manual, and draw maintenance schedule/frequencies and guidelines for maintenance personnel. Apart from the specific provisions laid down in concerned Parts/Sections of the Code, the following, as may be applicable to the project concerned, shall additionally be taken into account: ... b) Periodic accessibility audits to ensure that the buildings remain universally accessible and barrier free for persons with disabilities.*" (Clause 7.2 b)

They have added an additional recommendation which is mentioned below.

4. Under the section, 'Planning, Designing and Development', it is mentioned that, "*the following considerations, as may be applicable to the project, maybe considered during planning: ... Requisite mandatory provisions for persons with disabilities.*" (Clause 5.2 (10)).

Recommendations that have not been included

1. We had recommended that the functions of 'Accessibility and universal design specialist' be given in the section where the functions of the design team have been detailed. However, that has not happened.

Part 2: Administration

This Part covers the administrative aspects of the Code, such as the conditions required for the applicability of the Code, the organisation of the building department needed for the enforcement of the Code, the procedure needed for obtaining development and building permits and finally the responsibility of the owner.

Recommendations that have been included

1. In the 'Foreword', it is stated that, *"The significant modifications made in this revision are as follows: Provision of periodic audit of designated public buildings for accessibility for the elderly and persons with disabilities, has been included". Further, it is mentioned, "The Sectional Committee observed that this Part has been so formulated as to ensure quality and safety in the whole gamut of activities primarily divided into planning, design, execution and supervision. This has been ensured by obtaining certification from the registered professionals involved in planning, design and supervision. Apart from these, various other persons are involved whose contribution may be duly taken into account depending on the type, nature, magnitude and complexity of the project, such as fire protection engineer, security system specialist, environment specialist/sustainability specialist, accessibility specialist, interior designer, project management consultant, etc, in proper planning, design, erection, commissioning and operation of buildings and built environment".* (f).
2. In the section, 'Application for Development/Building Permit', under the sub-section, 'Building Plan and Details', as per our recommendations, NBC 2016 says, *"Features related to accessibility for the elderly and persons with disabilities shall be in accordance with 13 of Part 3 Development Control Rules and general building requirements of the Code for the designated buildings and areas."* (Clause 12.2.5.1 u).
3. For the section, 'Periodic Occupancy Renewal Certificate', we had recommended adding a periodic access audit. This has been accepted. The text given in NBC 2016 is as follows: *"All buildings covered under 12.2.5.1 shall be subjected to*

periodic physical inspection by a team of multi-disciplinary professionals of local Authority. The work by team of professionals may be outsourced by the authority to competent professionals as may be deemed necessary. The team shall ensure the compliance of byelaws, natural lighting, ventilation, etc. besides structural and electrical safety and accessibility (for designated public buildings and areas as per 13 of Part 3 Development Control Rules and general building requirements of the Code.). After checking, the team shall be required to give the certificate for above aspects. If any shortcoming/ deficiencies or violations are noticed during inspection, the Authority shall ensure the compliance of these within a specified time frame of six months. If not complied with, the building shall be declared unsafe. The period of inspection shall usually be 3 to 5 years but in any case, not more than 5 years.” (Clause 14.4.2).

Recommendations that have not been included

1. In the section on 'Architectural Control', we had recommended adding a new section titled, 'Universal Design/Disability Accessibility Commission' on the same lines as the Urban Arts Commission. This recommendation has not been included.
2. In the Form given for 'First Application to develop, erect, re-erect or to make alteration in any place in the building', we had made suggestions for including accessibility features, which have not been considered.

Part 3: Development Control Rules and General Building Requirements

This Part deals with the development control rules and general building requirements to ensure health and safety of the public. This Part has detailed Accessibility Standards for Persons with Disabilities in Clause 13, 'Requirements for Accessibility in Built environment for Elders and Persons with Disabilities' and Annexure B: 'Anthropometrics and Requirements for Accessibility in Built environment for Elders and Persons with Disabilities'.

Recommendations that have been included

1. In the 'Foreword', we had recommended adding information about disability legislation, Convention on the Rights of Persons with Disabilities (CRPD), population of people with disabilities and universal design. In NBC 2016, in the Foreword, it is mentioned that, *"It is important that the fruits of development are equally shared by all cross-section of the society irrespective of their age and abilities. This Code therefore covered provisions for buildings and built environment to ensure a barrier-free environment for elders and persons with disabilities. The goal of barrier free design is to provide an environment that supports the independent functioning of individuals so that they can participate without assistance, in everyday activities. It has been intended to progressively update these provisions and make the same more effective and elaborate based on experience gained with the implementation of the Code and feedback received from stakeholders. As a conscious decision, opportunity has been taken in this revision of the Code to further mainstream the issue of barrier free environment by covering the requirements at greater length. The concept of universal design has also been included herein that promotes the usability of built environment by all without discrimination. It is worthwhile to note that The Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995 in its Chapter VIII 'Non-Discrimination', Section 44 to 46 mandates accessibility in public buildings and transportation systems. National policy for persons with disabilities also emphasizes the role of barrier-free environment as one that enables people with disabilities to move about safely and freely, and use the facilities within the built environment. Therefore, to the maximum extent possible, buildings/places/transportation systems for public use should be made barrier free. India has also signed and ratified the UN Convention on Rights of Persons with Disabilities that casts an obligation on the member states in its Article 9 'Accessibility', to enable persons with disabilities to live independently and participate fully in all aspects of life."*
2. This Part has provisions for general areas like footpath, pathways, parking and other aspects, apart from the accessibility standards. In the WCD, the accessibility standards were not included in these general areas nor cross

- reference was provided to accessibility standards. The final text of NBC 2016 has corrected this to some extent, based on our recommendations
3. In the section, 'Footpaths', we had recommended adding kerb ramps, tactile indicators and other requirements. NBC 2016 states that, "*the footpath shall be level, non-slip and continuous, and shall be provided with tactile orientation, kerb and kerb ramp. The footpath shall comply with the requirements given in B-2 other than for width which shall be as per 4.3.2.1.1.*" (Clause 4.3.2.1.2).
 4. In the section on 4.3.2.2 'Pathways', they have given cross reference based on our recommendation. It reads, "*The approach to the buildings from road/street/internal means of access shall be through paved pathway complying with requirements in B-2*" (Clause 4.3.2.1.2).
 5. We had recommended under the section, 'Uses permitted podium', we had suggested adding one accessible toilet and one urinal for every 50 cars on the podium floor. NBC 2016 states the following: "*Podium may be used for the following purposes: a) When used for parking, one WC, two urinals and two washbasins for every 500 cars or part thereof, shall be provided on each podium floor. At least one accessible toilet complying with the requirements given in B-9 shall be provided preferably near the accessible parking.*" (Clause 4.6.1.2).
 6. In the section, 'Other Amenities', there was a list of amenities to be provided in the layouts. In the WCD, the list of amenities included 'School for physically challenged (Class 1 to 12) (1 for every 45 000 population)' and 'School for mentally challenged (1 for every 1 000 000)'. We suggested that it should be clearly mentioned that all amenities, including schools, colleges, hospitals, open spaces should be inclusive and meet the accessibility standards and replacing the special schools for physically challenged and mentally challenged with a Centre for support services for people with disabilities (1 in every 10,000 people). In NBC 2016, they have modified the text as, "*School for children with intellectual and developmental disabilities 1 for every 1 000 000 population and School for children with disabilities (Class 1 to 12) 1 for every 45,000 population*". They have added the note that, "*The schools should be inclusive providing education to all children including those with disabilities. However, it*

- may be required to have exclusive schools in case of certain disabilities, such as, speech, hearing, sight and multiple disabilities.” (Clause 4.6.1.3).*
7. As per our recommendations, in NBC 2016, it is mentioned that, *“following requirements shall be satisfied for buildings constructed on podium: ... Requirement of accessibility for elders and persons with disabilities shall be ensured in compliance with the provisions of Annex B which may require providing ramps with specified gradient or accessible lifts for access to different levels.” (Clause 4.6.1.3 g).*
 8. In the section on ‘Group Housing’, under the point related to parking, we recommended adding one accessible parking for every 10 flats should be provided as per the standards. In NBC 2016, it is mentioned that *“Parking space shall be provided in accordance with 10. Designated accessible parking spaces shall be provided in accordance with B-3”.* (Clause 9.6.3.3).
 9. Under the section, ‘Off-Street Parking Spaces’, our recommendation for providing designated parking spaces has been accepted. NBC 2016 states that, *“Designated accessible parking spaces shall be provided in accordance with B-3 for the occupancies specified in 13.”* (Clause 10.10).
 10. We had made specific recommendations to be added under the sections, Plinth (12.1.1), basement (12.9.3), Office-cum-Letter Box Room (12.16), Staircase/Exit Requirements (12. 18),12.18.3 Exit Requirements (12.18.3). In NBC 2016, instead of adding the specific points, they have made a general statement which would apply to all the sub-sections in 12, *“The requirements for various parts of buildings shall be in accordance with 12.1 to 12.9. The requirements as given in 13, for public buildings and sites as accessible and barrier free for elders and persons with disabilities, shall also be complied with.”*
 11. Clause 13 and Annexure B of Part 3, where accessibility standards have been detailed is now more or less similar to ISO 21542. Most of our recommendations have been included in the final text of NBC 2016. However, the Emergency Evacuation section in Annexure B is cross referencing the Fire and Life safety chapter (Part 4) without detailing out the provisions. But, the issue is that Part 4 in itself is not comprehensive enough as far as accessibility standards are concerned.

12. In Table 9, 'Norms for Off-Street Parking Spaces' in Annexure A, we had suggested adding reserved parking for persons with disabilities in the Norms. In the Notes given below the Table, it has been mentioned that, "*Designated accessible parking spaces shall be provided in accordance with B-3 for the occupancies specified in 13.*"

Recommendations that have not been included

1. This Part (Part 3) contains a paragraph or so on various aspects, like Lighting, Electrical Installations, Air Conditioning, Lifts, Acoustics, Communication Enabled Installations, Plumbing Services, Facility Management, etc. There are also separate chapters (Parts) for these aspects in NBC. In this Part, they have included a paragraph and linked it to the relevant chapters through cross referencing. For example, in the paragraph on Lighting and Ventilation, cross reference Part 8 Section 1 which is on Lighting and Ventilation has been provided. We had suggested adding a cross reference to the accessibility standards (Clause 13 of Part 3) as well. That has not been done. (Clauses 20 to 29).
2. Annexure F which deals with the 'Planning in Hilly Areas, we had recommended adding a section on Accessibility / Barrier Free environment. This has not been done.

Part 4: Fire and Life Safety

This Part covers the requirements for fire prevention, life safety in relation to fire and fire protection of buildings. The Code specifies occupancy-wise classification, constructional aspects, egress requirements and protection features that are necessary to minimise danger to life and property from fire.

Recommendations that have been included

1. In the 'Foreword', it is mentioned that, "*For provisions relating to universal accessibility and barrier-free environment, Part 3 Development Control Rules and General Building Requirements of the Code may be referred.*"

2. In the 'Terminology' section, our suggestions to add the terms assisted evacuation (2.1), evacuation lift (2.15) and visual strobes (2.62) have been accepted. Apart from the ones we had recommended, in the definition of 'Fireman's Lift', it has been mentioned that, "*This lift also serves the purpose of meeting the requirement of evacuation lift for assisted evacuation*" (Clause 2.27).
3. In the section titled, 'Life Safety', in the sub-section, 'General', we had recommended adding quite a few points. They have not done that. However, they have given a cross reference to the section on accessibility standards. It reads, "*See also 13 of Part 3 Development Control Rules and General Building Requirements of the Code for accessibility for elderly and persons with disabilities for various requirements for enabling a smooth and safe egress.*" (Clause 4.1).
4. Under the sub-section, 'Ramps', it was mentioned in the WCD that, "In certain cases steeper slopes may be permitted subject to prior approval of authorities concerned, but in no case greater than 1 in 8." We had asked this line to be deleted and suggested that ramps should comply with the accessibility standards and cross references should be given to the specific section on accessibility standards. They have done that. (Clause No. 4.4.2.4.3.5).
5. Under the section, 'Fire Detection and warning', our recommendation was that fire detection alarms must be both visual and audible. NBC 2016 states that, "*Appropriate visual warning arrangement to visual strobes/beacons may be considered in appropriate situations particularly in public buildings at required locations to ensure visual as well as alarm for persons with hearing impairment.*" (Clause 4.9 d).
6. In the section, 'Egress Components', in the sub section 'Exit Access', one of the points that has been included is, "*Exit access to fireman's lift and refuge area on the floor shall be step free and clearly signposted with the international symbol of accessibility.*" (Clause 4.4.1 e).
7. In the section, 'Internal staircase', our suggestion has been followed only partially. Our suggestion was to provide cross reference with accessibility standards in Part 3. They have done that. However, they have allowed for

handrails to be present on only on one side of the internal staircase (for staircases that are less than 1500 mm in width). NBC 2016 states, "A *handrail shall be provided on one side of the staircase of width less than 1500 mm, and on both sides of the staircase of width 1500 mm and more. The projection of handrail(s) in the staircase width shall not be more than 115 mm. All other requirements of handrail shall be in accordance with Part 3 'Development Control Rules and General Building Requirements' of the Code.*" (Clause 4.4.2.4.3.2 f).

8. In the section, 'External staircase', NBC 2016, states, "*Handrails, to be provided on both sides, shall be of a height not less than 1000 mm and not exceeding 1200 mm. There shall be provisions of balusters with maximum gap of 150 mm.*" (Clause 4.4.2.4.3.4 h). However, they have not given any cross references to the accessibility standards for staircases given in Part 3 for other requirements. They have mentioned that handrails should be provided on both sides. However, the height of the handrail given here is not consistent with the height given in the Annexure of Part 3.
9. In the section, 'Organization Chart for Fire Drill and Evacuation Assignment', it was mentioned in the WCD that, "Have available an updated listing of all personnel with physical disabilities who cannot use stairs unaided." We had recommended that the term "physical" be deleted. The current text reads, "*Have available an updated listing of all personnel who need assistance during emergency.*" We had also suggested adding provisions regarding voluntary self-identification a confidentiality of information, which have not been considered. (Clause D-9.3.5).

Recommendations that have not been included

1. Our suggestions to include Audio and Tactile Evacuation Maps, Personal Emergency Evacuation Plans and wayfinding in the 'Terminology' section have not been considered.
2. We had made specific recommendations with regard to accessibility to be added in the following sections, i.e. 'General Exit Requirements', 'Walking surfaces in egress pathways', 'Arrangement of Exits', 'Capacities of Exits', 'Doorways',

'Internal and External staircases', 'corridors and passageways', 'Illumination of Means of Exits', 'Fire Extinguishers/Fixed Fire Fighting Installations', 'Refuge areas', 'Signage' and in the Table regarding 'Minimum Requirements for Fire Fighting Installations'. They have not been included.

3. In the section, 'General Exit Requirement', it was mentioned in the WCD that, 'where changes in elevation of more than 300 mm are encountered in the egress route, ramps or sloped surfaces shall be used with handrails and floor finish materials that contrast with the adjacent finish materials.' We recommended that there should be no steps even for heights less than 300 mm and that all level differences should be ramped. This seems to have been missed. The clause remains as it was.
4. Our suggestions to include a system for creating a Personalised Emergency Evacuation Plan and to introduce a procedure for self-identification have not been included.
5. It was mentioned in the WCD that, "Turnstiles or similar devices that restrict travel to one direction or are used to restrict unauthorized entry shall not be placed so as to obstruct any required means of egress. Alternate door openings shall be available within 3 m of such devices, if installed." We had suggested adding specifications for the door which have not been included.

Part 6: Structural Design, Section 8: Glass and Glazing

This section covers the provisions for the selection and manifestation of glass in buildings, subject to safety with respect to human impact of the occupants.

Recommendations that have been included

1. Our recommendation for the section on 'Reflective Glass' was that highly reflective glass should be avoided, especially in internal environments. The reflections from these surfaces can be particularly confusing for persons with vision impairment. In NBC 2016, a note has been added stating, "*Highly reflective glass should be avoided, especially in internal environments. The reflections from these surfaces can be particularly confusing for persons with vision impairment.*" (Clause 4.2.6).

2. For the section 'Manifestation (Making Glass Visible)', we had suggested adding specifications for marking in the form of an opaque band on glass doors. In NBC 2016, it has been given that, "*Manifestation shall be in the form of an opaque band in accordance with B-5.3.13 of Part 3 'Development Control Rules and General Building requirements' of the Code.*" (Clause 7.4).

Recommendations that have not been included

1. There was a point in the section 'Manifestation (Making Glass Visible)', which said, 'A band or marking is not required where any one of the following applies'. We had recommended deleting this point. That has not been done. (Clause 7.4.2).

Part 7: Construction Management, Practices and Safety

This Part of the Code covers construction project management, constructional planning and practices in buildings, storage, stacking and handling of materials, and safety of personnel during construction operations for all elements of a building and demolition of buildings. It also covers guidelines relating to repairs, retrofitting and strengthening of buildings.

Recommendations that have been included

1. In the section, 'Urban Roads/City Roads Planning and Construction', it is mentioned that, "the objective should be to create urban streets/roads that are efficiently planned, safe for vehicles as well as pedestrians, universally user friendly, and sustainable. As per our recommendation, in the sub-section, 'Elements required in an efficiently planned street', they have added "*kerb ramps; tactile ground surface indicators.*" (Clause 6.7.1). We had also suggested adding elevators for footovers, accessible traffic signals, accessible signage, accessible bus shelter, accessible Street Furniture. They have not done that.
2. In the WCD, it was mentioned that, "elements need to be integrated at the planning stage duly indicating the methodology of execution..." and several

points were listed. Our recommendation was to add to the list that, *“Selection, procurement and installation in respect of accessibility features as per the requirements given in 13 of Part 3 ‘Development Control Rules and General Building Requirements’ of the Code.”* (Clause 6.7.1). This has been accepted.

In addition to our recommendations, they have also added one more which is mentioned below.

3. In the section titled, ‘General’ it is mentioned that, *“The objective of universal design and accessibility is to ensure that all users, including those with disabilities and elderly people are able to access all the facilities within the built environment including in the public buildings, on an equal basis. Requirements for accessibility in built environment for the elderly and for persons with disabilities as given in 13 of Part 3 ‘Development Control Rules and General Building Requirements’ of the Code shall be complied with at all stages of the construction project.”* (Clause 3.2).
4. In Section ‘Construction of All Elements’, it is stated, *“Construction of all accessibility features/elements in a building and its built environment shall be as per the requirements given in 13 of Part 3 ‘Development Control Rules and General Building Requirements’ of the Code.”* (Clause 6.4.2).

Recommendations that have not been included

1. In the section, ‘Construction Project Management Functions’ where the processes of construction management are given, we had recommended adding Universal Design and Accessibility Management. This has not been considered. (Clause 4.3).

Part 8: Building services, Section 1: Lighting and natural ventilation

This Section covers requirements and methods for lighting and ventilation of buildings.

Recommendations that have been included

1. We had suggested specific points under 'Aims of Good Lighting'. We had also suggested adding minimum illuminance level required for different areas. They have not given the specifications as we had recommended. However, a cross reference to the accessibility standards has been given as stated below. In the section titled, 'Scope', it is mentioned that, *"For all buildings and facilities open to and used by the public, including all forms of public housing by the government/civic bodies and private developers, adequate lighting and ventilation for barrier free access and movement within and around buildings by elderly and persons with disabilities shall be ensured in accordance with 13 of Part 3 'Development Control Rules and General Building Requirements' of the Code"* (Scope 1.3).
2. In the section, 'Lighting', under the sub-section, 'Principles of Lighting', it is stated that, *"In case of all buildings and facilities open to and used by the public including all forms of public housing by the government/civic bodies and private developers, the requirements for visual contrast as given in 13 and Annex B of Part 3 'Development Control and Rules and General Building Requirements' of the Code shall also be complied with for ensuring visual comfort for elders and persons with disabilities."* (Clause 4.1.2.4).
3. Under the section, 'Recommended Values of Illuminance', it is mentioned that, *"In case of all buildings and facilities open to and used by the public, including all forms of public housing by the government/civic bodies and private developers, the minimum luminance level as given in 13 and Annex B of Part 3 'Development Control Rules and General Building Requirements' of the Code shall also be complied with for ensuring sufficient lighting for accessibility by elders and persons with disabilities."* (Clause 4.1.4).

4. For the section on 'Planning the Brightness Pattern', we had recommended that minimum lux level should be included for different areas. They have given a cross reference to Annexure of Part 3 for visual contrast. NBC 2016 mentions that, *"In case of all buildings and facilities open to and used by the public including all forms of public housing by the government/civic bodies and private developers, the requirements for visual contrast as given in 13 and Annex B of Part 3 'Development Control and Rules and General Building Requirements' of the Code shall also be complied with for ensuring visual comfort for elders and persons with disabilities."* (Clause 4.1.2.4).
5. In the section, 'Lighting for Movement About a Building', it is mentioned that, *"Most buildings are complexes of working areas and other areas, such as passages, corridors, stairways, lobbies and entrances. The lighting of all these areas shall be properly correlated to give safe movement within the building at all times. In case of all buildings and facilities open to and used by the public, including all forms of public housing by the government/civic bodies and private developers, the illuminance in these areas shall comply with requirements given in 13 and Annex B of Part 3 'Development Control Rules and General Building Requirements' of the Code."* (Clause 4.1.5).

Recommendations that have not been included

1. We had suggested that under the 'Aims of Good Lighting', it should be mentioned that "Good lighting is important to facilitate for persons with disabilities especially the deaf and persons with low vision in communicating and wayfinding respectively". This has not been considered. Further, we had suggested adding a few points in the section, 'Realization of these aims involves'. Those have also not been considered.
2. Table 4 provides 'Recommended Values of Illuminance'. We had recommended adding the minimum lux requirements as per accessibility standards to ensure correct lux levels across all building types. This has not been done.
3. We had suggested specific points to be included for 'Concert Halls, Cinemas and Theatres, Reception, Cashier's and Porters' Desks'. These have not been considered.

4. We had also recommended specific points to be added under the section, 'Glare'. They have also not been included.

Part 8: Building Services, Section 2: Electrical Installations

This Section covers the essential requirements for electrical installations in buildings to ensure efficient use of electricity including safety from fire and shock.

Recommendations that have been included

1. In the WCD in the section, 'Socket-Outlets and Plugs' section, it was mentioned that ordinary socket-outlet may at a height above 200 mm from the floor level and shall be away from danger of mechanical injury. We suggested that it should be above 400 mm. We also suggested adding details about the accessible heights for switches and controls. NBC 2016 states that, "*In case of public buildings, to facilitate operation of switches/socket-outlets by persons with disabilities and the elderly, these shall be installed at an accessible height for reaching and operating, between 800 mm and 1100 mm above floor level and shall be located at a minimum of 600 mm with a preference of minimum 700 mm, from any internal corner (see also B-7 of Part 3 'Development Control Rules and General Building Requirements' of the Code). They shall be so fixed so as to be away from danger of mechanical injury. NOTE As an exception, electrical wall socket outlets, telephone points and TV sockets can be located at a minimum height of 400 mm above floor level.*" They have added a "NOTE — *As an exception, electrical wall socket outlets, telephone points and TV sockets can be located at a minimum height of 400 mm above floor level.*" (Clause 7.2.3).

Part 8: Building Services, Section 3: Air Conditioning, Heating and Mechanical Ventilation

The provisions of this section aim to ensure a heating, ventilation and air conditioning system which can provide comfort by managing air temperature, humidity, indoor air quality and distribution of conditioned air for the specific use

and occupancy of built space while giving due consideration to minimising energy consumption and other resources.

Recommendations that have been included

1. In NBC 2016, for the sections, 'Offices' and 'Hotel Guest Rooms', we had suggested that wall mounted temperature controls must be mounted such that they are no higher than 1.1 m from the ground and have an obstruction free access. The controls must not be touch type. Braille indicators is recommended on the control unit. NBC 2016 states that, "*Wall mounted temperature control shall be mounted preferably on an inside wall and shall meet the requirements given in 13 and Annex B of Part 3 'Development Control Rules and General Building Requirements' of the Code for universal accessibility.*" (Clauses 7.3.1 and 7.3.2).

Part 8: Building Services, Section 4: Acoustics, Sound Insulation and Noise Control

This Section covers requirements and guidelines regarding planning against noise, acceptable noise levels and the requirements for sound insulation in buildings with different occupancies.

Recommendations that have been included

1. In the 'Foreword' it is stated that, "*Provisions have been updated to take care of the requirements of persons with disabilities.*"(q)
2. For the section on 'Planning and Design Against Indoor Noise', we had recommended adding equitable inclusion of deaf /hard of hearing persons in public places and gave specific points. NBC 2016 states that, "*People with hearing impairments have particular difficulty in making out sounds and words in noisy environments. Therefore, adequate sound insulation would minimise noise from both outside and inside the building. Also, low reverberation times are more suitable for hearing impaired persons and should thus be planned while designing the size and shape of the room. Persons using hearing aids may*

require quiet areas with induction loops in very noisy information counters or where announcements are made. Induction loops may also be provided in all areas where there are verbal inputs provided, such as conference halls, auditoria, class rooms and cinema halls.” (Clause 4.3.1).

Recommendations that have not been included

1. In the section on ‘Terminology’, we recommend adding the definition of Induction loop system. This has not been done.

Part 8: Building Services, Section 5A: Lifts

This Section covers the requirements for planning, design, installation, operation, maintenance and inspection of lifts (passenger lifts, goods lifts, hospital lifts, service lifts and dumb waiter) so as to ensure safe movement of people with satisfactory performance. This Section also gives information that should be exchanged among the architect/engineer, the consulting engineer and the lift manufacturer from the stage of planning to installation including maintenance.

Recommendations that have been included

1. The WCD had a very exclusionary approach. There was a separate section titled, ‘Lifts for Differently Abled People’. We recommended that such exclusionary approach should not be followed and that all lifts should be accessible. NBC 2016 states that, *“All lifts open to public shall adhere to accessibility provisions in terms of size of the car, door width, control panel, flooring, finishes, handrails, communication systems and information given in 13 of Part 3 ….”* This has been repeated quite a few times in the chapter.
2. In the subsection titled ‘Conformity with Lifts Act and Rules’, we had suggested adding a section on conformity with the disability legislation. It has been accepted. In NBC 2016, in the section ‘Conformity to Accessibility Requirements’, it is mentioned that, *“All lifts installed for public use shall meet the accessibility requirements in accordance with 13 of Part 3 ‘Development Control Rules and General Building Requirements’ of the Code.”* (Clause 3.4)

3. Under the section, 'Considerations for Selection of Lifts', in the WCD it was mentioned that, "Requirements, if any, for use by persons with disabilities". We recommended that "if any" should be removed and that it should be made mandatory. In NBC 2016, the section is titled 'Accessibility requirement' and they have cross referenced it to 3.4. (Clause 3.6).
4. In the WCD in the section, 'Buildings Taller than 15 m' there was a point about communication facility in the lift car. Our recommendation was to add that communication system should be accessible to persons with disability. We had also mentioned specifying standards for the mounting height, accessible controls etc. In NBC 2016, it is mentioned that, "*For lifts for use by persons with disabilities, the facility shall be provided in accordance with 13 of Part 3 Development Control Rules.*" (Clause 7.1.1 (f)).
5. It was mentioned in the WCD that, "Sign shall be posted and maintained on every floor at or near the lift indicating that in case of fire, occupants shall use the stairs unless instructed otherwise. The sign shall have the plan of the respective floor showing location of the stairways." Our recommendation was to add that the signs should be in accessible format and to provide reference to the section on accessible signage. NBC 2016 states that, "*All signs posted and maintained on every floor of buildings open to and used by the public shall comply with the requirements of accessible signage given in 13 of Part 3 'Development Control Rules and General Building Requirements' of the Code.*" (Clause 7.1.1 (g)).
6. In the WCD, it was mentioned in the section on 'Evacuation Lifts' that, "Buildings, particularly super high rise (height more than 200 m) buildings, may be designed for a systematic evacuation of persons in case of emergencies that are relevant to a specific building." Our recommendation was that all lifts/elevators in new buildings should, be capable of being used for evacuation in a fire situation as per the ISO standard. NBC 2016 has not modified the section the way we had suggested. It states that, "*Buildings, particularly super high rise (height more than 200 m) buildings, may be designed for a systematic evacuation of persons in case of emergencies that are relevant to a specific building. There are many reasons why a building may*

need to be evacuated, for example, a fire, explosion, chemical or biological attack, flooding, storm damage, earthquake, etc. Not all of these are relevant to every building hence those which are not relevant can be disregarded. Designers of buildings shall determine, if a particular hazard is sufficiently great as to require addressing. This clause deals primarily with fire situation although similar logic can be used in case of other situations as well. The lifts may be planned only supplementary to, not as a replacement of, exits. In fact, using lifts instead of stairs may well increase evacuation times in many building designs, especially low and medium rise buildings. However, lifts may be allowed to play a positive role in assisting and improving efficiency of the building evacuation strategy especially for persons with disabilities. The building designers should decide, if they want to use lifts for evacuation purpose. It may be noted that in general a fireman's lift may be suitable as an evacuation lift." (Clause 7.2). The NBC 2016 has not changed the requirement that Evacuation Lifts should be in super high buildings of height 200m and above. However, by stating that the fireman's lift can be used for evacuation of people with disabilities, it is clearly an improvement, as these are required to be installed in buildings above 15 m in height.

7. Under the section 'Minimum Technical and Safety Requirements', in the subsection 'General Requirements', we had recommended that all labels, notices, markings and operating instructions shall be permanently affixed, indelible, legible and readily understandable (if necessary aided by signs or symbols) and should be accessible (with high contrast with the background, good font size, tactile and Braille). An audio pre-recorded message of the information should also be installed for those with reading difficulty. In NBC 2016, they have given a cross reference. It reads, "*All labels, notices, markings and operating instructions shall be permanently affixed, indelible, legible and readily understandable (if necessary aided by signs or symbols). See also 13 of Part 3 'Development Control Rules and General Building Requirements' of the Code. They shall be of durable material, placed in a visible position, and written in the accepted language(s). (Clause 8.1 b).* Further, in the section, 'Notices', it states that, "*The following is a typical list of Do's and Don'ts that should be*

displayed in the lift car, and in case of lifts open to public use, in an accessible format complying requirements of accessible information board/signage, given in 13 of Part 3 'Development Control Rules and General Building Requirements' of the Code". (Clause 8.1 e (5)).

8. We had suggested that in the section on 'Finishes', it must be mentioned that they should be non-reflective. In NBC 2016, in the section 'Finishes', it is mentioned that, "*Finishes to be considered may include interior car finish, false ceiling design, false ceiling lighting, flooring material and weight, blower, ventilation details, car wall cladding details (weight to be considered), multimedia display details (like screen type, size, location, etc), door cladding details, transom details (flushed with the wall, material type, etc.). See also 13 of Part 3 'Development Control Rules and General Building Requirements' of the Code."* (Clause 12.3).
9. In the section, 'Lift Enquiry or Invitation to Tender', we had recommended adding voice announcement of floor levels, accessible control panel (good contrast with the background wall, Braille, raised letter and font), railing on 3 sides, two way accessible communication system in the list of particulars when enquiring for and ordering the elevators. This has been done. NBC 2016 says, "*Disable-friendly requirement such as voice announcement of floor levels, accessible control panel (good contrast with the background wall, Braille, raised letter and font), railing on 3 sides, two way accessible communication system"*. (Clause 12.1 (26)).
10. In the section, 'Inspection from the Lift Car', we recommended that several points be added to the checklist from the accessibility point of view. NBC 2016 has, instead, added a 'Note' at the end of the checklist, stating that, "*Lifts open to public use shall also be inspected for requirements as per 13 of Part 3 Development Control Rules and general building requirements of the Code including those relating to lift closing time, finishes of interior surfaces, etc."* (Annexure: A -9).
11. There was a separate checklist for 'Special Features for Disabled Persons Lifts' (A -11) in the WCD. We recommended that there should be only one checklist and that it should have all features including those on accessibility. They have

deleted the separate checklist and added a note in the regular checklist as mentioned in the previous point.

12. In the tables titled, 'Recommended Dimensions of Passenger Lifts and Service Lifts' and 'Recommended Dimensions of Passenger Lifts', we had suggested deleting the lift car dimensions that were not compliant with the accessibility standards. They have not done that. However, they have added a 'Note' at the end stating that, "*The minimum size of the lift car and all other requirements relating to accessibility, in all public buildings shall be in accordance with 13 of Part 3 'Development Control Rules and General Building Requirements' of the Code.*" (Tables 12 and 18).

Recommendations that have not been included

1. In the section, 'Painting at Works and on Site', we suggested that the colour of the lift door and the surrounding wall shall have a difference in light reflectance value to doorframe of not less than 30 points. This has not been done. (Clause 8.5).
2. We had asked for new section to be added vertical and inclined lifting platforms. This has not been done.

Part 8: Building Services, Section 5B: Escalators and Moving Walks

This Section covers the essential requirements for planning, installation, operation, maintenance and inspection of escalators and moving walks so as to ensure safe movement of people with satisfactory performance. This Section also gives information that should be exchanged among the architect/engineer, the consulting engineer and escalator/moving walk manufacturer from the stage of planning to installation including maintenance.

Recommendations that have been included

1. We had suggested adding few points for escalator and moving walks. They have been added in NBC 2016. In the section, 'Ensuring Accessibility for All Users', it

is mentioned that, *"The accessibility requirements given in Part 3, 'Development Control Rules and General Building Requirements' of the Code shall be complied with. The location of escalators and moving walks should be considered in relation to the position of adjacent fire protected lift shafts and lobbies, staircases and their associated areas of rescue assistance, as at the time of an emergency these become non-functional. A surface of the escalator and moving walks should contrast visually with the approach and there should be audible signals or pre-recorded messages that indicate the start and finish of the escalator to help visually impaired people. For important reasons of safety, special warning notices and tactile warning indicators shall be provided at the top and bottom of escalators. Escalators shall not be considered as the accessible route. Persons with locomotor disability cannot use them. Hence a lift should also be installed as an alternative accessible route. For moving walks, the maximum inclination should be up to 6° for use by people with disabilities. People with disability may find it difficult to use moving walks. Hence, alternative like an accessible battery cart, may be provided to them in appropriate cases. Moving walks shall be free of projecting objects and obstacles up to a height of 2 100 mm. A minimum level of illumination of 100 lux shall be provided on moving walks."* (Clauses 5.2.1 and 5.2.2).

2. Under the section, 'Plates, inscriptions and notices for use', in the sub-section, 'Safety signs near the entrances of escalators or inclined walks which are above 6 degree incline', we had recommended putting a sign that *"wheelchair users not permitted"*. It has been done. (Clause 8.14.2.1).
3. For the section, 'Escalator Enquiry or Invitation to Tender' (11), we recommended adding details of voice announcements, visual contrast, tactile indicators and warning signage, when enquiring for and ordering the escalators/moving walk. In NBC 2016, one of the points given under the section, 'When enquiring for and ordering the escalators/moving walks', is *"Details of voice announcements, visual contrast, tactile indicators and warning signage."* (Clause 11.1 t).

Part 8: Building Services, Section 6: Information and Communication Enabled Installations

This Section covers the guidelines required for planning and providing information and communication technology services in the building at the planning and execution stages.

We recommended adding a section titled, 'Hearing Enhancement System'. This has not been done. However, Section 4, 'Acoustics, Sound Insulation and Noise Control', has provided for installing induction loops at various places.

Part 9: Plumbing Services, Section 1: Water Supply

The Section covers the basic requirements of water supply for residential, business and other types of buildings, including traffic terminal stations. It also deals with the general requirements of plumbing which is connected to the public water supply system.

Recommendations that have been included

1. In the 'Foreword' it has been mentioned that, "*Provisions have been reviewed and updated from the point of view of accessibility by elderly and persons with disabilities, also, in this context, duly giving cross-reference to 13 of Part 3 'Development Control Rules and General Building Requirements'.*" (21).
2. In the section, 'Minimum Water Amenities', we had recommended adding accessibility features in family dwelling unit. In NBC 2016 they have stated, "*In case of a group housing, the requirements relating to toilet or sanitary room and kitchen as given in 13 and B-9 of Part 3 'Development Control Rules and General Building Requirements' of the Code shall also be complied with.*" (Clause 3.1.5).
3. In the WCD, the term accessibility was used the space required for cleaning. We objected to that. We suggested that a section be added for accessibility to persons with disability. It has been done. In NBC 2016, there is a section titled, 'Accessibility for Persons with Disabilities', under which it is mentioned that, "*All doors, windows and fixtures, including WC, urinals, grab bars, washbasin,*

mirror and all other accessories for use by persons with disabilities shall be so installed/located that they have proper access with appropriate width, height, space, centerlines, and ease of operation (see 13 of Part 3 'Development Control Rules and General Building Requirements' of the Code)." (Clause 3.16).

4. In the WCD, there were standards given for installing non pressure type hot water heater or cylinders. We recommended that it should be ensured that such vents and pipes are above reach/inaccessible during daily use to avoid accidents such as accidental contact and burning. NBC 2016 states that, "*it shall be ensured that such vent pipes are so located so as not to encroach into the minimum maneuvering space should be suitably insulated to avoid accidental contact and burns.*" (Clause 4.13.12.1.1).
5. We had suggested that the hot and cold water mixers/diverters/faucets should have the 'hot' and 'cold' clearly marked in form of color coding and tactile information. The functioning of hot and cold water from the mixer/diverter/faucet should be consistent eg. A clockwise turn should result in discharge of hot water and counter clockwise for cold. In NBC 2016, under the section, 'Hot water heaters', it is mentioned that, "*The hot and cold water thermostatic mixers/diverters/faucets for public use should have 'hot' and 'cold' clearly marked in the form of colour coding and tactile information. The functioning of hot and cold water from the thermostatic mixer/diverter/faucet should be consistent, for example, a clockwise turn should result in discharge of hot water and counter clockwise for cold. It is recommended that a thermostat be installed to limit the temperature of the hot water to a maximum of 40°C in order to prevent scalding. All faucets/mixers/diverts in public use shall be automatic (sensor operated) or lever type (see also B-7 and B-9 of Part 3 'Development Control Rules and General Building Requirements' of the Code).*" (Clause 4.14.12.2.4).
6. In the section on swimming pools, we had recommended that all pools open to public should be accessible and wanted the details to be mentioned. NBC 2016 has added the following points:
"The width between handrails of the pool stairs should be between 500 mm and 600 mm.

Pools shall be completely surrounded by a deck that is at least 1.2 m in width and extends completely around and adjacent to the pool. There shall be no obstructions or interruptions of the pool deck within the 1.2 m adjacent to the pool other than necessary structural supports, or appurtenances such as diving boards, slides, perimeter overflow systems, or handrails. A clear, unobstructed walkway at least 1.2 m in width shall be maintained at such obstructions or interruptions. A wheelchair turning space of minimum 1.5 m × 1.5 m shall be provided at key places in the walkway. Structural supports located within the minimum required deck width or within 1.2 m of the swimming pool shall be no closer than 3 m apart measured parallel to the adjacent perimeter of the pool, with the dimension of any single support in a plane parallel to the adjacent pool perimeter not greater than 1 m and the sum of all such support dimensions not greater than 10 percent of the pool perimeter. The deck between two adjacent swimming pools shall be at least 2.5 m wide. All decks and walkways shall have an unobstructed overhead clearance of at least 2 m. Synthetic material which meets the following criteria may be installed for deck coverings: a) Non-fibrous and allows drainage such that it will not remain wet or retain moisture; b) Inert and will not support bacterial or fungal growth; c) Durable; d) Cleanable; and e) Provides a slip-resistant finish. The decks and walkways shall have a paved surface. The surface of the pool deck and other surfaces used for foot contact, such as gratings of perimeter overflow systems, shall be slip-resistant. The outer perimeter of the deck for outdoor pools shall be at least 10 cm higher than the surrounding ground surface except where access is provided to adjacent turf areas.

The pool shall have an accessible entry and exit that is accessible to persons with disabilities. Accessible entry/ exit may require provision of a transfer wall or/and a sloped entry with an aquatic chair. Installing a pool lifts may be another option for accessible entry/exit. The transfer wall should have a minimum clear deck space of 1.5 m × 1.5m, with a slope not steeper than 1:48 at the base of the transfer wall. The height of the transfer wall should be 400 mm to 480 mm from the deck floor. The transfer wall should be 300 mm to 400 mm wide. The length should be minimum 1.5 m centered on the clear deck

space. Surfaces of transfer walls shall not be sharp and shall have rounded edges. A grab bar should be provided on the transfer wall. Grab bars shall be perpendicular to the pool wall and shall extend the full depth of the transfer wall. The top of the gripping surface shall be 100 mm to 150 mm above transfer walls. Clearance of 610 mm should be available on both sides of the grab bar."

Part 9: Plumbing Services, Section 2: Drainage and Sanitation

This Section covers the design, layout, construction and maintenance of drainage and sanitation.

Recommendations that have been included

1. In the 'Foreword' it is mentioned that, "Provisions have been reviewed and updated from the point of view of accessibility by elderly and persons with disabilities, also, in this context, duly giving cross-reference to 13 of Part 3 'Development Control Rules and General Building Requirements' of the Code." (24).
2. There was a section on accessibility in the WCD. The term access was used to mean the space required to be left for cleaning the fixtures and didn't mention about access to persons with disability. There was another section called, 'Fixture for disabled'. It said, "Special toilet fixtures shall be provided for the disabled with required fixtures and devices". We suggested combining the two sections and suggested the title and the text that should be included there. It has been done. The NBC 2016 text reads, "*Accessibility for Persons with Disabilities - All doors, windows and fixtures, including WC, urinals, grab bars, wash basin, mirror and all other accessories for use by persons with disabilities shall be so installed/ located that they have proper access with appropriate width, height, space, centerlines, and ease of operation (see 13 of Part 3 'Development Control Rules and General Building Requirements' of the Code).*" (Clause 3.1.16).
3. In the WCD, it was mentioned that each family dwelling unit should have certain requirements to meet the basic requirements of sanitation and personal

hygiene. We had suggested that in case of a group housing, it should be ensured that they are accessible. In NBC 2016, in the section, 'Minimum Amenities', it is stated that, *"In case of a group housing, the requirements relating to toilet or sanitary room and kitchen as given in 13 and B-9 of Part 3 'Development Control Rules and General Building Requirements' of the Code shall also be complied with."* (Clauses 3.1.5 and 4.2.2).

4. In the section on 'Manhole covers and frames', our recommendation was that ventilation holes on manhole covers must not be wider than 12mm diameter. Where metallic strips are used on manhole covers the strips should not be placed further than 12 mm and run perpendicular to the circulation route. NBC 2016 mentions that, *"The holes over the surfaces of covers/gratings of various manholes, gullies and other chambers/drains shall comply with the requirements given in 13 of Part 3 'Development Control Rules and General Building Requirements' of the Code.* (Clause 4.5.10).

Recommendations that have not been included

1. There were 15 tables (Tables 1 to 15) in the WCD where the requirements for fittings for drainage and sanitation (toilets, drinking water fountain, urinal etc.) were given in the case of buildings other than residences. We also noted that it was only in Table 14, 'Airports and Railway Stations', that 'toilet for disabled' was mentioned. In the other tables for hospitals, schools, hostels, restaurants, shopping malls etc., it was not mentioned. We recommended that all facilities provided in the buildings should be accessible for people with disabilities and should meet the standards. In NBC 2016, they have removed the 'toilet for disabled' from Table 14 and have added a common point in the beginning stating that, *"The requirements for fittings for drainage and sanitation in the case of buildings other than residences shall be in accordance with Table 1 to Table 15. The accessibility requirements for provision of these facilities for persons with disabilities shall be in accordance with 13 of Part 3 'Development Control Rules and General Building Requirements' of the Code.* (Clause 4.2.5.1). However, in Table 2, 'Factories', they have added the following 'Note' stating that, *"Depending on the type of disability of a person and the hazard*

posed by the type of activities in the factory for a person with disabilities, if a person with disabilities is decided to be engaged for a particular activity, the requirements of accessibility shall be guided by the provisions given in 13 of Part 3 'Development Control Rules and General Building Requirements' of the Code."

2. For the section, 'Dwellings without individual conveniences', where the fitments that needs to be provided, like water taps, WC, bath etc. are mentioned, we recommended that the fitments should be accessible thus complying with the standards. This has not been done. (Clause 4.2.4.2).

Part 9: Plumbing Services, Section 3: Solid Waste Management

This Section covers the solid waste management, that is, collection and disposal of domestic garbage from a building and addresses other types of wastes such as municipal waste and electronic waste.

Recommendations that have been included

1. In the 'Foreword' it is mentioned that, "*Accessibility provisions for persons with disabilities to enable efficient operation of refuse chutes, have been included.*"
2. For the section, 'Opening for feeding of refuse chute', we suggested that they should be accessible for people with disabilities and gave specific points for the same. This has been done. NBC 2016 states that, "*All care shall be taken for ensuring accessibility to the chute for persons with disabilities. The opening of the chute shall not be higher than 700 mm and there shall be a clear space of minimum 1500 mm × 1500 mm in front of the chute opening to gain easy access even for persons using wheelchairs. There may be high colour contrast provided around the chute opening to make it easy to identify it. The flooring in front of the chute opening may be texturally highly different from the rest of the floor.*" (Clause 4.3.2 k).

Part 9: Plumbing Services, Section 4: Gas Supply

This Section covers the safe use of gas for fuel or lighting purposes in buildings.

Recommendations that have been included

1. Under the section, 'Warning Signs', we recommended that it should be ensured that warning signs meet the accessibility standards and cross reference should be given. The NBC 2016 states that, "*From accessibility point of view, the signs shall be in accordance with 13 of Part 3 'Development Control Rules and General Building Requirements' of the Code.*" (Clause 11.4.5).

Recommendations that have not been included

1. In the section related to 'fire extinguishers', we had suggested that a few points, including mounting heights etc., be mentioned. However, NBC 2016 has just added that they should be mounted keeping in view ease of accessibility in accordance with good practice and Part 4. (Clause 11.4.6.2).
2. We suggested that, in the section, 'Instructions to Consumers', a point should be added stating that all information should be provided in accessible formats, which would include Braille and pictorial/graphic representations, and that the same should also be available in audio-visual accessible formats as well. This has not been done. (Clause 11.3.5).

Part 10: Section 1: Landscape, Planning, Design and Development

This Section covers requirements of landscape planning, design and development with the view to promote quality of outdoor built and natural environments.

Recommendations that have been included

1. In the section, 'Landscape Development Documents Required for Statutory Approvals', under the sub-section, 'Landscape Master Plan', we had suggested changing the terminology from handicapped to persons with

disabilities. NBC 2016 states that, "(g) *Parking including, location, parking spaces, size and number, and typical parking space details for both persons with disabilities and for standard spaces. (h) Circulation for vehicles, bicycle and pedestrian, including for persons with disabilities clearly identified.*" (Clause 3.31 g, h).

2. In the section, 'Basic Design and Construction Details', we had recommended accessibility features such as kerb ramps, Tactile Walking Surface Indicator (TWSI), etc. NBC 2016 states that, "*All paved areas for pedestrian and vehicular use, including edges, kerbs, bumper stops, steps, ramps, planters, railings or other protective devices; tree protection with tree grating, tree guard, etc; provision for wheelchair access and movement, and other accessibility details in accordance with 13 of Part 3 'Development Control Rules and General Building Requirements' of the Code.*" (Clause 3.3.5 a).
3. Under the section, 'Community-Friendly Design Guidelines' (the title of the section has been modified in NBC 2016 as 'General Landscape Development Guidelines'), we had recommended adding points related to accessibility standards in order to ensure barrier free spaces for persons with disabilities. This has been accepted. In the 'General Landscape Development Guidelines', one of the points states that, "*Accessibility—The planning and design of open spaces may be accessible for a wide range of users, including pedestrians, cyclist, transit riders and those using private modes of transport (see also 13 of Part 3 'Development Control Rules and General Building Requirements' of the Code)*". (Clause 5.1.1 (2)).
4. We had made specific suggestions for open spaces, drop off areas, covered walkways, seats, paved surfaces, ramps, handrails, parking, street furniture for including accessibility features in them and for providing cross reference to Annexure of Part 3. The format of the final chapter has changed compared to the WCD. Following are the points that have been added in the section, 'Pathways and Pedestrian Movement Corridors', "*a) Pedestrian circulation path consists of sidewalks, wheelchair ramp, and landings. Footpaths of minimum width 1.80 m may be provided along the length of road for any public or private building where pedestrian traffic is expected. See 4.3.2.1 of*

Part 3 'Development Control Rules and General Building Requirements' of the Code for computation of capacity of footpaths with respect to their widths. d) Change in levels and steps may be depicted in different texture or colour as a visual clue. e) The cross slope of sidewalk may be designed so as not to exceed two percent (1 in 50). The longitudinal slope of path may not exceed 1 in 20, unless the longitudinal slope of the road exceeds this maximum, in which case the norms applicable to a ramp should be applied. Kerb ramps may be provided at pedestrian crossings. See also 13 of Part 3 'Development Control Rules and General Building Requirements' of the Code. f) All ramps should have minimum width of 1.20 m, excluding edge protection. The cross slope of ramp should not exceed 1 in 50 and the longitudinal slope of ramp may not exceed 1 in 12. All ramps may have an unobstructed level landing both at top and bottom of the ramp. The landing may have the minimum width as that of the ramp. The landing may be minimum 1.50 m in length. Any ramp beside the road may be located in such a way so that vehicles cannot park blocking the access. The ramps shall also comply with the requirements of 13 of Part 3 'Development Control Rules and General Building Requirements' of the Code. g) Handrails may be provided for any ramp with a vertical height greater than 150 mm, to prevent pedestrians and wheelchair users slipping from the ramp. The height of the top handrail may be 900 mm from the top surface of the ramp. The ramp surface may be rough finished. All ramp and landing may be designed so that water does not collect on the surface of the ramp or landing." (Clause 5.2.9 a, d, e, f, g).

5. In the section, 'Provision for Adequate Parking Requirements' it is mentioned that, "Parking bays for persons with disabilities shall be provided as per 13 of Part 3 'Development Control Rules and General Building Requirements' of the Code." (Clause 5.2.10 e).
6. For the section on Playgrounds, Pocket Parks and Public Plazas (the title of the sub section has been changed to Design for maximising usable space in the final text), we had recommended that all play spaces must be inclusive and accessible. They need to have universally accessible features in the

space as well as in play equipment. The following provisions are included in NBC 2016 with respect to park/play areas: "

- *Under the section, 'Design Guidelines for General Types of Landscape Open Spaces' in the sub-section, 'Provision for Various User Activities Spanning Different Age Groups', it is mentioned that "Spaces should be designed for use by people of all abilities, including those using mobility aids (for example, wheelchairs). See 13 of Part 3 'Development Control Rules and General Building Requirements' of the Code."* (Clause 5.2.4).
- *Provision for Free and Imaginative Play Opportunities in Children's Play Areas, all possible efforts should be made to extend opportunities to children of all abilities and age, by providing access to a variety of play features and using features that appeal to all of the senses. See 13 of Part 3 'Development Control Rules and General Building Requirements' of the Code."* (Clause 5.2.5 e).

Recommendations that have not been included

1. We suggested that the terminology section to have definitions for kerb ramp, TWSI, etc. They have not been included.

Part 10: Section 2: Signs and Outdoor Display Structures

This Section covers the requirements with regard to public safety, structural safety and fire safety of all signs and outdoor display structures.

Recommendations that have been included

1. In the 'Foreword', it is mentioned that, *"This Section has been linked with Part 3 'Development Control Rules and General Building Requirements' of the Code through reference to the same, for ensuring appropriate controls of signs as applicable for the purpose of accessibility for persons with disabilities."*
2. In the section, 'Scope', it is stated that, *"the requirements for signs and related aspects for the persons with disabilities shall be complied with in accordance*

with 13 of Part 3 'Development Control Rules and General Building Requirements' of the Code (1.2)."

3. In the section, 'Signs', we had recommended adding International Symbol of Accessibility and its specifications. NBC 2016 has added 'International Symbol of Accessibility' in the Terminology section. It states that, *"The symbol consisting of a square overlaid with a stylized image of a person using a wheelchair. It is also known as the (international) wheelchair symbol. NOTE: The symbol is often provided where access has been improved, particularly for wheelchair users and other mobility impaired persons. The symbol denotes a barrier free environment to help older people, parents with prams and travellers with luggage besides persons with disabilities. The wheelchair symbol is always facing to the right."* (Clause 2.1.18).
4. In the section, 'Environmental Graphics for Cityscape', there was point in the in the WCD which stated, *"Signage for the handicapped at all grade changes, entry points to buildings and public conveniences and facilities. Braille strips used should be displayed not above 1.5 m height for the benefit of the visually impaired at all important nodes, entrances and routes. Ramps for the people on wheelchair should be highlighted with the appropriate international sign of the wheelchair. These need to be lighted adequately even for night time."* Our recommendation was for them to modify the text so as to include the standards for accessible signage. We also objected to use of the term handicapped. NBC 2016 states that, *"Signage for the persons with disabilities at all level/grade changes, entry points to buildings and public conveniences and facilities; including Braille and tactile signage used for the benefit of the visually impaired at all important nodes, entrances and routes (see Part 3 'Development Control Rules and General Building Requirements' of the Code)."* (Clause 17 b).

Recommendations that have not been included

1. In the section, 'Design and Location of Advertising Signs', the WCD had mentioned that, *"Braille strips may be placed along sign edges or raised letters may be used for readability for the blind and partially sighted."* Our recommendation was to modify the text to state that, *"All signs should be*

accessible, in terms of adequate colour contrast, glare free, accessible font and size, raised letters, Braille and pictorial/graphical symbol. Signs shall comply to specifications on Signage provided in Annexure B of Part 3.” This has not been done. (Clause 6.3).

2. In the sections, ‘Wall Signs’ and ‘Ground Signs’, we suggested adding a point that, “All signs should be accessible, in terms of adequate colour contrast, glare free, accessible font and size, raised letters, Braille and pictorial/graphical symbol. Signs shall comply with the specifications on Signage provided in Annexure B of Part 3. This has not been done (Clauses 3.2.2 and 3.2.3).
3. In ‘Examples of Signs’, we recommended that it would be useful to add an image of an accessible sign. They have not done that.

Part 11: Approach to Sustainability

This Part covers the parameters required to be considered for planning, design, construction, operation and maintenance of buildings and those relating to land development, from sustainability point of view.

Recommendations that have been included

1. The ‘Foreword’ in NBC 2016 states that, “*Greater emphasis on ensuring barrier free design for universal accessibility, as part of approach to sustainability.*” (b)
2. In the section, ‘Elements of Sustainability’, in the WCD, it was mentioned that, “This should also reflect the aspirational needs of barrier free environment by differently abled people including by people under various age groups.” Our recommendation was to modify the text. In NBC 2016 it is stated that, “*Have deep understanding of requirements of performance and human comfort in a building and its surroundings, considering building type and use, quality of building and plumbing services as desired, needs of persons with disabilities and of different age groups, and her parameters. The sustainable design process must be based on principles of universal design and address accessibility needs of persons with disabilities and persons of different age groups as per Part 3. Functional requirements of buildings have to also*

measure up to the required comfort levels demanded for all types of user requirements." (Clause 3.2).

3. In the section, 'Bicycle Lanes and Pedestrian Access – Safety and Comfort', as per our recommendation, it is mentioned that, "*Barrier free environment to make public streets and crosswalks fully navigable by all persons including the persons with disability and the elderly.*" (Clause 7.4.3 k). We had also suggested adding standards for adequate street lighting. This has not been done.
4. In the WCD, in the section, 'Barrier free external landscape', it was stated that, "The external landscape shall be barrier free to enable access in the permitted areas to all (see art 3 'Development Control Rules and General Building Requirements). In NBC 2016, the section is titled, 'External Access Design' and the text has been modified and it states that, "*The external access, including pedestrian walkways/pathways shall be designed and developed in accordance with Part 3 'Development Control Rules and General Building Requirements' of the Code.*" (Clause 7.4.1).
5. In the section, 'Off Street Parking' our recommendation was to provide for reserved car parking for persons with disabilities. We also suggested that space should be provided for passenger drop-off points for taxis, public transport and also for large vehicles such as vans, etc., as near as possible to the main accessible entrance. In NBC 2016, it is stated that, "*The off street parking shall be planned taking care of the following objectives as per Part 3 'Development Control Rules and General Building Requirements' of the Code.*" (Clause 7.4.4)

In addition to the recommendations we made, they have added one more which is stated below.

6. In the section, 'Providing Neighbourhood Connectivity, Walkability and Safety', it is mentioned that, "*Based on local climate, minimum 2 h daylight access to neighbouring buildings to be ensured through provision of required street width-to-height ratios, in accordance with Part 3 Development Control Rules and General Building Requirements' of the Code.*" (Clause 7.4.6).

Recommendations that have not been included

1. In the section, 'Disaster Risk Assessment and Mitigation', we recommended adding the following point: "Prepare a disaster risk reduction plan, that includes protection and safety of persons with disabilities on an equal basis with others. Allocate sufficient budgetary provisions." This has not been done. (Clause 3.11.3).
2. In the section, 'Long term Public and Private Transportation Plan', we suggested that it should be ensured that the public and private transport system is accessible to persons with disabilities and is planned in accord with Universal Design principles such that it is accessible to all. Our suggestion has not been taken. (Clause 7.4.2).
3. In the section, 'Discouraging Subsidized Parking in Public Realm', our recommendation was that, "Reserved car parking for persons with disabilities should be provided. Space should be provided for passenger drop-off points for taxis, public transport and also for large vehicles such as vans, etc., as near as possible to the main accessible entrance". This has not been included. (Clause 7.4.5).

Part 12: Asset and Facility Management

This Part of the Code covers provisions relating to management of building assets and associated services and deals with issues relating to maintenance of all types of facilities and fixed assets such as buildings and building services. Besides these provisions, critical activities and critical assets which need to be focused upon by facility managers have also been identified. The responsibilities of occupants for maintenance of facilities, such as, structures, equipment and exterior property have also been covered.

Recommendations that have been included

1. In the section, 'Stakeholder Engagement,' we had recommended including people with disabilities. In NBC 2016, it is mentioned that, "a) *involving stakeholders, as far as practicable, in identifying their needs through, for*

example, the use of questionnaire-based surveys and in contributing to the drafting of service specifications and service levels; b) identifying diversity of need such as when seeking to include people with disabilities or other individuals' specific needs;" (Clause 3.3.3 a, b).

2. In the section on 'Aspects Influencing Building Maintenance' under the sub-point titled, 'Users' we had suggested mentioning people with disabilities. That has been accepted. In NBC 2016, it reads, "*User — the maintenance requirements of buildings and their various parts are directly related to the type and intensity of use they receive and the people who use these facilities especially those with disabilities, elderly and children in particular.*" (Clause 9.4.1 d).
3. In the section, 'Risk Control and Corrective Actions' where they had listed people who may be at risk from maintenance, to add persons with disabilities on the list. In NBC 2016, it is stated that, "*Identification of people who may be at risk from maintenance, for example, maintenance personnel, occupants, visitors, passers-by, trespassers, persons with disabilities, elderly people and children*". (Clause 9.4.2.1.3 b).
4. In the section, 'Influence of Design', we recommended adding a point that all maintenance and refurbishment must take into account improving accessibility for persons with disabilities. In NBC 2016, under the section, 'Maintenance from Accessibility Consideration' it is stated that, "*All maintenance and refurbishment in public buildings and built environment shall take into account improving accessibility for persons with disabilities and care taken that accessible design features are properly maintained during maintenance activities (see B-25 of Part 3 'Development Control Rules and General building Requirements' of the Code). Periodic access audits shall be carried out at least once in three years to ensure that the requisite accessible features as per Part 3 'Development Control Rules and General Building Requirements' of the Code are provided in the building and its built environment and maintained in good condition on an ongoing basis.*" (Clause 9.14).
5. In the section, 'User feedback' our recommendation has been accepted. In NBC 2016, it is mentioned that, "*Feedback should aim at the following: a) User*

satisfaction, particularly from diversity of users, such as women, elders and person with disabilities; b) Continuous improvement, and c) Participation by all." (Clause 9.7.2.).

6. We had suggested adding accessibility features in the general inspection of the building and in specific inspections for fire alarms, public address systems etc. Our recommendation has been taken only partially. In NBC 2016, in the section, 'Inspections', one of the points states that, "*Maintenance of walkways, roads and paths should specifically ensure proper maintenance of accessibility features provided, to facilitate movement of people with disabilities.*" (Clause 16.4). However, in specific inspections of fire alarms, etc. our suggestion has not been considered.
7. In the section, 'Maintenance of Landscape and Horticulture Works', we had recommended adding that maintenance of accessibility features. This has been done. NBC 2016 states, "*Maintenance of walkways, roads and paths should specifically ensure proper maintenance of accessibility features provided, to facilitate movement of people with disabilities.*" (Clause 18.1).
8. Under the section, 'Training and Skilling', we had suggested the staff (cleaning supervisor/cleaning personnel) should be sensitised regarding the needs of persons with disabilities in particular. NBC 2016 states, "*During training, housekeeping staff should be sensitized on needs of persons with disabilities, elderly and frail people and children in particular.*" (Clause 19.5).
9. In the section, 'Security Services for Building Occupants', we recommended sensitisation of security staff for needs of persons with disabilities. In NBC 2016, it is mentioned that, "*While ensuring safety and security measures adopted, the staff deployed should take into account needs of persons with disabilities, elderly and frail people, women and children in particular.*" (Clause 21.1).
10. In the section on 'Facility Handbook', we suggested adding a chapter on accessibility features in the handbook. In NBC 2016, in the 'List of contents of the Handbook', it is mentioned that, "*Information on accessibility features of the building that makes it friendly to users with disabilities and elders.*" (Clause 24.2.1 g).

In addition to our recommendations, they have added another one which is mentioned below.

11. In the section, 'Ease of Movement', it is mentioned that, "*It should be ensured that foot paths/walkways are easily approachable and are user-friendly especially to elderly people and persons with physical disabilities. A simple test for the same can be to make a person walk with a trolley and he should be able to move around without having to lift the trolley at any point.*" (Clause 16.2.1).

Recommendations that have not been included

1. In the section, 'Acceptance' which is related to lift installation, we suggested adding that all the controls, interiors of lift car, features should meet the requisite accessibility standards as per Annexure B, Part 3 and that without these features in place the lift should not be accepted. This has not been done.
2. In the section related to 'Checklists' we suggested adding an Accessibility Audit checklist focused on Maintenance which has not been done.

Analysis

Interventions made by NCPEDP and recommendations proposed by DEOC and AccessAbility on the Wide Circulation Drafts (WCDs) were timely. As a consequence, the final text of NBC 2016 has included several of our recommendations as detailed above.

The 'exclusive' approach, followed in NBC 2005, where accessibility standards were only in the Annexure has been corrected in NBC 2016. The accessibility of persons with disabilities has now been explicitly mentioned in all the relevant chapters. It has also been mentioned several times within chapters as and when required with a cross reference being made to the accessibility standards detailed in Part 3.

In the main Foreword of NBC 2016, it is mentioned that, "*The major changes incorporated in this third revision of the Code are as follows: Requirements for accessibility in buildings and built environment for persons with disabilities and the elderly have been thoroughly revised and updated.*"

In the foreword written at the start of several of the Parts/Sections comprising NBC 2016, where the updates that have been made to the Part in this present revision have been detailed, it has specifically included statements such as, "*provisions have been updated from the point of view of accessibility*" or "*greater emphasis on ensuring barrier free design for universal accessibility*" or "*this Section has been linked with Part 3 'Development Control Rules and General Building Requirements' of the Code for... ensuring accessibility for persons with disabilities*". Many chapters emphasise the fact that facilities open to the public should adhere to accessibility standards.

One of the most important modifications incorporated in this revision of NBC is that the 'Accessibility and universal design Specialist' has been included as part of the list of professionals in the design/construction team. One other very significant change is the inclusion of the provision of periodic accessibility audit of public buildings.

Accessibility standards which were archaic in NBC 2005 have undergone considerable change and it more or less conforms to ISO Standards (IS 21542). However, there are still a few concerns. These are:

1. The cross reference given in various chapters to link accessibility standards in Part 3 is not very specific. It usually just states, "*in accordance with 13 of Part 3...*". Now Clause 13 is a very detailed clause which has an Annexure as well. It would definitely not be very easy to refer to. One would have to spend a significant amount of time looking for the needed information unless more specific pointers are given.
2. The chapter on Fire Safety has not included many of our recommendations. Even the section on 'Emergency Evacuation in Buildings' in Annexure B (B 23) of Part 3 only provides cross reference to Part 4, which in itself is not very comprehensive as far as accessibility standards are concerned.

Conclusion and the Way forward

A major milestone in terms of integrating accessibility standards in the National Building Code (NBC) has certainly been achieved. This should have a huge impact in the way design and construction professionals view disability and accessibility.

Following are some recommendations for the way forward:

1. The accessibility standards in NBC 2016 are reasonably comprehensive. There are points related to accessibility in the various chapters. They need to be disseminated widely among all stakeholders involved in infrastructure development.
2. Building Bye laws should be modified to take into account the revised accessibility standards given in NBC 2016.
3. Suitable training of professionals would be required to ensure effective implementation of the standards.
4. There is a need to create a cadre of competent Access Auditors who can inspect and certify buildings based on the standards.
5. With the Rights of Persons with Disabilities Act (RPWD) Act 2016 mandating accessibility of all new constructions, it is important to set up a process for its implementation. An Access Board could be set up to monitor the implementation.
6. Standards should continue evolving and should be dynamic in nature. A large content of the accessibility standards in NBC 2016 are borrowed from International Standards. There is also a need for developing standards suitable for Indian contexts particularly for rural areas/ hilly regions. As the technology is rapidly changing, the standards have to be periodically updated so as to include new developments.
7. There was no representation of accessibility/universal design experts in the Committees that were in charge of revising the NBC. In the next revision of NBC, experts with disabilities should be part of all the relevant Sub-committees of different sections/Parts. Universal Design should be the widely accepted way forward in further improving NBC 2016.