

Building Regulations For Faecal Sludge Management: Review of Building Regulations From Indian States

RESEARCH REPORT

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Introduction

Disposal of human excreta is conducted principally through two methods. In conventional thinking and in urban contexts, it is believed that human waste is best disposed of through a network of underground sewage pipes that convey the waste, along with domestic wastewater, to disposal facilities. However, this wisdom is undermined by the glaring absence of underground networks in many urban and high-density settlements, and the high costs and technical challenges of installing new networks, as well as the operational difficulties of keeping networks in a state of optimal functioning. Non-network or on-site sanitation is now recognized as a viable alternative; here human excreta is kept on-site in a safe 'containment structure', from where it is evacuated from time to time by mechanical means and transported to disposal facilities.

Non-network sanitation is now widely referred to as faecal sludge management (FSM) or on-site sanitation (OSS). However, it is not an entirely new practice, as it builds on existing practices of household containment prevalent in areas where there are no sewage networks. According to the 2011 Census, only 32.7% of the total households in urban India are connected to piped sewer systems. In contrast, 38.2% of the urban Indian households have septic tanks while 1.7% of the urban Indian households are connected to systems other than the piped sewer system or septic tanks. Such 'other methods' include flushing of the excreta to the street, yard/plot, drainage ditch or other locations. Therefore, nearly 40% of urban Indian households may be relying on on-site systems of human waste disposal.

However, at present, few cities have adequate arrangements for evacuating waste (faecal sludge) from these containment structures ('de-sludging'), and faecal sludge that is removed from the containment structures does not usually reach treatment facilities. At the same time, household practices of containment vary, and not all of them are technically sound. Local authorities have also so far paid little attention to this aspect of building construction. As a matter of fact, many building regulations do place the responsibility for making adequate on-site containment structures on the owners of new properties, and municipal laws contain various restrictions on dumping of domestic wastewater and faecal sludge at any place except in designated drains. In some of the states, there are clear and coherent rules for on-site containment in the building regulations, but in others it would appear that the framers of the regulations have not thought very deeply about the practical application of the rules relating to on-site containment.

In this report we will look into what the building regulations currently say about on-site containment, and to what extent they do impose clear and binding legal obligations on property owners and developers to make on-site containment arrangements. For this purpose, we have looked at the building regulations applicable to urban areas in Andhra Pradesh, Maharashtra, Odisha (Bhubaneswar and Rourkela), Tamil Nadu, Rajasthan and Uttar Pradesh.

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According to the 2011 Census, only 32.7% of the total households in urban India are connected to piped sewer systems

Building Regulations as Law

Building regulations are also variously referred to as 'building bye-laws', 'building code', 'building rules' and 'development control regulations'. Building regulations set out various controls on building activity within the notified area where they are applicable. In effect, the owner of the property needs approval from the notified authority – usually the municipal body or development authority – in order to carry out any building construction activity. For this approval, an application is to be made in the prescribed form, and containing required information. The building application, and the construction activity and completed building must comply with the conditions and specifications laid down in the regulations and in the approval issued to the building owner. In legal terms, one could say that building regulations place various restrictions on the owner's use and enjoyment of the property, albeit in public interest. These restrictions can be placed only with the authority of law, and must be clear and non-arbitrary. Also in legal terms, building regulations are a form of 'delegated legislation', formulated under the state's planning laws and notified after government approval. In terms of the parent statute under which regulations are formulated, these regulations have the force of law. Building regulations are referred to variously as 'building bye-laws', 'building code' and 'development control rules'. For standardisation, we will refer to these instruments as building regulations, but will use more specific names when referring to each state- or city-level instrument.

Urban development, civic infrastructure, housing and land regulation are all State subjects under the Seventh Schedule of the Constitution. In terms of Articles 246 and 162 of the Constitution of India, this means that the States have almost exclusive law-making and executive power in relation to these subjects, to the exclusion of the power of the Centre. The 74th Amendment to the Constitution further mandated that urban planning should be devolved to municipalities (Article 243W and the Twelfth Schedule of the Constitution). Following this, State legislatures were to frame State-level laws for land development and town planning, but few have gone all the way to delegating full urban planning powers and functions to municipalities.

Instead, the State laws tend to delegate power over land use, urban development plans and building regulations to specially constituted urban authorities, or States may keep the power with a specific agency of the State government, such as a Directorate of Town & Country Planning.

The role of implementing building regulations is however usually delegated to municipalities, which are responsible for issuing plan approvals, building completion and occupancy certificates in areas within their jurisdiction. For urban areas in which there are no municipalities, these powers may be held by development authorities or even by the district administration. The municipal body or other agency or unit of government is also responsible for monitoring compliance at the time of construction and at any time after. It can undertake action in case the construction is not in compliance with the approved building plan.

There are multiple points of contact between the owner of the property and the agency or government unit responsible for implementing building regulations. The implementing agency also has various types of powers with which it can enforce the regulations. In order to understand the structure of control and supervision better, we have looked at the Andhra Pradesh Building Rules, 2017¹ (AP Building Rules) as an example. Most other building regulations have similar provisions, with a few differences.

The AP Building Rules require that approval must be sought for every case of building erection, re-erection and alteration. An application for building permission should be accompanied by several prescribed documents, which include the location plan, site plan, subdivision or layout plan (if a subdivision of a plot is being made), building plan, services plan, certificate of supervision and a copy of the applicant's ownership title. The owner is also required to submit various no-objection certificates from other government agencies, for agricultural land, land near waterbodies, railway land, etc. [Rule 3(10)].

The rules also set out the scale and other specifications for the various types of plan documents to be submitted along

¹ G.O. Ms. No. 119 dated 28-03-2017 of the Municipal Administration and Urban Development (M) Department, Government of Andhra Pradesh.

with these regulations. Typically, the locations of drains and sewers are to be marked in the layout/ subdivision plan. The plans for the sewage disposal system are also expected to be provided in the services plan [Rule 3(14)].

At the time the owner commences construction, s/ he is required to provide a notice to the local authority of commencement of construction [Rule 3(29)]. Subsequently, when the building construction work is completed, the owner is required to submit a 'Notice of Completion' to the local authority. On receipt of the Notice of Completion, the local authority is expected to carry out a site visit, to verify various aspects of the completed building, including the installation of recycling and water treatment plants, where applicable, and to issue an 'Occupancy Certificate' after it is satisfied about all aspects [Rule 3(33)]. In terms of this rule, regular connections for electricity, water supply, drainage and sewerage can be obtained only after issue of the Occupancy Certificate [also Rule 3(35)].²

Plans submitted for building approval and the Notice of Completion are meant to be signed by licensed technical personnel, the architect, engineer, town planner and surveyor (as relevant depending on the nature of the plan); the registration details of the licensed technical personnel should also be included [Rules 3(10) and 3(32)]. This is intended as a form of certification that the details submitted in the plans and documents are verified and truthful. The technical personnel are also supposed to ensure that building construction under their supervision is carried out in accordance with the sanctioned plan. In terms of the rules, misrepresentations and misstatements in this respect by the licensed technical personnel can

make them liable for blacklisting or being debarred from practice – presumably after the local authority makes a complaint to the professional association to which the personnel belong [Rule 3(28)].

The AP Building Rules contain some unusual features, presumably to ensure better compliance. One of these conditions is that the owner is required to mortgage 10% of the built-up area of the completed building at the time of seeking approval. The idea behind this is that the mortgage could be enforced by the local authority as a penalty if there are violations in the construction of the building, but that it is otherwise released once the local authority is satisfied that the building has been constructed according to plan [Rule 3(20)].

The scope of the AP Building Rules however ends at the stage where the building is constructed and the occupancy certificate is issued. The Rules would come into effect again if and when any form of alteration, reconstruction, occupancy or use changes, or repairs are carried out which are such that they require permission to be sought from the local authority. In such cases the local authority would carry out inspections, inquiries and enforcement actions, as provided in the Rules. However, the Rules have no effect with respect to buildings that have already been constructed prior to the coming into force of the rules, or in cases that are outside the scope of application of the rules, and where no alteration, reconstruction, occupancy or use changes or repairs are being carried out, even if such buildings are in violation of any conditions specified in the Rules. For this, one would have to refer to other sources of local authority power, such as the municipal laws.

2 Unlike several of the other features described here, this one appears to be unique to the AP Building Rules.

Understanding the Limitations of Building Regulations

Typically, building regulations contain several stringent enforcement provisions, but in spite of this, regulations are widely violated across Indian cities. Some of these violations can no doubt be attributed to the weak capacity and poor accountability mechanisms of local authorities, and to the rent-seeking opportunities that building regulation enforcement provides for local officials. However, there are also some structural issues that undermine the effectiveness of building regulations.

It is difficult to apply building regulations to low-income settlements for various legal and technical reasons. All of the building plan regulations mandate that the plan application must be accompanied by ownership documents, which 'owners' by way of informal and unregistered sales may not possess. In addition, small plots in informally planned settlements may not be able to comply with all the building regulation conditions, such as for road widths, setbacks, room sizes and staircase widths. While it is worth noting that some of the building regulations make special provisions and relax some conditions for low-income housing, this is not the case in all the regulations. Moreover, there are technical difficulties in on-site containment in small plots and in high-density settlements, as a result of which it is difficult to enforce and implement provisions relating to on-site containment in these areas.

The second limitation in this regard relates to the practical difficulties in inspecting sub-ground structures such as septic tanks, especially when many building instruments demand that compliance with their various stipulations should be checked by designated officials at approval, completion and occupancy stages.

As we can see in the AP Building Rules in the previous section, the instruments for regulating buildings operate mainly at the time before the building comes into occupation, and cannot be used to effectively monitor how the building or its infrastructure and facilities are used and maintained. Such instruments do of course give local authorities the power to monitor additional constructions made after the building is occupied, but for practical reasons this can be done only where complaints are made, or deviations from the approved building plan are spotted by local authorities in random checks.

It should also be noted that municipal laws and regulations may supplement what is in the regulations, and that the owner's responsibility for on-site sanitation can be fully delineated only on review of municipal, environmental and several other laws. As such, this policy brief could be seen as a first step in a systematic review of the legal responsibility of owners for on-site sanitation.

Review of Rules, Standards and Specifications for On-Site Containment in Building Regulations

In this section we will review the provisions of various building regulations relating to on-site containment and septic tanks. However, as a starting point for this review, we will look at some of the principal sources of standards, rules and specifications that the building regulations draw on, which include the National Building Code, the Model Building Bye-Laws and the Environment Impact Assessment requirements notified from time to time by the Ministry of Environment, Forests and Climate Change (MOEFCC). After this, we will look at the building regulations of the following states: Andhra Pradesh, Odisha (Bhubaneswar and Rourkela), Rajasthan, Tamil Nadu, Maharashtra and Uttar Pradesh.

The attempt will be to see: (a) if these regulations make on-site containment mandatory for all properties that are not connected to sewerage systems, and (b) whether this mandatory requirement is specified in adequate detail so that it is coherent and easy to follow and implement.

The requirement for making on-site containment mandatory should be distinguished from a general reference that drainage and sanitation systems should be specified in the building plan application documents. The requirement to specify drainage and sanitation facilities in the plan application documents is no doubt useful, but it is inadequate in the absence of a specific rule that makes on-site containment mandatory.

We will also explore what the building regulations consider to be appropriate as forms of on-site containment. For the most part, on-site containment is treated as synonymous with septic tanks, but in fact 'twin pits' or other types of containment systems may also be in use in urban areas. At the other end of the spectrum, the regulations mandate on-site sewerage treatment and wastewater reuse for buildings above a certain threshold size. This, too, may be problematic as the building regulations do not consider how the operations of these on-site sewerage treatment facilities can be effectively monitored, and whether the managers of these buildings have established systems to manage the complex and hazardous aspects of sewerage treatment.

National Building Code

Several of the building regulations refer to and adopt standards from the National Building Code (NBC), which is issued by the Bureau of Indian Standards (BIS) from time to time. The first version of NBC was formulated in 1970, and the second in 1983. In current circulation we have versions of the NBC issued in 2005 (National Building Code, 2005, or NBC 2005) and 2016 (National Building Code, 2016, or NBC 2016). NBC is considered to be a guiding document for all planners, builders and architects in relation to various aspects of building such as building services, plumbing services, construction, etc. The NBCs in turn draw from 'Indian Standards', also issued by BIS from time to time. Standards, specifications and guidance from the NBC are intended as a reference document for technical experts and planning authorities, but are not binding in themselves. These standards and specifications could however be expressly adopted by various building regulations and other instruments, in which case they become a part of that legal instrument and acquire a binding nature on whoever they are applicable to.

In NBC 2005, the relevant sections for on-site sanitation are Parts 3 and 9. Part 3, Clause 12 sets out various basic standards and specifications for septic tanks. Clause 12.15 further provides minimum conditions for septic tanks and subsoil dispersal systems, and specifies that effluents from septic tanks are not be discharged directly into an open channel or body of water without adequate treatment. Clause 12 of Part 3 cross-refers to Part 9 of the Code (Part 9 Plumbing Services, Section 1 Water Supply, Drainage and Sanitation (including Solid Waste Management)).

This arrangement is continued in NBC 2016, in which Part 3 contains references to on-site sanitation and septic tanks. Clause 12.15 of Part 3 in NBC 2016 provides several minimum conditions for septic tanks and subsoil dispersal systems, and specifies that effluents from septic tanks are not be discharged directly into an open channel or body of water without adequate treatment. Clause 12 also cross refers to Part 9 of the Code (Part 9 Plumbing Services (including Solid Waste Management), Section 2 Drainage and Sanitation).

Part 9 of NBC 2005 contains drainage and sanitation requirements for buildings, up to the point of connection to sewerage, individual sewage disposal systems, cesspools and other approved points of disposal or treatment. It includes the principle that where it is not possible to dispose of domestic sewage through a public sewerage system, suitable provision should be made for acceptable treatment and disposal. Cesspools, with management of effluents through subsoil dispersal, trenching or secondary treatment, are considered possible solutions. According to Clause 5.4.3.6 of Part 9 of NBC 2005, 'Where no other method of disposal is possible, foul water may be diverted to cesspools and arrangements made with the Authority for satisfactory periodic removal and conveyance to a disposal works.' NBC 2005 states that effluents from the building can be discharged only after meeting acceptable levels as specified by statutory authorities.

Part 9 of NBC 2016 also elaborates the design, layout, construction and maintenance of drains for foul water, surface water, subsoil water and sewage. It provides standards and minimum conditions for various features in the plumbing of a building. It also contains the general principle that where discharge into a public sewer is not possible, the drainage of a building/building campus shall be in a separate system, and effluents may be discharged only after meeting norms specified by the statutory authority. As in NBC 2005, the 2016 version provides that 'Where no other method of disposal is possible, foul water may be diverted to cesspools and arrangements made with the Authority for satisfactory periodic removal and conveyance to a disposal works' (Clause 4.4.3.6 of Part 9 of NBC 2016).

One aspect in which NBC 2016 differs from NBC 2005 is in the condition specifying the construction of septic tanks: NBC 2016 states that their construction is preferred in rural and fringe areas of suburban and isolated buildings where

the underground system may be neither feasible nor economical (Clause 4.5.14.5.2 of NBC 2016). This particular condition is not found in the 2005 version, even as both 2005 and 2016 versions contain various standards for subsoil dispersal and seepage that discourage the use of septic tanks in congested settings (such as the requirement that subsoil dispersal system should be 18 metres away from any source of drinking water and 6 metres away from the nearest habitable building).

Neither the 2005 nor the 2016 version however contain a detailed standard for the construction and management of septic tanks, leaving it to statutory and local authorities to elaborate on this as and where required.

Another issue with the NBCs is that they are not very easily accessible or usable for lay-persons or less proficient readers. The NBCs consist of two volumes each, with several thousand pages of technical writing. Print copies may be ordered from the Bureau of Indian Standards, but they are not easily found online. Moreover, the style, layout and content are aimed at technical readers.

Model Building Bye-Laws, 2016

We also look at the Model Building Bye-Laws, 2016 (MBBL 2016), issued by the Ministry of Urban Development, Government of India, in that year. Model building bye-laws were prepared for the first time by the central government in 2004, after the earthquake in Bhuj, Gujarat, with the idea that states could review and improve their existing building regulations with respect to structural safety and other provisions like rainwater harvesting and wastewater recycling, solar assisted heating, barrier-free public buildings and fire safety.³ According to the Ministry of Urban Development, 22 states and union territories reviewed their building regulations after the Model Building Bye-Laws, 2004, were issued.⁴

The Model Building Bye-Laws were revised in 2015-16 for reasons such as the need to address 'growing environmental concerns' and the launch of 'Swachh Bharat Mission', and were formulated through a consultative process involving many national and state agencies, including town, state and country planning departments, development authorities and municipal corporations.⁵

The Model Building Bye-Laws are not directly enforceable, much like the National Building Code. However, they provide a template or a source document for states to revise or update their building regulations. We found in our review that many of the states have indeed adopted several provisions directly from MBBL 2016.

One of the main features of MBBL 2016 is that it integrates environment clearance conditions issued by MEOFFC with the building approval process. In recognition of the Swachh Bharat Mission, MMBL 2016 also adds some specific requirements for toilets for women and the provision of public conveniences in public buildings.

Rule 2.10.7 sets out the requirements for a services plan, and states that 'Plans, elevations and sections of private water supply, sewage disposal system and details of building services, where required by the Authority, shall be made on a scale of not less than 1:100.'

Further, it asserts that 'For residential plots of more than 2000 sq.m. and non-residential plots of more than 1 hectare in size (...), separate conveying system to be provided for sewerage and sullage to facilitate reuse of sullage water for gardening and washing purposes. This may require suitable storage facilities that are to be indicated on the building plans.'

The requirement to make provisions for on-site containment in non-sewered areas is included, not specifically but by reference to NBC 2005: 'The planning, design, construction and installation of water supply, drainage and sanitation and gas supply system shall be in accordance with Part-9: Plumbing Services, Section-I Water supply, Drainage and sanitation (including Solid Waste Management) and Section-2 Gas supply of NBC, 2005' (Rule 4.32.1).

We found that MBBL 2016 includes several conditions and specifications in relation to septic tanks and pits, including the requirement that the pit/tank should be located in a place that facilitates easy and hygienic emptying. This is a useful inclusion, which was in fact left out in NBC and previous standards and specifications.

In a listing of 'Other factors to be considered' in relation to building requirements and services (Chapter 4), Rule 4.33.5 states that 'Since sewers may not be available in

³ Prelude to the Model Building Bye-Laws, 2016.

⁴ Ibid.

⁵ Ibid.

many cities, in most cases the toilet blocks will have on-site sanitation, which would require periodic cleaning of tanks / pits. Location on site should allow easy and hygienic emptying of the pits / tanks and ensure that ground water table is not contaminated by wastewater percolation.'

Chapter 4 also lists specific conditions and specifications for septic tanks. Rule 4.15 states that 'Where a septic

tank is used for sewage disposal, the location, design and construction of septic tank shall conform to requirements of Part 9 Plumbing Services, Section 1 Water Supply, Drainage and Sanitation (Including Solid Waste Management) of NBC, 2005.' Subsequent provisions set out some basic conditions for septic tanks, such as distance from water sources and habitable structures, dimensions and construction standards that are extracted in Box 1 below.

● **4.15.1 Location of the Septic Tanks and Subsurface Absorption Systems**

A sub-soil dispersion system shall not be closer than 18 m from any source of drinking water, such as [a] well, to mitigate the possibility of bacterial pollution of subsurface water. It shall also be as far removed from the nearest habitable building as economically feasible but not closer than 6 m, to avoid damage to the structures.

● **4.15.2 Requirements**

- a) Dimensions of septic tanks - Septic tanks shall have a minimum width of 750 mm, a minimum depth of 1 m below the water level and a minimum liquid capacity of 1 m³. The length of tanks shall be 2 to 4 times the width;
- b) Septic tanks may be constructed of brickwork, stone masonry, concrete or other suitable materials as approved by the Authority;
- c) Under no circumstances shall effluent from a septic tank be allowed into an open channel drain or body of water without adequate treatment;
- d) The minimum nominal diameter of the pipe shall be 100 mm. Further, at junctions of pipes in manholes, direction of flow from a branch connection shall not make an angle exceeding 45° with the direction of flow in the main pipe;
- e) The gradients of land drains, under-drainage as well as the bottom of dispersion trenches and soakways shall be between 1:300 and 1:400;
- f) Every septic tank shall be provided with [a] ventilating pipe of at least 50 mm diameter. The top of the pipe shall be provided with a suitable cage of mosquito-

proof wire mesh. The ventilating pipe shall extend to a height which would cause no smell nuisance to any building in the area. Generally, the ventilating pipe may extend to a height of about 2 m, when the septic tank is at least 15 m away from the nearest building and to a height of 2 m above the top of the building when it is located closer than 15 m;

- g) When the disposal of septic tank effluent is to a seepage pit, the seepage pit may be of any suitable shape with the least cross-sectional dimension of 0.90 m and not less than 1.00 m in depth below the invert level of the inlet pipe. The pit may be lined with stone, brick or concrete blocks with dry open joints which should be backed with at least 75 mm of clean coarse aggregate. The lining above the inlet level should be finished with mortar. In the case of pits of large dimensions, the top portion may be narrowed to reduce the size of the RCC cover slabs. Where no lining is used, especially near trees, the entire pit should be filled with loose stones. A masonry ring may be constructed at the top of the pit to prevent damage by flooding of the pit by surface runoff. The inlet pipe may be taken down a depth of 0.90 m from the top as an anti-mosquito measure; and
- h) When the disposal of the septic tank effluent is to a dispersion trench, the dispersion trench shall be 0.50 m to 1.00 m deep and 0.30 m to 1.00 m wide, excavated to a slight gradient, and shall be provided with 150 mm to 250 mm of washed gravel or crushed stones. Open jointed pipes placed inside the trench shall be made of unglazed earthenware clay or concrete and shall have a minimum internal diameter of 75 mm to 100 mm. Each dispersion trench shall not be longer than 30 m and trenches shall not be placed closer than 1.8 m.

MBBL 2016 also includes requirements for on-site sewerage treatment and wastewater reuse in larger building projects. In the chapter on building services, Rule 4.32.4 states that ‘Sewage treatment plant of capacity of treating 100% waste water to be installed.’ In turn, Tables 14.1, 14.2 and 14.3 of MBBL 2016 set out the various environmental conditions to be incorporated for buildings of various sizes, which have been classified into three categories: Category A for buildings of 5,000 to 20,000 square metres, Category B for buildings of 20,000 to 50,000 square metres, and Category C for buildings of 50,000 and 1,50,000 square metres of built-up area. For Category C buildings, these include the requirement to have ‘Separation of grey⁶ and black water⁷ through the use of a ‘dual plumbing system’. Buildings are also required to have ‘Sewage treatment plant with capacity of treating 100% waste water’. Further, ‘Treated water must be recycled for gardening and flushing’ (Table 14.2 of MBBL 2016).

However, as we saw above, Rule 2.10.7 requires a dual plumbing system and reuse of non-sewage wastewater for residential plots more than 2000 square metres and non-residential plots more than 1 hectare in size. Further, in the chapter on ‘Green Buildings and Sustainability Provisions’ there is a requirement that ‘All buildings having a minimum discharge of 10,000 l. and above per day shall incorporate waste water recycling system. The recycled water should be used for horticultural purposes’ (Rule 10.2.2).

These somewhat overlapping requirements (excerpted below in Table 1) use different threshold measures—plot sizes in one place, built-up area in another, and measure of liquid discharge in another. We understand that these requirements owe their origin to MOEFCC notifications, but as we see in the following subsection on MOEFCC notifications, these conditions are somewhat different from what is contained in the current MOEFCC notification. This is possibly the source of some confusion in the building regulations that have attempted to incorporate various environmental features.

Table 1: Environmental conditions for large construction projects in MBBL 2016

Category (if any)	Size	Environmental conditions in relation to liquid waste
N/A	Plot size for residential plots of more than 2000 square metres and for residential plots more than 1 hectare in size	‘Separate conveying system to be provided for sewerage and sullage to facilitate reuse of sullage water for gardening and washing purposes. This may require suitable storage facilities that are to be indicated on the building plans’ (Rule 2.10.7).
N/A	All buildings having a minimum discharge of 10,000 litres per day	‘All buildings having a minimum discharge of 10,000 l. and above per day shall incorporate waste water recycling system. The recycled water should be used for horticultural purposes’ (Rule 10.2.2).
Category C	Between 50,000 to 1,50,000 square metres built-up area	Separation of grey and black water should be done by the use of dual plumbing system.’ ‘Sewage treatment plant with capacity of treating 100% waste water shall be installed. Treated water must be recycled for gardening and flushing’ (Rule 4.32.4, Table 14.2).

6 Grey water is not defined in MBBL 2016 or in any of the other regulations, government notifications or other documents we have reviewed, but is generally understood to mean and include all domestic wastewater from baths, sinks, washing activities, etc., which has not come into contact with faeces or hazardous chemicals, and can be reused for activities like gardening without further treatment.

7 Black water is not defined in MBBL 2016 or in any of the other regulations, government notifications or other documents we have reviewed, but is generally understood to mean any liquid waste from toilets and urinals, or other water that has come into contact with faeces and urine.

MOEFCC notifications for buildings and construction

MOEFCC (then the Ministry of Environment and Forests) first notified rules for the environmental impact assessment of projects in 1994 through a notification issued under the Environment (Protection) Act, 1986.⁸ This requirement of environment impact assessment (including a public hearing and an environment management plan) was first extended to building and construction projects in 2004. At that time it covered projects for more than 1000 people, or discharging more than 50,000 litres of sewage per day, or having an investment of more than Rs. 50 crore.⁹

In 2006, the rules further elaborated that projects requiring environmental impact assessment could be classified into Categories A and B, requiring central government and state government clearance respectively, and they exempted building and construction projects from the need to hold a public hearing.¹⁰ The notification changed and clarified the threshold limits for the applicability of environmental clearance requirements for building and construction projects, and township and area development projects. Accordingly, the notification was made applicable to building and construction projects having a built-up area from 20,000 to 1,50,000 square metres, and township and area development projects covering an area of 50 hectares, or having a built-up area of more than 1,50,000 square metres. The templates for environment impact assessment set out in this notification implied requirements for wastewater recycling, dual plumbing and on-site sewerage treatment in projects, but this was not specifically stated in the notification. Various options for wastewater treatment and recycling, and legally notified effluent standards are discussed in a Manual on norms and standards for environment clearance of large construction projects issued by MOEFCC, but even this makes no clear statement about the types of on-site management and treatment that are mandatory for large construction projects.¹¹

Finally, in 2016, states were directed to integrate environmental conditions for building construction and area development projects of up to 1,50,000 square metres of

built-up area with the building approval process.¹² States were asked to make suitable changes to their bye-laws and rules to incorporate environmental conditions, as set out in the 2016 notification of MOEFCC. Construction projects in states that complete this process no longer need a separate environment impact assessment, environment clearance or any separate approvals under the Water (Prevention and Control of Pollution) Act, 1974, as long as they are within the upper threshold limit of 1,50,000 square metres of built-up area.

In terms of the 2016 notification of MOEFCC, building construction projects have been classified into three categories: Category 1 of building construction projects having a built-up area between 5,000 to 20,000 square metres, Category 2 of building construction projects of 20,000 to 50,000 square metres, and Category 3 of building construction projects of 50,000 to 1,50,000 square metres.

In terms of this notification, buildings of up to 20,000 square metres built-up area can connect to municipal sewer systems where they are available, but need to make an on-site treatment system where there is no municipal sewer. They are encouraged to reuse wastewater wherever possible, but can discharge treated effluents in line with applicable environmental norms. Buildings and constructions of Categories 2 and 3, on the other hand, are required to install treatment facilities for all the wastewater that they generate; presumably this is regardless of whether or not they can access municipal sewerage systems. Treated water is to be reused on site, but excess water can be discharged following CPCB norms. In addition to this, Category 3 buildings and constructions should have a dual plumbing system to separate grey and black water, and in case of single stack system separate recirculation lines for flushing by dual plumbing system is to be installed.

For all three categories, the notification also mentions that sludge is to be collected and disposed of in accordance with the Central Public Health and Environmental

⁸ Ministry of Environment and Forests Environment Impact Assessment Notification S.O. 60(E) dated 27/01/1994.

⁹ Ministry of Environment and Forests Notification S.O. 801(E) dated 7/7/2004.

¹⁰ Ministry of Environment and Forests Notification S.O. 1533 dated 14/9/2006.

¹¹ 'Manual on norms and standards for environment clearance of large construction projects', Ministry of Environment and Forests (undated).

¹² Ministry of Environment, Forests and Climate Change Notification S.O. 3999(E) dated 9/12/2016.

Engineering Organisation (CPHEEO) Manual on Sewerage and Sewage Treatment Systems (2013), issued by the Ministry of Urban Development.¹³ However, in this the wording is somewhat confusing, stating that 'sludge from the onsite sewage treatment, including septic tanks (...)'. Does this suggest that septic tanks are acceptable as a form of on-site treatment? This is unlikely given the emphasis on reuse of treated wastewater. There is no further clarification in this text, except the suggestion that 'natural treatment systems which integrate with the landscape shall be promoted'.

Surprisingly, CPHEEO norms have not been mentioned in connection with on-site treatment and reuse of wastewater, and only made applicable for the disposal of sludge. Wastewater norms, which are applicable to disposal of treated effluents in terms of these rules are focused only on effluent standards and not on protocols and standards to be maintained in the treatment facility itself. In effect, then, what are the norms for safety and hygiene within the building complex? The environmental conditions under the 2016 notification are completely silent on this.

The 2016 notification also evades the issue of effluent disposal and sludge disposal facilities. How are managers of buildings supposed to ensure that sludge is disposed of in accordance with applicable norms if there are no supporting services and facilities available for the same? The disposal of excess treated effluents outside the building complex is also possible only if adequate drainage facilities are available.

Moreover, as we know, the building approval process typically ends once building construction is done and occupancy certificate is issued. The environmental regulation and monitoring process, on the other hand, continues: project proponents are required to submit regular reports, and the State and Central Pollution Control Boards established under the Environment (Protection)

Act, 1986, are, at least on paper, empowered to conduct various monitoring and checking activities to ensure that all the applicable norms are being complied with.

In order to account for post-construction compliance, the 2016 notification also suggests to states that they should establish Environment Cells within the state government or local authorities to take on the task of compliance monitoring. It states further that for buildings of more than 20,000 square metres of built-up area, 'The project proponent shall submit Performance Data and Certificate of Continued Compliance of the project for the environmental conditions parameters applicable after completion of construction from Qualified Building Environment Auditors¹⁴ every five years to the Environment Cell with special focus on the following parameters (...)' which include 'Water use and waste water generated, treated and reused on site'. The constitution, financing and functions of the Environment Cell are set out in Appendix XVI of the notification, and it is expected that they will work under the control and direction of the local authorities responsible for the building approval process. As the integration of this notification into building bye-laws is fairly recent, it remains to be seen how far local authorities are able to take on this challenge.

The variance in environmental conditions between MBBL 2016 and the MOEFCC 2016 notification is also a continuing source of confusion. The two use different threshold limits, impose different (but similar) environmental conditions, and even use different classifications – Categories A, B and C in MBBL 2016, and Categories 1, 2 and 3 in the MOEFCC notification (excerpts below in Table 2). The MOEFCC notification is issued using powers under the Environment (Protection) Act, 1986, and is actually mandatory for states to follow, whereas MBBL 2016 is only a model that states can choose to follow to the extent that it suits them. Considering this, MBBL 2016 should perhaps have been modified after the MOEFCC notification was issued, but as this was not done, states have mostly followed MBBL in recent changes in their building regulations.¹⁵

¹³ Referring to a three-volume compilation of engineering standards relating to sewerage and sewage treatment issued by the Ministry of Urban Development and available at: <http://cpheeo.gov.in/cms/manual-on-sewerage-and-sewage-treatment.php>.

¹⁴ Qualified Building Environment Auditors are to be empanelled by MOEFCC as per a procedure for empanelment provided in Appendix XV of the 2016 notification.

¹⁵ At the time of writing the report, it was not clear how this contradiction was to be resolved. At present, but MOEFCC and state-issued building bye-laws would stand in parallel, and builders would have to comply with both.

Table 2: MOEFCC conditions for buildings and construction

Category	Size	Environmental conditions in relation to liquid waste
Category 1	5,000 to 20,000 square metres built-up area	<p>‘Sewage: In areas where there is no municipal sewage network, onsite treatment systems should be installed. Natural treatment systems which integrate with the landscape shall be promoted. As far as possible treated effluent should be reused. The excess treated effluent shall be discharged following the CPCB norms.</p> <p>Sludge from the onsite sewage treatment, including septic tanks, shall be collected, conveyed and disposed as per the Ministry of Urban Development, Central Public Health and Environmental Engineering Organisation (CPHEEO) Manual on Sewerage and Sewage Treatment Systems, 2013.’ (Appendix XIV, S.O. (E) 3999)</p>
Category 2	20,000 to 50,000 square metres built-up area	<p>‘Sewage: Onsite sewage treatment of capacity of treating 100% waste water to be installed. Treated waste water shall be reused on site for landscape, flushing, cooling tower, and other end-uses. Excess treated water shall be discharged as per CPCB norms. Natural treatment systems shall be promoted.</p> <p>Sludge from the onsite sewage treatment, including septic tanks, shall be collected, conveyed and disposed as per the Ministry of Urban Development, Central Public Health and Environmental Engineering Organisation (CPHEEO) Manual on Sewerage and Sewage Treatment Systems, 2013.’ (Appendix XIV, S.O. (E) 3999)</p>
Category 3	50,000 to 1,50,000 square metres built-up area	<p>‘Separation of grey and black water should be done by the use of dual plumbing system. In case of single stack system separate recirculation lines for flushing by giving dual plumbing system be done.’</p> <p>‘Onsite sewage treatment of capacity of treating 100% waste water to be installed. Treated waste water shall be reused on site for landscape, flushing, cooling tower, and other end-uses. Excess treated water shall be discharged as per CPCB norms. Natural treatment systems shall be promoted.</p> <p>Sludge from the onsite sewage treatment, including septic tanks, shall be collected, conveyed and disposed as per the Ministry of Urban Development, Central Public Health and Environmental Engineering Organisation (CPHEEO) Manual on Sewerage and Sewage Treatment Systems, 2013.’ (Appendix XIV, S.O. (E) 3999)</p>

Andhra Pradesh

The state of Andhra Pradesh has brought in several changes and innovations in its method of building regulation and control, and has recently, in 2017, updated its building regulation, which is now applicable to urban areas in the entire state. The AP Building Rules follow many provisions from MBBL 2016.

The AP Building Rules require that a building plan application should be accompanied by a layout plan, which includes 'The location of drains, sewers, public facilities and services and electrical lines etc' [Rule 3(14)]. There is also a requirement for a services plan, for which it is stated that: 'Plans, elevations and sections of private water supply, sewage disposal system and details of building services, where required by the concerned Authority, shall be made on a scale of not less than 1:100' [Rule 3(14)].

In the provision relating to general space requirements and other services (Chapter IV), the sub-rule on bathrooms and WCs states that 'all sewage outlets shall be connected to the municipal sewage system. Where no such system exists, a septic tank shall be provided within the plot conforming to requirements' [Rule 4(3)]. Further, Rule 20(2) states that 'The Planning, design and installation of water supply systems, drainage, sanitary installations and gas supply installations in buildings shall be in accordance with Part XI Plumbing Services; Section 1-Water Supply; Section 2-Drainage and Sanitation and Section 3-Gas Supply of NBC.'

This is restated in Annexure 5 (Water Supply and Sanitation Requirements in Buildings) of the Rules, where the first paragraph states that 'The planning, design and construction and installation of water supply, drainage and sanitation and gas supply system shall be in accordance with Part 9-9: Plumbing Services, Section-1 Water supply, Drainage and sanitation (including Solid Waste Management) and Section-2 Gas supply of NBC, 2005' and that 'Sewage treatment plant of capacity of treating 100% of wastewater to be installed. (Refer Table – 37 of the AP Building Rules).' Subsequently, in the same Annexure 'Other factors to be considered' are listed,

which include 'Wastewater conveyance/treatment and prevention of contamination'. In this it is stated that 'Since sewers may not be available in many cities, in most cases toilet blocks will have on-site sanitation, which would require periodic cleaning of tanks/pits. Location on site should allow easy and hygienic emptying of the pits/tanks and ensure that ground water table is not contaminated by wastewater percolation' (Annexure 5, paragraph 3).

This is perhaps the only one of the building regulations that draws on the MBBL 2016 mention of location of septic tanks for facilitating easy cleaning. However, unlike in MBBL 2016, there is no general application of the provisions of Annexure 5 to all types of buildings. The only references we found to Annexure 5 in the main text of the AP Building Rules are in Rule 55, which states, in connection with 'Assembly Buildings (Cinema, Theatres etc.)' that 'Requirements of Water Supply, Drainage and Sanitation shall conform to provisions as given in the Annexure to these Rules.' There are similar provisions for 'Educational Buildings' and 'Industrial Buildings' in Rule 55.

In addition, Andhra Pradesh has several provisions relating to on-site treatment in larger real estate projects, although the applicability and scope of several overlapping provisions would have to be determined in line with the specifics of particular cases. In this the AP Building Rules largely follow MBBL 2016, but with some modifications.

Rule 3 states that 'for residential plots of more than 2000 sq.m. and for non-residential plots of more than 1-hectare, separate conveying system to be provided for sewerage and sullage to facilitate reuse of sullage water for gardening and washing purposes. This may require suitable storage facilities that are to be indicated on the building plans' [Rule 3(14)(h)(iii)].

The AP Building Rules also refer to the Energy Conservation Building Code that has been adopted in the state¹⁶ and a number of green buildings; sustainability provisions are directly incorporated in Chapter X-5 of the Rules. According to the AP Building Rules, 'Waste

16 G.O. Ms. No. 30, Government of Andhra Pradesh dated 28/1/2014.

Odisha

Water Recycle and Reuse' is mandatory for all developments, residential or non-residential, on plot sizes of more than 1000 square metres (Rule 140, Table 34). It is further provided that 'All buildings having a minimum discharge of 15,000 litres and above per day or premises consisting of 25 dwelling units and above shall incorporate waste water recycling system. The recycled water should be used for horticultural purposes' (Rule 142).

Further, in Chapter XI-3, the MBBL 2016 environment conditions for Categories A, B and C buildings have been adopted. Accordingly, for Category C projects, i.e. projects of 50,000 to 1,50,000 square metres built-up area, it is stated that 'Separation of grey water and black water should be done by the use of dual pumping system' and that 'Sewage treatment plant with capacity of treating 100% of waste water shall be installed. Treated water must be recycled for gardening and flushing' (Rule 165, Table 39).

In Odisha, each city has a separate bye-law for the purpose of building and construction. For this report, we have reviewed applicable building regulations for Bhubaneswar and Rourkela, i.e. the Bhubaneswar Development Authority (Planning and Building Standards) Regulations, 2008 ('Bhubaneswar Regulations'),¹⁷ and the Rourkela Development Authority (Planning & Building Standards) Regulations, 2017 ('Rourkela Regulations').¹⁸

Looking across both Bhubaneswar and Rourkela Regulations, we find that at the building plan approval stage, there are certain requirements for plumbing and sanitation details to be included in the application for approval. In terms of the Bhubaneswar Regulations, the application for building approval is to be accompanied by a site plan which is supposed to contain a drawing of 'any physical features, such as well, drains, etc.' [Rule 5(2)(j)]. A similar provision can also be found in the Rourkela Regulations [Rule 5(b)(x)].

Rule 5(2)(vi) of the Bhubaneswar Regulations requires that a 'service plan' be submitted alongside the said application. Such a services plan is to include all details of 'building and plumbing services, and also plans, elevations and sections of private water supply, sewage disposal system and rain water harvesting system'. A similar requirement has been laid down in the Rourkela Regulations in Section 4(2)(f).

Both sets of regulations refer to the National Building Code and incorporate relevant standards and specifications from it, in both general and specific terms. The Bhubaneswar Regulations refer to NBC 2005, whereas the Rourkela Regulations refer to the National Building Code of India, and as updated from time to time, which would in effect imply that it is referring to NBC 2016.

The Bhubaneswar Regulations provide the standards relating to water and sanitation requirements for various occupancies and uses in Annexure-IV (Rule 46). There is no specific mention of requirements for on-site

¹⁷ Sanctioned vide Government Notification No. 1199/BP/BDA dated 15/12/2008.

¹⁸ Sanctioned vide Government Notification No. 1087—XVI-2/2009-2010-RDA dated 06/08/2015.

sanitation, except in Paragraph 4 of Annexure-IV, which states that 'Every parts (sic) of the building and other building related activities shall be planned and designed in accordance with the clause-12, part-3 of the NBC, 2005.' As we know, Clause 12.15 of Part 3 of NBC 2005 provides minimum conditions for septic tanks and subsoil dispersal systems, and specifies that effluents from septic tanks are not be discharged directly into an open channel or body of water without adequate treatment. Some further detailed standards are incorporated by reference to Part 9 of NBC 2005.

In seemingly similar terms, the Rourkela Regulations state that standards related to water and sanitation requirements and uses, fire protection and fire safety requirements shall be referred to as given in Annexure VII, Annexures I & II and Annexure IV respectively (Rule 47). However, we found that Annexure VII sets out standards for various water supply requirements, but makes no mention of sanitation, whereas Annexures I and II specify requirements for toilet facilities and washbasins in various types of buildings, but also make no mention of disposal facilities. Annexure IV is unrelated and deals with fire safety. In effect, then, the Rourkela Regulations contain no explicit requirement for on-site containment or septic tanks, although it is not clear whether this is deliberate or by administrative oversight. The effect of this omission is however somewhat counteracted by more general references to NBC later on in the text, as mentioned below.

In both Bhubaneswar and Rourkela Regulations there are specific provisions for certain types of constructions, such as 'farmhouses', where the owner is 'responsible to provide septic tank with necessary disposal trenches for human and animal waste in the farmhouse within his own premises' (Rule 56 in Bhubaneswar Regulations and Rule 56 in Rourkela Regulations).

For multistorey buildings, group housing schemes and apartments, there are some additional requirements

set out in Part VII of both Bhubaneswar and Rourkela Regulations. The Bhubaneswar Regulations state that 'the planning, design, construction and installation of water supply, drainage and sanitation and gas supply system shall be in accordance with Part-IX, Plumbing Services, section-1 water supply; section-2 drainage and sanitation and section-3 of the National Building Code of India 2005' (Rule 69, Bhubaneswar). A similar provision is contained in Rule 65 of the Rourkela Regulations.

The Rourkela Regulations incorporate various environmental conditions in the building plan approval for structures of more than 50,000 square metres of built-up area; this appears to be in line with the MBBL 2016 model. Accordingly, in the Category C buildings that have a built-up area of more than 50,000 square metres and up to 1,50,000 square metres, it is required that 'separation of grey and black water should be done by use of dual plumbing system' and that a 'Sewage treatment plant with capacity of treating 100% waste water should be installed'; further, 'Treated water must be recycled for gardening and flushing' [Rule 4(3)(c) and Table 3 of Annexure III of the Rourkela Regulations].

The Bhubaneswar and Rourkela Regulations also adopt NBC in more general terms: 'Where no express provision has been made in respect of any matter connected with the planning and building standards by the Act, the Rules, the Development Plan, the Town Planning Schemes, or these Regulations or by any resolution of the Authority, the provisions of the National Building Code of India, 2005 shall mutatis mutandis be applicable' (Rule 84 in Bhubaneswar Regulations and Rule 84 in Rourkela Regulations). In addition, Rule 5(b) of the Rourkela Regulations state that 'All aspects related to structural design, building surface, plumbing, electrical installation, sanitary arrangements, fire protection shall adhere to the specification, standards and code of practice recommended in the National Building Code of India and any breach shall be deemed to be a breach of these regulations.'

Rajasthan

The Rajasthan Unified Building Regulation 2017 ('Rajasthan Regulations'),¹⁹ is applicable for urban areas in the entire state, except Mount Abu and Jaisalmer.²⁰

Rule 14.5 of the Rajasthan Regulations states that the building application should include a site plan, which provides information about the infrastructure and facilities such as wells and drainage. However, in Rajasthan a separate services plan is not required, except in the case of multistorey buildings. For multistorey buildings, Rule 8.3 states that two copies of a plan which specifies various features including arrangements for disposal of wastewater and excreta, and certified by the architect and engineer, should be submitted to the competent official and approved by him prior to commencement of construction.

Rule 6 states that building owners do not need to seek specific prior approval for septic tank construction, which is exempt from the general condition that building construction activity needs prior permission of the competent authority. Looking at this together with the fact that no separate services plan is required at the time of building approval application, this would suggest that applicants do not need to provide a plan for on-site containment at the time of making building applications, except in the case of multistorey buildings.

However, the exemption of septic tanks from the approval process should not imply that on-site containment is not mandatory for buildings in Rajasthan. Rule 9 of the Rajasthan Regulations sets out various norms for building construction, and of this Rule 9.1 states that

facilities for the management of wastewater should be in accordance with norms set under the National Building Code (presumably NBC 2016). Further, Rule 9.12 states that all wastewater outlets should be connected to sewer lines, and where sewer services are not available, an underground septic tank/soak pit will have to be provided within the site itself. It also states that water supply and sanitation facilities should be in accordance with the National Building Code.

The Rajasthan Regulations also incorporate several environmental conditions as part of the building approval process, which vary for different sizes of plots and built-up area. Of these, Rule 8.11.2 sets out requirements for treatment and recycling of wastewater, although these do not entirely follow MBBL 2016 or MOEFCC. The Rajasthan Regulations state that for plot sizes of more than 5000 square metres, there is a requirement to separate toilet water from other types of wastewater, and to undertake treatment and recycling of the other types of wastewater. In cases where the built-up area is more than 10,000 square metres, there is a requirement also to set up a sewerage treatment plant, and to reuse the treated water for gardening, toilet flushing, etc. Further, and more in line with MBBL 2016, the Rajasthan Regulations state that for a built-up area of 50,000 to 1,50,000 square metres, there is a requirement to have a dual plumbing system to separate grey water from black water. This is somewhat confusing as the previous provisions would imply that the principle of dual piping is applicable for plot sizes of more than 5000 square metres, so it is not clear why it is restated in different ways for different plot sizes.

¹⁹ Sanctioned vide Government Notification No. 18 (13), District Development Authority/Jaipur/2016 dated 18/10/2017.

²⁰ Based on review of the Hindi text.

Tamil Nadu

Tamil Nadu has a number of rules and regulations relating to building plan approval, including the Tamil Nadu District Municipalities Building Rules, 1972, which applies to municipalities and transitional urban areas, the Tamil Nadu District Municipalities (Hill Stations) Building Rules, 1993, the Multi-storeyed and Public Building Rules, 1973, the Tamil Nadu Cyclone Prone Special Building Rules, 1982, and the Special Rules for Regulating the Construction and Maintenance in the Vicinity of Civil Aerodromes, 1972. There are also separate rules for city corporations.

There is now a proposal to replace these disparate rules with a unified building code for the entire state. We understand that a draft of the unified building rules is currently under review, although we could not access a copy of the draft. For the purpose of this report, we have reviewed the Tamil Nadu District Municipalities Building Rules, 1972 ('Tamil Nadu Rules').²¹ We also looked at the Operative Guidelines for Septage Management for Local Bodies in Tamil Nadu, 2014 ('Tamil Nadu Operative Guidelines'),²² to see if there were any directions in these that were applicable as a part of the building code.

The Tamil Nadu Rules explicitly require that an application for building plan approval must be accompanied by a site plan that includes specifications for 'The manner in which the room and house drainage and the surface drainage of the site are proposed to be disposed of', and the 'means of access that will be available for conservancy' [Rule 3(2)(iii) and Appendix D]. Building plans submitted for approval are also required to have 'the form and dimensions' of any cess pool to be constructed in connection with the building [Rule 3(2)(ii) and Appendix C].

Although there is no further statement of options for drainage and conservancy that may be acceptable, a number of other provisions give us the idea that the executive authority is expected to set some specifications and requirements for the same. Rule 7 states that for building construction that is within 15 metres of a tank, reservoir, watercourse, river, fresh-water channel or well, special measures may need to be carried out, as directed by the authority, to prevent any contamination or risk of the drainage of the building passing into the waterbody. In the same vein, there is also a condition that special arrangements need to be made in order to get approval for construction on sites on to which storm water drainage (from elsewhere) flows, or which are prone to subsoil waterlogging

(Rule 6). Referring also to drainage and sanitary conveniences, Rule 17 states that all buildings should provide effective means of drainage for storm water, sullage and sewage, and there is an 'explanation' for the provision stating that the drainage arrangements shall be in accordance with such rules or bye-laws as may have been framed for that.

Turning now to the Tamil Nadu Operative Guidelines, we find that they provide instructions to local bodies to evaluate existing septic tank designs and other storage/treatment systems, and to modify the prescribed design specifications based on what is provided in Annexure 1 of the Operative Guidelines. Annexure 1 in turn provides some specifications for septic tanks that are extracted from the CPHEEO Manual, including recommended sizes depending on the number of users. It also states that 'Depending on the geography, soil condition, water seepage capacity of the soil the design should be prepared and approved by local bodies'; and that it should ensure the septic tank (i) is of a proper size, with appropriate detention time, volume and hydraulic retention time, (ii) has proper inlet and outlet structures, (iii) includes at least one baffle separating the tank into multiple compartments, (iv) is water tight, and (v) has an access port for each compartment that allows for inspection and pumping.

In effect, then, both the Rules and the Operative Guidelines put the onus on local authorities to make location-appropriate design specifications for septic tanks. However, where this is not done, local bodies could also refer to the basic specifications provided in the Operative Guidelines and make these applicable in the building plan approval process.

The Operative Guidelines also instruct local bodies to issue notice to non-compliant septic tanks, using powers under the Tamil Nadu Public Health Act, 1939, and to identify insanitary latrines and convert the same to sanitary latrines. It is also envisaged that local bodies in Tamil Nadu will adopt Septage Management Bye-laws, a draft of which is provided in the Operative Guidelines, which will give them specific powers with respect to septic tanks and latrines.

The current version of the Tamil Nadu Rules do not include any of the changes suggested in MBBL 2016 or the MOEFCC notification, although this may be contemplated in the changes that are currently being considered by the state government.

21 Sanctioned vide G.O. Ms. No. 1009, Rural Development and Local Administration dated 19/5/1972.

22 Issued by G.O. Ms. No. 106, Municipal Administration & Water Supply Department, Government of Tamil Nadu dated

Maharashtra

For the state of Maharashtra, we reviewed the Standardised Development Control and Promotion Regulations for Municipal Councils and Nagar Panchayats in Maharashtra,²³ notified in 2013 (Maharashtra DCR), which is applicable to A, B and C class towns in the state.

The general provisions in the Maharashtra DCR relating to building applications state that drawings indicating drainage and sewerage work should accompany the application for building plan approval (Rule 6.2.1.3). Additionally, Rule 6.2.4 of this regulation requires that a drawing of any existing physical features such as wells, tanks, drains, pipelines, etc. should be a part of the site plan to be submitted at the time of building approval. Rule 6.2.5 also dictates that the location of drains and sewers should be denoted in the subdivision/layout plan.

Rule 30.1 in Part VII ('Structural Safety, Water Supply, Drainage & Sanitary Requirements, Outdoor Display and Other Services') states that 'The planning, design, construction and installation of water supply, drainage and sanitation and gas supply systems shall be in accordance with the provisions of Part 9 - Plumbing Services - Section 1 Water Supply, Drainage and Sanitation, Section 2 - Gas Supply of National Building Code of India as amended from time to time.'

In addition, the Maharashtra DCR contains specifications and various details about septic tanks in Rule 17.15 (extracted below in Box 2), which includes requirements for the location of septic tanks and subsurface dispersion systems, sizes and specifications of various features, and the principle that under no circumstances should effluent from the septic tank be allowed into an open channel drain or body of water without adequate treatment. Requirements set out by state or central government, or national institutes such as NEERI for 'modern methods of disposal' are also permissible in terms of this provision.

Extracted from the Maharashtra DCR

17.15 Septic Tanks: Where a septic tank is used for sewage disposal, the location, design and construction of the septic tank shall conform to requirements of 17.15.1 and 17.15.2.

17.15.1 Location of Septic Tanks and Subsurface Absorption System: - A subsoil dispersion system shall not be closer than 12.00 m. of any source of drinking water, so as to avoid the possibility of bacterial pollution of water supply. It shall also be as far removed from the nearest habitable building as economically feasible but not closer than 6 m. to avoid damage to the structures.

17.15.2 Requirements:

- (a) Dimensions of Septic Tanks: Septic tanks shall have minimum width of 75 cm., minimum depth of 1 m. below the water level and a minimum liquid capacity of 1 cu.m. Length of tanks shall be 2 to 4 times the width.
- (b) Septic tanks may be constructed of brick work, stone masonry, concrete or other suitable materials as approved by the Chief Officer.
- (c) Under no circumstances should effluent from a septic tank be allowed into an open channel drain or body of water without adequate treatment.
- (d) Minimum nominal diameter of pipe shall be 100 mm. Further, at junctions of pipes in manholes, direction of flow from a branch connection should not make an angle exceeding 45 degree with the direction of flow in the main pipe.
- (e) The gradients of land drains under drainage as well as the bottom of dispersion trenches and soak way should be between 1:300 and 1:400.
- (f) Every septic tank shall be provided with ventilating pipe of at least 50 mm diameter. The top of the pipe shall be provided with a suitable cage of mosquito proof wire mesh.

23 Sanctioned vide Government Notification No-TPS-1812/157/CR 71/12/REC No. 34/12UD dated 12/11/2013.

The ventilating pipe shall extend to a height, which would cause no smell nuisance to any building in the area. Generally, the ventilating pipe may extend to a height of about 2 m. when the septic tank is at least 15 m. away from the nearest building and to a height of 2 m. above the top of the building when it is located closer than 15 m.

(g) When the disposal of septic tank effluent is to seepage pit, the seepage pit may be of any suitable shape with the least cross-sectional dimension of 90 cm. and not less than 100 cm. in depth below the invert level of the inlet pipe. The pit may be lined with stone, brick or concrete blocks with dry open joints which should be backed with at least 7.5 cm. of clean coarse aggregate. The lining above the inlet level should be finished with mortar. In the case of pits of large dimensions, the top portion may be narrowed to reduce the size of the RCC cover slabs. Where no lining is used, specially near trees, the entire pit should be filled with loose stones. A masonry ring may be constructed at the top of [the] pit to prevent damage by flooding of the pit by surface run off. The inlet pipe may be taken down to a depth of 90 cm. from the top as an anti-mosquito measure.

(h) When the disposal of septic tank effluent is to a dispersion trench, the dispersion trench shall be 50 to 100 cm. deep and 30 to 100 cm. wide excavated to a slight gradient and shall be provided with 15 to 25 cm. of washed gravel of crushed stones. Open jointed pipes placed inside the trench shall be made of unglazed earthenware clay or concrete and shall have minimum internal diameter of 75 to 100 mm. Each dispersion trench should not be longer than 30 m. and trenches should not be placed closer than 1.8 m.

17.15.2.1 Septic Tank Requirements: Requirements specified by State and Central Government, Public Health Institutes such as NEERI, for modern methods of disposal, may also be permissible.

Some further rules for the location of on-site facilities are implied in the provision on wells for the supply of water for human consumption (Rule 17.14), where it is stated that wells should be located not less than 15 metres from 'soak pit, refuse pit, earth closet or privy and shall be located on a side upwards from the earth closet or privy', and 'not less than 18 metres from any cess pit, soak way or borehole latrine and shall be located on a site upwards from the earth closet or privy', 'such that contamination by the movement of sub soil or other water is unlikely'.

There are some special provisions for low-cost housing schemes undertaken by the Maharashtra Housing and Area Development Authority set out in the Schedule to Part V (Additional FSI in Certain Categories in Non-Congested Areas). This includes the provision that 'A septic tank shall be provided with capacity of 141.6 litres (five cubic feet) per capita. Where municipal services are likely to be available within four to five years or so, pour flush water seal latrines (NEERI type) shall be permitted where the municipal sewerage system is not available and the water table in the area is not high.'

The Maharashtra DCR does not currently incorporate MBBL 2016 or the MOEFCC environmental conditions.

Uttar Pradesh

Uttar Pradesh has a model building bye-law, which is adopted by the development authorities for the urban areas under their respective jurisdictions, called the _____ (name of urban area) Development Authority Building and Development Bye-Laws, 2008 (which we will refer to as the 'UP Bye-Laws').²⁴

The UP Bye-Laws mandate that a 'Services Plan' submitted along with the building plan application should contain information with respect to drainage, arrangements for removal of excreta and solid waste, and nearby sewerage and drainage networks (Rule 2.1.2.6). Further, Rule 3.1.2.3 states that the 'Building Plan' submitted for building permission should include drawings that detail locations of toilets, sinks, bathrooms, excreta disposal, soak pits/septic tanks and sewer line connections.

Rule 3.6 provides specifications for other facilities in buildings for which plan approval is sought. It has no specific mention of drainage and waste disposal. Rule 3.6.9 states, in general terms, that 'Other Requirements' for the building should be in accordance with BIS standards and NBC (Rule 3.6.9).

As we can see, this is quite vague and non-specific to sanitation considering it is the only general provision of this type. There is no other provision relating to the need to have on-site septic tanks or other disposal facilities in places where there are no common sewerage services for domestic wastewater and excreta disposal. As we have seen, in some states this is implied by reference to NBC, whereas in others it is clearly stated. Neither of these approaches have been followed in the UP Bye-Laws.

Instead, the UP Bye-Laws make specific conditions for septic tanks only in relation to certain types of sites and buildings. In terms of the UP Bye-Laws, construction activities are not permitted within 200 metres of the Ganga river, except for repairs and restoration of existing buildings. Applications for building approval in relation to such sites need to ensure that there will be no pollution of the river, for which the approval of the water and development authorities is required. Further, it is specified that drainage from the building should not flow into the river, but into other drains, and in case there is no arrangement for these services near the site, there will be no approval for residential or dharamshala use of the site (Rule 3.1.10).

There are also several annexures that set out special requirements for various types of buildings. While most of these make no reference to sanitation, a few do contain specific sanitation-related provisions. Annexure 7 sets out some special requirements for 'Farm Houses', where it is stated that septic tanks should be at a minimum distance of 15 metres from wells to ensure that there is no subsoil pollution, and that septic tanks should be at least 4.5 metres from the outer walls of the building (Rule 7.11). Annexure 19 sets out requirements for 'Guest Houses', which includes the condition that the planning, construction and installation of water supply, drainage and sanitation systems should be in accordance with Part 9, Section 1 of NBC 2005 (Rule 19.10). Requirements for 'Shopping Malls' are set out in Annexure 21, where it is stated that arrangements for 'plumbing services' shall be made in accordance with Part 9 of NBC 2005.

The UP Bye-Laws do not currently incorporate environmental conditions from MBBL 2016 or MOEFCC.

²⁴ Sanctioned vide G.O. 5416/8-3-08-181/2008 dated 14/11/2008. Sanctioned vide G.O. 5899/8-3-08-181/2008 dated 20/11/2008. (The government website mentions two orders regarding this released within a week. Link: http://uptownplanning.gov.in/Go/From_Jan2008_Dec2008/GO_Jan2008_Dec2008.pdf.)

Conclusion

In our review of building regulations, we see that mostly (barring some exceptions) there is a requirement to make on-site containment facilities wherever no sewerage connection is available. This general requirement is missing in the Rourkela Regulations and the UP Bye-Laws, although other references to septic tanks in these two regulations suggest that this is either an inadvertent error or the result of a lack of understanding of the issue.

However, except in Tamil Nadu and Maharashtra, planning authorities seem not to have made any contextual specifications for on-site sanitation, and have generally adopted the NBC standards in the broadest possible terms. The Tamil Nadu Rules envisage that special measures may have to be carried out for sites near waterbodies or prone to subsurface water, which the authority can direct. There is no similar provision in any of the other regulations.

Conceptually, the idea of on-site sanitation is not limited to septic tanks, but wherever some detailed standards and specifications for on-site containment are included, whether in the regulations themselves or by reference to the NBCs, this is focused on septic tanks. Therefore it may be difficult to have plans approved for alternative models of on-site containment, without a specific mention of the same in the building regulations.

The drafters of the building regulations do not seem to have given serious thought to the integration of septic tanks to the rest of the FSM chain. In part, this is because building regulations apply only at the time when construction activity is planned, and till such time as it is completed. However, one of the critical issues to be specified at this time is accessibility of septic tanks for septic tank-emptying trucks. This is briefly mentioned in the Tamil Nadu Regulations (from 1971) where 'access for conservancy' is a listed requirement, although at the time when these regulations were drafted, de-sludging was more likely to have been a manual scavenging operation. MBBL 2016 also makes some reference to accessibility for cleaning of septic tanks, but does not provide any further specification of accessibility. We saw that this point was picked up in the

AP Building Rules, but because of a drafting error it is not directly applicable as part of the regulations.

More broadly, there are so many inconsistencies and inadequacies in all the regulations we reviewed that it appears that the drafting units responsible for preparing these regulations do not themselves have a very good understanding of the issues around FSM and on-site containment. Perhaps it is for this reason that even the most basic requirement for on-site containment is adopted by reference to NBC, when it could just as easily have been directly written into the regulations for ease of use.

In the case of larger construction projects, this confusion is further compounded by overlapping but different conditions included in MBBL 2016 and the MOEFCC notification of 2016. The MOEFCC notification made a significant departure from past practice in relation to environmental clearance for building and construction projects by allowing for environmental conditions to be integrated with the building regulation process. This would exempt building and construction projects from the need to seek separate clearances from the state environmental clearance agency or the state pollution control board. However, this direction has not been taken on board in any of the building regulations we have reviewed so far, even in the ones that have been issued subsequently. It is also not clear why the urban ministry maintains a separate set of environmental conditions in its MBBL 2016, when these could have been reconciled with the MOEFCC conditions. This specific issue could be resolved between the two ministries of the central government, to ensure that state planning agencies do not face any confusion on this front.

With respect to all the regulations that mandate on-site sewerage treatment for larger building and construction projects (of varying threshold sizes), we have also noted that the regulations mandate installation of treatment infrastructure with little thought as to how the operations of this infrastructure will be supervised. Even the MOEFCC notification concerns itself only with norms for disposal of treated effluents and sludge, and not with safe and

hygienic management of the on-site treatment facility. In effect, then, this aspect of the treatment facilities is left to self-regulation by the residents or managers of the building complex. This is problematic for various reasons, not least of which is the fact that sewerage treatment plants can be extremely hazardous if poorly managed

and operated, and can create life-threatening conditions for people directly exposed to them.²⁵

A comparison of some of the key features of all the building regulations we have reviewed here is presented in Table 3 below.

Table 3: Comparison of key features from building codes and regulations reviewed in this report

Does the building regulation or code provide the following?	NBC 2005	NBC 2016	MBBL 2016	Andhra Pradesh	Odisha - Bhubaneswar	Odisha - Rourkela	Rajasthan	Tamil Nadu	Maharashtra	Uttar Pradesh
Does it make on-site containment mandatory for sites where a sewerage connection is not available?	Yes	Yes	Yes	Yes	Yes	NO	Yes	Yes	Yes	NO
Is this done directly, or by reference to NBC?	NA	NA	NBC & directly	NBC	NBC	NA	NBC & directly	Directly	NBC	NA
Is on-site containment scrutinised as part of the building plan approval process?	NA	NA	Yes	Yes	Yes	Yes	No	Yes	Yes	No
Does it contain any specifications and requirements for the septic tanks? E.g., restrictions on open discharge, protection of groundwater, etc.	Yes	Yes	Yes	No	No	No	No	Yes	Yes	No
Does it require that access for cleaning should be provided?	No	No	Yes	No	No	No	No	Yes	No	No
Are there any special requirements for special locations?	No	No	No	No	No	No	No	Yes	Yes	Yes
Does it incorporate special provisions for larger real estate projects?	No	No	Yes	Yes	No	Yes	Yes	No	No	No

²⁵ This aspect has been highlighted by recent deaths of cleaning workers in on-site sewerage treatment plants in Delhi and Bangalore. See Alok Singh & Sourav Rou Burman, Five killed while cleaning tank in basement of West Delhi DLF complex, Indian Express, 10 September 2018. Available at <https://indianexpress.com/article/india/five-killed-while-cleaning-tank-in-basement-of-west-delhi-dlf-complex-5347815/> (last visited on 24 September 2018).

Shiv Sunny, In Delhi sewer, three deaths in just seven minutes but not one cry for help, Hindustan Times, 7 August 2017. Available at <https://www.hindustantimes.com/delhi-news/in-delhi-sewer-three-deaths-in-just-seven-minutes-but-not-one-cry-for-help/story-MRdoVjg2Z3pAAwHuV7JF5K.html> (last visited on 24 September 2018). Three labourers die of asphyxiation while cleaning STP (Bangaluru), Hindu, 7 January 2018. Available at <https://www.thehindu.com/news/cities/bangalore/three-labourers-die-of-asphyxiation-while-cleaning-stp/article22390956.ece> (last visited on 24 September 2018).

SCALING CITY INSTITUTIONS FOR INDIA: SANITATION (SCI-FI: SANITATION)

Sanitation programme at the Centre for Policy Research (CPR) is a multi-disciplinary research, outreach and policy support initiative. The programme seeks to improve the understanding of the reasons for poor sanitation, and to examine how these might be related to technology and service delivery models, institutions, governance and financial issues, and socio-economic dimensions. Based on research findings, it seeks to support national, state and city authorities develop policies and programmes for intervention with the goal of increasing access to inclusive, safe and sustainable sanitation. Initiated in 2013, the programme is primarily funded by the Bill and Melinda Gates Foundation (BMGF).

