Don't Poo-Poo the Toilet:

Architectural Contributions to Human Waste

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Abstract:

Eliminating waste is a natural bodily function, common to all, yet its protocols are evidence of a strange discomfort in society. This thesis investigates the ways in which this discomfort manifests in the architecture of the toilet, suggesting in the process that the toilet is space that is more significant than the architecture profession might acknowledge. A toilet and its accompanying infrastructure are not typically considered architecture. While a necessary feature of a building, a typical toilet must be discrete, private, with an emphasis on functionality; any particular design flair – unless it is of service to concealment – is considered unusual. Such architectural tendencies cannot be separated from attitudes to excrement, which is generally considered disgusting, worthless or dangerous. These negative attitudes are not strictly scientific or rational in their foundation; instead, attitudes to excrement and the toilet are culture and context specific. Accordingly, the architecture of the toilet in the West is neither inherently 'correct', nor 'desirable' – rather, it is the product of specifically Western perceptions of waste, which are shrouded in negativity. In this light, this thesis argues that the architecture of the toilet should not be viewed as an unquestionable norm. Instead, the profession should be considering its responsibility to interrogate the place of waste in our society.

Don't poo-poo the toilet: architectural contributions to human waste reveals that the toilet is an architectural manifestation of broader societal attitudes towards what is considered dirty. The toilet unifies all of human kind at a common, base level, and yet it reveals much about how the human world is divided into categories of clean and dirty, proper and improper, good and bad. This thesis thus offers a lens for viewing the world we live in, through the dirt of this architecturally neglected space.

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Contents

Introduction

Don't Poo-poo the Toilet: Architectural Contributions to Human Waste was born out of experiencing, first hand, life on the Ganges River. Unravelling in front of my eyes, at 6am on a foggy, winter's morning, was the great Hindu paradox (Alley 61). Pilgrims and locals alike were standing, waist deep, along the shallow depths of the Ganges, going about their morning ablutions. For the pilgrims, it was an act of spiritual purification: the Ganges is for Hindus a Goddess and possesses the highest purifying powers. For others, it was a way of getting clean. The Ganges was and still is amongst the world's most polluted rivers, into which people without toilets eliminate openly, and sewage from the city's pipes flows untreated. Consequently, faecal coliform counts are hundreds, even thousands of times those of safe limits. The display I witnessed that morning gave quite a jolt – the idea that bathing in human excrement could be purifying was unfathomable. For me, the opposite was true: to come into contact with these waters would be a form of voluntary contamination.

The Ganges River highlights that attitudes to dirt, and in particular to excrement, are not universally the same. The differences in Western versus Hindu views are accounted for, to a large extent, by cultural norms and religious beliefs. The Hindu belief system means that, on the Ganges, going to the toilet is not incompatible with other activities, spiritual or secular. Consequently, the river banks display an astonishing mixture of the clean and the dirty. In contrast, human waste is for Westerners the most disgusting substance imaginable (Kira 93). Accordingly, our toilets are hidden in a secret closet, behind lockable doors, banished from the 'cleaner', more 'dignified' face of life. Observing life, first hand, on the Ganges River revealed that Western society is remarkably uncomfortable with a waste product that every human produces.

Elimination is an essential biological need: a home without a toilet would be as inconceivable as a home without walls. But perhaps architecture would rather this were not the case. As Marco Frascari notes, a toilet is deemed successful in architecture, not through specific design merit, but only if it does not "stick out like a sore thumb"[1] (Frascari 166). Just like the euphemism that avoids the mention of "toilet" in polite conversation, architecture avoids highlighting the toilet in our buildings. The profession appears little interested in it, if the showroom spec fittings and the two meter square cubicles are any indication. Indeed, the architectural differences between

two toilets are usually as thin as the tiles that clad their walls. Architecture instead prefers more dignified pastures, like art galleries, civic buildings and homes for the more wealthy.[2] In other words, the toilet is a necessity of building, but is not necessarily considered architecture.

If the Ganges demonstrated for me the Western reluctance to acknowledge our waste, it equally revealed that the disposal of excrement is not without considerable problems. Nearly forty percent of the world's population live without a toilet, and must therefore eliminate in the open, in streets, fields, or, as in Varanasi, in rivers (Lenton, Wright and Lewis 113). The sub-standard latrines that are a typical feature of the third world are perhaps functional; but their insipid, fly infested interiors could never be considered architectural.

[1] Marco Frascari writes: "In most of the buildings I had collected for my design library, a bathroom was successful if it didn't stick out like a sore thumb in the layout of the plan." I assume that if architecture is disinterested in bathroom architecture, then it is likely the profession shares the same view of toilet architecture, given that (a) toilets are often in bathrooms, and (b) toilets are even more lowly considered than bathrooms. See M Frascari, "The Pneumatic Bathroom," Plumbing: Sounding Modern Architecture, ed. Lahji N. et al. (New York: Princeton University Press, 1997).

[2] For the more civic-building focus of architecture, see A Ballantyne, "The Nest and the Pillar of Fire," What Is Architecture?, ed. A Ballantyne (London: Routledge, 2002) 48. For a general tendency for architectural clients to be wealthy individuals, see D Cuff, Architecture: The Story of Practice (M.I.T. Press, 1992) 40.

However, waste disposal problems are not confined to developing nations. We are fortunate in the West to have virtually complete sanitation coverage. But there remains a question of disposal: upon flushing, excrement does not disappear – it simply pollutes some other place (Kira 96). Despite the huge advances in technology, cities can think of no better solution than to flush its waste to the nearest watercourse, squandering precious drinking water and valuable fertiliser. The insistence with which the infrastructure of waste is hidden, suggests that waste disposal in cities, like the latrine, is also not architectural.

Architecture's disinterest in waste cannot be dissociated from general tendencies to consider excrement repugnant. Who, one might ask, wants to be reminded of their waste through attention-worthy 'toilet architecture'? Architecture makes possible a certain way of living (Ballantyne 23). Much of what characterises daily lives is facilitated by recurring patterns in our built environments that favour certain behavioural habits (27). In this light, architecture needs to question whether the rejection of waste in our built environments actively maintains the negative attitudes to waste that are commonly held. Architecture is able to interrogate its position, and question our daily interactions to waste. Given this fundamentally important, and ever present part of our lives, the problems of waste disposal in the world warrant an attention that few are willing to give it. Architecture is one of the means of changing that.

Rather than marginalise the toilet, perhaps architecture should consider its responsibility in re-evaluating the position of waste in society. In this light, *Don't Poo-poo the Toilet* suggests that if architecture were to invest more creative energy exploring the toilet, then new, more positive perceptions of waste would emerge. The approach to this thesis is broad – the questions asked of a Western public toilet, for example, are quite different from those of a sanitation scheme for urban slums. I decide thus to look at the architecture of the toilet from many different angles. The thesis is set out as follows.

Chapter one, "Kia Ora Toilet", questions privacy in the context of a public toilet, and asks whether a toilet that reveals rather than conceals the elimination process can permit more positive behavioural relationships to waste.

Chapter two, "From Waste to Water," returns to the banks of the Ganges. It looks at the inefficiencies of the flush system, and asks what a sewerage network for a city might look like it if were liberated from negative attitudes to excrement.

Chapter three, "Cover the Face, Expose the Base," likewise set in India, examines the relevance of architecture to the third world toilet. Architecture would not normally be considered necessary in economically deprived areas. To the contrary, this chapter argues that designing a latrine with spatial and poetic appeal is an essential aspect of solving the need to provide sanitation to the world's poorest people.

Chapter four, "Glossy Dirt," does not deal with the toilet directly, but instead views it as part of a broader tendency for architecture to reject that which is dirty, even though dirt, like excrement, is an inevitable part of habitation. It looks at ways in which waste can be incorporated as an aesthetic device that would enrich, rather than taint architecture.

In its various states, the toilet has been neglected by architecture, reflecting the lowly status given to human waste in Western society. Throughout this thesis, therefore, I suggest different ways in which architecture can question assumptions of the toilet, aiming to create more positive attitudes to and experiences with waste. But in addition, this thesis reveals that the toilet is much more than a little room with a ceramic bowl: it is a focal point of wider human attitudes to filth – both physical and symbolic – and is emblematic of the way humans view the world, themselves and fellow humans through lenses that categorise as 'clean' or 'dirty', 'proper' or 'improper', 'good' or 'bad'. Understanding the toilet opens a door to understanding the slightly strange phenomenon that is human existence. We begin by tackling a particularly unsavoury space – the public toilet – and try to find a touch of love in what is typically loathed.

Chapter 1

Kia ora Toilet: a public toilet for Wellington

There is a line inside. Women lean against a curving wall, only a few feet away from half a dozen women squatting opposite, over squat latrines placed above a channel of trickling water. There isn't a door in sight. […] I lean into the wall, making no eye contact and hoping to go unnoticed, but this is untouristed China and I stand out anyway

Rose George[3]

Eliminating in stall-less public toilets would be, for most Westerners, problematic. Rose George used the Chinese open-stall public toilets called "ni-hao" or "hello" toilets, though

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[3] This is Rose George's personal account, as published in R George, <u>The Big Necessity: Adventures in the World of Human Waste</u> (London: Portobello Books, 2008) 146.

not without considerable apprehension. In parts of China, not only is eliminating a communal activity, it is also a social one, to which the name "ni-hao" toilet alludes. In contrast, the combination of elimination and public socialising is quite an affront to Western view of toilet protocol.

In the West, toileting is, for the most part, an individual undertaking. While small children, the disabled, or the elderly may require assistance to pass waste, communal elimination is a rare occurrence. Public toilets present occasions when elimination is done in proximity of others. But individual toilet cubicles mean that solitude can be assured in the public setting. The male, stainless-steel wall urinal – perhaps the last bastion of communal elimination – is gradually being replaced by individual ceramic urinals, often separated by small partitions. Humans may be gregarious, social creatures (Jenks 21), but they are not when it concerns elimination.

The Chinese do not share our strict codes of privacy for the toilet, nor are they embarrassed by elimination. Western toileting, by contrast, is not only a solitary activity – it

is, in the words of Rose George, "a hidden, shameful one" (George 147). Since eliminating waste is an inherently natural biological function, the Western embarrassment for elimination seems rather curious. The public and unashamed practices of the "faecal-philiac"[4] Chinese may cause us to question the insistence with which eliminating must be private. Consequently, this chapter questions the implications of privacy of the Western toilet. It questions whether architecture, in interrogating privacy, can create new relationships to waste that are less rooted in shame. To do this, it is important to understand the function of privacy and concealment, specifically in relation to the elimination process. Emulating a Chinese style open-stall toilet (perhaps called the "Kia ora" Toilet) is unlikely to meet a favourable reaction in New Zealand. The question of privacy is more complex; more

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[4] Rose George uses the term "faecal-philiac" to describe the Chinese lack of squeamishness when confronted with excrement. See George, The Big Necessity: Adventures in the World of Human Waste 124.

subtlety would be required to appease a Western audience. The chapter will conclude with a design for a public toilet for Wellington, for which humour and pleasure are at its core.

The making of privacy

Architecture creates buildings for human occupation. It cannot be separated from societal norms. If, for example, the protocol of elimination demands privacy, then architecture (usually) obliges. Privacy implies three things: a self, an external social body, and a desire to regulate the exposure of the self (Spacks 4). Toileting becomes individual when architecture provides a mediator between the self and the other person, usually in the form of discrete locations, high walls and lockable doors. But privacy is a far more complex matter than simply providing visual barriers, and the toilet is a prime example. Architecture provides other forms of separation to ensure a buffer zone between the toilet and neighbouring activities – examples including discrete locations, carefully recessed door-ways, or

the maze-like wall configurations that obscure views to the toilet from outside. Aural privacy is equally important. The sound of waste hitting water, the murmur of defecation, the ripping of toilet paper and the flush of the evacuation of waste are all potential aural intrusions that defy visual barriers. In situations where privacy is compromised, and when architectural separation is not provided, social behaviour takes over. At open public urinals, for example, males practise what Erving Goffman calls 'civil inattention,' the avoidance of interaction with other persons respecting needs for privacy (Manning 85). Decorum requires of us that eliminating be private – when privacy is not provided by architecture, it is provided by social behaviour.

In architecture, greater values put upon privacy were seen to develop in the 1700s, where the compartmentalisation of the bourgeois home sought to provide refuge for individual members of a family (Spacks 6). This was in contrast to the tightly knit living quarters of the single-roomed homes of the poor. The various domestic activities became divided from one another where available funds allowed. In more wealthy homes, a careful zoning took place: servant quarters were distinguished from the masters' quarters, the clean from the dirty, the public from the private. The modern home inherits at least aspects of this compartmentalisation: private bedroom quarters are split from living quarters; rooms for food preparation or for tending to personal hygiene equally are reserved their own space (Rosner 64-65). Elimination was one of many activities to benefit from a dedicated space.

According to design reviews such as *Houses New Zealand* and *Trends*,[5] the modern home enjoys greater spatial freedom than did the villa of the 1700s. Instead, designs that are displayed in reviews are more likely to dissolve boundaries between rooms than insist on maintaining them. Open plan kitchen and living spaces, and spaces that blur indoors with

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[5] Removed though not isolated from the scholarly discourse of architectural research, design reviews are indications of popular aspirations of the present time. They are also good indications of how scholarly research is assimilated into everyday architecture.

outdoors, are common hallmarks of *Houses* and *Trends* designs. The traditionally 'dirty' zones of the house, the bathroom and toilet, are of particular interest to this section: how is openness treated with respect to the spaces of body hygiene? Bathing no longer must be a private affair: fully glazed showers look out to open landscapes, while bathrooms merge with adjacent master bedrooms placing the tub as centre attraction.[6] One particular architect describes the "exhilarating experience" of bathing in a frankly open environment. The modern bathroom appears to have assimilated Bernard Tschumi's theories of eroticism in architecture: breaking

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[6] On the following pages, photographs depict bathrooms or showers in connection with the outdoors: *Trends* 25.6: 13, 14, 32, 37, 38, 44, 47, 49, 53, 54, 65, 75, 81; *Trends* 16.7: 55, 83, 99; *Trends* 17.7: 10, 15, 26, 63; *Trends* 21.11: 9, 10, 14, 67, 71, 78, 95. On the following pages, photographs depict bathrooms or showers in connection with the master bedroom: *Trends* 25.6: 18; *Trends* 16.7: 57, 63; *Trends* 17.7: 76; *Trends* 21.11: 19, 43, 71.

"Escape to nature"
Trends: Bathroom, vol.16, no. 7

"At one with nature"
Trends: Bathroom, vol.25, no. 6

taboos – in this case, the taboo of bodily immodesty – heighten sensual pleasure of the bathing experience.

While the privacy of bathing can be explored, architecture seems less interested in that of the toilet: the temptations to explore privacy for elimination are not nearly as audacious. If an open bath or shower can take pride of place in the bedroom suite, the toilet should be housed in a separate cubicle or screened off from direct view.[7] Indeed, in these reviews, the toilet is conspicuous by its absence: attention is drawn to the toilet only when its concealment has been deemed successful: "[the architect] changed the position of all the major fittings to ensure a more functional and space saving

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[7] Of the toilets to feature in photographs in *Trends*, the following pages showed toilets in either recesses or cubicles, or screened off by partitions or other bathroom fittings. *Trends* 25.6: recesses: 12, 24, 27; cubicles: 18, 74; screened off: 21, 33. *Trends* 16.7: recesses: 5, 43, 44, 65, 68, 71, 76, 101; cubicles: 78; screened off: 21, 33, 84. *Trends* 17.2: recesses: 9, 29, 61, 92; cubicles: 23, 31, 33; screened off: 67. *Trends* 21.11: recesses: 28; cubicles: 19, 43; screened off: 65, 90, 102, 113, 115, 157

layout. The toilet […] is now tucked away to the side, no longer immediately in view when the door is opened" (Trends vol. 17 no. 7. 4). To be "functional," the toilet must be hidden from view. Functionality, when the subject of toilets, is not associated with convenience, durability or utility. Here, it concerns privacy. While showering and bathing are worthy of heightened architectural pleasure, the profession is less interested in the toilet. It remains hidden in a recess, hidden from view, and concealed in architectural images. A toilet is a standard fitting in any modern building, but perhaps architecture prefers it were not.
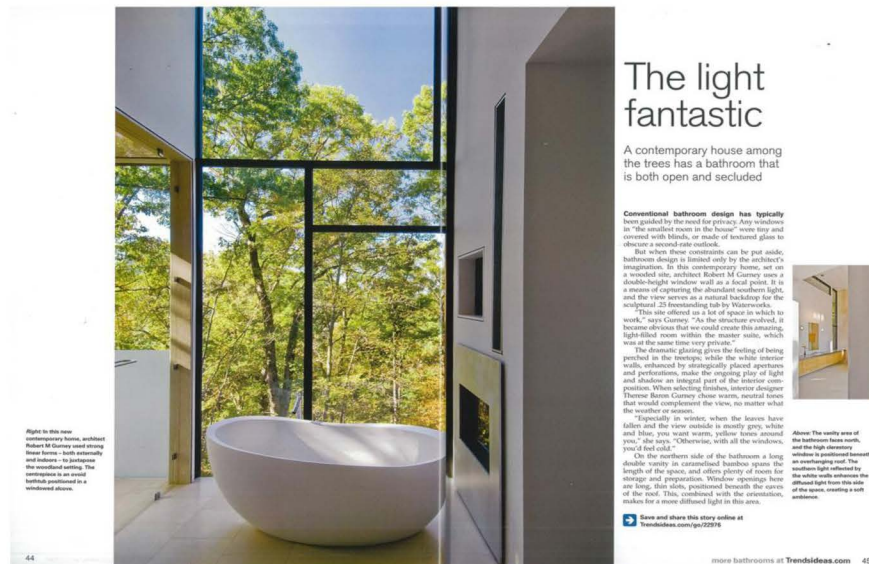
Privacy for the disgusting

Bathing and eliminating share much in common. Both relate to body hygiene, remove dirt and grime, use water as their primary mode of cleansing, and require exposing the body's private parts. But the distinction between bathing and eliminating needs to be considered with respect to the type of

"Sense of the past"
Trends: Bathroom, vol.25, no. 6

"The light fantastic"
Trends: Bathroom, vol.25, no. 6

body hygiene that the two activities promote. If bathing concentrates on the body's external hygiene, eliminating is dedicated to internal hygiene. Bathing focuses on the skin, eliminating on the internal core of the body and the waste it produces. Attitudes to bathing and eliminating are perhaps consequently quite different. Where showering or bathing can be considered a "leisurely", "sensual", "indulgent" or even "exhilarating" activity, toileting is more likely to be burdened by shame:

> *Urine and feces, in particular, are generally regarded by contemporary Western societies as filth of the worst sort, so much so that the individual not only wants to dispose of them as quickly as possible but also wishes to be completely dissociated from the act of producing them. In fact, it is probably fair to say the for many people urine and feces are the most repulsive and worthless substances imaginable* (Kira 93)

These disparate views of bathing versus eliminating reveal how the body is not a neutral entity; rather we relate to it in inconsistent ways. Waste from inside our bodies triggers disgust and shame, and yet grime on the surface of our bodies is far less likely to. Exterior appearances are a source of positive attention, while interiors are more likely to be a source of a more troubled relationship.

Much of the trouble people have with the elimination process can be attributed to the physical properties of faeces. In other words, they disgust us. Denis Hollier, in interpretations of writings of Plato, writes on the formal properties of spit, mud and dirt, but could equally have included excrement. He views scatological things as obstacles to the theories of form (Hollier 99-100). They lack a finite and identifiable limit, and determining the form of the entity thus becomes problematic. As such, scatology does not lend itself to being perceived and understood through sight. Similarities can be seen with the Lacanian Real, though the emphasis is not on sight: the Real, devised by Jacques Lacan, is a category of matter or experience that cannot be assimilated through language. Because scatological things lack finite forms, they defer to a representation of matter: this viscous matter lacks an outer surface of stability and order that language can describe. The inability of scatological things, like excrement, to be assimilated through either sight or language – and therefore thought – means that they exist for human beings in a traumatic relationship that manifests in the emotion of disgust.[8]

According to William Miller, disgust signals to the human body an impending danger. Disgust operates at the limit that defines the acceptable from the unacceptable, the normal from the abnormal, the safe from the dangerous. Far from easily triggered by casual overstepping of a line, disgust

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[8] For the connection between human excrement and the Lacanian Real, see Holm, L. "Es Aitch Eye Tee." *The Journal of Architecture* 12 4 (2007) p. 426. For the link between traumatic experience and that which cannot be assimilated through language, see Evans, D. "Real (Réel)." *An introductory dictionary of Lacanian psychoanalysis.* New York: Routledge, 1996

marks the outermost extremes of a limit. A person, for example, is likely to feel disgust towards things or actions that are grossly detrimental to human cohesion, whether this be in the form of extreme violence, at gross repression of human rights, or at toxic substances harmful to health. In these circumstances, disgust affirms that such behaviour or substances have no place in society. Disgust is thus a trigger that gives expression to the outer limits of an invisible boundary – it is, in effect, a self-protection mechanism. Disgust can operate in a slightly different way also: rather than be viewed solely as a protection mechanism or 'police force', it also can serve as punishment for overstepping boundaries. It becomes a self-imposed jail sentence that reinstates faith in the boundaries that society creates. It serves to prevent further transgression of the rules. Disgust thus demonstrates consciousness of the limits of a society, and also gives strength to them (Miller 105-08).

The disgust mechanism operating around toilets and faeces would suggest that human waste is extremely dangerous, with potentially destructive and anti-social consequences. In cases of inappropriate disposal of waste, faeces are indeed carriers of disease and ill-health. Westerners are by no means alone in carefully policing the dangerous potential of human waste; it is a common theme in all cultures even though rituals governing excrement differ in detail (Douglas 35). Society's limits can manifest themselves in other ways: architecture, for one, cannot be separated from the society for which and in which it is produced (Ballantyne 23). The profession cannot ignore society's limits, least of all those announced by disgust, for it announces the very outer edges of acceptability. The limits of disgust are manifest in architecture through the ways in which architecture creates space: they are particularly evident in the creation of toilet space.

Threshold of disgust

The synchronicity of architectural limits and societal limits is revealed in Victoria Rosner's discussion of the homes of well-known writers in Victorian Britain. Rosner analyses the architectural separations made between what is considered proper, clean and public, versus improper, unclean and private (Rosner 65). Of particular importance to Rosner are the thresholds that define the categories of domestic space: "Thresholds of rooms or junctures between different areas of the house were a particularly sensitive area of concern, since these architectural transitions also distinguished different household constituencies" (Rosner 64). Thresholds not only demarcate; they also announce the passage from one category of space to the next. The threshold is particularly relevant in separating servant from master quarters: it is concealed, and thus it enables the dirty operations of household chores, maintenance and food preparation to be almost invisible from the clean, public operations of the home.

In a particular instance, Rosner describes the consequences of breaking this threshold: when the children of the home peer into the servant quarters out of curiosity, their reactions are ones of "horror" and "offence" at the filth, in what looks like "a crime scene" (Rosner 68). The servant quarters are out-of-bounds for the privileged children, the threshold defining the limit of their world, and the beginning of the next. In overstepping the limit, their indulgence is punished by feelings of disgust[9] – the servant zone thus becomes synonymous with the zone of the disgusting. As Rosner explains, the home does not eliminate the dirty, the improper, or the offensive – rather it carefully identifies and regulates them through the threshold (Rosner 68). The disgusting is recognised at the threshold; it is separated from the clean public face of the home, and labelled as off-limits. The threshold is the line that announces the limits of society and the passage towards the disgusting.

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[9] I assume the equivalence of horror and disgust in this case.

Disgust can be seen to operate in the toilet similarly to the servant quarters of the Victorian home. Whether a solid door, partial wall or equivalent, privacy is the architectural device that contains and conceals the space of elimination, marking the toilet as separate from other, more public spaces. Just as the threshold marks the limit of servants' quarters, the threshold here marks the limits of the world of faeces and urine. In doing so it consequently marks the territory of the disgusting and the boundary of public operations. When the threshold is broken, it announces the passage toward the disgusting, for without it, the limits of the disgusting are no more; the boundaries of society are no longer known; the disgusting and the non-disgusting merge as one. Privacy is less about body modesty than we might think: the glazed showers and open baths of *Trends* and *Houses* reviews are, if anything, more revealing of the body than eliminating could ever be. Privacy is instead a means of announcing a limit, for without privacy, containment, or some form of concealment, the limit fails to be acknowledged, and the disgusting threatens to merge with normal and social existence.

Privacy may prevent the disgusting from contaminating things or beings outside of the toilet, but it is powerless to prevent the contamination and subsequent devaluing of the toilet user (Miller 5). The user who defecates (and urinates, though to a lesser degree), becomes momentarily devalued via contact with disgusting things. They are in a 'disgusting state'. This is obvious, perhaps, but when disgust shifts its focus from things (a toilet, faeces, in this case) to an individual (the user), disgust is felt as shame. According to Miller, disgust, when targeted at a person causes a "loss of honour", a "loss of self-esteem" that tends ultimately towards self-loathing. The emotion shame supports disgust in repelling us from potentially dangerous things; they also punish us if we should overstep (Miller 34). In the toilet, privacy thus acts as containment for, and announcement of, the disgusting, but equally it acts as a protection mechanism by preventing the user from being the subject of shame. Disgust is the barrier

that holds privacy in place; shame is the consequence if it is removed. Both emotions necessitate privacy as the dutiful provider of psychological shelter (Harries 1982). The shameful and loathsome act of eliminating are made bearable thanks to the intervention of architecture.

In protecting us from the emotions of disgust and shame, privacy becomes the norm in the architecture of the toilet. Mary Douglas explains that through insistent repetition, a norm is given added strength and acquires durability. A norm's resilience to change comes from the comfort we draw from them – the more consistent our comfort, the greater confidence instilled in the norm. Over time, what does not fit with the norm is sidelined with greater force; comfort slowly becomes synonymous with the norm that provides it (Douglas 36,37). The norm of privacy thus instils confidence that the adverse effects of disgust and shame are dealt with appropriately – architecture must therefore oblige and provide this privacy. But in instilling confidence in the norm and in the comfort we draw from it, we equally solidify the feelings of

disgust and shame that we are protecting ourselves from. The perceptions that the toilet is disgusting and a source of shame are reinstated simultaneously with the norm. The privacy of toilet is thus caught in a catch-22: architecture is bound by a norm that is required to protect us – but in protecting us, architecture enshrines the negative emotions it is protecting us from. In other words, in bowing to the norm of privacy, the architecture of privacy perpetuates the shameful and disgusting perception of waste.

Privacy undone

If architecture contributes to negative perception of waste, it would be reasonable to ask whether architecture can contribute to the undoing of these. At the beginning of this chapter, I began with a description of the Chinese *hutong* toilet. In the "ni-hao" toilets of China, the threshold is totally absent: eliminating is done unashamed, unabashed in the presence of others in a completely open space. These toilets

demonstrate that the attachment of shame or disgust to waste is not inherent to human kind, and that the privacy norm in the West is not universal. The Chinese must either embrace the disgusting and have no shame, or have removed any notion of these emotions with the removal of privacy.[10] The Chinese *hutong* toilet might suggest that architectural form can also play a role in defining more positive attitudes to waste.

Tim Geisler explains that the public toilet is, for the Chinese, more than a place to pass waste. From the 1950s, public toilets were built as part of a drive to provide sanitation for many of the toilet-less '*hutong*' communities. Conceived as more than an infrastructural requirement, the *hutong* toilets were a vehicle for the communist ideals of equality and modesty. Built at communal hubs, they were envisioned as a

social gathering facility, fostering cooperative living, that united people at the 'lowest', 'basest' level of human existence – elimination (Geisler 216). These facilities are quite different to their Western equivalents: inside, the space is free of all dividing walls and doors; users eliminate in full view of others – Western-style privacy is totally absent. Rather than be a source of alarm, this openness enabled the public toilet to become a place for "on-the-stool" discussions and jokes, or for users to "chat about neighbourhood news" (217). Given the social nature of these encounters, the Chinese clearly do not share the Western shame for their bodies, prohibitions for their orifices and revulsion at waste, suggesting that there is nothing definitive or inherent about Western attitudes to toileting. Instead of creating a space of crime, graffiti, and apprehension (Holm 427), the *hutong* toilet became "conspicuous elements in the urban landscape and in the minds of the people" (Geisler 217). Indeed, Geisler speaks of the *hutong* toilet with a certain affection, describing them as "humble", "cosy" and "curious." This favourable perception

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[10] Victoria Rosner suggests similar possibilities to define the place of 'dirty' zones in the Victorian home. I draw inspiration from her in deriving these two avenues explaining the Chinese ease with waste in the *Hutong* toilet. See Rosner, V. *Modernism and the Architecture of Private Life*. New York: Columbia University Press, 2005 p. 68,69

cannot be separated from the openness and central location of the toilet that encourages social interaction even at the level of man's lowest common 'denominator.' The *hutong* toilet does suggest that interrogating the construction of privacy and the solitary nature of toileting could make the experience less shameful and more appreciable.

For this section, my design experiment aims to foster positive relationships and attitudes towards the toilet, as the Chinese *hutong* toilet does, through restoring to the public toilet the essential architectural qualities of pleasure and delight. Removing privacy partitions in a public toilet would hardly be pleasurable for Westerners. It would instead expose one to shame and potential self loathing. Seeking positive relationships to waste requires a more nuanced exploration of the privacy threshold. To do so, it must not directly threaten cherished values of privacy or the threshold of disgust or shame, for this could result in condemnation. Instead of removing privacy, I propose to reinterpret privacy in a way that brings pleasure. I suggest that interrogating the private nature

of the toilet is the key to changing perceptions, for this may be the key to altering perceptions of disgust.

Pleasure in transgression

For Bernard Tschumi, pleasure arises when architecture challenges assumptions and expectations of what spatial experience should be. This implies deconstructing norms and transgressing limits (Tschumi 180). It thus necessitates venturing into new territory that can be both a site of anxiety and enriched existence (Douglas 39, 40). In citing Georges Batailles and his theories on eroticism, Chris Jenks explains that transgression becomes a combination of joy at having exceeded the limits that man has imposed on himself, pleasure at new experience and realisation, and a source of angst due to danger at having overstepped a boundary (Jenks 99-100). To transgress norms therefore is a double edged sword: it combines potential of the new with the fear of the unknown. This double face of transgression is mirrored in

disgust and shame mechanisms. According to Miller, disgust and shame work together to provide a barrier to overstepping society's limits, but they do so out of a need to restrain subconscious desire (Miller 34, 109). This desire for and distancing from the limit can be explained through the simultaneous attraction and repulsion of things or actions that are of borderline societal acceptance:

Something makes us look at the bloody auto accident,
thrill to movies of horror, gore, and violence; something
makes porn big business and still draws people to
circus sideshows. Is there no moral offensiveness that
doesn't by some dark process elicit fascination, if in no
other way than in the horror, wonderment and
befuddlement such depravity evokes? (112)

In a similar vein, exploring the privacy of the toilet involves exploring the territory of the disgusting, and therefore the simultaneous double sensation of repulsion and fascination. But are faeces not simply disgusting as the Lacanian Real demonstrates? Given social norms of privacy that have been cultivated over centuries, exploring the disgusting territory of faeces does risk forfeiting pleasure for offence.

Within social protocol exist ways of overstepping even some of the strictest barriers set up by disgust. Laughter is one tool able to overcome the prohibitions, and it allows indulgence in what would normally be out of bounds. It is the form through which the marginalised, the inappropriate or the disgusting is able to be assimilated, provided it is in a limited and harmless capacity, such as a light joke (117). Laughter operates as a disguise. But more than a disguise, it draws pleasure from people in what is normally a danger: it is, in the words of Denis Hollier, "a practical refutation, [...] that refutes nothing" (Hollier 101). Laughter betrays the hidden pleasures of transgression, the pleasures of excess and the pleasures that accompany the mildly disgusting or slightly embarrassing. If disgust and shame are the emotions that prohibit unconscious and dangerous desire, laughter permits a minor indulgence behind a veil that makes it acceptable. Scatological humour and toilet jokes play precisely at the norm that they

are violating – they depend on transgression for their effect; they depend on breaking rules (Miller 116).

The Kia Ora Toilet

Is humour thus the architectural tool that can convert a public toilet into a more pleasurable space? Can the confrontation of expectation, with deliberate comic twists, evoke delight and not disgust or shame? Thus, the following design will take a public toilet as its basis, and aim to make it pleasurable and fun. It will ignore practical justification through the logic that making toileting something other than disgusting is justification in itself. It aims to shift concepts of public toileting through fanciful gestures, through what might be considered excessive or simply ridiculous. It aims to transgress through toilet humour, through confronting expectations of privacy and discretion in toilets. One thing it must not be, however, is a mask that simply re-clothes the toilet under a new pretence. Instead it questions the creation of privacy in toileting, for

privacy appears as a key element in protecting us from, and yet simultaneously creating, the negative emotions of disgust and shame.

This public toilet relies on an industrial design language. Scale and movement are central to confronting the expectations that a toilet needs to be discrete, providing privacy for its users and from others. The element central to the scheme is an elevator mechanism that lifts users up into the toilet. The toileting is experienced in the following way.

Scale and drama:

The over-sized, over-tall and exposed lift mechanism is the 'beacon' that draws attention to the public toilet. In big letters, W.C. announces the function of this curious, crane-like building. The scale of the lift mechanism is contrasted with the small toilet cubicle, which perhaps recalls the scale of a port-a-loo.

Human Interaction:

To access the interior of the toilet, one must turn a winch to open the sliding metal door. To close the door, the assistance of a second person is required: from the inside, there is no means of closing the door; the winch must be turned from the outside of the toilet by a friend of family member. In the case of a lone user, one must ask a passing member of the public. Toileting thus is not a solo affair – it requires interacting with others in order for the toilet to become private. Privacy thus becomes highly ambiguous.
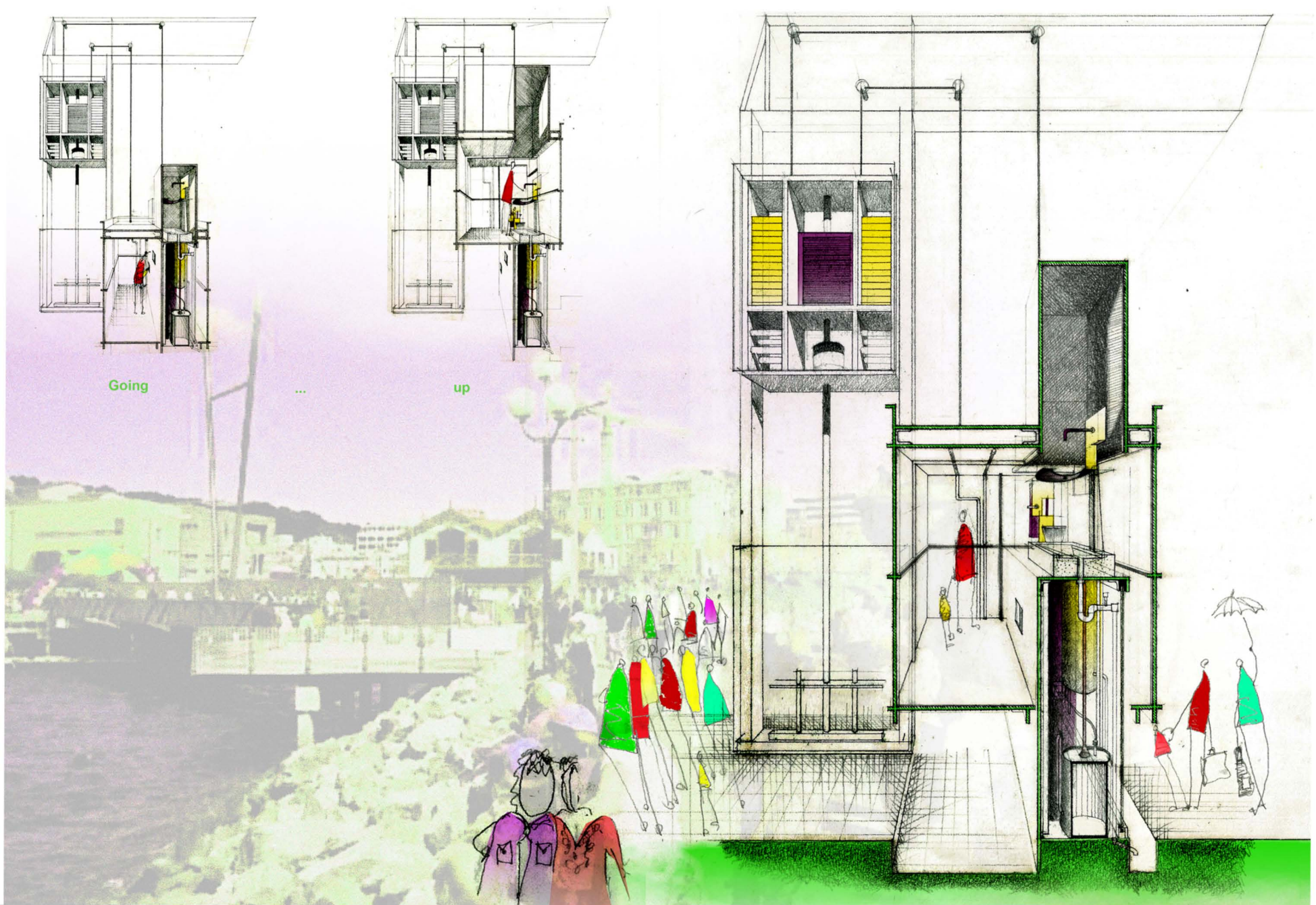
Going Up:

Once inside, the user pushes a button. The lift mechanism hoists the user in a lift-car to the level of the toilet and wash basin. Going to the toilet is drawn out, and dramatised by movement. It is not a simple task of opening and closing a door – it requires effort. The toilet and wash basin are revealed to the user only as the lift-car reaches its highest point.

Visual and Aural Privacy:

Once at the top, the toilet is visually private, ensuring there is nothing shameful about using this toilet. However, the toilet is made of corten steel flat sheets. The material reverberates as the toilet is used or as the occupant moves about. The occupant may have visual privacy, but is denied aural privacy.

Hiding and Revealing:

When *not* in use, the lift-car is at its lowest position and the toilet and wash-basin can be seen from the outside of the building, through full sized windows. Seeing the toilet bowl from outside expresses the content of the building. When *in* use, the lift-car is raised to its highest point; the windows lift up and the toilet and wash-basin are concealed ensuring privacy for the user. Conversely the plumbing and bio-gas digester are revealed when the toilet is in use: What happens to human waste after the flush is thus expressed.
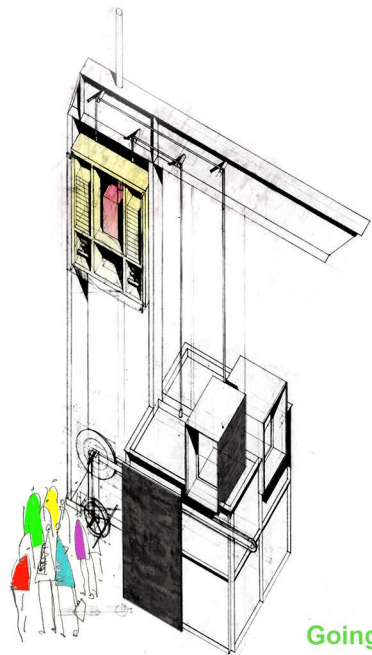
Going ... up

Going Down:

Once elimination is complete, the user pushes a button to descend in the lift-car. Once at the bottom, an assistant friend, family member, or member of the public must let the person out by operating the door's winch mechanism. The assistants thus witness the overall elimination process: no longer can going to the toilet be hidden by euphemism; one is left with no query as to what has just taken place. If the assistant does not let the user out, the user must press a siren that draws the attention of other passers-by, in the hope that they may be let out.

This design for a public toilet questions the relationship between privacy, the toilet and perceptions of the toilet as disgusting and shameful. The public toilet here is not discrete; it is unashamedly extravagant. It is not individual; it requires the assistance of others. It does not conceal the toilet bowl and plumbing; it flaunts them. It may provide visual privacy, but it denies aural privacy.

Disgust and shame are social disciplinary emotions that police the limits of social behaviour, but they also punish those who transgress. Westerners protect themselves from the ill-effects of these emotions by duly respecting the behavioural and social norms communities establish. The architecture of the toilet, in the grip of these emotions, accordingly invests in the privacy norm that protects against shame and disgust. But through reinstating the norm of privacy, each time a person goes to the toilet, the 'off-bounds' nature of the toilet and the label 'disgusting' or 'shameful', are insisted upon. Architecture effectively cultivates the perceptions of shame and disgust, which in turn makes the need for privacy ever more pressing. Architecture is caught in an upward spiral of disgust and shame, making privacy an unbreakable rule by never breaking the rule.
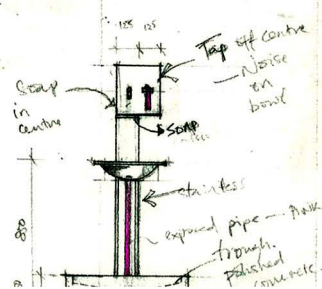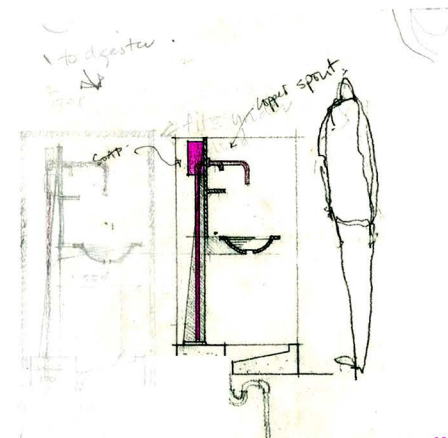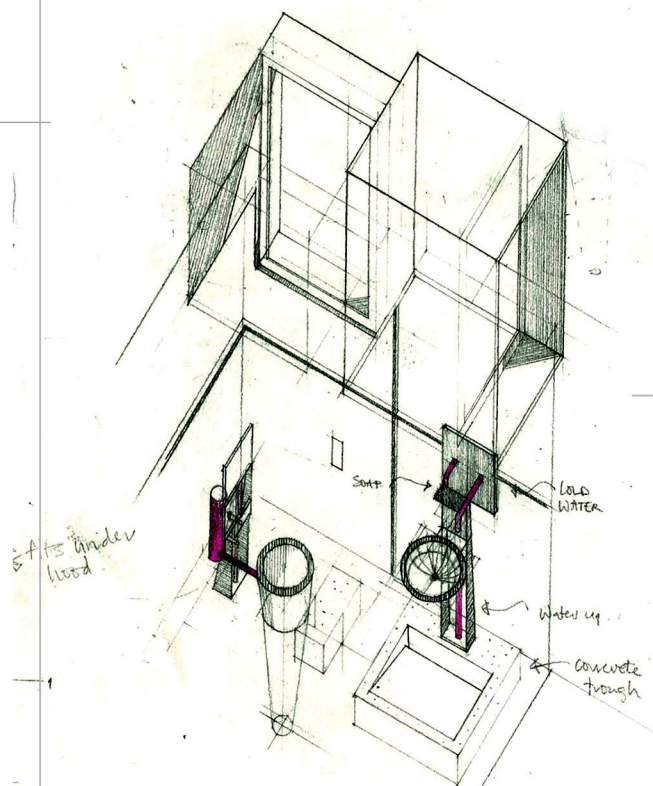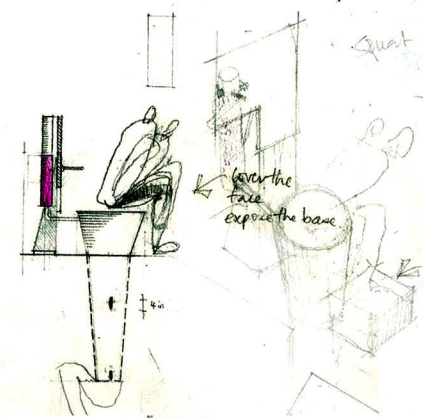
Going

... up

Wash Basin 1:20

Wash Basin 1:20
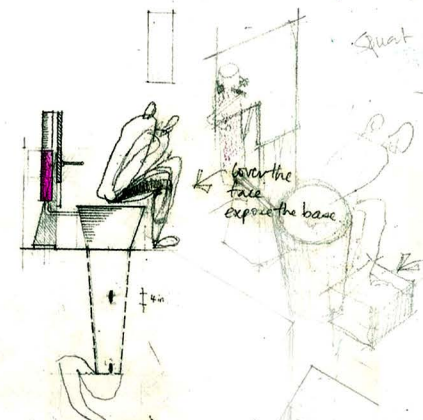

Wash Basin 1:20

Axonometric toilet and hand basin 1:20

Toilet 1:20

In this design for a public toilet for Wellington, extravagance and humour become the media through which the taboo of the toilet can be broken. It is the tool that allows casual side-stepping of norms in a limited but authorised manner that makes the disgusting and the embarrassing a bit more fun and a bit less shameful. Extravagance, colour and a certain ridiculousness are accompanied by new ways of interacting with waste. This fun interpretation of toilet architecture, however, does come with the proviso that shame is not thrust upon the user, and that he/she does not become the victim of disgust. These emotions are too damaging to the individual, too much of an "unpleasant recognition of moral or social failure" (Miller 117). Architecture might change perceptions momentarily, and make the loathed experience of toileting a little more dignified, as in this design for a public toilet. But architecture cannot undo the culture that cultivates the attitudes in the first instance.

Chapter 2

From Waste to Water: a sewerage scheme for Varanasi

In the 1860s, London received the world's first water-based sewerage scheme and pumping stations (Dobraszczyk 353). Waste was flushed underground and pumped to the city of Barking, downstream of London, where it was released into the Thames. The water-based system was a key element in sanitising the city of London after the faeces-related disease outbreaks of the industrial revolution. From London to La Paz, the flush toilet and underground sewerage network have since become the standard urban waste disposal system.

While effective and sanitary, the flush system does have problems that can easily be overlooked. These include inefficiencies (wasteful use of water, loss of fertiliser potential in human excrement), extravagances (vast infrastructural requirements), and questionable responsibility of appropriate disposal – as residents in Barking noted when their township bore the brunt of London's excrement (Dobraszczyk 353). Water-based networks do not solve the problems of human waste disposal; they merely shift them elsewhere (Kira 96).

In the light of the problems of the water-based sewerage scheme, a more efficient, and resourceful use of human waste might be to recycle faeces as fertiliser to grow food, and to recover the water used after flushing for drinking. This might not be as preposterous as it sounds: cities around the globe are experiencing water shortages (De Villers), and yet the flush toilet accounts for up to a third of fresh water usage (Sebenza); to add to the wastage, disposing faeces in the sea squanders a valuable fertiliser. Nature created the perfectly cyclic resource recovery in human excrement, and yet humans defy this every morning when they flush.

Drinking flush water and human manure would elicit feelings of uneasiness, or even disgust among most Westerners. This can be explained in part by excrement's ability to harbour disease – exposing oneself to ill-health contradicts an instinctive will for survival. An obvious way of combating disease is to sterilise waste prior to crop application, and to treat or filter flush water. However, this purely rational perspective does not alleviate lingering discomfort. It appears thus that there are things more symbolic in nature that make the idea of connecting waste with food unpalatable. Combining the faecal with the oral exposes the Westerner to a form of contamination, though this appears more symbolic than real.

Relationships to human excrement suggest that Westerners are not purely rational or scientific around 'dirt', and that symbolism may play an important part in shaping attitudes. Could it be that the unappealing symbolism attached to human waste is the prime obstacle to more effective and resourceful waste management? If we imagine different attitudes towards waste, an accordingly different infrastructure

might be conceived. It might even become architectural – what might it do, and what might it look like?

I introduced this thesis with a very personal experience of life on the Ganges River in Varanasi, India. Here, it appears that very different attitudes shape the experience of waste in the city. The resulting mix of human waste and spirituality is inconceivable in a Western society, suggesting that indeed, experiences of waste are culturally and contextually dependant. This chapter must look, therefore, at the symbolic categorisation of 'dirty' and 'clean.' It explains the Western sewage disposal system as an appeasement of symbolic ideas as much as practical ones. Thus, I question whether this symbolism prohibits a more resourceful and efficient use – and expression – of waste.

To do this, I look at theories by Mary Douglas that explain the cultural subjectivity and symbolic nature of cleanness. Douglas's theories are useful in illustrating that Western ideas of cleanness are not absolute. I shall then return to the banks of the Ganges and question what a

sewerage scheme for Varanasi might be in the context of Hinduism. This Indian study is used as a counter to the Western model demonstrating how different frameworks allow for different spatial and architectural concepts of waste.

Inadequacies of the flush

Hidden beneath our streets and discharged away from populated areas, the nature of urban waste networks fosters an 'out of sight', 'out of mind' mentality. The invisibility of the infrastructure means that their deficiencies are invisible. They are, however, numerous. Firstly, Western sewerage networks require great lengths of piping to service their cities. Such piping is expensive; burying them underground only increases costs. These place a sewer scheme out of reach for developing nations, while even the world's wealthiest cities, such as London, struggle to maintain their creaking, existing infrastructure due to costs. Repairing poorly maintained underground networks is logistically difficult, resulting in long-

term leaks, contamination, blockages and flooding. (De Villers 101). Secondly, flushing waste into oceans or rivers is polluting and wasteful of valuable fertiliser. Waste is the foundation of the food chain, nature's way of returning nutrients to the ground, ensuring a harmonious inter-dependency that links plants with animals, with the soil we live on. Today, however, our more 'civilised' society is less sure if human excrement should be used as fertiliser.[11] Thirdly, wastage is not just a problem of inadequate maintenance: it is inherent in the flush system, accounting for 30% of a person's daily water consumption, or up to 14 litres per flush (Sebenza). With only one percent of the world's water usable as fresh drinking water, when the world faces falling water tables, any

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[11] Bio-solids, the name given to sterilised human excrement, are banned in the Netherlands and Switzerland, while French, German and Swedish farmers are fervently against them. They are permitted in the UK and US, but if negative popular opinion grows the practice may be reduced. See George, The Big Necessity: Adventures in the World of Human Waste 192.

water wastage should be of concern (De Villers 40). It would make environmental sense to capture the water from the flush system, and reuse it for general consumption.

When our sewerage systems are concealed underground, awareness of the problems of waste is low. Due to the general attitudes to human excrement, interest is even lower. The infrastructure of waste is practically invisible, from the toilet to its arrival in a far-off treatment plant; all is neatly concealed in the walls of our buildings, or under the streets of our cities. Rose George implies that the invisibility of waste is part of the obstacle in dealing with the considerable problems: "The first thing sanitation needs is a spotlight shining on it. It needs to be unshackled from shame. It needs some scrutiny" (George 269). Architecture can potentially put this spotlight on waste – something the entire flush system resolutely avoids – through exploring the way the toilet and toilet infrastructure relate to the built environment. The problem with putting a spotlight on waste, however, is that perception of urban infrastructure is generally unfavourable, while faeces and urine

are considered utterly filthy (Kira 93). According to David Bass, pipes filled with innocuous substances, such as water or air, are "an outrage" to the "the high-spec builder and most architects" (Bass 26) – a pipe filled with faeces therefore is likely to elicit even greater objection. Indeed, unfavourable perceptions of faeces and the elimination process are reflected in similarly unfavourable views towards equipment, buildings and infrastructure destined to house them (Kira 103).

Given the shortages in the world, even wasting our waste needs to be examined. There would be value in recycling excrement as fertiliser, and in trapping, filtering and re-using the water from flush systems for general consumption. But reusing water that was polluted with excrement or urine is met with resistance. Re-using flush water in drought stricken San Diego and parts of Australia by way of advanced water-treatment plants was rejected by voters. Even the best filters, as George writes, "can't filter out natural aversion." (George 258). Similarly, using sewage for field application is often rejected by Western communities

because of its 'despised' and 'contaminated' origins, despite scientific reports demonstrating the practice to be safe (Kira 96). Westerners should note that China uses human excrement on its food crops, and has done so for centuries (George 124), and that this disposal method is seen as a solution to the waste disposal problems of the third world.[12] For Westerners, linking the faecal with the oral is considered dirty, while for other cultures it is less of an issue. It would be too self-aggrandising to dismiss the differences on the basis of an 'educated' versus 'uneducated' society. The question is

more complex, for it is important to understand the mechanisms for differentiating the clean from the dirty.

For Westerners, the sensitivity of the faecal-oral route highlights the tension between scientific procedure and human inclination. It demonstrates the disgust that reincorporation of body excreta can provoke (Miller 98). The disgust of linking faeces with the oral route can be seen as a protection mechanism that protects us from diseases potentially harboured in faeces. I deal with the disease-related side of excrement in more detail in the chapter *Cover the Face, Expose the Base*, but for now it suffices to note that many would be anxious about the safety of reusing flush water or excrement for food crops, and of the reliability of the sterilisation techniques. The issue, however, is not solely one of lack of faith in scientific procedures and hygiene. Doubt can be accounted for by the 'dirtiness' of faeces, and the fact that they are regarded by Western culture as defiling, irrespective of sterilisation. The thought of re-ingesting faeces would

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[12] In Humani design's *Toilet for Africa* competition, the three top designs promoted the use of human waste for crop growth, while the Swedish designers of *Peepoo* similarly advocate burying sterilised waste as manure. See HIDO, Humanitarian International Design Organisation (Hido), 2006, Available: http://www.humanidesign.org/contesttoilets1.html, 20th January 2011., and Peepoople, Peepoople.Com Fertiliser, Available: http://www.peepoople.com/showpage.php?page=3_4, 20th January 2011.

contaminate symbolically and psychologically, irrespective of physical purification.

By breaking with the tradition of concealment, architecture might play a role in drawing attention to the problems of waste disposal. But doing so would require either cunning or extreme sensitivity, given the aversion to waste prevalent in Western society. At the same time as enhancing our waste infrastructure, architecture should question whether sewerage plants can integrate recycling techniques, in a way that combats aversion to the faecal oral route.

The symbolic nature of dirt

For architecture to combat aversion to waste and waste infrastructure, it is necessary to understand the construction of notions of 'clean' and 'dirty' in society and consequently in architecture. While many Westerners might consider their attitudes to dirt to be hygienic in basis, hygiene cannot paint the full picture. Hygiene is a question of bacteriology and

pathogens, and is a study of what is conducive to good health. Cleanness is different in that it relates to the more subjective category of purity: a clean object is that which is free of contaminating matter, while a dirty object is not. Hygiene and cleanness are not synonymous. Mary Douglas, in *Purity and Danger: an analysis of taboo*, explains that our attitudes towards 'clean' and 'dirty' pre-date pathogenic understanding. While science might shape them, it cannot discount the assumptions and behavioural patterns that have been forming for centuries (Douglas 35). In imagining a time before science, Douglas argues that much of what distinguishes the clean from the dirty lies in the ordering relations that structure a society. Dirt, she writes, is "matter out of place," thus implying two conditions: "a set of ordered relations and a contravention of that order" (Douglas 35). Dirt is not intrinsically dirty; rather, it is simply that which cannot be included within the ordering system of the moment (Douglas 36). An example might be a hair brush – in the bathroom it is not dirty, but on the kitchen bench it is. Undergarments on the floor are dirty, but in a chest

of drawers they are not. 'Dirty' is only dirty if it does not fit within the limits of the present order.

What emerge through Douglas's theories of order are not absolute categories but instead symbolic categories of dirt. Western cultures, like supposed 'primitive' cultures, subscribe to symbolic systems of dirt, even though the details of their organisation might differ (Douglas 35). Regardless, differences in concepts of cleanness must be traced back to the structuring relations of society, for 'dirty' and 'clean' are experienced differently depending on the given parameters. While science has helped shape perceptions, the categories of 'clean' and 'dirty' are culture dependant, subjective and largely symbolic (Douglas 35 - 40).

In the West, 'clean' and 'dirty' are ordered into opposing categories: the clean needs to be protected from the dirty, for its 'clean' label to be maintained. In other words, separation is the key to maintaining order (Douglas 7). This may be obvious, but one should note that other cultures do not categorise clean and dirty in this manner. For Hindus, pollution is determined by relative categories (Douglas 8-9): what is polluting to one person, a Brahmin for example, may at the same time be purifying to a lower cast member, such as a Dalit. I shall return to examine in more detail the Hindu perceptions of pollution later in the chapter when designing a sewerage scheme for the Ganges. For now it is important to note the fundamentally different classifications of 'clean' and 'dirty' that can exist depending on culture.

Symbolic nature of architecture

The Western opposition of 'clean' and 'dirty' emerges in our architecture. As was seen in the chapter "Kia Ora Toilet," the Victorian home distinguishes between (clean) masters' quarters and (dirty) servants' quarters, where the latter are concealed by solid walls and thick curtains. Similar architectural devices in these homes provide a concealing mechanism so that "social improprieties" – Rosner gives the examples of sobbing, bathing, sulking, sexual

promiscuousness – can occur tacitly beyond the public realm. Like walls and curtains, the folding doors of the living room act as a division that "banishes the improper." The improper is rendered "permissible," but only in so far as it is not seen (Rosner 75).

The careful concealment of physical dirt and the 'socially improper' is paralleled in the way excrement is managed in the city. Excrement is "filth of the worst sort," and the Western protocol of toileting makes it improper even to mention the word in conversation. Like the Victorian home, these forms of dirt must be segregated and made invisible: from the moment the toilet is flushed, to being discharged in a sufficiently distant water course, excrement is tightly confined to an invisible world of pipes. Indeed, as Lorens Holm writes, excrement is "something that our entire civilisation has endeavoured to keep hidden" (Holm 426). Infrastructure buries all traces of waste, separating it from the clean face of society. It is known to exist, but it is dismissed from everyday life. Waste cannot be purged from society, however – it is a

biological occurrence. The inevitability of waste means symbolic separation and concealment of burial must suffice instead of purification.[13]

Rosner explains that while the different entities of the Victorian home were carefully separated and concealed, they were also subject to breaches. The folding doors of the drawing room were essential in creating a separate and private domain that gave a space to the secretive and shameful. The folding doors may provide a visual barrier, but they could be opened at any time, rendering the barrier fragile, "like a pressure valve, a restraining mechanism that could give way, allowing the contents of one room to steam into the next."

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[13] Victoria Rosner explains, with respect to domestic architecture, that the act of closing doors to conceal household dirt is a symbolic act that "segregates dirt, in lieu of banishing it." Similarly in the city, banishing human excrement is impossible: rendering it invisible to the naked eye is offered instead of purification. See V Rosner, Modernism and the Architecture of Private Life (New York: Columbia University Press, 2005) 75.

The folding doors maintained a separation of 'clean' and 'dirty,' public and private, but due to their inherent weakness, they were potential sites of pollution and anxiety.

In contrast, unlike the folding doors of the drawing room, the underground sewer system is carefully protected against potential breaches and pollution. Contained in concrete pipe-work, then buried under layers of soil and tar-seal, the concealment of waste from the city is more than visual: burial is an impermeable barrier against the worst forms of dirt: excrement. Not only is the sewer invisible to the eye, soil provides a protective buffer zone should there be leaks or cracks in the pipe-work, containing potentially catastrophic pollution from the clean world above. Or is it merely a symbolic buffer? Heavy rains overwhelm ill-maintained or blocked sewerage systems every year, flooding homes and beaches with raw sewage.[14] The eruption of sewage casts aside the

rules of dirty and clean, and exposes the 'underbelly' of the city. It reveals the fragility of a system that tries in vain to banish the dirty from the clean: cities are not clean; they merely conceal the dirty in an attempt to uphold a clean image. Breaches remind us that humans can never be separated from their dirt-producing realities,[15] despite the best efforts of infrastructure.

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[14] The most recent incident in New Zealand was in Coromandel, on 29th January 2011 when a storm caused overflows of raw sewage on to properties and into Whangamata harbour. See N.Z.P.A., "Raw Sewage Overflows in Coromandel," New Zealand Herald 2011. Sewage overflows occurred in May 2008 and February 2009 in Wellington, New Zealand. See Wellington City Council, Sewage Overflows: Steer Clear of South Coast, 2008, Available: http://www.wellington.govt.nz/news/display-item.php?id=3202, 28 January 2011.

[15] Victoria Rosner describes the scene when the flush of a lavatory is heard in the drawing room of a Victorian home. The sound "violates the integrity of the threshold" and "brings together mind and body, clean and dirty, value and waste." It is a reminder that the "Victorian body is not a clean body, but rather a body that willingly conceals its dirt." See Rosner, Modernism and the Architecture of Private Life 81.

Sewage overflows can be seen as the emergence of a metaphorical "lower grade" life form that exists, oppressed but tacitly acknowledged, under the city. David Bass likens the conduits carrying building services to the veins and arteries of bodies that bring in fluids for nutrition and carry away waste. Building services are the organs; cladding is the skin. The entire building "becomes a physiological entity" (Bass 29). Service pipes, like the organs of the body, need to be well sealed in their conduits, and housed beneath a protective 'skin' – the cladding – to ensure the 'good health' of a building. To the contrary, an exposed leaking pipe is like a 'flesh wound' (Bass 30). Worse still, an invisible leaking pipe is as dangerous as an internal rupture, quietly eroding the health of the building while retaining a healthy appearance. The 'building as body' symbolism can be extended to the scale of the city. Thus, underground infrastructure makes the entire city a living, breathing, consuming – and expelling – organism. The sewer system is not just a sewer: it is a synthetic intestine; an extension of the body that has many layers of 'skin': clay, soil,

concrete and tar-seal. Like the servants of the Victorian house, this metaphorical 'being' operates in secrecy. This makes breaches of this secrecy more surprising and more catastrophic. The burst sewer, therefore, not only has the inherent disgustingness of faeces, but evokes the horror of a burst intestine. The synchronous symbolism of body and building suggest that any feelings of distaste felt towards services metaphorically mirror the feelings towards the body and its organs. The inverse is equally true, where anxieties about the health of the body are paralleled in the angst felt towards architectural services (Bass 30).

Separation, concealment and containment characterise our dealings with excrement, but these, as Douglas and the analogy with the human body demonstrate, are but means of ordering society into subjective and symbolic categories. The flush system is a product of this ordering. Just as Douglas extracts notions of health and bacteriology from notions of dirt (Douglas 35), it is important to see sanitary disposal of waste as distinct and different from the symbolism of 'clean' and

'dirty'. In other words, healthy disposal of waste is not contingent on the flush system – they are not mutually bound. It must therefore be possible to imagine a new form of waste architecture operating in a society that does not share the same symbolic fear of sewerage pipes and excrement as in the West.

Hinduism and the order of relative purity

For the design component of this section, I rethink the architecture of sewage treatment in an urban environment. A Western context risks being unduly conditioned by preconceived ideas of 'clean' and 'dirty' and the symbolism attached to waste and sewerage networks. Therefore, to escape such limitations, I propose returning to the banks of the Ganges, to ask what an architecture of waste might consist of in this context. As Varanasi is a spiritually significant township of Hindu worship, I propose to design with the Hindu symbolic order of purity in mind. This will reveal the capabilities of

architecture to create new relationships to waste in the urban environment. We must begin by understanding the structuring purity of the Ganges River.

For Hindus, the Ganges is a Goddess, the life-blood of their religion. It is the centre of Varanasi's urban life. The river banks are home to a plethora of activities, sacred and secular: body cremation, meditation, and religious bathing mix with cooking, laundry, and casual socialising. Extraordinarily, the attraction that unites these activities is a holy river that is not unlike an open sewer: 5044 million litres of raw sewage are pumped into the Ganges and its tributaries daily, while the town's poor practice open defecation indiscriminately along its shores (Narayama Murty; Alley). Despite this, religious rites and everyday activities are unperturbed by excrement. From an architectural perspective, the harmonious blend of human waste and sacred and secular activities is a form of multi-programming unimaginable in the West.

As explained, Westerners separate 'dirty' and 'clean' into opposite categories. Clean must be protected from dirty, and Western architecture obliges by concealing dirt from sight. In contrast, Hinduism operates under a different symbolic ordering system. Instead of opposites, 'clean' and 'dirty' are categorised in a scale of relative purity: what is 'pure' to one person, may be 'impure' to another, depending on the person, place or situation (Douglas 9). Of interest in this study is the quality given to the Ganges River: it is considered by Hindus as both 'pure' and 'purifying'. The Ganges overrides the regular hierarchy of purity, and imposes its own symbolic order that alters the framework by which things are judged. Its spiritual powers purify any physical contamination – making ordinarily polluting substances, like human excrement, pure. Thus, bathing in the Ganges purifies one's body; cooking with and drinking from the waters purifies one's digestive system (Coward 10). That raw sewage should flow unabated in the river is not problematic, because it has been purified. That Westerners should consider excrement polluting is irrelevant.

The Ganges is the heart of Varanasi. Pilgrims bathe and drink from the holy waters of the Ganges as part of a purifying ritual (above). The shaved heads indicate respect for a recently deceased member of family. The dead are cremated on the river banks before being sprinkled in the waters for release from the cycle of reincarnation. The Ganges is also home to more secular activities, such as this laundry business (right). Photographs courtesy of the author

Here, in the Ganges, the experience of waste is not negative; waste need not always be polluting. The order of purity on the Ganges means that waste can be experienced in more positive ways (Dobraszczyk 353).

It is clear that we are dealing with symbolic categories of purity. For the Hindu bather, the power of symbolism is strong enough for the negative effects on body hygiene, and the river's ecosystem to count for nothing. Let us not forget, however, that Westerners likewise are influenced by symbolism: we do so in a different capacity, but the differences are a matter of detail, not principle (Douglas 40).

A sewerage network for Varanasi

No matter what one's spiritual beliefs, a sewer network and treatment system for Varanasi would help reduce faecal levels in the river, thus improving water quality for the physical well-being of bathers. I thus propose a sewerage system for the town of Varanasi.

On the Ganges, human waste and defecation is not separated from other activities. There is no need for separation, because in this context, faeces are not dirty. The apparent happy coexistence of excrement and everyday life might suggest that the concealment of a sewerage network is unnecessary. In this light, would it be possible go further and flaunt a sewerage scheme? An above ground and more visibly present network might be envisioned. I propose that the singular treatment plant that deals with all of the city's waste be replaced by localised plants. These are dispersed across the city, dealing with the excrement loads of individual neighbourhoods.[16] Compared to the lone treatment plant, there are practical benefits of this strategy: lower costs, smaller excrement loads

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[16] In R. Lenton, A. Wright and K. Lewis, "U.N. Millennium Project: Task Force on Water and Sanitation," Health, Dignity, and Development: What Will It Take? (London: Earthscan, 2005) 99., it is explained that the technique of unbundling sewage treatment to create localised plants leads to infrastructure costs 30% lower than centralised plants. This technique is seen as a way of overcoming the cost implications of sewage schemes for cities of poorer nations.
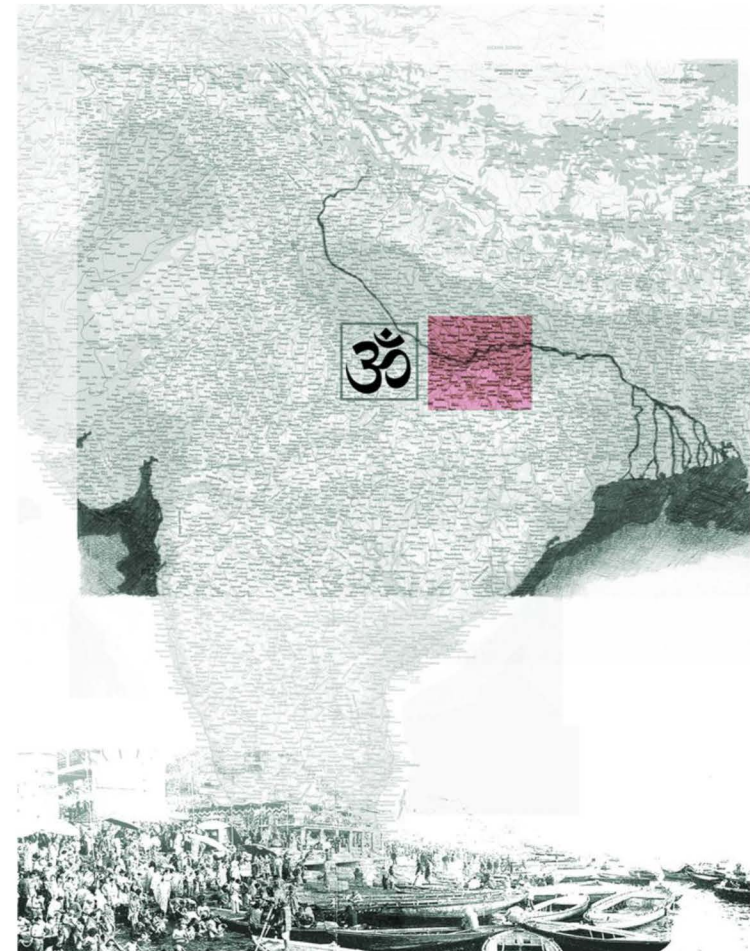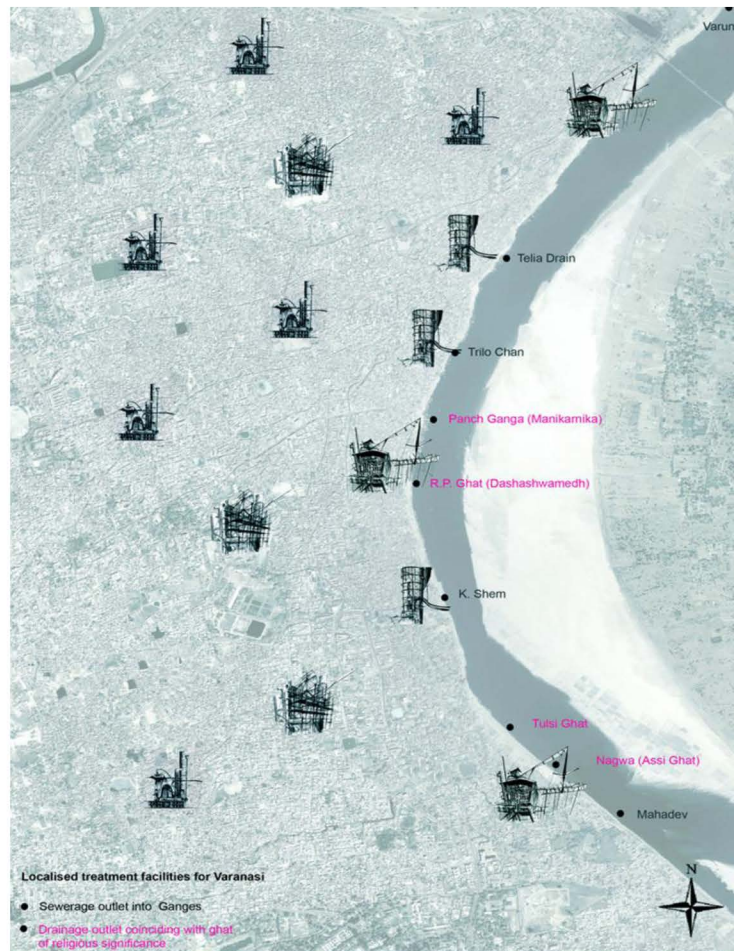
for infrastructure to handle, and staged development is less demanding on resources (Lenton, Wright and Lewis 99). From an architectural perspective, localised, above-ground treatment plants can function as markers in the cityscape, defining neighbourhoods in the same way as shops and civic buildings do. They emerge on street islands, or punctuate the Ganges river-front. Waste might then become landmarks in the minds of inhabitants.

The symbolic ordering system of the Ganges River might permit new relationships to waste. Technology can provide physical purification; holy water can grant spiritual purification. Technology can purify for health and for the environment; holy water filters out symbolic aversion and

Localised treatment facilities for Varanasi
● Sewerage outlet into Ganges
● Drainage outlet coinciding with ghat of religious significance

Varanasi and the Ganges River on the Indian subcontinent (far left), and a proposed de-bundled sewerage network and treatment stations for Varanasi.

transforms waste-water into something positive and spiritual. An infrastructure that re-establishes the faecal-oral loop might be imaginable, permitting resourceful use of excrement. In this scheme, faeces-contaminated water is drawn from the Ganges, filtered then distilled by the riverside plant. The faeces, spiritually purified by the holy waters, are sterilised by urea crystals and heat treatment. They are offered as fertiliser to create physically healthy and spiritually auspicious food crops. As such the natural cycle of life is reinstated, and faeces can return their nutrients to the soil. The spiritual qualities of the Ganges eliminate the symbolic pollution of faeces, which would prohibit the use of human excrement as fertiliser in a Western context.

The treatment plants will also help reduce faecal levels in the holy waters, benefiting the health of the environment and bathers alike. The treatment plant draws on water from the Ganges, filters and cleanses it of pathogens. The filtered water is then sprayed over the terraces for religious bathing and ceremonies on the river's edge. Remaining water is tapped for cooking and drinking, which both nourishes the body and purifies the soul. The combination of holy water and filtration ensures the delivery of pure water in both spiritual and physical terms. The waste treatment plant thus articulates the symbolic world of purity, the spiritual world of higher belief and the physical world of bodily health. Waste infrastructure is no longer a utilitarian disposal mechanism; it is architecture that has symbolic and spiritual value.

Treatment plants located on the city's limits are subject to an architecture where aesthetics are subservient to function. In contrast, an above ground sewerage scheme where treatment plants are visible throughout the cityscape, means that the formal properties are of greater significance. The task force for achieving the U.N. Millennium Development Goals advocates "aesthetically acceptable compact sewage treatment plants" for developing countries (Lenton, Wright and Lewis 101). In the quest for 'acceptable' solutions, architects might aim for discrete aesthetics that harmonise with the urban context. However, any temptation to 'aestheticise' sewage

plants behind unassuming – but ultimately fake – façades needs to be questioned. Façadism may create a new, palatable identity, but like any mask, it ultimately conceals and reveals in equal measure (Bonnevier 173). The inevitable and unavoidable pipe, duct or shaft that pokes through the mask, or the simple absence of regular daily activities, means that prettifying can never be totally affective. Cracks in the mask reveal the feared 'underside' of the city – except that it is no longer beneath us; it is alongside us. Sheathing waste architecture in a 'skin' of acceptability merely perpetuates the secrecy that waste infrastructure subscribes to. Potential violations of this secrecy remain a source of anxiety.

In acknowledgement of the vital role that sewage disposal plays in the city, I instead propose a frank and expressive architecture of waste, one that finds aesthetic qualities in the supposedly un-aesthetic. 'SHIT artists,' Andres Serrano and Paul McCarthy, explore the artistic qualities of the abject: Serrano photographs excrement at close range with an aesthetically attractive backdrop of subdued colour that has an

air of ironic seriousness. Paul McCarthy exhibits giant and inflatable balloons taking the form and colour of faeces, in an almost cartoon-like parody of waste. Beneath these superficially laughable art forms lies an institutional critique of higher art and of society's preconceptions of beauty and ugliness. Serrano and McCarthy bring back the worthless and the despised, and suggest latent aesthetic qualities can be found once symbolic aversion is overcome (Kuspit).

Like the 'SHIT artists', this architecture for the Ganges hopes to express a certain paradoxical, but also dramatic beauty. Here, pipes, vents, pumps, filters, inlets, outlets rise from the ground in a flamboyant manner. Mechanical arms attached to tubes flex and move to deliver purified water to the neighbouring buildings. Colour and un-muffled sounds animate the workings of the treatment plants. Raw and yet privileging the aesthetic over the functional, they aim to dramatise the not insignificant demands of waste infrastructure. Like the 'SHIT' artists, lowly pipes and filters here attain a new sense of
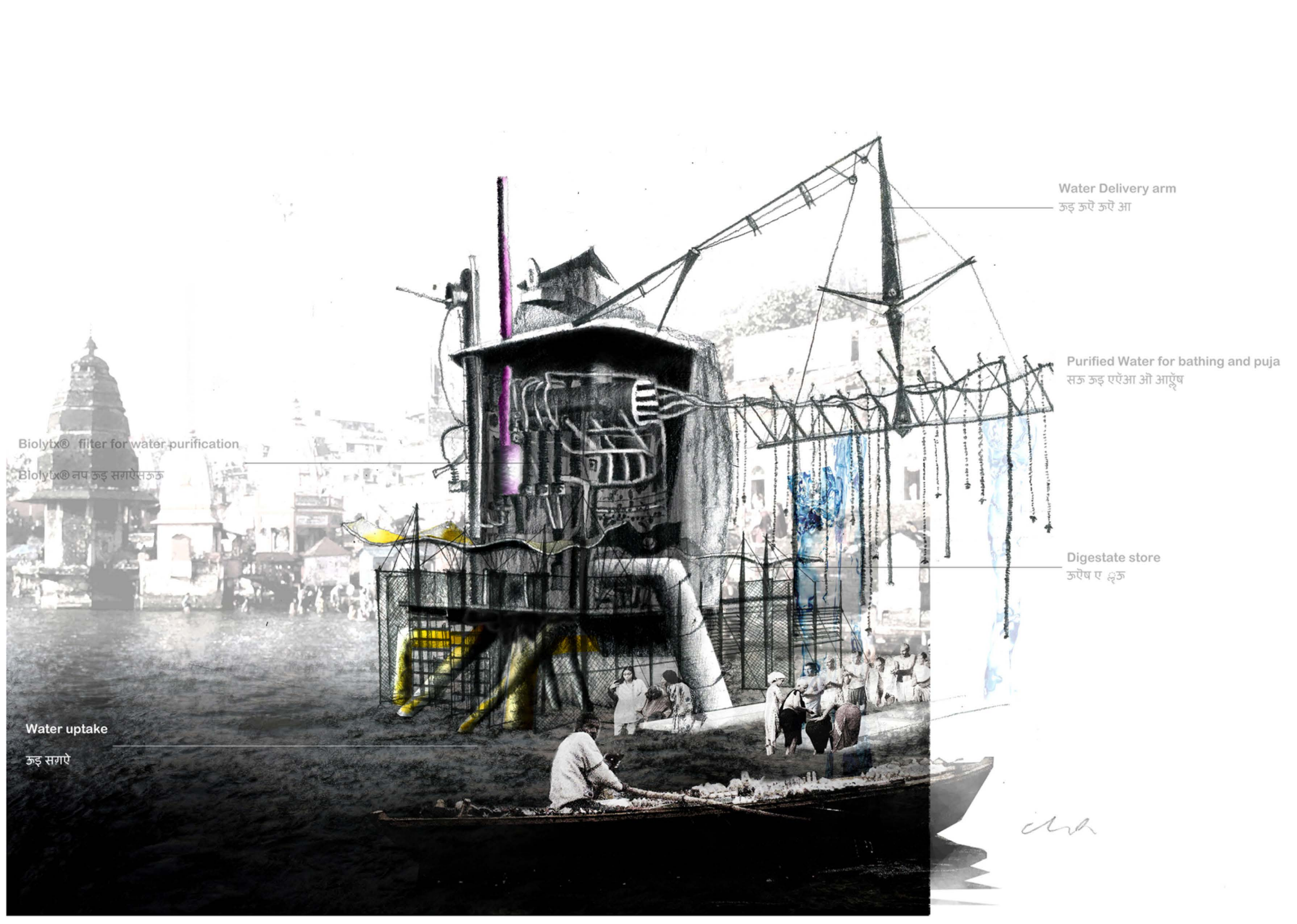
Water Delivery arm
ऊइ ऊऐ ऊऐ आ

Purified Water for bathing and puja
सऊ ऊइ एऐआ ओ आऐॆष

Biolytx® filter for water purification
Biolytx® नप ऊइ सगऐसऊऊ
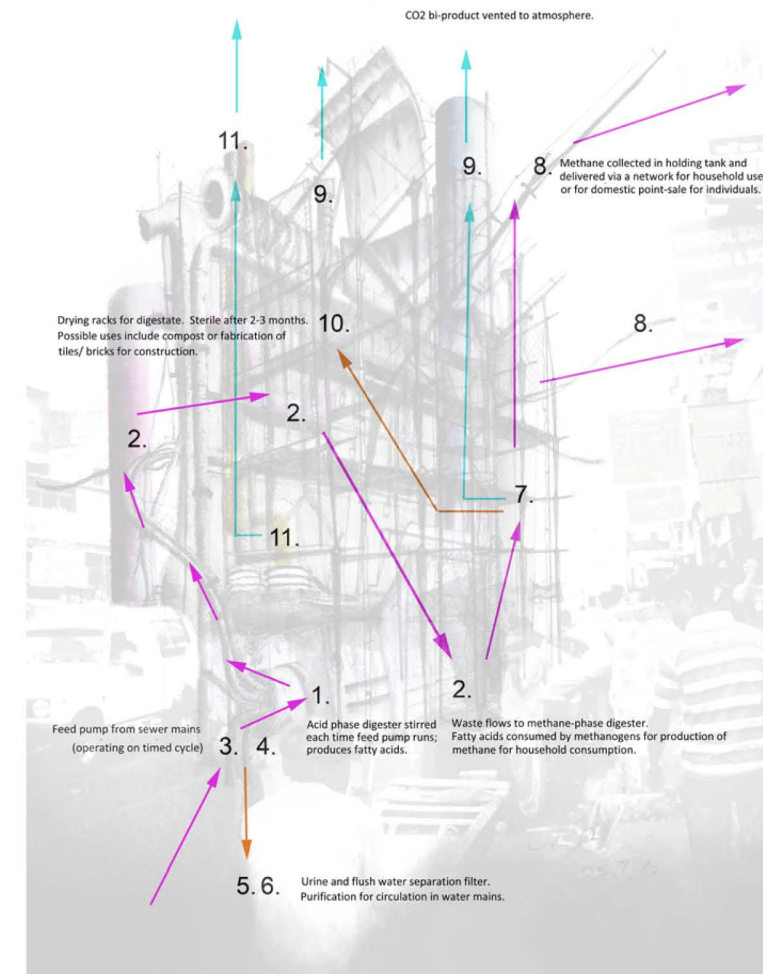
Digestate store
ऊऐष ए ॒ऊ

Water uptake

ऊइ सगऐ

Cycle of Life:
नप ऊइ सगऐसऊऊ

1. Acid phase digester - 3-day turn around
   ऊइ ऊऐ ऊऐ आ ऊइ 3 ऊऐ ऊऐ आ

2. Methane phase digester - 9-day turn around
   ऊइ ऊऐ ऊऐ आ ऊइ 9 ऊऐ ऊऐ आ

3. Feed pump from sewer mains (operating on timed cycle)
   सऊ ऊइ एऐआ (औ आट्टैष)

4. Effluent overflow to existing sewer system
   नप ऊइ सगऐसऊऊ

5. Water to underground Wastewater® garden for purification
   औआ षकए Wastewater® एआ इ आ

6. Water recycled as drinking water
   ऊऐष एऐळ नप ऊइ

7. Methane collection tank
   ऊइ ऊऐ ऊऐ

8. Methane delivery arm and conduit for lighting and cooking
   औआ षकए एआ इ

9. CO2 vent to atmosphere
   एऐ CO2 ळ नप ऊइ

10. Digestate dying racks (3-4 month turn around for sterilisation)
    सगऐसऊऊ (3-4 ऊइ सगऐसऊऊ)

11. Heat Exchanger
    आइऊओओए

CO2 bi-product vented to atmosphere.

11.

9.

9.

8. Methane collected in holding tank and delivered via a network for household use, or for domestic point-sale for individuals.

Drying racks for digestate. Sterile after 2-3 months. Possible uses include compost or fabrication of tiles/ bricks for construction.

10.

2.

2.

8.

2.

7.

11.

1.

2.

Feed pump from sewer mains (operating on timed cycle)

3. 4.

Acid phase digester stirred each time feed pump runs; produces fatty acids.

Waste flows to methane-phase digester. Fatty acids consumed by methanogens for production of methane for household consumption.

5. 6. Urine and flush water separation filter. Purification for circulation in water mains.

Smoke stack
ऐऊष &

Digestate Incinerator
ऊऍष एऍळ

Water filter
ऊइ ओऍ

Intake from water-based sewer
&ऋग ळऍऐक

Purified water outlet to mains
ओआ षक़ए एआ इ आ

Pump station
क़गसश

dignity and worth through becoming architecture.[17] This suggestive worth and beauty demands that previous assumption-based judgements of sewers be cast aside. But unlike façadism, this worth is not simply skin deep; instead, the overt expression gives worth to what is normally worthless in a bid to change perceptions of infrastructure. Architecture thus becomes the medium that expresses the importance of filtering, cleansing and recycling of excrement and waste-water. Physical purification does not happen invisibly: instead, these processes, which are vital for the (physical) well-being of the inhabitants, are communicated through architectural gestures of corresponding importance.

Part of the dignity bestowed on 'SHIT' artworks lies in the ability to question assumptions (Kuspit). This 'architecture

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[17] Werner Hoffmann, in an interpretation of Marcel Duchamp, explains that the insignificant lowly object presented as art beholds a new dignity. See W. Hoffmann, "Marcel Duchamp and Emblematic Reality," Marcel Duchamp in Perspective, ed. J Mashek (Cambridge: Da Capo Press, 2002) 61.

of sewers' critiques not so much the Hindu who bathes in polluted holy waters, but the Westerner's reluctance to confront human excrement. In designing for the Hindu view of waste with an architecture that recycles water and faeces, the scheme gives a 'voice' to the suppressed world of excrement, highlighting through contrast the inefficiencies of the Western flush system. The Western fear of waste and sewers has resulted in an underground sewage management scheme that hides its considerable flaws.

Can this exercise in design represent a way forward for architecture of waste – or is it simply an institutional critique? This sewerage scheme hopes to be both, though the scale of the proposal is problematic and needs adjusting for symbolic, not practical reasons. The proposal here is unashamedly a monument to waste, paralleling the importance of sewers and treatment facilities with an equivalent architectural expression. The overt display of sewers inverts the traditional relationship between building envelope and services. However, this architectural 'celebration' of waste effectively monumentalises

the unseen dangers of society: in Varanasi, as in much of India, excrement is so prevalent that the threat of disease is an almost unremarkable everyday reality. In the West, an equivalent architecture would likewise be symbolically dangerous: it would evoke the invisible 'underworld' of sewers residing beneath our cities, that might erupt at any moment (Bass 30). But for both Indians and Westerners alike, this architecture of waste risks monumentalising in the minds of people the "disquieting potential" of excrement. It is almost no longer a monument, but a monster that symbolises the unpalatable, unseen aspects of life (Kirk 14).

In the light of the monstrous potential of monuments, an architecture of waste in the real world should not be so provocative. Instead, it might be a more discrete, but retaining the aesthetic exploration of the original proposal, using 'worthless' sewers and drainpipes. It ought to remain a mechanical organ that celebrates technological processes, but at a more intimate scale that is suggestive, rather than demonstrative of the world of waste. However, it must not fall into a pattern of concealment of the present infrastructure, for this is undermined by paradox and prudishness. An expressive voice, an aesthetic acknowledgement, is what architecture needs to provide.

Examining the notions of 'clean' and 'dirty' in Western society means that we can view the flush and sewer system not as a practical response, but as a deference to the Western symbolic order of separation and concealment. Cities rely on architectural concealment to construct notions of cleanness. Architects, town planners and plumbers alike ensure there are many surfaces that separate us from our excrement. But for the drop to the toilet bowl, our waste is tightly confined to a network of pipes – a biological sewer when inside the body, and a synthetic intestine when outside.[18] Our cities then carefully clothe this bodily extension with the cladding of a

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[18] In David Bass, "Towering Inferno: The Metaphoric Life of Building Services," AA Files 30.Autumn (1995)., David Bass likens building services with the organs of a human body. I extend his metaphor here.

respectable building, or with layers of clay, soil and a final cap of tar-seal (Bonnevier 168). These ensure excrement remains in an inside world, separated from the outside. Cleanness – rather, the perception of cleanness – depends on these layers of separation, and not on any actual purification. The city may appear clean, but it upholds this appearance only through separation and concealment. Cleanness, it might be said, is an architectural construct.

Designing for waste out of prudishness and fear, by hiding it deep underground, or cloaking it under a veil of respectability perpetuates a denial for waste. Beauty is only skin deep, and waste will always alarm no matter what frock it wears. Symbolic fear of excrement will prevail as long as concealment of waste from the 'cleaner' face of cities continues. In opposition to the status quo, this design experiment suggests that frank and aesthetic expression of waste architecture can replace the systematic concealment of this essential part of a city. Architecture ought to find value in

'anti-aesthetic' infrastructure, by making it inherently aesthetic. Only then will waste rise in our minds as worthy of attention.

Chapter 3

Cover the Face, Expose the Base: a toilet for rural and slum India

Elimination of waste is a fundamental human need, irrespective of wealth, occupation, or nationality. It was described by Alexander Kira as "the great leveller of all man-kind" (Kira 202). An analysis of architecture of the toilet would thus be incomplete without considering the needs of the poorest, most 'architecturally neglected' of the world. While the wealthy flush away their waste at the push of a button, for many, no such provisions for toileting exist. As a result, they are forced to eliminate in the open, with neither privacy nor a waste disposal system. V.S. Naipaul observes the following in India:

Indians defecate everywhere. They defecate, mostly beside the railway tracks. But they also defecate on the beaches; they defecate on the streets; they never look for cover [...] the truth is that Indians do not see these squatters[19] and might even, with complete sincerity, deny they exist [...] (Naipaul 74, 75)

Naipaul may be of Indian descent, but he is a third generation immigrant who writes with a Western mindset (Tripathy 77). Naipaul's response to open elimination is thus likely to typify a Western response: shock, disgust, with a slight degree of mockery (85). Irrespective of a Westerner's response, Naipaul's account suggests that Indians, unlike other nationalities, are neither ashamed nor disgusted by open elimination. For them, it is so normal as to be inconspicuous. Though this may be the case, poor sanitation is the cause of much suffering. Indisposed faeces harbour diseases and contaminate water supplies, and result in millions of avoidable

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[19] Italics in the original

Indian railway
Rajasthan, India
Photo courtesy of the author

deaths every year (Lenton, Wright and Lewis 21). The U.N. acknowledges that providing sanitation for the world's poor remains a daunting task with many obstacles, and goals to halve the number of toilet-less people by 2015 are unlikely to be met (Anand 91).

Through focusing on the needs of India, this section questions architectural responses to toilets of the third world. The chapter begins by outlining in more detail the health implications of sub-standard toileting, before questioning the design of the pit latrine, widely adopted as the standard third world toilet. The chapter concludes by designing a third world toilet, starting not from functional, but from spatial principles. It hopes to demonstrate that architecture can be relevant even in the most deprived parts of the world.

A toilet to die for

Readers of Naipaul's account on open defecation might question whether it is the product of an author's artistic licence or of real-life observation. While I cannot discount the possibility of hyperbole, the novelist's description is certainly anchored in reality: the statistics on toilet facilities suggest that many Indians have no choice but to eliminate in the open. In 2000, only 30% of the population had access to sanitation; this is likely to increase to 46% by 2015, but this still leaves more than 600 million residents without toilets (119). In the slum settlement of Tirupur, Tamil Nadu, there were 382 toilets for a population of 204,553, making the ratio of toilets to people roughly one to five hundred (United Nations Human Settlements Programme 74). In 2010, The Telegraph reported that more of India's population had a cell-phone than access to adequate sanitation (Telegraph Media Group Limited). The problem is by no means restricted to India, however; worldwide, the United Nations estimates that 2.6 billion people,

or close to 40% or the earth's population, are without access to safe sanitation (Anand 119).

Being without a toilet might not be a problem were it not for the ill-health affects that are a consequence. There is nothing inherently unhealthy about our own faeces. According to Rose George, a person can safely eat his or her own faeces (George 197). A lone person in the bush could happily defecate in the open and have little concern about their personal hygiene (Kira 12). Faeces disposal becomes of concern in community situations because of their potential to transmit an individual's disease to other members in the group. Indisposed faeces contaminate water supplies in which water-borne diseases like cholera, viral hepatitis A and dysentery thrive (Lenton, Wright and Lewis 21). Cholera can kill healthy adults within hours if left untreated (World Health Organisation), while diarrhoea, normally an inconvenience rather than real threat in the Western world, results in 1.6 million child deaths every year (20). Adequate sanitation addresses the problem at its source: the safe disposal of

faeces, prevents the contamination of water, and thus avoids disease transmission and improves health (Lenton, Wright and Lewis 193). Improving sanitation is integral to lifting the quality of lives (Anand 90).

Those without sanitation are most likely to be the world's poorest. The ill-health affects that children suffer prevent them from attending school, while adults suffer reduced productivity. Both result in long-term economic disadvantage, perpetuating a cycle of poverty (Lenton, Wright and Lewis 17). With billions of people around the globe lacking any form of toilet, finding an accessible form of sanitation for the world's poor is a distinct area of need. Irrespective of the solution found, a technological intervention – whether extremely basic or high-tech – is indispensable (93). The nature of this technology – its form, the space it inhabits and its interaction with users – is a question that surely concerns architecture.

A latrine as 'saviour'

The UN Millennium Development Goals aim to halve the number of people without access to adequate sanitation by 2015. While an admirable goal, improving sanitation for the world's poor is fraught with difficulties. The western-style flush system is ill-adapted to the task at hand, its underground infrastructure requirements too expensive for poorer nations. But even if adequate funds were available, the inadequacies of the flush system make it inappropriate for India's urban slums and rural villages. It is wasteful of drinking water in a water-depleted nation, deprives the soil of manure, and pollutes rivers and lakes. As Alexandra Baumeyer notes, the flush system *creates* significant problems, and is "ecologically nonsensical" (Baumeyer 15-16). Discussed in more detail in the chapter *From Waste to Water: a Sewerage Scheme for Varanasi, India*, the Western flush system is a wholly inappropriate response to the sanitation crisis.

The pit latrine – referred to as the 'drop-and-store' approach (16) – is more cost effective and less draining on water. The Indian government evidently supports this approach: it built 9.45 million latrines between 1986 and 1999, and improved latrine access by 15% in this time (George 198). The solution to the sanitation crisis, however, is more complex than a comprehensive building programme, for having access to a pit latrine does not necessarily constitute safe sanitation. George writes: "giving someone a latrine – even someone whose only other option is open defecation – doesn't mean they'll use it […]" (200). Providing infrastructure to people who – along with their ancestors – have never used a toilet in their lives, is only one facet of a wider human and social issue. As George explains, people need to *want* a toilet; if they do not, they vote with their feet, and continue to eliminate in the open (199,200). With the daunting scale of India's waste disposal needs and their thinly spread financial resources, the emphasis on functional latrines over subjective values of human appeal is understandable. But when the human user is neglected in the name of efficiency and functionality, the entire program can be rendered ineffective.

This appears to have been the case with latrines. While functional, they are lacking in any form of human appeal. George calls them "dark, fetid, infested concrete box[es]" (George 199), while Lorens Holm refers to them as "the brick shithouse[s]," "unloved," and even "loathed." Many Indians agree, if the abandoned latrines that litter the country are any indication (199). These latrines may dispose of human waste, but their darkness, foul odours, flies and unpleasantly warm interiors have no degree of spatial appeal. When a population has practiced open defecation for centuries, the standard latrine offers little incentive to be used – and I, like many Western travellers in India and like much of the local population, preferred eliminating in the open to using many of the local latrines.

In the face of resistance to latrine use, Government and non-governmental organisations believe in educating villagers and slum dwellers in latrine-based toileting. When

educating does not work, residents are shamed into using the latrines. Community-Led Total Sanitation (C.L.T.S.) is one example of programs in place promoting latrine use. C.L.T.S. works by employing children to embarrass the villagers who defecate in the open: they chant and blow whistles when they see people defecating outside; they chase defecators away; they place flags on faeces they find in the fields (Plan International Television). C.L.T.S. hurts the dignity of the open defecator, instilling shame where previously there was none. But if dignity "is simply another face of freedom" (Soyinka), then shame is a coercive power, forcing latrine adoption in the face of resistance. For C.L.T.S., as with other education programs, the problem with third world toileting solutions is not the solutions provided, rather the mentality of its users.

Perhaps a more appropriate area of criticism should be the latrine toilet itself. While the ingenuity of C.L.T.S. cannot be denied, to exploit the of emotion shame is unusual: the adoption of new and good design seldom requires such cunning, for benefits should be obvious and the inconveniences few or non-existent. The reluctant adoption of latrines ought to highlight the inadequacies of their design. The design profession ought to question, not the intellect of latrine users, but some of the hallmarks of what a third world toilet could or should be.

Forgotten by architecture or is architecture forgotten?

Recent design proposals, however, seem reluctant to depart from the latrine model, but offer instead incremental and technological refinements that maintain the basic principle. The Sulabh Toilet is a higher-tech latrine using low amounts of water to flush waste from its receptacle to a composting pit. In Humani-design's *Toilet for Africa* competition, two highly commended proposals rely on ergonomic or technical modifications to the 'drop and store' principles: folding flaps on wheeled receptacles improve cleanliness and waste disposal (George 109) (HIDO). Other inventions include the 'Gulper', a stirrup pump for evacuating waste from latrines, and is

endorsed by Oxfam (George 246). These designs use functionality as their start-point and end-point and have little concern for spatial pleasure. These designs assume two things: that the latrine is a sound basis upon which to improve, and that current sanitation problems can be resolved through technical improvements alone.

Such approaches might tacitly imply that architecture is irrelevant for those without sanitation; or, more broadly speaking, that architecture is simply an extraneous indulgence in poorer nations. One's immediate response might be to agree. Architecture, as is commonly held by the public and architects alike, is more often concerned with civic buildings, top end housing, slick detailing and "frivolous" design (Dekker), and has little room for the bare-basics necessities of life. Philip Johnson once said that "architecture is the art of wasting space," a light 'dig' that perhaps highlights a more serious point: wastage is the preserve of the wealthier of this world, for only they have the income to delve into excesses after the necessities of sustaining life are met. While this may

be common perception, to evaluate more deeply architectural relevance in poorer nations requires understanding of the basic tenets of architecture. Leon Batista Alberti views architecture as satisfying daily needs, providing shelter and doing so in a manner that fosters enjoyment and delight. Palladio refers to architecture as providing a place for happiness, while for Marco Frascari, architecture creates "numinous rooms" and "increases potential for investing in psychic ability" (Frascari 164). For Frascari, like Karsten Harries, architecture must connect with the human spirit. Across the ages, the scope of architecture has emphasised more than utilitarian function: while utility cannot be ignored, architecture must respond to a psychological as well as physical existence. Architecture engages the mind, an essential part of what makes a human being a human.

Charles Jencks suggests in *Architecture of Hope: Maggie's Cancer Caring Centres* that architecture can operate in areas of distinct need and suffering. While Jencks writes with respect to terminally-ill cancer sufferers, his message

equally applies to those without adequate sanitation, for there are few more underprivileged in the world than those without a toilet. He explains that architecture has the possibility of giving hope to the most desperate: architectural delight and humour expressed through form and spatial sensibility, affect people positively in a way that the purely technical or functional cannot. It provides happiness and appeals to the human spirit. It provides an extra dimension that engages with a person's humane side, rather than respond to a biological or technical need in isolation (Jencks 13,14).

Thus, to argue that architecture is irrelevant for the world's poor would suggest that, in the absence of sufficient wealth, psychological well-being is a luxury, and that design should only to cater to functionality. This view, however, tends to reduce people – invariably poorer people – to biological entities that have only physical requirements. It forgets that these people are human beings, governed by human minds. Architecture has the ability to communicate to people – the most underprivileged and vulnerable among us in this case –

that they are more than bodies or statistics, and that they do matter (Jencks 13,14). Through endowing buildings with formal and spatial qualities, architecture is able to engage mind as well as the body; architecture treats the individual with a sense of worth and dignity that utilitarian buildings do not.

I am not for a moment suggesting that third world toilets need to become architectural emblems of 'flashy' and 'avant-garde' design. This is merely one face of architecture that exists in a very restricted niche. Instead, I question the narrow focus on functionality that design in poorer nations is characterised by, and challenge the view that architecture is unnecessary and superficial. The standard latrine is a response to biology, but the failures of latrine building programs cannot be separated from their human short-comings – namely, their squalid interiors ignore the human need for a minimum of pleasure. I advocate an approach to third world design that does not lose sight of this need to appeal to the human mind.

Can we not therefore think of toilet design that uses pleasure as its starting point, but that equally does not ignore the basic function it must provide? To consider the toilet as a pleasurable space would challenge the traditionally utilitarian focus to toileting, and architecture generally in the third world. Those who doubt the relevance of pleasure may be surprised to note that the Indian open defecator is not aloof to the poetic side of discharges. Naipaul writes:

> "[T]he peasant, Muslim or Hindu, suffers from claustrophobia if he has to use an enclosed latrine. A handsome young Muslim boy, a student, […] had another explanation. Indians were poetic people, he said. He himself always sought the open because he was a poet, a lover of Nature; […] and nothing was as poetic as squatting on a river bank at dawn." (Naipaul 74)

Accompanied by the glow of morning sunlight, a cool breeze and a natural outlook, the student draws attention to spatial quality and poetics, issues not usually associated with toileting

Jait Sagar, Bundi,
Rajasthan, India
Photo courtesy of the author

and third world design. Indeed, the student describes an experience that ignores the functionality of body parts or waste receptacles, and instead evokes qualities that appeal to the human spirit. If the Indian government builds latrines, it builds functional buildings that it repeats ad infinitum across the country. But when the student eliminates by the river, he perhaps unknowingly connects with an essential quality of architecture: poetics. In the absence of partitions, the toileting experience effectively takes on the poetic qualities of its setting: squatting is imbued with the aura of the river or the open field, while in contrast the brick latrine remains enclosed, cut off and suffocated. In this light, the Western preference for absolute enclosure can be viewed as specific and should not be assumed as universal.

Biological theorists support the value of openness, not in reference to toileting, but as being inherent to human preferences. In *Ecology, Community and Delight: Sources of Values in Landscape Architecture*, Ian Thompson analyses the psychological effects of natural evolution on humans. In interpretations of theories by George Orians, Thompson explains that positive feelings towards landscapes have developed in a biological sense through natural selection. For Orians, appreciable qualities in landscapes are derived from the African Savannah, the site of human evolution. Preferences for wide fields of view and open skies are among features of the Savannah that aided prehistoric man's survival, and have consequently been inherited by the modern man. Rachel and Stephen Kaplans's research builds on Orians's theories, but are more comprehensive: man was dependant on his intellectual capacity to survive in the face of more powerful predators: where he could not out-run them, he could out-wit them. As such, landscapes offering wide vistas were valued because they were rich in information; they presented opportunities for viewing and evaluating, allowing man to exploit his cerebral advantage (Thompson 27-29). Therefore, one might argue that the open field, like architecture, engages the mind – the richness of the field of view stimulates, provokes thought, analysis and evaluation.

Thompson discusses general preferences in isolation from the complex cultural and social demand of a toileting situation. Nevertheless, Thompson's ideas are useful for capturing the architectural pleasure that Naipaul's 'poetic student' and 'claustrophobic peasant' describe, for they have never been socially conditioned to prefer enclosed toileting. For Westerners to appreciate the qualities of openness in toileting, they must discard their culturally induced need for privacy. Once achieved, they will realise that the openness of open defecation is not the root problem: considered solely as an action, eliminating in the open concerns privacy, not health. The health implications concern the intermingling of different people's excreta and the contamination of water courses or ground water. The spread of disease concerns what happens to excrement *after* elimination, and can therefore be treated separately and independently from the question of openness at the time of elimination.

Openness in toileting cannot be the inherent problem of open defecation. To the contrary, it is a significant element in improving the toileting experience over the brick latrine. A solution to the problem of third world toileting might consider ways of treating health while maintaining a degree of openness, avoiding alienation of the open-defecator, and maintaining some of the pleasurable aspects of eliminating in the open.

Cover the Face; Expose the Base

According to Andrew Ballantyne, the central focus of architecture is humanity and human needs (Ballantyne 43). In this light, a function driven latrine might respond to needs of waste disposal, but it neglects qualities that appeal to the human mind, and thus cannot be architecture. This proposal questions the conceptual starting point of toilet design. Rather than begin with a functional consideration, I begin from a spatial perspective in a bid to appeal to human sensibilities.

This proposal may test more specifically a design for a latrine toilet, but underlying this is a broader theme testing the relevance of architectural principles in development in the third world.

Any design intervention, to be relevant in the third world, needs to be inexpensive. Materials and technology need to be readily available, and manufacture needs to be able to take place locally. With these considerations in mind, the components that are used in this design come from a cycle rickshaw, the ubiquitous short distance mode of transport used in urban and rural centres in India. This rudimentary technology may not be architectural in itself, but the way in which it is used for the latrine design must not preclude architectural qualities. A key component that makes the cycle rickshaw attractive for this design is the concertina-style hood that shields the passenger bench seat. This hood can be open to sky, when folded back, or offer shelter from sun or rain when fully extended. I propose to use this folding hood as the key element in the design, providing a toileting space of adjustable openness that can at all times connect to the open environment in some way or form. The unorthodox assembly of familiar rickshaw parts will create a whimsical, slightly humorous latrine, spatially and formally quite different from a standard brick latrine.

Adjusting the height of the folding hood regulates the degree of enclosure and privacy, responding to the (culturally induced) stricter codes of bodily privacy for women, as compared to men. The hood can be fully raised or fully lowered, and positioned at any point in between –

Raised:

the user is sheltered from behind, but is otherwise is in an open setting: the user eliminates with a full view of what is ahead, and aims to engage the 'poetic qualities' of the river-side, early-morning experience that Naipaul's student evokes.

Lowered:

the hood is drawn down to shield face, torso and knees. At feet level the toilet remains open. At all times, the ground-level openness helps remove odours and permits air to circulate,
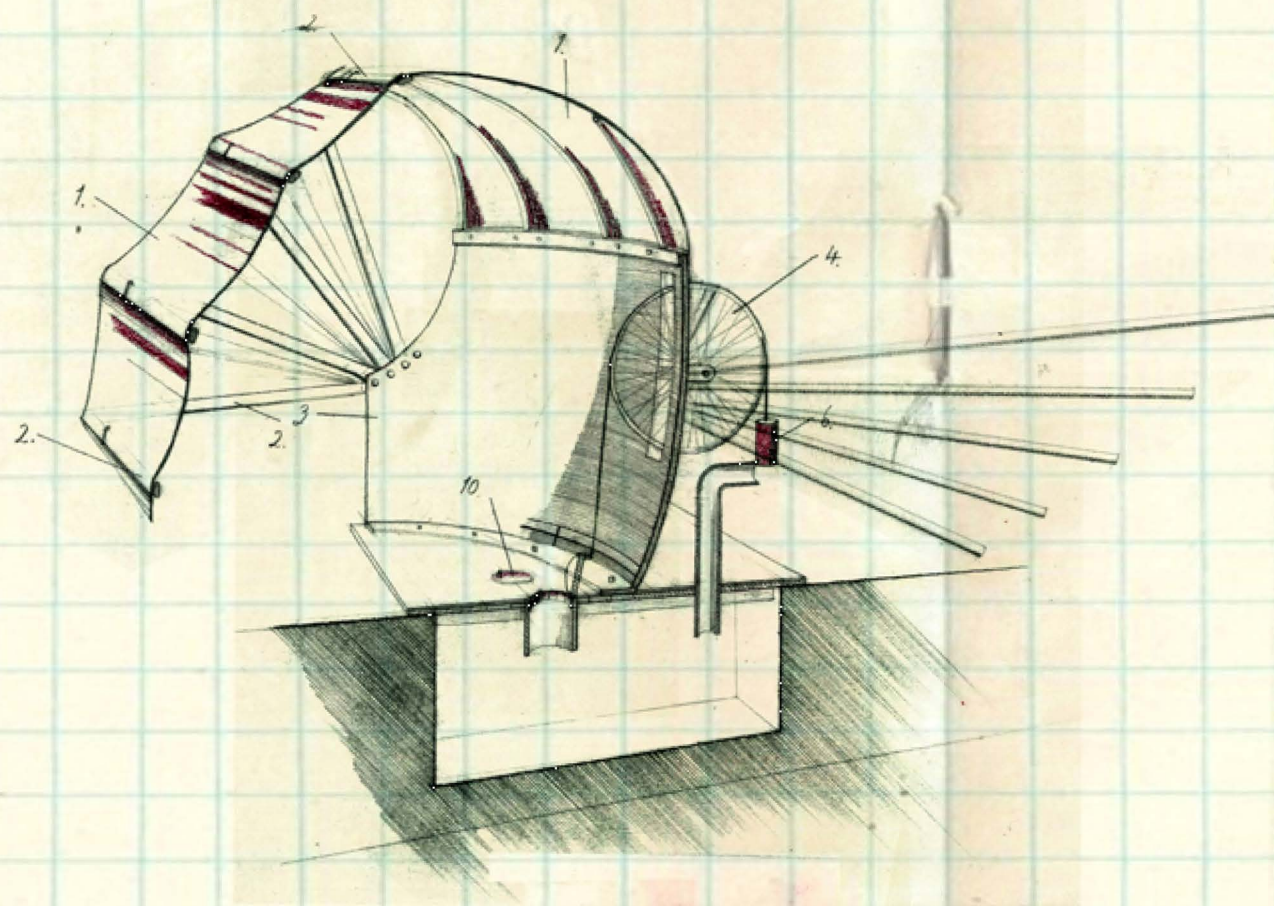
Inventor: M.W. Rickards, Wellington, N.Z.

Witness: R.I. Aitken, Wellington, N.Z.
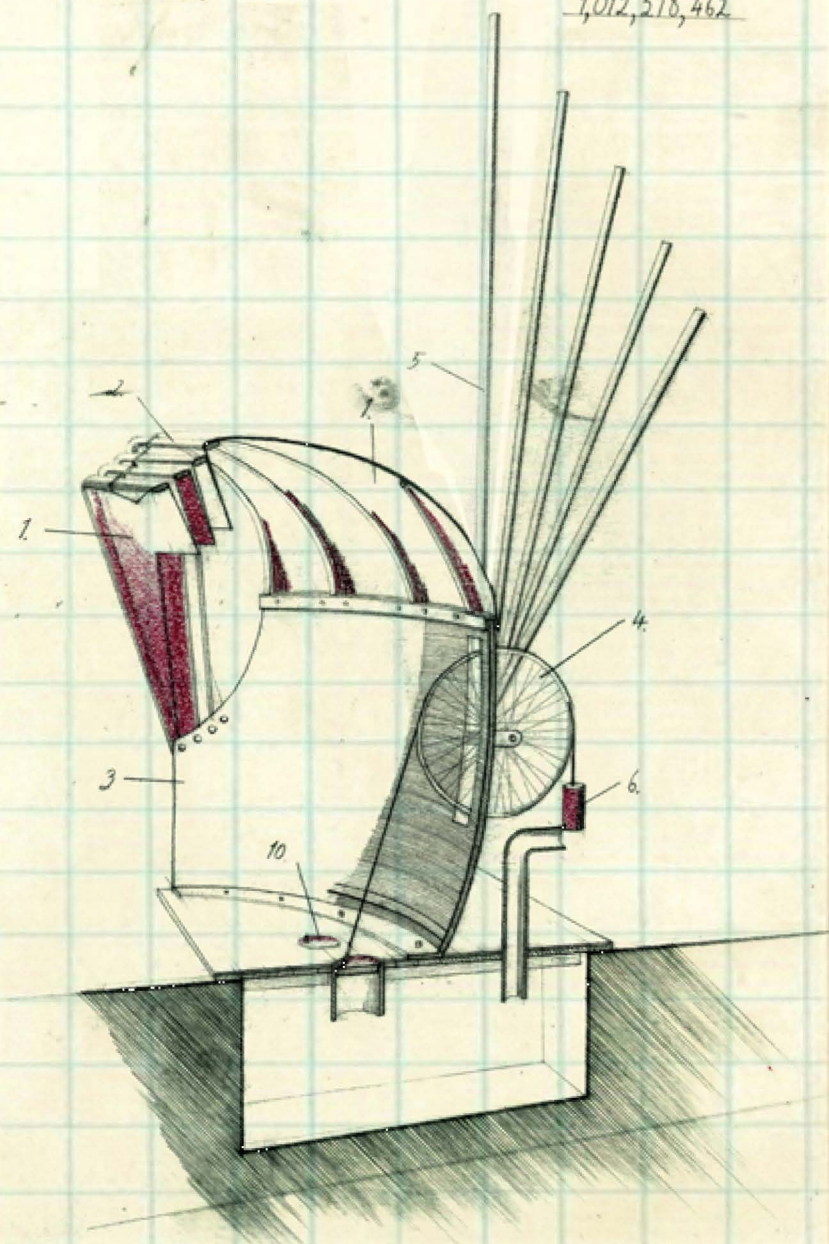
helping to make using the latrine pleasurable even when enclosure is desired. The name for the scheme *Cover the Face and Expose the Base* derives from this position. [20]

This proposal seeks to do more, however, than create a latrine of variable enclosure. If this were the intent, a simple roller door attached to a standard cubicle would suffice – but the design would remain mired in functionality. This design instead questions the functional nature of the toilet, and the very form it takes. Here, form and space need to engage the human mind to become architecture. A hint of formal delight, whimsy, humour, becomes integral to the design: the rickshaw theme is developed to create an element of fun.

As part of the whimsical nature of the toilet, an integrated bicycle wheel expresses the open-and-closure mechanism of the waste shoot: the user turns the wheel to open the shoot; then turns in the opposite direction to close it. Rods connected to the wheel (to which one might connect a flag) are raised and lowered simultaneously as the shoot opens and closes, expressing externally the occupancy of the toilet. Whimsical formal gestures and appealing spaces are without relevance if they do not respond to the basic functional need of disposing of waste. The first proposal of this design uses the 'drop and store' technique for faeces disposal. Two pits are available: while one is in use, collecting fresh faeces, the other, once full, decomposes over a period of time for later use as fertiliser. The twin pit system ensures continual use while faeces decompose as fertiliser.

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[20] "Cover the Face; Expose the Base" is a phrase used by Joe Madiath in George, The Big Necessity: Adventures in the World of Human Waste 197., to describe the female open defecator, who raises her sari over her head while open-defecating. I borrow this term for the title of my toilet design.

Commissioned as part of the former
British Empire by: Sir U.P. Stool, Leeds, U.K.

Toilet for Rural and Slum India.
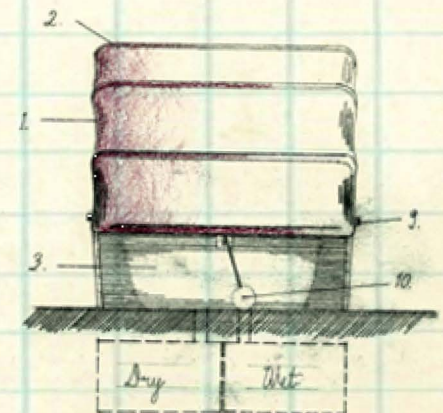
Patented: Oct. 3rd, 2010
1,012,318,462
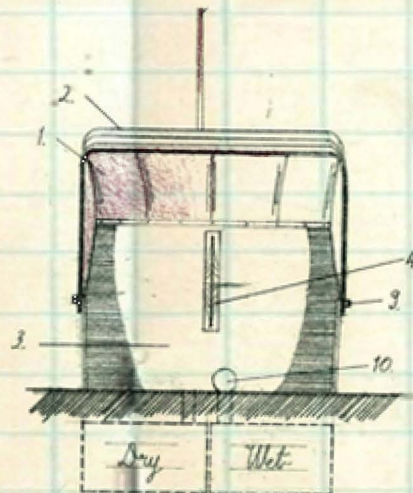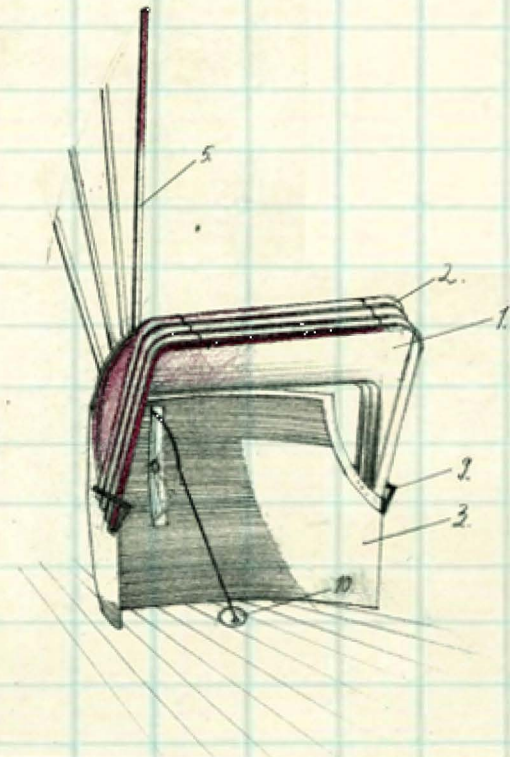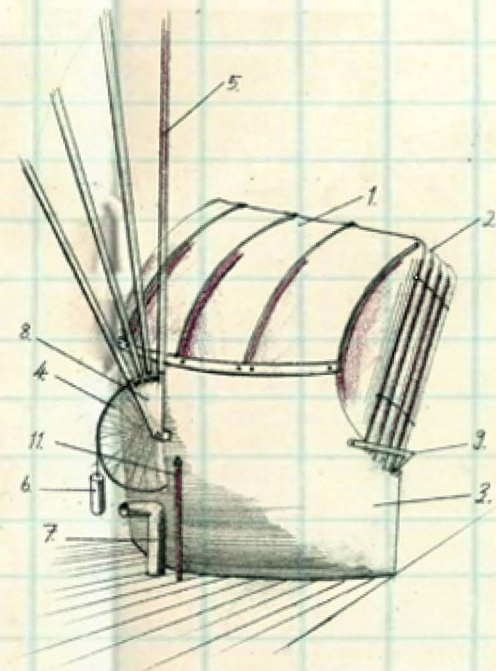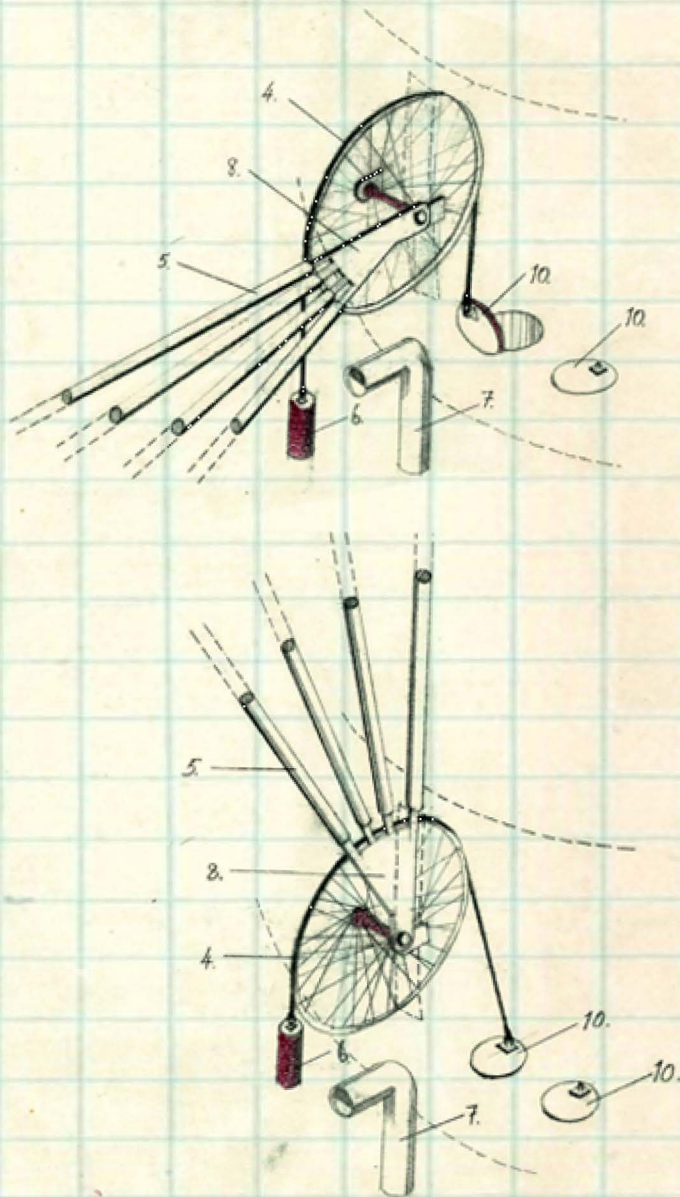
A second proposal develops the rickshaw theme further: instead of being fixed to the ground, the toilet is mobile. The rickshaw-toilet *becomes* a rickshaw. Instead of going to the toilet, a person 'hails' a rickshaw, and the toilet comes to you. The ubiquitous transport system of India fuses with toileting, capitalising on mobility for a number of benefits. It avoids expensive infrastructure: disposal areas can be held out of the main village or slum, and waste is transported to these areas by rickshaw. Toilet provisions become a private initiative, supplied by rickshaw owners who ensure satisfactory cleanliness and waste disposal, for a small fee.[21] At an architectural level the mobility of the open defecator is maintained, giving users the ability to eliminate in the spatial environment of their choosing, such as a river, open field, away from the home in a prescribed toileting area, or at their door step, if preferred.

It works in this way: a user hails a rickshaw-toilet-wallah,[22] pays a modest amount to the rickshaw-toilet-wallah; requests, if desired, to be taken to his favourite setting by the river (rickshaw-toilet-wallah obliges for a supplementary sum); jumps aboard and adjusts the dual retractable hood for the required degree of openness and connection to the landscape; turns the bicycle wheel to raise the lid of the toilet shoot (which simultaneously lowers an outside flag to indicate occupancy); eliminates; lowers the bicycle wheel to cover the shoot; is returned to his home or work-place and is bid farewell.

At the end of the day, the rickshaw-toilet-wallahs cycle to the disposal area, and empty their waste. The disposal area implements the twin-pit system of the fixed toilet proposal, at the appropriate scale for the village or slum.

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[21] Sulabh public toilets operate on a pay and use basis, and is a viable non-profit business strategy that does not rely on aid and government grants. See George, The Big Necessity: Adventures in the World of Human Waste 114.
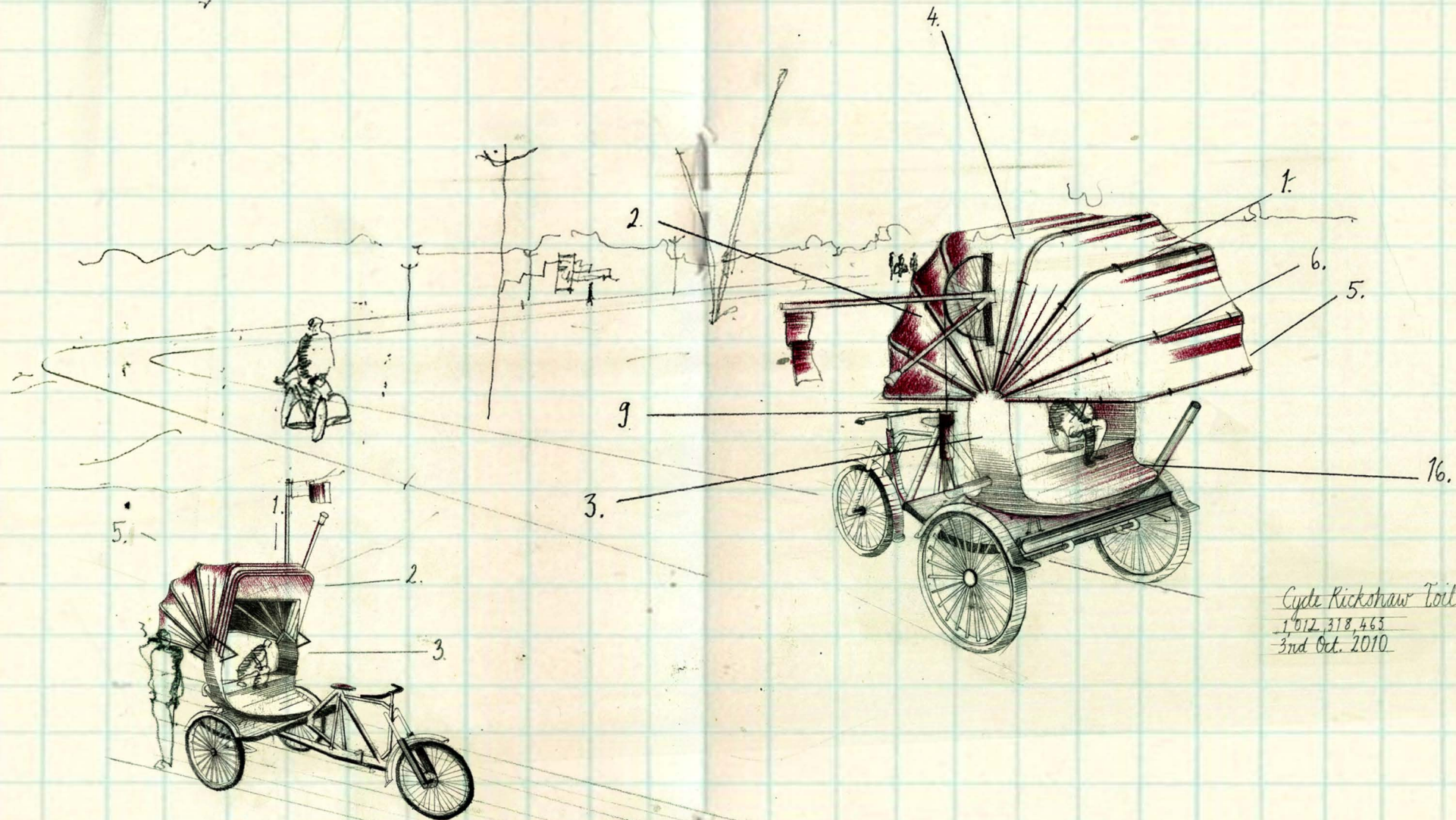
[22] 'Wallah' is a term used in India to indicate someone who performs a specific task: a rickshaw-wallah is someone who pulls a rickshaw

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Patented: Oct. 3rd, 2010

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Cycle Rickshaw Toilet
1,012,318,463
3rd Oct. 2010

This proposal for a third world toilet communicates that architecture can be relevant even in economically deprived areas where basic infrastructure is lacking. While any form of aesthetic or spatial 'pleasure' would normally be deemed superfluous due to financial obstacles, this proposal begs to differ. By focussing on the spatial qualities experienced by the open defecator, it reinterprets what a third world toilet might be, by being more pleasurable to use, and having a twist of architectural delight that lifts it beyond the purely functional.

Architecture is not normally considered in the same breath as poverty; it is even less likely to be associated with latrines. Sanitation is traditionally a question of technology and plumbing; and where basic infrastructure is lacking, architecture is even more likely to be viewed as an unnecessary extravagance. But purely technological and functional approaches seem not to be working. The screeds of abandoned latrines used as wood stores and goat sheds across India suggest that this approach is too narrow in its focus (George 199). The convoluted education programs that shame inhabitants into using latrines suggests utilitarian latrine design is out of touch with the people who are to use it.

In focussing solely on the functional, these buildings cater for a physical need of the human body – waste disposal – but they forget that people also have human needs, a mind, a spirit and a need for a minimum of pleasure and dignity. Utilitarian latrines reduce the user to a statistic that needs catering for, forgetting that he or she is, in fact, a human being. Begrudgingly providing utilitarian latrines to the poor, on the basis that financial means can bring them little else, is to rob them of that "social property that answers to the name of dignity" (Soyinka). Design, if it is to be a valuable contribution, needs to support social values and an individual's dignity (Buchanan 35). A purely functional design focus cannot achieve this – it is too neglectful of the human aspect in every person. Instead, design approaches need to balance the functional with the social, the artistic, and the humane, even if the design in question is as 'lowly' as a latrine. This is where

architectural principles are crucial if the design is to be valuable for the people it will serve.

This implies a rethink of the entry-level point at which a building becomes architecture. Architecture seldom stretches as low as a latrine; this dirty little building is kept apart from the 'more dignified' world of higher architecture, just as the sewers of a city are separated from the clean world of everyday life. But architecture is not only about grand high-rises, monumental designs, or the more common face of modest architecture serving normal – but still comparatively wealthy – people. *Cover the Face, Expose the Base* demonstrates that architecture concerns not just the final object, but a design philosophy that places human well-being at the centre. This way of thinking can bring architecture to the most impoverished little latrine, in the most impoverished corners of the world.

Chapter 4

Glossy Dirt: a tile that should never be clean

Toilets receive little attention in design reviews. Few are displayed, even in reviews dedicated to bathrooms, where one might expect to see toilets. Showers, baths and hand basins are the focus of attention, while the toilet is invariably demoted to a background presence. Even laundries benefit from specific sections displaying the latest fold-out ironing-boards. Bucking the trend, a toilet for guests was deemed worthy of attention in *Trends*.[23] But despite the 'promising' inclusion, the room was illustrated not by an image of the toilet, but by an image of the hand basin. It seems curious, knowing the primary function of the space was to provide a toilet, that hand-washing was given pride of place.

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[23] *Trends: Bathroom* 16. 7 (78)

As demonstrated in *Kia Ora Toilet*, the toilet is the recipient of the most disgusting substances: urine and faeces. Connotations and attitudes to the toilet cannot be separated from these. To depict a toilet in reviews is to risk tainting the image of the architecture with the disgusting associations of human waste. It would act as a subconscious and unpalatable reminder that we can never be separated from the waste we produce (Rosner 73). But beyond figurative associations, concealing the toilet in architectural representation is simply the two dimensional equivalent of concealing the toilet behind walls and doors in three dimensional buildings. The lack of imagery dedicated to the toilet upholds the spatial tradition of separating the dirty from the clean, the private from the public, and the improper from the proper (Rosner 65).

The reluctance to depict the toilet in architectural photographs can be viewed as a specific example of a theme in which all things dirty or disorderly are removed from the image. Architectural photography typically depicts buildings in a clean state, free from disorder and decay which are a natural

"Chic convenience"
Trends: Bathroom vol. 16, no. 7

consequence of occupancy. In other words, they are dislocated from their less-than-perfect realities. The gap that exists between the everyday state of buildings and their portrayal in photographs suggests that architecture places a greater emphasis on an outward show of cleanness than a clean reality.

This section does not focus specifically on the toilet per se. Instead, it views the toilet as part of a broad issue in architecture that hides a dirty existence behind a perfectly clean veil. Here, the implications of this insistent image of cleanness are examined. The approach begins by looking at bathroom trends, typically dirty spaces that are depicted in a spotlessly clean manner, before examining what these unrealistic representations reveal about how architects think about their creations. The European perspective of cleanness in architecture is then contrasted with that of a traditional Japanese perspective. The section concludes with a prototype for a wall tile that hopes to find artistic potential in our 'dirty' realities.

Aesthetic of cleanness

A clean image is not necessarily dependant on being clean. A person who has skipped a bath but applied an extra spray of deodorant or perfume subconsciously acknowledges this idea. On one hand, he or she is concerned for self image, but on the other, the needs of bodily hygiene are relegated to a secondary level of importance. Being free of bodily grime surely aids a clean image – a person who is genuinely clean is, for example, unlikely to emit offensive odours – but a look of cleanness can exist independently of a clean reality. In other words, a clean image is a matter of aesthetics; a clean body is a matter of hygiene.

Much of common hygiene rituals are preoccupied with aesthetics. Kira cites the examples of feigned personal grooming as a hallmark of image fabrication (Kira 16). He notes that hand washing is often performed not for purposes of hygiene, but for preserving the clean appearance of the items we touch. In a similar manner, he suggests that superficial hand-washing after toileting is done either out of habit or "out of fear of embarrassment – because we have been taught that it is the proper thing to do" (14).The image of the self cannot be dissociated from how our bodies and actions are perceived by others. In this light, a visibly clean body accompanied by actions that suggest cleanness are sufficient in the creation of image. What lies beneath the image is seldom questioned until there is cause to do so.

Architecture, like the body, operates through the construction of clean images. Usually dislocated from their environment, architecture is portrayed in a narrow window of time between completion and the first occupation: the building is invariably shown as brand new, and utterly clean (Wilson 266). While such imagery is dominant in much of architectural representation, it is striking in the case of bathrooms because bathrooms are often in a less-than-clean state. Water marks, soap scum, mildew and condensation would not be out of place in a common bathroom. This 'dirty side' of bathrooms conflicts with the imagery that architecture promotes.

"Time for reflection"
Trends: Bathroom vol. 16, no. 7

According to *Houses New Zealand* and *Trends*, the modern bathroom is no longer a utilitarian room; it has become a prominent space in the home that "is expected to look good"[24] (Ellery). While a justifiable aspiration, "to look good" might be synonymous with "to look clean," for the bathrooms are made spotlessly tidy: bath mats, toothbrushes, shavers or cleaning brushes are absent; toilet paper is seldom seen, as is soap; signs of inhabitation are staged: perfume bottles are neatly aligned; towels are folded or elegantly draped; surfaces are clean and dry, and free of steam, condensation, or any signs of mould. All bathrooms are brightly lit, with down lighting and up lighting preventing dark recesses under hand-basins and in corners.[25] But these immaculate images of the bathroom

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[24] For the 'greater prominence of the bathroom in the home', see *Trends: Bathroom 24.10.* p. 8; for the modern bathroom "is expected to look good," see Ellery, C. "From the Editor." *Houses New Zealand: Kitchen + Bathrooms* 2009

[25] In *Trends: Bathroom* 24.10, of 94 pages depicting bathrooms, there were zero bath mats, toothbrushes, shavers or cleaning

present an inconsistency. According to Rosner, the bathroom is "the central space for negotiations with the body's dirt" (Rosner 73), while water is the primary agent that cleans. It appears that the space designed specifically for water and dirt cannot be portrayed in its naturally wet and dirty state. In other words, dirt is out of place even when it is in place.

A bathroom as presented in an architecture review and a regularly used bathroom are thus two different things. This desire to rid architectural representation of dirt and inhabitation implies that architecture, like the public that it addresses, has an uneasy relationship with dirty matter and the very concept of inhabitation. Architecture does not account for the cyclical

brushes; 1 box of tissues; 5 roles of toilet paper; 5 bars of soap; 17 images featuring bottled oil or perfume or soap dispensers. 1 image had water on the floor; none had steamy glass or condensation. In *Houses New Zealand Bathroom Edition*, Issue 01, of 34 pages depicting bathrooms, there were zero bath mats, toothbrushes, shavers cleaning brushes, tissue boxes; 1 bar of soap; 8 images featuring bottled oil or perfume or soap dispensers. 1 image had water on the floor; none had steamy glass or condensation

"Bird's eye view"
Trends: Bathroom vol. 17. no.7

"undoing" and "redoing" of space that inhabitation and cleaning bring. This exposes, in the words of Teresa Stoppani, strangely "unresolved issues" in what architecture strives to be (Stoppani 437).

The undoing of order

One of the fundamental tenets of architecture is to provide shelter (Harries 60). It creates a structured environment that orders and tames the natural environment, giving protection for the human condition. Beyond providing a physical sanctuary, architecture also provides psychological protection "from feelings of vulnerability and mortality" and from the terror of the passage of time (60). The built environment confronts the natural world of life, death and decay by imposing solidity and robustness, and a sense of order. Dirt, in contrast, undoes this creation of order and strength (Stoppani 437). When dirt emerges within our buildings, it contradicts the very stability that building is destined to provide, by creating disorder in the

midst of order. It coats and corrodes, infiltrates and stagnates, and effectively creates its own arbitrary forms, cloaking materials in a layer of dirt, making them lose their tactile and visual qualities (439). In other words, architecture makes form. Dirt imposes its own form. Dirt is the first sign of nature slowly claiming back a building. It is a reminder of the human being's fragility,[26] of their animal roots,[27] and that any architecture created to shelter us will ultimately succumb and rot into the

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[26] Karsten Harries writes that "man knows of his mortality, knows that all that now is and all that still awaits him will some day be past […] and at times this makes life a precarious business" in K. Harries, "Building and the Terror of Time," Perspecta 19 (1982): 60.

[27] For the association between dirt and animal roots, see J. Kristeva, "Approaching Abjection," Powers of Horror: An Essay on Abjection (New York: Columbia University Press, 1982) 12., Julia Kristeva writes: "the abject confronts us with those fragile states where man strays on the territories of _animal_ thus by way of abjection, primitive societies have marked out a precise area of their culture in order to remove it from the threatening world of animals or animalism"

land. Clean is thus a manifestation of resilience, of strength, of permanence; dirt is a sign of weakness.

This architecture that denies the forces of natural dirt is ultimately a utopian dream. In interpretations of theories by Fredrich Jameson, Roger Wilson explains that utopian representation of architecture is a subconscious manifestation of the ideal imaginings of the creator. Thus, utopian representations of architecture demonstrate the architect's desire for their creations to be impervious to dirt and decay (Wilson 266 - 69). This, however, can be achieved only when the realities of inhabitation and the decay of time are abstracted. Clean buildings are desired, and yet dirtiness will always pervade. In an imaginary and ideal world, the architect would rather remove the fundamentally dirty nature of the inhabitant, for only then might the image become a reality. The utopian imagery of architecture suggests that the profession does not embrace dirt; instead, it has an eternal frustration with dirt.

An Asian perspective: greater ease with dirt

More naturally dirty architecture does exist. One particular bathroom, by Guz Wilkinson Architects (Singapore),[28] stands out in *Trends* and *Houses New Zealand* as a lone bathroom to shun smooth surfaces, preferring rough, textured and natural finishes with nooks and crannies that accumulate dirt. It is the only bathroom to depict the toilet, complete with toilet brush and toilet paper, as central to an image. Combined with discoloured grout and stains, this bathroom has a less-than-utopian vision of itself. Absolute cleanness is replaced by a rustic look that is more accepting of inevitable dirt. The dirt is not portrayed as dangerous. Rather, it is naturalised, and viewed as unproblematic (Campkin 33). A utopian aesthetic has been rejected in favour of one that is more at ease with the presence of dirt.

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[28] See *Trends: Bathroom* 17.7: 28,29.

"A Black and white case"
Trends: Bathroom vol. 17, no. 7

It is perhaps not a coincidence that this example comes from Singapore, and not Europe, North America or Australasia. It embraces an Asian perspective on aesthetics that is not unlike those in *In Praise of Shadows* by Japanese novelist Jun'ichiro Tanizaki. Tanizaki contrasts the natural, rustic textures of the traditional Japanese architecture with the Western penchant for sparkling and spotless bathroom surfaces. The Western bathroom, though efficient and sanitary, "destroy[s] all affinity with good taste and the beauties of nature" (Tanizaki 5). In contrast, Tanizaki describes the Japanese toilet as poetic and sensitive, with finely grained timber, textured tatami mats and shoji gifting the toilet a natural elegance unimaginable in its glossy Western counterpart (4,5).

With its dirt-gathering textures, the Japanese toilet will never be as clean as a Western bathroom, but this is seen as unproblematic. Dirt, grime and soot are viewed, not as unclean, unsanitary stains, but as emblems of the passing of time: they bring sheen, patina and charm to objects and are

revered rather than repelled. While these might be viewed by Westerners as emblematic of wear, for Tanizaki they give a further dimension, that of a glowing touch of history that no new object can possess (11,12). That they should be, strictly speaking, dirty is irrelevant given their poetic and sensory qualities. When a Japanese toilet, less clean than our own though still sufficiently so, creates such poetic delight, Tanizaki implicitly questions the relevance of the Western idealisation of cleanness, and provides an alternative that is not only at home with dirt, but for which it is critical in enhancing tactile and visual qualities.

The bathrooms featured in *Trends* were well illuminated. In contrary to this, the natural elegance that Tanizaki evokes does not rely on light to reveal materials of form; rather, the traditional Japanese aesthetic is perceived through shadows that actually become the architectural qualities of the space. Textures, form and materials are architecturally enriching, not in themselves but for the shadows they cast: "And so it has come to be that the beauty of a Japanese room depends on a variation of shadows, heavy shadows against light shadows – it has nothing else" (18). The Japanese space is bereft of ornament, but Tanizaki draws much pleasure from observing the subtle, fading glow of light and the tireless mystery of shadows that animate neutral, but textured walls. Traditional Japanese architecture necessitates a new way of observing architecture, for, in the absence of decorative or complex formal stimuli, the eye must be adjusted to receive the subtle play of light and dark (18). The penchant for shadows is conceptually very different from the brightly lit interiors of the bathrooms reviewed earlier. It provides gloom where a Western bathroom prefers sheen.

In Praise of Shadows was first published in December 1933, two years after the completion of Le Corbusier's Villa Savoye. But despite temporal proximity, Tanizaki's book inhabits an architectural ethos far from the minimal whiteness and machined steel work of Modernism. While traditional Japanese architecture favours shadows, Modernism is an architecture of whiteness: "Imagine the results of the Law of

Ripolin. Every citizen is required to replace his hangings, his damasks, his wall-papers, his stencils, with a plain coat of white ripolin (white paint). His home is made clean. There are no more dirty, dark corners. Everything is shown as it is" (Le Corbusier 188). For the "pathologically obsessed"[29] Modernists, the shadowed intricacies of ornament are a danger, for in them hide dirt, impurities and immoralities: Modernists would equally be scornful of Tanizaki's fondness of shadow for its dirt-harbouring potential. The smooth white wall is a surface that reveals any stain, soot or patina. It obliges a clean look, a form of visual purification, an emphatic display *that there is no dirt*. But as Oliver Domeisen demonstrates, Modernists put forward an argument not about pathology, but about an image of hygiene. Architecture joins the white walls of the hospital in ensuring a look of cleanness (Wigley 36).

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[29] Oliver Domeisen writes that the arguments of Modernist architects, Adolf Loos and Le Corbusier, as revealing a "pathological obsession with an image of cleanliness." See O. Domeisen, "Communicating Content," Volume Archis.3 (2008): 73.

This image is still evident today as part of contemporary modernism,[30] and that modern bathroom trends exemplify and perpetuate.

This image of hygiene incessantly repels dirt but, given it represents a space drastically different to the one that people occupy, its significance is unclear. The Western "cult of hygiene" (Frascari 167) strives for unobtainable perfection of stain-less and dirt-less surfaces dislocated from realistic occupation. For Tanizaki, this can never be aesthetic, for "the quality that we call beauty [...] must always grow from the realities of life" (Tanizaki 18). Traditional Japanese beauty embraces not simply selected moments of life, (such as the instant at which all has been cleaned but not touched, as in Western bathrooms), but all of life running the whole spectrum

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[30] Tom Spector analysis of *Architectural Record*'s April 2005 "Record Houses" reveals a marked similarity between the design vocabulary of contemporary Modernism and those of the protagonists of Modernism. See T. Spector, "The Morals of Modernist Minimalism," Harvard Design Magazine.25 (2006/7): 84.

from lacquer-ware to painting to the lowliest of spaces, such as the toilet (Harper 46). Even shadows, an inevitable part of whenever light is cast, become poetically essential to the appreciation of space, even if they can hide traces of grime. The Western utopian vision for total cleanness suggests that, in the face of the dirt and disorder of inhabitation, architecture will always be poorer. For the Japanese, however, their architecture will be richer.

Glossy Dirt, the tile that should never be clean:

Wilson explains that utopian imagery reveals subconscious desires and frustrations with the imperfect nature of reality. Furthermore, utopia suggests a positive future that society would aspire to (Wilson 268). The representation of bathroom design in *Trends* and *Houses New Zealand* suggests that total eradication of dirt would be an aspiration of many practicing architects and their clients. This Western idealisation of an image of cleanness is not only dislocated from reality, and will

therefore be a source of perpetual frustration, but it appears, given Tanizaki's account, to be denying poetic and expressive potential in architecture.

Thus, the design component of this section questions how dirt might be expressed, rather than repressed, so as to enrich the architectural qualities of the bathroom. It was decided to explore possibilities through prototyping a wall tile. The wall tile is a common protagonist in creating an image of hygiene in bathrooms and toilets. Just as the shoji and grained timber mentioned by Tanizaki characterise Japanese space, questioning the nature of a wall tile looks at materiality as a means of creating architectural space. Prototyping a wall tile out of dirty material thus is a means of questioning the 'clean face' of a bathroom. The aim is not simply to create an architecture that will age and therefore emulate the architecture that Tanizaki aspires to; rather, the tile shall incorporate dirt and waste into the architectural medium as an enriching aesthetic and poetic device.

Exploring the abject

Having dedicated the first three chapters of this thesis to the toilet, one might be tempted to use real human excrement as the ultimate abject wall-tile. However, the disgust element proved too great for me. Initial experiments for the wall tile used a discarded and stained urinal tray as the dirty medium. It was soon discovered that the tray was neither clean, nor dirty to a sufficient degree; it being unclear that it was indeed a former urinal tray. The potential for a poetic aesthetic was diminished by the ambiguity of its state of dirtiness. The dirty medium needed to be obviously dirty. Dirt, compost, poo are, depending on the state of dryness, disgusting materials. These were chosen as the medium through which to challenge the image of hygiene.

Dirt, compost and worm poo: abject that confronts expectation

Plaster casts reproduce the texture of the compost, dirt and worm poo in a solid form.[31] Dirt, sticks, decomposed material, and worm poo that formed the mould, were only partially cleaned from the cast, being sure to leave visible some dirty material. The physical filth imbedded in the plaster cast forms becomes a part of the aesthetic of the tile. The tile expresses that which would normally be hidden or removed.

The use of dirt on a tile does not automatically grant aesthetic or poetic appeal. It was decided to introduce a form of grid that would structure the random textures and patterns of dirt imbedded in the plaster cast. Order was provided by

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[31] Similarities have been noted between my plaster casts and those of the Boyle Family art work series entitles "Earth Pieces" 1963-present. See Boyle Family, Earth Pieces, 2010, Available: http://www.boylefamily.co.uk/boyle/works/index.html, September 11th 2010.
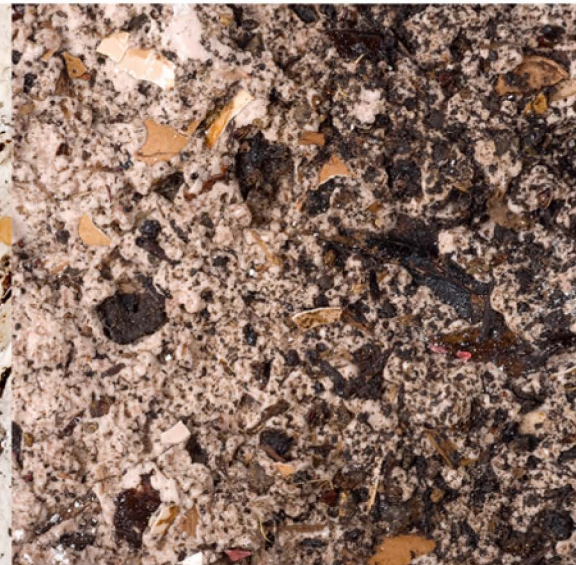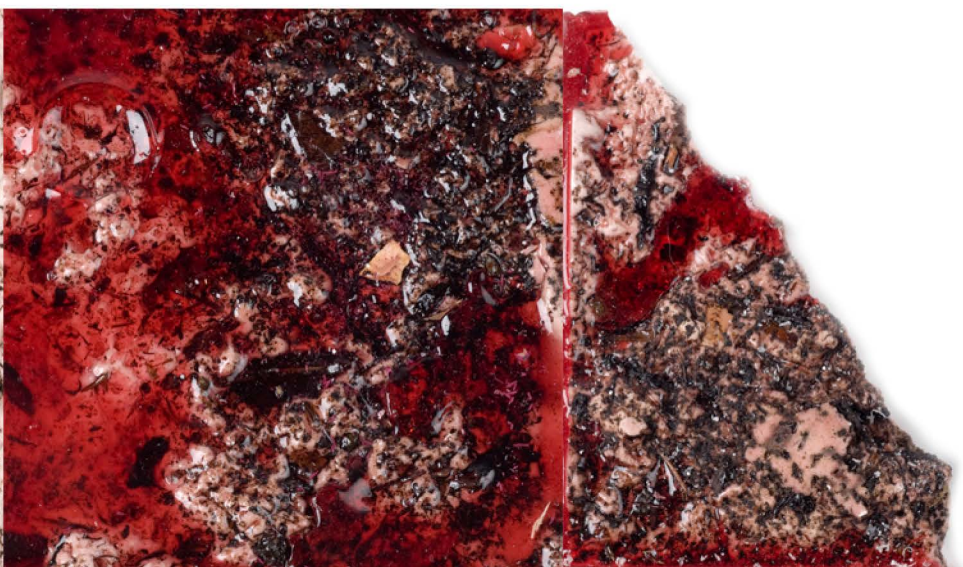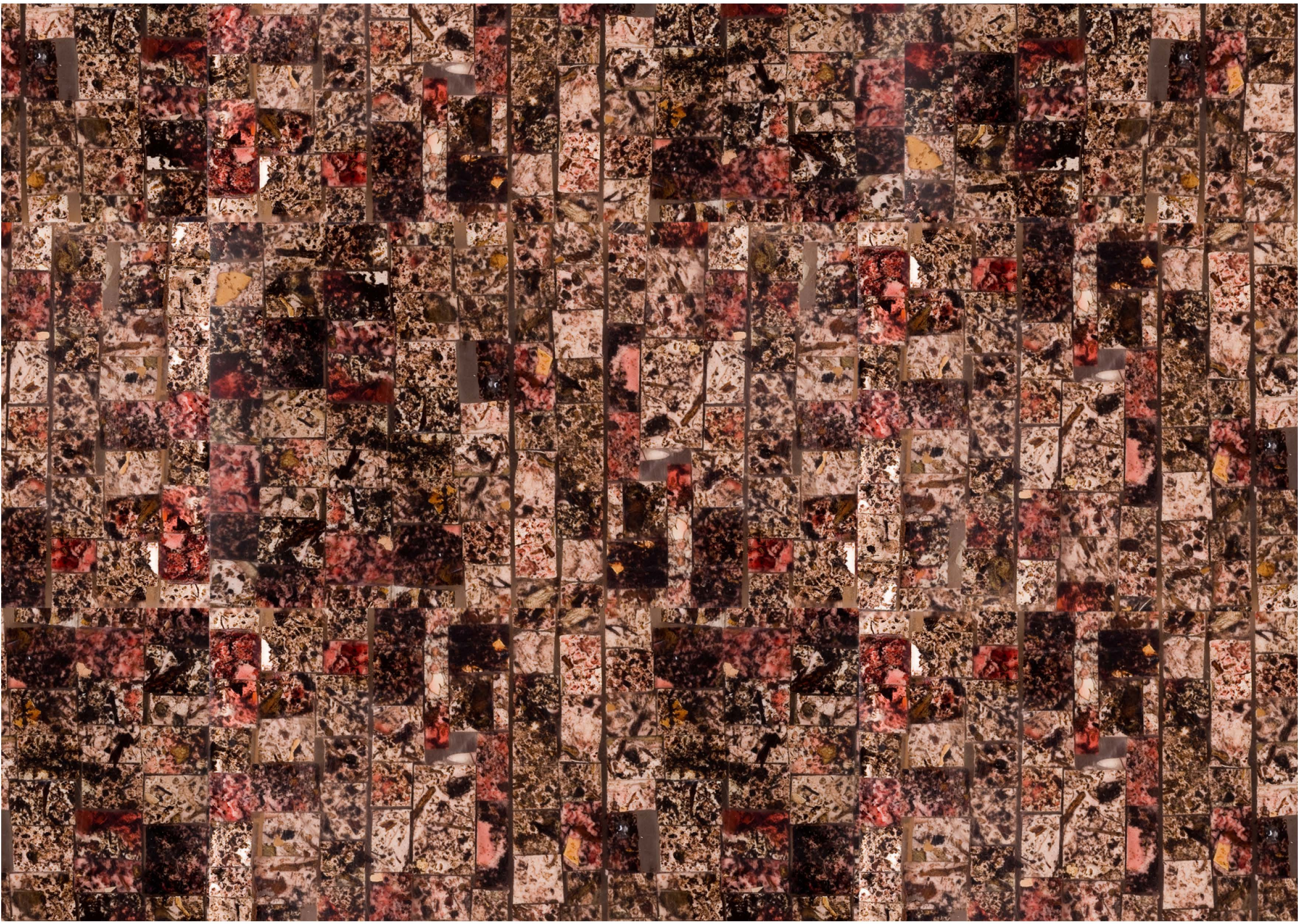
cutting the plaster casts into pieces of equivalent size, then reassembling the pieces into a new composition. Cuts remain visible in the final tile, and impose a sense of order to the disorder – the abject qualities, though present, are domesticated, tamed, set into a pattern that makes the dirt part of a deliberate act of creation. The new sense of rigour distances the tile from the arbitrary dirtiness of household grime; dirt is an artistic medium used in conjunction with the structured world of architecture. Dirt effectively ceases to be dirt. It has been accorded a dignity, a sense of purpose that lifts it above that of dirt.[32] It shall thus be called *Glossy Dirt.*

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[32] Werner Hoffmann in Hoffmann, "Marcel Duchamp and Emblematic Reality," 61-62. explains that the insignificant, lowly object, such as a chair, frock or fridge magnet beholds a new dignity, a new purpose when presented as art. Dirt in a similar vein, can be seen as lowly matter which is lifted through being accorded the status of architectural wall tile.

Relief: the recess that harbours dirt

The relief of *Glossy Dirt* contrasts the ornament-free and smooth wall that the modern aesthetic of hygiene prefers. At a physical level, relief gives refuge to the microbe; at an aesthetic level, the casting of shadows creates zones of uncertainty where dirt can potentially operate, unseen. Where the aesthetic of hygiene privileges smoothness and light in a display of cleanness, this aesthetic of dirt activates texture and shadow and suggests danger in its recesses. The textured surface made by dirt becomes an ornament for the accumulation of the microbe.

At this point, the development of *Glossy Dirt* became problematic. In this state, the dirty tile raises a practical consideration: the ability to clean a textured relief would difficult, and cleaning is likely to remove the very dirt that is being valorised. Retrospectively, this presents an interesting proposition of which I was unaware during prototyping. The cyclic dirtying and cleaning of the tile would be expressed in

the relief itself – the act of cleaning gradually removing the dirt of fabrication, while a new dirt – that of use, and wear and tear – would begin to accumulate. Rather than embrace this potential, it was decided to account for the problems of cleaning by using a surface of polished, transparent resin, protecting the dirt of the tile, and providing a smooth surface that would be easy to clean. *Glossy Dirt* now exists in a truly ambiguous state – gloss and shine of the resin overlays shadow and dirt of the ornamentation. With the application of resin, the tile has perhaps become a victim of the aesthetic of hygiene that dominates architecture. Or would the tile without the resin have become blatantly unhygienic? Both scenarios have artistic merit, though the more interesting intellectual experiment lies with the tile lacking the final resin coating. A solution to this dilemma may have been to leave portions of the tile without resin, so as to display dirt in its naked state.

But a more thorough analysis of *Glossy Dirt* perhaps suggests that the repulsion of dirt in its natural state has not been overcome. The dirt in *Glossy Dirt* is not real dirt: it is artistic dirt that is used as an artistic medium. It is dirt that is of service to art, and for that reason this dirt is in fact clean (Campkin 386). That it should be made from dirt actually becomes irrelevant. *Glossy Dirt* could be likened to the sublime in that it evokes the horrors of dirt and of waste, but does so with the knowledge that this dirt is staged; it is safe dirt; it is not real. It may be dirt, but that it is of service to art means that it cannot become monstrous like real dirt might be (Kirk 14).

Glossy Dirt challenges the aesthetic of hygiene, but does not challenge the all-dominate place of hygiene that shapes architecture. It would be unreasonable to expect architecture – let alone a wall tile – to revolutionise hygienic expectations of the way we live. *Glossy Dirt* instead explores the inherent contradiction of dirt in architecture: that cleanness is a mask – a hefty dose of perfume, perhaps – behind which lie the dirt and disorder of everyday life.

Like traditional Japanese architecture, this design experiment sought to find value and beauty in the dirt that

Western architecture rejects. *Glossy Dirt* reaches into the realm of the 'dirty', and changes the symbolism we attach to it, by making it art. Architecture ought not to pre-select what is architectural material, based on society's preconceived idea of what dirty or disgusting is. Instead, architecture should take the view that it has the power to change perceptions of dirt through investing creative, sensitive and aesthetic energy – and in doing so change its symbolic constitution to become art.

If we view human excrement as simply the 'dirtiest' form of dirt, architects ought to be able to do the same to the toilet. Indeed, Tanizaki suggests they can:

> *[…] one could with some justice claim that of all the elements of Japanese architecture, the toilet is the most aesthetic. Our forebears, making poetry of everything in their lives, transformed what by rights should be the most unsanitary room in the house into a place of unsurpassed elegance […] (Tanizaki 4).*

In a marked contrast to the loathed latrine, or the graffiti-ridden public toilet, the traditional Japanese toilet attains through architecture a degree of respect and admiration. It is no longer dirty, disgusting, or shameful, but is beautiful and an experience to enjoy. This architecture is not a masked charade that denies the shame of dirt. Instead, its dirt is no longer dirty because it is architectural. Rather than attempt to silence the physically and symbolically dirty in our buildings, Western architects might take a lesson from Tanizaki, and replace denial with a dialogue.

Conclusion

[…] a public toilet is a building and a town hall is architecture. I'm sure a lot of architects think that, and [that] the public thinks that… [but] I can show you town halls that are toilets of buildings, and toilets that are lovely little bits of architecture.

Gerald Melling[33]

In a witty turn of phrase, Melling captures a commonly held view of a building unworthy of the term 'architecture'. The architecture profession – like the public – is generally more interested in buildings of greater dignity and worth than the cubicle that receives our "worthless" bodily waste (Kira 93). Architecture typically conceals toilets in buildings, just like it conceals dirt in architectural publishing; it has no interest in

exploring the boundaries of privacy, nor the hidden forms of waste infrastructure. It is reluctant to invest in sanitation design that could significantly change lives, and to confront the problems of efficiency that plague water-based sewerage systems. Architecture, like the society it serves, categorically evades all matters relating to human waste. Architecture's downcast interest in toilets cannot be separated from the disgusting view held of human waste, which contaminates the toilet as well as anything else it touches both physically and symbolically. Architecture, rather than be an active proponent in explorations of waste, instead is more passive, preferring to conceal the toilet from view, protecting us and itself from waste's disgusting, contaminating abilities.

This study of the toilet reveals how what is categorised as dirty and disgusting is not considered architecture. In Kia Ora Toilet, it is demonstrated that architecture conceals the toilet and maintains privacy, hiding the disgusting and the shameful from the more 'dignified' life on the other side of the barrier. In a similar vein in From Waste to Water, we saw how

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[33] Gerald Melling in an interview with Diane Dekker; see D Dekker, "Defiant Design," <u>The Evening Post</u> 27 March 2010.

architecture rejects pipes and sewers, burying these dirty but vital 'organs' that ensure the city's survival. The underground world is the place for dirt, segregated from the aboveground world of architecture. The third world latrine, the basest, dirtiest of spaces, is also not considered architectural – as Cover the Face, Expose the Base identified, the waste disposal needs of the poor are viewed instead through a technical and functional lens, ignoring the ability of architecture to give pleasure and hope to the most underprivileged in the world. And finally in Glossy Dirt, dirt, grime and decay – extensions of the symbolism of the toilet – are similarly removed from architectural representation, considered as obstacles to the pursuit of an unobtainable and ever-frustrating utopian cleanness.

The profession forgets, or is unaware, that cleanness is but a perception, recreated and thus reinforced each time architecture bows to norms that require the concealment or segregation of dirt. Throughout this study, alternatives to the Western perspective of dirt have shown that our concepts of

the dirty and the disgusting, and in particular, faeces and eliminating, are not shared by other cultures. Similarly, the shame we feel towards these fundamental aspects of life is equally not universal. This means that Western architecture must be viewed as a particularly Western response to the toilet, faeces, and dirt – and not as a necessarily 'correct' or inherently desirable model of architecture.

This architectural response to the toilet gives an insight into how Western society views and operates with respect to those things that disgust us at a more general level. Bringing together the seemingly unlikely combination of human dignity and excrement, the 2007 movie *Kenny* is a comedy with an ultimately serious message about human character (Thomson). The plot outlines the life of Kenny, the plumber cum port-a-loo installer whose humble and hard working nature fails to earn him dignity because of his daily dealings with human excrement. Scorned by family and the public alike, Kenny has resilience and good humour in this unfeeling world of moral prejudice. But outside the movie set, not all people

share Kenny's strength to defy negative moral perceptions – I for one hid behind half-truths and told people my thesis was on "the ecology of waste" or "third world sanitation" in a bid to fortify myself against moral sceptics. The reality was that I was studying toilets.

The problem of dirt and the disgusting is that it tarnishes everything it touches, even if the point of contact is merely symbolic. If the tarnished thing in question is a fellow human being – a real life Kenny – one can appreciate the power humans give to the symbolic nature of dirt to create or uphold lasting moral judgements of flesh-and-blood equals. Dignity is not a "mystic endowment," but an intangible "product of social interaction" (Soyinka). Society, like architecture, needs to be aware of dirt's symbolic ability to obstruct or break down the dignity of human relationships.

While architecture cannot change the world, it can start to question the infiltration of society's ways into the built environment, and can thus decide whether it supports or counters them. But such philosophical decision making requires awareness – the status quo sees architecture blindly following protocol, giving tacit support to the condemning and shameful nature of dirt and human excrement. Rather than being moulded by society, architecture ought to be doing the moulding, shaping the dirty lives we live. It can start from the lowest point on the scale, by questioning whether a third world latrine really needs to be a latrine, and move up through the scales to interrogate the very form that waste disposal takes in our cities. Perhaps then we can begin to appreciate in our built environments the waste that we can never escape.

Appendix

This appendix aims to respond to criticism by the examination panel that the thesis body lacked a pragmatic, real-world application to toileting and its architecture today. Still operating within the original theoretical framework of the thesis, this design intervention explores how architecture might respond to the needs of the millions of urban squatters who live without adequate sanitation provisions. It specifically looks at how human waste might be treated in Kumbharwada, a neighbourhood of the slum Dharavi, in Mumbai, and how waste treatment architecture might be articulated in a dense urban environment.

Chapter three, *Cover the Face, Expose the Base* examines the large populations at risk of disease due primarily to the lack of human waste provisions. The chapter also investigates the role architecture might play in articulating such provisions. It argues that toileting in the third world cannot be solved by engineering and plumbing alone – indeed, to date, the shortfalls of comprehensive latrine building programs and the costs of comprehensive sewerage schemes mean that alternative solutions need to be explored. This is where architecture has a role in questioning the spatial and social relationships between our waste, and our daily lives.

This fifth and final design experiment continues in this vein, and looks at how the technologies available today for sanitary human waste treatment might be employed in a slum to solve sanitation needs and improve the well-being of the lives of slum dwellers.

This design is sited in Kumbharwada, one of eighty *nagars* (neighbourhoods) in Dharavi, one of Asia's largest slums. While designed specifically for Kumbharwada and its 9400 inhabitants (Sharad 6), this intervention can be seen as questioning at a broader level how architecture might play a role in the sanitation crisis in slums. In the process of designing for Kumbharwada, the typical architectural and social relationships to our waste have been questioned.

The informal and illegal status of slum settlements means that precise statistics on slum sizes are difficult to obtain (Davis 26). Despite this lack of specificity, slum statistics are difficult to apprehend for the average westerner and Dharavi is no exception. The last reliable survey carried out in 1986 put Dharavi's population at 550,000; the population in 2011 is likely to be between 700,000 and one million ("Lakhs of Residents, Billions of Dollars"). This population approaching that of a sizable urban agglomeration is contrasted by the paucity of land area occupied: approximately 500 acres. This creates an urban density in the order of 18000 people per acre (Davis 93).

The illegal nature of the slums means that municipal services are provided seldom by municipalities, but more through private enterprises. Provisions are poor both qualitatively and quantitatively (Davis 144). Water and sanitation provisions, of key interest to this study, are alarming in their scarcity: one report puts the ratio of toilets to inhabitants at one to 1400 (Dugger). As outlined in chapter

three of this thesis, the vast quantities of indisposed or poorly disposed faeces means that otherwise preventable water-borne or faecal diseases are commonplace in slum dwellers, reducing quality of life and perpetuating poverty cycles.

This design experiment inspires itself from Dharavi's recycling-based industries. It is estimated that there are over 4000 industries within the slum of Dharavi ("13 Compound"). Much of Dharavi's economies are based around these industries, of which many recycle the city's waste as primary material for the production of commercial goods, providing employment and wages – albeit low – to its inhabitants. These industries form the basis of Dharavi's internal 'waste' economy to the tune of 500 billion USD per year ("Inside the Slums: Light in the Darkness").

This design proposal asks whether a similar value can be sought from human waste, and if it is in embracing a 'waste-to-gold' attitude that a solution to Dharavi's sanitation problems might lie. It explores how architecture might embody

this attitude in a waste treatment scheme as well as the technologies it might employ.

As observed in chapter two of this thesis, centralised water-based underground sewerage networks and treatments plants are ill-adapted to India, being too wasteful of water, and too expensive to implement and maintain. The value of a decentralised sewage treatment scheme was conversely noted, following observations of a UN Millennium Project Task Force whereby multiple, smaller treatment units deal with more manageable loadings of human waste, and reduce or do away with the networks of underground sewerage. A decentralised scheme has the advantage of having overall lower costs than a centralised one, as well as allowing staggered intervention in accordance with the availability of funds, facilitating the practical aspects of financing and implementing such a scheme (United Nations Human Settlements Programme 99).

With limited financial resources and the difficulties of underground sewerage networks, the adoption of decentralised waste treatment has merit for the scheme in

Kumbharwada. But a technological treatment plant cannot be designed in isolation from the realities of ongoing operation and maintenance costs and its social insertion into an existing urban fabric (George 198-200). While any intervention is likely to need external financial support for its set up, it is important for the scheme to be at least self-financing and supporting once operational. Drawing inspiration from the industries of Dharavi slum that recycle greater Mumbai's waste into sellable commodities, I propose that the treatment plant's on going survival be assured through treating the human waste in a way that garners financial reward. As we shall see, there exist technologies today that do indeed convert human waste into reusable materials that could aid with the ongoing cost of operations. In addition, it is hoped that the extraction of valuable commodities from the treatment plant would help facilitate the insertion of decentralized treatment plants into a slum community, and help placate potentially negative feelings towards the waste treatment plants. Not only is the plant necessary for sanitary living, it is hoped to be a worthy addition

to an urban environment. This plant aims to extract value from human waste, just as Dharavi's industries extract value in the form of jobs and income from seemingly worthless rubbish. It is necessary thus to examine technologies available today that might be appropriate for a decentralised treatment plant in an urban slum with an eye for extracting value from the treatment processes.

Natural plant-based systems have been implemented successfully as solutions to waste treatment in developing countries and have the advantage of providing low maintenance and operation costs. However, such systems soon are too consuming of space to be a candidate for the densely populated urban slums and work better in rural areas (Bhamidimarri).

Biogas digesters require less space to treat waste[34] but also have the benefit of producing methane through anaerobic

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[34] Biogas digesters of 40m3 and 68m3 are used for this plant in Kumbharwada serving 2000 people. This is markedly less than the 380m2 surface area needed for oxidation ponds alone, for example.

(without air) digestion. Biogas plants are particularly suited to India: the ambient temperatures of close to 30 degrees centigrade allow for anaerobic reactions to take place efficiently (Fulford 38) with a plentiful gas production. While Indian systems typically treat agricultural organic waste, such as cow faeces, it is common practice in China to link biogas digesters to human latrines (Fulford 58), while other biogas digesters, such as the Biorealis digester, are specifically designed for human waste (Biorealis Systems Inc). A human waste biogas digester, already present in India, would appear to be appropriate for a decentralised treatment plant; in addition, the yield of methane gas is a source of value for the community.

A particularly well-tested Indian digester design is the floating steel drum design, which is adopted for this design (Fulford 43). It is composed of subterranean cylindrical digester pits lined with masonry bricks, not unlike that of a water-well. A steel drum sits 'mouth downwards' on top of the pit, and floats either in the slurry mix, or in a separate water

channel. As the excrement gives off methane during its digestion period, the methane collects in the drum, causing the drum to float upwards. As the gas is tapped for use, the drum lowers again. As incoming slurry enters the digester pit, it displaces the 'spent' slurry to an outlet for disposal or for secondary treatment. Care must be made to ensure that the brick work is of high quality so as to prevent excrement leakages into surround soil and contamination of ground waste (Fulford 44). The constant supply of waste and the high and favourable ambient temperatures of Mumbai mean that it is possible to extract gas from the waste within an approximate ten day period (Fulford 38). However, the longer the retention time, the more complete the digestion. For this reason, the floating-drum digester has been sized to hold the waste for 12-days.[35] Incoming waste displaces the spent slurry in the primary digester to a secondary holding tank in which further decomposition takes place ensuring sterility. The methane gas

[35] See calculations for tank sizing calculations

is tapped to a kiln in which the slurry is dehydrated so as to aid its man-handling and storage. This kiln, when not in use for waste dehydrating, could potentially be made available for use by the potter community in Kumbharwada.

This dried and treated digestate has further reuse potential beyond methane gas production: the anaerobic digestion process releases nutrients, such as nitrogen, potassium and phosphorous, and is able to be used as fertiliser, provided the adequate care is taken to ensure the sterility (Fulford 39). The anaerobic reaction of the primary digester kills the majority of pathogens. Further retention in a secondary digester helps kill those that remain, while the kiln also aids achieving sterility. Finally, when treated human waste is applied as crop fertiliser, a fifteen day wait period between application and ingestion of the crops is sufficient to ensure pathogen transmission routes are broken (Del Porto and Steinfield 23). While in western circles the notion of using human waste as crop fertiliser is perhaps unpalatable, it is noted in chapter three that the disposal of human waste on

edible crops is considered an acceptable practise to combat the human waste disposal problem in developing countries. For this design experiment in Kumbharwada, however, it is conceivable to sell the spent digestate as fertiliser and use the methane gas produced, reaping financial benefit in order to offset the cost of waste treatment. Storage and sale of the dehydrated digestate has been provided for in this design, facilitating the gathering of revenue from the treatment plant.

The use of treated human waste slurry for construction materials, such as bricks, ceramics and tiles, has been explored since the 1980s, even if the idea had been patented as early as the late 19th century (Gunn 39). The manufacture of bricks has been trialled with 30-40 percent treated human waste, with no loss of compressive strength to the bricks. Bricks with 30% sludge content have been shown to meet United States building regulations while in Port Elizabeth, South, Africa, wastewater sludge is used in brick manufacturing since 1979. Incinerated human waste compounds are used in Japan for the manufacture of bricks,

tiles, and pipes (Gunn 40-41). Treated sludge can also be used as a substitute for aggregate in cement and asphalt. Although the idea of using treated human waste as a substitute for clay in construction materials is not widespread, its successful adoption points to ways of reusing digestate that generate products of value. In Dharavi, where recycling industries form a large part of the local economy, it would be conceivable to combine waste treatment with construction-oriented industries to reuse human waste, simultaneously disposing of, and extracting value from, this largely free and plentiful product.

The extraction of value is important for ensuring the long-term viability of the project. While it is almost mandatory that the initial set up costs of treatment plants need to be funded be municipal, central or even overseas aid, it is hoped that revenue gathered from the methane gas, fertilizer and

digestate sales, as well as low pay-per-use charges,[36] will ensure independent and ongoing financial survival of the plants.

Sanitary treatment of waste cannot be separated from water provisions, necessary for the promotion of good hygiene. With water supplies increasingly stretched in Mumbai, it is advantageous to combine the treatment of waste with an efficient water recycling scheme and rain-harvesting tanks. The biogas production process does not function adequately with dry toilet matter: it requires the addition of water to aid its flow from source, to the various digesters (Fulford 37). A micro flush of 500mL of water is adequate (Del Porto and Steinfield 2000 49). Rather than use fresh water for this flushing, it is proposed for this scheme that greywater from

hand-washing be treated in a system of septic and filter tanks (Del Porto and Steinfield 2007 42-44).

How will these technologies be implemented architecturally? And in what capacity will toilets be provided? The financial realities of slums make a toilet-per-household an unrealistic aspiration.[37] It was decided instead to provide toilets communally at the site of the treatment plants. Thus all forms of underground sewerage are avoided. As sanitation still must be convenient to use, it was deemed that 100m was the maximum comfortable distance one might travel to use a toilet. This maximum distance thus dictates the placement of the communal toilet facility and onsite treatment plant within the communities. The number of people living within this area determines the loadings the plant is subjected to. The number of toilets provided is 22, which provides toilets at a ratio of 1:80

[36] The Sulabh toilet is a pay-per-use scheme in poor communities in India that has been successfully implemented. It was found that communities, contrary to common belief, are prepared to pay for hygienic toilets. This cost helped with cleaning and operation costs. See George (2008), pp.198-200

[37] Average incomes can be as low as 100 Indian rupies or approximately 3NZD per day. See Inside the Slums: Light in the Darkness, 2005, Available: http://www.economist.com/node/3599622, 5 September 2011.

people. While inferior to ideal western ratios, it was necessary to balance cost, available space and convenience. This ratio represents a dramatic improvement on the status quo where a single toilet serves thousands (Dugger).

At an architectural level, the treatment plant is conceived of as more than simply a functional building. Following from the premise that the treatment plant must be seen to provide value to the community in order to facilitate its successful integration, the plant is conceived of as a node, a small neighbourhood collective building with a public space at ground level whereby the high density of the slum is alleviated momentarily. The partially subterranean digesters form stepped platforms for seating, inspired by the terraces of the Ganges River: these act as an extension of the narrow alleys of the slum, and aim to be places of informal encounters and social gatherings. The bright and playful colours are inspired by the Indian penchant for brightly coloured saris and fabrics, and are intended be a more uplifting addition within the otherwise grim building materials that prevail in slum housing.

Architecture here is not stripped back functionality – instead, good design hopes to play a role in ensuring the successful integration of waste treatment technologies.

This treatment plant inverts key aspects of typical sewage treatment architecture. This decentralised, communal toileting facility, with on-site treatment is not a 'repository for waste', hidden from the neighbourhood or city it serves; rather it exists in its midst as a key element that focuses on extracting value from waste. This value in turn not only helps ensure the ongoing operation of the plant, it also helps the plant become something other than an unwanted but necessary piece of infrastructure. Architecture is a key ingredient allowing this potential to be realised, by integrating human waste into the built environment. The architecture of waste here is a catalyst for positive change in a deprived community.
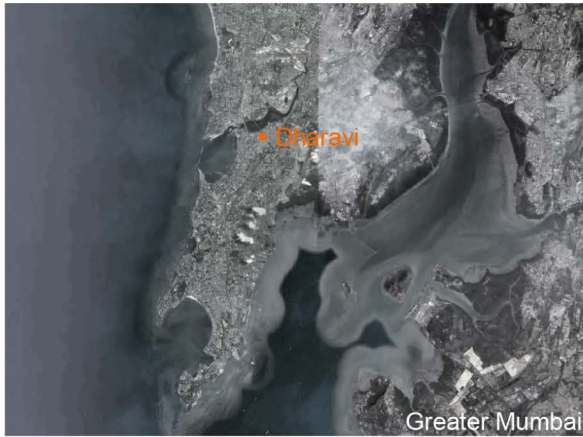
Dharavi Squatter Settlement
Mumbai, Maharastra, India

Pop.: 700,000-1,000,000
Area: 220 Hectares

Greater Mumbai

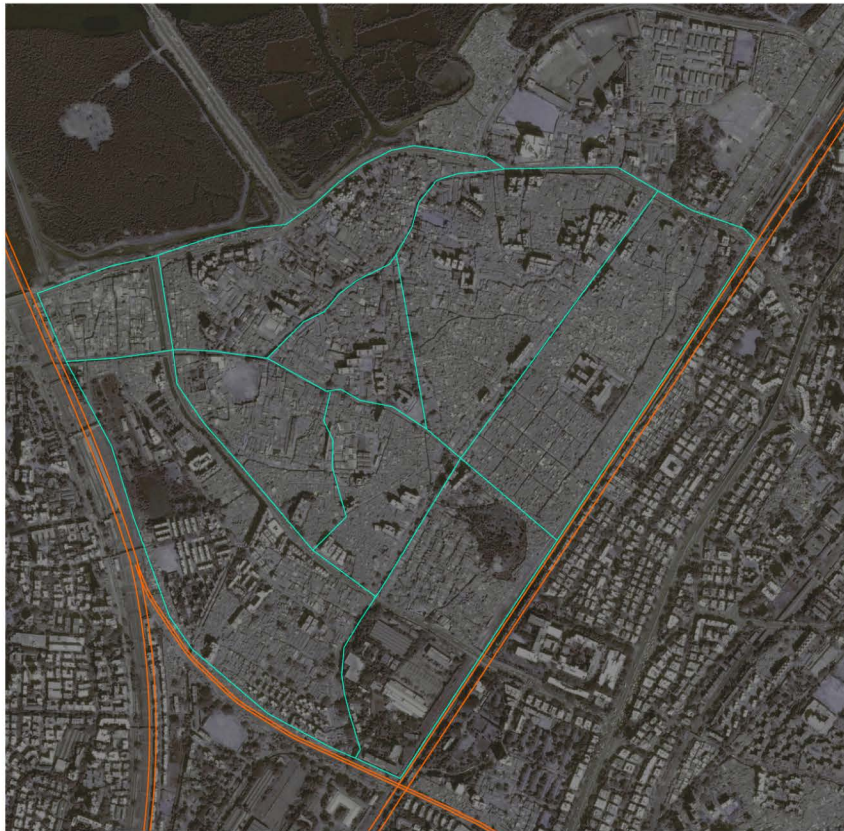Bounding Major Roads and Railways
Adapted from *dharavi.org*
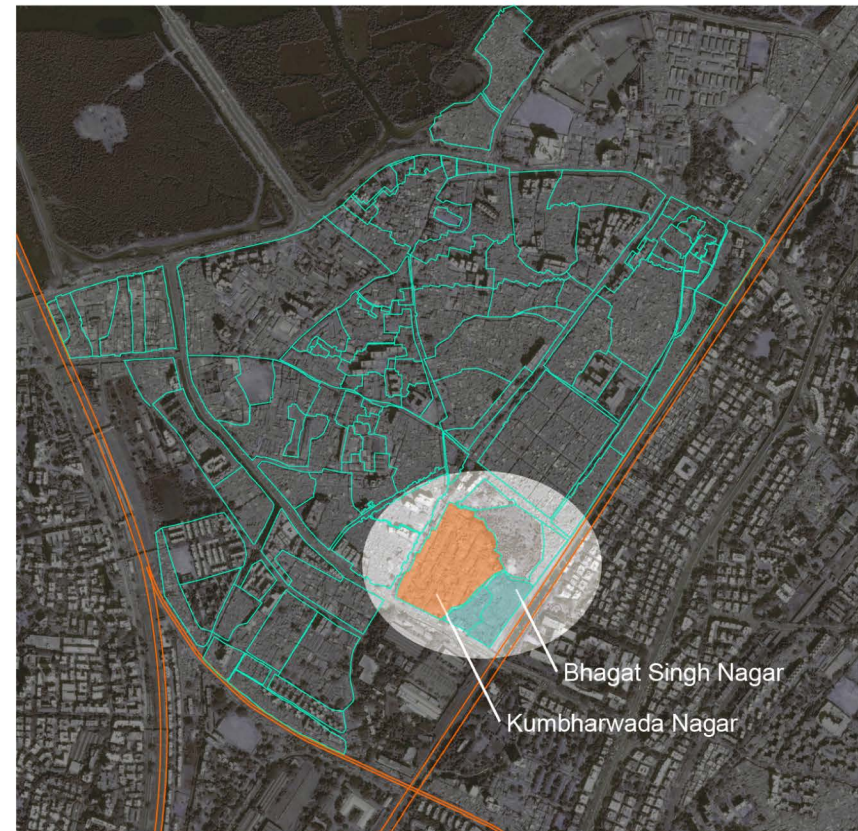
Principle Roads within Dharavi
Adapted from dharavi.org

Sector Boundaries
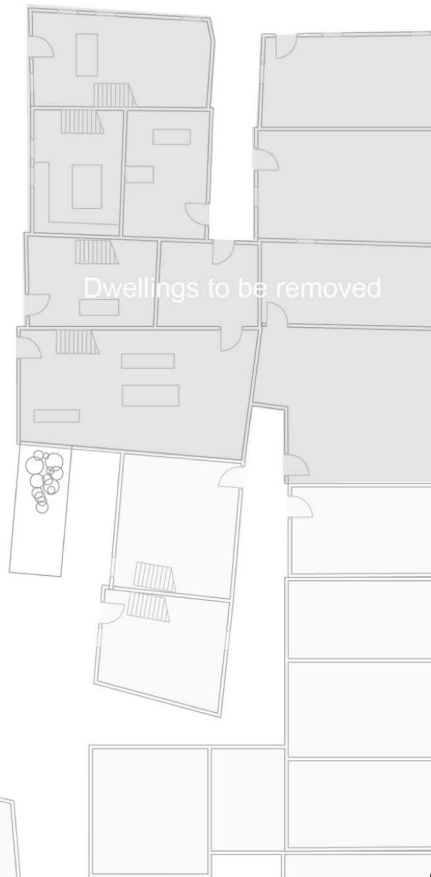Adapted from *dharavi.org*

Nagar Boundaries
Adapted from dharavi.org

Bhagat Singh Nagar

Kumbharwada Nagar

Treatment Plant Subject to
Detailed Elaboration

Location of
toilet/treatment plants
serving 2000 inhabitants

Bhagat Singh Nagar
1.96 Hectares
1200 Tenements
7600 Residents

Kumbharwada Nagar
4.82 Hectares
1500 Tenements
9400 Residents

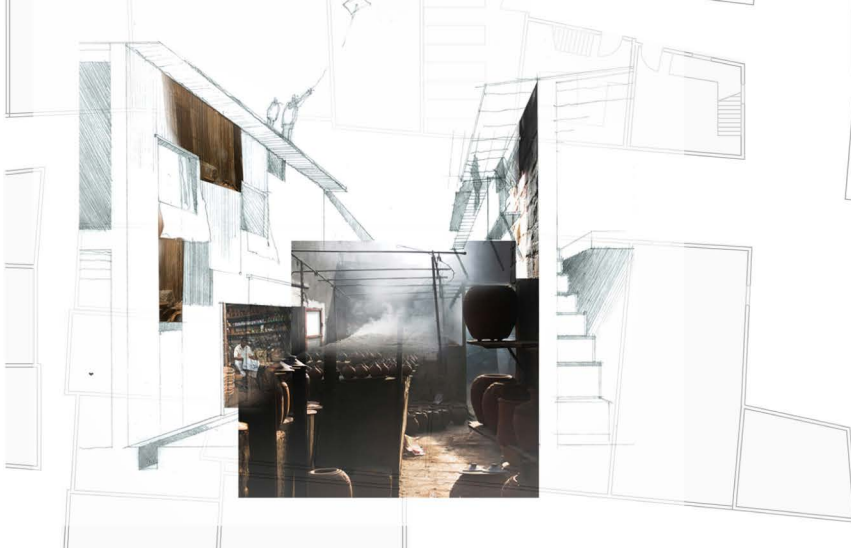Kumbharwada and Bhagat Singh Nagars
1:5000

Industrial and Residential Alleyways
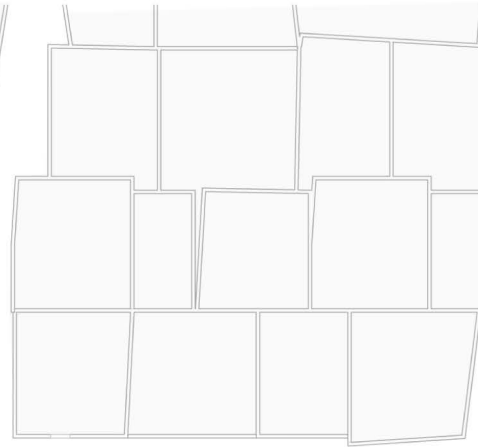

Social Space of the Alleyways

Dwellings to be removed

Kumbharwada
1500 tenements
average size 30m2
7 people per tenement
9400 inhabitants
1400 people per toilet

Urban context of extreme density,
vibrancy and muti-programming.

Industries, traditional (pottery and brick making)
and modern (plastic and steel recycling and
manufacturing), are intertwined with the homes of
the slum dwellers.

Ablution provisions are scarce:
What is typically a private affair in the west,
instead is a public affair taking place in the
streets and alleyways

Source: *Dharavi.org*

Potters' Courtyards
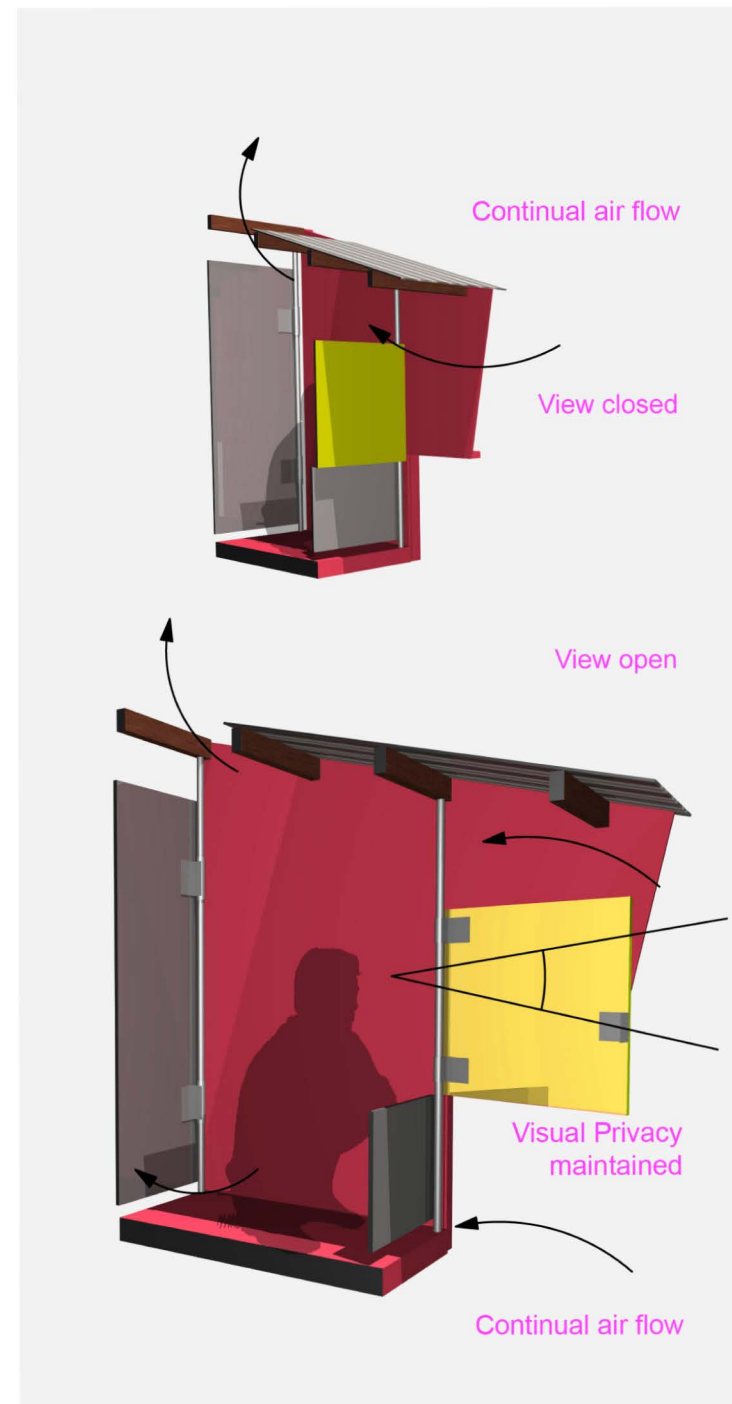

1   5   10   20
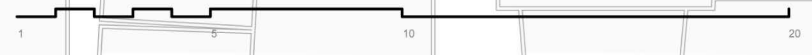
Decentralised treatment plants with
raised public toilet facilities
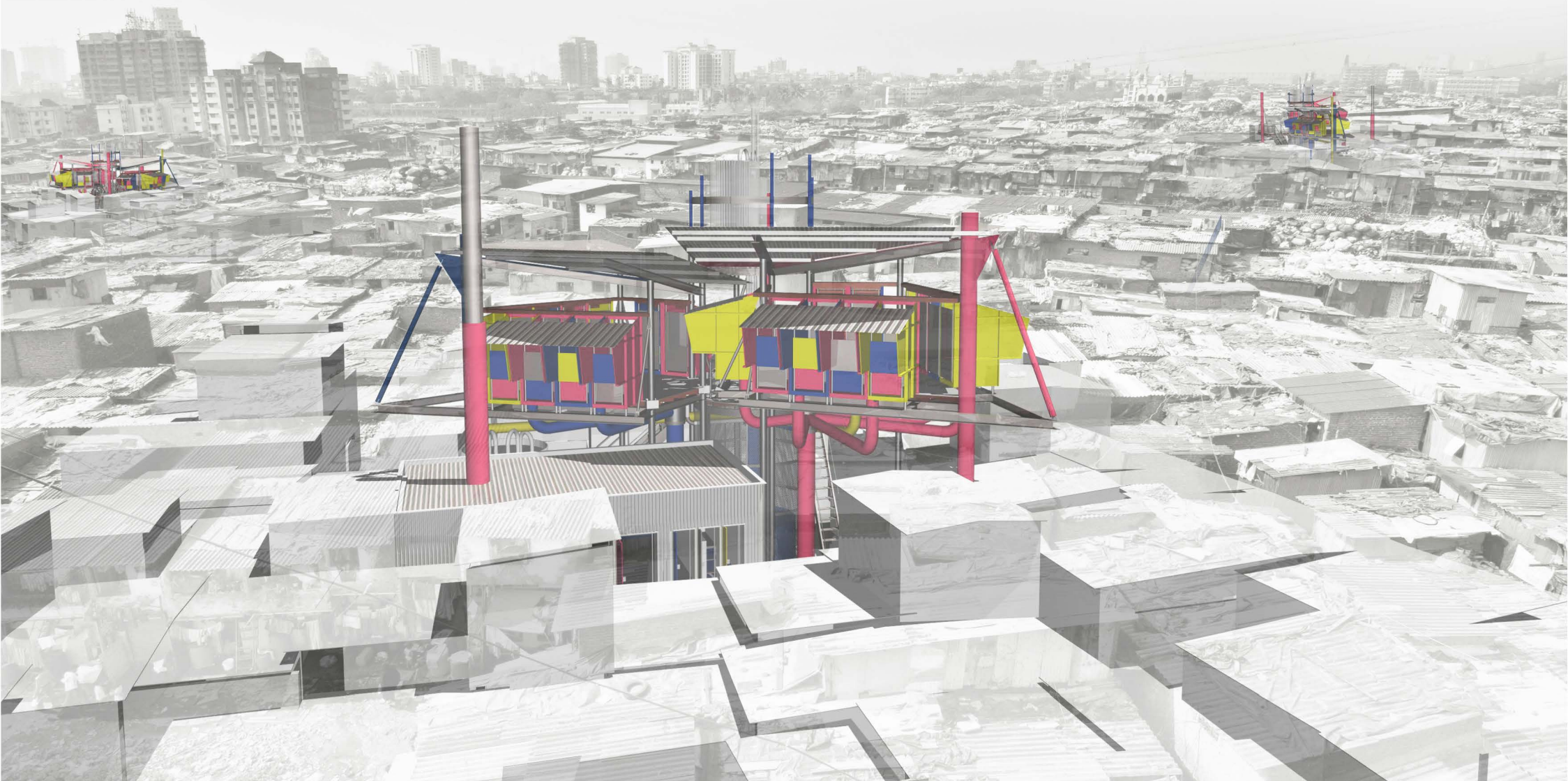
Decentralised treatment plants with elevated public toilet facilities. Primary and secondary waste digesters are partially subterranean, while a sheltered public space operates as an extension of the streett

Corrugated iron roof for rainwater harvesting

Timber toilet cubicles (see break out)

Locally sourced steel primary structure

Cantilevered secondary structure for toilet cubicles

Mesh screen

Storage and kiln

Conduits, sewerage, and water tanks

Sheltered public space

Partially subterranean masonry digesters

Continual air flow

View closed

View open

Visual Privacy maintained

Continual air flow

Human Waste Treatment and reuse

1. Greywater micro-flush (500mL) flushes human waste to primary methane digester. Piping to digester must be directas a consequence of the small quantities of flush water.

2. Masonry 12-day primary digester collects methane gas, collected in a floating steel drum. Gas is fed to power kiln and water pipes.

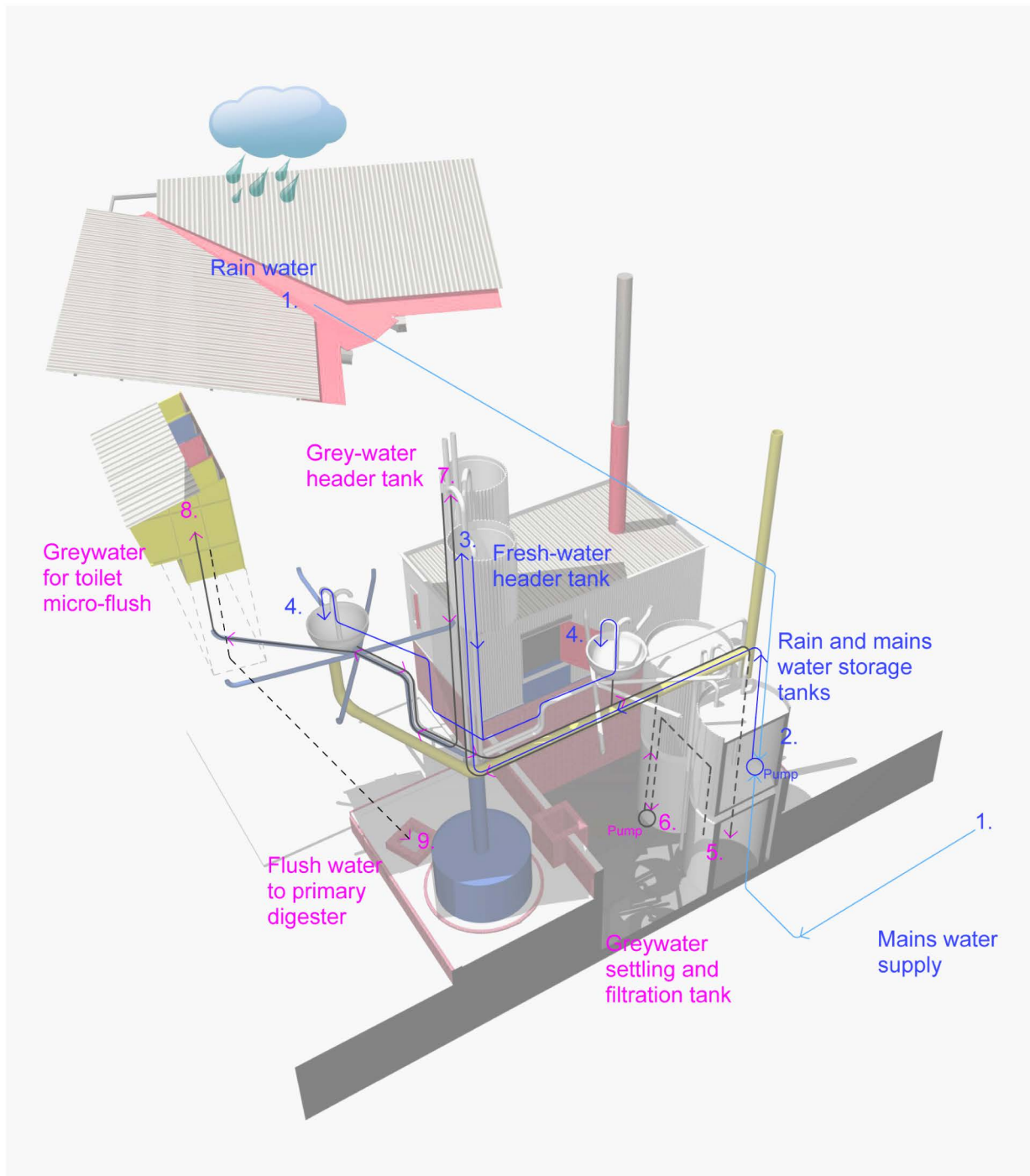3. Masonry 20-day secondary digester, operating in stable ambient temperatures of 30 degrees centigrade reduces potential pathogen content of sludge

4. Sludge is transferred to kiln where it is heated and dried. Kiln drying kills pathogens and reduces sludge volume, thereby aiding storage and improving the re-use potential.

5. Possible re-uses of sterile sludge include: fertiliser for crop growth, or as a clay substitute in the manufacture of pottery and bricks. Bricks with 30% sludge content have been shown to meet US building standards.[1]

[1] Gunn, A.P., *Use of Sewage Sludge in Construction,* London: CIRIA 2004. p.40

Rain water

1.

Grey-water
header tank

8.

7.

Greywater
for toilet
micro-flush

3.

Fresh-water
header tank

4.

4.

Rain and mains
water storage
tanks

2.
Pump

Pump 6.

5.

Flush water
to primary
digester

9.

1.

Greywater
settling and
filtration tank

Mains water
supply

Water Supply and Greywater recycling

1. Water is supplied by pressurised mains water, supplemented by rainwater when possible. Mains water supply in Dharavi is sporadic and un-reliable. 10m3 (10000L) tanks store water as it comes available until it is required by the toilet users.

2, 3, 4. Water is pumped via methane-powered pumps to header tanks, where it is pressurised and piped to communal washbasins.
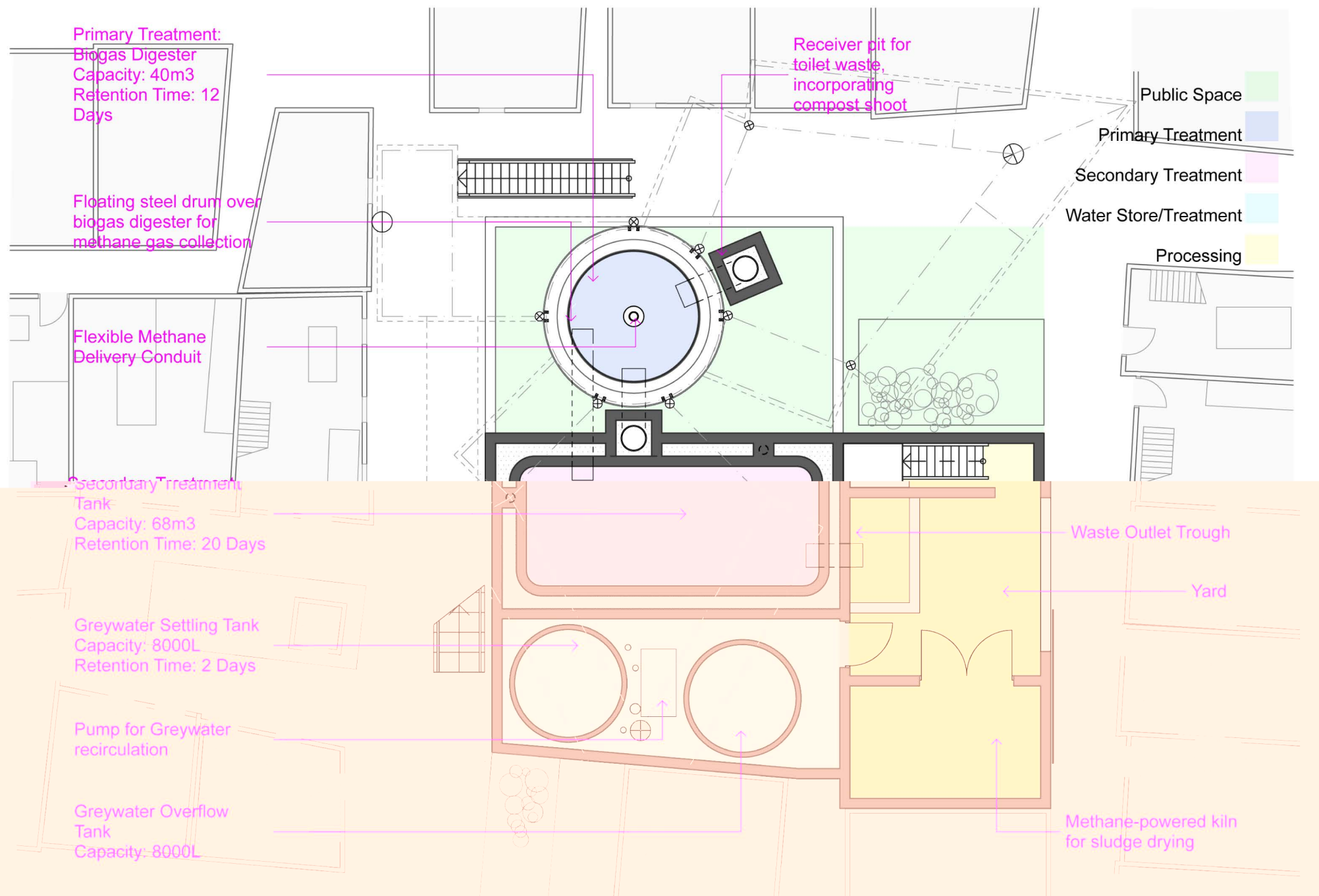
5, 6, 7. The greywater from the washbasins is piped to a greywater settling tank, in which solids settle at the base, and scum can be removed. Greywater is then filtered before being pumped to the greywater header tank.

8, 9. Treated greywater is piped under pressure to the toilets where a micro-flush (500mL) flushes waste to the primary and secondary digesters. As compared to a dry toilet, flush water improves the liquid content of human waste for the efficient production of methane gas in the digesters.[1] Greywater is appropriate for this task: its high carbon content balances the nitrogen content of urine, and thereby makes treated human waste more valuable as a plant fertiliser.[2]
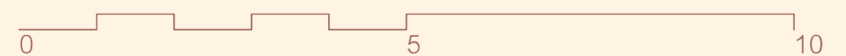
[1] Fulford, D., *Running a Biogas Programme: a Handbook,* London: Intermediate Technology Publications, 1988, p.
[2] Steinfield, C., Del Porto, D., *Reusing the Resource: Adventures in Ecological Wastewater Recycling,* New Bedford: Ecowaters Books, 2007, p.

Primary Treatment:
Biogas Digester
Capacity: 40m3
Retention Time: 12
Days

Receiver pit for
toilet waste,
incorporating
compost shoot

Public Space

Primary Treatment

Secondary Treatment

Water Store/Treatment

Processing

Floating steel drum over
biogas digester for
methane gas collection

Flexible Methane
Delivery Conduit

Secondary Treatment
Tank
Capacity: 68m3
Retention Time: 20 Days

Waste Outlet Trough

Yard

Greywater Settling Tank
Capacity: 8000L
Retention Time: 2 Days

Pump for Greywater
recirculation

Methane-powered kiln
for sludge drying

Greywater Overflow
Tank
Capacity: 8000L

Floor 0: Waste Treatment and Processing

0   5   10

Gas storage drum shown from above

Sewer feeders from toilets shown dotted

Open space for pottery making or for vegetable growing

Rain Water Collection Capacity: 8m3

Mains Water Storage Capacity: 10m3
Supply: 6am daily
Retention Time: 1 Day

Public Space

Primary Treatment

Secondary Treatment

Water Store/Treatment

Processing

To yard below

Sales/Storage Access

Main digestate store for sale

Kiln Chimney

Gas line for water pumps and kiln operation

Floor 1: Public Space and Store

0   5   10

Access core and bridge with payment desk

Feeder pipes to grey- and fresh-water header tanks

Communal hand-washing fed by stored mains water and rain water

Double opening cubicles for views and ventilation

Water storage tanks below

Male

Female

Access Bridge

Provision for auxiliary ladder to street below if required

Roof of processing unit below

Kiln chimney below

Floor 2: Toilet Cubicles and Access Bridge

0   5   10

+11,800

+10,830

+6,600

+5,800

+5,400

+1,500

+500

±0

-2,500

Header Tanks

Corrugated steel roof for rain catching and sun shading

Tubular steel struts supporting toilet cubicles

Toilet cubicles

Tubular steel struts

Rain and mains water holding tanks

Floating-drum gas collector

Grey water septic and filter tanks

Primary biogas digester

Secondary digester

Elevation from West
1:100

Public space with stepped platforms for seating, socialising. The corrugated compartment to the left is the digestate storage with enclosed brick yard beneath, while the circular core to the right houses the floating drum biogas digester

Decentralised treatment plants with raised public toilet facilities. Central circular core houses the floating drum biogas digester, main access and header tanks.

Statistics, loadings and calculations determining equipment sizing

Kumbharwada:

No. of tenements: 1521[38]

Average no. of inhabitants per tenement: 6.2[39]

Approximate population: 9400

Present ratio of toilets to people: 1:1400

Population served by each treatment plant: 2000

Excrement loading: 0.6L per person, per day[40]

Total excrement loading: 1200L per day

Urine loading: 1.2L per person, per day[41]

Total urine loading: 1200L per day

> Assumptions: *half of people will urinate informally in household pee-pots, in local drains rather than use local toilets. Indisposed urine is less of a health hazard than are faeces.*

Water loading: 0.5L per flush

Total water loading for flushing: 1000L per day

> Assumptions: *each person defecates once per day; urinating alone does not require flushing*

Total liquid loading: 1200L (excrement)

1200L (urine)

+ 1000L (flush water)

_____

3400L (total)

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[38] Shared, M. "Shelter Security Status in Dharavi." *Workshop on Shelter Security and Social Protection for the Urban Poor and the Migrants in Asia* 16 August 2011 2009. 6.

[39] Sharad, M. "Shelter Security Status in Dharavi." *Workshop on Shelter Security and Social Protection for the Urban Poor and the Migrants in Asia* 16 August 2011 2009. 6.

[40] D Del Porto and C Steinfield, The Composting Toilet System Book (Concord, Mass.: The Centre for Ecological Pollution Prevention, 2000) 29.

[41] Ibid 28.

Primary Biogas Digester:

Retention Time: 12 Days

Loading: 3400L

    x   12

_____

    40800L

or   40.8m3

Dimensions tank: Radius=2.0

    Height=3.5

Secondary digester:

Retention Time: 20 Days

Loading: 3400L

    x   20

_____

    68000L

or   68m3

Dimensions: Length=6.0

    Width=2.8

    Height=4.0

Water Holding tanks:

Hand-washing: 2L per person per day

    Assumptions: 4 hand washes on average per person

    per day

Total hand-washing loading: 2

    x   2000

_____

    4000L

or   4m3

4000L treated hand-washing water is above the 1000L daily flush-water demand. This leaves 3000L for general cleaning and maintenance for public use.

Retention time for greywater septic and holding tanks: 2 days

Capacity required: 8m3

Header tanks capacity: 4m3

Assumptions: 1 day retention time sufficient

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Tap and soap dispenser 1:10