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Brisbane's Subtropical Livability Goals and High-Rise Apartments: Vision and Reality



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Abstract

Climate-based design is very significant in the Brisbane planning context. Brisbane City Council's Vision 2031 aspires to capitalize on the city's enviable subtropical climate and be a city renowned for livability and sustainability. This paper focuses on the impact of multi-story residential buildings on both the quality of public spaces around them, and the livability of private dwellings in the evolving subtropical city. The study analyzed 15 recently-approved apartment buildings as well as a prominent older apartment building, Torbreck. The city's Multiple Dwelling Code was reviewed against frameworks for urban design quality and climate-responsive architecture and was found to provide a sound set of metrics. While the historic building was exemplary, the findings generally describe formulaic outcomes for high-rise apartments that seem to ignore the code's objectives. Some cases demonstrate high-quality interface with the street, yet perform less well as places for subtropical living; others demonstrate reasonable climate-responsive credentials, yet contribute little to the public realm.

Keywords: Multi-Residential, Subtropical, Streetscape, Livability, Sustainability, Climate-Responsive, Planning Code, Urban Design

A City Designed for Subtropical Living

Brisbane has the fundamental attributes for livable and sustainable urbanism. It has a wealth of natural and human resources, and subtropical climate conditions that fall within the "comfort zone" most of the time. Outdoor living is a hallmark of the Brisbane lifestyle, and residents say they rarely desire

continuous air-conditioning indoors (Kennedy, Buys, and Miller 2015), preferring instead to choose when to rely on breezes through open windows, and when to seal up and use cool, dry conditioned air. Whether in open space or indoors, air movement is sought-after as a way to counter tropical humidity in the summer months, and solar access is beneficial during the temperate conditions of cool winter days.

Brisbane is also a low-density car-dependent city. In 2002, during its corporate visioning process, Brisbane City Council (BCC) differentiated the city's identity with the aspirational value "city designed for subtropical living" to clearly link sustainable city planning with climate-based urban design and architecture. The strategy underpinned policies to encourage urban consolidation and keep urban sprawl in check as the population grew. The urban context would be framed by buildings and subtropical vegetation working together to support the city's transformation from car-oriented to a denser, more sustainable, pedestrian-oriented urban form. These values have now been embedded in the



Figure 1. Brisbane's transformation from low-density single-family homes to high-rise apartment living is underway. Apartment towers and office buildings are indistinguishable from each other in the city's new skyline.

City's planning instruments for well over a decade. *Brisbane Vision 2031* (BCC 2013) reiterates the aspiration to maximize the city's subtropical advantage, and the strategic intent of Brisbane's City Plan 2014 Planning Scheme (BCC 2014) unequivocally links the city's character and identity, and residents' way of life, to the local subtropical climate and landscape.

Apartment building construction in the city has increased dramatically over the past five years. While the addition of thousands of dwellings is welcome, the community is somewhat skeptical of the new buildings' contribution to public amenity and their "fit" with the city's subtropical image. Some concerns stem from the stark departure from existing built form and scale. For example, in low-rise residential neighborhoods, five-story multi-residential buildings are perceived as "tall" when compared to their neighbors. While tall apartment buildings are an accepted feature of the CBD, 30-story towers in hitherto relatively low-rise precincts are also seen as over-scaled. The "rectilinear, air-conditioned, glass-skinned box template" (Wood 2015) borrowed from office buildings, and now becoming ubiquitous for residential towers, is viewed as sterile, closed, and lacking empathy with subtropical values (see Figure 1).

The BCC's Independent Design Advisory Panel (IDAP) initiated this critical review of recently approved apartment buildings. The scope broadly included developments from five to 30 stories, outside the CBD, to investigate the impact of these buildings on the public realm, and on occupants' private dwellings, and evaluate how they are contributing to the Council's sustainable subtropical vision. The results suggest that the urban character and built form emerging in densifying localities will be quite different from the leafy and livable subtropical image and identity envisaged.

The sample

A purposive sample of 15 cases, representing a range of scales of development in Brisbane's inner suburbs, was derived from the Council's online system. Approved

architectural drawings were downloaded and a content analysis was undertaken. Torbreck, a landmark apartment building in inner suburban Brisbane, completed in 1961, and notable for its garden setting and attention to climate control through form and materials (AIA 2010) was also analyzed (see Figure 2). The case studies and their spatial-structural characteristics are summarized in Table 1.

Though cases varied from a single five-story apartment block, to a development with three 30-story towers, there was little diversity in building configurations, spatial characteristics or basic floor layouts. All cases featured "tall" towers, either freestanding or above podiums, with repetitive stacked floors, and dwellings clustered about a central vertical access core. Some cases had commercial tenancies on the ground level. Most dwellings had two bedrooms and two bathrooms, though Case 14, made up solely of one-bedroom apartments, accounted for 42% of total dwellings. Larger apartments or small studios were rare. The 22 towers in the sample represented 2,199 apartments and an estimated occupancy of 3,376 residents (GBCA 2009) whose lifestyles would be directly affected.

Brisbane's Multiple Dwelling Code

The city's Multiple Dwelling Code (MDC) (BCC 2014) calls for "development that ensures an attractive streetscape interface that contributes to Brisbane's character and identity, high-quality subtropical streetscapes and public space network" and "a high level of amenity for occupants and adjoining residents, including access to sunlight and breeze to support outdoor subtropical living." The MDC's inventory of 53 performance outcomes (POs) and extent of detail indicate that these are significant aspects for citywide outcomes. Twenty-one POs are directly relevant to the impact on streetscapes; most are concerned with amenity, aesthetics, and climate-responsive architecture. All are accompanied by acceptable outcomes (AOs) that provide numerous and detailed metrics, some which refer to diagrams for further guidance. Prescriptive requirements regarding parking



Figure 2. Case 16: Torbreck, Brisbane (Job and Froud Architects, 1961). © Craycraybadger (cc by-sa)

arrangements are also included. The MDC metrics align with urban design quality literature applicable to streetscapes (PPS 2000, Gehl 1987, Groat 1988, and Dempsey 2008) and climate-responsive subtropical urbanism and architecture (Givoni 1998, Hyde 2000, Emmanuel 2005) and provide a sound basis for objective evaluation of design quality.

Streetscape qualities

Functional design of pedestrian-friendly streets must address physical, physiological and psychological needs by taking into account thermal comfort, safety, security, inclusivity, sense of good maintenance and so on. Formal aesthetics (such as enclosure, complexity, and order) and symbolic urban aesthetics (such as naturalness, upkeep, and style) are important in human perceptions of spatial experience, and can provide the basis for objective streetscape design-quality review (Nasar 1994). Natural elements such as specimen trees and water in urban areas contribute to perceptions of visual attractiveness. Preference declines where man-made content such as poles, wires, signage, and vehicles proliferate and greenery decreases. Signs of neglect, whether superficial or not – for example, unkempt planters or broken pavement

– affect perceptions of quality and produce concerns about general upkeep and personal safety (Dempsey 2008).

When buildings and trees work together in streetscapes to define street edges and frame a view of the sky, streets and sidewalks have a sense of enclosure related to human scale. People prefer street edges that have a

level of architectural order and complexity. They generally notice the façades of buildings more than they notice massing, and visual richness is preferred over bland and unengaging presentations of blank walls or voids (Groat 1988). Car-centric streets are less “involving” for pedestrians because signage and other elements are not

designed to be read at a walking pace (Gehl 1987).

Subtropical streetscapes

In Brisbane’s subtropical urban environment, inviting streetscapes require a high level of integration between buildings and greenery to provide favorable conditions for people on the street. Subtropical streets need shade

Case	Building Form	Spatial Configuration	Height (stories)	No. Dwellings	Typical FAR	SA : Vol Ratio (m ² /m ³)	Site Area (m ²)	Frontage (m)	Front Setback (m)
1	Tower, SB carpark	Edge-core DL	5	19	8:1	0.167	1,012	Single: 20 (West)	7
2	Tower, GL carpark	Edge-core DL	5	17	9:1	0.174	936	Corner site: 37 (South) 23.4 (West)	4 4
3	Tower, GL carpark	Edge-core DL	5	14	12:1	0.210	815	Single: 20.2 (South)	5.6
4	Two towers, basement carpark	T1 – Central-core DL T2 – Edge-core DL	5 5	21 22 43	15:1 7:1	T1 0.139 T2 0.136	2,519	Dual street: 30.1 Primary (Northwest) 20 Secondary (Southeast)	3.8 3.9
5	Tower, SB carpark	Central-core Point access DL	5	20	17:1	0.107	1,164	Single: 33 (North)	Variable, no data available
6	Tower, GL carpark	Edge-core DL	5	16	13:1	0.195	809	Single: 20.1 (Northeast)	5
7	Tower, podium & basement carpark	Central-core DL Point access	7	18	9:1	0.194	828.5	Single: 24 (North)	4
8	Tower, basement carpark	Central-core DL	7	38	8:1	0.185	959	Single: 39.5 (Southeast)	0
9	Tower, GL carpark	Edge-core DL Point access	7	17	14:1	0.168	761	Single: 20 (West)	6
10	Tower, GL carpark	Edge-core DL	7	18	10:1	0.242	780	Single: 20 (North)	4.1 (3 m road widening applied)
11	Tower, podium carpark	Central-core DL	20	140	7:1	0.125	1,051	Corner site: 33.7 (Northwest) 30.8 (Southeast)	0 0
12	Tower, basement parking	Central-core DL	10	48	7:1	0.166	696	Corner site: Approx. 31 (Northwest) Approx. 22.4 (Southeast)	2 3
13	Tower, basement parking	Central-core DL	15	135	7:1	0.082	1,573	Single: 29 (East)	1
14	Three towers above five-story podium & Basement parking	T1, T2 and T3 Central-core DL	30 30 30	352 296 267 915	10:1 7:1 11:1	T1 0.090 T2 0.265 T3 0.237	4,233	Whole block , 3 frontages: 108 (West) 91 (Southeast) 44 (North)	0 0 0
15	Three towers above five-story podium & Basement parking	T1, T2 and T3 Central-core DL	29 12 19 3-5	257 97 206 40 (podium) 601	7:1 7:1 6:1	T1 0.097 T2 0.089 T3 0.063	4,661	Whole block, 3 frontages: 99 (North) 85 (East) 126.5 (Southeast)	2 3 0
16	Two towers, podium & GL parking	T1 Central-core DL T2 Edge-core SL	18 8	91 49 140	8:1 9:1	T1 0.150 T2 0.164	6,521	Dual street: 37 (South) 35.5 (North)	6 70
Key: GL = ground level SB = semi-basement SA : Vol Ratio = ratio of surface area to enclosed volume DL = double-loaded SL = single-loaded T1 = Tower One T2 = Tower Two T3 = Tower Three									

Table 1. Summary of case study characteristics.

Performance outcome (PO)	Acceptable outcome (AO)	Desired design characteristics	Emerging trends
SUBTROPICAL STREETS		Lively streets conducive for walkability	Environmentally hostile and uncondusive for walkability
PO26 – LANDSCAPED STREETSCAPE Integrated landscaping on street frontage	<ul style="list-style-type: none"> • Deep planting • Canopy trees • Two-meter-wide planter bed to 50% 	<ul style="list-style-type: none"> • Streetscape image and amenity: green and shady; aesthetic foreground and favorable microclimate for street and dwellings. • Large trees and diverse plants support local character and identity. Deep planting zones for canopy trees; and two-meter-wide planter beds supporting greenery to at least half of the frontage. 	<ul style="list-style-type: none"> • Ground plane dominated by hard surfaces that do not support vegetation. • Vehicles and services dominate the interactional zones. • Small-scale plantings such as palms and shrubs not shade-giving. • Vegetation levels decreasing, not replacing or improving on prior levels. • Species inconsistent with locality character.
PO31 – DEFINED STREET EDGE Building street edge consistent with desired neighborhood character	<ul style="list-style-type: none"> • Parallel to street • Within 2 meter of minimum required setback • Casual surveillance of street 	<ul style="list-style-type: none"> • Defined street edge for sociability and neighborliness. 	<ul style="list-style-type: none"> • Street-level façades dominated by hardware and utilities. • Scale and proportion respond to large waste collection vehicles, rather than to human use and interaction. • Base reads as void.
PO32 – DEFINED THRESHOLD Threshold attributes for pedestrian site access	<ul style="list-style-type: none"> • Prominent and separate pedestrian entry • Shelter from verge to front door • Mail boxes 	<ul style="list-style-type: none"> • Layout of transition space clearly defines threshold between public and private areas. • Clear pedestrian entry with shelter and visual connection to the street. 	<ul style="list-style-type: none"> • Pedestrian entries relegated to secondary side pathway; central garage entry dominates. • Poor visual connection to entrance from street. • Most pedestrian entries are weather-sheltered.
PO33 – UNOBTUSIVE SERVICES Visual impact of vehicle access, parking, services and utilities	<ul style="list-style-type: none"> • Driveway width 30% or less of frontage • Design and materials consistent • Services screened 	<ul style="list-style-type: none"> • Unobtrusive utilities and vehicular access. • Frontage dedicated to greenery rather than parking. 	<ul style="list-style-type: none"> • Vehicular entries and car parking prominent on frontage. • Token greenery.
SUBTROPICAL DWELLINGS		Structural design supports subtropical lifestyle preferences for thermal comfort and outdoor living	Active strategies for climate control take precedence for majority of dwellings

Table 2. Brisbane's Multiple Dwelling Code (MDC) design objectives, compared to emerging trends in apartment tower development.

and shelter from the rigors of summer heat, and warm, sunny places to walk during the brief winter. Private gardens and foliage make important contributions to streetscape aesthetics and to pedestrians' thermal comfort, especially when complemented by public plantings.

Because individual cases rather than whole streets were evaluated, the interface where the large-scale building meets the street was identified as the critical focus of inquiry. The MDC's performance outcomes and associated acceptable outcomes for individual buildings' relationship to streetscape image and amenity, defined street edge, defined threshold, unobtrusive utilities and parking, were selected to provide measurable indicators of contribution to public-realm quality.

Subtropical apartments

Residents' top livability expectations for apartments in Brisbane are: aural and visual privacy; usable private outdoor space; natural ventilation and access to breezes; and the choice of occasional rather than continuous energy use for control over indoor climate conditions (Kennedy, Buys, and Miller 2015).

Theoretically, subtropical buildings can be designed and thermal comfort maintained without significant energy inputs, providing that key physical and organizational rules to balance thermal mass and strategic openings for climate control are followed. In general, controlled response to solar orientation and a "thin" building form that facilitates cross-ventilation by means of its narrow cross-section are fundamental principles. Though Brisbane's humid subtropical climate is a hybrid of both tropical and temperate conditions, the ideal architectural outcome to meet local preferences for livable apartment buildings would allow effective cross-ventilation for individual dwellings in both summer and winter, complemented by active controls to attenuate the effects of external conditions

on indoor environments, on a continuum that minimizes energy use.

The MDC calls for dwellings to be cross-ventilated and have adequate daylight, externally shaded walls and windows, and livable private open space. Acceptable outcomes provide suitable metrics for objective analysis of the extent to which new apartment buildings are designed for subtropical living.

How Livable are Brisbane's Apartments and Emerging Streetscapes?

As the sample size was small, an inductive approach was used to develop generalizations from the set of criteria observed. Table 2 summarizes the MDC

“Currently a myriad of services associated with functional multi-story living, including parking, is positioned in tension with the need to accommodate street-based, surface-level trees and landscaping.”



Figure 3. Case 9: Utilities and driveways create voids in the streetscape.



Figure 4. A shade tree spreads out in front of Torbreck's Dornoch Terrace frontage.

metrics for both streetscapes and dwellings used in this analysis, and compares the desired design characteristics of the climate-responsive approach for streetscapes and dwellings with emerging development outcomes. Currently, not all new residential and mixed-use developments are achieving the expected standards. Some cases demonstrated high-quality street interface, yet performed less well as towers for subtropical living. Others showed some climate-responsive formal credentials in the towers and individual dwellings, yet did little to enhance the quality of the subtropical public realm. The historic case (Torbreck, Case 16) was exemplary and set a benchmark for both climate-responsive dwellings and street interface.

Street interface

The analysis found that across the sample, vital street frontage was given over to voids created by prescribed requirements for driveways, garage entries and bulky services infrastructure for power supply, waste management and firefighting (see Figure 3). While Torbreck's street frontages offered shady canopy trees (see Figure 4) the overwhelming impression presented by contemporary developments was of a lack of greenery, rather than a cool and leafy image. Disappointingly, vegetation was poorer on both private land and the adjacent public verge, post-development (see Figure 5).

Typically, the smaller-scale infill developments with a single 20-meter frontage contributed least to quality streetscapes. Here, hard paving for vehicular use characterized the street interface, rather than gardens. Most successful streetscape quality was achieved on corner sites where the main frontage presented a prominent street address, and the vehicular entry and utilities were discretely located on the secondary frontage, such as in Case 12 (see Figure 6). Cases with single, but wider street frontages used a similar strategy by locating driveways along a side boundary, rather than in a dominant central position.

Cases 14 and 15, both large multi-tower developments, occupied whole city blocks. In these cases, loading docks, parking garage access, pump rooms, switch rooms, and exhaust ventilation dominated the entire streetscape. Blank walls produced a bland and exposed "no man's land" on the adjoining public sidewalk. The podium roof plans indicated greenery, but at five stories above the street, this was unlikely to impart a foliaceous image in the public realm.

The physiological and psychological comfort and image that substantial trees and vegetation provide in the subtropical urban environment cannot be underestimated. Site-by-site, as neighborhood densities increase, Brisbane's residential streets are becoming more environmentally hostile, instead of more inviting for pedestrians. If

adjacent sites continue to develop in the same way, the cumulative urban quality will fall well short of the vision of a "well-designed subtropical city" where buildings and vegetation work together to frame public space and raise the neighborhood's livability.

As the city transforms from lower to higher densities, more effective strategies will be required to ensure subtropical streetscapes evolve. Greater responsibility to the street requires tighter development controls on narrow, single-orientation sites and a re-thinking of the purpose and priorities of the interface between buildings and streets. Currently a myriad of services associated with functional multi-story living, including parking, is positioned in tension with the need to accommodate street-based, surface-level trees and landscaping. More effective, less space-hungry and less energy-intensive systems for waste management, energy generation and distribution, and vehicle storage must be actively pursued by both regulators and private developers.

Dwelling quality

Formal, and spatial configurations of buildings and material choice were found to be generic rather than climate-responsive. Only Torbreck demonstrated the full suite of subtropical design controls available, and offered residents choice regarding their climate comfort preferences. Torbreck's

towers exemplified the essential principles for climate-based cross-ventilation. Tower One's cruciform plan, and the narrow cross-section of Tower Two, ensured every dwelling had at least two external walls, and windows and doors were optimally placed for air movement. While every building in the sample featured some apartments with more than one exterior wall (typically the corner positions on the floor plate) the majority of dwellings were single-sided and could not be cross-ventilated. The climate profiles these presented were incompatible with subtropical living. Table 3 presents a snapshot of Wall-to-Floor-Area (WTF) investigations for typical dwellings within the buildings, showing the minimum Case 15 (climate-defensive), the climate-responsive median Case 16, and the maximum, Case 4, which incidentally also has the highest net-to-gross salable area in the sample.

Table 3 also describes the area of glazing available for daylighting compared to openable area for ventilation. Torbreck's apartments achieved a balance between solid walls and glazed windows and doors. In comparison, the single exterior wall available to apartments in the largest buildings was entirely glazed and unshaded, regardless of orientation. The desktop study could not determine whether low emissivity (low-e) and spectral selective glazing technology was used. Nevertheless, studies have shown that openable windows with external window hoods are preferred by residents. Where design documents indicated external "shading", it appeared to be designed for cosmetic rather than climatic reasons – adornment that provided little functional shade and lacked adjustability for changing seasonal needs.

Crucially, the sample also indicated that very few well-designed private outdoor living spaces were delivered. Many fell short of minimum dimensional requirements, and many dwellings in the largest buildings had no private outdoor space at all. Some had narrow spaces formed between the external glass curtain wall and the inner glass walls of living rooms. These were less than 0.5 meters wide and clearly not useful for outdoor living,

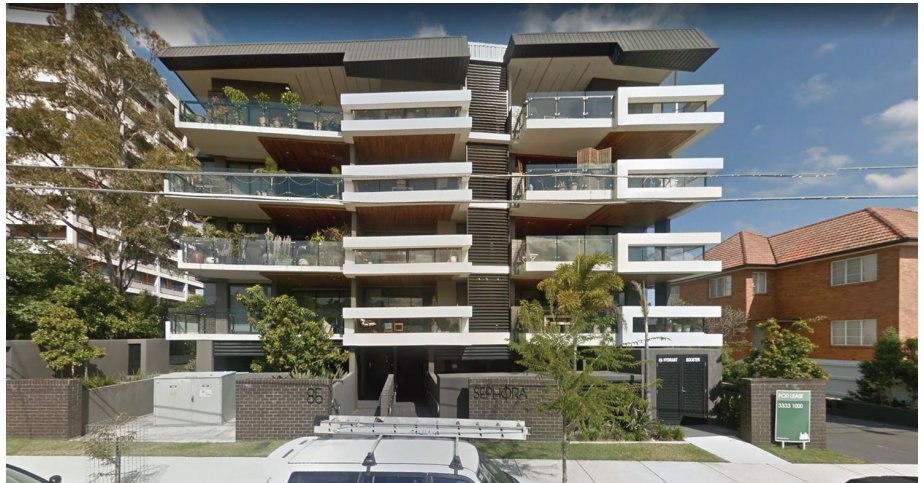


Figure 5. Case 5: New developments often lack greenery. Source: Google.com

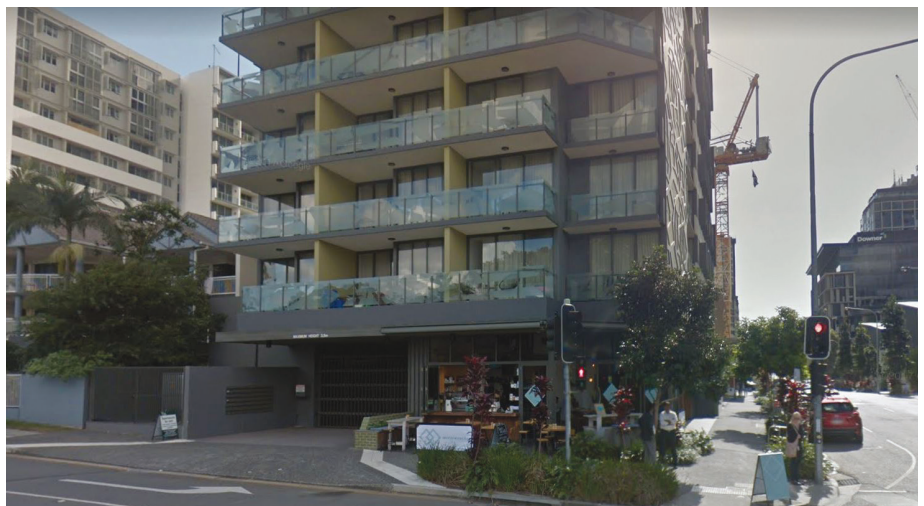


Figure 6. Case 12: Building streetscape. Source: Google Earth

but were likely to become de facto storage spaces. In other cases, extensively-glazed balustrades failed to provide privacy, shade, or breeze for comfortable outdoor living on balconies. Though north is the ideal orientation for outdoor spaces in the southern hemisphere, many unshaded balconies faced the hot western afternoon sun. By contrast, Torbreck's apartments, though diverse in planning and orientation, have a primary balcony for outdoor living, with flexible and adjustable shading, and a secondary utility balcony.

The overall results of this study indicate that though the MDC is deeply detailed, it appears that codified items are given selective emphasis, or are outweighed by prescribed functional requirements. The

findings highlight the critical relationship between the environmental and social drivers of building form (cross-ventilation, daylight, spaciousness and privacy) and economic drivers in the overall property-development value profile of tall apartment buildings in the subtropical city. The approach that encloses a large number of small apartments in an "efficient" glass façade may be economical to build, due to its minimum façade-to-volume ratio, and maximum net-to-gross salable area (see Table 1 for SA/Vol and FAR metrics). But this approach creates dwellings that make few concessions to subtropical residents' home-based lifestyle preferences. Similarly, the drive for yield increases the spatial requirements for on-site waste collection and parking management modes that

“Where design documents indicated external ‘shading,’ it appeared to be designed for cosmetic rather than climatic reasons – adornment that provided little functional shade and lacked adjustability for changing seasonal needs.”

Case	Building Height (stories)	Typical Dwelling	FECA (m ²)	External Wall Area (m ²)	WTF Ratio	Glazing Area (m ²)	Total Openable Area (m ²)
Minimum Case 15	30	1B/1Ba 2B/2Ba	50 81	6.9 8.7	0.13 0.10	6.9 8.7	6 6
Median Case 16	18	1B/1Ba 2B/1Ba	92 107	37.8 53.7	0.41 0.50	7 26	5 13
Maximum Case 4	5	1B/1Ba 2B/2Ba	52 74	49 58	0.94 0.78	10 18	5 5

Key: B = Bedroom, Ba = Bathroom, FECA = Fully Enclosed Covered Area, WTF = External Wall-to-Internal-Floor-area ratio

Table 3. Climatic-design profiles of typical dwellings, with minimum and maximum wall-to-floor-area ratios identified.

expand to the lot boundaries at the expense of subtropical vegetation. Together, these factors may actually represent poor investment decisions, where unviable propositions are compensated for by submitting applications for over-development. Such applications and subsequent approvals are not helping sustainable subtropical planning objectives and long-term livability for residents of the city.

The next move

In order to realize long-term benefits for the city and foster well-designed urban apartment buildings that contribute public amenity to subtropical streetscapes, it will be necessary to simplify and strengthen the extremely detailed MDC by clearly signaling and prioritizing essential design characteristics for site and built form. Two major challenges will be resolving perennial tensions between so-called “cost-effectiveness” and climate-effectiveness, and re-thinking the role of outmoded urban systems that have a detrimental effect on the

city’s streetscapes. If Brisbane can operationalize its vision based on livability goals, and resolve these conundrums, it can produce the next big move that shifts subtropical apartment development away from energy-intensive, generic design towards more locally-responsive outcomes, and can lead the way in realizing place-based 21st-century living. ■

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Unless otherwise noted, all photography credits in this paper are to the author.

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