

SALE OF WHITE SITE AT JURONG LAKE DISTRICT LAND PARCEL AT TOWN HALL LINK

TECHNICAL CONDITIONS OF TENDER

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1.0 GENERAL

- 1.1 The Urban Redevelopment Authority (“the Authority”), acting as agent for and on behalf of the Government of the Republic of Singapore (“the Government”), is inviting offers for lease by tender for the Land Parcel at Town Hall Link in Jurong Lake District (“the Land Parcel”) for an integrated mixed-use development.
- 1.2 The lease and development of the Land Parcel is subject to these Technical Conditions of Tender and the Conditions of Tender contained in the eDeveloper’s Packet. In these Technical Conditions of Tender, where the context so admits, the expression “the Authority” includes the Government.
- 1.3 The Successful Tenderer shall in addition to the Conditions of Tender observe and comply with these Technical Conditions of Tender. The Conditions of Tender and these Technical Conditions of Tender are to be read together with the Control Plans and the Conditions and Requirements of Relevant Competent Authorities and Public Utilities Licensees supplied in the eDeveloper’s Packet.

2.0 INTRODUCTION TO THE SITE AND ITS URBAN CONTEXT

2.1 Jurong Lake District, Singapore’s Next Largest Business District

- 2.1.1 Jurong Lake District (JLD) is a 410-hectare new growth area located in the west of Singapore. The district is envisioned as the largest mixed-use business district outside the city centre¹, a model for urban sustainability and innovation, and a place to grow businesses, homes, and communities by Jurong Lake and Jurong Lake Gardens, our third national gardens. The district will serve as a place to redefine live, work, play and learn, and an opportunity for companies to build high quality offices, grow brand-new campuses and scale up easily.
- 2.1.2 The area around Jurong East MRT Interchange station today comprises a mix of offices, retail, residential and institutional uses². Over the next few years, new projects will further enhance the vibrancy of JLD. These include the completion of the new Science Centre and Jurong Gateway Hub – an integrated transport hub next to Jurong East MRT Station, incorporating a bus interchange, library, community club, sports facilities, offices and shops. Some agencies are also currently studying plans to move their offices to the district to support the decentralisation effort.

¹ When fully developed in the next 30 years, JLD will have a total Gross Floor Area (GFA) of more than 5.8 million sqm, comprising 1.4 million sqm of Office spaces, 0.9 million sqm of Business Park spaces, more than 20,000 new homes and 1.2 million sqm of complementary uses such as Retail, Restaurants, Hotel, Civic & Community Institution, Leisure, Sports & Recreation, and other uses.

² There are approximately 185,000 sqm of office space and 2,000 homes in JLD today. Around Jurong East MRT Interchange station, residences at J-Gateway and J’den (under construction) and offices at JEM, Westgate, Vision Exchange, The JTC Summit and Jurong Gateway Hub (under construction) connect seamlessly to popular retail malls and major transport nodes. The Devan Nair Institute for Employment and Employability offers programmes for continuous learning and Ng Teng Fong General Hospital and Jurong Community Hospital serve the community’s healthcare needs.

2.1.3 To further advance the development of JLD, the vacant land south of Jurong East MRT interchange station, between Jurong Town Hall Road and Ayer Rajah Expressway, will be developed progressively over the next 20 to 30 years. The new precinct is zoned 'White' to provide greater flexibility for developers to introduce a mix of offices, housing, retail, hotel, entertainment and other complementary amenities, experiment with new development concepts, typologies and ways to better integrate live, work and play, and for companies to locate all their activities and teams in one place, within a car-lite and park-like setting. The precinct will be connected seamlessly back to the existing commercial centre and Jurong East MRT Interchange station via a new road network and a series of at-grade, elevated and underground pedestrian links.

2.1.4 The Government will spearhead the development of this area by undertaking major infrastructure works to prepare the land south of Jurong Town Hall Road for the development of a new precinct. These include undertaking the demolition of state properties, construction of road and sewer works (e.g. expunction of part of Science Centre Road, construction of N1 and N3 roads) as well as diversion of services and utilities (e.g. gas pipes, electrical and telecommunication cables). URA will also undertake the construction of a Common Services Tunnel (CST) which will house essential district-level infrastructure (e.g. district cooling and district pneumatic waste conveyance system pipes) and ensure that cleaner and more efficient urban solutions are in place to serve future developments in the new precinct. The new infrastructure will also provide capacity for expansion to meet the changing utility needs of businesses and communities.

2.2 **A Dynamic Ecosystem to Grow Businesses**

2.2.1 JLD is situated near more than 3,000 multinational companies clustered in the nearby International Business Park, Jurong Innovation District (an advanced manufacturing hub), Jurong and Tuas Industrial Estates, and Tuas Port. Companies that take up office spaces in the Land Parcel can tap on the large talent pool from the many tertiary institutions and research hubs in the vicinity such as Nanyang Technological University, National University of Singapore, one-north and the Science Parks. It will also be an ideal location for companies to set up their bases to provide business and professional services to high-value industries (e.g. advanced manufacturing, biomedical, chemicals and energy, clean tech, logistics, transport, maritime, engineering, IT etc.) in Jurong and Tuas. With over a million residents in the West region, companies will also be able to gain ready access to a large pool of talent and workers, and customers from the surrounding towns of Clementi, Bukit Batok, Jurong East, Jurong West and Tengah.

2.2.2 To build on this dynamic business ecosystem, JLD will be the focus of new office developments in the next 10 to 15 years to support decentralisation and new economic growth. As the district grows, an ecosystem of innovation, collaboration and synergy within the region will emerge.

2.3 Fast Connections to Major Hubs

- 2.3.1 JLD is a major transport hub today. It enjoys excellent rail connectivity with the existing North-South and East-West MRT lines and is well-served by the Ayer Rajah Expressway (AYE) and Pan-Island Expressway (PIE).
- 2.3.2 To drive the development of JLD and make it more attractive to businesses, workers and residents, the Government has invested significantly in key rail infrastructure with the addition of two new MRT lines - Jurong Region Line (JRL) and Cross Island Line (CRL) to be operational by 2028 and 2032 respectively.
- 2.3.3 The JRL will link JLD to academic expertise, R&D and skilled talents at Nanyang Technological University, Jurong Innovation District and Jurong Industrial Estate, where many high-value industries are located, while CRL will connect major business hubs and developments in the western, central, north-eastern, and eastern corridors. These two new MRT lines, together with the existing North-South and East-West lines, will significantly boost rail network resilience and JLD's connectivity within the west region and to the rest of the island, including the city centre and upcoming Changi Airport Terminal 5. The CRL will save commuters about 20 minutes of travel time between JLD and Pasir Ris Central as compared to today. Construction works to extend the CRL further west from JLD to improve its public transport connectivity to the Jurong and Tuas industrial areas is slated to start in 2027. In addition, LTA has announced plans for the West Coast Extension, which will extend the JRL to connect to the CRL at the West Coast station by the late 2030s, and the Circle Line at Kent Ridge station by the early 2040s, reducing journey time between the West region and the city centre by up to 20 minutes.
- 2.3.4 The 3.7ha White site at Town Hall Link (Land Parcel) sits strategically at the confluence of all four MRT lines, with direct elevated/at-grade sheltered pedestrian connection to the Jurong East MRT Interchange station (3 MRT lines) and direct underground pedestrian connection to the upcoming CR19 Cross Island Line MRT station (1 MRT line).

2.4 Convenient City Living in 10-Minute Neighbourhoods

- 2.4.1 JLD will be made up of neighbourhoods where amenities, green spaces and public transport nodes will be within a 10-minute reach by walking, cycling and public transport. A comprehensive network of elevated, at-grade and underground pedestrian links will also be constructed, along with covered walkways/linkways, connecting all the developments to the public transport nodes. This will allow for seamless first- and last-mile connectivity and make travelling within, and in and out of the district convenient and enjoyable.
- 2.4.2 New and inspiring urban campuses will seamlessly integrate with parks, cafes, restaurants, attractions, recreation, healthcare and schools, and house businesses

and residential communities where people meet and interact in lushly planted courtyards, convivial plazas and intimate public spaces.

2.5 A District of Gardens and Waterbodies

- 2.5.1 More than 40% of the district's land-take is set aside for parks, greenery and waterbodies, connected to more than 10 kilometres of active waterfront promenade. JLD's streets will be lined with canopy trees, forming green corridors that provide shade while acting as Nature Ways for wildlife. Rain gardens promote climate resilience by cleansing urban runoff before channelling stormwater to roadside drains and Jurong Lake. A central green spine will link all neighbourhoods to the edge of Jurong Lake, drawing in parks and greenery to cool the urban spaces.

2.6 Signature Attractions Around Jurong Lake

- 2.6.1 Unique attractions will surround Jurong Lake, adding to the variety of recreation and water activities around the lake. Lakeside Garden and the revamped Chinese and Japanese Gardens of the 90-ha Jurong Lake Gardens (Singapore's third national gardens) were opened in 2019 and September 2024 respectively. The new Science Centre³, when completed around 2027, and a future tourism development, will line the waterfront with exciting educational, leisure and entertainment offerings.
- 2.6.2 Located within the district are two distinctive landmarks. The Jurong Town Hall is a gazetted National Monument that sits on a hillock and is symbolic of the success of Singapore's industrialisation programme in Jurong. Next to Jurong Lake, the Singapore Science Centre is a significant place of social memory for all Singaporeans, especially in the promotion of scientific and technological education. These two landmarks will be retained and adaptively reused. They could become centres for co-working, innovation, museums, art studios, theatres, event grounds and playscapes with open spaces for the community to enjoy. They will also be physically and visually integrated via a view corridor and public thoroughfare lined with activity-generating uses, which will also extend through the Land Parcel. The buildings serve as important anchors to celebrate the district's history and create a strong sense of place for the community.

2.7 A Model Sustainable District, Primed for the Green Economy

- 2.7.1 JLD will serve as a model district that promotes urban sustainability and a healthy living environment for residents, workers, and visitors, with six key pillars

³ Designed by Zaha Hadid Architects in collaboration with Architects 61, the new Science Centre will be Singapore's biggest living lab to showcase real-world applications of science and technology. Its facilities, programmes and lush lakeside location will create an immersive learning experience in a one-of-a-kind space for visitors, workers and residents in Jurong Lake District

encapsulating JLD's ambitions: (1) Achieving net zero emissions, (2) Towards zero waste, (3) Pursuing sustainable transport, (4) Enabling healthy living, (5) Building a city in nature and (6) Advancing sustainability through partnership and innovation.

- 2.7.2 In line with JLD's sustainability positioning, the Government hopes to attract companies that are interested to develop sustainability solutions and capabilities, and/or identify with the sustainability branding, to site their corporate offices and research facilities in JLD. This will support the district's sustainability agenda and the growth of the sustainability economic sector under the Singapore Green Plan. It is envisioned that JLD will complement the CBD by providing high quality office spaces for sectors such as professional services, engineering and architecture, infrastructure and building construction, maritime services, technology, e-commerce, wholesale trade, among others.
- 2.7.3 JLD is currently home to the offices of government agencies, such as JTC Corporation, Building and Construction Authority and Singapore Food Agency. Other government agencies leading Singapore's sustainability, environmental, and transport strategies are also studying plans to relocate to JLD, attesting to the Government's commitment to making the district a demonstration for sustainable growth.

2.8 Achieving 'Net Zero' Emissions and Towards Zero Waste

- 2.8.1 As part of Singapore's national climate ambitions, JLD aims to lead the way by achieving net zero emissions for new developments by 2045, ahead of the national target in 2050.
- 2.8.2 All new developments (including residential developments) in JLD will be required to minimally achieve BCA's Green Mark Platinum Super Low Energy (SLE) rating. Where feasible, new developments should aim to achieve Zero Energy Rating as new technologies and systems evolve over time. All new Government Land Sales (GLS) developments in JLD, including the Land Parcel, will also be required to achieve the Maintainability, Whole Life Carbon and Intelligence Green Mark 2021 Badges, beyond the legislated minimum requirements. Solar energy deployment will be optimised on all suitable building surfaces within the district, not only on rooftops and building facades, but also on vacant land within the district, as a transitory measure to offset the district's emissions while the national grid is being decarbonised over time.
- 2.8.3 All new developments within the area will be served by a District Cooling System (DCS), an area-wide network where chilled water for air-conditioning is supplied from one or more centralized chilled water plants through a network of piping to buildings in the area. The DCS eliminates the need for standalone In-Building Chiller Plants (IBCP) for individual buildings, reaping benefits such as enhanced energy savings,

lowered lifecycle costs and reduced carbon emissions and lowers the overall Urban Heat Island effect in the district.

- 2.8.4 A District Pneumatic Waste Conveyance System (DPWCS) will also be implemented to enable waste management activities to be carried out with reduced manpower, fewer truck trips, lesser numbers of individual bin centres and contribute to an overall improvement in urban environmental quality. MSE has given public notice that future developments in the new precinct south of Jurong Town Hall Road will be included within a DPWCS area. NEA will separately call for a tender to appoint a DPWCS operator, and DPWCS requirements for the Land Parcel will be progressively updated in due course.
- 2.8.5 The Land Parcel, as the first development to kickstart the next phase of growth in the new precinct in JLD, will integrate and house the DCS Plant and DPWCS Central Station.

2.9 Pursuing Sustainable Transport

- 2.9.1 JLD is gazetted as a Zone 4 car-lite area. To achieve our sustainable vision and to support greener mobility in JLD, at least 85% of all trips are targeted to be made by Walk, Cycle, Ride modes of transport by 2035. Key roads will be designed as Transit Priority Corridors, with bus-only usage lanes, wider footpaths and dedicated cycling paths on both sides of all roads.
- 2.9.2 Car parking provisions will also be lowered to reduce traffic in the district and create a people-friendly environment. Pick-up / drop-off locations, service areas and loading / unloading bays are located underground to free up the 1st storey for pedestrian use. Inter-connected basements will allow service vehicles to move between developments without contributing to street traffic. To encourage the electrification of private vehicles, Electric Vehicle (EV) charging points will be progressively deployed across the district. The bus fleet serving JLD will run on cleaner fuel, including fully electric buses that would be deployed on feeder services by 2030.

2.10 Enabling Healthy Living & Building a City in Nature

- 2.10.1 Apart from setting aside more than 100 hectares of land in JLD for parks and green spaces, all new developments will be required to achieve 100% landscape replacement, where greenery lost through development will be fully replaced by vertical greenery, sky terraces and landscaping.
- 2.10.2 Thermal comfort, wind flow and shade analyses will be conducted at the development design phase to combat the Urban Heat Island (UHI) effect, reduce energy consumption for cooling and create a comfortable indoor and outdoor environment for occupants.

2.11 The Next Strategic Move

- 2.11.1 Located within the heart of the new precinct and with a direct underground pedestrian link to the upcoming CR19 Cross Island Line MRT station and an elevated/at-grade sheltered pedestrian connection to the existing Jurong East MRT interchange station, the 3.7-hectare Land Parcel offers a unique opportunity to create a distinctive mixed-use landmark development. Providing a critical mass of new offices, homes and amenities, the development will catalyse the next phase of development for JLD and set the direction for the new precinct. The development is to be well-designed, featuring outstanding architecture that can also help achieve JLD's sustainability and net zero ambitions.

2.12 Jurong Lake District Planning and Urban Design Guide

- 2.12.1 The Jurong Lake District Planning and Urban Design Guide (<https://www.jld.gov.sg/events-and-resources/publications/jld-pud-guide/>) presents the planning and urban design considerations for Jurong Lake District to help guide its future developments. The Guide aims to visually communicate the desired outcomes of the planning and urban design objectives, and the principles behind the design requirements from planning to implementation details. It should be read in conjunction with the land sales requirements and conditions for specific sites and developments within the district.

3.0 SUMMARY OF PLANNING AND URBAN DESIGN REQUIREMENTS

- 3.1 The Successful Tenderer is required to comply with the following planning and urban design requirements for the proposed development on the Land Parcel. These aim to achieve a high quality and well-designed development that relates to the surrounding context and realise the planning intentions envisaged for the site.
- 3.2 A summary of the planning and urban design requirements for the proposed development on the Land Parcel is set out in Table 1 and the accompanying Control Plans. The details are set out in Parts IV, V and VI.

Table 1 – Summary of Planning & Urban Design Requirements for the Development on the Land Parcel

PARAMETERS	PROVISIONS / REQUIREMENTS
Site Area ⁴	Plot 1: 37,227.7sqm (Main Land Parcel) Plot AS1: 1,449.4 sqm ⁵ (air space stratum over Jurong Town Hall Road) <u>Optional:</u> Plot SS1: 3,251.3 sqm ⁶ (subterranean stratum under N2 Road)
Land Use and Permissible Gross Floor Area (GFA)	Land Use: White <u>Overall</u> Maximum permissible GFA: 186,139 sqm Minimum permissible GFA: 167,526 sqm <u>Office use</u> The GFA for office use shall not be less than 40,000 sqm. <u>Residential use</u> Residential use for the proposed development shall be for flats and/or serviced apartments. The total GFA for residential use shall not exceed 126,000 sqm, out of which the total GFA for flats shall not exceed

⁴ Subject to cadastral survey.

⁵ The stratum of air space shall be subject to the final design as approved by the Authority and cadastral survey by the Successful Tenderer.

⁶ The stratum of subterranean space shall be subject to the final design as approved by the Authority and cadastral survey by the Successful Tenderer.

	102,000 sqm and the total GFA for serviced apartments shall not exceed 24,000sqm. <u>Retail use</u> The total GFA for retail use (being uses for shop, food and beverage, entertainment and outdoor refreshment areas (as permitted by the Competent Authority under the Planning Act) shall not be less than 20,000 sqm and shall not exceed 44,000 sqm, out of which: a) Minimum 1,000 sqm shall be for Supermarket use; and b) Minimum 1,000 sqm shall be for Food Court use <u>Other uses</u> The total GFA for Early Childhood Development Centre use shall not be less than 800 sqm. The remaining GFA shall be for White use (e.g. additional Office, Hotel, Sports & Recreation, Civic and Community Institution use, Medical Clinics, Attractions use) if permitted by the Competent Authority under the Planning Act. The detailed requirements are as set out in Part IV (Conditions 4.2, 4.6, 4.7 and 5.1).
Strata Subdivision	Where any GFA for office use within the proposed development is proposed to be strata subdivided, each strata lot for office use ('Office Strata Lot') shall have a minimum GFA of 20,000 sqm. The whole of the Development, excluding any GFA for office (whether comprised in an Office Strata Lot or otherwise), the flats, serviced apartment and hotel uses, areas for common facilities and services within the proposed development shall be in no more than two strata lots. All publicly accessible areas, public plazas, elevated pedestrian links and underground pedestrian links, as well as the District Cooling Plant (DCP) Spaces and the Common Services Tunnel (CST) and CST associated works shall be either in:- - An Office Strata Lot; or

	- a strata lot with a minimum Retail GFA of 20,000 sqm The detailed requirements are as set out in Part IV (Condition 4.3).
Building Height	The proposed development is subject to the following specific building height controls: Low-Rise Zone: Maximum 60.0m SHD View Corridor Low-Rise Zone: Maximum 23.0m SHD Wind-Corridor Low-Rise Zone: Maximum of 6 storeys High-Rise Zone: Subject to technical height control of 140.0m SHD The detailed requirements are set out in Part IV (Condition 4.10) and as shown on the Control Plans.
Common Services Tunnel (CST)	The Successful Tenderer is required to construct and provide the Common Services Tunnel (CST) Link Chamber and Ancillary Facilities to be integrated within the proposed development. The GFA for the CST Ventilation Shaft cum entrance/ exit structure, Facilities Control Centre and a CST 22KV Electrical substation and any other ancillary structure within the Land Parcel shall form part of maximum permissible GFA of 186,139 sqm for the Land Parcel. The Successful Tenderer shall fit-out and commission part of the proposed CST structure⁷ connecting the Land Parcel to the future Development west of N1 road (refer to Control Plan - Underground Infrastructure Works Plan for the indicative location). The technical requirements are as set out in Part IV (Condition 4.2), Part V (Condition 5.1) and as shown on the Control Plans.
District Cooling System (DCS)	The Successful Tenderer is required to construct and provide for the District Cooling Plant (DCP) Spaces (allowed above and beyond the maximum permissible GFA for the

⁷ Estimated to be implemented by URA by 4Q2030

	Land Parcel) which shall be well integrated with the proposed development. The DCP Spaces will be computed as Utility GFA. The GFA for the DCP Spaces is estimated to be approximately 8,000 to 10,000 sqm, and of which the DCS pipe corridors is estimated to take up about a third of this space. The GFA for the DCP Spaces, allowed over and above the maximum permissible GFA of 186,139 sqm for the Land Parcel, is to be determined by the Successful Tenderer and subject to the approval of the Authority. The Successful Tenderer is required to work with Keppel DHCS Pte Ltd on the suitable corridors for the laying of the DCS pipes, with reference to the Control Plans - Infrastructure Plan: District Cooling System. The Successful Tenderer can plan to lay the DCS pipes within the basement carpark or within the basement spaces contiguous with the basement carparks or within the ceiling spaces of the Underground Pedestrian Linkways (UPL) and Elevated Pedestrian Link-bridges (EPL). DCS pipe corridor spaces, being M&E spaces, may be considered for GFA exemption subject to prevailing Development Control Guidelines. The abovementioned GFA figures for the DCP Spaces stipulated are thus indicative only and the actual GFA required is subject to the final laying of the DCS pipes. The Successful Tenderer is required to provide and construct the spaces for the DCS Plant which includes the thermal energy storage (TES) tanks, cooling towers, electrical substation as well as provide for suitable DCS corridors for the laying of the DCS pipe network. The details are as set out in Part IV (Condition 4.2), Part V (Condition 5.3) and as shown on the Control Plans.
District Pneumatic Waste Conveyance System (DPWCS)	The Successful Tenderer is required to construct and provide for the DPWCS Spaces for housing, installation and operation of an underground DPWCS Central Station. The DPWCS Spaces shall be well-integrated with the proposed development and its GFA shall be excluded from the maximum permissible GFA for the Land Parcel. The

	DPWCS spaces will be handed over to NEA for ownership and maintenance. The details are as set out in Part IV (Condition 4.3), Part V (Condition 5.2) and Section 9.0 of the Conditions and Requirements of the Relevant Competent Authorities and Public Utility Licensees.
Fitting out of Underground Pedestrian Link (UPL)	The Successful Tenderer is required to fit-out the sealed Underground Pedestrian Link (UPL) space connecting the Land Parcel to the CR19 Cross Island Line station to render the UPL functional and ready for operation (shell structures of the UPL will be built by LTA as a sealed space envisaged with pop-up structures). The detailed requirements are as set out in Part IV (Condition 4.17).
Sustainability, Green Mark Scheme, Digitalisation and Productivity	The proposed development shall minimally achieve the Building and Construction Authority (BCA)'s Green Mark rating of Platinum Super Low Energy (SLE), as well as the Maintainability, Whole Life Carbon and Intelligence Green Mark Badges. The Successful Tenderer is strongly encouraged to improve building energy efficiency beyond the SLE requirements, and achieve Zero Energy rating for some, if not all, of the buildings within the proposed development. The details are as set out in Part IV (Condition 4.23), Part VII and in BCA's requirements under Section 10.0 of the Conditions and Requirements of Relevant Competent Authorities and Public Utility Licensees.
Vehicle Lite Environment	In line with the sustainable vision of JLD, the Successful Tenderer shall holistically plan and design the proposed development with infrastructure provisions and accompanying operational plans/measures to create a vehicle-lite environment that extends to its immediate vicinity. The following aspects (not exhaustive) shall be considered: car parking, pick-up / drop-off, business-to-business loading / unloading, business-to-consumer deliveries (e.g., food, courier, postal), and Walk, Cycle, Ride (WCR) initiatives.

	As part of the Walk, Cycle, Ride (WCR) initiative, the Successful Tenderer shall develop a proposal that promotes a good walking and cycling environment as well as the use of more sustainable transport modes and services that considers comfortable, convenient and direct commuter connectivity and accessibility to the larger public transport network (both existing and future planned).
Design Advisory Panel	The development proposal will be reviewed by a Design Advisory Panel (DAP) as part of the formal Development Control submission process in relation to the application and grant of Planning Permission. The details are as set out in Part VII.

4.0 PLANNING AND URBAN DESIGN REQUIREMENTS

4.1 General

- 4.1.1 The Planning and Urban Design Requirements as set out in Part IV are to be read in conjunction with the Control Plans and the Conditions and Requirements of Relevant Competent Authorities and Public Utility Licensees provided in the eDeveloper's Packet.

Development Control

- 4.1.2 The Successful Tenderer shall comply with the Development Control (DC) Guidelines issued or may be issued by the Competent Authority under the Planning Act 1998, unless otherwise stated in the Technical Conditions of Tender.

Access into State Land

- 4.1.3 For the purpose of entering State Land to do any works for the purpose of or in relation to the proposed development as may be required under these present Technical Conditions of Tender or Conditions of Tender, the Successful Tenderer shall obtain a Temporary Occupation License (TOL) from the Singapore Land Authority (SLA) for use of the State Land. The TOL may be granted on such terms and conditions and subject to the payment of such charges and fees as the SLA may determine.

Existing Underground Structures

- 4.1.4 The Successful Tenderer shall be responsible, at his own cost and expense, to carry out his own site investigation to verify whether there are any sub-structure or other obstructions, e.g. footings, piles, tree roots, etc. in the ground of the Land Parcel, and ascertain their effect on the proposed development, including the removal of such sub-structure or obstructions, if necessary.

Deviations from Planning Requirements

- 4.1.5 The Planning and Urban Design requirements set out in this Part relating to location, height, size, area or extent of uses, etc. are specified with a view to achieving the relevant planning objectives as outlined or indicated in the provisions in this Part. The Successful Tenderer may submit for the Authority's consideration alternative proposal to any such requirements. Where the Authority is satisfied that the alternative proposal will serve to achieve the planning objective relevant to the requirement, the Successful Tenderer may be allowed to adopt such alternative proposal instead; in which event the relevant provisions in this Part shall be deemed to be complied with. The Authority however reserves the absolute discretion to decide whether to allow any alternative proposal to be adopted.

4.2 Land Use and Quantum

- 4.2.1 The Land Parcel is zoned for White use and shall be developed as an integrated mixed-use development with complementary and supporting uses that will contribute towards creating an attractive development and add vibrancy to the area. The proposed development shall also be well-integrated with the Common Services Tunnel (CST) Ancillary Facilities, District Cooling Plant (DCP) Spaces and District Pneumatic Waste Conveyance System (DPWCS) Central Station.
- 4.2.2 The total Gross Floor Area (GFA) for the proposed development excluding the DPWCS Space and DCP Spaces shall not exceed 186,139 sqm and shall not be less than 167,526 sqm.
- 4.2.3 The total GFA for office use shall not be less than 40,000 sqm.
- 4.2.4 The total GFA for retail use (being uses for shop, food and beverage, entertainment and outdoor refreshment areas, as permitted by the Competent Authority under the Planning Act) shall not be less than 20,000 sqm and shall not exceed 44,000 sqm ('Retail GFA'), out of which:
- a) a total gross floor area of not less than 1,000 sqm of the Retail GFA shall be for use as a supermarket; and
 - b) a total gross floor area of not less than 1,000 sqm of the Retail GFA shall be for use as a food court.
- 4.2.5 The total GFA for residential use shall not exceed 126,000 sqm, out of which:
- a) the total GFA for flats use shall not exceed 102,000 sqm;
 - b) the total GFA for use as serviced apartments shall not exceed 24,000 sqm.
- 4.2.6 The total GFA for use as an early childhood development centre shall not be less than 800 sqm.
- 4.2.7 Commercial uses that may result in dis-amenity to residents of the proposed development and surrounding developments, such as night club, bar/pub, massage establishment, amusement centre and any live entertainment uses etc. shall be subject to the evaluation and approval by the Authority at the formal submission stage.
- 4.2.8 Any additional GFA, over and above the maximum permissible GFA specified for the proposed development and accrued from incentive GFA schemes will be subject to the prevailing Development Control Guidelines and the approval of the Competent Authority under the Planning Act. This additional GFA may be subject to the payment of Land Betterment Charge, if applicable.

- 4.2.9 All tenderers are advised to carry out their own simulation studies to ascertain the achievable GFA for the development, particularly if any additional GFA allowable under the prevailing Development Control Guidelines is included in the development. These simulation studies should take into account all relevant considerations, including the building height controls and existing ground conditions of the Land Parcel as well as the possible need to provide basements.

Common Services Tunnel (CST)

- 4.2.10 The Successful Tenderer is required to provide and construct the Common Services Tunnel (CST) Link Chamber and Ancillary Facilities including but not limited to Ventilation Shaft cum entrance/exit structure, Facilities Control Centre (FCC) and a CST 22KV Electrical substation in accordance with Condition 5.1 as well as to fit out and commission part of the CST tunnel as shown in the Control Plan. The CST Ventilation Shaft cum entrance/ exit structure, FCC and a CST 22KV Electrical substation shall be well-integrated together with the Development. The GFA for the CST Ventilation Shaft cum entrance/ exit structure, FCC and a CST 22KV Electrical substation is to be determined together with the Development by the Successful Tenderer and form part of the maximum permissible GFA of 186,139 sqm for the Land Parcel.

District Cooling System (DCS)

- 4.2.11 The Successful Tenderer is required to provide and construct the District Cooling Plant (DCP) Spaces which shall be well-integrated in the proposed development, in accordance with Condition 5.3. The DCP Spaces will include the spaces for the District Cooling System (DCS) Plant, Thermal Energy Storage (TES), cooling tower, electrical substation as well as suitable DCS corridors for the laying of the DCS pipe network. The DCP Spaces will be computed as Utility GFA (allowed above and beyond the maximum permissible GFA of the Land Parcel). The GFA for the DCP Spaces is estimated to be approximately 8,000 to 10,000 sqm, and of which the DCS pipe corridors is estimated to take up about a third of this space.
- 4.2.12 The Successful Tenderer shall liaise and work directly with Keppel DHCS Pte Ltd to ensure that the DCS corridors for laying of the DCS pipe network within the proposed development and to serve future developments beyond the Land Parcel, will be provided for and safeguarded with reference to the Control Plans - Infrastructure Plan: District Cooling System. This is to ensure the efficient installation and operations of the DCS Plant and DCS pipe network.
- 4.2.13 The GFA for the DCP Spaces, which is allowed over and above the maximum permissible GFA is to be determined by the Successful Tenderer and subject to the approval of the Authority. The design of the DCP Spaces shall be submitted as part of the development proposal to be reviewed by the Design Advisory Panel (DAP).

- 4.2.14 The Successful Tenderer can plan to lay the DCS pipes within the basement carpark or within the basement spaces contiguous with the basement carparks or within the ceiling spaces of the Underground Pedestrian Linkways (UPL) and Elevated Pedestrian Link-bridges (EPL).
- 4.2.15 DCS pipe corridor spaces, being M&E spaces, may be considered for GFA exemption subject to prevailing Development Control Guidelines. The abovementioned GFA figures for the DCP Spaces are thus indicative only and the actual GFA required is subject to the final laying of the DCS pipes.
- 4.2.16 The design guidelines, physical dimensions, and requirements for the DCP Spaces “District Cooling System Requirements for JLD” as mentioned in Condition 5.3 of the TCOT are set out in Annex F1 below.

District Pneumatic Waste Conveyance System (DPWCS)

- 4.2.17 The Successful Tenderer shall undertake and complete the design and construction of the DPWCS Spaces for housing, installation and operation of an underground DPWCS Central Station at the location as shown on the Control Plans and in accordance with Condition 5.2, and which shall be well-integrated with the Development. The Successful Tenderer shall liaise with the National Environment Agency (NEA) and the appointed DPWCS operator to ensure that DPWCS corridors for laying of the DPWCS pipe network to serve Developments within the DPWCS Area will be provided for and safeguarded. This is to ensure the efficient installation and operations of the DPWCS Central Station and DPWCS network. The GFA for DPWCS Spaces is excluded from the maximum permissible GFA of 186,139 sqm for the Land Parcel, and the DPWCS Spaces will be handed over to State for alienation to NEA for ownership and maintenance.

4.3 Strata Sub-Division of Development

- 4.3.1 The Successful Tenderer shall ensure that for the development of the Land Parcel, where any GFA for office use within the proposed development is proposed to be strata subdivided, each strata lot for office use (‘Office Strata Lot’) shall have a minimum GFA of 20,000 sqm; and
- 4.3.2 The whole of the development, excluding the following areas, shall be comprised in no more than two strata lots:
- a) any gross floor area for office (whether comprised in an Office Strata Lot or otherwise), flat, serviced apartment and hotel uses within the proposed development; and
 - b) areas for use for common facilities and services for the proposed development referred to in Condition 4.3.5.

4.3.3 All publicly accessible areas, public plazas and elevated and underground pedestrian links as well as DCP Spaces and the CST and CST associated works within the proposed development, shall be comprised in either:

4.3.3.1 an Office Strata Lot; or

4.3.3.2 a strata lot with a minimum Retail GFA of 20,000 sqm

4.3.4 The Authority may as an exception having regard to the circumstances of the case consider and allow part or parts of the pipe network, as specified by the Authority, which is or are required for the installation and operations of the DCS Plant and forming part of the DCP Spaces to be excluded from the strata lot under Condition 4.3.3.1 or 4.3.3.2.

4.3.5 To avoid doubt, the Successful Tenderer may designate areas within the proposed development of the Land Parcel that are to be used for common facilities and services for the proposed development (e.g. bin centre, car park, driveways, fire engine access, fire command centre, electric substation, shared mechanical and electrical services) as common property for the proposed development.

4.3.6 The Successful Tenderer shall not sell or dispose of the strata lots as mentioned in Condition 4.3.2 until after expiry of five (5) years after the TOP Date of the proposed development.

4.4 Uses at First and Second Storeys

4.4.1 To contribute to the liveliness and vibrancy of the precinct at street level, Activity-Generating Uses (AGUs), such as Shops, Food and Beverage (F&B), Entertainment, Sports and Recreation (including gymnasiums and fitness centres, etc.) and other similar uses, shall be provided at the first storey of the proposed development fronting the through block links and proposed public spaces in a contiguous manner of critical mass. AGUs shall also be provided along the covered walkways of the following:

- a) Jurong Town Hall Road;
- b) S1 Road;
- c) N2 Road; and
- d) E1 Road.

4.4.2 AGUs shall be provided along N2 Road as it is envisioned to be a main pedestrian spine that is visually anchored at both ends by two iconic heritage landmarks i.e. the Jurong Town Hall National Monument and the existing Science Centre building. Outdoor Refreshment Areas (ORAs) can be located within the 7.5m setback from the line of Road Reserve of N2 Road to create an activated and pedestrian-friendly street.

4.4.3 Along the elevated pedestrian network at the second storey, AGUs shall be provided minimally on one side of the walkway.

4.4.4 The GFA for the AGUs will be computed as part of the maximum permissible GFA for the proposed development.

4.5 **Outdoor Refreshment Areas (ORAs)**

4.5.1 ORAs are allowed within the public areas and open spaces within the proposed development. These are intended to provide an opportunity for outdoor seating that forms an extension of the seating areas within a restaurant or café. Where provided, the ORAs should be located and designed so that they do not compromise pedestrian circulation. The ORAs shall be clearly defined to prevent encroachment onto the adjacent pedestrian thoroughfares – e.g. with planters or other physical markers, etc.

4.5.2 ORAs are to be computed as part of the maximum permissible GFA for the proposed development, unless otherwise permitted under prevailing bonus GFA schemes. The ORAs shall be subject to the prevailing Development Control Guidelines issued by the Competent Authority under the Planning Act. The Successful Tenderer is encouraged to incorporate spaces for ORAs at the design stage.

4.5.3 The detailed design and layout of the ORAs shall be subject to approval from the Authority and the relevant Competent Authorities. The type of structures, lightweight covers / shading devices, furniture etc., for the ORAs are to complement the design of the public areas within the proposed development and are to be of good quality and easy to maintain to ensure the structures appear presentable at all times and do not deteriorate over time. The storage of furniture and utensils, preparation of food and beverages, or location of service stations within the ORAs is not permitted.

4.6 **Early Childhood Development Centre (ECDC) Facility**

4.6.1 The Successful Tenderer shall be required to provide an Early Childhood Development Centre(s)⁸ (ECDC) with Class A licence (formerly known as infant care services) and Class B licence (formally known as childcare services) within the Land Parcel for a minimum of 10 years from the date of issuance of the ECDC licence. The ECDC is to be a minimum of 800 sqm in size and will be computed as part of the maximum permissible GFA for the proposed development. The ECDC(s) is/are to be held as part of the strata lot(s) as mentioned in Condition 4.3.3.2.

⁸ An ECDC is defined as any premises where any early childhood development service is provided or is to be provided. An ECDC service refers to the provision of care or education, or care and education, habitually of 5 or more children who are below 7 years of age, for a fee, reward or profit by a person who is not a relative or guardian of all the children. All ECDCs are required to obtain a licence under the ECDC Act and Regulations before commencing operations. There are 3 classes of licences: (i) Class A licence (formerly known as infant care services); (ii) Class B licence (formerly known as child care services); and (iii) Class C licence (formerly known as kindergarten services). Operators must indicate the class of licence(s) they are applying for according to the types of services they wish to provide or are required to provide. Please refer to ECDC Act 2017 for more details.

- 4.6.2 The ECDC shall comply with the requirements and guidelines established by the Early Childhood Development Agency (ECDA) for ECDCs. Tenderers may refer to the guideline published by ECDA “Guide and Application to Set Up an Early Childhood Development” which is found on ECDA’s website: (<http://www.ecda.gov.sg>) to understand the requirements and guidelines for ECDCs.
- 4.6.3 The Successful Tenderer must inform ECDA when the Certificate of Statutory Completion for the Development with ECDC is obtained. The Successful Tenderer is to appoint an operator to run the ECDC. The operator shall comply with requirements stipulated under the Early Childhood Development Centres Act 2017 and be licensed accordingly. The Successful Tenderer may approach ECDA should they need assistance to identify an ECDC operator.
- 4.6.4 After the initial 10-year period, owner may convert the ECDC space within the proposed development to other community uses, e.g. elder care centre, subject to the land use planning quantum controls specified in Condition 4.2 and approval of ECDA, URA and relevant agencies. In the event ECDA, URA and relevant agencies deem that the space is no longer suitable or required for other community-based uses, the space can be converted for other compatible uses, subject to the approval of the Competent Authority and the land use planning quantum controls specified in Condition 4.2.
- 4.6.5 The ECDC should preferably be located on the ground floor of the proposed development. The ECDC shall not be located at the basement nor above the 5th storey of the proposed development. The ECDC shall not be located along the road frontage and shall be located as far as possible from the main roads with sufficient space for the designated pick-up/drop-off points to be provided for the ECDC.
- 4.6.6 The ECDC is to be located near the perimeter and access points (e.g. main entrance) of the proposed development to facilitate public access. The Successful Tenderer shall provide for seamless and convenient pedestrian access from the nearest public transport node (e.g. bus stop) for parents arriving by public transport. The Successful Tenderer shall provide adequate segregation of vehicular traffic between workers, residents and the ECDC, e.g. separate lanes within the proposed development catering to office, residential and ECDC uses. The ECDC will also need to ensure sufficient queuing distance to prevent vehicular traffic tailing back to public roads.
- 4.6.7 The ECDC will need to be served by a pick-up/drop-off facility with minimal sheltered walking distance and barrier-free accessibility, especially if a shared pick-up/drop-off facility is proposed. This pick-up/drop-off facility will need to be easily accessible from the local road. All pick-up and drop-off activities of the ECDC shall not overspill to public roads or be conducted along the public roads at all times.

- 4.6.8 The ECDC will need to cater for car park provision in accordance with LTA's prevailing Range-based Parking Provision Standards for Zone 1.
- 4.6.9 Car park spaces for the ECDC shall be located as close as possible to the ECDC. Minimal sheltered walking distance with barrier-free accessibility between the ECDC and its car park spaces shall be considered. In a hub parking environment, the ECDC will need to propose for signs and measures (e.g. Car decal) to indicate that the dedicated car park spaces are serving only ECDC's allowed vehicles. The ECDC will also need to work with the car park operator to enforce these dedicated car park spaces to prevent inconvenience to ECDC's users.

4.7 Attraction Use

- 4.7.1 The inclusion of an attraction that is well-integrated together with the proposed development is welcomed. The attraction should add to Jurong Lake District's vibrancy, increase attractiveness of Singapore as a destination, and appeal to local and overseas visitors. Interested tenderers may wish to contact STB via email at stb_qsm@stb.gov.sg to further discuss potential ideas and available support .

4.8 Urban Design Approach

- 4.8.1 The Successful Tenderer shall propose a Design Concept and Public Realm proposal to be submitted at the pre-submission stage and reviewed by a Design Advisory Panel (DAP). The submission materials shall include and demonstrate how the building typologies, building form and massing, building height, building setback, building edge, as well as pedestrian network and public spaces for the proposed Development satisfies the performance criteria outlined in Conditions 4.9 to 4.32 below. The details and guidelines on the pre-submission stage are specified in Condition 7.0 and Annex E1.

4.9 Building Form / Massing

- 4.9.1 The proposed development shall be well-designed as distinctive landmarks of international standard and focal points within the future skyline profile of JLD that sets a high standard for future developments in the new precinct. The Successful Tenderer is encouraged to explore building typologies of appropriate form, massing and scale for the proposed development that would create a convivial and enriching environment for live, work and play.
- 4.9.2 When designing the proposed development, the Successful Tenderer shall reinforce the existing urban edges within the area and take into consideration the contextual relationship with the existing Jurong Gateway, Jurong Town Hall National Monument and future developments as well as the views to and from the surrounding spaces and buildings. Diversity in the built form may be achieved through maximising opportunities for views and the establishment of vistas.

- 4.9.3 Wall-like Developments should be avoided. Please refer to the circular on *Sensitive Design and Development: An Industry Guide of Good Practices to Minimise Wall-Like Developments* to avoid creating a wall-like development.
- 4.9.4 The Successful Tenderer shall adopt a courtyard or campus typology for the proposed development, with an open-to-sky public central area surrounded by the building massing at the ground level (see Figure 1).
- 4.9.5 The ground level of the proposed development shall be designed as a highly porous, fine-grain, pedestrian-friendly environment. The central courtyard shall be linked to the surrounding streets and adjacent developments via a contiguous series of open-to-sky streets, through-block links, and/or multi-volume covered pedestrian malls.
- 4.9.6 To create a high degree of visual and physical porosity on the street level, the building massing is to comprise discrete, smaller scale building blocks arranged around the central courtyard. These are to be well-articulated with a good proportion of solids (walls) and voids (fenestrations) to contribute to an animated and engaging facade fronting its public spaces and surrounding streets. Large podium-tower building forms, with the podium occupying the entirety of the site, are to be avoided.
- 4.9.7 The proposed development shall have a maximum site coverage of 80%. It is to be designed such that at least 20% of the site is open-to-sky at the ground level of the proposed development. This open-to-sky area is to be accessible and open to the public at all times.

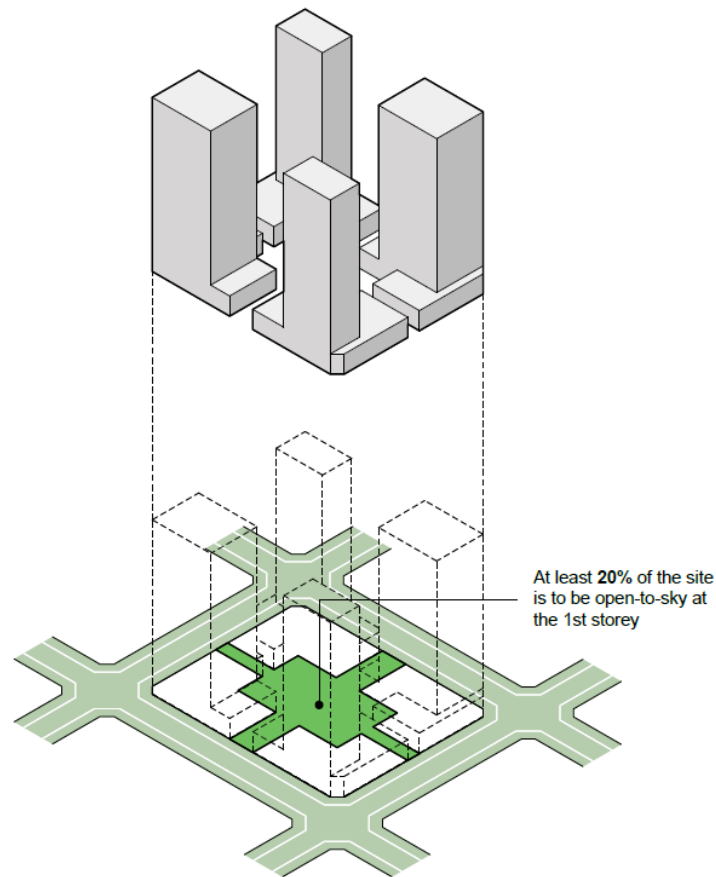


Figure 1: Courtyard typology with discrete, smaller scale building blocks, and highly porous ground level

Wind Corridor

- 4.9.8 The Successful Tenderer shall take into consideration the proposed wind corridors / low-rise zones in the design of the proposed development and explore innovative building forms, orientation, and height variations to better harness and direct the prevailing winds into the residential units and public spaces.
- 4.9.9 District-level wind flow analyses using Computational Fluid Dynamics (CFD) (see Figure 2) indicate that the provision of wind corridors throughout the district, which are aligned to predominant wind directions (North-East and South), would enhance average wind flow. As such, a low-rise zone that functions as a wind corridor is proposed across the Land Parcel. The detailed form and specifications are specified in Condition 4.10.

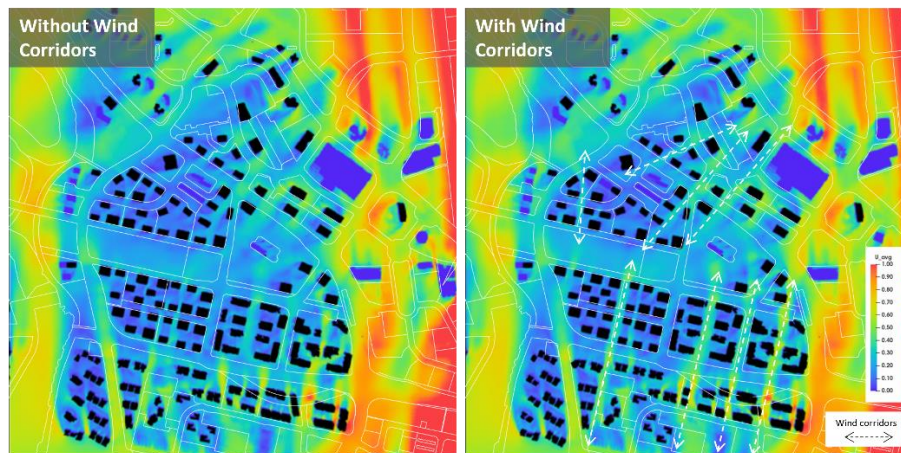


Figure 2: Normalised, cumulative average wind speed contour map for predominant North-East & South wind directions, showing enhanced wind flow through the land parcel and district with provision of wind corridors

- 4.9.10 A minimum 20m-wide low-rise wind corridor shall be proposed to be located within the 60m-wide zone as shown on the Control Plans, with the maximum allowable height set out in Condition 4.10.5. The proposed wind corridor is to be straight and oriented to the same angle as the 60m-wide zone.
- 4.9.11 However, the Successful Tenderer may consider an alternative proposal that differs from the above wind corridor. The Successful Tenderer shall conduct CFD analysis, based on the technical guidelines listed in Annex A2, and submit a report to illustrate how the alternative proposal would enhance the average wind flow throughout the district. Where the Authority is satisfied that the alternative proposal can achieve the same planning objective of enhancing wind flow throughout the district, the proposal would be allowed and the relevant provisions in this Part shall be deemed to be complied with. The Authority however, reserves the absolute discretion to decide whether to allow the alternative proposal to be adopted.

4.10 Building Height

- 4.10.1 Given the future high development intensity within JLD, there is a need to safeguard view and wind corridors within the proposed development. A set of low-rise zones with varying building height controls has therefore been specified for the Land Parcel to guide the design of the development.
- 4.10.2 The high-rise components of the proposed development are to be designed to provide variation in the profiles of the buildings and to contribute towards an attractive skyline for the district. They should be designed such that the proposed development does not appear visually congested or wall-like.
- 4.10.3 The proposed development is subject to the following building height controls below, and as shown on the Control Plans:

View Corridor Low-Rise Zone

- 4.10.4 To maintain a visual connection between the Science Centre building and the Jurong Town Hall Monument along N2 Road, the maximum allowable height of the low-rise zone within the view corridor is 23.0m Singapore Height Datum (SHD).

Wind Corridor Low-Rise Zone

- 4.10.5 The maximum allowable height within the proposed 20m-wide wind corridor is 6 storeys. Articulation of the roof area beyond this building height control can be considered, subject to evaluation and approval of the Authority.

Low-Rise Zone

- 4.10.6 The maximum allowable height of the low-rise zone along N2 Road is 60m SHD. Articulation of the roof area beyond this building height control can be considered, subject to evaluation and approval of the Authority.

High-Rise Zone

- 4.10.7 The maximum allowable height of the high-rise zone is subject to an overall technical height control of 140.0m SHD which is applicable to all permanent structures and fixtures at the roof level, such as TV antennae, water tanks, lift motor rooms, building maintenance equipment, lightning conductors, and obstacle lights.
- 4.10.8 The proposed development is to be designed to include an attractive crown to the high-rise components to contribute to the distinctive skyline of the area. The design will be subject to detailed evaluation by the Competent Authority.
- 4.10.9 All construction equipment and temporary structures, such as cranes, piling rigs, etc., as well as permanent structures, such as water tanks, mechanical and electrical (M&E) equipment, lift, motor rooms, TV antennae, etc., are subject to the maximum technical height controls of 140.0m, and shall comply with the requirements of the relevant Competent Authorities. Republic of Singapore Air Force's (RSAF) clearance shall be sought for the use of construction equipment and temporary structures above 82.0m SHD via email to: Height_Control@defence.gov.sg.

4.11 Building Platform Level

- 4.11.1 The minimum platform level for the proposed development shall comply with the requirements of the relevant Competent Authority.
- 4.11.2 Any level differences between the proposed development and public spaces or adjacent developments shall be addressed with sensitive landscape treatment.

Where possible, retaining walls should be avoided, or be well-concealed with greenery.

4.12 Building Façade / Edge

4.12.1 The facades of the proposed development fronting Jurong Town Hall Road, Town Hall Link, E1 Road, N2 Road and S1 Road shall be treated as the proposed development's main elevations.

4.12.2 The building facades of the proposed development shall be well articulated with solid (walls) / void (fenestration) areas to respond well to the tropical climate. They shall be well-integrated with greenery in the form of permanent planting or roof gardens, sky terraces and balconies. Other elements of tropical architecture such as sun-shading louvres, deep recesses, window ledges, communal planter boxes and vertical green walls shall be provided together with the proposed development and integrated with the overall building form and architectural treatment of the proposed development. Full height glass facades are not allowed. Variations in the use of materials, detailing, lighting and finishings are encouraged.

4.12.3 The Successful Tenderer shall include the following building edge requirements for the proposed development to ensure that a well-defined urban streetscape is maintained within the area, where the building edge is measured from the minimum platform level of the proposed development:

- a) A minimum 2-storey high building edge abutting the building setback lines along N2 Road and Jurong Town Hall Road;
- b) A minimum 2-storey high building edge abutting the lines of Road Reserve along E1, S1, N1 Roads, and Town Hall Link; and
- c) A party wall shall be provided along the western common boundary with the future adjacent development.

4.12.4 Up to 40% of the length of the building edge, between the two corners of a plot, can be setback from the building setback lines/ lines of Road Reserve. This will allow for articulation of the building forms.

4.13 Building Setback

4.13.1 Given that N2 Road is envisioned to be an attractive and active street with a view corridor linking the Jurong Town Hall National Monument and the existing Science Centre, the proposed development is required to be set back 7.5m from the line of the Road Reserve along N2 Road to allow for a wider pedestrian walkway, Outdoor Refreshment Areas (ORAs), and an additional row of trees to create a tree-lined boulevard.

4.13.2 The proposed development is to be set back 3.0m from the line of Road Reserve along Jurong Town Hall Road for the provision of a green buffer.

4.14 **Corner Accentuation**

4.14.1 The corners of the proposed development fronting the road junction at Jurong Town Hall Road / E1 Road, and the road junction at E1 Road / S1 Road, are encouraged to be articulated architecturally to express the strategic location of the proposed development as the “gateway” into the new precinct and address views from the key public open spaces and surrounding approaches.

4.15 **Traffic Impact Study**

4.15.1 The Successful Tenderer shall carry out a Traffic Impact Study (TIS) to guide the Qualified Person when designing the internal driveway for efficient internal vehicular circulation within the proposed development, to prevent vehicle queue from spilling onto the public roads.

Walking and Cycling Plan

4.15.2 As part of the TIS, the Successful Tenderer shall submit a Walking and Cycling Plan (WCP) to LTA and URA for approval. The purpose of the WCP is to ensure that pedestrian and cycling connectivity is well-considered and an integral part of the design of the proposed development. Direct and seamless connection to transport nodes and related facilities shall be provided for whenever possible. Details of the WCP submission can be found in LTA’s Code of Practice for Street Works Proposals relating to Development Works.

4.15.3 At the formal submission stage, the Successful Tenderer is required to provide a Walking and Cycling Network (WCN) in 3D GIS format to URA and LTA. The shape geometry, attributes fields and values are listed under Annex B.

Development Internal Layout Plan

4.15.4 As part of the TIS, the Successful Tenderer shall also submit a Development Internal Layout Plan, showing adequate and appropriate design features and transport-related facilities of the proposed development such as pick-up / drop-off points, vehicular accesses, loading and unloading bays, car parking entrance(s) and location(s), gantry position(s) etc.

4.15.5 The Successful Tenderer shall study the optimal locations for the vehicular accesses based on the internal circulation plans of the Land Parcel as part of the Traffic Impact Study (TIS) that shall be conducted, as set out in Section 7.0 of the Conditions and Requirements of Relevant Competent Authorities and Public Utility Licensees.

- 4.15.6 The detailed requirements for the TIS, WCP and Development Internal Layout Plan are as set out in Section 7.0 of the Conditions and Requirements of Relevant Competent Authorities and Public Utility Licensees.

4.16 **Pedestrian & Cycling Network**

Cycling Paths and Park Connectors

- 4.16.1 The Successful Tenderer shall, at his own cost and expense, implement the following path typologies within the Road Reserve, as shown on the Control Plans and as set out in Section 7.0 of the Conditions and Requirements of Relevant Competent Authorities and Public Utility Licensees:
- a) 2.5m-wide dedicated cycling path alongside a 2.3m footpath on both sides of N2 Road; and
 - b) 2.0m-wide dedicated cycling path alongside a 1.5m footpath on both sides of Town Hall Link;
- 4.16.2 The Successful Tenderer shall, at his own cost and expense, implement a 4.0m-wide Park Connector along Jurong Town Hall Road abutting the Land Parcel and within the Road Reserve, in tandem with the drainage upgrading works to be carried out by the Successful Tenderer. The detailed requirements are as shown on the Control Plans and as set out in Section 8.0 of the Conditions and Requirements of Relevant Competent Authorities and Public Utility Licensees.

Covered Linkways

- 4.16.3 The Successful Tenderer shall, at his own cost and expense, implement high covered linkways and covered linkways within the Road Reserve, as shown on the Control Plans and as set out in Section 7.0 of the Conditions and Requirements of Relevant Competent Authorities and Public Utility Licensees. The design and implementation details of the high covered linkways and covered linkways are subject to the approvals of the LTA, NParks and other relevant Competent Authorities or Agencies.

Pedestrian and Cyclist Access Arrangements

- 4.16.4 The Successful Tenderer shall provide pedestrian and cyclist friendly accesses to adjacent footpaths and cycling paths. It is important to ensure that visibility at these accesses is not hindered by hard structures and tall/dense vegetation to minimise any possible collisions. More details relating to design of the accesses can be found in The Code on Accessibility in the Built Environment 2025 published by the Building and Construction Authority. Details of the pedestrian access design shall be approved by LTA at detailed design stage.

Pedestrian Network and Linkages

- 4.16.5 The underground, at-grade and elevated pedestrian networks, up to the required minimum widths, and the associated dedicated vertical pedestrian circulation points and entrance/exit structures, including lifts, escalators, staircases, and any associated fire-escape staircases, are to serve as part of the overall pedestrian network for the area and may be exempted from GFA, subject to the prevailing Development Control Guidelines issued by the Competent Authority under the Planning Act. Internal circulation spaces within the proposed development which are not part of the required pedestrian network will not qualify for GFA exemption.

4.17 Underground Pedestrian Link (UPL) within the Land Parcel

Design Requirements

- 4.17.1 The Successful Tenderer shall, at their own cost and expense, provide an UPL within the Land Parcel comprising a pedestrian walkway with a minimum clear width of 5.0m, and a 4.0m wide two-way traveller corridor with a minimum 4.0m clear internal floor-to-ceiling height maintained throughout the pedestrian areas, as shown in the Control Plans.
- 4.17.2 The level of the pedestrian areas shall be maintained at a constant level throughout the entire length, wherever possible and comply with the relevant codes on barrier-free accessibility in buildings. Any changes in level shall be kept to a minimum and shall be accommodated with ramps or with two-way escalators and lifts, subject to the requirements of the Authority and the relevant Competent Authorities.
- 4.17.3 Travellers shall be provided for at least two-thirds of the length of the UPL within the Land Parcel.
- 4.17.4 The Successful Tenderer is strongly encouraged to provide public art and other forms of visual interest to create a pleasant pedestrian experience in the UPL. AGUs, such as retail, food and beverage, entertainment and other similar uses, may be provided along one side of the UPL within the Land Parcel.
- 4.17.5 Vertical circulation points to the UPL, shall be provided as shown on the Control Plans. All vertical circulation points shall be provided with two-way escalators, staircase and a pair of lifts to connect the UPL to the at-grade and elevated pedestrian network, subject to the requirements of the Authority and the relevant Competent Authorities, especially LTA. The vertical circulation points shall be integrated within the proposed development and connect directly to the at-grade covered linkways / walkways and elevated pedestrian network.

- 4.17.6 The Successful Tenderer shall, at his own cost and expense, liaise with and make all necessary arrangements with LTA to ensure that the UPL within the Land Parcel will be seamlessly connected to the future UPL towards CR19 CRL MRT Station.
- 4.17.7 The Successful Tenderer may propose to provide an elevated pedestrian network in addition to, or in lieu of the UPL within the proposed development (Condition 4.18.2), as long as it meets the intended objective and outcome of a direct, sheltered, comfortable and uninterrupted pedestrian connection. The design will be subject to detailed evaluation by the Competent Authorities.

Operation

- 4.17.8 The UPL and the associated vertical circulation points within the Land Parcel are to be maintained by the Successful Tenderer at their own cost and expense and kept open for public use during the operating hours of the RTS, without any hindrance or obstruction, to the satisfaction of the Authority and the relevant Competent Authorities. They are not to be used for commercial purposes, and no temporary or permanent structures are to be erected within these areas.

Completion Timeframe

- 4.17.9 Should the CRL open prior to the completion of the UPL within the Land Parcel, the Successful Tenderer shall build a 2.4m wide temporary covered linkway along the construction hoardings at the north boundary facing Jurong Town Hall Road and eastern boundary facing E1 road, with extensions terminating at the nearby crossings / bus stops. The Successful Tenderer shall, at his own cost and expense demolish the temporary covered linkway once the development is completed and the UPL is open for use.

4.18 At-Grade Pedestrian Network

- 4.18.1 The at-grade pedestrian network comprises covered walkways within the building envelope and covered linkways between buildings. These are to be designed seamlessly with the specifications set out below.

Covered Walkways at the First Storey

- 4.18.2 Continuous covered walkways are required at the first storey within the building envelope abutting the lines of Road Reserve and setback lines, at the following locations and as shown on the Control Plans:
- a) The covered walkways fronting Jurong Town Hall Road, E1 Road and S1 Road are to have a minimum width of 5.0m (and minimum clear width of 4.4m) and a maximum soffit height of 5.0m.

- b) The covered walkways fronting N1 Road, N2 Road and Town Hall Link are to have a minimum width of 3.6m (and minimum clear width of 3.0m) and a maximum soffit height of 3.6m.

4.18.3 Higher external soffit heights can be supported, subject to the approval of the Authority, and subject to the provision of drop-down panels along the edge of the walkways or the width of the covered walkways being increased to match the higher soffit height in order to provide adequate weather protection for pedestrians and users during inclement weather. Higher soffit heights for the covered walkways can be allowed at the location of vehicular access points to comply with LTA's minimum clearance requirements for vehicular access, and PUB's minimum clearance requirements for maintenance access.

Platform Levels

- 4.18.4 The covered walkways shall abut, open out onto and match the platform level of the open walkways within the adjacent Road Reserve, where possible. Where the platform level of the first storey of the proposed development is higher than the required level of the covered walkways, ramps and steps to connect the two levels are to be built within the first storey of the proposed development and not along the covered walkways. Where the covered walkways are intercepted by vehicular ingress / egress points, any cross ramps are to be located on either side of the pedestrian walkway area.
- 4.18.5 The covered walkways shall be at a constant level throughout the entire length with any level changes accommodated by ramps.

Paving

- 4.18.6 The covered walkways and footpaths within the Land Parcel shall be paved in predominantly 600mm x 600mm mid to dark grey granite slabs. These are to be set out perpendicular to the Road Reserves and have a coordinated paving pattern. The design, materials and finishes of the pedestrian areas are to be of high quality, good durability and easy maintenance. The paving materials are to withstand high pedestrian traffic, cycling and fire engine access where required, and have abrasive hardness suitable for outdoor use. The surface of the granite is to be resistant to discolouration and staining due to atmospheric conditions, other than normal weathering.
- 4.18.7 The paving materials can be intermixed with other materials of similar high quality and accent tiles within the tiling pattern can be considered. The tiling layout and paving pattern are to match that of the adjacent covered walkways and cycling paths. The overall tiling layout, paving pattern, design, material specifications and samples of any additional paving materials, accent tiles, water features and other street

furniture and lighting are to be subject to the approval of the Authority and the relevant Competent Authorities.

Other Requirements

- 4.18.8 The Authority and the relevant Competent Authorities will review the extent and alignment for the covered walkways at the formal submission stage, in relation to the detailed design of the Development. The covered walkways are encouraged to abut the building edge to ensure easy and seamless connection to the streets.
- 4.18.9 The at-grade pedestrian network, including covered linkways as required in Part IV and Part V, are to be completed prior to, or at the same time, as the TOP is obtained for the proposed development.
- 4.18.10 To facilitate ease of pedestrian movement and walkability, all pedestrian routes and public spaces within the proposed development, including the covered walkways / linkways, and pedestrian areas within the Road Reserve, including open walkways and paved breaks in the planting verge, shall match and be maintained at a constant platform level as much as possible, to achieve an attractive seamless and barrier-free environment at the first storey. Any level differences between the road levels and the required building platform level for the proposed development shall be mitigated within the building envelope at the first storey. Where steps are needed to mitigate the level differences, appropriate barrier-free vertical circulation facilities, such as lifts and / or ramps shall be provided to comply with the relevant codes on barrier-free access.

Through-Block Links (TBL) at the First Storey

- 4.18.11 To ensure a porous ground plane and efficient at-grade pedestrian network, the Successful Tenderer shall provide minimum 7.0m-wide (clear) through-block links within the proposed development at the following locations, as shown in the 1st Storey Control Plan, and as follows:
- a) From the junction of Jurong Town Hall Road and E1 Road to the central courtyard(s) of the Land Parcel;
 - b) From N2 Road to the central courtyard(s) of the Land Parcel;
 - c) From the junction of E1 Road and S1 Road to the central courtyard(s) of the Land Parcel;
 - d) From the future bus stop by others to the central courtyard(s) of the Land Parcel;
and
 - e) Between courtyards, if more than one courtyard is provided.

Operation

- 4.18.12 The at-grade pedestrian network is to be kept open and unobstructed for public use at all times. No commercial uses or temporary or permanent structures are allowed to be erected within the pedestrian areas.
- 4.18.13 To facilitate maintenance and management, all spaces for covered walkways and through-block links are to be held as part of the strata lot(s) as mentioned in Condition 4.3.3.

4.19 Elevated Pedestrian Network

- 4.19.1 A comprehensive Elevated Pedestrian Network (EPN) is planned in the area centred around Jurong East MRT Interchange station to provide developments within the vicinity of the MRT station with convenient all-weather connection to the MRT station and the new Jurong Lake Central mixed-use precinct. The proposed development on the Land Parcel is strategically positioned within JLD and will be a key pedestrian interchange within a seamless multi-level pedestrian network connecting Jurong East MRT Interchange station to the future CR19 CRL MRT station.

Elevated Pedestrian Links (EPL)

Design requirements

- 4.19.2 The Successful Tenderer shall, at their own cost and expense, provide elevated pedestrian links (EPL) within the proposed development with a minimum clear internal ceiling height of 4.0m and clear internal width of 9.0m, as shown in the Control Plans. The EPLs are to be adequately covered.
- 4.19.3 The Successful Tenderer shall provide associated vertical circulation points within the building envelope to connect the EPN to the covered walkway and public spaces at the 1st storey and the proposed UPL within the Land Parcel. These circulation points are to be highly visible from the covered walkway and the public spaces at the 1st storey. Each vertical circulation point shall minimally include a pair of two-way escalators, staircases and two passenger lifts.

Elevated Pedestrian Link-bridge across Jurong Town Hall Road

Design requirements

- 4.19.4 The Successful Tenderer shall, at their own cost and expense, design and construct an EPL bridge across Jurong Town Hall Road with a minimum clear internal ceiling height of 4.0m and clear internal width of 9.0m, within Plot AS1 as shown in the Control Plans. This EPL bridge shall be designed to seamlessly connect to a proposed covered linkway that will be built by LTA along Jurong East Street 12 (i.e.

along the eastern edge of the existing interim Jurong East Bus Interchange) to provide effective sheltered pedestrian connectivity to the eastern end of Jurong East MRT station via the temporary Pedestrian Overhead Bridge across Jurong Gateway Road.

- 4.19.5 The EPL bridge shall also be designed to seamlessly interface and connect to the proposed EPL within the proposed development.
- 4.19.6 The Successful Tenderer shall provide a vertical circulation point within the Road Reserve on the northern side of Jurong Town Hall Road. The vertical circulation shall be designed as a temporary structure. This vertical circulation point shall minimally include covered staircases and one passenger lift with covered lift landings at both at grade and EPL levels.
- 4.19.7 The EPL bridge and its vertical circulation points at both ends shall be open 24/7 for public use. The vertical circulation within the proposed development shall be located close to the roadside footpath for ease access of commuters/pedestrians.
- 4.19.8 The Successful Tenderer shall, at their own cost and expense, demolish the temporary vertical circulation point once the permanent vertical circulation point that will be integrated within the future development at the current interim Jurong East Bus Interchange site is completed. The temporary vertical circulation structure is to be owned and maintained by the Successful Tenderer until its demolition and reinstatement.
- 4.19.9 The proposed EPL bridge shall preferably be designed to be single span structure without structural columns within the Centre Medians of Jurong Town Hall Road. The structural columns and vertical circulations at the sidetables within the Road Reserve, shall be suitably located such that sight visibility is not affected. The structures shall also be provided with required road safety barriers like VIG, etc. where necessary. The EPL and all associated vertical circulation points shall be owned and maintained by the Successful Tenderer at his own cost and expense, including those located within Road Reserve.
- 4.19.10 The DCS pipes between the Land Parcel and the future development at the current interim Jurong East Bus Interchange will be laid via the proposed EPL bridge across Jurong Town Hall Road. The Successful Tenderer shall accommodate the loading and future installation of DCS pipes by Keppel DHCS Pte Ltd in the design of the EPL. The Successful Tenderer is to liaise with Keppel DHCS Pte Ltd on the required provisions, including the size, necessary space and access hatches for the design and implementation of the infrastructure required to support the operations and maintenance needs of the DCS. This includes making provision in the design of the EPL to ensure that the DCS pipes can be housed within the spaces for future interconnection, safeguarding of relevant DCS corridor(s) for maintenance needs and

implementing the necessary DCS Services and Structures (including but not limited to any pipes, shafts, vents, knock-out panels) as required.

Integration with Future Elevated Pedestrian Links

- 4.19.11 The Successful Tenderer is required to provide Knock-Out Panels (KOP) for elevated pedestrian connections to surrounding developments at the following locations:
- a) Minimum 9.0m-wide (clear) KOP to abut the Road Reserve Line of the future development at the existing interim Jurong East Bus Interchange site.
 - b) Minimum 6.0m-wide (clear) KOP to abut the Road Reserve Line of E1 Road to connect across E1 Road to future development at the Jurong Town Hall National Monument site.
- 4.19.12 The Successful Tenderer shall provide the KOPs with the necessary structural and design provisions within the proposed development, to seamlessly receive the future EPLs that will be constructed by the future owners of the surrounding future developments, such that they can connect to the KOP without the need for additional support and columns within Road Reserve. The loading provision shall take into account the prevailing guidelines for the future EPL such as LTA's Civil Design Criteria and BCA's building codes.
- 4.19.13 To ensure that the structural loading provision at the KOP can take the weight of the future EPL to be built by the adjacent developer, the Successful Tenderer is required to submit a notional scheme of the future EPL to be built by the adjacent developer showing the alignment and any column landing points within the setback area of the adjacent site at the formal submission stage.
- 4.19.14 The Successful Tenderer shall, without any hindrance or obstruction whatsoever, and at no cost and expense, grant the necessary access and right of way to, and be responsible for liaising with the owner(s) of adjacent developments and their appointed agents, to facilitate the construction and connection of the EPL with the adjacent developments.

Operation

- 4.19.15 The EPL and associated vertical circulation points connecting to the at-grade pedestrian network shall be kept open for public use at all times, i.e. 24/7.
- 4.19.16 To facilitate maintenance and management, all spaces for the elevated pedestrian network are to be held as part of the strata lot(s) as mentioned in Condition 4.3.3.
- 4.19.17 The prevailing Development Control Guidelines issued by the Competent Authority under the Planning Act on the GFA exemption for such linkages shall apply.

4.20 Wayfinding Signages

- 4.20.1 The Successful Tenderer is required to provide a coherent and comprehensive wayfinding system to guide the public to and from destinations, landmarks, key transportation nodes within the vicinity and towards the pedestrian and cyclist related facilities (e.g. bicycle parking) and public spaces within the proposed development. A guide for wayfinding signage and related facilities can be found in the Code of Practice for Street Works Proposals relating to Development Works or <https://www.lta.gov.sg/content/dam/ltaweb/corp/GreenTransport/2016/Guide%20for%20Wayfinding%20Signage.pdf>.
- 4.20.2 The Successful Tenderer shall comply with the J-Walk Wayfinding Signage Guidelines and submit the signage layout and design to the Authority for detailed evaluation and approval before TOP can be issued for the proposed development. The Successful Tenderer shall also obtain clearances from the LTA and other relevant Competent Authorities on all matters related to the Wayfinding system before commencing construction of the proposed development.

4.21 Public Spaces

- 4.21.1 The Successful Tenderer shall provide a network of public spaces as part of the public realm at street level. These public spaces enhance the streetscape and create an attractive and pedestrian-oriented environment. These spaces can take the form of multi-volume covered spaces to be used as public 'city-rooms' and atrium spaces, or spaces that are open-to-sky. They can be used for staging events, exhibitions or concerts, as well as provide a sense of respite amidst the dense urban environment for people to gather and interact.
- 4.21.2 The proposed public spaces shall include well-designed and integrated street furniture, signage, landscaping and provision of amenities that enhances comfort. These spaces shall also be designed to accommodate the needs of users of all age groups and mobility levels.
- 4.21.3 These public spaces shall be kept open and publicly accessible at all times. They shall be designed to be well-connected from the at-grade, elevated and underground pedestrian networks around the proposed development. No blank facades, services and other back-of-house uses shall be located along the frontages to these public spaces.
- 4.21.4 The design of these public spaces shall comply with the prevailing Design Guidelines for Privately Owned Public Spaces (POPS).
- 4.21.5 The prevailing Development Control Guidelines issued by the Competent Authority under the Planning Act regarding the exemption of covered public spaces from GFA computation will apply.

- 4.21.6 The Successful Tenderer shall provide at least one central courtyard within the proposed development with multiple connection points to adjacent streets. As part of the total area required for the POPS, the area of each central courtyard, excluding the covered/open-to-sky connections to adjacent streets, is to be at least 1,800 sqm. The central courtyard(s) shall be open-to-sky. To encourage public use throughout the day, shade can be provided by trees, canopies/pergolas, adjustable umbrellas/awnings, and/or landscape elements.
- 4.21.7 The Successful Tenderer shall provide two entrance plazas within the proposed development. The first entrance plaza is to be located at the junction of E1 Road and S1 Road. The second entrance plaza is to be located at the junction of E1 Road and Jurong Town Hall Road. The entrance plazas are to be multi-volume covered public spaces and at least 400 sqm in size. The proposed vertical circulation points to the Underground Pedestrian Link (UPL) and the Elevated Pedestrian Network shall be incorporated within the entrance plazas.

Design Requirements

- 4.21.8 The design and location of these spaces are to take into consideration the relationship of the proposed development to the surrounding context, including the overall at-grade pedestrian network and urban pattern. The spaces are to be integrated with the overall building form and architectural treatment of the proposed development and linked to the EPLs, covered and open walkways and UPLs.
- 4.21.9 To ensure that the public spaces are comfortable for use throughout the day, the Successful Tenderer needs to demonstrate using environmental modelling and analysis as set out in Condition 4.24, that the public spaces are optimally located, oriented and designed for shade, ventilation and outdoor thermal comfort in mind.
- 4.21.10 To create welcoming and attractive spaces for people to meet and gather, the public spaces are encouraged to be fronted by AGUs, including ORA, that contribute significantly to the vibrancy of the public spaces.
- 4.21.11 To maximise the sense of openness of the public spaces, any covered areas are to be column-free as far as possible, and the canopies / roofs are to be of transparent or translucent materials to allow for natural day lighting of the space. Appropriate directional and wayfinding signage is to be provided within the proposed development to facilitate easy access to and from the public spaces to the pedestrian network in the area and the key developments and public facilities, such as MRT Stations. Appropriate signage is also to be prominently displayed within the public open space to inform the public that it is open for their uses.
- 4.21.12 To facilitate maintenance and management, all public spaces are to be held as part of the single strata lot(s) as mentioned in Condition 4.3.3.

4.22 Roofscape and Screening

- 4.22.1 The roof areas of the proposed development shall be considered as the “fifth” elevation and are to be designed to be fully integrated as part of the overall building form and architectural treatment. The Successful Tenderer is strongly encouraged to design the roof areas of the proposed development as landscaped roof gardens, usable outdoor spaces, urban farms and/ or to support solar photovoltaic (PV) deployment.
- 4.22.2 They are to be designed to be fully integrated with the overall form and architectural treatment of the proposed development. The Successful Tenderer is to design the roof areas as either a distinctive crown to the building to contribute positively to the skyline profile of JLD or landscape them as a roof garden.
- 4.22.3 Where Mobile Telecomm Operator’s (MTO’s) equipment is required on the roof areas of the high-rise or low-rise components of the proposed development to serve public spaces around the development, the Successful Tenderer is to work with the MTOs to integrate equipment into the overall design of the façade and roof of the proposed development, and to use suitable materials for screening and mounting the equipment. The Successful Tenderer is to grant the MTOs installation and servicing access to the roof at no cost and at all times.
- 4.22.4 All service areas, Mechanical and Electrical (M&E) equipment, water tanks, air-con ledges, etc., are to be located within and fully integrated within the overall building envelope and visually well-screened from the top and on all sides, subject to the prevailing screening guidelines for M&E services.

4.23 Sustainability

Green Mark Scheme

- 4.23.1 The proposed development is to be designed as a class-leading sustainable Development that minimally achieves the Building and Construction Authority (BCA)’s Green Mark rating of Platinum Super Low Energy (SLE), and the Maintainability, Whole Life Carbon and Intelligence Badges.
- 4.23.2 The Successful Tenderer is strongly encouraged to improve building energy efficiency beyond the Green Mark SLE requirements, and achieve Zero Energy rating for some, if not all, of the buildings within the proposed development.

Reporting of Environmental Sustainability Data

- 4.23.3 The Successful Tenderer is encouraged to track and report the proposed development’s environmental sustainability data, including embodied carbon data

and emissions data during construction, to the Super Low Energy Building (SLEB) Smart Hub. The SLEB platform aims to foster closer collaborations among building owners and developers, contractors and consultants, green technology companies and green financiers to enable a more sustainable built environment as stated in Section 11.0 of the Conditions and Requirements of Relevant Competent Authorities and Public Utility Licensees.

- 4.23.4 The prevailing Green Mark standards and indicators may be used for measuring and reporting the environmental sustainability performance data of the buildings.

4.24 **Climate Sensitive Design**

- 4.24.1 The overall architecture shall feature sensitive and future-proofed responses the local equatorial climate and strongly supports JLD's positioning as a leading sustainability district and district of gardens and waterbodies. Well-integrated lush landscaping should be an integral part of the design to enable healthy living and building a city in nature. The Successful Tenderer shall use environmental modelling and analysis to optimise the design of the building form and massing to mitigate Urban Heat Island (UHI) effect and improve thermal comfort at key public spaces and thoroughfares (e.g. by harnessing prevailing winds and providing shading for key public spaces).
- 4.24.2 At the Pre-submission DAP stage, the Successful Tenderer is required to submit a report outlining the overall concept and design strategies to mitigate Urban Heat Island (UHI) effect and improve thermal comfort for the proposed development especially at key public spaces and thoroughfares. The report shall include details on the impact of the proposed design strategies which may be substantiated with environmental modelling and analysis where applicable.
- 4.24.3 During the formal development application stage, the Successful Tenderer is required to conduct environmental modelling and analysis and submit the results together with the modelling methodology to illustrate the design considerations and strategies for UHI mitigation and providing thermal comfort. The modelling and analysis shall include, but is not limited to, Shadow Impact, Wind Flow and Thermal Comfort analysis, based on the technical guidelines listed in Annex A2-A4, to inform and optimise the design of key public spaces and thoroughfares stated in Condition 4.21.
- 4.24.4 These requirements are aligned with BCA's Green Mark technical guidelines (under Resilience Section) for UHI mitigation measures and Outdoor Thermal Comfort (OTC). The Successful Tenderer is strongly encouraged to include the proposed UHI mitigation and OTC optimisation strategies as part of BCA's Green Mark submission.

Collection of Environmental Data in the Public Spaces

- 4.24.5 To validate the effectiveness of the design strategies implemented in mitigating UHI and improving thermal comfort, the Successful Tenderer shall work with, allow and facilitate access for URA and appointed vendors/partners to the proposed development after completion to collect key environmental data, especially for key public spaces and thoroughfares.

4.25 Greenery Replacement and Landscaping

- 4.25.1 The Successful Tenderer is to provide a distinctive, garden-like environment within the proposed development and incorporate Landscape Replacement Areas equivalent to the site area of the Land Parcel across the proposed development.
- 4.25.2 The total Landscape Replacement Areas (LRAs) for the proposed development is to be equivalent to the total site area of the proposed development, and provide a distinctive, garden-like environment. The detailed proposal shall be subject to further evaluation at the formal development application stage.
- 4.25.3 At least 40% of the LRAs are to be landscaped with permanent planting. The remaining areas can be used for hardscape uses, as outlined in the *Landscaping For Urban Spaces And High-Rises (LUSH) 3.0 Programme*, URA Circular No: DC/ADMIN/CIRCULAR/PB_17 dated 9 November 2017.
- 4.25.4 As part of the LRAs, the Successful Tenderer shall include meaningful and contiguous tree planting areas with a minimum area equivalent to 5% of the site area. These tree planting areas shall be open-to-sky, located at the ground level, publicly visible and accessible from the street. The design of these green spaces should allow sufficient sunlight for the growth of healthy trees and shrubs. The use of irrigation systems and growth lights should be minimised. Please refer to the details set out in Section 8.0 of the Conditions and Requirements of Relevant Competent Authorities and Public Utility Licensees.
- 4.25.5 The vision for the new precinct is to have a green carpet effect at key levels to create a three-dimensional landscape datum (see Figure 4). Prominent greenery shall be provided at the podium levels between the 2nd to 6th storey of the proposed development and shall include trees and shrubs planted close to the perimeter of the podium so that the greenery is visible from street level and adjacent developments. These podium roof gardens are to be connected across the various building blocks within the proposed development, to create a seamless experience of an additional green communal space above the street. Knock-out Panels shall be provided along the party wall for connection to future adjacent developments.

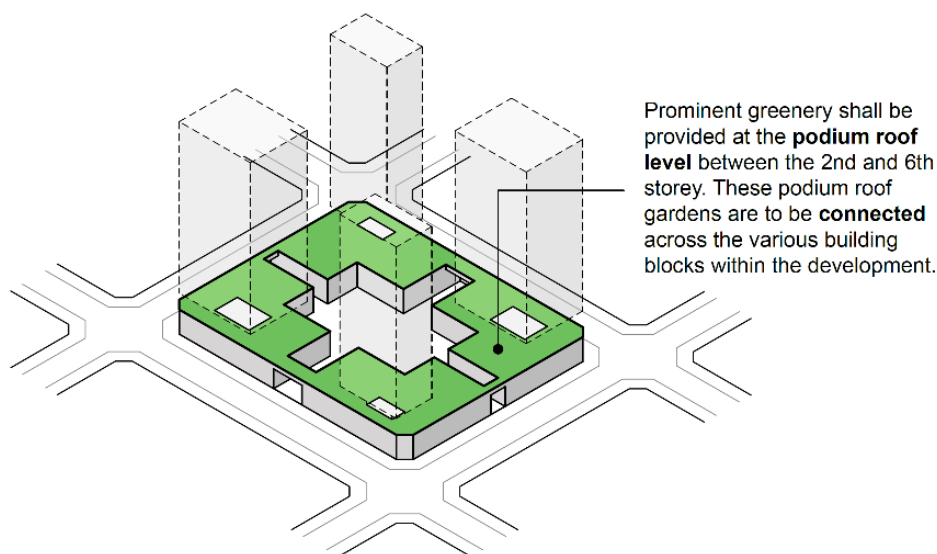


Figure 4: Green carpet effect through the provision of roof gardens at the podium levels

- 4.25.6 The Successful Tenderer is strongly encouraged to incorporate urban farming within the proposed development and/or to co-locate solar panels with greenery, as well as allow the communal rooftop gardens of the podium to be publicly accessible during the opening hours of the building.
- 4.25.7 N2 Road is envisioned as a major pedestrian promenade, a well-activated and well-shaded street, that provides unique views to visually celebrate the Jurong Town Hall National Monument and existing Science Centre building on either end. The green buffer within the proposed development along N2 Road shall be designed to allow pedestrian movements. This is to support a more porous at-grade pedestrian realm.
- 4.25.8 The existing three (3) Angsana trees in the Land Parcel, numbered 1352, 1356 and 536 in the topographical survey, shall be retained and integrated into the design of the proposed development. All development works are to comply with NParks' requirements for the retention of trees given in Section 8.0 of the Conditions and Requirements of Relevant Competent Authorities and Public Utility Licensees.
- 4.25.9 The landscaping for the proposed development shall be guided by the planting palette provided by NParks and a detailed landscaping proposal shall be submitted for approval by NParks and URA at the formal submission stage. The tree and shrub planting specifications for the planting verge within the adjacent Road Reserves are subject to URA and NParks' requirements and approval.
- 4.26 **Basement Levels / Subterranean Developments**
- 4.26.1 Basement levels and permanent subterranean structures, including the Underground Pedestrian Links (UPL), may be built up to the respective site boundaries, subject to

the prevailing Development Control Guidelines issued by the Competent Authority under the Planning Act and technical requirements of the relevant Competent Authorities.

- 4.26.2 The Successful Tenderer has the flexibility to house car parking, servicing, district infrastructure and other uses in Plot SS1, which is optional for the Successful Tenderer to include within the Land Parcel. If developed, the Successful Tenderer shall ensure that Plot SS1 is well-integrated as an extension of the proposed development's basement levels and not carved out as standalone spaces.
- 4.26.3 Basement levels are not allowed to be constructed below the Tree Protection Zone around the three (3) Angsana trees that are to be retained fronting Town Hall Link, to comply with the National Parks Board's (NParks) requirements given in Section 8.0 of the Conditions and Requirements of Relevant Competent Authorities and Public Utility Licensees.
- 4.26.4 A minimum earth cover of 2.5m depth is to be provided below the platform levels of the roadside verges to allow for tree planting within the Road Reserves.
- 4.26.5 All at-grade structures, including the vertical circulation points, and entrance / exit structures to UPLs, mechanical ventilation shafts, and fire escape staircases are to be located and integrated fully within the building envelope of the proposed development on the Land Parcel.
- 4.26.6 Skylight structures are encouraged to be provided within the open-to-sky areas of the site to provide natural day lighting for the UPLs and basement pick-up / drop-off areas.
- 4.26.7 All excavation works are to comply with the requirements of the relevant Competent Authorities and the Public Utility Licensees.
- 4.26.8 As stated in Condition 4.28, the Successful Tenderer is required to reflect the proposed spatial configuration of specified underground elements in a navigable 3D view that is to be included within the native Building Information Model (BIM) file to be submitted as part of the formal submission.

4.27 Interconnected Basements

- 4.27.1 To create a car-lite environment and make the ground level pedestrian and cyclist-friendly, the basement levels of all developments in the new precinct are to be interconnected, to enable the seamless movement of people and vehicles, deliveries, and other forms of transport options that may arise in future (e.g., delivery robots, Autonomous Vehicles) between developments. As such, the car parking and pick-up / drop-off facilities for the proposed development are to be located at the basement levels.

- 4.27.2 The Successful Tenderer shall provide a minimum 10m-wide knock-out panel (KOP) within each of the stipulated zones at the Basement 1 level of the proposed development, as shown on the basement level Control Plans, to allow for future basement connections to the future adjacent developments:
- a) Along Town Hall Link, abutting the line of the Road Reserve at Basement 1;
 - b) Along Future S1 Road, abutting the line of the Road Reserve at Basement 1; and
 - c) Abutting the common boundary with the adjacent future development to the west of the proposed development at Basement 1.
- 4.27.3 These KOPs shall cater for minimum 7m-wide Dual-1 two-way driveways and a minimum 3.0m-wide pedestrian walkway on one side of the carriageway. This pedestrian walkway shall have a minimum clear height of 2.4m. These knock-out panels shall be designed to accommodate service vehicles (minimum clear height of 4.5m), any auxiliary services for the basement carpark connection, and to receive chilled water and pneumatic waste collection pipes from the DCS plant and DPWCS central stations located within the proposed development.
- 4.27.4 At the specific locations of the KOPs, the platform level of the driveways is to be within 6.5m to 8.5m below the ground level.
- 4.27.5 The basement of the proposed development shall be designed to include vehicular driveways and pedestrian paths that are connected to the KOP, so as to seamlessly receive vehicles and pedestrians from future adjacent developments.
- 4.27.6 The owners of the future adjacent developments will construct basement connections to connect to the KOPs of the proposed development. The basement wall of the proposed development shall be designed with the necessary structural and design provisions for these future basement connections.
- 4.27.7 The Successful Tenderer/subsequent owner shall liaise with the owners of future adjacent developments to work out and coordinate any necessary operational measures, such as sufficient grace periods and coordinated gantry charging methods, to allow vehicles to pass from one development to another without additional cost.
- 4.27.8 As stated in Condition 4.28, the Successful Tenderer is required to reflect the proposed spatial configuration of the KOPs for future basement connections in a navigable 3D view that is to be included within the native Building Information Model (BIM) file to be submitted as part of the formal submission.

4.28 Digitising Underground Spaces as part of Building Information Model (BIM) Submissions

- 4.28.1 The proposed development will integrate several underground provisions within and around the underground spaces of the proposed development as part of larger district-level underground networks. These include the Underground Pedestrian Network (UPN) and interconnected basements (facilitating pedestrian and vehicular movement respectively), and the district infrastructure (e.g. DCS, DPWCS) connected via the planned CST and USD networks. As such, it is important for the design of underground spaces within the proposed development to be well-considered and well-integrated during the detailed design and Authority submission stages to ensure that sufficient provisions are made upfront to deconflict the various underground uses and services.
- 4.28.2 To demonstrate that the space requirements and overall configuration of underground uses and services have been considered as part of the development proposal, the Successful Tenderer is required to provide a navigable 3D view that clearly shows the proposed spatial configuration of the 3D elements within and around the Land Parcel, as listed in Table 2 and reflected in Figure 5. These 3D elements may be represented as massing, generic models or other placeholder equivalent, and are to be clearly annotated and/or enriched with properties that will facilitate the Authority's identification of the respective elements in Table 2. The 3D view is to be included within the main native Building Information Model (BIM) file that is required to be submitted as part of the formal submission.

Table 2 – Underground elements to be included in 3D view

S/N	Type of underground uses / services	3D elements to be shown
1	Underground Pedestrian Network (UPN)	• Underground Pedestrian Links (UPLs) and vertical circulation points • Knock-out Panels (KOPs) for future UPL connections
2	Vehicular parking and service areas	• Car and motorcycle parking lots and driveways • Pick-up / drop-off points and taxi laybys • Loading and unloading bays • Holding bays • Refuse bin centre • Electrical substation • KOPs for future basement connections to facilitate vehicular (and people) movement
3	District infrastructure and utility networks within and outside the site boundary	• District Cooling System (DCS) plant • District Pneumatic Waste Conveyance System (DPWCS) Central Station • Common Services Tunnel (CST) Link Chamber and its Ancillary Facilities

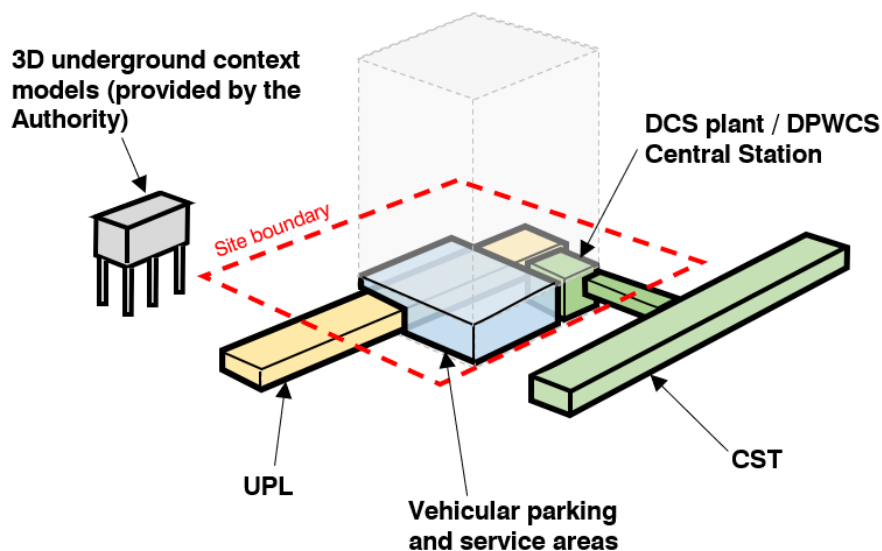


Figure 5: Diagram of how the spatial configuration of 3D elements may be reflected in the 3D view within the main native BIM file

4.28.3 To facilitate the design development of the underground spaces, the Authority will provide the Successful Tenderer with a 3D context model of the adjacent underground structures, where available, for reference.

4.29 Car, Motorcycle and Bicycle Parking Provision

4.29.1 The Successful Tenderer shall comply with LTA's requirements for car, motorcycle and bicycle parking provision as set out in Section 7.0 of the Conditions and Requirements of Relevant Competent Authorities and Public Utility Licensees, and shall be subject to the evaluation and approval of the Authority and other relevant Competent Authorities.

Car and Motorcycle Parking Provision

4.29.2 Jurong Lake District (JLD) has been gazetted as a Zone 4 Car-lite Area under LTA's Range-based Parking Provision Standards (RPPS). In line with the car-lite vision of JLD, the car parking provision for the proposed development of the Land Parcel shall be in accordance with LTA's prevailing Range-based Parking Provision Standards for Zone 1. The Successful Tenderer may also propose to provide a lower car parking provision based on the proposed development's needs and operations, subject to LTA's approval.

4.29.3 The car and motorcycle parking facilities for the proposed development shall be located at the basement level(s) only, to create a pedestrian and cyclist-friendly ground level and achieve the interconnected basements as outlined in Condition 4.27.

- 4.29.4 The Successful Tenderer is required to reflect the proposed spatial configuration of the basement car and motorcycle parking lots and driveways in a navigable 3D view that is to be included within the native Building Information Model (BIM) file to be submitted as part of the formal submission, as set out in Condition 4.28.

Electric Vehicles (EV) Charging Infrastructure Provision

- 4.29.5 To support the vision for a sustainable JLD, the Successful Tenderer shall ensure that the proposed development is EV-ready by providing necessary space and infrastructure for charging points. Active and passive provision for EV charging points shall be provided for the proposed development, as set out in Section 7.0 of the Conditions and Requirements of Relevant Competent Authorities and Public Utility Licensees.

Bicycle Parking Provision and End-of-Trip Facilities

- 4.29.6 To facilitate cycling as a mode of transportation to major transport nodes and key amenities, the Successful Tenderer shall comply in full with the LTA bicycle parking requirement under the Parking Places (Provision of Parking Places and Parking Lots) Rules 2018. A guide for Bicycle Parking and related facilities can be found in the Code of Practice for Street Works Proposals relating to Development Works and Code of Practice for Vehicle Parking Provision in Development Proposals.
- 4.29.7 The detailed requirements for bicycle parking are as set out in Section 7.0 of the Conditions and Requirements of Relevant Competent Authorities and Public Utility Licensees.

4.30 Service Areas

- 4.30.1 To create more attractive and active street frontages, all service areas including those for the refuse bin centre, recycling points, electrical substation, loading / unloading bays, holding bays etc., are to be provided within the basement levels of the proposed development.
- 4.30.2 No service areas shall be located fronting Jurong Town Hall Road, and the future E1 Road, N1 Road, N2 Road and S1 Road.
- 4.30.3 The Successful Tenderer is strongly encouraged to adopt the best practices in the Loading Bay Design and Operation Guide for Commercial Buildings to facilitate better design and management of loading bay operations by commercial building owners (see URA Circular No.: URA/PB/2020/05-SPG and www.ura.gov.sg/Corporate/Guidelines/Circulars/dc20-05).
- 4.30.4 Exhaust and ventilation shafts are to be fully integrated within the overall building form and architectural treatment of the proposed development. M&E services are to

be visually well-screened from the top and all sides, and subject to the prevailing screening guidelines.

- 4.30.5 Other service areas/ structures, such as air-conditioning ledges (if any), laundry drying areas, ventilation shafts to basements levels, etc., are to be fully integrated within the overall envelope of the building and visually well-screened, and subject to the prevailing screening guidelines for M&E services.
- 4.30.6 All service areas will be subject to the requirements and approval of the Authority and the relevant Competent Authorities at the formal submission stage.
- 4.30.7 As stated in Condition 4.28, the Successful Tenderer is required to reflect the proposed spatial configuration of the service areas at basement levels (e.g. refuse bin centre, recycling points, electrical substation, loading / unloading bays, holding bays) in a navigable 3D view that is to be included within the native Building Information Model (BIM) file to be submitted as part of the formal submission.

4.31 Vehicular Access

- 4.31.1 Vehicular access (for servicing, car parking, passenger pick-up / drop-off points, taxi lay-bys, etc.) shall be taken from Science Centre Road and N2 (East) Road and adopt a Left-In-Left-Out (LILO) arrangement where stipulated, at locations shown indicatively on the Control Plans and in accordance with Section 7.0 of the Conditions and Requirements of Relevant Competent Authorities and Public Utility Licensees. The Successful Tenderer shall study if three separate vehicular accesses are necessary given the proposed use mix of the proposed development. Any proposed residential use shall have its own dedicated access point.
- 4.31.2 All vehicular access points, passenger pick-up / drop-off points, taxi lay-bys, external ramps to service areas, car parks and all associated structures to the car parking facilities are to be located within the site boundary. These shall be well-integrated with the overall architectural treatment and building form of the proposed development and visually well-screened, and will be subject to the approval of LTA, the Authority, and the relevant Competent Authorities at the formal submission stage.
- 4.31.3 The detailed proposal for the access points and traffic layout plans will be subject to the requirements and approval of the Authority, LTA and the relevant Competent Authorities at the formal submission stage and as set out in Section 7.0 of the Conditions and Requirements of Relevant Competent Authorities and Public Utility Licensees.

4.32 Construction Access Arrangement

- 4.32.1 Construction access to the Land Parcel shall be taken from public roads as per the detailed requirements provided by LTA in Section 7.0 of the Conditions and

Requirements of Relevant Competent Authorities and Public Utility Licensees and subject to the approval of the LTA and other relevant Competent Authorities.

5.0 INFRASTRUCTURE REQUIREMENTS

5.1 Common Services Tunnel (CST)

General

- 5.1.1 The Common Services Tunnel (CST) is a reinforced concrete structure housing and distributing utility services to the basement levels of individual developments. Phase 1 of CST in JLD is being planned under N1 and N3 roads to optimise the use of underground space and ensure robust utilities provision for the area. The CST in JLD houses District Cooling System (DCS) pipes and District Pneumatic Waste Conveyance System (DPWCS) pipes. URA's appointed contractor will construct the CST structural shell of Phase 1 (CST) networks with no mechanical and electrical (M&E) installations, planned for completion by 4Q2030.

CST-related Infrastructure Works to be Implemented by Successful Tenderer

- 5.1.2 The Successful Tenderer, at his own cost and expense, carry out the following CST-related infrastructure works (hereinafter referred to as "CST-related infrastructure works"):
- a) take over from URA the core and shell of the completed CST, fit-out and commission the CST under proposed N1 Road as shown in the Control Plan and Annex C with the full M&E installation, etc. The Successful Tenderer shall be responsible for the maintenance of CST from the date of takeover until the date of handover back to URA.
 - b) Design, construct and commission the CST-related Ancillary Facilities to be integrated with the proposed development within the Land Parcel including payment of all charges as required by relevant agencies. The term CST-related Ancillary Facilities shall consist of the entire infrastructure required to serve CST, and shall be but not limited to the following:
 - i. CST Ventilation Shaft cum Entrance/ Exit structure complete with M&E installation;
 - ii. CST Facilities Control Centre; and
 - iii. CST 22KV/LV Electrical Substation and ancillary facilities.
 - c) Design, construct and commission a basement connection structure outside the Land Parcel, i.e. Proposed Link Chamber for DCS and DPWCS pipes connection to the CST Junction Box, including payment of all charges as

required by relevant agencies. This is to facilitate the installation and maintenance of the respective pipes to the future development.

- 5.1.3 The Successful Tenderer shall refer to Annex C on the detailed requirements for the part of Common Services Tunnel (CST) to be fitted out and the proposed Link Chamber and Ancillary Facilities to be designed and built by the Successful Tenderer.
- 5.1.4 The Successful Tenderer shall supply, install, and commission the required M&E systems for part of the CST, the proposed Link Chamber and Ancillary Facilities. These systems shall include, but are not limited to
- i. Ventilation System;
 - ii. Drainage and pumping system;
 - iii. Lighting system;
 - iv. Power and distribution system;
 - v. Anti-disaster and anti-vandalism system;
 - vi. Fire protection and fire fighting system;
 - vii. Communication system;
 - viii. Detection and alarm system;
 - ix. Surveillance and control system;
 - x. Safety facility for worker;
 - xi. Monitoring and control system;
 - xii. Cybersecurity; and
 - xiii. Security system.
- 5.1.5 The Ancillary Facilities and required M&E systems implemented by the Successful Tenderer shall be installed to allow integration into the final operation of the future segments of CST tunnel to be fitted out by URA in the future.
- 5.1.6 The Successful Tenderer is to, at his own cost and expense, design, construct, and complete, all civil (temporary and permanent works), architectural, structural, mechanical, and electrical works for the CST-related infrastructure works, including testing and commissioning of all works for handing over to URA / URA's appointed Operations and Maintenance (O&M) operator.
- 5.1.7 The Successful Tenderer shall be responsible to consult and obtain all necessary planning permissions and statutory approvals from the relevant authorities for the construction, fitting out and completion of the CST-related infrastructure works. The Successful Tenderer shall comply with all the submission procedures and requirements to obtain the formal written permission for the works.
- 5.1.8 The Successful Tenderer shall first obtain the clearance of URA of all provision and details before making its formal application to the Competent Authorities as well as any submissions to other competent authorities. All design and construction concepts, drawings, studies, reviews, methodology for the CST-related infrastructure

works and associated works shall be submitted to URA for review and approval as part of the development plan.

- 5.1.9 In addition, the Successful Tenderer shall co-ordinate with URA and its appointed consultant/contractor on all interfacing details and works including but not limited to the fitting out of the future CST structure, the platform levels of the proposed development and adjacent roads (e.g. N1 road and Town Hall Link) to mitigate differential settlement, and the associated drain and Earth Retaining Stabilizing Structure (ERSS) / earthworks required for the interfacing works. Minimal earthworks may be required to be done by URA's appointed contractor within the Land Parcel along N1 road to mitigate level differences and the Successful Tenderer shall coordinate with URA and its appointed consultant/contractor on the scope and timeline of the works for all the required interfacing works.
- 5.1.10 The Successful Tenderer/subsequent owner shall also be responsible to coordinate with private developers and owners, designers and contractors of adjacent existing and future development works.
- 5.1.11 Within four months of the award, the Successful Tenderer shall prepare and submit to URA for approval a programme for the design, fitting out and construction of the CST-related infrastructure works as described in Condition 5.1.2 and submit to URA for information the proposed development's overall programme highlighting the works interfacing N1 road and proposed works at Town Hall Link. The programme shall stipulate the major milestones and completion dates.
- 5.1.12 The Successful Tenderer shall commission the CST-related infrastructure works, which involves obtaining Development Control (DC) approval, Building Plan (BP) approval, Structural (ST) approval, SCDF approval, Temporary Fire Permit (TFP), Temporary Occupation Permit (TOP), Fire Safety Certificate (FSC), Certificate of Statutory Completion (CSC) and all other relevant statutory approvals, and handing over to URA or its appointed managing agent. The Successful Tenderer shall appoint the required Registered Inspector (RI) for clearance of Temporary Occupation Permit (TOP) of the works.
- 5.1.13 The Successful Tenderer shall also coordinate with other stakeholders, developers and relevant authorities and their appointed designers/contractors on the interfacing works at the interface boundary which includes but not limited to the scheduling and sequencing of works at the interface, site management of excavation, waterproofing provision and preparation of interface reports.
- 5.1.14 The Successful Tenderer shall give the unconditional right of access for URA, CST's Owner and its appointed Agent or CST O&M Operator and his team/ contractors/ personnel to any part of the CST and CST Ancillary Facilities within the proposed development for the operational and maintenance works at all times.

Design of the CST and Associated Works

5.1.15 URA has appointed a consultant to carry out detailed design of the CST and its associated works complete with foundation, M&E installation, fire accesses, architectural finishes, hoist rail, manholes and sump pits. The Successful Tenderer shall consult and coordinate with URA and its appointed consultant on the details of the CST-related infrastructure works at the planning and design stage before commencement of CST-related infrastructure works.

5.1.16 The key design parameters of the proposed CST Link Chamber and Ancillary Facilities as summarized below are to be designed by the Qualified Person appointed by the Successful Tenderer at the planning and design stage before commencement of the construction of the relevant elements:

S/No	Description (to be read together with the Control Plans and Notional Plans)	Details/ Requirements
a	Link Chamber	i. Structural connection of the Junction Box to the proposed development's basement as well as the future development's basement.
b	CST Ventilation Shaft cum Entrance/ Exit structure (minimum area= 40m ²)	i. Complete with M&E installation like fans, lighting, environmental sensors, access control like electromagnetic lock ii. Ventilation opening for the ventilation shaft at not lower than the 3 rd storey but not higher than the 6 th storey of the proposed development. iii The entrance / exit structure is to be located at the first storey and with the entrance / exit doors directly discharging into the public covered walkway.
d	CST Facilities Control Centre (minimum area = 150m ²)	i. Minimum clear height 3.0m from finished approved ceiling to floor level. All the essential control system / facilities as required.
e	CST 22KV/LV Electrical Substation (ESS)* (minimum area= 80m ²)*	i. The ESS and its associated electrical rooms including genset room, LV transformer room and electrical switch room shall be integrated within the land parcel.

Note:

* Successful Tenderer to consult URA for the minimum load for CST ESS.

5.1.17 The design of the CST to be carried out by URA's appointed consultant will be based on the following requirements:

- a. The loadings of the hoist rail, DCS pipes (including consideration of thrust force effect and design support of the pipes e.g., concrete plinths for pipes etc,) and location of pre-drilled holes are to be coordinated with the respective operator. The Successful Tenderer will be required to work with the appointed DCS and DPWCS operator on the loadings and supports of the respective pipes for the design of the CST.
- b. Design and construction of hoist rail, manholes, sump pits, laying of services, pipes and ducts leading to the Development as shown in the CST notional drawings (Annex C), including but not limited to power cables, lightings and ventilation ducts etc.
- c. Design and construction of drainage and associated connections for ground discharge from pump sumps within the tunnels to the nearest public drains. Minimum of 2 pumps (1 duty, 1 standby) in the sump pit are required.
- d. Provision and installation of the required Low Voltage (LV) systems (lightings, power points), Extra Low Voltage (ELV) systems (e.g. Fire Alarm, Public Address, call points/break glass, electromagnetic door locks and/or monitoring system), Mechanical Ventilation (MV) and Sump Pump system in the CST built by the Successful Tenderer according to requirements of relevant authorities and URA.
- e. For entrances, exits or openings to the CST, other than the watertight manhole, PUB's minimum crest levels shall be at least 300mm above the minimum platform level (MPL).

CST VENTILATION SHAFT cum ENTRANCE/EXIT STRUCTURE

5.1.18 The Successful Tenderer is required to comply with the following requirements during the planning and design stage of the proposed CST ventilation shaft cum entrance/exit structure:

- a. The CST ventilation shaft cum entrance/exit structure are to be integrated within the Land Parcel at the suggested location as shown in the Control Plan and Annex C.
- b. The Successful Tenderer shall locate the ventilation opening for the ventilation shaft at not lower than the 3rd storey but not higher than the 6th storey of the proposed development. The entrance / exit structure is to be located at the first storey and with the entrance / exit doors directly discharging into the public

covered walkway. The Successful Tenderer shall locate another door at the CST level directly discharging into the proposed development's basement.

- c. All above ground CST ventilation structures shall be designed and fitted with approved ventilation louvers. The Successful Tenderer shall note that the future CST will be constructed by others and the ventilation shaft opening provided shall cater for the ventilation of the entire CST. The Successful Tenderer shall consult URA for the details of the ventilation requirement for the entire CST.
- d. The Successful Tenderer shall provide the following M&E facilities prior to the handing over of the new permanent ventilation shaft and entrance / exit structure to the CST's O&M Unit:
 - i. Mechanical ventilation fans and ventilation louvers;
 - ii. CCTV;
 - iii. Lighting and switches;
 - iv. Staircases;
 - v. Doors at entrance / exit structure and magnetic door contact;
 - vi. Biometric access control system;
 - vii. Intercom and emergency phones;
 - viii. Break glass and alarm bell;
 - ix. Photoelectric smoke detectors; and
 - x. Conduits and trunking

CST 22KV/LV ELECTRICAL SUBSTATION AND ANCILLARY FACILITIES (CST ESS_AF) WITHIN THE DEVELOPMENT

5.1.19 The Successful Tenderer is required to comply with the following:

- a. To build and integrate the proposed CST 22KV/LV electrical substation and ancillary facilities (CST ESS_AF) within the Land Parcel. The ESS_AF comprises of a CST's 22KV/LV ESS (to be handed over to SPPG), a CST's Low-Voltage (LV) Switch room, an emergency generator room, cable trenches/pipes and a Facility Centre Control (FCC) room within the Land Parcel.
- b. The CST ESS_AF shall be designed by the QP of the Successful Tenderer with approval from SPPG for the ESS and URA for the CST ancillary facilities respectively. The CST ESS_AF shall be allocated with official address/lots number assigned by the relevant Authority, separate from the proposed development which the Successful Tenderer is building. The CST ESS_AF shall meet the full functional and technical requirements as stipulated by URA, SPPG and the Transmission Licensee.

- c. The CST ESS_AF rooms are to be handed over to SPPG and CST Owner/Appointed Agent for the installation of SPPG's ESS equipment/gears and the CST M&E /ELV (Extra Low Voltage) equipment/systems respectively.
- d. The location for the CST ESS_AF is to be located along the allowable stretch of frontage along N1 Road or Town Hall Link and in close proximity to the proposed CST built by the Successful Tenderer as shown on the Control Plans. The Successful Tenderer is also required to seek SPPG's approval for the location of CST's 22KV/LV ESS at the basement level.
- e. To provide and install the required LV systems (lightings, power points), M&E and ELV systems (e.g. Fire Alarm, Public Address, call points/break glass, EM door locks and/or monitoring system), and etc. to all the rooms built by the Successful Tenderer according to requirements of relevant authorities and URA. All ELV signals shall be terminated at the ELV termination panels (by the Successful Tenderer) within the CST FCC room including the Fire Alarm Panel. Cable trenches/pipes are required to be provided for cables laying between the CST ESS_AF and the CST built by Successful Tenderer.
- f. The proposed cables routing shall be located within secured area and accessible at all times by URA, the CST Owner and its appointed CST O&M Operator/contractors/agents for operation, repair maintenance and replacement purposes.
- g. Appoint and engage a License Electrical Worker (LEW) to liaise with Keppel DHCS Pte Ltd for the installation of LV (min 400A) essential supply (connected to emergency supply) from their LV switchboard to serve the M&E/ELV systems within the CST built by the Successful Tenderer.
- h. To bear all the services connection charge as imposed by the Transmission Licensee and the relevant Competent Authorities. The Successful Tenderer is also required to pay all the electrical installations and the M&E/ELV equipment/accessories costs including all submission fees, all the associated building works and professional services fees. All the above cable works including cables and DBs (Distribution boards) shall be borne by the Successful Tenderer; and
- i. To provide all necessary shop drawings and calculation with PE endorsement for the approval of URA before carrying out the works.

General Design and Construction Requirements

- 5.1.20 The Successful Tenderer is to ensure that any vehicular ingress / egress, servicing points, drop-off points, driveways, etc., are not located above the CST manholes and CST installation mouths.

- 5.1.21 The Successful Tenderer is required to, at his own cost and expense, obtain TOL from the SLA and seek the necessary clearances from URA for the construction of the proposed CST Link Chamber. The Successful Tenderer is to bear the cost and expense for the construction of the proposed CST Link Chamber described in Condition 5.1 and is responsible for the structural integrity and maintenance of the CST structure in accordance with all relevant acts in place.
- 5.1.22 The Successful Tenderer is required to provide accurate cross-sectional details of the service connections between the proposed CST Link Chamber (at the basement level) to the CST Junction Box for URA's evaluation. The details must clearly show the portion to be built by the Successful Tenderer and the structural connection to the Junction Box, etc.
- 5.1.23 The Successful Tenderer shall ensure that the construction of the proposed development within the Land Parcel and the proposed CST Link Chamber does not affect the stability and integrity of the CST structure along N1 Road. The Successful Tenderer is to submit to URA for acceptance the detailed drawings, structural calculation and method statements on the proposed development work to ensure that the proposed development can be carried out without affecting the structural integrity of the existing CST structure. Impact Assessment Engineering Evaluation Report is to be submitted to URA concurrently with the relevant structural plan (ST) submission to BCA.
- 5.1.24 The Successful Tenderer shall carry out all civil engineering works including open cut excavation with temporary earth retaining structures, earth formation, including cutting, filling, rolling, to the required levels and compacting of subgrade, removal of soil and debris to approved dumping grounds; construction and completion of temporary vehicles access ways, open and covered drains, manholes, chambers, inspection shafts, ventilation shafts, above ground structures, and all works relating to the CST-related infrastructure works.
- 5.1.25 The scope of Successful Tenderer will also involve interfacing civil works with URA's appointed contractor to construct the CST Tunnel, N1/N3 Road including associated earthworks and drain works. These may include ERSS provision at the proposed interface or minimal earthworks by URA's appointed contractor within the Land Parcel along N1 road for a seamless connection at the interface. The Successful Tenderer shall liaise with the CST appointed contractor to reduce abortive works at the interfaces between the respective works.
- 5.1.26 The Successful Tenderer shall provide all necessary shop drawings and calculation with PE endorsement for the approval of URA before carrying out the works.

Mechanical & Electrical Requirements

- 5.1.27 The Successful Tenderer shall provide dedicated M&E equipment including pump sump, drainage and utility services, not limited to electrical, mechanical and ventilation, fire-services, with the sole purpose to serve the functions of the CST.
- 5.1.28 The Successful Tenderer shall as part of the design of the CST Ventilation Shaft factor the following design specifications:
- a. Louvres shall achieve Class A rain defense performance at design air velocity in accordance with BS EN 13030.
 - b. Maximum allowable face velocity through louvres shall not exceed 2.5 m/s.
 - c. Pressure drop across louvres shall not exceed 50 Pa at design air velocity.
 - d. Louvres shall be constructed of corrosion-resistant materials with durable finishes suitable for long-term operation.
 - e. Louvres shall be coordinated with the architectural façade design and allow for maintenance access and integration with ventilation systems.
 - f. Intake and exhaust louvres shall be installed with a minimum 5m separation distance.
 - g. Louvres shall be sized to accommodate the airflow volume required for the entire CST operation including part of CST to be fitted by URA in the future.
 - h. Louvres shall be partially blanked-off, if necessary, to suit interim ventilation requirement.
- 5.1.29 The Successful Tenderer shall consult URA on the design specification for the design of the CST Ventilation Shaft. Samples and shop drawings of the louvers shall be provided for the approval of URA prior to any fabrication and installation works.

Other CST Design and Construction Requirements

- 5.1.30 For other ancillary facilities supporting the CST, the Successful Tenderer is required to comply with the following requirements during the planning and design stage:
- a. Pipe Sleeves
 - i. Utility names and identification (ID) members shall be painted on the external plates of pipe sleeves and also on the internal walls of junction boxes.

- ii. The pipe sleeves identification numbers shall be painted accordance to the following or other such colours as approved by URA:

District Cooling System – Green

Pneumatic Refuse Conveyance System – Red

- iii. The locations and ID numbers for all pipe sleeves shall be shown on the as-built drawings.

b. Provision of Pump Sump

- i. The ST shall provide and install sump pump design capacity of pump shall be determined to cater for seepage or minor leakage at his own cost and expenses. The ST shall consult URA for the required sizing of sump pump.

c. Waterproofing of Structure

- i. The Successful Tenderer shall propose and submit to URA for approval a complete system of waterproofing membrane for CST-related infrastructure works, including slabs, walls, sumps and other related underground structures to ensure absolutely watertight. The waterproofing system shall consist of self-adhesive, preformed waterproofing sheet or equivalent as approved by URA. The waterproofing system shall be supplied, installed and protected by a qualified waterproofing specialist, all in accordance with the manufacturer's recommendations.
- ii. Samples and shop drawings shall be provided for the approval of URA prior to any installation work.
- iii. The Successful Tenderer is to ensure that the proposed waterproofing material of the CST-related infrastructure is compatible to the existing waterproofing material of the CST structure, if affected, and that its warranty is not to be voided.

Warranties

- 5.1.31 The Successful Tenderer is to ensure that the relevant Schedule of Warranties in the below table are incorporated into the handing over list of items to URA and granted in favour of URA. These warranties are to be duly executed (to the URA's satisfaction) by the Successful Tenderer, the Successful Tenderer's Contractor, the

sub-contractor who carried out or supplied the Warranted Works and all levels of sub-contractors in between the Successful Tenderer's Contractor and the first-mentioned sub-contractor.

No.	Type of Work/Product	Period of Warranty
1	Water proofing / watertightness	10 years

- 5.1.32 The Successful Tenderer is to ensure that the relevant Schedule of Warranties in the below table are incorporated into the handing over list of items to URA and granted in favour of URA. These warranties are to be duly executed (to the URA's satisfaction) by the Successful Tenderer, the Successful Tenderer's Contractor, the sub-contractor who carried out or supplied the Warranted Works and all levels of sub-contractors in between the Successful Tenderer's Contractor and the first-mentioned sub-contractor.

As-built Drawings, BIM Models and Calculations

- 5.1.33 The soft copy as-built drawings (CAD and PDF) and as-built BIM models showing all details as actually constructed shall be prepared and submitted within three months from the date of completion/ hand over of the CST. The Successful Tenderer shall submit to URA for acceptance one complete set of original drawings with accompanying set of complete calculations of the Works as built. All as-built drawings and accompanying set of complete calculations submitted to URA shall be signed by the respective Professional Engineer/Registered Architect.
- 5.1.34 The level of detail and information in the BIM models shall be as per Singapore BIM Guide Version 2.0, where applicable.
- 5.1.35 In the case of piling works, these plans shall be accompanied by a set of pile eccentricity plans duly endorsed by the relevant Qualified Person(s) and a Registered Surveyor.

Handing / Taking Over Requirement

- 5.1.36 The Successful Tenderer shall obtain the Certificate of Statutory Completion including Temporary Occupation Permit (TOP) for the proposed development and submit the Certificate to Authority.
- 5.1.37 Appropriate authorities' submissions should be made to facilitate obtaining of TOP separate from the proposed development which the Successful Tenderer is building. The CST ESS is to have a separate official address from the proposed development that it is located on, for the purpose of signing the service agreement with SPPG for its power intake and billing.

- 5.1.38 The Successful Tenderer shall provide a one-year defect liability period (DLP) with the necessary warranties and O&M manuals for all the equipment/facilities/systems installed to the Authority. The DLP shall commence after inspection with URA upon obtaining the TOP / Certificate of Statutory Completion for the CST.
- 5.1.39 The Successful Tenderer shall maintain and warrant during the DLP period that all permanent plant and equipment furnished and Works performed under this contract shall be free from defects in title, design, materials, and workmanship.
- 5.1.40 During the Defects Liability Period, the Successful Tenderer shall make good any defects, repairs and replacement of defective equipment, plants, cables, materials and structures, within 2 working days upon notification by URA or its appointed agent.
- 5.1.41 The Successful Tenderer is required to complete fully and hand over the CST and its Ancillary Facilities to URA or its appointed O&M operator after the end of the 1-year DLP period. URA reserves the rights not to take over the CST until all Works satisfy the Authority requirements and inspections. The Successful Tenderer is required to obtain the TOP for the CST prior to, or at the same time, as the TOP is obtained for the Development works for the Land Parcel.
- 5.1.42 Before the handing/ taking over of the CST, the Successful Tenderer shall also submit the following documents in soft-copy (CAD and pdf formats) and hard-copy:
- a. All endorsed architectural, civil & structural and M&E (building services and systems) as-built drawings by relevant QPs.
 - b. All relevant submissions and approvals from authorities.
 - c. Complete assets listing and warranties.
 - d. All endorsed operation & maintenance manuals (including frequency of maintenance and tasks) and Testing and Commissioning documents by relevant QPs.
 - e. Relevant documents required by URA.
- 5.1.43 The Successful Tenderer shall submit a full set of official documents which includes:
- a. Asset listing of the installed M&E equipment.
 - b. Authority approvals/ waivers sought for the CST inclusive of the approved submission plans/ materials to authority, drawings, Operation & Maintenance manuals, equipment specifications, testing & commissioning documents/ reports, warranty certificates and summary lists for all documents handed over. Soft copies shall be provided in editable/ searchable format.

- c. As-built drawings in both hard and soft copies in the format requested by the Authority.
- d. Soft copies shall be in editable format.

5.1.44 The Successful Tenderer shall engage a Registered Surveyor to carry out the title survey of the CST for the purpose of land/ subterranean allocation. The title survey shall include site area, all relevant sections and levels of the CST. The Successful Tenderer shall submit the survey and all relevant documents to URA within 1 month from the date of completion/ hand over of the CST.

Obligations of the Successful Tenderer

5.1.45 The Successful Tenderer shall allow the CST Owner / Managing Agent / Operator to gain right of access into the new permanent integrated ventilation shaft-entrance-exit structure within the proposed Development at no cost and expense for the operation, maintenance and repair works of the CST, as and when required.

5.1.46 The Successful Tenderer shall own, maintain and keep in good repairs, including waterproofing, the structural shell of the new permanent ventilation shaft and entrance / exit structure within the proposed development at the Successful Tenderer own cost and expense. The Successful Tenderer is not to demolish or carry out any works, alteration or addition to or within any part of the CST structure unless with the prior written approval of the Government or the Authority.

5.1.47 The Successful Tenderer shall bear all maintenance and repair costs for the structural shell of the proposed integrated CST ventilation shaft and entrance/ exit structural shell (including waterproofing) within the proposed development.

5.1.48 The Successful Tenderer shall ensure at all times that the CST structure is not damaged in any way and that its use and operation is unaffected by any works or activity being or to be carried out within the proposed development.

Requirements for Protection of CST in case of Future Redevelopment

5.1.49 As the CST is an important infrastructure, the Successful Tenderer is to ensure that the following requirements are complied with if and when Land Parcel is redeveloped in future:

- a. The redevelopment plans are not to affect the structural, functional and operational integrity of the CST and all utility services within during the redevelopment works. The redevelopment plans are to comply with the requirements of the relevant Competent Authorities / Public Utilities Licensees; and

- b. Both the temporary and permanent works, which must be submitted to URA for approval, are to be designed to ensure that they will not affect the stability and safety of the CST structure. The construction sequence and method of construction adopted for any excavation works are to be planned and executed to minimise ground movement in the vicinity of the CST and disturbance to the sub-grade beneath the CST. In addition, proven techniques and good workmanship are to be used to restrict ground loss.

5.2 District Pneumatic Waste Conveyance System (National Environment Agency)

- 5.2.1 The Successful Tenderer shall design and construct a District Pneumatic Waste Conveyance System (DPWCS) Central Station within the stratum of space proposed for DPWCS Central Station (“the DPWCS Central Station Lot”) at the location as shown on the Control Plans and make provisions for the required infrastructure network for waste conveyance in accordance with the requirements in the Building Agreement and the Technical Conditions of Contract for Design and Build of the DPWCS Central Station and the associated works at JLD (Appendix I of Conditions of Tender) and National Environment Agency (“NEA”)’s requirements in Section 9.0 of the Conditions and Requirements of Relevant Competent Authorities & Public Utility Licensees. The exact dimensions, form and boundary of the DPWCS Central Station Lot shall be determined by NEA at its sole discretion, upon the acceptance of the design of the DPWCS Central Station by NEA, and shall be subject to cadastral and title survey by a registered surveyor.
- 5.2.2 The Successful Tenderer shall enter into a Design & Build Agreement (“D&B Agreement”) with NEA for the design and construction of the DPWCS Central Station and the associated works (Appendix I of Conditions of Tender). NEA will reimburse the Successful Tenderer the cost of design and construction of the DPWCS Central Station and associated works by way of monthly progress payments, as provided for in the D&B Agreement.
- 5.2.3 The Government shall retain all proprietary and ownership rights, title and interest in the DPWCS Central Station Lot and the DPWCS Central Station will not be comprised in the Lease for the said Land.
- 5.2.4 The Successful Tenderer shall apply for a TOL from SLA to enter into State Land to undertake the construction of the DPWCS Central Station. The TOL shall be granted on the terms, charges and fees stipulated by SLA.
- 5.2.5 The vehicular access from public roads to the Central Station shall allow for waste collection operations (i.e. refuse truck to enter/exit the proposed development) and comply with the relevant authority’s regulations (e.g. minimum height clearance, minimum bend radiuses, etc.), if applicable.

- 5.2.6 The Successful Tenderer is to carry out the civil works required for the DPWCS Central Station and the installation of the auxiliary services in tandem with the proposed Development. The Central Station is to be handed over to NEA during the period that is 16 to 22 months before the issuance of BCA's TOP for the first development to be served by the DPWCS. The design and construction of the DPWCS Central Station shell must meet all conditions / requirements imposed by all relevant Authorities. With the completion of the DPWCS Central Station shell and installation of all auxiliary services, the ownership of the DPWCS Central Station shell shall be transferred to NEA by a date set by NEA, and NEA will notify the Successful Tenderer of the date at least 4 weeks in advance. NEA would henceforth own the DPWCS Central Station. This would facilitate the installation of the DPWCS equipment within the Central Station by NEA's DPWCS Licensee.

Form, Massing & Design Treatment

- 5.2.7 The exact dimensions, form and boundary of the part of the said land or the stratum of space therein to be occupied by the DPWCS Central Station and which shall not be included in the Lease to be granted to the Successful Tenderer shall be in accordance with Section 9.0 of the Conditions and Requirements of Relevant Competent Authorities & Public Utility Licensees.

5.3 District Cooling System

Introduction

- 5.3.1 A District Cooling System (DCS) is to be implemented in Jurong Lake District (JLD). The Authority, acting as agent of the Government of the Republic of Singapore, has appointed Keppel DHCS Pte Ltd (hereinafter referred to as the "Keppel DHCS") to design, build, own and operate the district cooling system plant (hereinafter referred to as the "DCS Plant") to supply chilled water twenty-four (24) hours a day everyday through a network of pipes for the air-conditioning of developments within JLD which includes the Land Parcel, hence removing the need for standalone air-conditioning plants for individual developments.
- 5.3.2 The Successful Tenderer is required to set aside and provide spaces (core & shell) for the DCS Plant within the proposed development at no cost and expense to Keppel DHCS, obtain chilled water services from the DCS Plant for the air-conditioning of the proposed development (excluding flats) on and within the Land Parcel and implement the necessary infrastructure to receive chilled water services from the DCS Plant for the whole development (excluding flats) on the Land Parcel. The DCS Base Tariff rates for developments within JLD offered by Keppel DHCS are stipulated in the table below. The Successful Tenderer shall refer to Annex F2 and F3 for the price fluctuation formulae which will be pegged to a market competitive commodity/index such as electricity charges, water charges and core Consumer Price Index (CPI).

DCS Base Tariff Rates -

Non-Residential*		
Installation Charge (IC)	\$/RT	3000
Demand Charge (DC)	\$/RT/month	4.70
Energy Charge (EC)	\$/RTh	0.1865
Residential		
Installation Charge (IC)	\$/RT	1500
Energy Charge (EC)	\$/RTh	0.35

*including serviced apartments

- 5.3.3 The Successful Tenderer as per Condition 7.2 of the Conditions of Tender is required to enter into a Memorandum of Agreement, an in-principle agreement, with Keppel DHCS for the proposed development within the Land Parcel in relation to the provision of chilled water services from the DCS Plant. The terms and conditions relating to the provision of the chilled water services are to be agreed between the Successful Tenderer and Keppel DHCS. A specimen of the Chilled Water Supply Agreement (“CWSA”) will be provided to the Successful Tenderer for information after award of the tender.
- 5.3.4 With DCS, In-building chiller plants (IBCP) are not needed as chilled water supply will be served from DCS plant. If Successful Tenderer due to its operational needs propose to provide an IBCP, all M&E spaces in relation to the provision of IBCP shall be computed as GFA, which shall form part of the permissible GFA. All prevailing M&E GFA exemptions as stated in the Development Control Handbook shall not apply to these M&E spaces related to IBCP.

Provision of DCP Spaces within the Land Parcel

- 5.3.5 The Successful Tenderer is to provide and construct as part of and within the proposed development, the space(s) for the DCS Plant (including any required structures or apparatus), electrical substation and spaces for pipe network required for the installation and operations of the DCS Plant to serve developments within JLD (hereinafter referred to as the “DCP Spaces”). The DCS Plant which is to be integrated within the proposed development will ultimately serve buildings within the Land Parcel and other developments within JLD.
- 5.3.6 Based on a structurally independent building design, the DCP Spaces to be provided comprise of the following:
- Main machine room (including water make up transfer tank)
 - Electrical and other supporting infrastructure area
 - Thermal energy storage tanks
 - Cooling towers (including make up water tank)

- e. Electrical Substation
- f. DCS piping network

All basic and essential building and M&E services are to be provided by the Successful Tenderer. The exact and actual physical dimensions of DCP Spaces will depend considerably on the building design, layout and configuration adopted by the Successful Tenderer. The design guidelines, physical dimensions, and requirements for the DCP Spaces will be set out in greater detail in Annex F1 - "District Cooling System Requirements for JLD" document. The Successful Tenderer is required to work closely with Keppel DHCS to finalise the exact requirements to meet the functional needs of the DCS.

Integration of DCP spaces

- 5.3.7 The Successful Tenderer is required to integrate the DCP Spaces as part of the proposed development and re-configure the layout of the DCS Plant to suit the building layout and design of the proposed development. Annex F1 - "District Cooling System Requirements for JLD" document, illustrates this arrangement. The reconfigured layout is subject to Keppel DHCS' approval to ensure that the functional and operational requirements of the DCS are met.

Electrical Substation for DCS Plant

- 5.3.8 The DCS Plant is to have its own intake electrical substation. The Successful Tenderer is to provide separate substation(s) to the requirement of the Transmission Licensee authorised under the Electricity Act 2001 for electricity supplies to the proposed development on the Land Parcel. The space(s) for the separate substation(s) for the proposed development will be computed as part of the GFA for the Land Parcel, in accordance with prevailing Development Control Guidelines.

DCS piping network

- 5.3.9 Chilled water services are supplied via network of chilled water pipes within and to surrounding developments. As part of improving overall connectivity, Elevated Pedestrian Link bridges (EPL), Underground Pedestrian Links (UPL) and basement linkages extending to/from the Land Parcel are planned within the area and will be implemented by various parties as indicated in the Control Plans. These infrastructures would serve as corridors for the laying of DCS pipes to provide chilled water supply within and to the surrounding developments. The Successful Tenderer is to safeguard necessary DCS corridor within the Land Parcel for connection of future DCS pipes to the proposed EPL, UPL and other basement linkages.
- 5.3.10 The DCS Plan illustrates the indicative location of the DCS Plant, DCS pipe alignments and essential connection points as required to serve the surrounding developments. There may be other alternative suitable corridors for the laying of DCS

pipes aside from what is indicated in the DCS Plan. The Successful Tenderer is required to work with Keppel DHCS for the design and implementation of the infrastructure required to support the operations and maintenance needs of the DCS including the proposed DCS pipe alignments, network and relevant corridors and, if required, submit the proposed plans and design to the Authority for review and approval prior to the submission to the relevant authorities for approval. This includes making provision in the design of the EPL, UPL and basement linkages to ensure that the DCS pipes can be housed within the DCP Spaces for future interconnection, provision of relevant DCS corridors and access points for maintenance needs and implementing the necessary DCS services and structures (including but not limited to any pipes, shafts, vents, knock-out panels) as required to meet the functional and operational needs of the DCS.

5.3.11 The Successful Tenderer is deemed to have taken into account the cost for design, construction and provision of all the spaces required in relation to the DCP Spaces in the tender submitted. Notwithstanding the provision of the DCP Spaces, the chilled water services to the proposed development on and within the Land Parcel will be provided at the same tariff rate applicable to other developments within JLD.

5.3.12 The Successful Tenderer undertakes that it shall:

- a. not at any time without the previous consent in writing of the Authority or the Government, demolish or make any alteration or addition to or change the DCP Spaces (including making any change to the use and/or locations of the DCP Spaces) and not without the same consent in writing undertake any works to the buildings forming part of the proposed development or any redevelopment works or carry out any other activities that will disrupt, obstruct or otherwise adversely affect the installation, operation, maintenance, repair or improvement of the DCS Plant within the DCP Spaces and activities related thereto; and
- b. comply with all requirements imposed by the Authority and ensure that the DCP Spaces are maintained and made available at all times for the installation, operation and maintenance of the DCS Plant, and in the event of any redevelopment, to provide such replacement spaces in the new development as the Authority may require for the aforesaid purposes of a DCS Plant.

Access to and Use of DCP Spaces

5.3.13 The Successful Tenderer is to ensure that Keppel DHCS, with or without workmen and others and with or without equipment and/or materials, is allowed free and unconditional access to and use of the DCP Spaces at all times for purposes of installation, operation, maintenance, repair and improvement of the DC Plant and all activities related thereto, without any charge, payment, hindrance, obstruction or restriction whatsoever. The provision of suitable access way from the public roads to the DCP Spaces is to be within the scope of the Successful Tenderer.

- 5.3.14 The Successful Tenderer may require Keppel DHCS to pay service charges for the use of spaces such as common areas, facilities and services that may be shared with or provided by the Successful Tenderer e.g. charges for maintenance of accessways, waste disposal, etc.

GFA Treatment for DCP Spaces and other associated facilities

- 5.3.15 The treatment and computation of the DCP Spaces and other associated facilities like DCS corridors, electrical substation etc shall be in accordance with Condition 4.2. The GFA of the DCP Spaces will constitute as Utility GFA, allowed over and above the maximum permissible GFA for the Land Parcel. This additional GFA may be subject to the payment of Land Betterment Charge, if applicable.

District Cooling Service Intake Stations

- 5.3.16 The Successful Tenderer is to provide room(s) within the buildings on the Land Parcel to accommodate heat exchangers and other equipment for connection to the DCS. The intake station room is computed as part of the GFA for the Land Parcel, in accordance with the definition of 'floor area' under the Planning (Development Charge) Rules. The dimensions of the intake station room are dependent on the supply capacity required at the intakes. Details on the provisions to be made will be stipulated in the "District Cooling System Requirements for JLD" document. The Successful Tenderer is required to hand over the intake station room to Keppel DHCS at least six (6) months before the target date of chilled water supply at each intake.

Scope of Works between the Successful Tenderer and Keppel DHCS

- 5.3.17 The detailed scope of works for Non-Residential and Residential developments between Keppel DHCS and Successful Tenderer is indicated in Annex D: Definition of Shell and Core of DCS Plant in JLD Development.
- 5.3.18 The Successful Tenderer is to obtain the necessary statutory approvals and/or permits (including TOP, Certificate of Statutory Completion (CSC), Fire Safety Clearance (FSC), etc) for the DCP Spaces with all its basic building and M&E services. Keppel DHCS is to obtain the approvals and/or permits within its scope such as the FSC, Factory Permit etc, for the DCS Plant. The required scope of works by the Successful Tenderer and Keppel DHCS is as shown in Annex D: Definition of Shell and Core of DCS Plant in JLD Development.
- 5.3.19 The Successful Tenderer is to take due consideration in its development planning and building design of the noise dissipation from the equipment of the DCS Plant and the discharge from the cooling towers.
- 5.3.20 Operational continuity is essential for the DCS and the DCS Plant. To allow for any

future redevelopment or refurbishment of the Development, the Successful Tenderer is to make necessary provisions, in consultation with Keppel DHCS, to localise any likely constraint to such future redevelopment or refurbishment.

- 5.3.21 The Successful Tenderer is to take note that Keppel DHCS will be responsible for the maintenance of all equipment and facilities of the DCS Plant (including the TES tanks) and general maintenance of all building spaces (including shafts) designated exclusively for the DCP Spaces. However, the Successful Tenderer or building owner is responsible for the maintenance of the building structure and all areas external to the designated DCP Spaces including exterior walls of the buildings, the building screen walls and trellis (if any) of the cooling tower area.

Timeline for hand-over of DCP Spaces to Keppel DHCS

- 5.3.22 The Successful Tenderer is required to complete and hand-over the DCP Spaces, at the Successful Tenderer's own cost and expense, to Keppel DHCS at least eighteen (18) months before the target date of chilled water supply is required. The Successful Tenderer is required to maintain the constructed DCP Spaces upon completion until such time that the spaces are handed over to Keppel DHCS for fitting out works for the DCS Plant.

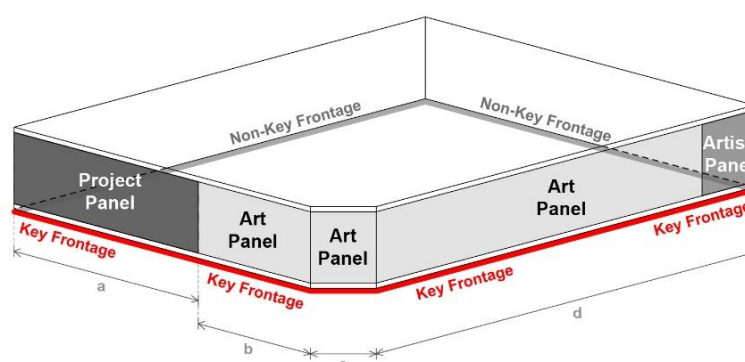
6.0 OTHER REQUIRED WORKS AND REQUIREMENTS

6.1 General

- 6.1.1 Clearance from SLA, URA, LTA, NParks and the relevant Competent Authorities shall be obtained prior to commencement of any construction works affecting State land. All State land affected by the construction works associated with the developments on the Land Parcel shall be reinstated to the requirements and satisfaction of SLA, LTA, NParks and the relevant Competent Authorities upon completion of the works.
- 6.1.2 The Successful Tenderer is required to obtain a TOL from Singapore Land Authority (SLA) for entry into, and the use of, State land for any works in relation to the proposed development and as may be required under these present Technical Conditions of Tender or Conditions of Tender. The TOL may be granted on such terms and conditions, and subject to the payment of such charges and fees, as the SLA may determine.
- 6.1.3 All development works are to be cordoned-off and screened by hoarding and illuminated by night lighting during the construction period, subject to the requirements and approval of the relevant Competent Authorities. Any inconvenience and disturbance to the adjacent uses and developments is to be minimised. Pedestrian access along the roadside tables around the perimeter of the site is to be maintained at all times and all construction hoarding is to incorporate covered

linkways for pedestrians. Given the strategic location, the design of the hoarding and the quality of materials are to be befitting to the quality of the developments in the area and, as a guide, designed as the “public front” of the development during its construction phase.

- 6.1.4 All development works in JLD shall include Creative Hoarding for construction sites, to create a more attractive and vibrant streetscape. The hoarding can feature graphics and artworks that are made by either commissioned artists or the community. As a guide, the hoarding is to be constructed using “prestige” panels or an equivalent product. The smooth surface of the panels will facilitate the mounting of graphics on the hoarding. Alternatively, incorporating vertical planting and greenery on the hoarding can also be considered. At least 75% of the hoarding along key frontages of the proposed development, such as main streets and key pedestrian routes, are to be covered with artwork or greenery (see Figure 8). With reference to the prevailing best practice guide on creative hoarding, the Successful Tenderer is to liaise with the Authority on the design and construction of the hoarding works. The Successful Tenderer is to ensure that the hoarding around the construction workspace is properly maintained throughout the construction period.



$$a / (a + b + c + d) \leq 25\%$$

Figure 8: Creative Hoarding to be applied to 75% of hoarding along key frontages of the Development

6.2 Road Works

- 6.2.1 The Successful Tenderer shall, at his own cost and expense, design and construct the proposed 32.6m wide new access roads (i.e. N2 Road) complete with open walkways, cycling paths, planting verges, rain gardens, roadside drains, sewers, Utility Specific Ducts (USD) and other required road and junction improvement works, to connect to N1/N3 Road (estimated to be implemented by URA by 4Q2030), as shown on the Control Plans and in accordance with the requirements of the relevant Competent Authorities. For information of tenderers, the detailed requirements of the proposed road are set out in Section 7.0 of the Conditions and Requirements of Relevant Competent Authorities and Public Utility Licensees.

- 6.2.2 For information of tenderers, the detailed requirements of the proposed roadside drains, sewers, road and USD are set out in Section 3.0 (Condition 3.2), Section 3.0 (Condition 3.4), Section 7.0 and Section 12.0 of the Conditions and Requirements of Relevant Competent Authorities and Public Utility Licensees respectively.
- 6.2.3 The typology of N2 Road shall include a 1.5m wide space for laying of services below rain gardens, on both sides of the road. Rain gardens are designed to detain and treat rainwater runoff, before channelling to the roadside drain. The Successful Tenderer shall engage an ABC (Active, Beautiful, Clean) Waters Professional in the design of the rain gardens for approval by PUB and other relevant Competent Authorities. The Successful Tenderer may refer to PUB's submission requirements under the Active, Beautiful, Clean Waters Programme and ABC Waters Design Guidelines and engineering procedures for more information. The Successful Tenderer may refer to LTA's Standard Details of Road Elements for the details of the slotted kerb design.
- 6.2.4 The Successful Tenderer shall, at his own cost and expense, carry out road improvement works to downsize the existing Science Centre Road (part) and Town Hall Link, as shown on the Control Plans. For information of tenderers, the detailed requirements of the proposed road are set out in Section 7.0 of the Conditions and Requirements of Relevant Competent Authorities and Public Utility Licensees.
- 6.2.5 The Successful Tenderer shall ensure that Science Centre Road and Town Hall Link is kept open for public use at all times, and to ensure that Genting Hotel Jurong can continue to be served with access.
- 6.2.6 The Successful Tenderer shall, at his own cost and expense, also liaise and coordinate with all relevant utility agencies on the laying / diversion / reconstruction / upgrading of their respective services within the proposed N2 Road and as part of other road improvement / junction improvement works.
- 6.2.7 The Successful Tenderer shall submit detailed Traffic Plans at the formal submission stage. The Traffic Plans shall also include proposed modifications to existing directional traffic signs to reflect the new roads and junctions.
- 6.2.8 The construction of the proposed 32.6m wide new access roads (i.e. N2 Road), and road improvement / junction improvement works, shall be certified physically completed and open for use by the LTA before the issuance of TOP for the proposed Development.
- 6.2.9 The completed road works are to be maintained at the cost and expense of the Successful Tenderer and to the satisfaction of the LTA, National Parks Board (NParks), Public Utilities Board (PUB) and other relevant Competent Authorities and Agencies during the maintenance period (MEP) and until such time when they are

handed over to the State for ownership and maintenance.

- 6.2.10 The Successful Tenderer is required to obtain a TOL from the SLA for the area required for construction of the new access roads and carrying out of road improvement / junction improvement works, at least 8 weeks prior to the proposed TOL commencement date. The TOL area shall not be used for other purposes and is to be kept free of obstruction at all times.

The Successful Tenderer shall allow public agencies, including contractors, agents, employees and owners/occupiers of adjacent developments, access and use of the said TOL area at all times if required, without any charge, payment, hindrance, obstruction or restriction whatsoever.

6.3 Fitting-out of UPL between the Land Parcel and CR19 CRL MRT station

- 6.3.1 The Land Parcel is in proximity to the upcoming CR19 Cross Island Line (CRL) MRT station and is planned to be directly and seamlessly connected to the station concourse level via a 9.0m wide Underground Pedestrian Link (UPL). The location / alignment of the UPL is shown indicatively on the Control Plans.
- 6.3.2 The shell structures of the UPL between the Land Parcel and CR19 CRL MRT station will be built by LTA as a sealed space envisaged with 3 nos. of pop-up structures (2 nos. of exit staircases and 1 no. of ventilation shaft). The pop-up structure quantities and configurations are indicative only and subject to detailed design development, regulatory requirements, and site constraints. LTA reserves the right to amend the number and type of pop-up structures as necessary during the design and construction process. The Successful Tenderer is required to fit-out the sealed space to render it functional and ready for operation in accordance with Conditions 6.3.3 to 6.3.8 and the requirements set out in Section 7.0 of the Conditions and Requirements of Relevant Competent Authorities and Public Utility Licensees.
- 6.3.3 The fitting-out works are to be completed prior to, or at the same time, as the Temporary Occupation Permit (TOP) is obtained for the development works for the Land Parcel, or the completion of the future CR19 CRL MRT Station (tentatively scheduled in 2032), whichever is earlier. The Successful Tenderer shall liaise with LTA for the latest updates on the implementation timeframe for the shell structure of the UPL.
- 6.3.4 The Successful Tenderer shall obtain a TOL from SLA to enter into and / or use State Land to undertake the fitting out of the UPL. The TOL shall be granted on such terms and charges and fees as may be agreed to by SLA.
- 6.3.5 In fitting out the sealed space, the Successful Tenderer shall ensure that all vertical circulation points, where proposed within the section of the UPL, are provided with two-way escalators, staircase and a pair of lifts.

- 6.3.6 The level of the pedestrian areas shall be maintained at a constant level throughout the entire length, wherever possible and comply with the relevant prevailing codes on barrier free accessibility. Any changes in level shall be kept to a minimum and subject to the requirements of the Authority, LTA and the relevant Competent Authorities.
- 6.3.7 At time of fitting-out works, the Successful Tenderer shall at his own cost and expense, retrofit the structures of the sealed space including its pop-up structures to comply with prevailing codes, standards and any other statutory requirements, where necessary and required.
- 6.3.8 The fitting out materials and finishes of the section of the UPL and its associated vertical pedestrian circulation points, are to be durable, appropriate for use and easily maintained and will be subject to the approval of the Authority and LTA.
- 6.3.9 Where necessary and required, the Successful Tenderer shall be responsible for providing additional vertical circulation points to the UPL, as required by the relevant Competent Authorities, especially LTA and SCDF, in relation to fire evacuation and smoke ventilation of the proposed development and any other statutory requirements.
- 6.3.10 The UPL shall also be designed to accommodate future installation of District Cooling System (DCS) pipes (as shown in DCS Infrastructure Plan in Control Plan) by Keppel DHCS Pte Ltd (notionally placed on the ceiling of the UPL). The Successful Tenderer shall coordinate with the Keppel DHCS Pte Ltd on the details for the required provisions in fitting-out works related to future DCS pipes installation (to refer to Clause 1.3 of Annex F1 – DCS Requirement for JLD for the proposed pipe sizes and necessary space requirement).
- 6.3.11 The UPL outside of the Land Parcel shall be handed over to the LTA for ownership and maintenance. Any associated vertical circulation points outside of the Land Parcel and required by the Authority and relevant Competent Authorities shall be handed over to the LTA for ownership and maintenance.
- 6.4 **Existing Buildings, Expunged Science Centre Road and Hardcourts within and around Land Parcel**
- 6.3.1 There are ongoing demolition works of existing buildings (10, 10A Science Centre Road and guardhouse), and the expunged portion of Science Centre Road located within and in the vicinity of the Land Parcel as shown on the Control Plans. The demolition works is expected to complete by 1Q2027. The as-built plan for the left-in piles will be provided to the Successful Tenderer after the site is awarded.
- 6.3.2 The Land Parcel will be sold with existing hardcourts / tennis courts in their current

conditions. The Successful Tenderer is required, at his own cost and expense, to demolish these affected hardcourts / tennis courts and remove any abandoned services.



Figure 10: Indicative location of Hardcourts/Tennis courts within the Land Parcel

6.3.3 The Successful Tenderer shall liaise with SLA to carry out the removal of the affected hardcourts / tennis courts. The Successful Tenderer shall also realign the existing fence to ensure that the State land (9 Science Centre Road) outside the Land Parcel remains enclosed for SLA.

6.5 **Construction Quality Assessment System (CONQUAS)**

6.5.1 The Successful Tenderer shall be required to refer and submit the proposed development to BCA to be assessed for the construction quality of the building works under the Construction Quality Assessment System (CONQUAS).

6.5.2 The Successful Tenderer is to comply with all requirements, procedures, directions and requests of BCA and pay all fees, charges and other amounts payable to BCA for and in relation to the assessment of the construction quality of the Development under CONQUAS. The Successful Tenderer is to render full co-operation to BCA, its officers, employees and agents in relation to such assessment under CONQUAS.

7.0 DESIGN ADVISORY PANEL

7.1 General

- 7.1.1 To ensure that the development meets the planning and urban design objectives described in Part IV, the development proposal will be subject to review by a Design Advisory Panel (DAP) and approval from the Authority before the formal submission process.
- 7.1.2 The DAP will be appointed by the Authority and will comprise members from the building and real estate industries as well as representatives from related fields, as and when necessary. The DAP will convene necessary meetings to provide inputs and comments on the overall building layout and architectural design, including the appropriate use of building materials, finishes and external lighting.

Pre-Submission DAP

- 7.1.1 A pre-submission DAP review will be convened prior to the DAP review, to provide opportunity for an early dialogue with the DAP and facilitate exploration of different development options in response to the site context for the proposed development.
- 7.1.2 The site's strategic location within JLD presents an opportunity for a mixed-use development that establishes a precedent for design excellence in future developments in JLD and contributes to a vibrant mixed-use business district. The pre-submission DAP review facilitates upstream review and opportunities for the Successful Tenderer to clarify or propose options, encouraging innovative building typologies and setting an appropriate design language for the precinct.
- 7.1.3 The pre-submission DAP review should be convened no later than 6 months after the tender has been awarded. After comments from the pre-submission DAP panel have been conveyed, the typical DAP evaluation process applies.
- 7.1.4 Please see Annex E1 for details on the scheduling of pre-submission DAP meetings and submission requirements.

DAP Evaluation Process

- 7.1.5 The DAP evaluation will be a two-stage process with Stage 1 (Pre-DG DAP) addressing the broader urban design aspects of the development proposal in relation to the form, massing, pedestrian connectivity, vehicular circulation, landscaping concepts, as well as the conceptual proposal in relation to the environmentally friendly design practices and features to meet BCA's Green Mark requirements. This is to ensure major issues affecting the layout of the proposal are addressed prior to the Design Gateway submission.

- 7.1.6 Stage 2 (Pre-CG DAP) commences after the Design Gateway clearance is obtained and will focus on the building layout and architectural design aspects of the proposal including the appropriate use of building materials, finishes, detailed landscaping design and external lighting design.
- 7.1.7 Please refer to the DAP Advisory Notes (Annexes E2 to E4C) for details on the scheduling of DAP meeting and submission requirements.

ANNEX A – ENVIRONMENTAL MODELLING AND ANALYSIS (WIND FLOW, SHADOW, AND THERMAL COMFORT) ADVISORY NOTES

- 1) Jurong Lake District (JLD) aims to be a sustainable model district, with new developments leveraging environmental modelling and analysis to inform design strategies.
- 2) This section outlines the general technical guidelines, modelling parameters and submission requirements to ensure that the environmental modelling works are conducted based on the best practices and in a consistent manner, to produce results that are more accurate and reliable to inform the design and decision-making processes.
- 3) The following table further summarises the environmental modelling and analysis requirements for Prospective Tenderers and Successful Tenderer at various stages:

Table 1 – Summary of Environmental Modelling and Analysis Requirements and Submission

Type of Environmental Modelling and Analysis Study	Successful Tenderers at Pre-submission DAP stage	Successful Tenderer at Development Application Stage	Relevant Segments within the TCOT
A1 - Wind Flow Analysis Study	Encouraged, but not a requirement.	Required to submit results with modelling methodology to illustrate the design optimisation process.	Part IV (Conditions 4.9 and 4.24)
A2 – Wind Flow Analysis Study for Alternative Proposals to the Proposed Wind Corridor	Only required if Tenderers wish to submit alternative proposals.		Part IV (Condition 4.10)
A3 – Shadow Impact Analysis Study	Encouraged, but not a requirement.	Required to submit results with modelling methodology to illustrate the design optimisation process.	Part IV (Conditions 4.9 and 4.24)
A4 - Thermal Comfort Analysis Study	Encouraged, but not a requirement.	Required to submit results with modelling methodology to illustrate the design optimisation process.	Part IV (Condition 4.24)

[A1] Guidelines for Wind Flow Analysis Study

- 1) The Successful Tenderer is required to demonstrate the use of Computational Fluid Dynamics (CFD) wind flow analysis in the design of building form and placement of building massing across the Land Parcel and show how it interfaces with neighbouring developments.
- 2) The Successful Tenderer is required to show how the design interventions were made to enhance the site's overall wind flow and thermal comfort, especially for key public spaces and thoroughfares stated in Part IV (Condition 4.23).

Modelling Parameters

- 3) The following parameters and assumptions shall be used for the CFD wind flow analysis:
 - a) The model extents shall include:
 - i. All 3D massing and terrain that are provided as part of the eDeveloper's Packet (Figure 1). Vegetation and trees are not required to be modelled for the purpose of the study.
 - b) To conduct the CFD wind flow analysis based on North-East wind to represent the North-East Monsoon and the South wind to represent the South-West Monsoon.
 - c) The inbound vertical wind profile shall be represented by Logarithmic Law with reference height at 33m and reference wind speed of 2.2m/s for North-East wind and 2.4m/s for South wind (based on wind data from nearest available weather station located at Boon Lay East from 2010-2015).
 - d) URA may provide and require an alternative inbound vertical wind profile used in CFD wind flow simulations, the Successful Tenderer is required to check with URA before conducting the CFD wind flow analysis.
 - e) Other modelling assumptions and parameters that are not listed here (e.g. computational domain, turbulence models, etc.) shall be based on BCA's CFD technical guidelines.

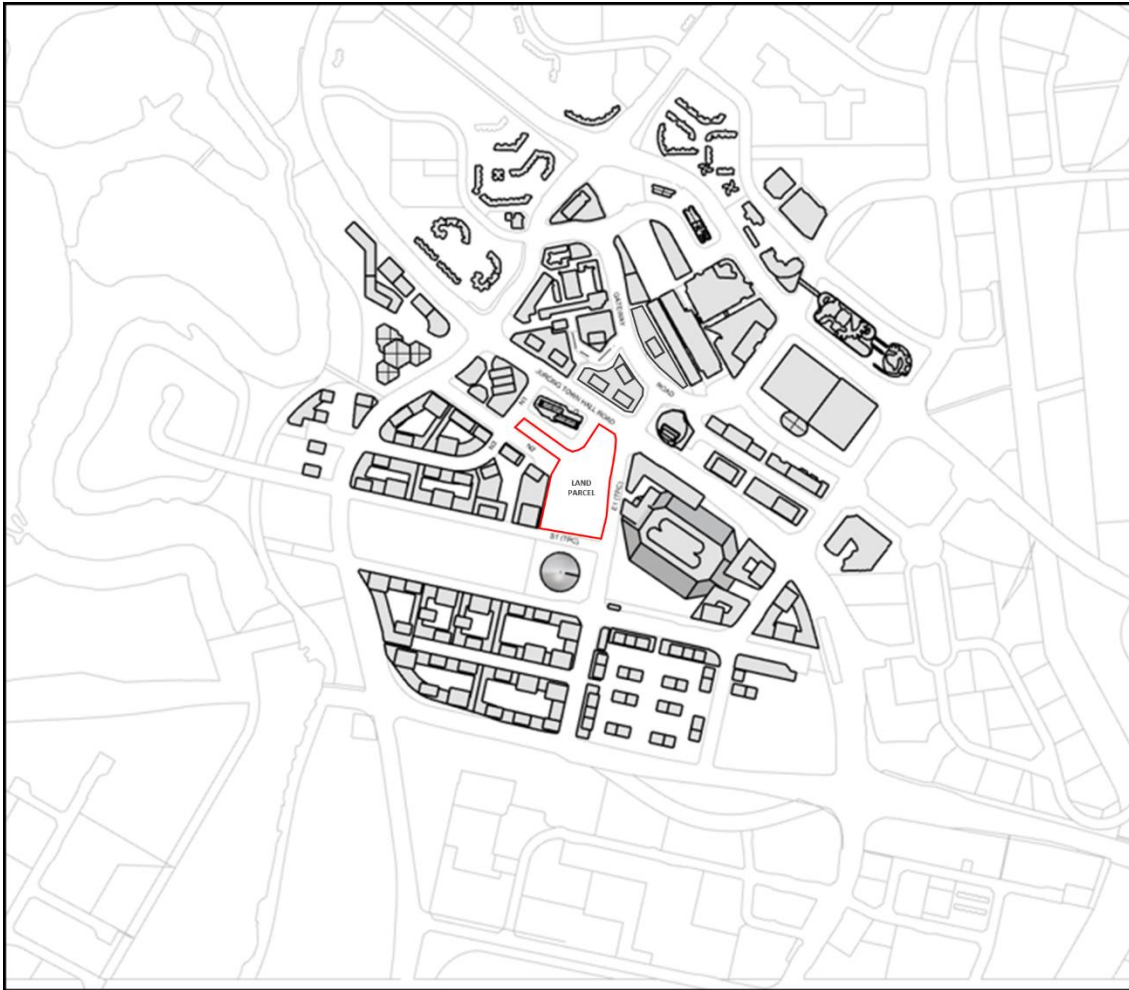


Figure 1: 3D massing for Environmental Modelling purposes, will be included as part of the eDeveloper's Packet

Submission Requirements

- 4) The materials submitted shall include (but are not limited to):
 - a) Write up on CFD methodology and modelling settings (e.g. Boundary Conditions, Wall Functions, etc) for the study.
 - b) The wind speed contour maps for the two prevailing monsoon wind directions at 1.5m and 60m cut plane from the ground to model wind and ventilation conditions of the mid-block of the existing and future developments in JLD.
 - c) Results and written analysis, to substantiate through quantitative analysis, the iterative process of improving the wind flow through testing and optimisation of design options.

[A2] Guidelines for Wind Flow Analysis Study for Alternative Proposals to the Proposed Wind Corridor

- 1) The Tenderer may submit, for the Authority's consideration, an alternative proposal on the requirements pertaining to the wind corridor, that is substantiated with Computational Fluid Dynamics (CFD) wind flow analysis.
- 2) The submission will be part of the pre-submission DAP process and/or formal Development Application process.
- 3) The CFD wind flow analysis shall be accurately done for the specific design proposal. If major design revisions to the proposal or parts of it are made after submission, a resubmission of the CFD wind flow analysis is required.
- 4) Deviations from the guidelines or waiver requests will be evaluated in relation to the overall design concept/scheme and evaluated against the objectives of the guidelines, to determine if there are merits to allow the deviations/waivers. Tenderers are advised to factor in additional time for the evaluation of deviations/waivers.

Modelling Parameters

- 5) The following parameters and assumptions, in addition to those stated in Annex A1, shall be used for the CFD wind flow analysis for alternative proposal:
 - a) The model extents shall include:
 - i. All 3D massing and terrain that are provided as part of the eDeveloper's Packet plus the additional 3D massing in brown hatch (Figure 2).
 - ii. The additional 3D massing will be provided on request by the Tenderer for the purpose of the CFD wind flow analysis study for alternative proposals.



Figure 2: Additional 3D Massing in brown hatch will be provided for CFD wind flow analysis study for alternative proposals

Submission Requirements

- 6) The materials submitted shall include all the requirements listed in Annex A1 and the following (but are not limited to):
 - a) Results and written analysis, to substantiate through quantitative analysis, that the alternative proposal will serve to achieve the same or even better planning objective in enhancing ventilation and wind flow through JLD.

[A3] Guidelines for Shadow Impact Analysis

- 1) The Successful Tenderer shall conduct shadow impact analysis for 21 March, 21 June and 21 December at one hour interval from 7:00am to 7:00pm to show the cumulative shadows cast for each day on the public space. Key public spaces and thoroughfares which are exposed more than 50% of the time shall be mitigated with appropriate design strategies (e.g. high albedo selection, landscape design, etc.).
- 2) The Successful Tenderer shall demonstrate sufficient shade is provided using shadow diagrams at 9:00am, 12:00pm and 4:00pm on 21 March, 21 June, and 21 December that:
 - a) At least 50% of the total courtyard area is shaded; and

- b) At least 50% of the public space seating in the courtyard is shaded by integrating various design strategies (i.e. self-shadow, cast-shadow, trees, canopies/pergolas, adjustable umbrellas/shelters, landscape elements).

Modelling Parameters

- 3) The following parameters and assumptions shall be used for the Shadow Impact analysis:
 - a) The model extents shall include:
 - i. 3D massing and terrain within 200m of the Land Parcel, to be extracted from the 3D massing provided in the eDeveloper's Packet (Figure 1).
 - ii. Vegetation and trees may be modelled as solid geometries with justifications on the shape, height, and size, for the purpose of the study.

Submission Requirements

- 4) The materials submitted shall include (but are not limited to):
 - a) Write up on shadow impact analysis methodology and modelling settings (e.g. Location, sky conditions, etc) for the study.
 - b) Representations of the shadow casting from neighbouring buildings and proposed developments in different colours to differentiate between the shadows casted.
 - c) Results and written analysis, to substantiate through quantitative analysis, to demonstrate how the shading requirements are being met.

[A4] Guidelines for Thermal Comfort Analysis

- 1) For key outdoor public spaces and thoroughfares, the Successful Tenderer shall conduct Outdoor Thermal Comfort (OTC) modelling and analysis using Universal Thermal Comfort Index (UTCI) as an indicator, showing the results at 12:00pm for a typical day in April and October months.
- 2) For other key sheltered, naturally ventilated public spaces and thoroughfares, the Successful Tenderer shall recommend a suitable thermal comfort index (e.g. Predicted Mean Vote (PMV)) and perform thermal comfort modelling and analysis to show the predicted comfort level of such spaces.
- 3) The Successful Tenderer shall make use of the wind speeds from the CFD Wind Flow Analysis as part of the input parameters in modelling of thermal comfort for all key public spaces and thoroughfares.

Modelling Parameters

- 4) The following parameters and assumptions shall be used for the Thermal Comfort Modelling and analysis:

- a) The model extents shall include:
 - i. 3D massing and terrain in the immediate surrounding of the Land Parcel, if required, can be extracted from the 3D massing provided in the eDeveloper's Packet (Figure 1).
 - ii. Vegetation and trees may be modelled as solid geometries with justifications on the shape, height, and size, for the purpose of the study.
- b) Where mechanical ventilation is considered, the Successful Tenderer are encouraged to model the wind speed using CFD software and use it for calculating the overall improvement in thermal comfort.
- c) The Dry Bulb Temperature (DBT) at 12:00pm for the modelling of UTCI can be assumed to be 31.3°C for a typical day in April and 30.8°C for a typical day in October (DBTs extracted from latest available data from Boon Lay East weather station).
- d) URA may provide and require the use of other DBT data to be used for thermal comfort modelling, the Successful Tenderer is required to check with URA on the modelling parameters before conducting any thermal comfort analysis.
- e) Other modelling assumptions and parameters that are not listed here shall be based on BCA's CFD technical guidelines.

Submission Requirements

- 5) The materials submitted shall include (but are not limited to):
 - a) For outdoor public spaces - Write up on OTC modelling methodology, (e.g. methods to determine environmental parameters like air temperature, mean radiant temperature, humidity, wind) in the UTCI model and the assumptions that are used in the model.
 - b) For sheltered, naturally ventilated public spaces – Write up on the thermal comfort modelling methodology and justification of the chosen thermal comfort indicator (e.g. PMV or other comfort index) to be used and assumptions made to derive/model the different environmental parameters.
 - c) Results and written analysis, to substantiate through quantitative analysis, to demonstrate how the design of various key public spaces and thoroughfares are optimised to achieve the desired thermal comfort levels.

ANNEX B – WALKING AND CYCLING NETWORK SUBMISSION

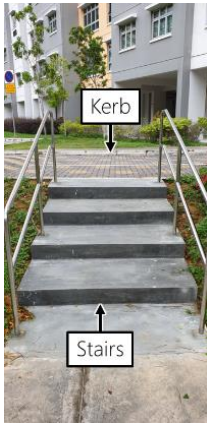
At the formal submission stage, the Successful Tenderer is to submit a precinct-level digital pedestrian and cycling network georeferenced to Singapore TM SVY21. This network should be connected to the surrounding pedestrian and cycling network, provided by URA. The network is to be provided in a 3D GIS format and must include the following attribute fields as outlined in Table 2. Examples of the attributes and its values are shown in Table 3.

Table 2 – Formal Submission Stage

3D Submission Pedestrian and Cycling Network Layers

S/N	Attribute Field	Value Code	Value Description	Geometry /Data Type
1	VERT_LINK	0	None	Line
		1	Stairs	
		2	Escalator	
		3	Elevator	
		4	Travelator	
2	SHELTERED	0	Non-Sheltered Path	
		1	Sheltered Path	
		2	Sheltered Path with Air Conditioning	
3	BARRIER_FREE	0	Non-Wheelchair Accessible	
		1	Wheelchair Accessible	
4	PATH_WIDTH	Based on the path width	Actual Width (in metres)	Numeric

Table 3 – Examples of the WCN features and its attributes

S/ N	Attribute Field	Value Codes: Value Description				
	VERT_LINK	0: None 	1: Stairs 	2: Escalator 	3: Elevator 	4: Travelator 
2	BARRIER_FREE	0: Non-Wheelchair Accessible 		1: Wheelchair Accessible 		
3	SHELTERED	0: Non-Sheltered Path 	1: Sheltered Path 	2: Sheltered Path with Air Conditioning 		

DEVELOPMENT
A T TOWN HALL LINK

INFRASTRUCTURE PLAN
Notional Common Services Tunnel
(CST) Plan

LEGEND

- Road Reserve Line
- Development Boundary Line
- The core and shell of the proposed Common Services Tunnel (CST) is to be constructed by URA. The Successful Tenderer is to fit-out and commission the CST afterwards
- Proposed CST ancillary structures by Successful Tenderer are:
- Proposed Ventilation shaft and Entrance/ Exit structure complete with M&E installation
- Proposed Facilities Control Centre (FCC) including all essential control system/ facilities as required (Location indicative only)
- Proposed CST 22KV/LV Electrical Substation (CST 22KV/LV ESS) (Location indicatively only)
- Proposed Link Chamber connecting CST to Plot 1's basement to be constructed by Successful Tenderer (Location indicative only)
- 7.40 Proposed Road Level (SHD +7.40m)

NOTES:

This Infrastructure Plan of the proposed development is intended as a guide on the requirements of the Urban Redevelopment Authority.

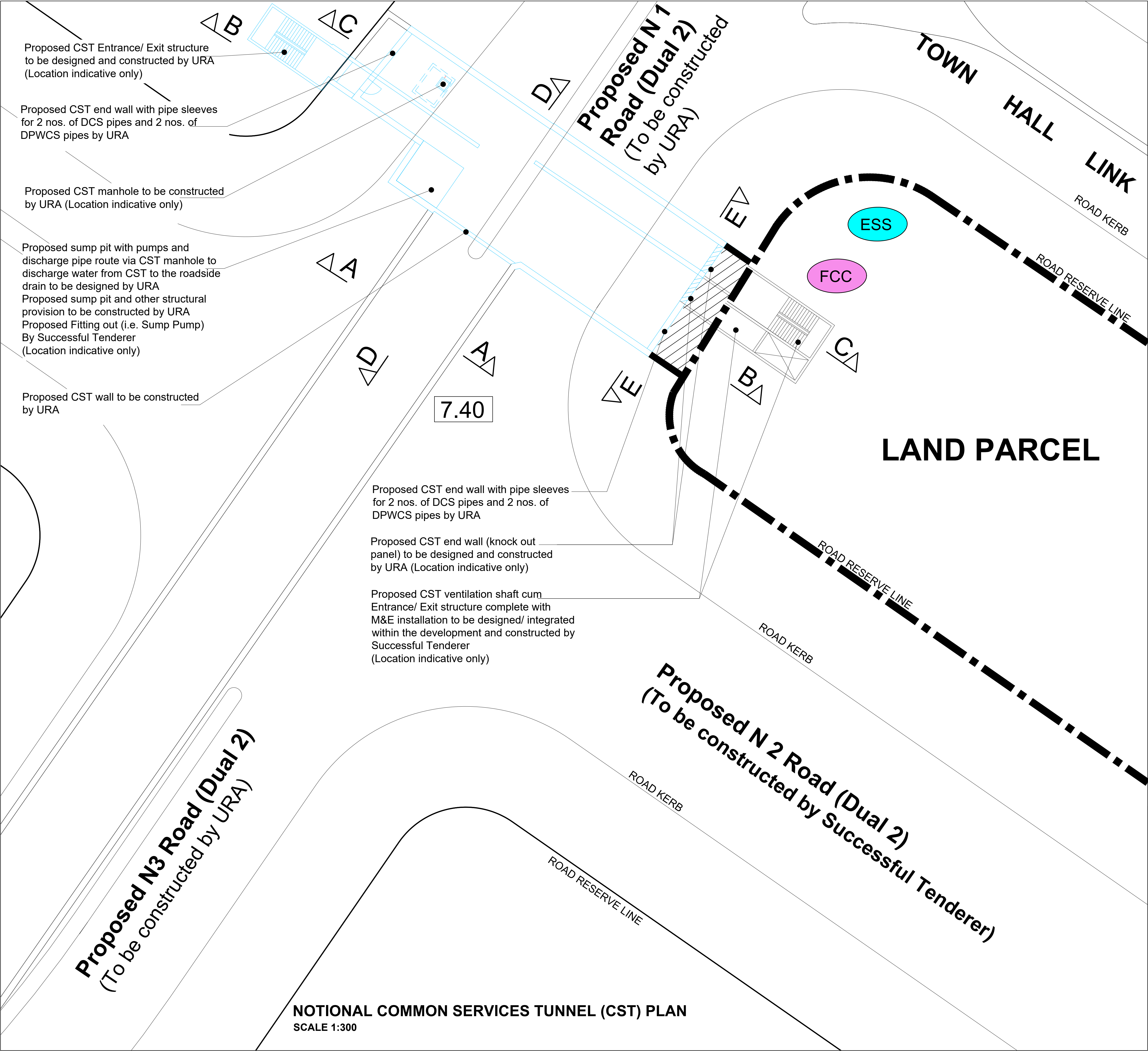
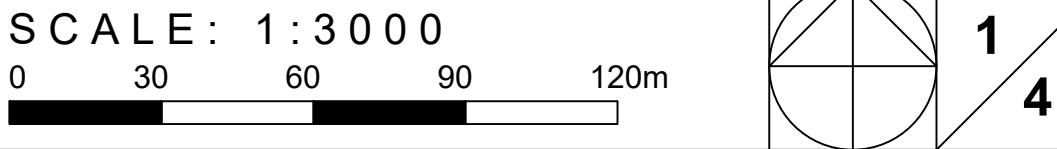
The successful tenderer shall confirm and comply with requirements of the relevant Competent Authorities before submission of plans for formal consideration.

This Infrastructure Plan is to be read in conjunction with the relevant Terms and Conditions.

All site areas are estimated and subject to final survey.

All platform levels are indicative only and subject to detailed site investigation and final survey.

The alignment and location of the existing / proposed infrastructure; services etc are indicative only. The successful tenderer shall consult the relevant Competent Authorities / Public Utility Licensees on the detailed information if any. The information given without any liability for any error or mis-statement or omission on the part of the Urban Redevelopment Authority.



DEVELOPMENT
A T TOWN HALL LINK

INFRASTRUCTURE PLAN
Notional CST Sections A-A and B-B

LEGEND

- The core and shell of the proposed Common Services Tunnel (CST) is to be constructed by URA. The Successful Tenderer is to fit-out and commission the CST afterwards

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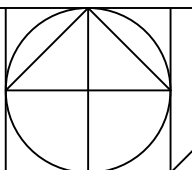
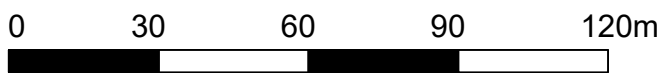
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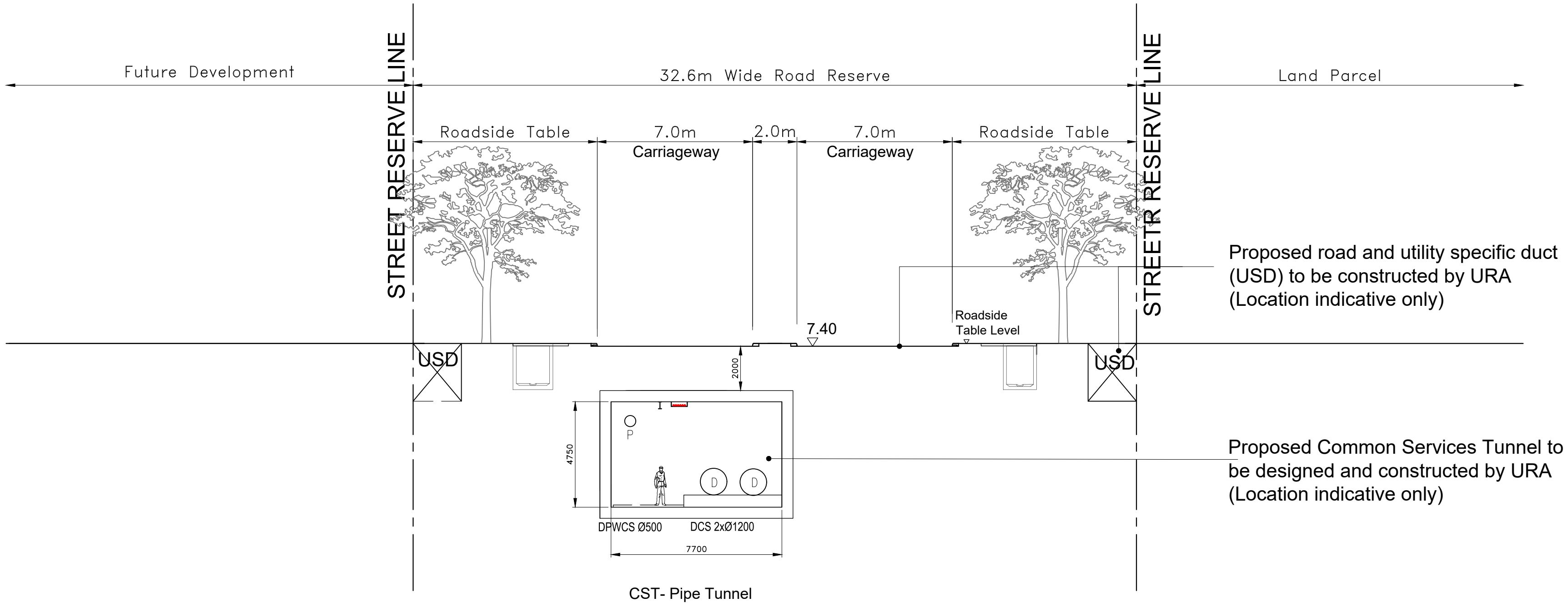
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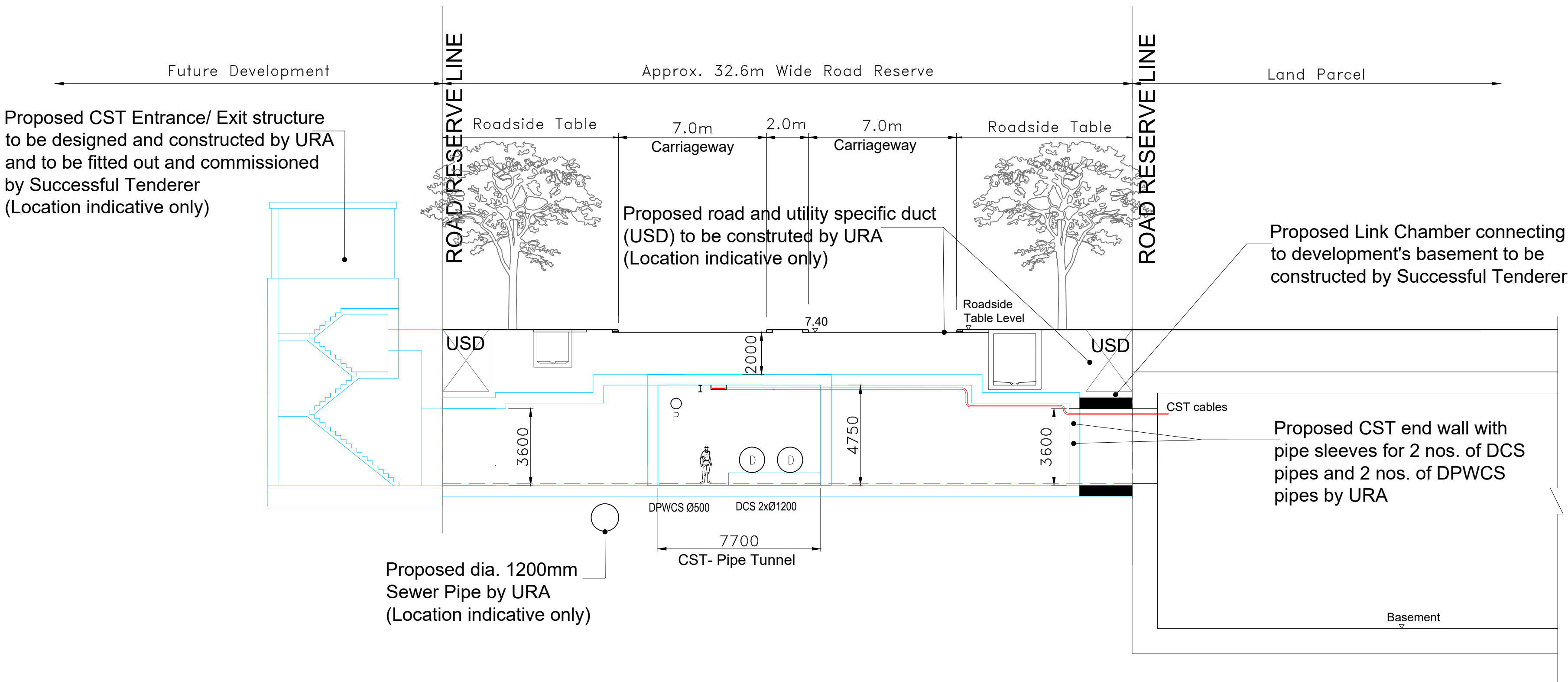
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To make Singapore a great city to live, work and play



SECTION A - A
SCALE 1:300



SECTION B - B
SCALE 1:300

Notional Sections C-C and D-D

===== The core and shell of the proposed Common Services Tunnel (CST) is to be constructed by URA. The Successful Tenderer is to fit-out and commission the CST afterwards

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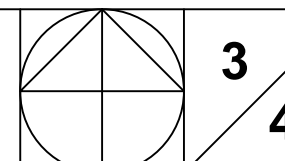
All site areas are estimated and subject to final survey.

All platform levels are indicative only and subject to detailed site investigation and final survey.

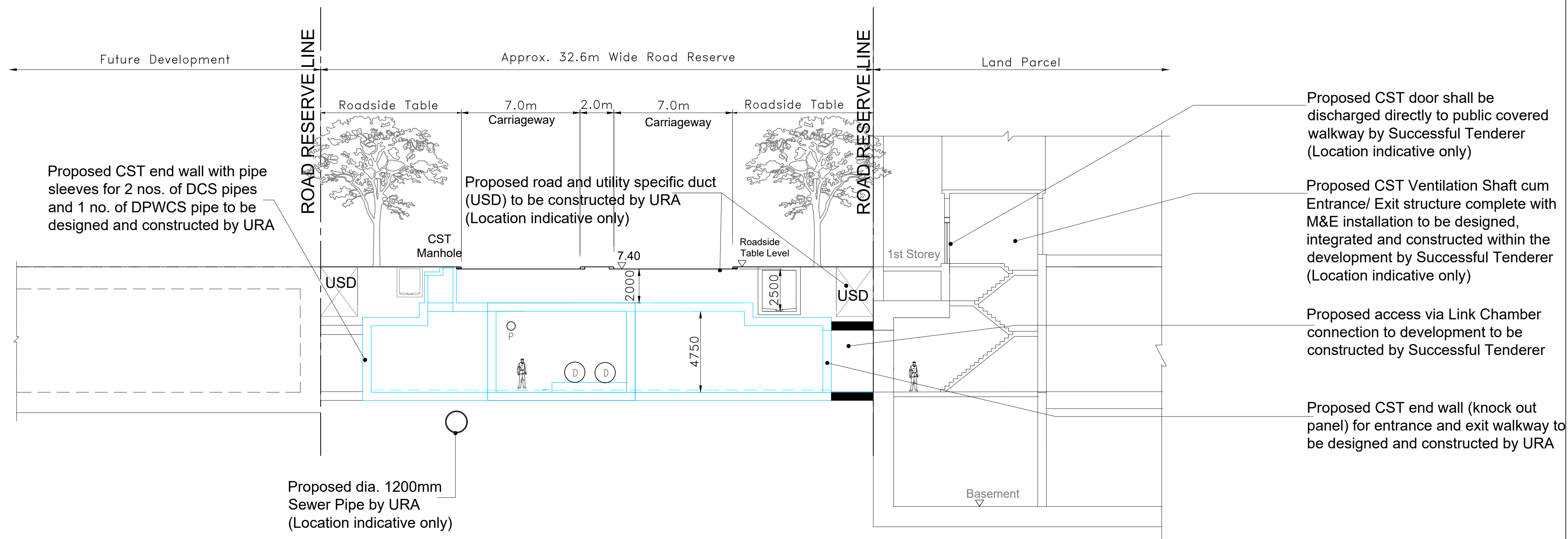
The alignment and location of the existing / proposed infrastructure; services etc are indicative only. The successful tenderer shall consult the relevant Competent Authorities / Public Utility Licensees on the detailed information if any. The information given without any liability for any error or mis-statement or omission on the part of the Urban Redevelopment Authority.

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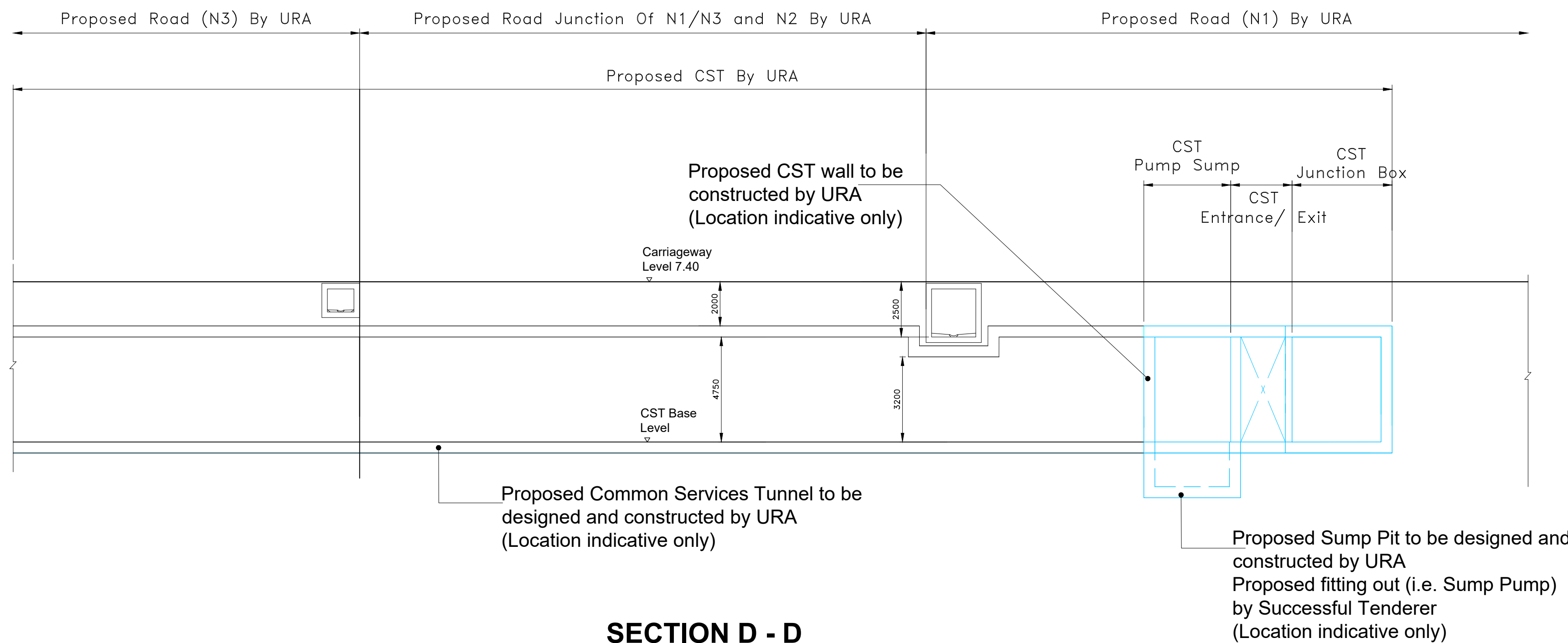
0 30 60 90 120m



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SECTION C - C
SCALE 1:300



SECTION D - D
SCALE 1:300

DEVELOPMENT
A T TOWN HALL LINK

INFRASTRUCTURE PLAN

Notional CST Sections E-E and F-F

LEGEND

The core and shell of the proposed Common Services Tunnel (CST) is to be constructed by URA. The Successful Tenderer is to fit-out and commission the CST afterwards

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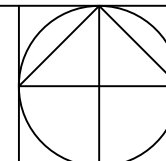
All site areas are estimated and subject to final survey.

All platform levels are indicative only and subject to detailed site investigation and final survey.

The alignment and location of the existing / proposed infrastructure; services etc are indicative only. The successful tenderer shall consult the relevant Competent Authorities / Public Utility Licensees on the detailed information if any. The information given without any liability for any error or mis-statement or omission on the part of the Urban Redevelopment Authority.

SCALE: 1:3000

0 30 60 90 120m

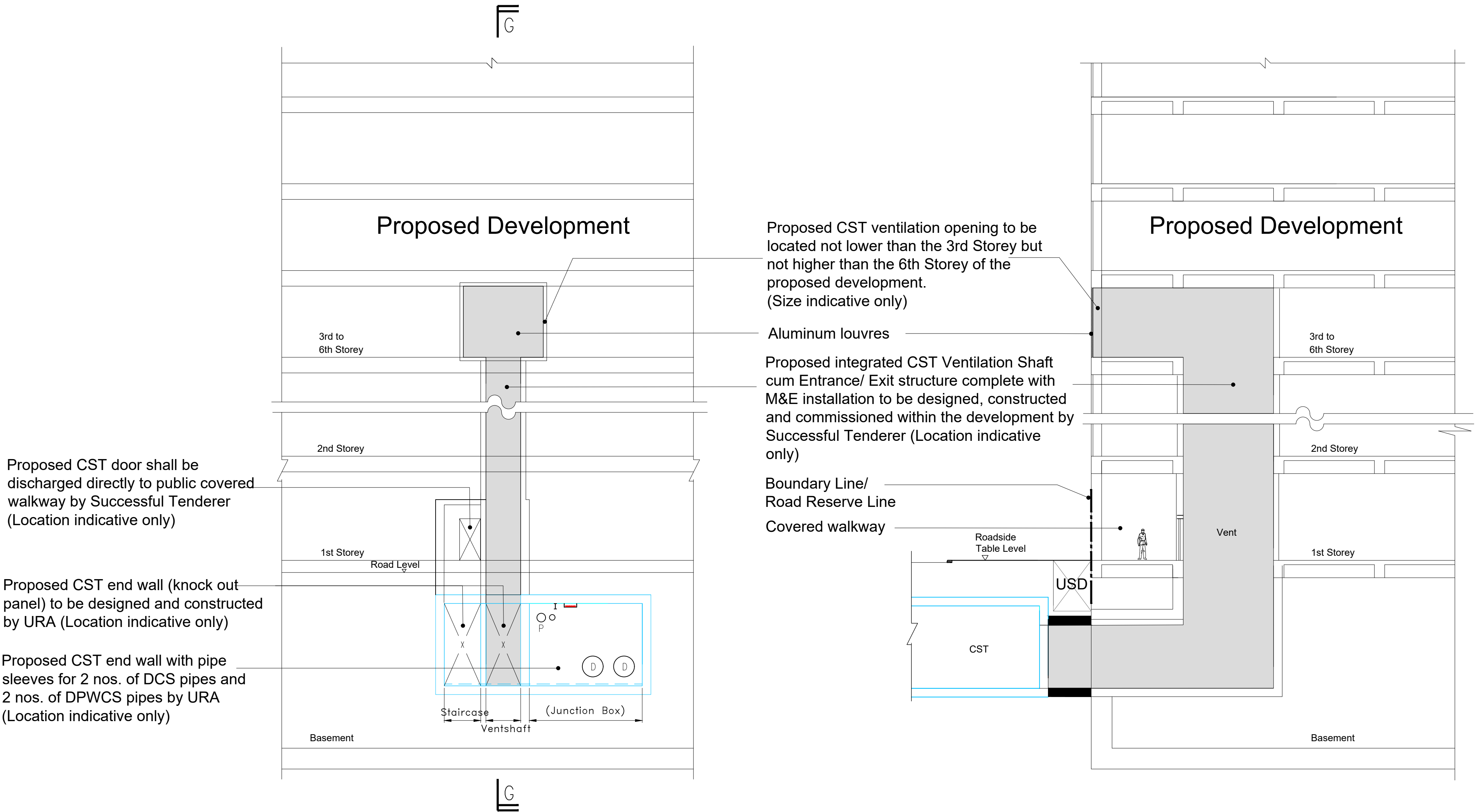


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URBAN
REDEVELOPMENT
AUTHORITY

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SECTION E - E
SCALE 1:300

SECTION F - F
SCALE 1:300

ANNEX D – DEFINITION OF SHELL AND CORE OF DCS PLANT IN JLD DEVELOPMENT

DEFINITION OF SHELL AND CORE OF DCS PLANT

All other items or works which are not mentioned in this list, be it necessary for the operation of the DCS Plant or otherwise, shall be deemed to be carried out and paid by Keppel DHCS Pte Ltd, the DCS Operator (“DCSO”).

All submissions to relevant authorities which are necessary for the operation of the DCSO, shall be deemed to be carried out and paid by DCSO unless otherwise agreed in writing between the parties. Any changes to the shell building as a result of the DCS requirement shall be borne by the DCSO unless otherwise agreed in writing between the parties.

	Item Description	Designed By	Supplied By	Constructed / Installed By	Remarks
1	Structural floor and concrete finishes For the avoidance of doubt, works including but not limited to the following shall be carried out and borne by the DCSO: • RC Plinths for all main equipment. • All water proofing where required to wet area and floor screeding to RC plinths • Sump pit, pumps, pipework c/w breeching inlets and all associated cablework at chilled water tank room • Intermediate RC beam for piping cable support purpose • Provisions for hoisting	Successful Tenderer's Consultant	Successful Tenderer's Contractor	Successful Tenderer's Contractor	The finishes provided under the Main Contract, if any, will be just screeding. DCSO's Consultant and Contractor shall provide structural loading requirements, detail plinth layout with dimensions, forces transmitted to structural slab, beams, columns etc based on final equipment selection to the Successful Tenderer's consultants for design verification based on latest design.

	Item Description	Designed By	Supplied By	Constructed / Installed By	Remarks
2	Structural and architectural provision up to finishing level of the roof for placing of cooling towers. For the avoidance of doubt, works including but not limited to the following shall be carried out and borne by the DCSO: Acoustic and aesthetics treatment for equipment on the roof (e.g. cooling towers)	Successful Tenderer's Consultant	Successful Tenderer's Contractor	Successful Tenderer's Contractor	DCSO shall ensure that water proofing provided by the Successful Tenderer is not damaged by the DCSO's installation works. DCSO shall coordinate with the Successful Tenderer's Main Contractor before execution of their work and reinstate the affected element.
3	RC Plinths for main equipment	DCSO's Consultants	DCSO's Contractor	DCSO's Contractor	
4	Boundary wall with skim coat & painting. For the avoidance of doubt, works including but not limited to the following shall be carried out and borne by the DCSO: - All partition wall and rooms - All internal staircases, RC or metal, accessways, doors and access doors for shafts and spaces - Casting back of wall and slab openings and construction hatches that were kept open for moving in of DCS equipment	Successful Tenderer's Consultant	Successful Tenderer's Contractor	Successful Tenderer's Contractor	Refers only to walls separating / demarcating DCP Spaces from other spaces.

	Item Description	Designed By	Supplied By	Constructed / Installed By	Remarks
	- All roller shutters and hatches - RC make-up water tank and make-up pump room - Domestic Water supply pipework and tap points for DCS Plant rooms and areas				
5	Provision of “Knock-out panel” at Basement wall for pipe penetration. For the avoidance of doubt, works including but not limited to the following shall be carried out and borne by the DCSO: Pipe sleeve and sealing up of the pipe sleeves to ensure water tight integrity	DCSO’s Consultants shall propose design for acceptance by Successful Tenderer’s Consultant	Successful Tenderer’s Contractor	Successful Tenderer’s Contractor	DCSO will have to advise on locations and numbers of knock out panels before the start of the foundation works.
6	Allocation of space or floor space for the laying of DCS reticulation pipe and data communication cables in common basement. Detailed space calculation & coordination shall be by DCSO.	Successful Tenderer’s Consultant	Successful Tenderer’s Contractor	Successful Tenderer’s Contractor	DCSO shall coordinate with Successful Tenderer’s Contractor /Consultants on DCS reticulation pipe laying.
7	Floor Trap, insulated floor traps and sump pit for DCS Plant rooms/ areas. For the avoidance of doubt, works including but not limited to the following shall be carried out and borne by the DCSO: - All drainage to the floor traps - Sump pumps and associated piping	Successful Tenderer’s Consultant	Successful Tenderer’s Contractor	Successful Tenderer’s Contractor	

	Item Description	Designed By	Supplied By	Constructed / Installed By	Remarks
	system serving DCS plant rooms				
8	Services' shafts, if any. For the avoidance of doubt, works including but not limited to the following shall be carried out and borne by the DCSO: • Casting back of wall and slab openings and construction hatches that were kept open for moving in of DCS equipment • All roller shutters • All M&E works and any additional work required within the shaft • Domestic Water / NEWater supply pipework and tap points for DCS Plant rooms and areas	Successful Tenderer's Consultant	Successful Tenderer's Contractor	Successful Tenderer's Contractor	The shafts will be done by Successful Tenderer. However, all M&E works and any additional work required within the shaft is deemed to be designed, supplied and constructed by DCSO's Consultants and Contractor.
9	Cast-in pipe sleeves, cast in plates, puddle flanges and MCT frames in RC walls, RC tank walls, slabs	DCSO's Consultant	DCSO's Contractor	Successful Tenderer's Contractor	Design and supply to be by DCSO. Successful Tenderer's Contractor will assist to cast in the items but standing supervision will be provided by DCSO. The onus to ensure that the cast in items are in the correct position is on DCSO.

	Item Description	Designed By	Supplied By	Constructed / Installed By	Remarks
10	Thrust block for Condenser Water Supply / Return pipe risers	DCSO's Consultant	DCSO's Contractor	DCSO's Contractor	
11	M&E Services for DCS Plant rooms / areas i. 1st layer Sprinklers (upright, pendent and under obstruction), hoses, fire extinguishers at DCS Plant rooms / areas ii. Fire Alarm System for DCS Plant rooms / areas iii. Telecommunications for DCS Plant rooms / areas For the avoidance of doubt, works including but not limited to the following shall be carried out and borne by the DCSO: • All other M&E requirements and finishes for DCS Plant rooms / areas is considered as fit-out works • Interlocking of DCS Plant room refrigerant leak detection system, if any to make use of DCS Engineered Smoke Control System duct works as means of discharge for refrigerant leak detection system during normal mode	Successful Tenderer's Consultant	Successful Tenderer's Contractor	Successful Tenderer's Contractor	Successful Tenderer will only provide the basic M&E required for the Development's TOP purposes. Only Emergency lights required for TOP purposes will be provided by Successful Tenderer's Contractor. Successful Tenderer will safeguard shaft space for the DCSO to install its M&E ducting/piping/cabling.

	Item Description	Designed By	Supplied By	Constructed / Installed By	Remarks
	- Fresh air fan and associated ductwork within DCS Plant rooms - Earthing of equipment.				
12	Provision of space for a dedicated PowerGrid 22kV electrical substation space for incoming mains (if any) For the avoidance of doubt, works including but not limited to the following shall be carried out and borne by the DCSO: - Liaison and Application to Power Grid - Handing over to Power Grid	Successful Tenderer's Consultant	Successful Tenderer's Contractor	Successful Tenderer's Contractor	DCSO to specify the dimension & opening of HT room (if any).
13	Provision of water main from PUB bulk meter to cooling tower make-up water transfer RC tank (include RC transfer tank) DCS Cooling Tower Make-up transfer pumps and piping from Transfer Tanks to roof Cooling Tower make-up tanks For the avoidance of doubt, works including but not limited to the following shall be carried out and borne by the DCSO: Transfer pumps and piping from Cooling Tower Make up transfer tank to Roof Cooling Tower Make-up tanks	Successful Tenderer's Consultant	Successful Tenderer's Contractor	Successful Tenderer's Contractor	DCSO to specify storage capacity required for transfer tank provision.

	Item Description	Designed By	Supplied By	Constructed / Installed By	Remarks
	- Roof cooling towers make-up tanks complete with necessary accessories - Submission to relevant authority				
14	Smoke Purging / Engineered Smoke Control and all associated equipment, ductwork, cablework and shafts for DCS Plant rooms / areas	Successful Tenderer's Consultant	Successful Tenderer's Contractor	Successful Tenderer's Contractor	All design and installation are based on open space without internal partition / room.

Table 1. Non-Residential Developments*: Scope of Works between the Successful Tenderer and DCSO

	DCS Plant Core & Shell	DCS Plant equipment	Reticulation pipes	Heat exchanger station Core & Shell	Heat exchanger station equipment**
Specifications by	DCSO	DCSO	DCSO	DCSO	DCSO
Paid by	Successful Tenderer	DCSO	DCSO	Successful Tenderer	DCSO
Design, install and T&C by	Successful Tenderer	DCSO	DCSO	Successful Tenderer	DCSO
Ownership	Successful Tenderer	DCSO	DCSO	Successful Tenderer	DCSO
Maintained by	Successful Tenderer	DCSO	DCSO	Successful Tenderer	DCSO
Utility	NA	DCSO	DCSO	NA	NA

*Including serviced apartments

**Referring to equipment within one (1) heat exchanger station that serves the whole Development, located within 50m from the DCS Plant. The ST is allowed to provide for more intake stations within the Development at his own cost and expense (all additional costs associated with additional heat exchangers (including equipment) shall be borne by the ST).

Table 2. Residential Developments: Scope of Works between the Successful Tenderer and DCSO

	DCS Plant Core & Shell	DCS Plant equipment	Reticulation pipes	Heat exchanger station Core & Shell	Heat exchanger station equipment*	Tertiary pump system, pipe routing and risers**	BTU meters and remotely actuated valves for each dwelling unit**	Fan Coil units and chilled water pipe within dwelling unit**
Specifications by	DCSO	DCSO	DCSO	DCSO	DCSO	DCSO	DCSO	DCSO

Paid by	Successful Tenderer	DCSO	DCSO	Successful Tenderer	DCSO	Successful Tenderer	Successful Tenderer	Successful Tenderer
Design, install and T&C by	Successful Tenderer	DCSO	DCSO	Successful Tenderer	DCSO	Successful Tenderer	DCSO	Successful Tenderer
Ownership	Successful Tenderer	DCSO	DCSO	Successful Tenderer/MCST	DCSO	Successful Tenderer/MCST	DCSO	Resident
Maintained by	Successful Tenderer	DCSO	DCSO	Successful Tenderer/MCST	DCSO	Successful Tenderer/MCST	DCSO	Resident
Utility	NA	DCSO	DCSO	NA	NA	MCST	NA	Resident

Abbreviations:

DCSO – District Cooling System Operator, Keppel DHCS Pte Ltd

NA – Not Applicable

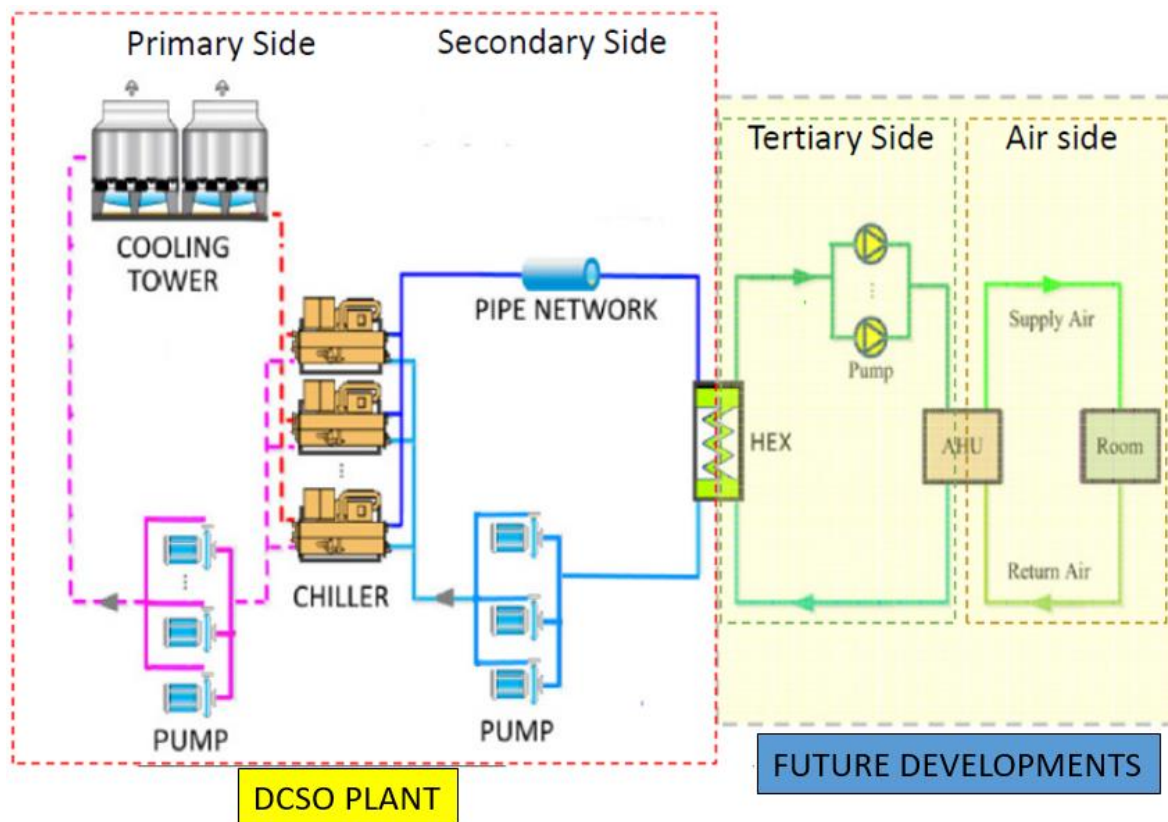
*Referring to equipment within one (1) heat exchanger station that serves the whole Development, located within 50m from the DCS Plant. The ST is allowed to provide for more intake stations within the Development at his own cost and expense (all additional costs associated with additional heat exchangers (including equipment) shall be borne by the ST).

**For Standard Specifications for Mechanical Works of DCS piping, equipment and fittings for Residential Developments please refer to Annex F4 as a guide.

Notes

1. Handover of building system ownership is from the Successful Tenderer to Resident/MCST.
2. Unless the system is proprietary or critical, ownership should remain with MCST. As per MOF IM, direct contracting should only be considered where absolutely necessary.
3. The onus should be on DCSO to clearly demonstrate as to why direct contracting should be considered if such scenario arises.

Schematic of DCS with respective primary, secondary, tertiary and air side



Note: to refer to Table 1 and 2 in previous page for the scope of works between Successful Tenderer and Keppel DHCS Pte Ltd (DCS Operator).

ANNEX E1 – PRE-SUBMISSION DAP ADVISORY NOTES

Pre-submission DAP Advisory Notes

Scheduling of pre-submission DAP Meetings

1. The pre-submission DAP process will convene no later than 6 months after the GLS tender is awarded.
2. The Applicant is to inform the Authority by way of email 4 weeks in advance, of submitting the concept proposal.
3. The pre-submission DAP session will take place approximately 3 to 4 weeks after receiving the Applicant's concept proposal with a complete set of pre-submission DAP materials as detailed below.
4. Conveyance of minutes will generally be issued approximately 2 weeks after the pre-submission DAP session. This is not meant as an endorsement of the proposal, but to provide clearer directions for the Successful Tenderer to continue developing the scheme with design strategies that respond positively to the site.

Guidelines for Preparing the Submission/Presentation Materials

5. The following aspects are to be included in the submission materials:
 - a) Design Concept demonstrating how:
 - i. A distinctive high-quality architecture underscores the importance of the site within JLD, and sets a high standard for future developments in the new precinct
 - ii. Well-considered mix and layout of the various uses, active frontages and public spaces contribute to a vibrant mixed-use business district
 - iii. Innovative building typologies of appropriate form, massing and scale respond sensitively to the surroundings and Singapore's equatorial climate, with placement of buildings spaces optimising thermal comfort for the Development (e.g. self-shading, channelling wind flow)
 - iv. Climate-sensitive and future-proofed design features are integrated in the proposed development (e.g. planters; sky terraces; water-sensitive urban design, solar panels)
 - v. Landscape Replacement Areas / landscaping concepts supports JLD's positioning as a district of gardens and waterbodies with well-integrated lush landscaping

b) Public Realm* proposal demonstrating how:

- i. A pedestrian-friendly experience can be achieved to facilitate seamless pedestrian movement through the site, to public transport nodes, surrounding developments and amenities.
- ii. Proposed public realm creates a pleasant arrival experience into the new precinct, via the 1st storey (pedestrian and vehicular access) and 2nd storey (pedestrian access e.g. from the MRT stations).
- iii. Sustainable designs, systems, and features are incorporated in the proposed public realm to provide optimal thermal comfort
- iv. Public space design can accommodate a variety of place making activities ranging from organised community events to informal gatherings, with meaningful variation in type, size, and/or configuration of public spaces that can attract different user groups of all age and mobility levels.

**The proposed public realm shall comprise the pedestrian network and other proposed public spaces, such as courtyards and open plazas, and be well-designed to enhance the streetscape.*

6. The submission should include the following:

- i. Schematic plans, sections, elevations and renders. The plan should indicatively show the location and integration of district-level infrastructure (DCS and DPWCS) to be provided for the proposed Development.
- ii. A pre-submission DAP presentation deck that is brief and succinct, not exceeding 30 slides. 2 hardcopies of the slides should be provided in A3 print format. The applicant should elaborate on their approach to design and propose topics for discussion at pre-submission DAP. If alternative options are proposed, diagrams should be provided to describe the different options.
- iii. A schematic physical massing model(s) showing the proposed development in relation to the surrounding existing and future site context at 1:750 scale. A cropped 3D digital model, for the physical scaled submission, can be purchased from the Developer's Package. The scaled physical model should include the surrounding existing and future context for JLD as shown in Figure 1. As a guide, the model shall include the future developments, existing developments, MRT viaducts, the indicative central park, and future roads.

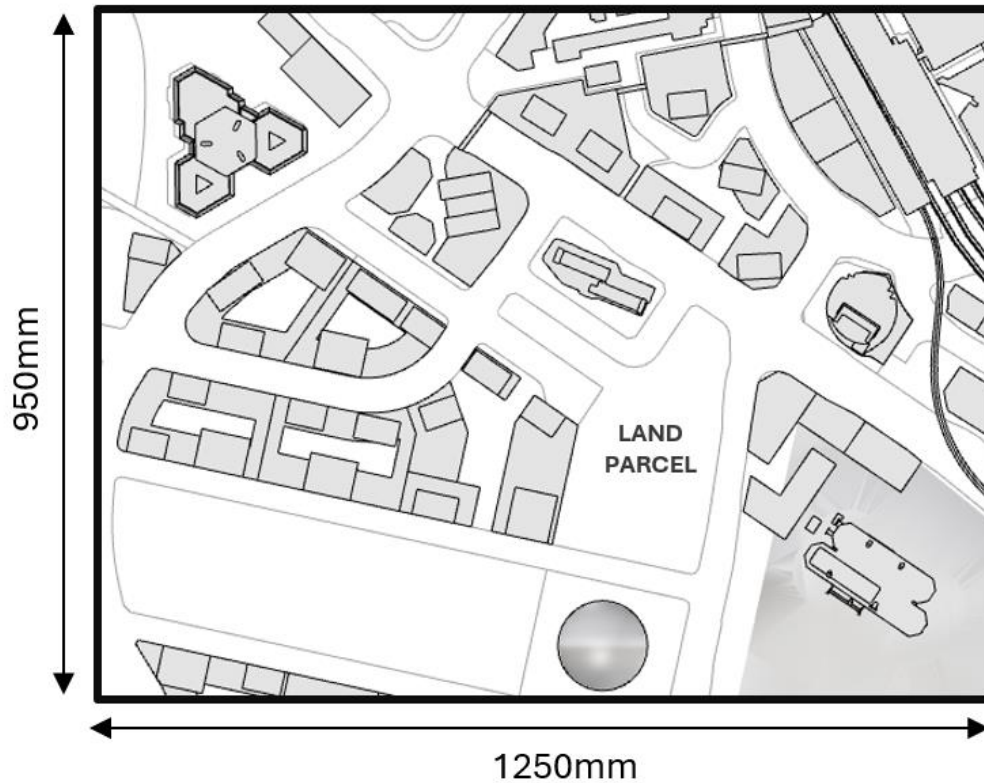


Figure 1: Extent and context for physical massing model at 1:750 scale

- iv. Digital massing models. The digital model is to be accurately geo-referenced (i.e. to SVY21). The files for the 3D digital model should be in any of the following formats: .3dm .max, .3ds, .skp, .dwg, .dxf, .fbx, or BIM format.
- v. A report outlining the overall concept and design strategies to mitigate Urban Heat Island (UHI) effect and improve thermal comfort for the Development, especially at key public spaces and thoroughfares. The report shall include details on the impact of the proposed design strategies which may be substantiated with preliminary environmental modelling and analysis, where applicable. Please refer to Annex A for the technical guidelines for environmental modelling and analysis.

ANNEX E2 – DAP ADVISORY NOTES

DAP Advisory Notes

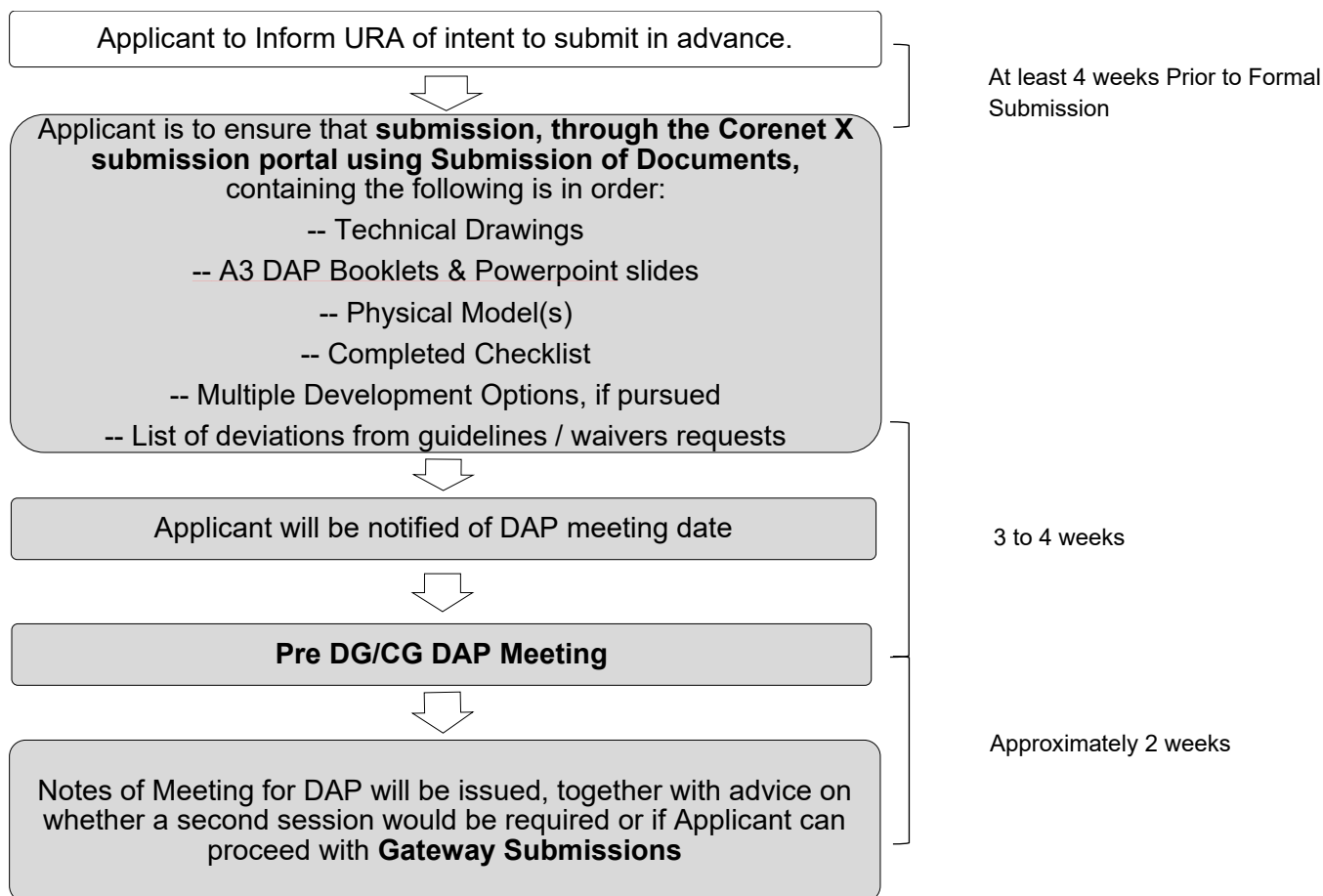
Scheduling of DAP Meetings

- a) The Pre-DG DAP and Pre-CG DAP review process will be carried out prior to the Design Gateway (DG) and Construction Gateway (CG) submission respectively. This would be akin to a pre-submission consultation. It is meant to facilitate the DG and CG clearance process and reduce abortive work for consultants and agencies.
- b) The Applicant is to inform the Authority by way of email, at least 4 weeks in advance, on the submission date of the DAP materials, to secure the availability of the various DAP members in the scheduling of the DAP session.
- c) The DAP session will take place approximately 3 to 4 weeks after the complete set of DAP materials have been submitted as detailed below.
- d) Please note that all submissions must be accompanied by the requisite materials and information (refer to Annex E2 Guidelines for Preparing the Submission/Presentation Materials) before a DAP session can convened.
- e) The DAP materials submitted is to reflect the design proposal accurately. If major design revisions to the proposal or parts of it are made after the formal submission, the DAP session might have to be rescheduled to a later date to allow more time for the new information and design changes to be evaluated before the DAP session convenes.
- f) Given that the DAP materials will be submitted prior to a formal submission, Applicants are required to declare upfront any deviations from guidelines or waiver requests. These will be evaluated in relation to the overall design concept/scheme and against the objectives of the guidelines, in order to determine if there are merits to allow the deviations/waivers. Applicants are advised to factor in additional time for the evaluation of deviations/waivers.
- g) Depending on the level of resolution by the Applicant, there may be more than 1 DAP session for each stage. Applicants are advised to factor in the necessary time for the DAP submissions.

DAP Advisory Notes

Workflow

The table below illustrates the typical workflow for a project selected for review by a DAP.



ANNEX E3 – DAP ADVISORY NOTES

DAP Advisory Notes

Guidelines for Preparing the Submission/Presentation Materials

- a) Technical drawings (plans, elevations and sections) submitted as part of the formal development application, DAP materials consisting of A3 booklets, presentation slides and physical models will have to be submitted. Additional reports, such as Conservation Reports, are to be included as Appendices to the A3 booklets.

Pre-DG DAP (Stage 1)

- b) For Stage 1, only the following aspects are to be included in the submission materials:
- Design Concept
 - Form and Massing
 - General architectural treatment (roofscape, façades in relation to context)
 - Pedestrian and Cycling Network and Vehicular Access
 - Public Spaces and Landscape Replacement Areas / landscaping concepts
 - Environmentally friendly design / Climate sensitive design
 - Sustainability performance outcomes
- c) Aspects such as night lighting, detailed planting palette, materials etc. will be addressed at Stage 2 and are not required to be submitted for Stage 1.
- d) The DAP booklet and presentation slides are to be presented in the format shown in Annex E3. The digital DAP booklet (including 2 hard copies in A3) should not exceed 50 pages, including appendices, attached drawings and plans, with a minimum font size of 12. The number of presentation slides should be comfortable for a 30-minute presentation without lengthy text, highlighting the key points with further elaboration provided in the DAP booklet.
- e) A 1:750 scale physical massing model, as well as a 3D digital model in any of the formats as stated below are required to be submitted to show the proposed Development in relation to the adjacent sites and surrounding context. The digital model is to be accurately geo-referenced (i.e., to SVY21). The files for the 3D digital model should be in any of the following formats: .max, .3ds, .skp, .dwg, .dxf, .fbx, or BIM format.

Pre-CG DAP (Stage 2)

- f) The DAP materials submitted at this stage will include:
 - Detailed building layout
 - Detailed architectural treatment including appropriate use of building materials and finishes
 - Night lighting design concept, including method statement and detailed drawings on the night lighting design intention would be achieved
 - Detailed landscaping design including planting palette
 - Detailed Design of Public Spaces
- g) Scaled elevations and sections of the relevant details (preferably 1:50 in hardcopy), digital architectural model of part(s) of the building (if necessary), as well as material samples of the façade and roof materials are required to be submitted to show the architectural design of the Development.
- h) The digital DAP booklet (including 2 hard copies in A3) should not exceed 50 pages, including appendices, attached drawings and plans, with a minimum font size of 12. As with Stage 1, the DAP presentation slides are to be kept salient and presented in the format shown in Annex E3.

Resubmissions

- i) All submissions are to include a digital massing model, in any of the formats as stated below to show the proposed Development in relation to the adjacent sites and surrounding context. The digital model is to be accurately geo-referenced (i.e. to SVY21). The files for the 3D digital model should be in any of the following formats: .3dm .max, .3ds, .skp, .dwg, .dxf, .fbx, or BIM format.
- j) Resubmissions should be kept succinct. The A3 DAP booklet and presentation slides should highlight only outstanding issues with a comparison between the previous and current proposal (see Annex E3). There is no need to highlight issues which have already been resolved.
- k) Physical models may be required, depending on the scale and complexity of the proposal. Where required, physical models are to adopt a 1:7500 scale (or smaller, depending on the scale and location of the project, which would be advised by the officer in charge).

ANNEX E4 - DAP ADVISORY NOTES

DAP Advisory Notes
Submission Templates

For First DAP Submission

Heading, e.g. Public Spaces

Key Rendering / Diagram (clearly annotated / captioned)	Supporting Rendering / Diagram	Supporting Rendering / Diagram	Supporting Rendering / Diagram
	Supporting Rendering / Diagram	Supporting text _____ _____ _____ _____	

A3 Booklet

Heading, e.g. Public Spaces

Key Rendering / Diagram (clearly annotated / captioned)	Supporting Rendering / Diagram	Supporting Rendering / Diagram
	• Key points _____ • _____ • _____	

Powerpoint Slides

For Subsequent DAP Submissions

Heading, e.g. Public Spaces

Previous Design	Revised Design	DAP's previous comments _____ _____ _____ _____	
		Revised design _____ _____ _____ _____	
Supporting Rendering / Diagram	Supporting Rendering / Diagram	Supporting Rendering / Diagram	Supporting Rendering / Diagram

A3 Booklet

Heading, e.g. Public Spaces

Previous Design	Revised Design	• DAP's previous comments _____	
		• Revised design _____ • _____ • _____	

Powerpoint Slides

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Part One: Design Guidelines / Requirements for District Cooling System Spaces

1.0 General Requirements

1.1.Objective of This Document

- 1.1.1. The objective of this document is to provide the Successful Tenderer the necessary information on the District Cooling System Spaces (DCS Spaces). The DCS Spaces shall be constructed as part of the development and handed over, gratis, to the District Cooling System Operator (DCSO). Functional requirements of the DCSO and key dimensions of space are provided to enable the Successful Tenderer to assess the scope of work to be provided.
- 1.1.2. This document does not purport to be exhaustive for design and construction purposes. The Successful Tenderer's Consultant, Architect and Engineers (hereinafter collectively referred to as the "Developer") are to incorporate all other requirements from relevant Government and Statutory Authorities and adjust the space allocation as necessary. All necessary provisions and work where specific requirements have not been stated shall be in accordance to industry standards and best practices.

1.2.Design and Construction

- 1.2.1. The Developer shall be fully responsible for the design and supervision of construction of the DCS Spaces. The DCS Spaces are to be handed over to the DCSO, according to agreed handover procedure, for installation of the DC Plant.
- 1.2.2. The design and construction of the DCS Spaces must meet all conditions/requirements imposed by all relevant Authorities in addition to specific requirements of the DCSO contained in this document.
- 1.2.3. Besides meeting the specified functional requirements, the Developer is to give due consideration to, inter alia, the following:
- a) Necessary access for installation of equipment and their subsequent maintenance / replacement.
 - b) Aesthetics of the DCS Spaces, with external design / finishes / landscapes to blend with the rest of the developments.
 - c) Selection of building materials with minimum maintenance requirement.
 - d) Proper and adequate access to the site must be available for DC Plant installation and transportation of heavy equipment by normal means (i.e. truck and trailer). The slope (if any) of the access way shall not be steeper than 1:20.
 - e) No flooding and fire hazard.
 - f) Possible effect on any curtain wall, screen of the development due to discharge from the cooling towers.
 - g) Noise dissipation from the DC Plant and necessary mitigation measures to avert any adverse impact to the development and surrounding.
 - h) Prior consultation with the DCSO shall be made before incorporating any structure/services over or below the proposed DCS Spaces.
 - i) Adequate civil and structural design to ensure no subterranean water seepage into the DCS Spaces.

1.3.Consultation with District Cooling Licensee

- 1.3.1. The key requirements of the DCS Spaces are laid down in this document for planning purposes. Close coordination and consultation between the Developer Consultants and the DCSO are expected for the detailed design of the building. As detailed dimensioning of building elements requires reconciliation with dimensional details of the specific make of equipment, detailed specifications for construction purpose, inclusive of architectural, structural, mechanical and electrical provisions, are to be determined at the detail design stage with consultation between Developer Consultants and the DCSO.

1.4.DCS Spaces and the Common Services Tunnel

The DCS Spaces are to be preferably located such that the main machine area is adjacent or close to the Common Services Tunnel.

1.5.DCS Pipe Corridors

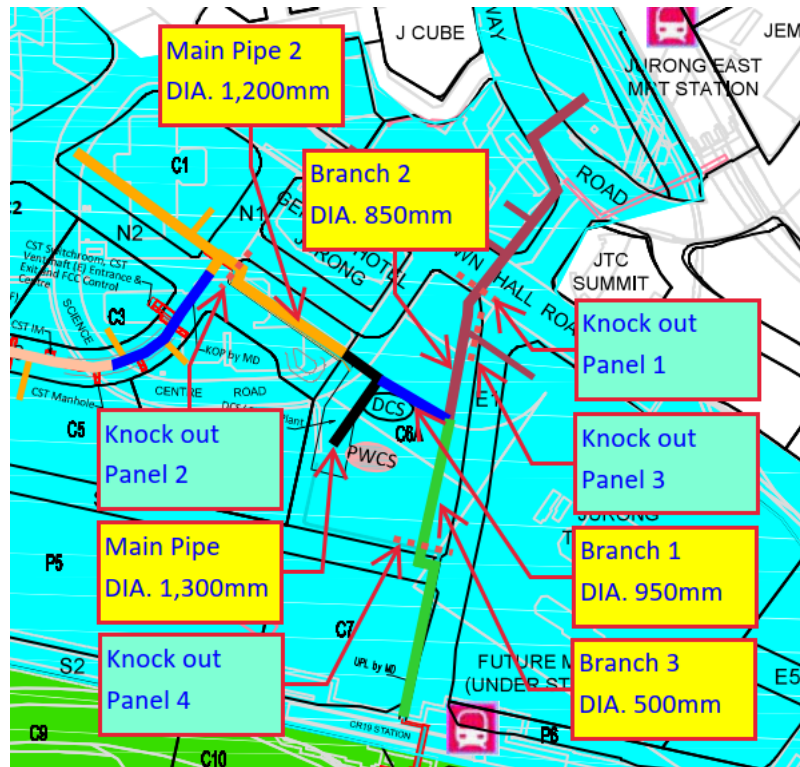


Figure 1: Proposed DCS reticulation pipe routing

The provision of space for the laying of DCS pipes and construction of knock out panels between the DCS pipes and the Common Services Tunnel (CST) is to form part of the scope of the provision of DCS Spaces by the Developer. The Developer is required to work with the DCSO on the proposed DCS pipe alignments and suitable corridors for the laying of DCS pipes as required. The space requirement for DCS pipes and knock out panel located at CST, Elevated Pedestrian Linkway (EPL), Underground Pedestrian Linkway (UPL) is shown in the table below. DCS pipes could be installed inside dedicated trenches constructed by developer, or overhang support from ceiling or structural element and free from any encumbrance such as carpark lots. The Developer is required to work with the DCSO on the suitable corridors for the laying of the DCS pipes. Prior consultation with the DCSO shall be made before incorporating any structure/services over or below the proposed DCS pipe area.

Provision for maintenance access for concealed DCS pipes is to be provided at the interval of no more than 10 meters.

Description	Nominal diameter (mm)	Outer diameter (mm)	Space required in meter (W x H x L*)
Main Pipe	1,300	1450	5.1m x 2.3m x 110*m
Main Pipe 2	1,200	1350	4.9m x 2.2m x 160*m
Branch 1	950	1100	4.4m x 1.9m x 133*m
Branch 2	850	1000	4.2m x 1.8m x 140*m
Branch 3	500	650	3.5m X 1.5m x 140*m

*Length is indicative only and subject to change depending on the final laying of the DCS reticulation pipes.

Table 1 Pipe Space Requirements within Land Parcel

Description	Nominal diameter (mm)	Space required in meter (W x H)
Knock Out Panel 1	1,300	5.1m x 2.3m
Knock Out Panel 2	1,200	4.9m x 2.2m
Knock Out Panel 3	500	3.5m x 1.5m
Knock Out Panel 4	500	3.5m x 1.5m

Table 2 Knock out Panel Space Requirements within Land Parcel

Refer to table above for the dimensions for Knock Out Panels 1, 2, 3 and 4. The DCSO will advise on the size, location and numbers of Knock Out Panels required for the Developer to make provision for and the Developer is required to design and construct the Knock Out Panels accordingly and in compliance with the local authority requirements.

The DCS supply and return pipes will be built and installed side by side. An illustration of the DCS pipes within the EPL is shown below.

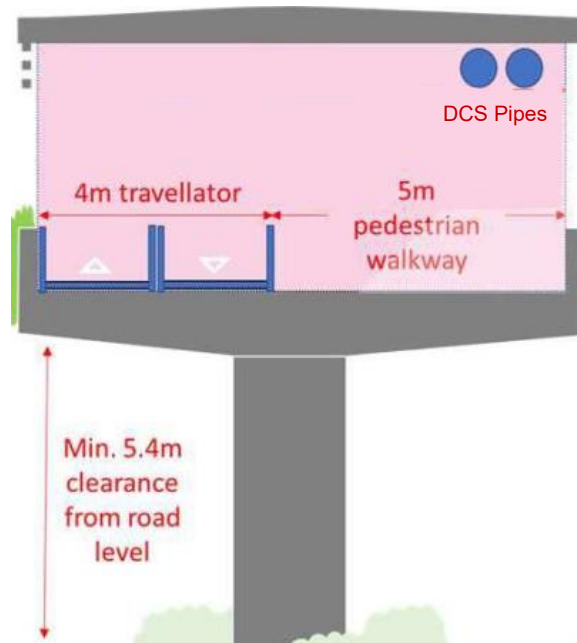


Figure 2: Proposed DCS pipes within the ceiling of EPL

Pipe penetration out from DCS chilled water plant

Developer is to make provision for the DCS pipe penetration from the core and shell of the DCS Plant, as per the standard details shown in section PART TWO (Figure 7) of this document:

1.6.Future Re-Development of Land Parcel

- 1.6.1. To allow for any future re-development or alteration of the building structure, the Developer is to make necessary provisions to maintain the integral functionality of the DCS Spaces such that the continuity of District Cooling System operation would not be affected.
- 1.6.2. If the Land Parcel is redeveloped and divided into smaller subplots by the subsequent developer, the following conditions are to be met:
- DCS plant room shall remain fully in the northern subplot.
 - The Land Parcel's Customer Stations shall be located within 50m from the DCS Plant.
 - The Cooling Tower Area shall be located within 100m (horizontally and vertically) from the DCS Plant.
 - Electrical Substation (ESS) located adjacent to the DCS Plant.
 - The Developer to make necessary provisions to allow the DCSO to connect the pipe works as per Figure 1.

1.7.Drawing to be supplied to DCSO

- 1.7.1. Three (3) sets of architectural, structural, mechanical and electrical drawings for the DCS Spaces are to be submitted by the Developer to DCSO for comments and acceptance before construction.
- 1.7.2. One (1) set, both in hard and soft copies, of the as-built architectural, structural, mechanical and electrical drawings for the DCS Spaces is to be submitted to DCSO for record purposes.
- 1.7.3. One (1) set of certified true copy of the relevant authorities' approved plans is to be submitted to DCSO for record purposes.

2.0 District Cooling Plant Space Requirements

2.1.The District Cooling Plant space requirements are as follows:

Based on a structurally independent building design, the DCP Spaces to be provided comprise of approximately 2,450sqm for the main machine room (including water make up transfer tank with clear headroom of 8m and approximately 690sqm for the thermal energy storage tank with clear headroom of 15m), about 1,062sqm for the electrical and other supporting infrastructure and approximately 3,417 sqm is required for the cooling towers (including make up water tank).

The floor area is summarized as follows:

S/N	Plant area	Plant room Area (m ²)	Clear Head Room (m)
1	Basement (Chilled Water Plant Room*, CT Make-up Transfer Tank & Pump Room & TES)	2,450	8 for Plant / 15 for TES
2	Level 1 (Electrical Rooms)	1,062	7
3	Roof (Cooling Towers and CT Make-up Water Tanks)	3,417	10

*Plant room area excludes structural column and wall thickness.

* TES Tank area excludes structural column.

* The Successful Tenderer is encouraged to locate the Chilled Water Plant Room, CT Make-up Transfer Tank & Pump Room & TES Tank at the Basement.

Table 3 Floor Area

Refer to PART THREE: APPENDICES for the proposed plant room layout, dimensions and sectional drawing.

2.1.1. The District Cooling Plant will accommodate the following main equipment:

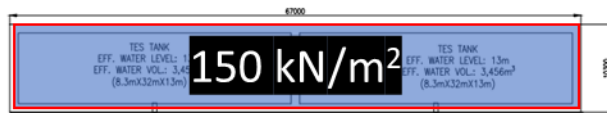
- Nine (9) nos. of water-cooled chillers;
- Nine (9) sets of cooling towers located at the roof of the building;
- Electrical installation including HT and LV switchgears, transformers and genset;
- Two large capacity concrete thermal energy storage tanks
- Cooling tower make-up water tank, cooling tower make-up water transfer tank, etc.;
- Associated heat exchangers, pumps, piping systems; structural steel supports for piping, cabling, etc.

2.1.2. The structural loading for the DCS plant space is listed below for preliminary information of the Developer in the planning of the DCS Spaces and access provisions, the plinths to be built, hoisting provisions.

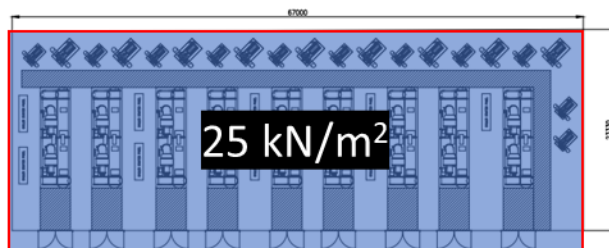
S/N	Description	Approx. Floor Loading (kN/m ²)
1	DCS Plant room area (basement)	25
	DCS Plant TES tank area (basement)	150
	CT Make-up Transfer tank area (basement)	30
2	DCS Electrical and Transformer Rooms (Level 1)	16
3	DCS Cooling Tower (Roof)	10
4	Make up water tank (Roof)	30

Table 4 Proposed Floor Loading

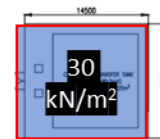
Basement (Recommended)



TES TANK (BASEMENT & LEVEL 1)



CHILLED WATER PLANT (BASEMENT)



CT MAKE UP TRANSFER TANK
& PUMP ROOM (BASEMENT)

Figure 3.1: Proposed Floor Loading for DCS Plant, TES Tank and CT Make-up Transfer Tank & Pump Room

- 2.1.3. The area and headroom requirement indicated for each equipment includes the working and maintenance space required for the equipment. It does not include the fire escape provision, the required transportation and normal access from external to the equipment and vice versa. The preliminary data on the weight and dimension of major equipment given above are meant to assist the Developer to estimate such access requirements. At detailed design stage, final details are to be provided / confirmed by the DCSO to the Developer.
- 2.1.4. The Developer is to take into consideration the following in planning of the DCS Spaces:
- a) Integrity of each equipment system area is to be maintained i.e. each system area cannot be broken into smaller areas.
 - b) Water chillers and Thermal energy storage water tanks are to be located adjacent to each other.
- 2.1.5. Risers and shaft openings for chilled water and condenser pipes are to be constructed by Developer. Condenser pipes will require an estimated size of 2.4m x 4.5m riser shaft. The developer shall also provide space for the horizontal run of the condenser pipes from the DCS Plant room to the riser shaft, with a space provision of 4.5m(width) X 2.4m(height).

2.2. Statutory and environmental requirements

- 2.2.1. The effects of noise and discharge from cooling towers on the development and its surroundings have an impact on where the cooling towers should be located. Cooling towers may be located on building roof with minimum clear headroom as stated in Table 3 Floor Area. The cooling towers shall be located at a distance no further than 100m (Total of horizontal and vertical distance) away from the DCS Plant room, measured from the boundaries of the chilled water plant to the nearest cooling tower.
- 2.2.2. Minimum clear headroom as stated is to be available for DCS Plant installation. The floor area requirement is to be read in conjunction with the headroom requirements because both the area and the volume of the DCS Spaces affect its suitability for equipment installation. Some flexibility for minor adjustments to the DCS Spaces is possible subject to consultation and agreement with the DCSO.
- 2.2.3. Interface requirements with the CST including the design and construction of the valve chamber by the Developer.
- 2.2.4. Safe and adequate access to the plant room space is to be provided. In particular, the building design is to allow for the DCSO to install the equipment in stages and for its subsequent replacement and renewal.

3.0 Customer Station Requirement

- 3.1.1. The Developer is to make available building space for the Customer Station to accommodate the equipment and installation by the DCSO. A guide on the required dimensions of the District Cooling Customer Station to accommodate heat exchangers, piping and other equipment to be installed by the DCSO is provided below. The DCSO and the Developer shall further discuss the Heat Exchanger configuration based on the Developer's technical and Service Level Agreement (SLA) requirements. The space required will be adjusted according to the final configuration.
- 3.1.2. For the avoidance of doubt, the Heat Exchanger station core and shell will be provided and paid for by the Developer while the specifications and Heat Exchanger station equipment will be provided and paid for by the DCSO. DCSO's provision is limited to equipment for one (1) Customer Station located within 50m from the DCS Chilled Water Plant, as set out in Table 5. If additional heat exchangers are required within the Development, the Developer shall bear all associated additional costs. A guide on the Heat Exchanger sizes based on the cooling load demand is reflected in Table 6, for Developer's reference.

Plot	Heat Exchanger Configuration*	Room Size* (with 4.5m Height)
Land Parcel	3,770 RT (1,885 RT x 2)	15 m x 12 m
* Heat Exchanger Sizing subject to changes base on final cooling load requirement from Developer.		

Table 5 Heat Exchanger dimensions

Cooling Load Demand (RT)	Heat Exchanger Configuration*	Room Size* (with 4.5m Height)
500	250RT x 2	9m x 5m
1000	500RT x 2	12 m x 5m
1500	750RT x 2	10m x 10m
2000	1000RT x 2	19m x 16m
* Heat Exchanger Sizing subject to changes base on final cooling load requirement from Developer.		

Table 6 Guide on Heat Exchanger dimensions based on cooling load requirements

4.0 Technical Requirements

4.1.Reinforced Concrete Thermal Energy Storage (TES) / Water Storage Tank

- 4.1.1. The Reinforced Concrete (RC) TES / water storage tank is to be designed and constructed by the Developer. The TES tank's structure is to be of watertight construction with twin compartment, and able to sustain thermal expansion and contraction for chilled water temperature fluctuations (4°C ~ 13°C for DCS operation, 36°C ~ 4°C for initial chilled down). The Developer shall consult and coordinate with the DCSO on the design of the TES Tank prior to construction. All internal surfaces of the underground water storage tank are to be handed over free from following condition:
- a) free from below concrete surface defects
 - b) Bug holes >1.0mm diameter,
 - c) honeycomb, crack thicker >0.3mm,
 - d) (Loose cement paste, laitance, curing compound layers, sharp edges, rough or irregularity surfaces) >1.0m²,
 - e) wet and water leakage, water ponding, exposed (foreign material, water stop, expansion & construction joints),
 - f) contaminants area >1.0m² - oil, grease, bond inhibitor, dust, sand, mud & etc.
 - g) Storage medium: water
- 4.1.2. The Developer is to provide manhole and cat-ladder in the RC structure for access of the tank interior by the DCSO in future. The Developer is to make all the necessary provision(s), in the RC TES and water tank structure for incoming and outgoing pipe connections, overflow warning pipe connection, drainpipe connection, sump pumps (one duty and one standby) if there is no proper drainage via floor trap is provided, tank level water indicator by the DCSO.

4.2.Roof

- 4.2.1. Cooling towers are to be located outdoors at the roof area of the development. The roof area allocated for the cooling towers is to be such that the cooling towers area is to have open deck to allow for unrestricted air flow, which is required for the efficient operation of the cooling towers, and minimum 5 meters away from building setback to comply with NEA's requirement.
- 4.2.2. The choice of the roof location for the cooling towers is to be such that it is possible to install the required number of cooling towers in phases and/or to replace cooling towers in future. A temporary crane may need to be installed for the installation and replacement work when the need arises. To this end, the Developer is to provide a permanent hoisting device at the cooling tower roof area. The hoisting device is intended to permit disassembled parts of the said temporary crane to be lifted to the roof area. Necessary building and structural provisions are to be provided in the building design for the installation of the temporary lifting crane.
- 4.2.3. The Developer is responsible for any aesthetic screening required by local authorities. Such aesthetic screening is to have no adverse effect on the designed airflow for the cooling towers. The aesthetic screening is to be of the dismantable type to facilitate future cooling tower replacement and maintenance by the DCSO.
- 4.2.4. The roof design is to be 100% waterproof with suitable insulation to ensure maximum ambient temperature of the floor below not to exceed 32°C with proper ventilation.

4.3.Access

- 4.3.1. The Developer is to allow appropriate and adequate access for the DCSO equipment/material delivery and maintenance of the DC Plant. Such access is to include and shall not be limited to personnel and equipment access to and from the DCS Spaces (passage through the development

is to be minimized as far as possible), vehicular access, space provision for stationing crane and other lifting device for equipment delivery etc.

4.3.2. Direct access to any of the equipment area within the DCS Spaces is preferred.

4.3.3. The Developer is to provide a cargo lift with a minimum capacity of 2,000kg that can be shared with and accessed by the DCSO within a reasonable distance, preferably not more than 40m, to the DCS Plant to facilitate equipment delivery and maintenance.

4.3.4. An access road of minimum 12.0m wide, 5.0m height up to the DCS Spaces is required for transportation of heavy equipment. Such access road is to have adequate turning radius for a normal 40 foot long trailer with at least for loading for chillers with 60 tons weight. Alternatively, access hatch of 14m X 5m shall be provided for delivery of heavy equipment directly from First Floor to Basement.

4.4. Walls/Access doors/ roller shutter sizes

4.4.1. For chiller delivery to the plant room, roller shutter and/or access door openings for the chillers should be at least 4m wide and 5m height, similar for the electrical rooms. Refer to layout shown in Part Three Appendices to reference quantity of openings.

4.4.2. The developer shall provide boundary walls with skim coat & painting. For the avoidance of doubt, works including but not limited to the following shall be carried out and borne by the DCSO:

- All partition walls and rooms
- All internal staircases, RC or metal, accessways, doors and access doors for shafts and spaces
- Casting back of wall and slab openings and construction hatches that were kept open for moving in of DCS equipment
- All roller shutters and hatches
- RC make-up water tank and make-up pump room
- Domestic Water supply pipework and tap points for DCS Plant rooms and areas

4.5. Electrical Rooms

The 22/6.6kV transformer bay, 22kV Switch room and 6.6kV Switch room are to be located together within an area, forming a cluster group. The LV Switch room and LV Transformer room are to be located adjacent to each other for efficient cable routing. No drain or water pipe is to be located within these spaces. Similarly, wet floors (e.g. toilet etc) above any of these spaces are to be avoided.

4.6. Transformer Bays

Transformers pits are to be provided by the Developer for oil containment in accordance with local authority requirements. For the 22/6.6kV transformers, they are to be located at the perimeter wall with provision of natural ventilation.

4.7. Incoming Water Pipe

The Developer is to provide incoming pipe for water supply to the water storage tanks within the DCS Spaces from the intake point as specified by PUB Water Department. Provision is to be made by the Developer to allow future access by the DCSO for maintenance of the incoming water pipe. The Developer is to note that NEWater is required to be used for the cooling tower make-up.

4.8. Cable Entry Pipes

Electrical cables are to enter the DCS Spaces directly from the Common Services Tunnel or cable trench. Two (2) rows of eight (8) nos. diameter 150mm HD UPVC pipe are to be provided on the

development side to receive the incoming electrical cables, complete with cable pull through test, subject to PowerGrid's final confirmation. All cable entry pipes and fittings including drawstring of polypropylene rope of diameter 5mm required for the incoming power supply to DCS Spaces are to be supplied and installed by the Developer up to the approved quantity and arrangement in relation to the configuration and layout of the development.

4.9. Columns, Beams and Expansion Joints

No column is allowed in all switch rooms. **No cross beam** is allowed across any floor opening in all switch rooms. No expansion joint within all floor slabs of HV and LV switch rooms is allowed. The Developer is to ensure that the floor slabs are not to move vertically with respect to each other.

4.10. Floor Finishes

Generally, all floors are to be constructed with 50mm thick cement rendering including a 20mm granolithic smooth finish of cement, granite chips and sand in the ratio 1:1:1. All surfaces are to be hardened by an approved hardener. Generally, the cement rendering is increased in thickness to flush with the DCSO's switchgear/equipment floor frames/I-beams.

4.11. Sunken Areas

All sunken pits and areas for equipment and cables are to be dry and free of water. Appropriate waterproof sealing compound is to be used. A proper drainage system by natural means is to be designed to achieve this. Automatic submersible pumps are to be used only if this is not possible.

4.12. Drains

Floor trap, insulated floor traps and sump pit for DCS Plant rooms/ areas are to be provided by the Developer. Works including but not limited to the following shall be carried out and borne by the DCSO: All drainage to the floor traps and sump pumps and associated piping system serving DCS plant rooms.

4.13. Louvers at External Walls (where applicable)

Where there are external walls to the plant rooms, weather-proof louvers of minimum 50% free area are to be provided for general ventilation purposes.

For louvers surrounding the cooling tower area, the Developer is to ensure that the louvers has minimum 70% free area and the maximum pressure drop across the louvers is not to exceed 10 Pa for nominal air flow at design velocity of no more than 3.5 m/s.

4.14. Oil Interceptor

Oil interceptors, if required by PUB, are to be provided adjacent to transformer pits and generators, fuel tanks, and at all sump pits within the plant.

5.0 Basic Building M&E Services Within District Cooling Plant

Basic building M&E services which do not constitute part of the DC Plant are to be provided by the Developer. They are to conform to the requirements of the relevant authorities and codes of practice in addition to the requirements stated below. The DCSO shall be responsible for subsequent maintenance and repair of M&E services within the DCS Spaces.

5.1. Lighting And Power Supply

An illumination of about 300 lux at 1m from the floor is required within the DCS Spaces inclusive of electrical rooms;

An illumination of about 100 lux at 1m from the floor is required within the thermal storage tank area, cooling tower area or any outdoor area.

5.2. Lightning Protection

Lightning protection is to be extended to the cooling towers within the DCS Spaces.

5.3. District Cooling Plant Earthing System

The Developer is to provide earthing points to facilitate the DCSO's connection for effectively earth all electrical equipment and non-current carrying metallic parts in accordance with SS 638 and SS 551 requirements.

5.4. Cranes And Hoists

Runway I-beams or cranes are to be provided by the DCSO and integrated in the structure for the hoisting of major equipment. The capacity of the hoist shall be 80 tonnes (to be confirmed upon final selection of equipment by the DCSO). The Developer is to provide all necessary structural provisions, such as cast-in bolts, beams and columns, etc to facilitate such installation by the DCSO.

5.5. Fire Protection

Fire protection for the empty DCS Spaces is to be provided by the Developer as per the latest revision of the Fire Safety Code. If necessitated by presence of the DC Plant equipment, additional sprinklers are to be provided by the DCSO. The Developer is to however ensure that sufficient landing valves and riser/header pipes are provided (design to match the full capacity of the DC Plant) to enable sufficient fire water connection points for future water spray installation by the DCSO.

Smoke extraction system, if required to comply with the Fire Safety Code, is to be provided by the Developer. The Developer is to take note that the headroom requirement for the plant space specified is to be maintained notwithstanding the smoke extraction requirement.

All provisions related to the Fire Command Centre etc is to be provided by the Developer. The DCSO will depend on the systems (such as standby generator, water storage tanks for sprinkler systems, public announcement system, etc) provided by the Developer.

5.6. Mechanical Ventilation System

Basic mechanical ventilation system, if required to comply with statutory and DCSO requirement, is to be provided by the Developer. The Developer is to take note that the headroom requirement for the DCS Spaces specified is to be maintained notwithstanding the mechanical ventilation requirement.

5.7. Telco Lines

Facilities (e.g. lead-in pipe or telco cables) are to be provided by the Developer to enable the DCSO to install communication systems.

6.0 Project timeline

The estimated handing over of the DCS space, DCS pipe way leave, Customer Station is shown as follows:

S/N	Area to handover by Developer	Estimated handover date
1	DCS space (Chilled water plant, TES Tanks, Cooling tower area, Electrical Room, ESS)	18 months before Plot 1 Developer's TOP
2	DCS pipe way leave area (Main pipe 1,2 and Branch 1,2,3)	15 months before Plot 1 Developer's TOP
3	Customer Station (Land Parcel)	13 months before respective Plot's TOP

Table 7: Key dates

Detailed schedule will be coordinated with Developer nearer to date.

DCSO requires 18 months for DCS plant fitting out works, 13 months for DCS pipes construction, 9 to 13 months for Customer Stations fit out works upon area handover, and 1 to 3 months for equipment testing and commissioning.

Customer Station has to be handed over by Developer minimally 9 to 13 months prior to combined testing of chilled water supply. Combined testing and commissioning for the DCS load testing with secondary side will take place 1 to 3 months before commercial operation of chilled water supply.

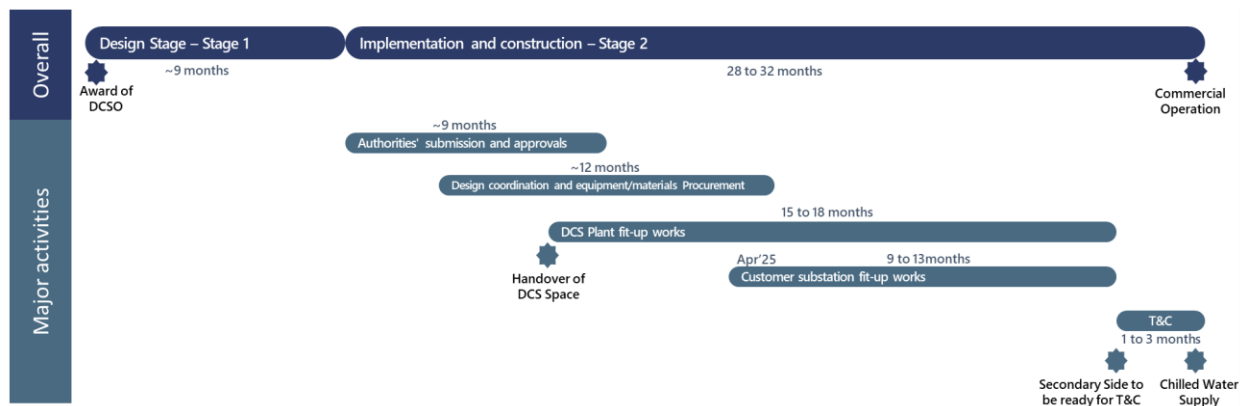


Figure 6: Overview of Project timeline

7.0 Defects Liability Period

The Developer is to ensure that the defects liability period specification is to be included in all architectural, structural and M&E works in accordance with generally accepted industry practice and compatible with the rest of the main building development.

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Part Two: Brief on Provisions for District Cooling Service Connection

1.0 CONDITIONS FOR CHILLED WATER SUPPLY (PRIMARY SIDE BY DCSO)

1.1 TEMPERATURE AND PRESSURE

1.1.1 Supply Chilled Water Temperature

The averaging temperature of supply chilled water measured at the sensing point on the supply side of the measuring unit shall be as follows:

	Standard Temp	Allowable Range
Chilled Water	7.0 °C	7.0 ± 1 °C

1.1.2 Return Chilled Water Temperature

The averaging temperature of return chilled water measured at the sensing point on the return side of the measuring unit shall be as follows:

	Standard Temp	Allowable Range
Chilled Water	15.0 °C	15.0 ± 1 °C

1.1.3 Pressure of Chilled Water

Generally, the pressure in the distribution pipe shall be 10.0 kg/cm²G (Plant's setting value), as a standard value.

1.2 CONTROL

1.2.1 Water Calorific Restriction

In order to maintain stable chilled water supply to all customers, when the DCSO senses a customer demand load exceeding the declared demand load beyond a preset limit, the chilled water flow may be restricted by operating a control valve. This is to ensure the contracted volume of the chilled water calorie will not be overused.

1.2.2 Return Chilled Water Temperature Control

The return chilled water will be restricted by operating a control valve so that the temperature of the water can be maintained at 15°C and above, measured at the sensing point on the return side of the measuring unit.

2.0 DESIGN CRITERIA FOR DEVELOPER'S AIR-CONDITIONING SYSTEM (SECONDARY SIDE BY DEVELOPER)

2.1 TEMPERATURE AND PRESSURE

2.1.1 Supply Chilled Water Temperature

Secondary supply chilled water temperature after heat exchangers shall be maintained by Developer at $8.0\pm1^{\circ}\text{C}$.

2.1.2 Return Chilled Water Temperature

Secondary return chilled water temperature shall be maintained by Developer at $16.0\pm1^{\circ}\text{C}$.

2.1.3 Pressure of Chilled Water

Secondary distribution chilled water system by Developer connected to DCSO's Equipment after heat exchanger shall not exceed $10\text{ kg/cm}^2\text{G}$.

2.2 AHU/FCU AND CONTROLS SETTINGS

- Supply chilled water temperature : $8.0\pm1^{\circ}\text{C}$
- Return chilled water temperature : $16.0\pm1^{\circ}\text{C}$
- Chilled water control : 2-way valve control
- 2-way valve shall be closed during shut-down of AHU/FCU operation

To prevent the in rush of chilled water from the heat exchangers when all AHUs / FCUs are turned on simultaneously, it is necessary to implement daily timed sequential start-up operation strategy for all AHUs / FCUs. This would reduce the chance of chilled water consumption exceeding the declared peak cooling demand.

2.3 CHILLED WATER PUMP

In order to maintain return chilled water temperature at 16°C and above, variable water flow control with constant water temperature shall be provided. A variable speed pump system is required to achieve this operation. The variable speed pump system shall be calibrated to deliver optimum flow to prevent energy wastage.

Developer is required to size up the variable speed pump(s) to take care of the minimum cooling load requirement during off-peak hours (which should be made known to the DCSO during the design stage).

3.0 CUSTOMER STATION LAYOUT

Customer Station Room's space requirement to be advised by DCSO depending on the cooling load requirements.

4.0 CUSTOMER STATION REQUIREMENTS

The Customer Station Room shall fulfil the requirements under the scope of works by Developer as specified below, prior to the official hand-over to the DCSO.

4.1 Concrete Plinth Work

Internal finish schedule in the Customer Station

- Standard finish schedule is shown below. Reasonable finish schedule used by Developer for other machine rooms (such as secondary pump station) can be considered.
 - Floor : Mortar smooth finish with dust proof epoxy paints
 - Baseboard : Ditto
 - Wall : Mortar smooth finish with resin paint
 - Ceiling : Insulation coating required if condensation occurred
 - Door size : 1,500mm (W) double leaf door x 3,200mm (H) with key lock
- If there is a room underneath the customer station, floor water proofing shall be required.
- Concrete plinth (with rein-bar) for equipment.
- Dust proof epoxy paint required for concrete plinth.
- Details to be provided by DCSO.
- Coordination will be required during detailed design and construction stage.

4.2 Measuring signal work

Measuring Items	Transmitting Signal	Range
Secondary supply chilled water temperature	4 – 20 mA	0 – 20 °C
Secondary return chilled water temperature	4 – 20 mA	0 – 20 °C

Table 8 Measuring signal range availability

For 4 – 20 mA transmissions, DCSO shall provide temperature transmitters for measuring secondary chilled water within the Customer Station. It shall be wired to the measuring panel provided by DCSO. DCSO shall provide non-voltage pulse transmission relay within the room and wired to the measuring panel provided by DCSO.

4.3 Ventilation in the Customer Station

Ventilation rate: 8 air change per hour

Fresh air shall be supplied directly from outdoor through fresh air duct to the Customer Station (by Developer)

Fresh air duct shall be installed up to inside of the wall opening (by Developer)

For exhaust from Customer Station to the outdoor, exhaust fan, ductwork and wall openings shall be provided by Developer.

No ductwork shall be run within the room, wall grilles shall be provided to terminate on room wall to have clear demarcation of scope between DSCO and Developer. Air grilles shall be sized to not exceeding 3 m/s air velocity.

Coordination will be necessary during detailed design and construction stage.

4.4 Requirements on water supply and drainage in the Customer Station

The Customer Station shall be provided with adequate drainage facilities to convey water out of the room. If a sump pit is provided, it shall be furnished with submersible sump pump for quick draining of water. The sump pit shall be covered with galvanized steel grating.

Sump pump operation shall be controlled automatically by float switches and manual activation. The alarm signal shall be monitored by the Building Automation System.

Floor mounted mop sink (minimum size 500 mm x 600 mm x 300 mm high) of either stainless steel or tiled concrete with diameter 15mm hose tap and bib shall be provided. Sink drain 50 mm diameter shall be fitted with stainless steel mesh strainer and drain stopper completes with stainless steel chain. A water meter shall be provided to monitor consumption of water.

Drain hoppers or micro-sumps with grating cover shall be provided for heat exchangers draining.

Coordination shall be required during detailed design and construction stage. Water proofing of floor slab, insulation of floor trap and exposed pipe branch will be required if there is any basement floor below the Customer station.

4.5 Requirements on electricity and emergency supply

Electricity shall be supplied to Customer Station with distribution / isolating switchboard by Developer from Emergency Supply (EMSB). An electricity sub meter shall be provided by Developer to monitor electricity consumption.

Specifications: 3 phase 4 wire 40A. Refer to Figure 9 for a typical wiring diagram.

Room shall be illuminated to at least 200 lux level with Internal lighting fixtures.

Power supply to receptacles, ventilation fans and sump pumps (If provided) shall be provided by Developer.

Coordination will be required during detailed design and construction stage.

This emergency electricity supply shall kick in upon power failure to sustain the operation of the controls and instrumentation in the Customer Station.

4.6 Black-Out Signal and power recovery signal

The Developer shall provide a black-out and power recovery signal(s) to notify DCSO in the event of power failure and power recovery. Please refer to Figure 9 for a typical blackout/recovering signal circuit diagram. The Developer shall provide similar or equivalent circuit for monitoring power in the Customer Station.

4.7 By-pass Pipes for Flushing

Developer shall install by-pass pipes at their secondary side chilled water piping system to prevent contamination of heat exchangers during chemical flushing. The by-pass pipe shall be installed near to the flange installed by DCSO. The water quality shall be within a reasonable quality acceptable by DCSO before water is allowed to enter into the heat exchangers. Side stream water filtration devices are recommended to install by Developer.

4.8 Secondary Pumps on/off Signal

To ensure proper interlocking between the chilled water demand by Developer and the supply by DCSO, Developer shall provide pump(s) operation signal to DCSO, so as to trigger the supply of chilled water at the primary side of the heat exchanger(s). This signal shall tap from a non-voltage dry contact, when pump(s) operates the contact shall be closed. The signal wiring shall be wired and terminated at the Customer Station control panel as provided by DCSO.

4.8 On/Off motorized valves

Developer shall install on/off motorized valves at secondary side chilled water circuit if common chilled water pipe header is provided inside secondary chilled water pump room due to space constraint (or) pumps configuration. This is to ensure chilled water supply temperature at secondary chilled water circuit is maintained within the specification while only one unit of heat exchanger is operating during the low cooling load. Respective on/off motorized valves shall react according to the feedback signal receive from DCSO. All the automatic control cables required for interfacing with DCSO shall be wired and terminated by the Developer at DCSO's panel located inside the Customer Station.

4.9 Water Quality Standard

In order to prevent corrosion and fouling to the piping and heat exchanger systems, Developer must ensure proper flushing, passivation and water treatment to be carried out by water treatment specialist on the secondary chilled water pipe work system to meet the following water quality control parameters, and the water quality test report must be at least 3 days prior to turn on of chilled water:

Essential items	Range of index	Affect to:	
	Chilled water =<20°C	Corrosion	Scaling
PH (25°C)	7 - 10.0	○	
Electrical conductivity (S/cm) at 25°C	<2500	○	
Chloride ion (mgCL/l)	<100	○	
Sulfuric acid ion (mgSO ₄ /l)	=<50	○	
Acid consumption PH 4.8 (mgCaCO ₃ /l)	=<50		○
Calcium Hardness (mgCaCO ₃ /l)	=<50		○
Silica (mgSiO ₂ /l)	=<30		○
Fe (mgFe/l)	<1.0	○	○
Total Phosphate (PO ₄)	>5	○	
Nitrite Ion (mg/l as NO ₂)	>190	○	
Turbidity (Degree)	<10	○	

Table 9 Water Quality Standard

Schematic of DCS with respective primary, secondary, tertiary and air side

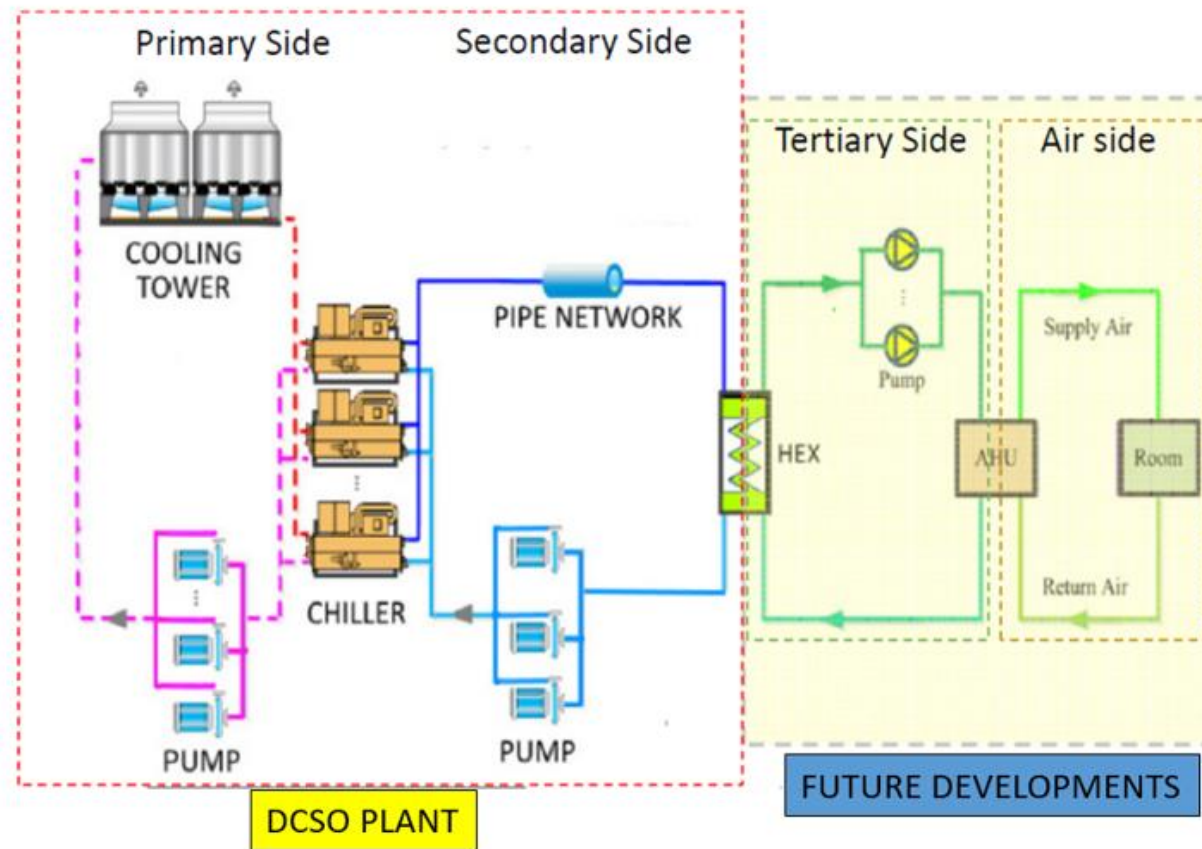


Figure 7: System Flow Sheet for DCSO's Customer Station and Unit

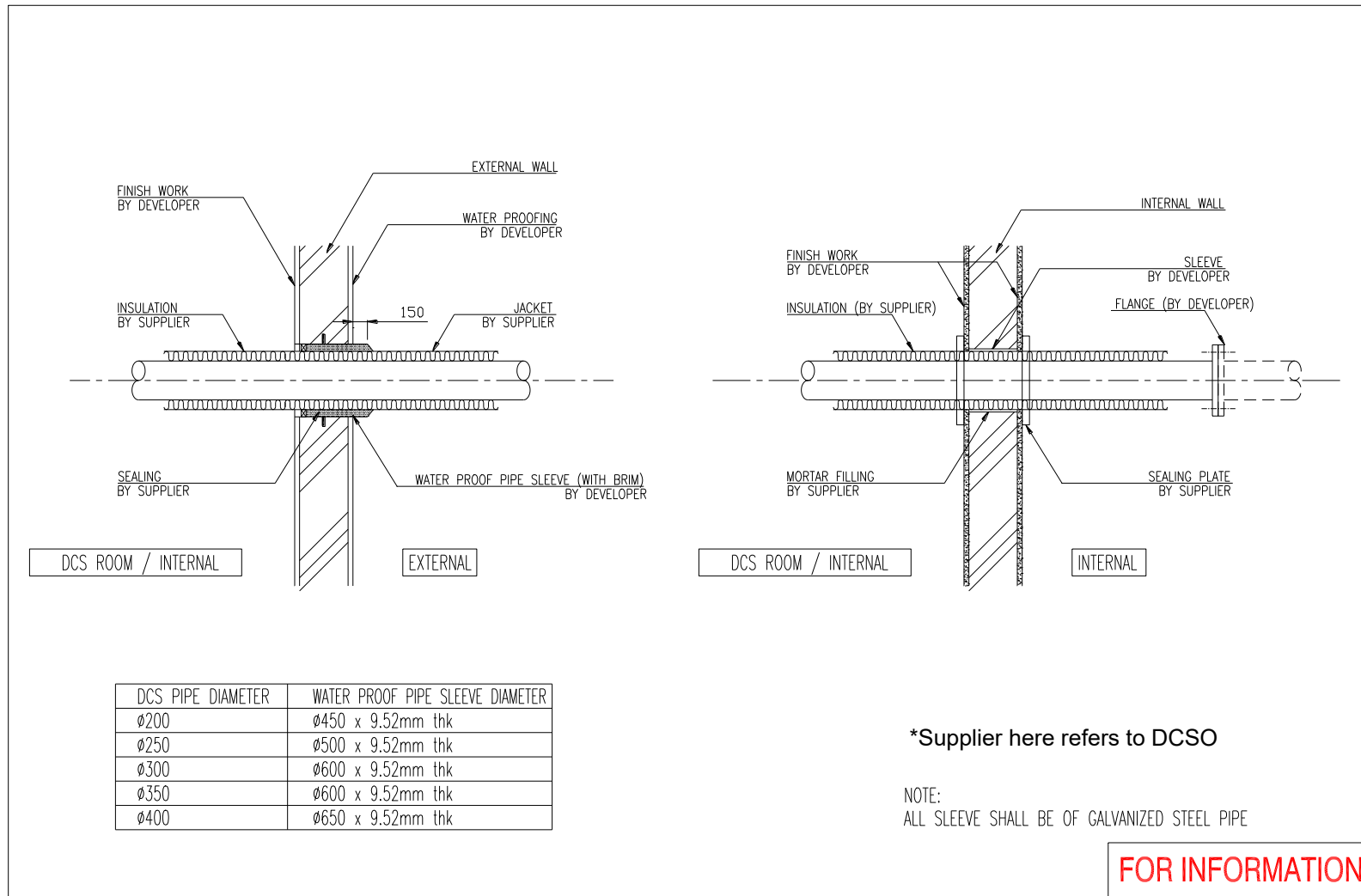


Figure 8: Standard Detail for Pipe Penetration into Customer Station

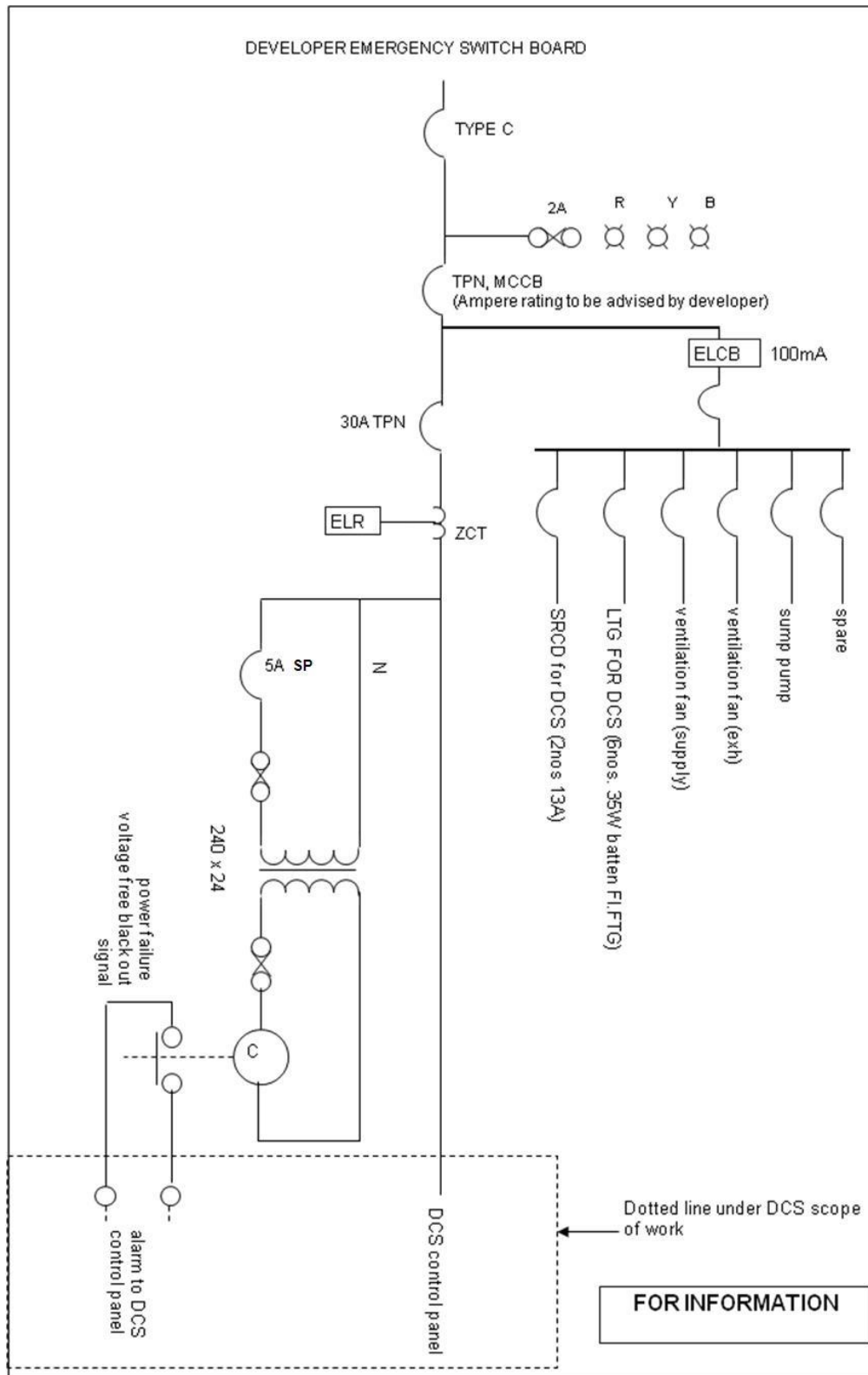
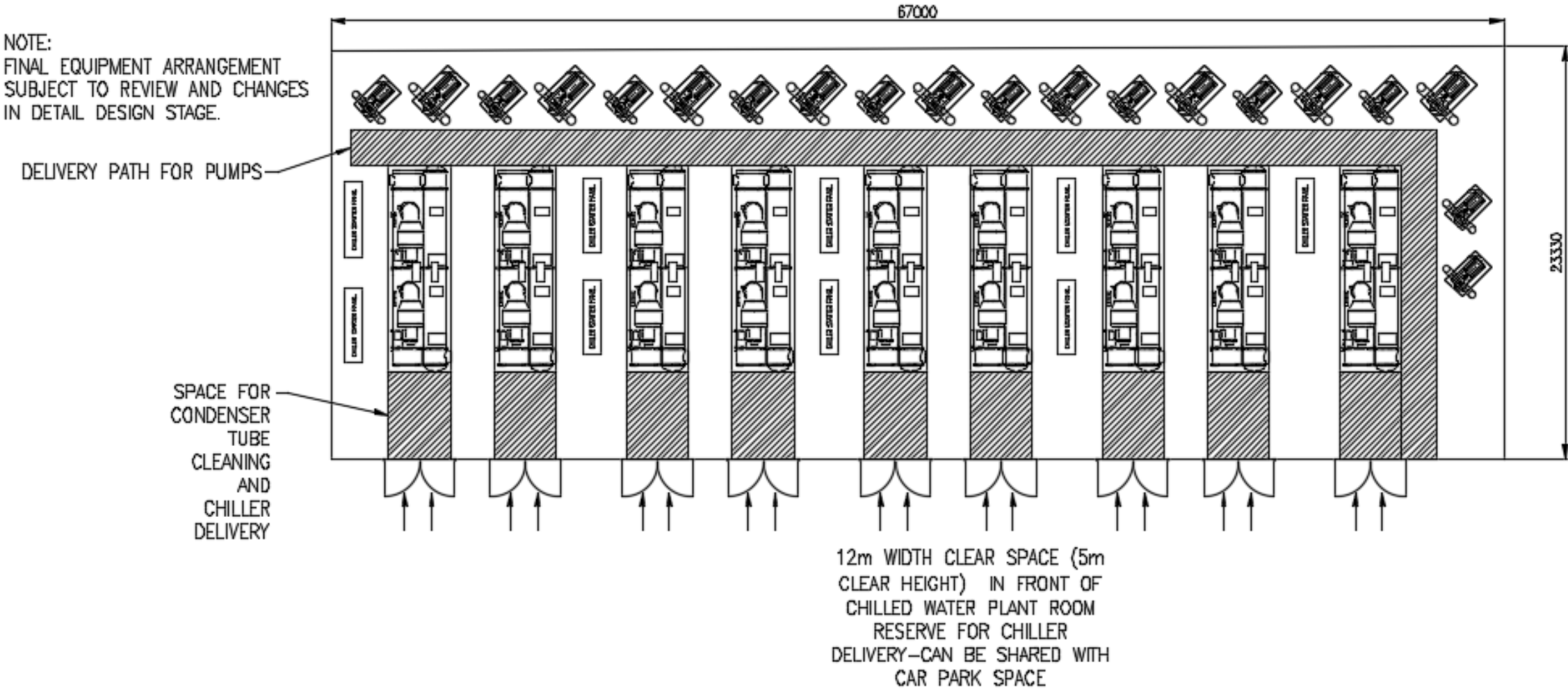


Figure 9: Typical Electrical Wiring Interface between DCSO's Heat Exchanger Station and Developer

PART THREE: APPENDICES

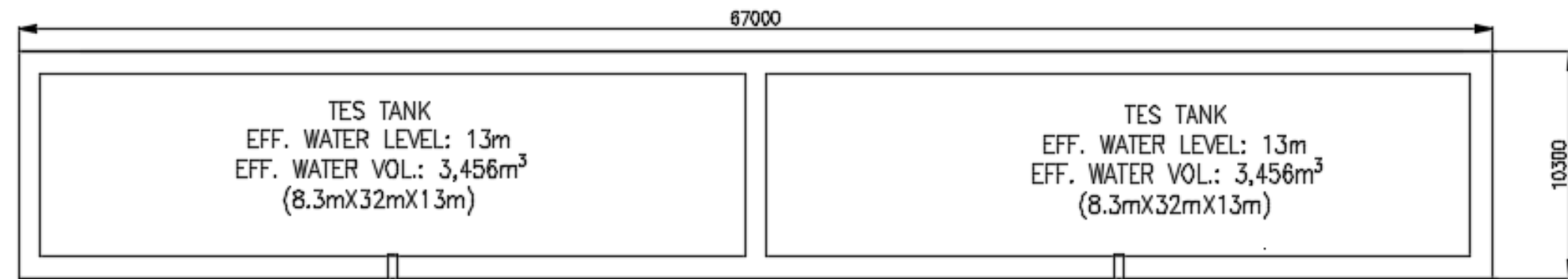
1.0 Basement



CHILLED WATER PLANT (BASEMENT)

NOTE:

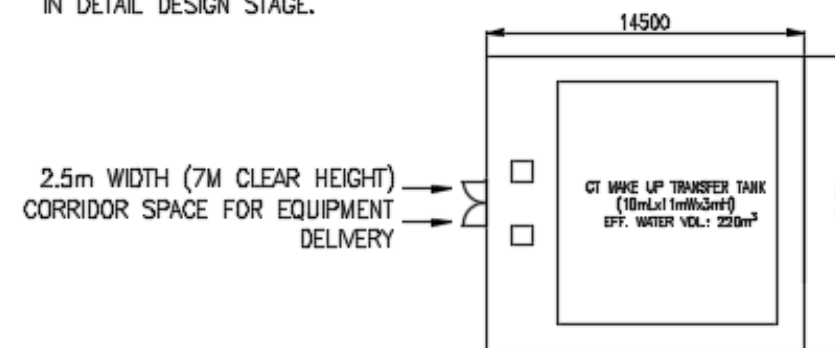
1. FINAL EQUIPMENT ARRANGEMENT
SUBJECT TO REVIEW AND CHANGES
IN DETAIL DESIGN STAGE.
2. TES TANK TO BE LOCATED
ADJACENT TO CHILLED WATER
PLANT AS THERE WILL BE CHILLED
WATER PIPES RUNING AT LOWER
LEVEL OF TES TANK TO THE
CHILLERS IN CHILLED WATER PLANT
ROOM.
3. TES TANK AT LEVEL 1 TO BE
SEPERATED FROM THE ELECTRICAL
PLANT ROOMS e.g. BY A PASSAGE
CORRIDOR.



TES TANK (BASEMENT & LEVEL 1)

NOTE:

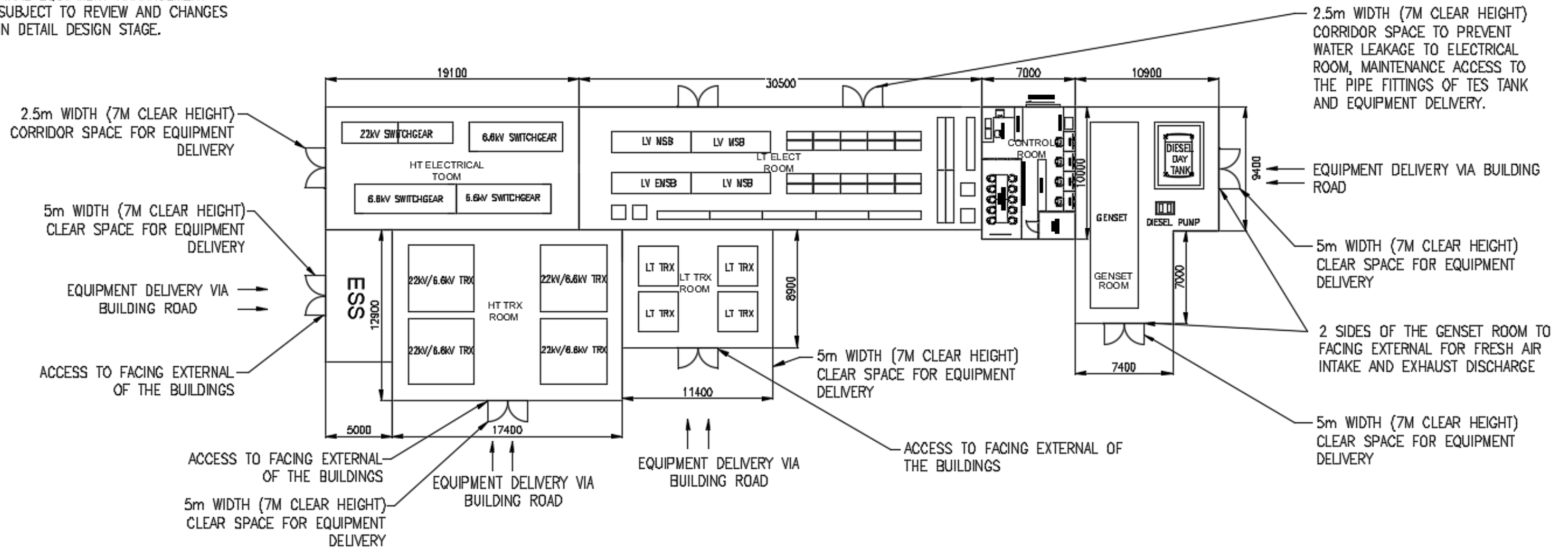
FINAL EQUIPMENT ARRANGEMENT
SUBJECT TO REVIEW AND CHANGES
IN DETAIL DESIGN STAGE.



CT MAKE UP TRANSFER TANK & PUMP ROOM (BASEMENT)

2.0 Level 1

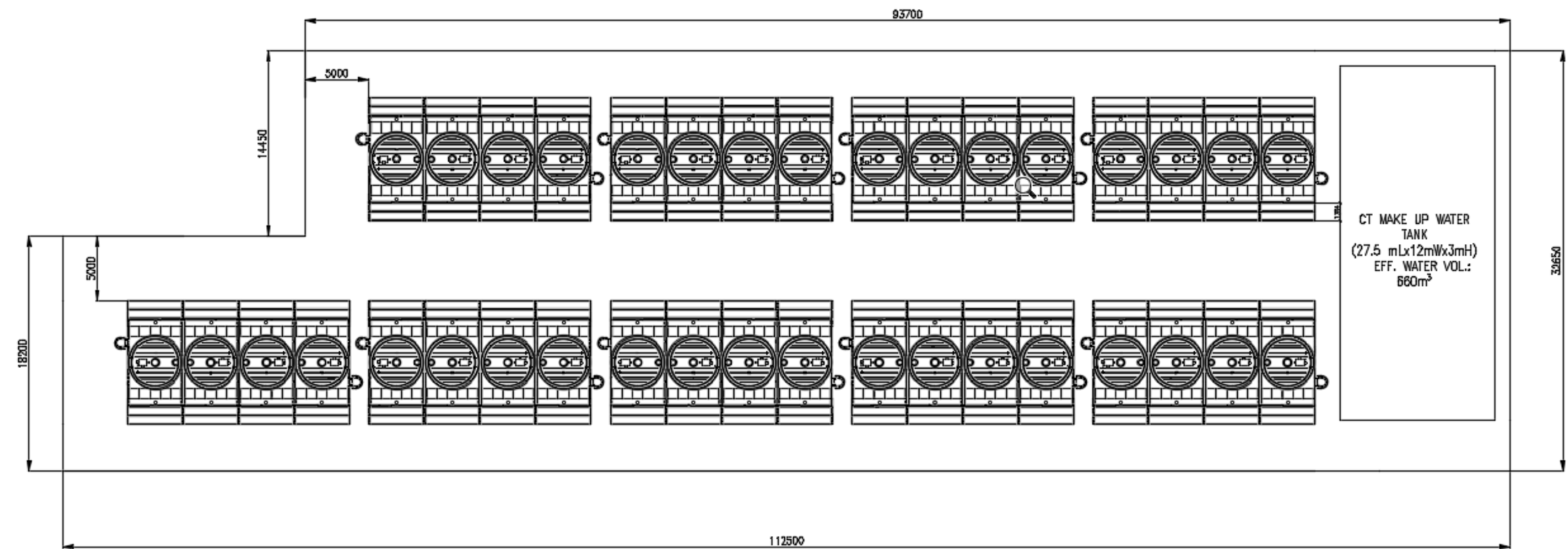
NOTE:
FINAL EQUIPMENT ARRANGEMENT
SUBJECT TO REVIEW AND CHANGES
IN DETAIL DESIGN STAGE.



ELECTRICAL ROOM (LEVEL1)

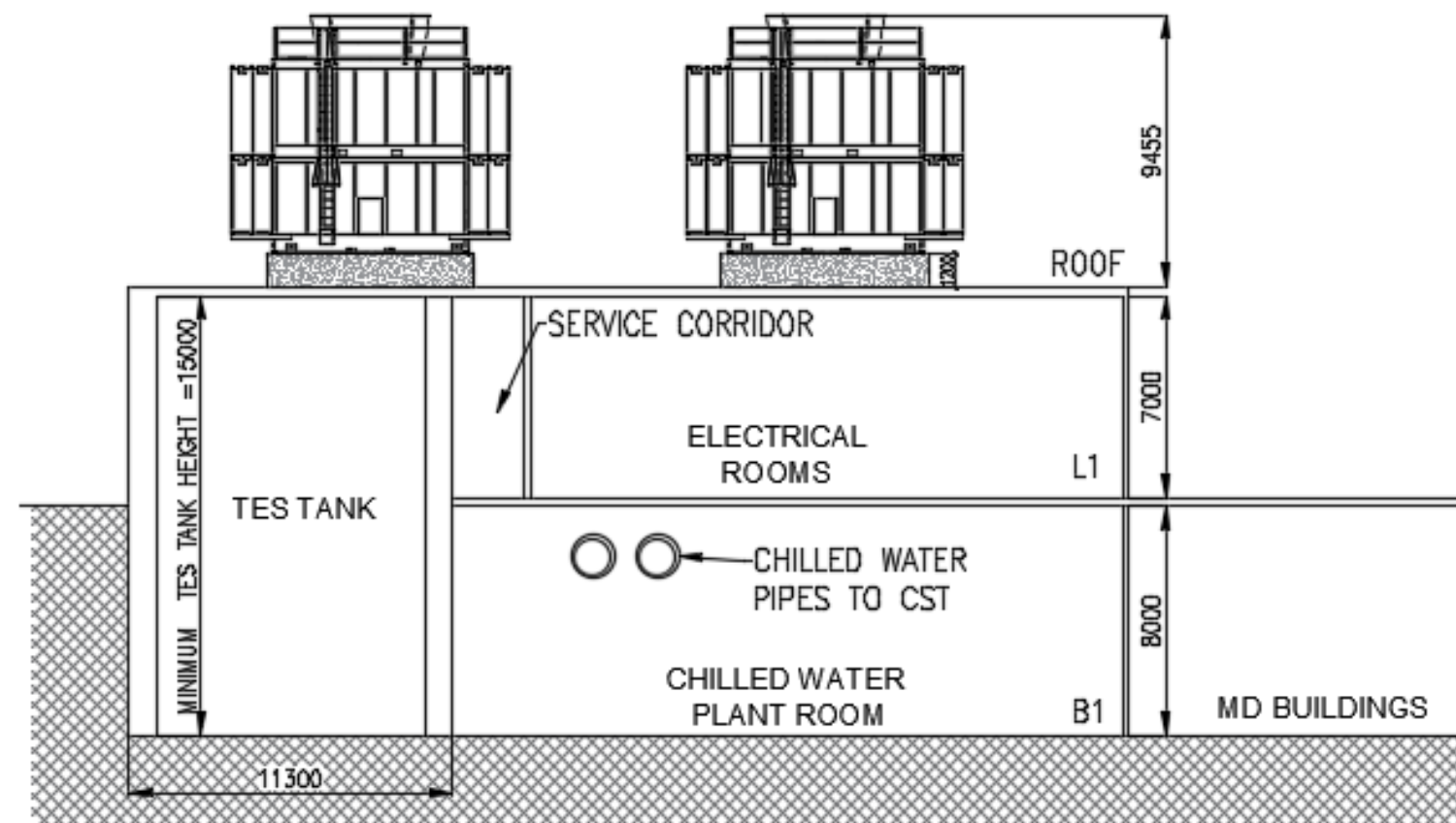
3.0 Roof

NOTE:
FINAL EQUIPMENT ARRANGEMENT
SUBJECT TO REVIEW AND CHANGES
IN DETAIL DESIGN STAGE.



COOLING TOWER AREA (ROOF)

4.0 Sectional Drawing



SECTIONAL DRAWING

ANNEX F2 - PRICE FLUCTUATION FORMULA FOR NON-RESIDENTIAL DEVELOPMENTS

INSTALLATION CHARGE – PRICE FLUCTUATION FORMULA

$$IC_{n+1} = IC_o \times (V_n / V_o)$$

where n is the number of Year(s) minus 1 from the date upon signing of the Chilled Water Supply Agreement,

IC_{n+1} = Installation Charge (S\$ / RT) for DCS' service at (n+1)th Year,

IC_o = Base Installation Charge (S\$ / RT) for DCS' services, set at S\$3,000 / RT,

V_n = Consumer Price Index for the nth Year as published by Monetary Authority of Singapore.

V_o = Base Consumer Price Index (Annual) as published by Monetary Authority of Singapore, set at 113.6.

DEMAND CHARGE – PRICE FLUCTUATION FORMULA

$$DC_{n+1} = DC_o \times \{(25\% \times ECCC_{n+1} / ECCC_o) + (75\% \times V_n / V_o)\}$$

where n is the number of Quarter(s) minus 1 from the date upon signing of the Chilled Water Supply Agreement,

DC_{n+1} = Demand Charge (S\$ / RT / month) for DCS' service at (n+1)th Quarter,

DC_o = Base Demand Charge (S\$ / RT / month) for DCS' services, set at S\$4.70 / RT / month,

$ECCC_{n+1}$ = Electricity Contracted Capacity Charge at (n+1)th Quarter,

$ECCC_o$ = Base Electricity Contracted Capacity Charge, set at S\$11.95 / kW / month,

V_n = Consumer Price Index for the nth Quarter as published by Monetary Authority of Singapore.

V_o = Base Consumer Price Index (Quarterly) as published by Monetary Authority of Singapore, set at 112.000.

ENERGY CHARGE – PRICE FLUCTUATION FORMULA

$$EC_{n+1} = EC_o \times \{(90\% \times E_{n+1} / E_o) + 10\% \times W_{n+1} / W_o\}$$

where n is the number of Quarter minus 1 from the date upon signing of the Chilled Water Supply Agreement,

EC_{n+1} = DCS's energy charge (S\$ / RTh) at (n+1)th Quarter,

EC_o = Base DCS's energy charge (S\$ / RTh), set at S\$0.1865 / RTh.

E_{n+1} = Peak electricity charge (cents / kWh) for SP high tension large tariff at (n+1)th Quarter,

E_o = Base Peak electricity charge (cents / kWh) for SP high tension large tariff, set at S\$0.2759 / kWh.

W_{n+1} = (NEWater tariff + Water Conservation Tax + Waterborne Fee) (S\$/m³) charged by Public Utilities Board (PUB) to non-domestic customers at (n+1)th Quarter,

W_o = Base (NEWater tariff + Water Conservation Tax + Waterborne Fee) (S\$/m³) charged by Public Utilities Board (PUB) to non-domestic customers, set at S\$2.33 / m³.

ANNEX F3 – PRICE FLUCTUATION FORMULA FOR RESIDENTIAL DEVELOPMENTS

INSTALLATION CHARGE – PRICE FLUCTUATION FORMULA

$$IC_{n+1} = IC_o \times (V_n / V_o)$$

where n is the number of Year(s) minus 1 from the date upon signing of the Chilled Water Supply Agreement,

IC_{n+1} = Installation Charge (S\$ / RT) for DCS' service at (n+1)th Year,

IC_o = Base Installation Charge (S\$ / RT) for DCS' services, set at S\$1,500 / RT,

V_n = Consumer Price Index for the nth Year as published by Monetary Authority of Singapore.

V_o = Base Consumer Price Index (Annual) as published by Monetary Authority of Singapore, set at 113.6.

ENERGY CHARGE – PRICE FLUCTUATION FORMULA

$$EC_{n+1} = EC_o \times \{(75\% \times E_{n+1} / E_o) + 25\% \times W_{n+1} / W_o\}$$

where n is the number of Quarter minus 1 from the date upon signing of the Chilled Water Supply Agreement,

EC_{n+1} = DCS's energy charge (S\$ / RTh) at (n+1)th Quarter,

EC_o = Base DCS's energy charge (S\$ / RTh), set at S\$0.3500 / RTh.

E_{n+1} = Peak electricity charge (cents / kWh) for SP high tension large tariff at (n+1)th Quarter,

E_o = Base Peak electricity charge (cents / kWh) for SP high tension large tariff, set at S\$0.2759 / kWh.

- W_{n+1} = (NEWater tariff + Water Conservation Tax + Waterborne Fee) (S\$/m³) charged by Public Utilities Board (PUB) to non-domestic customers at (n+1)th Quarter,
- W_o = Base (NEWater tariff + Water Conservation Tax + Waterborne Fee) (S\$/m³) charged by Public Utilities Board (PUB) to non-domestic customers, set at S\$2.33 / m³.

[GUIDE] PIPE SPECIFICATIONS FOR RESIDENTIAL DEVELOPMENTS
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1. PIPING, VALVES, FITTINGS AND PIPE SUPPORTS

1.1. General

This specification serves as a guideline for the tertiary DCS piping work to serve residential developments. This guideline shall only be used for reference. The specifications in section 1 and 2 are applicable for the whole residential development while section 3 refers to alternative pipe specifications for pipes inside the dwelling units only. The Developer shall consult Keppel DHCS Pte Ltd prior to installation and commencement of works.

a) Material

- i) Name of manufacturer, standard and etc, shall be indicated on the piping material.
- ii) Pipes and pipe fittings shall be sanitary, not absorptive and durable. Outer and inner surface shall be finished smoothly.

b) Arrangement

- i) Piping shall be arranged functionally and neatly and space for maintenance shall be provided as necessary.
- ii) Valves and other equipment shall be located at spaces that are easily accessible, unless ladders or other access devices are provided.
- iii) Prior to piping installation, detailed coordination with other services, equipment, and machinery shall be carried out, and pipe routing and locations shall be finalised.

c) Cutting and Connection

- i) Cutting tools that do not reduce the pipe diameter shall be used. Cutting tools shall be positioned perpendicular to the pipe. Cut edges shall be smoothly finished and cleaned of all debris and waste material. The interior of the pipe shall be checked for obstructions prior to connection. Where piping work is suspended, all open ends shall be properly plugged or capped.
- ii) Unless otherwise specified for special materials or subsidiary works, pipe connections shall generally be mechanical grooved joints or flanged connections.
- iii) Welding connections shall be as follows:
 - 1) Welding works shall be in accordance with the API 1104 and ASME IX.
 - 2) Welding connections for chilled water pipes shall be mechanical grooved

joints or welded flange connections.

- 3) The welding procedure specification shall include the welding process, the pipe and fitting materials, the diameter group including wall thickness, the joint design, the filler metal and number of beads, the current and polarity characteristics, roll or position welding, direction of welding whether uphill or downhill, time lapse between passes, type of line up clamp, removal of line up clamp, cleaning whether power or hand, preheating, shielding gas and flow rate, speed of travel and other related variables set forth in the above specification. All welders shall have valid welding certificates of Grade 6 issued from one of the recognized institutions (e.g. Lloyd, PSA or PSB) for the purpose of this project.
- 4) The weld area of adjoining ends shall be power wire buffed clean immediately prior to welding.
- 5) All welding details shall be recorded including details such as date, name of welder, location, line number, size, angle and distance of groove and root, etc.

d) Pipe Stress/Thermal Expansion

- i) Comprehensive stress analysis shall be carried out for piping systems. Stress exerted by the piping system to the nozzle of equipment shall not exceed the allowable stress of the pipes.
- ii) Allowance of thickness for corrosion shall be at least 1 mm.

e) Gradient Slope

- i) Gradient of Gravity flow system shall be designed to not cause interruption of flow.
- ii) Gradient slope shall be considered for air vent and water drain.

f) Pipe Friction Loss/ Inner Pressure.

The pipes shall be arranged to minimize piping friction loss. The pipe design shall simulate the proposed pipe alignment/arrangement to cater for friction loss calculation.

g) Piping Around Equipment

Flange connections shall be provided to facilitate removal and re-installation of equipment. Consideration to be given for accessibility and safety during the maintainability of the related equipment

h) Pipe Support

- i) Type of support shall be determined based on its intended function, such as weight support, fixed support, vibration isolation support etc. Calculations with PE endorsement shall be provided to confirm strength of the support.
- ii) Piping support shall be designed and installed to ensure that no pipe load are transferred to the equipment.
- iii) Thermal stress to the pipes are to be factored. If there could be extensive expansion or contraction of pipes, necessary slide supports or pipe guides shall be used if necessary.
- iv) Main pipe supports shall be connected to structural members such as beams or columns for load transfer. If not possible, supports shall be mounted on the floor slab.
- v) Bolts used for equipment support, to prevent waving, shall have double nuts.
- vi) Support for chilled water shall be isolated by incombustible insulation material to prevent condensation.

- i) Support distance shall be designed in consideration of the total weight and deflection to prevent bending and waving.

j) Penetration

- i) Pipes penetrating wall or floor shall go through a sleeve or opening of concrete. Sleeves and openings shall be reinforced during concrete casting to prevent distortion and displacement.
- ii) For pipe sleeve and opening through fire-wall, gap between pipe and opening shall be filled with incombustible insulation material.
- iii) Diameter of sleeve shall be 40mm larger than the outer diameter of the pipe (includes insulation thickness for insulated pipe).
- iv) Sealant shall be used at gaps between sleeve and pipe for locations where waterproofing is required.

k) Air Vent Valve

Air vent valve shall be provided where necessary. Each air vent pipe shall have 2 valves near the main line and approximately 1200 mm above floor level near discharge point.

l) Water Drain Valve

Water drain valves shall be provided where necessary.

m) Line Index Directory

A line index directory shall be prepared indicating the line identification number, utility of service, operating and design parameters, piping route, insulation type and thickness, inspection parameters (pressure test, non-destructive test and etc) and drawings identification.

n) Valve and fitting list

A piping service class specification shall be prepared summarising all piping and piping components used (fittings, flanges, gasket, bolt and nut, valves) with thickness identification calculated based on ANSI B31.1 or B31.3 together with pressure-temperature ratings, service medium, material, corrosion allowance etc. Branch material (fitting, stub-on, reinforcement pad) table shall also be prepared.

1.2. Piping Material

a) General

Piping material shall be in accordance with Table 1.1, 1.2(1) and (2) and shall satisfy the following conditions:

- i) Maximum pressure more than 980.7KPag (16 kg/cm²g), pipe standard ASTM A106 Gr. B or API 5L Gr. B equivalent or higher shall be used.
- ii) When it is necessary to calculate pipe thickness, follow ASME code for pressure piping B31.1 or B31.3 where applicable.
- iii) Welding method shall be straight seam follow ASME/ANSI B31.3. For straight seam, radiography inspection is not applicable.
- iv) Decide thickness of the piping based on tolerance and corrosion allowance should be more than 1.0mm.
- v) Valve
 - Valve shall have a pressure rating suitable to the total pressure head of the piping system.
 - Unless otherwise specified, outside screw type valve shall be used and stem material shall be zinc free.
 - Valve shall be suitable for pressure rating and material of the piping system.
 - Gate valve, globe valve and butterfly valve shall have indicator of opening.
 - Valves located 1.5 m and higher from floor level or operating platform and difficult to access shall be required to have operating chain with chain bag.

1.3. Measuring Instrument

a) Pressure Gauge & Compound Pressure Gauge.

- i) Unless otherwise specified, Bourdon type gauge shall be used.
- ii) Detail specification shall be referred following and JIS-B7505 or 150/DP 9399 or ANSI equivalent.
- iii) Type and Dimension of Pressure Gauge
 - Dimension of Pressure Gauge - 100mm
 - Type of purposeFor Liquid: Ordinary Type. If the vibration amplitude exceeds the permissible

- accuracy limit, a vibration-resistant type should be used.
 - If installed outdoor, use enclosed type.
- iv) Installation method of pressure gauge.
- In cases where the pipes are difficult to access, the gauges should be installed on an instrument panel on a wall, with a lead pipe stand provided, in the following situations:
 - To prevent the gauges from difficulty to access for maintenance.
 - When the gauge would not be read accurately had it been installed on the pipes.
 - When the vibration level at the installation point on the pipe exceeds the permissible accuracy limits.
 - If lead pipe is used, take off valve and on-off cock shall be installed.
- b) Double indicator pressure gauge.

A pressure gauge designed to display two distinct pressure readings, utilising either a pipe or a lead pipe, with 2 concentric needles for measurement.

Table 1.1 Piping Material						
	Size	Standard	Thickness	Fitting		
				Connection	Standard	Flange / Coupling
Chilled Water	Below DN 65	Carbon steel pipe (e.g. ASTM A-106 GrB Seamless /API 5L (Grade B or better) Or HDPE pipe (PE100/SDR11)	Sch. 40/Std* <i>*Developer's QP shall design the pipe thickness accordingly</i>	Flanged or Threaded	ASTM-A 234 WPB	ANSI B16.5 150 Lbs SO RF /Coupling
	Below DN 600	Carbon steel pipe (e.g. ASTM A-106 GrB Seamless /API 5L (Grade B or better) ERW.STD.WT STD.WT Or HDPE pipe (PE100/SDR11)		Flanged or Welded		
	Above DN 650	Carbon steel pipe API-5L Grade B or better SAW STD.WT		Flanged or Welded		

Table 1.2 Valves															
	Size	Class	Connection	Gate Valve			Butterfly Valve			Globe Valve			Wafer Check Valve		
				Body	Stem	Disk	Body	Disk	Seat ring	Body	Stem	Disk	Body	Disk	Pin
Chilled Water	Below DN 65	125	Threaded	Bronze ASTM B62 (85-5.5.5)	Bronze	Bronze	-	-	-	Bronze	Bronze	Bronze	Bronze	Bronze	Brass / SUS
	Above DN 65	125	Flange or Coupling	Cast iron	Bronze / SUS	Bronze	Cast iron Or Ductile iron	Al / SUS Or Ductile iron	EPDM / NBR	Cast iron Or Ductile iron	Brass / SUS or Ductile iron	Cast iron or EPDM	Cast iron Or Ductile iron	Cast iron Or Ductile iron	Brass / SUS or SUS304

Table 1.2 Valves (cont.)									
	Size	Class	Connection	Strainer / Suction Diffuser			Ball Valve		
				Body	Cover	Screen	Body	Stem	Ball
Chilled Water	Below DN 65	125	Threaded	Bronze	Bronze	SUS	Bronze	SUS	SUS
	Above DN 65	125	Flange or Coupling	Cast iron Or Ductile iron	Al or SUS or Ductile iron	SUS304	Cast iron	SUS	SUS

2. INSULATION, PAINTING AND CORROSION PROTECTION

2.1. Insulation Works

a) General

Generally, insulation materials used for insulating pipes, ducts and equipment shall be of incombustible material. Insulation and jacketing shall be non-combustible with surfaces being Class 0.

Insulation thickness shall be designed based on the following conditions:

- i. Ambient air temperature: 32 °C
- ii. Ambient RH: 80%
- iii. Chilled water supply temperature: 7 °C
- iv. Ambient air velocity: 0.1 m/s
- v. Dew point temperature: 28.1 °C

b) Material

All insulation, jacketing and miscellaneous materials shall be based on applicable standards as per the following tables or equivalent materials listed in the table.

Table 2.1 Insulation Material

Material	Specification
Polyurethane foam	Polyurethane Foam Boards & Cylinders Type 3

Table 2.2 Jacketing

Material	Specification
Galvanised Sheet	Galvanised Zinc more than 180 g/m ² Thickness 0.3mm ~ 0.5mm
Aluminium Sheet	0.3 mm (for pipes with outer diameter (O.D) < 250 mm) 0.4mm (250 < O.D < 500 mm) 0.5mm (O.D > 500 mm)
Stainless Sheet	0.2mm for pipes and valves 0.3 mm for others

Table 2.3 Miscellaneous Materials

Material	Specification
Polyethylene film	0.5mm
Adhesive tape	polyvinyl chloride tape 0.2mm
Iron Wiring	galvanised wire
Chicken Wire	0.5mm galvanised wire
Sealing	Chloroprene rubber or silicone
Steel frame	0.4mm above galvanised steel
Bond	Acetic adhesive, chloroprene

c) Others

- i) The thickness of insulation excludes jacket.
- ii) The gap of each insulation shall be minimised, and straight-line overlapping shall be avoided in same axis.
- iii) The end of insulation shall use seal plate, and band for the fitting.
- iv) Equipment's manhole door shall be properly insulated but it shall remain easy to access.
- v) For personal protection, equipment shall be adequately insulated and covered with external aluminium jacket.

d) Insulation Works for Piping

Insulation works for piping shall be in accordance with Table 2.5.

e) Removable Insulation

Removable insulation shall be used up to the maximum extent for flanged items requiring internal access or frequent maintenance. This includes but is not limited to; access openings, valves, flanges, strainers, filters, machinery and removable vessel and heat-exchanger heads.

Removable metal jacketed insulation sections or flexible covers shall be designed or selected to provide the same performance as the base insulation.

Table 2.5 Notional Insulation Thickness for Piping
(For reference only)

Chilled Water	Pipe Size (DN)	20	25	32	40	50	65	80	100	125	150	200	250	300	Above 300
	Insulation Thickness (mm)	30	30	30	30	40	40	40	40	40	50	50	50	50	Min. 75

REMARKS

Jacketing

*: Branch Pipe (Blow, Drainpipe) shall be min 40 mm insulation.

Plant: Aluminium Jacketing

Outdoor: Stainless steel Jacketing

Assuming chilled water of 4 deg C using polyurethane foam as insulation.

2.2. Painting

a) General

- i) Paint shall be directly used from the can but paint shall be mixed and adjusted properly depending on temperature fluctuation, surface absorption and surface roughness.

b) Painting Specification

Painting specification shall follow the Table 2.6.

Table 2.6 Painting Specification for Piping

Part	System	Painting Specifications
Cold Insulation	Chilled Water Pipe	1. Anticorrosion paint 1 time (heat resistance) 2. Identification (assign colour)
Support	Pipe Support Valve Control Support	1. Anticorrosion paint 1 time (heat resistance) 2. Finish coat 2 times(assign colour)

3. ALTERNATIVE CHILLED WATER PIPES SPECIFICATIONS FOR PIPES INSIDE DWELLING UNITS ONLY

3.1. PIPEWORK MATERIAL AND STANDARD

High-Density Polyethylene (HDPE) pipes shall be in full compliance with ISO 4427, UNI EN standards, ISO 15494, and DIN 8074, with material grade PE100 and SDR 11.

3.2. JOINTS IN STRAIGHT RUNS OF PIPES

Electrofusion and butt-fusion fittings for straight pipe runs shall comply with ISO 4427, GB/T 13663.3, and EN 1555-3, and shall have a pressure rating of PN 16.

3.3. JOINTS FOR EQUIPMENT CONNECTIONS

Joints for equipment connections shall be polypropylene (PP), reinforced with 30% glass fiber, provided with steel ring flanges, and rated for PN 16 pressure class.

3.4. FLANDGE DETAILS

All flanges shall be butt-fusion type and shall comply with ISO 4427, AS/NZS 4130, BS EN 12201, and SABS standards, with a pressure rating of PN 16.

3.5. PIPE FITTINGS

All pipe fittings shall be electrofusion or butt-fusion type and shall comply with ISO 4427, GB/T 13663.3, and EN 1555-3, with a pressure rating of PN 16.

3.6. INSULATIONS, JACKETING PAINTING

To follow section 2.1 & 2.2.