

Extract of Building Design Requirements for Model Checker InnoCall Problem Statement

The purpose of this document is to share the Building Design Requirements to be checked as part of the InnoCall problem statement for model checker. The document is not to be forwarded, reproduced in whole or in parts for any purpose other than to respond to the InnoCall. Checking shall be verified geometrically at object level, without relying on declarations in attributes and parameters not found in international standards.

1) ARCHITECTURAL DESIGN REQUIREMENTS

CHAPTER 4 Site Circulation

DRIVEWAY & RAMP

Width of driveway with parking/ loading bay on 1 side or both sides: Min. 16 m (for prime movers, 20', 40', 45' trailers).

Driveway Apron Min. 0.6m wide, provided along ground perimeter of building: Width of ramp Min. 12 m

CHAPTER 6 Industrial Block

Entrance Drop-Off

Drop-off porch shall be sheltered and be part of the covered pedestrian network within the site.

Length of Lay-by:

Min. 5 car length (business parks)

Min. 2 car length (all other developments)

Height clearance when roof projects over driveway/ service road: Min. 4.5m

Tenant Unit Door

Service Door Width:

Min. 2.5m (development handling pallet-sized goods)

Min. 4.0m roller shutter (development handling large-span goods)

Loading Bay

Width of Circulation Route

Min. 4.0m (between loading bay and wall)

Min. 6.0m (between loading bay and lift lobby)

Floor Finish

Max 5mm Heavy Duty Epoxy Coating

Goods Hoisting Point & Access: Access Gate

Width Min. 2.5m wide,

Height Min. 1.0m or same height of adjacent parapet/railing.

Lift Lobby: Passenger Lift

Width of Circulation Route: Min. 2.0m clear in front of lift door

Clear Height: Min. 2.5m

Lift Lobby: Goods/Service Lift

Width of Circulation Route: Min. 4.0m clear in front of lift door or 1.5times the clear width of lift door, whichever is greater.

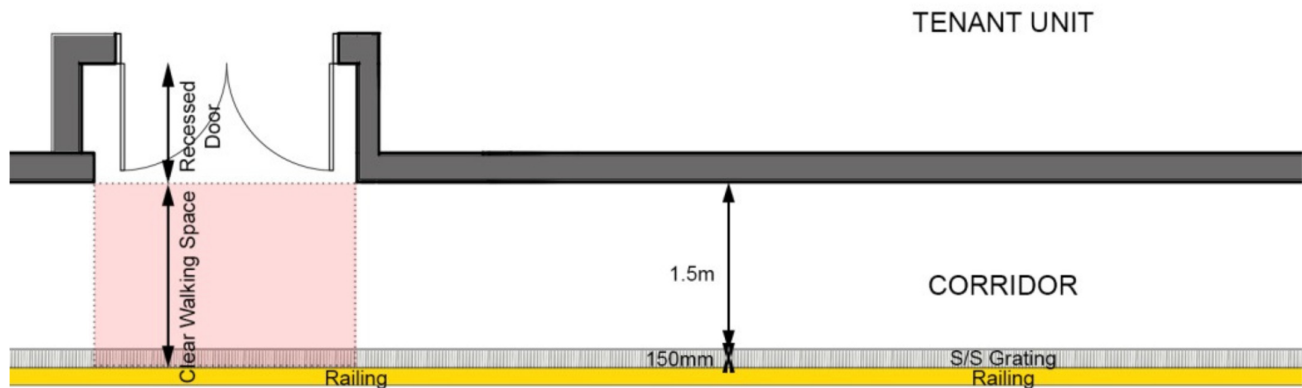
Clear Height: Min. 2.5m

Toilet

Cubicle Size: Min. 0.9(W) x 1.5(L)

Cubicle Partition: Mounted 100mm above FFL

Corridor: Passenger



Clear width of corridor: Min. 1.5m

Finishes

Wall: Low stain retention

Floor: Anti-slip and low stain retention.

Ceiling: 0.6m x 0.6m maintenance panels to be provided at all corners and at 20m interval

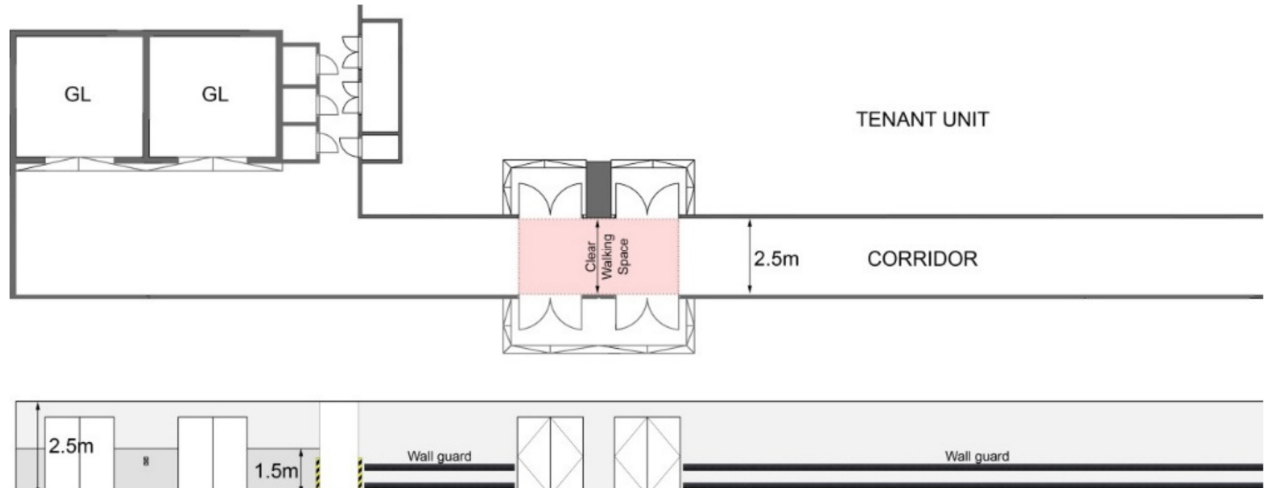
Drainage

Scupper Drain: 150(W) x 50mm (D) drain with metal grating; Minimum clear depth is 50mm and maximum depth shall not be more than 100mm, otherwise additional reinforcement shall be added to prevent cracking to the floor topping as per relevant code requirements.

Floor Fall Gradient: Floor to screed to fall (min. 1:200 grad) towards nearest drain outlets.

Louvre: Vertical louvres to be installed for corridors with high ceiling heights. Bottom of louvre shall not be more than 2.2m from the FFL.

Corridor: Goods/Services



Clear width of corridor: Min. 2.5m

Clear Height: Min. 2.5m

Door**Service Door Width**

Min. 2.5m (development handling pallet-sized goods)

Min. 4.0m roller shutter (development handling large-span goods)

Position: Door leaf cannot open into clear width of corridor.

Finishes

Wall: Enamel paint applied from FFL to a wall height of 1.5m

Floor: Anti-slip, heavy duty epoxy coating.

Ceiling: 0.6m x 0.6m maintenance panels to be provided at all corners and at 20m interval

Drainage

Scupper Drain: 150(W) x 50mm (D) drain with metal grating; Minimum clear depth is 50mm and maximum depth shall not be more than 100mm, otherwise additional reinforcement / wire mesh shall be added to prevent cracking to the floor topping as per relevant code requirements.

Floor Fall Gradient: Floor to screed to fall (min. 1:200 grad) towards nearest drain outlets.

Louvre: Vertical louvres to be installed for corridors with high ceiling heights. Bottom of louvre shall not be more than 2.2m from the FFL.

Roof

Clear Width of Service Access: Min. 1.5m

2) CIVIL & STRUCTURAL DESIGN REQUIREMENTS**2 Foundation Design****Clause 2.4. Consultant to consider the following in the design:**

- **Minimum 85% pile utilisation ratio** (pile working load vs. pile capacity)
- Limit to **maximum five (5) types** to achieve standardised substructure design.
- Common pile size (refer to the table below) to be adopted. Piles greater than the common pile size are only to be adopted for special case with justification.

Piling system	Range of Pile Size (mm)
Bore Piles	600 Ø to 2200Ø
Precast driven RC Piles	200 x 200 to 400 x 400

- Minimum concrete grade shall be **C32/40**

Complied with the minimum floor loading under clause 3.1

Type of Activity		Minimum Variable Load (kN/m ²)	Minimum Superimposed Dead Load SDL (kN/m ²)
Non - Accessible Roof Area ¹	RC Roof	0.5	1.2
	Steel Roof	0.5	0.5
Carpark		2.5	1.0
Loading Area/ Bay		15.0	1.0
Office		3.0	1.0
Roof Area with solar panel provision	RC Roof	1.5	1.2
	Steel Roof	0.5	0.5
Production Floor		7.5	1.5
M&E		7.5	1.0
Fire Engine Access		10	1.0
Driveway for 40 ft. truck		15 ²	1.0
Heavy Vehicle Carpark		15	1.0

¹ Non- Accessible Roof is allowed for normal maintenance and repair work only

Ensure that vehicular impact load had considered in column and wall design

- Vehicular impact loading of minimum 500kN at 0.75m height is to be included in the design of structural columns and walls (including parapet wall) next to production floor where movement of transportation equipment is expected.

Complied with min concrete grade requirement as below:

3.2 Structural Materials

i. Concrete

Minimum concrete grade to be adopted for JTC industrial buildings is as below:

Structural elements	Concrete Grade
Reinforced concrete slab/ beam ¹	C32/40
Column/ wall ²	C40/50
Post-tensioned beams	C40/50

¹ For ground level reinforced slab/beam to follow that of foundation design

² Applicable to shear / core wall

Complied with recycling material requirement:

structural/non-structural elements:

Recycle Material	Minimum %
Ground Granulated Blast-Furnace Slag (GGBS)	30% of replacement with Ordinary Portland Cement (OPC) for JTC Building Projects for structural element
Recycled Concrete Aggregate (RCA)	20% of replacement with the total concrete mix used in the project for the super structure by mass for non-structural element

Complied with structural standardisation requirements under clause 3.2

- Standardisation of structural elements size particularly columns and beams (3 most common sizes at 70 %)
- Repetition of structural floor layout (min 70 %)
- High strength concrete (min C70/85) for columns and walls
- Minimum **70 %** of the structural system shall be prefabricated modular structure such as precast concrete, steel structural and etc.

Ensure no hollow core slab used at roof and area expose to weather under clause 3.3.2

- Precast hollow core slab should not be considered at location(s) which are exposed to weather (example: Roof, 1st storey slab with basement and etc.) unless there are specific measures to do so. To also ensure that water will not trapped within the hollow core void during construction.

Complied with Waterproofing system for basement, refer to clause 4.2 (possible to check using BIM?)

Table 3 Combined Waterproofing System for JTC developments

s/n	Basement Retaining Wall System	Basement Usage	Waterproofing Protection Systems	Remarks
1	Diaphragm Wall	Grade 1	B + C	
		Grade 2	B + C	
		Grade 3	B + C	With raised floor to allow minimum 150mm drain cavity below for data centre and offices, ventilation or dehumidification to achieve drier environment
2	Contiguous Bored Pile (CBP) Wall & Secant Bored Pile (SBP) Wall	Grade 1	B + C	
		Grade 2	B + C	
		Grade 3	B + C	Type A (internal membrane) or Type B protection can also be applied to internal skin wall (if provided). With raised floor to allow minimum 150mm drain cavity below for data centre and offices, ventilation or dehumidification to achieve drier environment
3	Open-cut Reinforced Concrete Wall	Grade 1	A + B or A + C or B +	
		Grade 2	C	
		Grade 3	A + B or A + C or B + C	With raised floor to allow minimum 150mm drain cavity below for data centre and offices, ventilation or dehumidification to achieve drier environment

Type of Protection	Type A – Barrier Protection	Type B – Structural Integral Protection	Type C – Drained Protection
Description	Protection against water ingress which is dependent on a separate barrier system (external or internal) applied to the structure	Protection against water ingress which is provided by the structure	Protection against water ingress into usable spaces which is provided by the incorporation of an appropriate internal water management system
Method	Mechanical or chemical bond waterproofing membrane	Waterproofing admixtures – crystalline or hydrophobic	Drainage system – drainage sheet or cavity/channel, pump sump

Internal drain, clause 5.1 design requirement for common drain

C&S Engineer shall work with the Architect to design the internal common drain, and to comply with the following:

- Depth of the drain shall not be more than 2 times the width of the drain.
- For internal covered drain, access openings shall be provided at minimum 6 m interval.

Apron slab requirement under clause 5.4; cannot be directly supported by ground to prevent settlement

5.4 Other Design considerations

- Apron slab shall be structurally suspended.

3) MECHANICAL & ELECTRICAL DESIGN REQUIREMENTS

1.3 General Requirements

1.3.7

Consultants shall ensure no wet services (i.e: chilled and condenser water pipes, condensate trays, refrigerant pipes, cold/hot water pipes, rainwater down pipes, sprinkler pipes, drainage and sanitary pipes, all pressured and gravity pipes, etc) is above any electrical services such as electrical switchboard, generator, transformer, distribution board, MCC, control panel, busbar system, cable trunking, cable tray, isolator, power points, socket outlets, switches within the same level plant rooms, driveway, landlord common areas, covered parking, tenanted space, offices, meeting rooms and toilets.

2 Air-conditioning & Mechanical Ventilation Services

2.2 System Requirements

2.2.3 Chilled Water Distribution

i.

The Consultants shall design chilled water plant to meet project green mark efficiency. The leaving chilled water temperature shall be 8°C or higher. The Consultants shall seek JTC waiver if this design parameter is not met.

v.

A TES tank may not be provided in the chilled water plant, if the chilled water piping is sufficient to cater as thermal storage and fulfilling the requirement of 2.2.3. (iii).

vii.

The Consultants shall design water flow/energy meter for tenant units for monitoring of utility usage.

xi.

The Consultants shall design chilled water pipe tee-off with BTU meter outside tenanted units. Balancing valve (pressure independence type) shall be provided in the chilled water distribution system. Control valve authority shall be selected within the range of 0.25 to 0.5.

xii.

The location of display unit of BTU meter shall be at eye level facing to reader when he is in standing position on ground. The display unit shall be provided with lockable cabinet and a viewing panel. The distance between BTU meter and display unit shall not be limited by the selection of BMS sensor and meter. The necessary BMS signal booster shall be provided in between of BTU meter and display unit if it is required.

xiii.

The Consultants to propose Chiller Plant MCC location as a separate compartment from the Chiller plant room.

xv.

No water pipes shall enter into the Chiller Plant MCC room.

xvi.

Chilled Water Plant MCC room shall NOT be naturally ventilated and no louvres are allowed at where it may cause ingress of weather elements.

2.2.9 Water Consumption of Cooling Tower

ii.

Consultants shall design for water meter installation before the cooling tower condenser water make up tank.

3 Fire Protection Services

3.2 System Requirement

ii.

Monitoring isolating valve shall be provided at the main distribution pipe to isolate water supply during fit-out and maintenance without affecting the protection for other areas.

iii.

The Consultants shall include 2 jockey pumps for the design of sprinkler system.

4 Plumbing, Sanitary and Gas Services

4.2 System Requirement

4.2.2 Domestic Cold Water System

i.

Private Sub-meter shall be provided to all major draw-off, for e.g. water features, air-conditioning system, etc.

4.2.3 Soil & Waste System

i.

Floor traps or floor waste shall be provided to all M&E plant rooms & risers.

4.2.4 Kitchen Waste System

If there are F&B outlets in the development, there shall be a separate Kitchen Waste System. The kitchen wastes shall not connect to any soil waste pipe system serving toilets or sullage water system.

4.2.5 Domestic Gas Supply System

The gas supply shall be piped to all F&B units via a minimum 32mm diameter gas supply pipe and terminate within each unit complete with shut off valve. Out-going pipe work from shut off valve will be by tenant.

6 Electrical Systems**6.2.2 Metering Arrangement**

iv.

Private sub-metering shall be provided for monitoring the energy consumption of the following equipments below. All sub- meters are to be linked to BMS.

- a. Major mechanical ventilation system
- b. Central Air-conditioning system
- c. Vertical Transportation Systems
- d. Domestic Water Pump
- e. Fire Protection

6.2.4 Distribution Scheme

v.

All the landlord distribution boards shall be housed in electrical riser. Where it is not feasible to provide risers in the common area, these distribution boards shall be placed in an accessible location and provided with pad-locking facilities.

vii.

Isolators and socket outlets for general use shall be designed to be on a different distribution board with those serving mechanical equipment.

6.2.5 Busbar Trunking System

i.

Ingress Protection (IP) rating.

For busbar trunking systems installed in non-enclosed spaces, e.g. corridor, covered walkways, which are exposed to weather, the IP rating shall be IP 65.

Design and Placement.

Wet services like water pipes, waste pipes and sewer pipes should not run above the busbar trunking system either in parallel or at crossing.

The busbar trunking shall not pass under building joints. Consultants shall highlight any deviation and design adequate protection against water ingress.

The busbar trunking shall be installed minimum 4.5 metres above the driveway.

The busbar trunking shall be installed minimum 3 metres from edge of building opening to avoid water ingress from wind driven rain.

Consultants shall ensure the structural loading of busbar trunking on ceiling is incorporated in the structural designs.

6.2.7 Power Points Provision

i.

Power Point outlets shall be provided as follows: -

- a. Staircases: 1 no. of 13A metal clad lockable Power Point outlets complete with integrated RCCB at main staircase landing.
- b. Lift Lobbies: 1 no. of 13A Power Point outlets complete with integrated RCCB at every lift lobbies.
- c. Electrical closets: At least 1 no. of 13A metal clad Power Point ELV/Tel Risers outlet.
- d. Along open corridor exposed to weather: The 13A Power Points shall be provided and are weatherproof type and for other corridor, non-weatherproof types are to be provided.

8 Vertical Transportation Systems

8.2 Design Criteria for Lifts

8.2.4.

Lift Machine room(s) shall be provided for lifts. The consultants shall highlight if lift machine room(s) cannot be provided due to height constraint or other reasons.