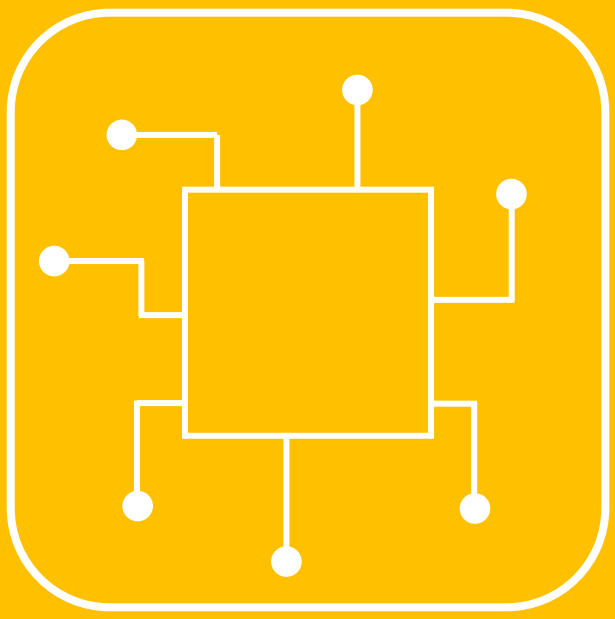


Green Mark 2021

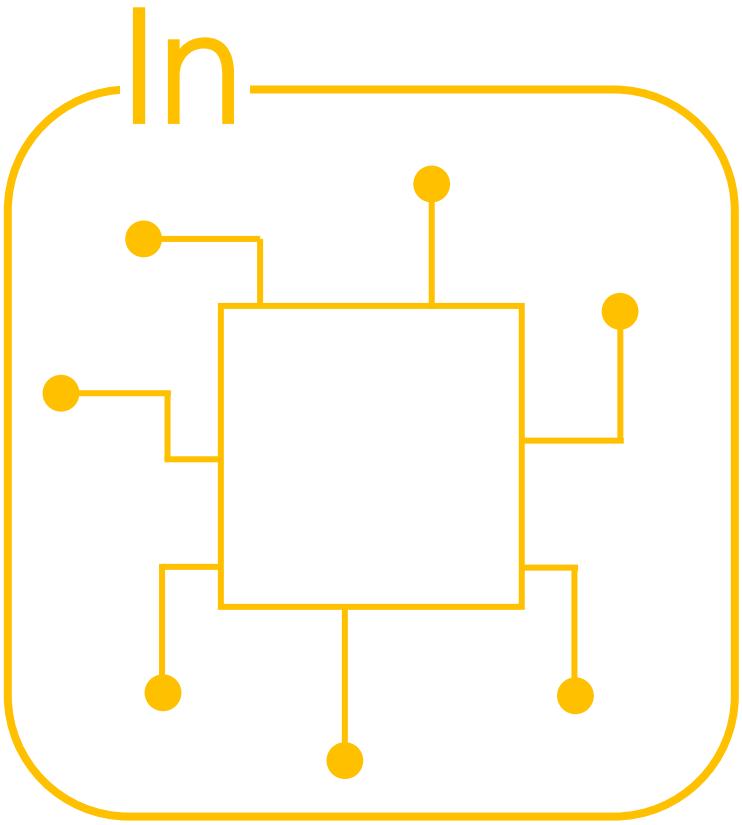
In

Intelligence

The Intelligence section looks at the adoption of relevant smart technologies and systems within the building design, construction, retrofit and operation that enable a fully integrated, automated, intelligent, responsive and aware building to delight its users.

The GM 2021 Intelligence section (In) has been created looking at the core principles of a smart building, looking at integration of systems, processes and technology, the collection of relevant data and the analytics of this with a view to direct response to improve aspects of the building performance from energy optimisation, health and wellbeing to spatial optimisation and user experience.

We are exploring recognition of robust smart building certification systems, and similar to the Resilience and Health and Wellbeing Section allowing them to be used in lieu of the criteria listed below.



Helps projects meet targets under the following SDGs

Revision	Description	Effective Date
R0	Launch for Pilot	22 April 2021
R1	1st Edition	1 November 2021
R2	2nd Edition with minor updates	1 January 2024

INTELLIGENCE		
IN1 Integrated	**Green Mark Points**	
IN1.1 Digital Life Cycle	**New**	**Existing**
Use Integrated Digital Delivery (IDD) solution(s) to develop Project Information Model (PIM) with adequate level of information need to facilitate integrated and digitalised design, construction, operational and retrofit process. PIM shall be sufficiently developed and detailed for purposes of co-ordination, environmental simulations, statutory submissions, tender and construction documentation as well as forming the basis for conversion into Asset Information Models (AIM). (i) PIM (BIM) developed in accordance with Singapore Model Content Requirements (MCR). (ii) Use of spatial model co-ordination platform based on PIM for spatial analysis including: a. Identifying system clashes through an automatic model checking tool. b. Spatial analysis for effective construction, maintenance and future alteration or replacement. (iii) Digital building commissioning, performance and defect co-ordination platform based on PIM to track, co-ordinate and manage the commissioning of systems and the tracking of defects and their rectification. References: • *ISO 19650–1 Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) - Information management using building information modelling - Part 1: Concepts and principles.* • *ISO 19650-2 Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) - Information management using building information modelling - Part 2: Delivery phase of the assets.* • *Model Content Requirements (MCR) stipulates the information requirements for Building Information Modelling (BIM) by building typology as part of project information deliverables according to project delivery stages.*	(i) 1 Point (ii) a. 1 Point (ii) b. 1 Point (iii) 1 Point	(i) 2 Points (ii) N.A. (iii) 1 Point (for re-commissioning or retro commissioning)

IN1.2 Good Practices to Facilitate Data Management		
Use of *a combination of workflow and information storage solution(s)* to consolidate multiple systems' data and key information of the asset(s). **Prerequisite** Non-residential projects must score minimum 1 point (for new building) or 2 points (for existing building) from IN1.2 to attain the Intelligence Badge. (i) Performance dashboard to monitor the different aspect of building assets' performance and operations from a single dashboard: a. Operational dashboard: sets of measures used to guide facility operations such as energy & water efficiency and work order status. b. Managerial dashboard: sets of metrics which may use data from multiple operational systems such as asset health and energy use per occupant. (ii) Data Management and Integration that: a. Connects and manages asset and facility data, operational data, and real-time equipment data extracted from different sub-systems based on an open protocol such as OPC UA, BACnet Secure, MODBUS, DLMS, or APIs (REST, HTTPS, MQTT). b. Allows data exchange between robots, lifts, and automated doorways. (iii) Data Accessibility and Security - information stored in the digital platform(s) can be accessed by facilities teams in a secured manner to facilitate operation and maintenance activities from anywhere and anytime. *Note: The Common Energy Dashboard (CED) data requirements set the requirements for building energy efficiency aspect. The copy of CED data requirements can be found here.*	(i) a. 0.5 Point (i) b. 0.5 Point (ii) a. 0.5 Point (ii) b. 0.5 Point (iii) 0.5 Point	(i) a. 1 Point (i) b. 1 Point (ii) a. 1 Point (ii) b. 1 Point (iii) 1 Point
IN1 Integrated	Cap at 5 Points	

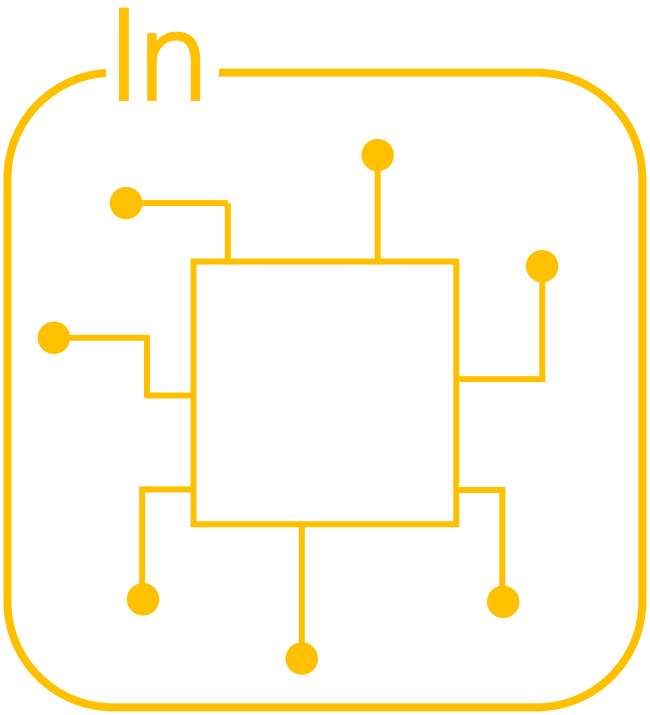
INTELLIGENCE		
IN2 Data Driven	**Green Mark Points**	
IN2.1 Asset Information Model	**New**	**Existing**
Use digital platform(s) to develop an operational up-to-date Asset Information Models (AIM) for purposes of asset tagging, co-ordination, and maintenance. (i) Development and handover of an accurate spatial model of the building or asset which is complete, fully up-to-date, and inclusive of renovations that would impact building services or layout alterations. (ii) Physical and virtual asset information tagging system that allows for tracking of maintenance work, repairs, refurbishments or upgrades, replacement, decommissioning, risk assessments, and performance evaluations of the physical asset to be captured. (iii) Adoption of a common international standard for asset ontology. For example, Brick Schema or Project Haystack. *Note: Asset Ontology helps to standardise semantic descriptions of the physical, logical and virtual assets in buildings and the relationships between them.* References: • ISO 19650-3:2020 Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) — Information management using building information modelling — Part 3: Operational phase of the assets. • Project Haystack. • Brick Schema.	(i) 1 Point (ii) 1 Point (iii) 1 Point	(i) 1 Point (ii) 2 Points (iii) 1 Point
IN2.2 Voluntary Disclosure of Building Energy Performance Data		
Projects that voluntarily contribute non-sensitive data pertaining to building energy performance to the Super Low Energy Building (SLEB) Smart Hub can facilitate dynamic energy performance benchmarking and automate Green Mark energy data reporting. (i) Create your SLEB Smart Hub user account by following the instructions in the video provided here: https://go.gov.sg/slebregister. Subsequently, become a SLEB Smart Hub member by referring to the step-by-step guide available in the video at this link: https://go.gov.sg/slebmember.	*Non-Residential* (i) 0.5 Point	*Non-Residential* (i) 0.5 Point

(ii) Share data to SLEB Smart Hub Operation Dashboard by following the instructions in the video provided here: https://go.gov.sg/sleboperation. (iii) Share data to SLEB Smart Hub Energy Performance Dashboard by following the instructions in the video provided here: https://go.gov.sg/slebenergy.	(ii) 0.5 Point (iii) 0.5 Point	(ii) 0.5 Point (iii) 0.5 Point
IN2.3 Data Ethics		
Demonstrate accountable data ethics practices that identifies the various opportunities for the collection, analysis, and use of data, organised around 4 principles: a) Governance and Transparency b) Management of Personal Data c) Care of Personal Data d) Individuals' Rights	2 Points	2 Points
IN2 Data Driven	Cap at 5 Points	

INTELLIGENCE		
IN3 Responsive	**Green Mark Points**	
IN3.1 Energy Usage Optimisation	**New**	**Existing**
Real time asset monitoring and optimisation	*Non-Residential*	*Non-Residential*
(i) Adaptive ACMV control system (Water Side) – continuously monitor, analyse, and modify BMS control settings to optimise energy usage of ACMV (water-side) system while maintaining occupant comfort.	(i) 0.5 Point	(i) 0.5 Point
(ii) Adaptive ACMV control system (Air Side) – continuously monitor, analyse, and modify BMS control settings to optimise energy usage of ACMV (air side) system while maintaining occupant comfort.	(ii) 1 Point	(ii) 1 Point
(iii) Adaptive lighting monitoring & control system – continuously monitor and control the lighting within specific areas based on inputs such as motion, daylight levels, or space temperature to reduce energy usage while maintaining comfortable user experience.	(iii) 0.5 Point	(iii) 0.5 Point
(iv) Tenant energy monitoring and optimisation – continuously monitor, benchmark, and report tenant energy consumption to optimise the energy consumption.	(iv) 1 Point	(iv) 1 Point
IN3.2 Greenhouse Gas (GHG) Emissions Monitoring and Tracking		
Point allocation is based on the scopes of GHG monitoring and tracking.	*Non-Residential*	*Non-Residential*
(i) Scope 1 GHG emission (direct emission) and Scope 2 GHG emission (indirect emission).	(i) 0.5 Point	(i) 0.5 Point
(ii) Scope 3 GHG emission (indirect emission) for at least 2 relevant categories.	(ii) 0.5 Point	(ii) 0.5 Point

IN3.3 Health & Comfort – Provision of indoor air quality monitoring system with zonal controls		
Health & Comfort – Provision of indoor air quality monitoring system with zonal controls.	*Non-Residential* 1 point	*Non-Residential* 1 point
IN3.4 Space optimisation		
To continuously monitor, track, and report space utilisation in order to empower building owner and/or FM team to optimise space functionality/utilisation and occupant/FM personnel productivity.	*Non-Residential* 1 point	*Non-Residential* 1 point
IN3.5 User Experience		
(i) User feedback: proactive collection and use of data using a digital user feedback platform to understand, track and manage the occupants or residents experience within the building: • User patterns. • Comfort (thermal, visual, aural, olfactory, and spatial, including locational information).	(i) 0.5 point	(i) 0.5 point
(ii) Community experience: a user-friendly digital platform that grants building occupants or residents convenient access to a variety of services available within the building and its community.	(ii) 0.5 point	(ii) 0.5 point
	Residential	*Residential*
(iii) a. Electronic notice board: to improve communication within residential building community, making it easier to share information, engage residents, and enhance the overall living experience.	(iii) a. 0.5 point	(iii) a. 0.5 point
b. Innovative use of the electronic noticed board system.	(iii) b. 0.5 point	(iii) b. 0.5 point
(iv) a. Parcel delivery management: a user-friendly parcel delivery management system that enhance the convenience and satisfaction of residents, as well as streamline the operations of property management.	(iv) a. 0.5 point	(iv) a. 0.5 point
b. Innovative use of the parcel delivery management system.	(iv) b. 0.5 point	(iv) b. 0.5 point
IN3 Responsive	Cap at 5 Points	

IN - INNOVATION		
	Green Mark Points	
	New	**Existing**
Where projects can demonstrate substantial performance to a specific Intelligence indicator or outcome innovation points can be awarded on a case-by-case basis. Points shall be awarded based on the strength of evidence of benefits and potential impact. <u>Process:</u> **At Design / Pre-retrofit stage** The project team is to submit a concise summary that articulates: • The nature of the environmental benefit of their intervention. • Justify the impact of the intervention through detailed calculations and comparisons with industry norms. • Substantiate the calculations and comparisons with evidence and data. **At Verification (As Built/ In Operation):** Details of the implemented intervention including measurements and monitoring of the environmental performance including lessons learnt if the intervention does not perform as expected. *Example:* • *Use of Singapore Green Building Council certified smart building products or product with equivalent certification where 0.25 point shall be awarded for each smart product used that is certified by Singapore Green Building Council or other equivalent certification entities. The coverage rate shall be at least 50% of the applicable areas.* • *Adoption of Digital Twin technology. The role of the Digital Twin is to function as the piece in the value chain that ties the various digitized deliverables in the previous sections together. The Digital Twin should provide the necessary insights through a single, coherent platform that acts as a "system of systems", to align all building data in a structured way that supports stakeholders to make better decisions.* • *An Enabling Infrastructure (EI) such as Robotics Middleware Framework (RMF) that enables interoperability among heterogenous robot fleets while managing robot traffic that share common resources such as space, building infrastructure (e.g., lifts, doors), and other automation systems within the same facility.*	Up to 2 Points	Up to 2 points
IN3 Innovation	Cap at 2 Points	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Developed by:

With inputs from IDD IFM Workgroup Members