Learning Portal Green Mark: 2021 In-Operation



5 May 2025

AGENDA

1. Background of Sample Project A
2. GM 2021: Key Qualification Criteria
3. Pathway 1: Energy Use Intensity (EUI)
4. Other Supporting Documentation Submitted



GM: 2021 IN-OPERATION

Background of Sample Project A

Sample Project A	
Gross Floor Area	56,247.51 m^2
Building Type	Non-Residential; Community Hospital
Green Mark Certification	Platinum [Green Mark for Healthcare Facilities (Version1)]
Year of Operation	2014
Year of Last Re-Certification	2019

GM 2021: In- Operation - Key Performance Criteria

Simplified re-cert is replaced with GM:2021 In Operation wef 1 Nov 21

Key Performance Criteria – Energy Efficiency

Pathway 1

- Energy Consumption Based
  - Energy Use Intensity (EUI)
  - Total System Efficiency (TSE) better than 0.9 kW/RT

Pathway 2

- Deemed-to-comply
  - Total System Efficiency (TSE)
  - Others Fixed Metrics

Pathway 3

- Performance-based
  - Energy Modelling
  - Applicable for New Construction only

Pathway 1: Energy Use Intensity (EUI)

EUI to Achieve Respective GM Rating for Community Hospitals

GM Rating	Gold	Gold^{PLUS}	Platinum	SLE
EUI	280	230	210	**185**

Actual EUI of Sample Project A

EUI	
Electricity consumption October 2021 - September 2022	9,302,072 kWh
GFA of Sample Project A	56,248 m^2
****EUI**	**165.38**

Green Mark 2021: In Operation Rating
Platinum + SLE achieved

Additional Notes
Non-Residential Buildings Minimum TSE: 0.9 kW/RT
Sample Project A TSE: 0.83 kW/RT (achieved)
Minimum Occupancy rate: ≥60%
Sample Project Occupancy rate: 95% (achieved)

Other Supporting Documentation Submitted

OSE REPORT

The operating System Efficiency (OSE) report detailing the performance of the Chilled Water Plant at Sample Project A.

WATER CONSUMPTION

The provision of the latest 3 years water bill (m^3).

CYCLE OF CONCENTRATION

Cooling tower's water treatment report showing at least 7 cycles of concentration (COC).

ENERGY CONSUMPTION

The provision of the latest 3 years electricity bill (kWh).

ENERGY AND WATER IMPROVEMENT PLAN

The Energy and Water Improvement Plan demonstrate intent on how Sample Project A can implement improvement target set against current performance over the next 3 years.

INDOOR ENVIRONMENTAL QUALITY

The conduct of IAQ surveillance audit by SAC accredited consultants/ companies.
The conduct of Lux level and Noise level report complying to SS531 and SS553 respectively.

OTHERS

- Post Occupancy Evaluation (POE) survey
- 1 year of waste collection report
- Evidence of 3 health and wellbeing activities conducted.

OSE Report Summary

Energy Audit performed at Sample Project A from **02/11/2022 to 08/11/2022** for 24 hours.

- Average Day Cooling load = **460.60 RT**
- Average Night Cooling load = **150.81 RT**
- Heat Balance (range of ±5%) = **85.83 %**
- Chiller Efficiency = **0.491 kW/RT**
- Chilled Water Pump Efficiency = **0.034 kW/RT**
- Condenser Water Pump Efficiency = **0.044 kW/RT**
- Cooling Tower Efficiency = **0.020 kW/RT**
- Chiller plant system efficiency = **0.588 kW/RT**
- Air Distribution system efficiency = **0.243 kW/RT**
- **Total System Efficiency = 0.831 kW/RT**

* Required for Chilled Water Plants
* Endorsed by PE/Energy Auditor
* Measured for 1-week period
* Data logging to trend at 1-minute sampling time interval

Recommended energy improvement measures

Opportunity in improving Condenser Water Pump by further lowering its minimum speed if allowable and finetuning its control.

Cycle of Concentration

- COC Report submitted from Sep-21 to Aug-22
- Average COC = **8.53** (*requires 7 or better)
- Anomaly in readings
  - Dec-21 CT3: basin fibreglass cracked
  - Dec-21 CT4: butterfly valve stuck due to debris
  - Jun-22: Cooling Tower washing carried out, thus COC low

* COC must be 7 or better
* Explanation shall be given for Anomalies in readings from the report

	CT1	CT2	CT3	CT4	Average
Aug-22	6.73	6.81	6.77	6.69	6.75
Jul-22	5.97	5.93	5.92	5.9	5.93
Jun-22	4.43	4.45	4.36	4.37	4.40
May-22	11.83	11.8	11.91	11.85	11.85
Apr-22	10.55	10.37	10.53	10.45	10.48
Mar-22	9.96	9.93	10.02	9.97	9.97
Feb-22	10.21	10.03	10	10.47	10.18
Jan-22	10.65	10.58	10.64	10.67	10.64
Dec-21	10.04	10	1.87	3.51	6.36
Nov-21	10.45	10.4	2.15	10.42	8.36
Oct-21	9.95	9.92	1.83	10.06	7.94
Sep-21	9.56	9.48	-	9.53	9.52
					8.53

Energy & Water Consumption

Total Building Energy Consumption

* Calculated based on Utility bills from past 3 years

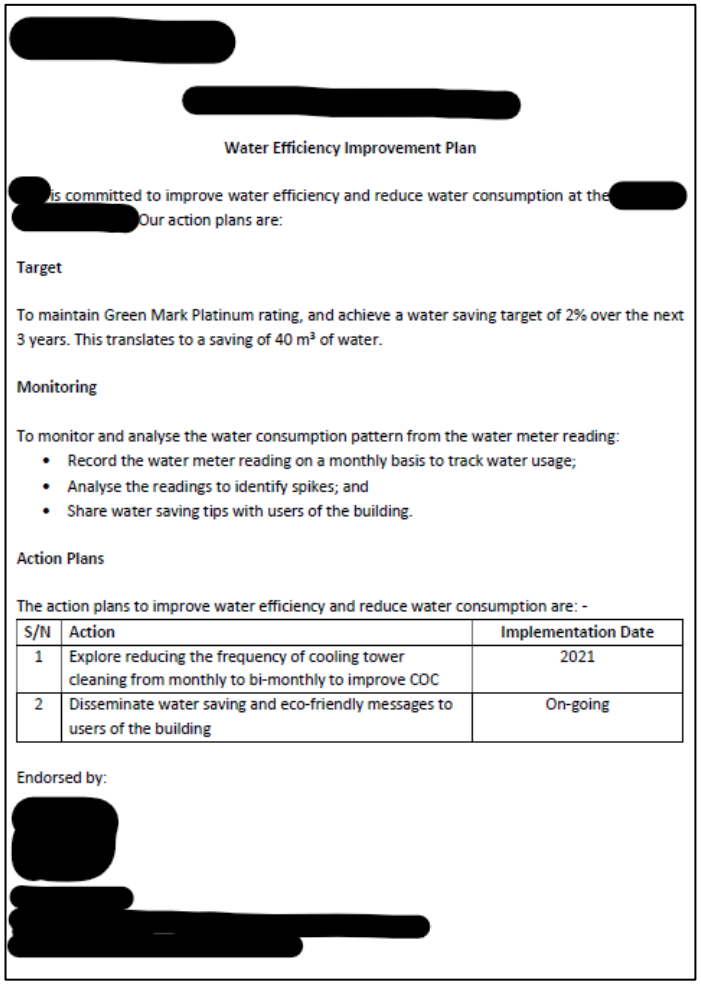
	2020	2021	2022
Total Building Energy Consumption (kWh)	8,792,926	8,930,184	9,302,072
Gross Floor Area,m^2 (GFA)	56,248		
Energy Use Intensity, EUI	156.33	158.77	165.38
Deviation	Baseline	1.56%	5.79%

Total Building Water Consumption

	2020	2021	2022
Total Building Water Consumption (m^3)	81,123.4	83,319.8	81,897.7
Deviation	Baseline	2.71%	0.95%

Energy & Water Improvement Plan

Submission of plans showing intent, measures and implementation strategies to achieve improvement target set against current performance over the next 3 years.



[redacted]

Water Efficiency Improvement Plan

[redacted] is committed to improve water efficiency and reduce water consumption at the [redacted] Our action plans are:

Target

To maintain Green Mark Platinum rating, and achieve a water saving target of 2% over the next 3 years. This translates to a saving of 40 m^3 of water.

Monitoring

To monitor and analyse the water consumption pattern from the water meter reading:

- Record the water meter reading on a monthly basis to track water usage;
- Analyse the readings to identify spikes; and
- Share water saving tips with users of the building.

Action Plans

The action plans to improve water efficiency and reduce water consumption are: -

S/N	Action	Implementation Date
1	Explore reducing the frequency of cooling tower cleaning from monthly to bi-monthly to improve COC	2021
2	Disseminate water saving and eco-friendly messages to users of the building	On-going

Endorsed by:

[redacted]

* To be endorsed by Building Owner
* To include % target of both energy and water efficiency improvement
* To include action plan to achieve target

Indoor Environment Quality (IEQ) Assessment

IAQ Audit carried out on 12/9/22 and 13/9/22

Results: **Acceptable levels**

Noise Level Audit carried out on 21/9/22

Results: **Acceptable levels**

* IAQ audit conducted by SAC accredited consultants / companies.
* Lux level comply to SS531
* Noise level comply to SS553

Lux Level Audit carried out on 21/9/22

Results: **Not within acceptable levels**

Recommendation: Replace fluorescent lights with LED lights, which is part of Sample Project A Energy Improvement Plan to progressively replace lightings in office and patient area. Rolling up blinds in hallways to allow natural lighting in is also recommended.

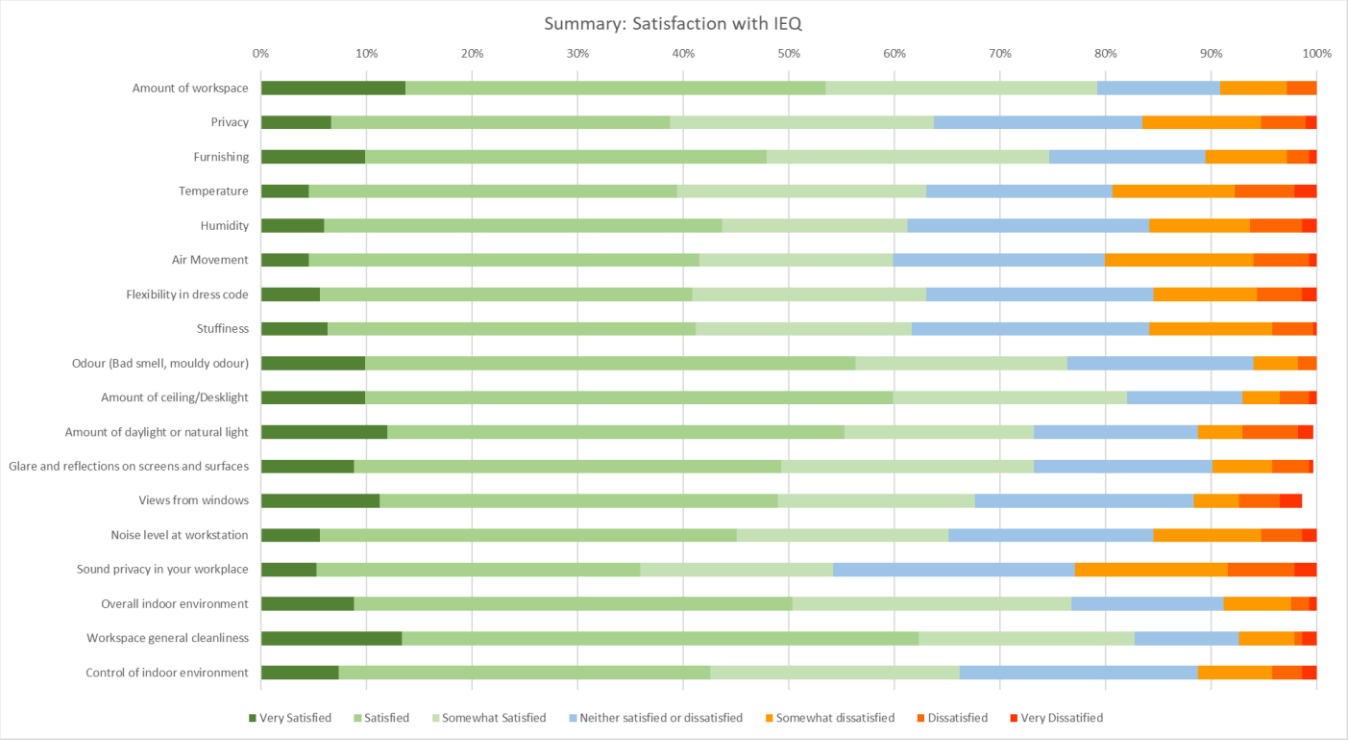
Others

Periodic Occupancy Evaluation (POE) Survey

Survey includes 5 broad categories: Spatial Comfort, Thermal Comfort, Air Quality, Lighting Quality, Sound Quality and Overall Workspace.

Result: **Generally Satisfied**

* Conducted once every 3 years
* Sample size shall be at least 10% of the occupant population
<100 pax: min 10 surveys
>1,000 pax: min 100 surveys



Others

Waste Collected

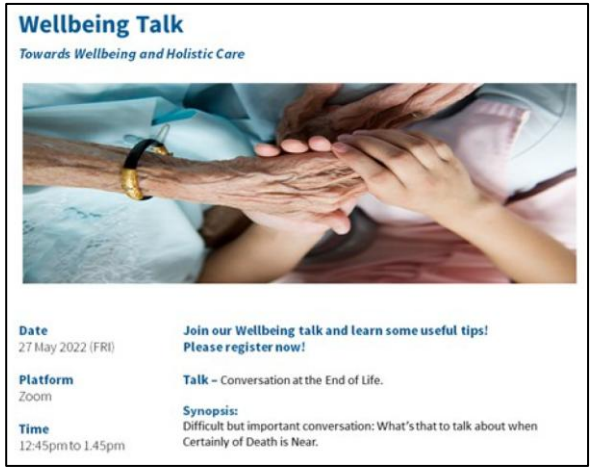
To show evidence of recycled waste collection and monthly collection of waste.

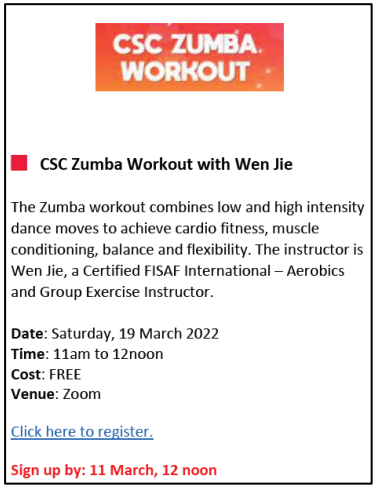
General Waste													
Month	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22
Total Tonnage	54.38	58.29	42.93	65.73	58.46	59.56	66.46	70.41	70.71	67.79	61.3	66.59	67.83

Recycle Waste													
Month	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22
Total KG	7960	7090	6970	7140	6780	5240	5580	5390	5435	5160	5544	4700	5780

Health and Wellbeing activities

Submit evidence of health and wellbeing related activities organized by Building Owner.





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