

Washroom Capacity Assessment

Alternative Compliance Submission (Scottish Building Standards)

Project / Site	Zedwell Capsule Hotel New Town Edinburgh
Client / Operator	Criterion Hospitality
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1. Executive Summary

This report assesses whether shared washroom provision is sufficient for observed operations and remains sufficient under near-full and full-occupancy stress tests, as part of an Alternative Method of Compliance (AMOC) submission to the City of Edinburgh Council. The analysis draws on a seven-day utilisation survey at Zedwell Piccadilly (16–22 December 2025) to characterise peak-demand behaviour for the Zedwell capsule operating model.

The survey records half-hourly and hourly “in-use” counts (snapshot observations of fixtures occupied at the time of measurement) alongside hotel occupancy. The data is aggregated across floors to quantify peak-period utilisation and used to extrapolate expected utilisation at higher occupancies.

Key Findings

- **Dataset and scope:** 7 days of hourly snapshot observations across 5 floors and 3 fixture types (showers, sinks, WCs).
- **Available fixtures (survey basis):** 67 showers, 68 sinks, 91 WCs.
- **Benchmark Piccadilly capsules:** 965.
- **Proposed Edinburgh capsules:** 296.
- **Peak period assessed:** 06:00–10:00, aligned to the highest observed demand.
- **Observed occupancy during survey:** 62%–79%
- **Observed peak utilisation** (peak window; snapshot utilisation across all days):

Fixture type	P95 utilisation*	Maximum utilisation
Showers	65%	69%
Sinks	55%	56%
WCs	32%	41%

**P95 represents a “busy but typical peak” level (95% of peak-window snapshots are at or below this utilisation); maximum is the single highest snapshot observed.*

- Extrapolated peak utilisation at higher occupancies (P95 basis) confirms that no fixture type reaches 100% utilisation under the stated assumptions:

Fixture type	85% occupancy	90% occupancy	100% occupancy	Indicative saturation point*
Showers	77%	82%	91%	~110%
Sinks	68%	72%	80%	~125%
WCs	40%	43%	48%	~210%

**Indicative saturation point = modelled occupancy where predicted peak utilisation reaches 100%*

Observed utilisation results relate to the operational benchmark site (Zedwell Piccadilly). The proposed Edinburgh assessment applies the same peak-demand intensities to the planned fixture provision and indicates material headroom at full occupancy, with predicted peak utilisation well below saturation across fixture types.

Based on the survey evidence and assumptions, the benchmark washroom provision at Zedwell Piccadilly is sufficient for the observed operations and, under the stated assumptions, remains sufficient at full occupancy for comparable schemes.

2. Purpose and Regulatory Context

2.1 Purpose

The City of Edinburgh Council has requested empirical evidence that the Zedwell capsule hotel model's shared washroom provisions are sufficient for the occupancy levels experienced in operation and would remain sufficient under 100% occupancy. This report therefore provides a performance-based capacity assessment of washroom fixtures observed during the peak demand period within a week in December, and a corresponding extrapolation to higher occupancies.

2.2 Relevant Scottish Building Standards

This submission addresses Scottish Building Standards Technical Handbook 2024 (Non-Domestic)(April 2024 edition), Section 3 (Environment), Mandatory Standard 3.12: Sanitary facilities. The mandatory standard requires sanitary facilities to be provided for occupants and visitors in a form that allows convenient use and avoids threats to health and safety (Scottish Government, 2024). The supporting guidance to Standard 3.12 states that sanitary facilities should be sufficient in number to prevent queuing, other than in exceptional circumstances (Scottish Government, 2024).

Where prescriptive ratios are referenced in the guidance for residential buildings (for example, where sanitary accommodation is not ensuite), Table 3.6 provides example provision rates (including WCs per persons, wash hand basins per bedroom, and baths/showers per persons). In particular, the guidance notes that, for dormitory sleeping accommodation, “an alternate ratio of 1 wash hand basin per four persons, or part thereof, may be used” (Scottish Government, 2024, Section 3.12.3).

2.3 Alternative Method of Compliance Proposed

Zedwell capsule hotels use a non-standard accommodation model (capsules with shared washrooms), which does not map cleanly to the prescriptive assumptions underpinning typical bedroom-based sanitary ratios. The proposed compliance route is therefore an alternative, performance-based demonstration, using measured washroom utilisation (simultaneous occupancy of fixtures at a given time) to evidence that fixture availability is maintained during peak demand and that queuing beyond exceptional circumstances is unlikely at operational and full occupancies.

Scottish Building Standards are expressed in functional terms and, while the Technical Handbook provides common guidance routes, alternative approaches are permissible where the applicant can evidence to the verifier that the requirements of the applicable standards will be met in the completed building (Scottish Government, 2024).

2.4 Definitions and Key Terms

- **Used (snapshot):** The number of fixtures recorded as ‘in use’ at the time of observation
- **Units:** The total number of fixtures available for use within the scope at the time of observation (i.e., excluding fixtures reported as out of order), consistent with the survey dataset.
- **Utilisation:** $\text{Used} \div \text{Units}$. Example: if 29 of 67 showers are in use at a snapshot, utilisation = $29/67 = 43\%$.
- **Peak window:** The time analysed as the highest-demand period (observed as 06:00–10:00).
- **Saturation (100% utilisation):** All fixtures of a given type are in use simultaneously at a snapshot; at this point, any additional demand would require queuing.

- **P95 (95th percentile):** The P95 utilisation is the peak-window utilisation level that 95% of observed snapshot readings do not exceed. It represents a high but typical peak condition, reducing sensitivity to one-off anomalies while remaining conservative for capacity assessment.

3. Data Description and Assumptions

3.1 Survey Description

The assessment is based on a washroom-usage survey undertaken at Zedwell Piccadilly over seven consecutive days (16 December to 22 December 2025). The survey records “in-use” counts at a mixture of half-hourly and hourly intervals (i.e., a snapshot of the number of fixtures occupied at the observation time) across five floors and three fixture types (showers, sinks and WCs).

Each observation is linked to hotel occupancy at the time of measurement via the recorded occupied rooms, total rooms and resulting occupancy rate. For Zedwell capsule hotels, the occupancy fields (‘occupied rooms’ and ‘total rooms’) are treated as the occupied and total capsules for the purposes of this assessment. For reporting consistency, the analysis uses a defined peak window (06:00–10:00). For consistency, the analysis is standardised to hourly intervals. Where half-hourly observations were recorded, values were consolidated to an hourly basis by taking the higher “in-use” count observed within the hour for each fixture type. Definitions of “Used”, “Units”, “Utilisation”, “Saturation” and “P95” are set out in Section 2.4.

Reported out-of-order fixtures during the survey were: Level 5 – 6 showers and 4 WCs; Level 2 – 5 showers.

3.2 Assumptions

The assessment and extrapolation to higher occupancies are based on the following assumptions:

- **Snapshot interpretation:** Each data point is treated as a snapshot of simultaneous fixture occupancy (concurrent demand), not cumulative throughput (total number of users per hour).
- **Peak-window representativeness:** The 06:00–10:00 window is assumed to represent the period of highest demand and is therefore the appropriate basis for a conservative capacity check.
- **Occupancy alignment:** The occupancy fields (occupied rooms, total rooms, occupancy rate) are assumed to correspond to the same operational period as the washroom observations and to be sufficiently accurate for scaling.
- **Scaling approach:** Peak demand intensity derived from the survey is assumed to scale proportionally with occupied rooms when testing 85%, 90% and 100% occupancy scenarios (i.e. demand per occupied room is treated as stable for the purpose of this stress test).
- **Fixture availability basis:** Utilisation calculations use the “Units” values recorded in the survey dataset, which represent fixtures available for use at the time of observation; any fixtures reported as out of order during the survey period are excluded from these availability counts. Unless stated otherwise, ‘Units’ in this report refers to fixtures available for use during the survey (i.e., excluding out-of-order fixtures), consistent with the dataset.

3.3 Limitations

The following limitations should be considered when interpreting results:

- **Snapshots vs queuing:** Snapshot utilisation indicates concurrent capacity pressure but does not directly measure queue length or waiting time. A conclusion of “sufficient” is therefore framed in terms of avoiding sustained saturation rather than guaranteeing zero waiting.
- **Survey duration and seasonality:** The dataset covers one week and may not capture longer-term variation (e.g. events, seasonality, atypical guest mix, operational changes).
- **Observed occupancy range:** The survey captures an observed occupancy range below full occupancy; extrapolation to 100% is therefore model-based and relies on the stated scaling assumption.
- **Out-of-order fixtures:** Reported out-of-order fixtures (L5: 6 showers, 4 WCs; L2: 5 showers) reduced effective capacity during parts of the survey. As Units records available fixtures at the time of observation, the resulting utilisation is conservative relative to fully operational conditions (i.e., utilisation would be lower if all fixtures were available).
- **Transferability:** The conclusions are directly supported for the surveyed site and are most transferable to future schemes only where layout, guest profile and operational practices are broadly comparable.
- **Scheme application:** Edinburgh predictions assume comparable guest profile and operating practices to the benchmark site; differences may shift peak intensity.

4. Results - Observed Utilisation

This section summarises observed washroom utilisation at the operational benchmark site (Zedwell Piccadilly) on a snapshot basis (i.e., the number of fixtures concurrently in use at the observation time), aggregated across the survey period 16–22 December 2025 and reported at hourly resolution.

4.1 Observed Concurrent Use vs Capacity by Time of Day (All Floors)

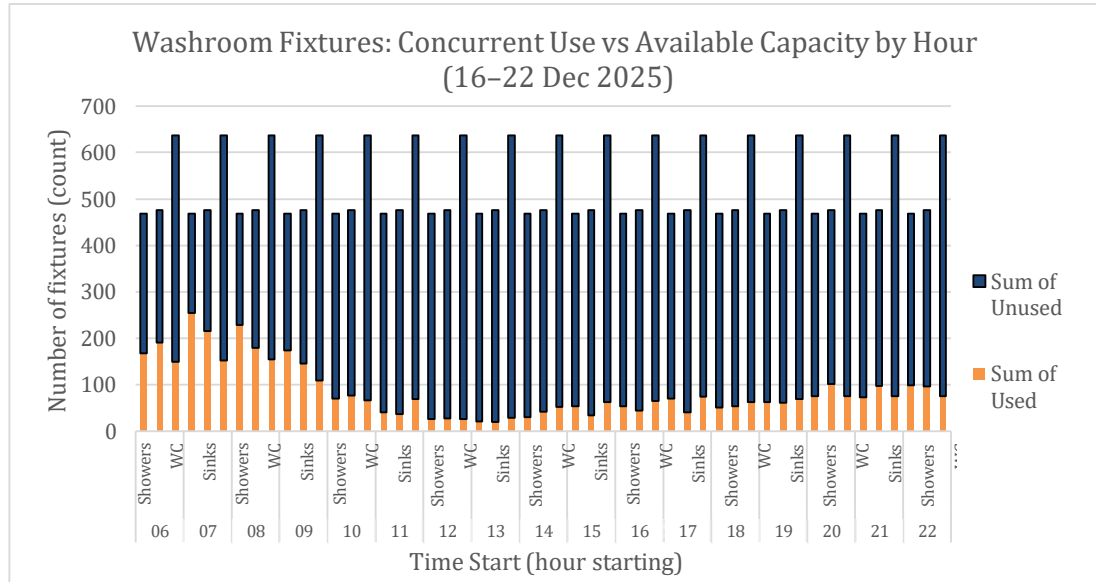


Figure 1: Concurrent Use and Available Capacity of Washroom Fixtures by Hour (16–22 Dec 2025)

Figure 1 presents the observed concurrent use and available capacity (Used vs Unused) for each fixture type by hour, aggregated across all survey days. This illustrates (i) the period of highest demand and (ii) the extent of spare capacity during observed operations.

Based on the aggregated profiles, the peak demand period is concentrated in the morning, consistent with selection of the 06:00–10:00 peak window used for the capacity stress test in Section 5.

4.2 Observed Peak-Window Utilisation (All Floors)

Observed peak-window utilisation (06:00–10:00) was summarised using P95 and the maximum observed snapshot (sensitivity check).

Fixture type	P95 utilisation	Maximum utilisation
Showers	65%	69%
Sinks	55%	56%
WCs	32%	41%

Table 1: Observed peak utilisation (peak window)

The observed results indicate that, when aggregated across all floors, no fixture type approached saturation in the peak window. Showers exhibit the highest concurrent utilisation and therefore represent the controlling fixture type for capacity assurance.

4.3 Floor-Level Distribution and High-Utilisation Events (Diagnostic)

To test whether building-wide results mask localised pressure, the analysis also reviews floor-level utilisation during the peak window. Floor-level results are used as a diagnostic to identify whether short-duration high utilisation occurs on particular floors even where whole-hotel utilisation remains below saturation.

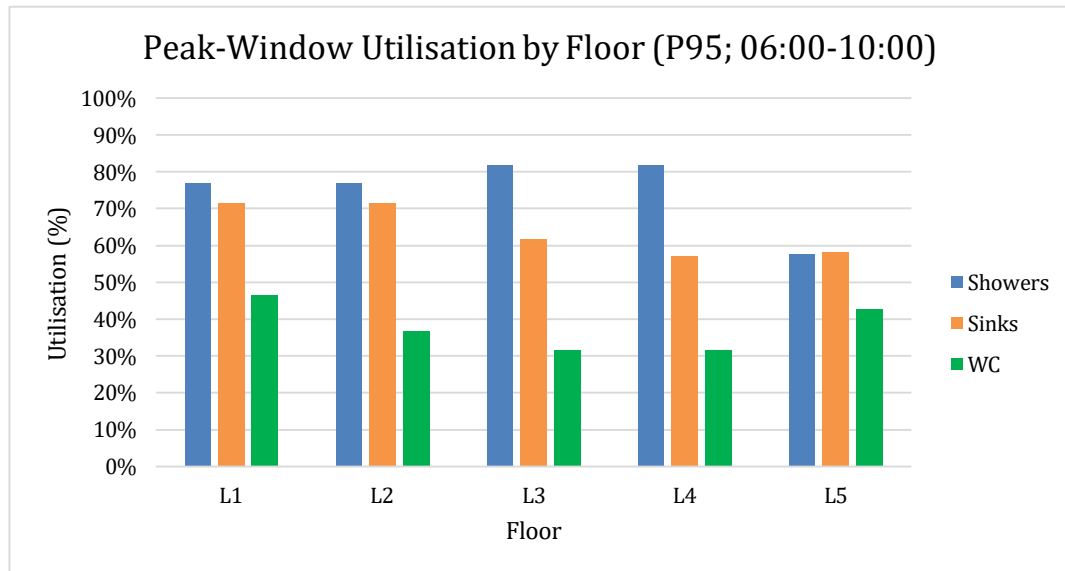


Figure 2: Peak washroom utilisation by fixture type and floor (P95; 06:00–10:00)

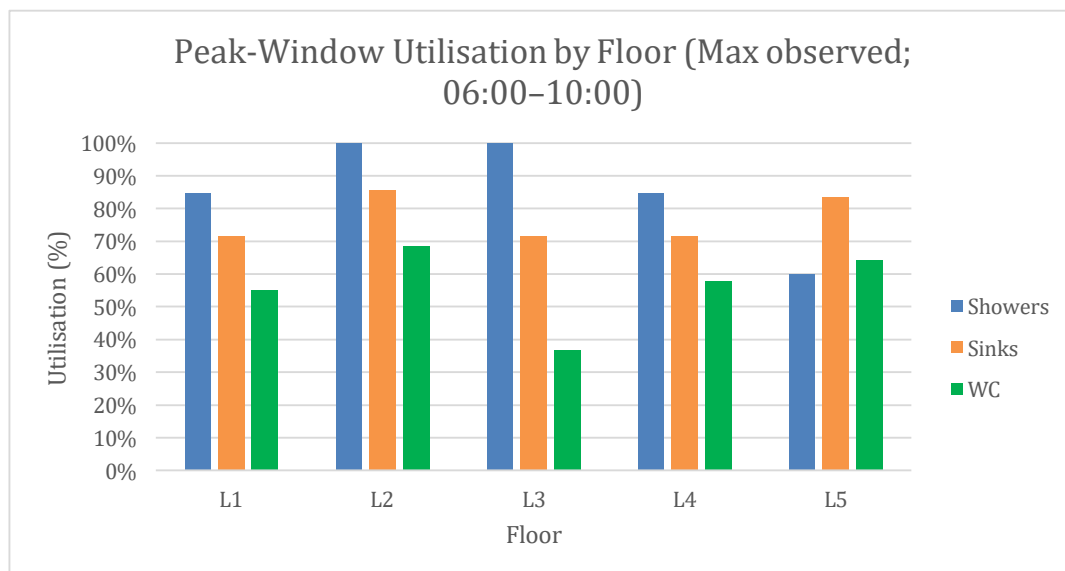


Figure 3: Peak-window utilisation by floor (maximum observed snapshot; 06:00–10:00)

Figures 2 and 3 provide a floor-level diagnostic to confirm that the whole-hotel assessment is not masking systematic saturation within the 06:00–10:00 peak window.

Figure 2 (P95) summarises a high but typical peak condition and indicates that showers exhibit the highest utilisation across floors, with sinks and WCs materially lower. Figure 3 (maximum observed snapshot) highlights exceptional pinch-points, including two isolated shower observations at 100% utilisation on L2 and L3; sinks and WCs do not reach saturation.

Taken together, these results indicate that full-utilisation conditions are localised and infrequent, rather than persistent or building-wide, supporting the conclusion that queuing beyond exceptional circumstances is unlikely under the stated assumptions.

Floor	Showers	Sinks	WCs
L1	21%	21%	0%
L2	18%	11%	4%
L3	25%	7%	0%
L4	25%	4%	0%
L5	0%	4%	4%

Table 2: High-utilisation frequency ($\geq 90\%$) by floor and fixture (peak window)

Table 2 summarises the frequency of high-utilisation events ($\geq 90\%$ utilisation) during the 06:00–10:00 peak window, by floor and fixture type. High-utilisation conditions are concentrated in showers on Levels 1–4 (approximately 18%–25% of peak-window snapshots), whereas sinks show lower high-utilisation frequency (range 4%–21%) and WCs are near-zero on most floors (generally 0%, with small non-zero values on selected levels).

Overall, the heatmap indicates that near-saturation conditions are intermittent and localised, rather than persistent across the building or across all fixture types, supporting the conclusion that peak-period pressure is primarily driven by showers and does not indicate systematic capacity shortfall under the stated assumptions.

5. Peak-Demand Stress Test and Scheme Application

5.1 Method

The purpose of this model is to test whether the observed peak-demand behaviour (Section 4) would remain within available washroom capacity at higher occupancies, including a 100% occupancy stress test.

The scaling approach uses demand per occupied room as the intensity metric: peak concurrent demand observed in the survey is normalised by the number of occupied rooms at the time of measurement, then scaled up to the target occupancy levels by multiplying by the corresponding occupied room count (see Appendix B). This provides a transparent way to extrapolate beyond the survey's operating range while keeping the model directly anchored to observed utilisation.

The model tests three design occupancies: 85%, 90% and 100%. These represent near-full operation and a conservative full-occupancy stress test.

P95 is used as the primary planning statistic because it represents a “busy but typical” peak condition and avoids over-reliance on a single maximum snapshot.

5.2 Results

The occupancy stress test indicates that, under the stated assumptions, no fixture type is predicted to reach saturation at 100% occupancy, and showers remain the controlling fixture type (highest predicted utilisation).

Fixture Type	Util@85 (P95)	Util@90 (P95)	Util@100 (P95)	MaxOccBefore100 %
Showers	77%	82%	91%	110%
Sinks	68%	72%	80%	125%
WCs	40%	43%	48%	210%

Table 3: Predicted peak-window utilisation at 85%, 90% and 100% occupancy, and indicative saturation occupancy (by fixture type)

Table 3 summarises predicted peak-window utilisation (P95 basis) at 85%, 90% and 100% occupancy for each fixture type, together with the occupancy at which saturation (100% utilisation) would occur under the same scaling approach. The results show that showers are the controlling fixture type (77% at 85%, 82% at 90%, 91% at 100%), followed by sinks (68%, 72%, 80%), while WCs remain materially lower (40%, 43%, 48%). Importantly, no fixture type is predicted to reach saturation at 100% occupancy, and the implied saturation points occur above full occupancy.

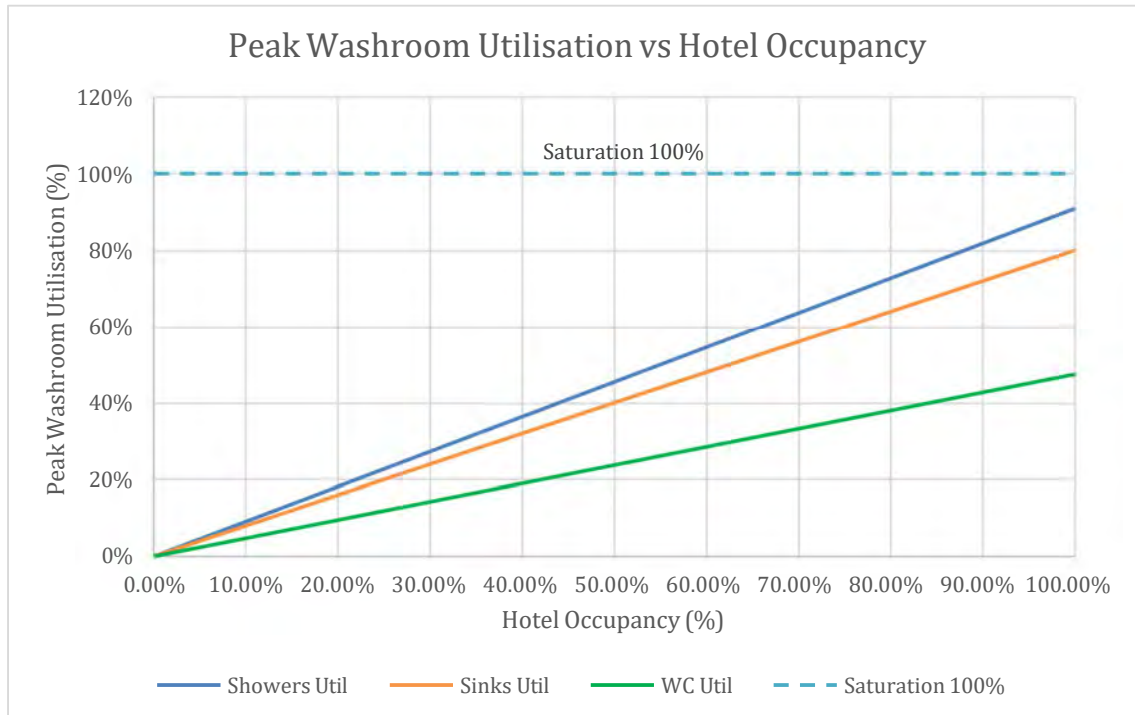


Figure 4: Predicted peak utilisation versus occupancy (by fixture type), with saturation threshold

Figure 4 visualises the same stress-test by plotting predicted peak washroom utilisation versus hotel occupancy, with the dotted line indicating the 100% saturation threshold. The chart shows a linear increase in utilisation with occupancy (consistent with the scaling approach), and it provides a clear visual confirmation that none of the fixture types reach saturation at 100% occupancy, with showers remaining closest to the threshold throughout. This supports the conclusion that, on a whole-hotel basis and subject to the stated assumptions, the washroom provision remains below saturation up to and including full occupancy, with showers representing the primary peak-capacity constraint. The following subsection applies the same benchmark peak-demand intensities to the proposed Edinburgh fixture schedule to provide a scheme-specific capacity check.

5.3 Application to Proposed Edinburgh Provision

Fixture Type	Util@85 (P95)	Util@90 (P95)	Util@100 (P95)	MaxOccBefore100%
Showers	27%	28%	31%	321%
Sinks	21%	22%	24%	413%
WCs	33%	35%	39%	256%

Table 4: Predicted peak-window utilisation for proposed Edinburgh provision (P95 basis) and indicative saturation occupancy (by fixture type)

To test the proposed Edinburgh washroom provision against the same peak-demand benchmark, the model applies the Piccadilly peak demand-per-occupied-room intensities (P95; 06:00–10:00) to the planned Edinburgh fixture counts. This provides a scheme-specific check of whether the proposed fixtures remain below saturation across the occupancy range, subject to the same assumptions and limitations set out in Section 3 (including transferability).

The proposed Edinburgh scheme comprises 296 capsules; for this check, 100% occupancy is treated as 296 occupied capsules. Based on the planned provision (60 showers, 69 sinks and 34 WCs), the modelled peak utilisation at 100% occupancy is approximately 31% for showers, 24% for sinks, and 39% for WCs (Table 4). The implied saturation occupancies are materially above full occupancy (~321% for showers, ~413% for sinks, and ~256% for WCs), indicating substantial capacity headroom under the stated assumptions. Under the proposed Edinburgh fixture schedule, WCs become the highest-utilised fixture type at 100% occupancy (39%); however, all fixture types remain well below saturation.

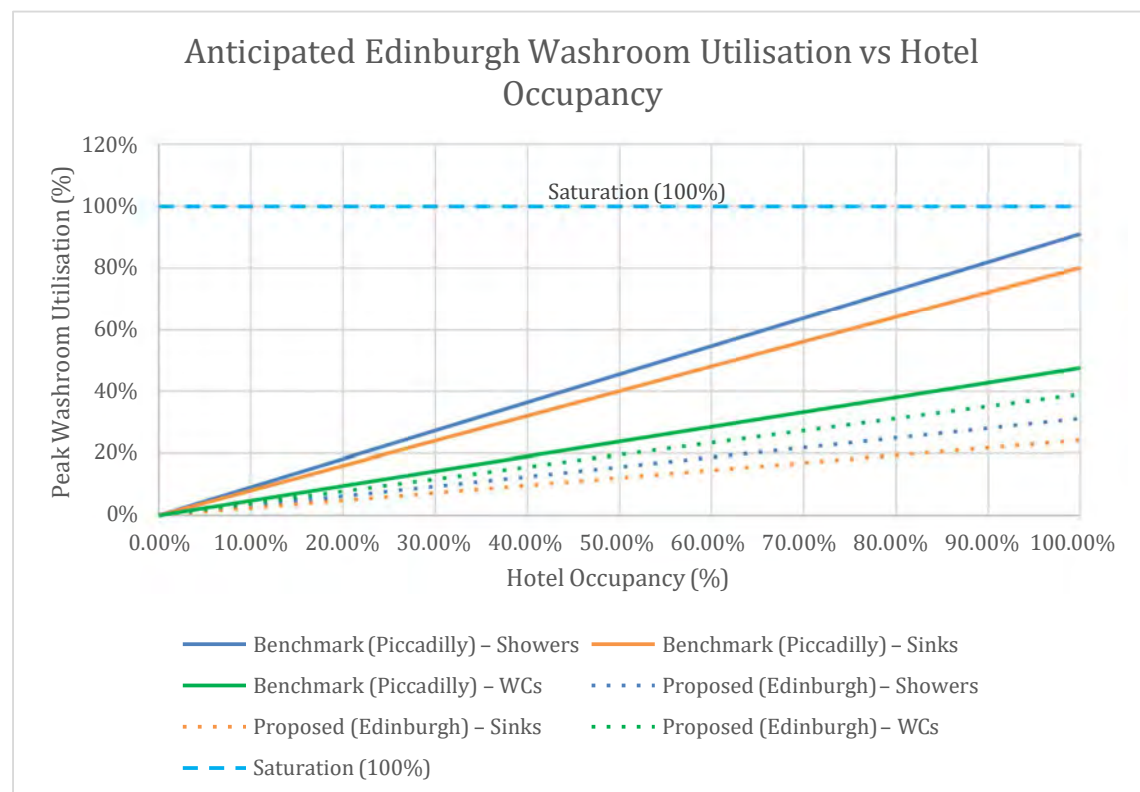


Figure 5: Anticipated Edinburgh washroom utilisation versus occupancy (P95 basis), compared to benchmark

Figure 5 plots the predicted peak utilisation versus occupancy for both the operational benchmark (Piccadilly) and the proposed Edinburgh provision. The comparison illustrates that the Edinburgh planned fixture schedule would operate at a materially lower utilisation level at any given occupancy than the benchmark case and remains well below the 100% saturation threshold throughout the 0–100% occupancy range.

6. Conclusion

Based on the seven-day utilisation survey at Zedwell Piccadilly (16–22 December 2025), whole-hotel peak-period (06:00–10:00) utilisation remains materially below saturation across all fixture types. Showers exhibit the highest concurrent utilisation and therefore represent the controlling fixture type, while sinks and WCs remain substantially lower. Floor-level diagnostics show occasional localised shower pinch-points (including isolated saturation snapshots) but these are intermittent rather than persistent or building-wide.

Applying the peak-demand scaling approach set out in Section 3 to stress-test higher occupancies indicates that, on a P95 peak-window basis, no fixture type reaches saturation at 100% occupancy (Figure 4), with showers remaining closest to the threshold. Accordingly, and subject to the limitations set out in Section 3.3 (notably snapshot-based measurement and extrapolation beyond the observed occupancy range), the evidence supports the proposed performance-based AMOC route that sanitary provision is sufficient and queuing beyond exceptional circumstances is unlikely for schemes of comparable layout and operating profile. On this basis, the proposed Edinburgh washroom fixture schedule is predicted to remain well below saturation at full occupancy (Figure 5), providing additional scheme-specific comfort alongside the operational benchmark evidence.

Appendix A: Data tables

Label (Pavilion)	Value
PeakStart	06:00:00
PeakEnd	10:00:00
Percentile	95.00%
Occ_85	85.00%
Occ_90	90.00%
Occ_100	100.00%
Total Rooms	965.00
MinObsOccRate	0.62
MaxObsOccRate	0.79
HighPressureThreshold	0.90

Pavilion Fixture Type	DemandPerOccRoom (P95)	DemandPerOccRoom (Max)
Showers	0.063	0.066
Sinks	0.056	0.059
WCs	0.045	0.049

Pavilion Fixture Type	All Floors Units
Showers	67
Sinks	68
WCs	91

Edinburgh Fixture Type	All Floors Units
Showers	60
Sinks	69
WCs	34

OccRate	Showers Util	Sinks Util	WCs Util
0	0%	0%	0%
0.1	9%	8%	5%
0.2	18%	16%	10%
0.3	27%	24%	14%
0.4	36%	32%	19%
0.5	46%	40%	24%
0.6	55%	48%	29%
0.7	64%	56%	33%
0.8	73%	64%	38%

0.9	82%	72%	43%
1	91%	80%	48%

Appendix B: Calculation Logic and Formulas

Appendix B demonstrates how Section 5 results are calculated in the Council model, using the P95 peak-window demand-per-occupied-room approach described in Section 3 and applied to the utilisation evidence in Section 4.

B2. Inputs used in the Council model (Whole-Hotel)

The following values are used to generate Table 3 and Figure 4:

- Total rooms: 965
- Units (available fixtures during survey): Showers 67; Sinks 68; WCs 91
- P95 demand per occupied room (peak window 06:00–10:00):
 - o Showers: 0.063
 - o Sinks: 0.056
 - o WCs: 0.045

B3. Step-by-step calculation (Showers)

Step 1 — Convert to target occupied rooms

For a target occupancy, the model converts occupancy to “occupied rooms”:

- **Occupied rooms at target occupancy = Total rooms × Target occupancy**

Examples:

- At 85% occupancy: $965 \times 0.85 = 820.25$ occupied rooms
- At 100% occupancy: $965 \times 1.00 = 965.00$ occupied rooms

Step 2 — Predict peak concurrent use at that occupancy (P95 basis)

- **Predicted fixtures in use (P95) = P95 demand-per-occupied-room × occupied rooms**

For Showers (P95 demand-per-occupied-room = 0.063):

- At 85%: $0.063 \times 820.25 = 51.68$ showers in use
- At 100%: $0.063 \times 965.00 = 60.80$ showers in use

Step 3 — Convert to utilisation (%) against available capacity

- **Utilisation (P95) = Predicted fixtures in use ÷ Units**

Units (showers) = 67, so:

- At 85%: $51.68 \div 67 = 77.1\% \Rightarrow 77\%$
- At 100%: $60.80 \div 67 = 90.7\% \Rightarrow 91\%$

These match Table 2 for showers (77%, 91%). These match Table 3 for showers (77%, 91%). The same steps are applied for the 90% occupancy case and for sinks and WCs; results are summarised in Table 3.

Appendix C: References

Scottish Government (2024) *Non-domestic Technical Handbook: 2024 April 2024 Edition*. Building Standards Division. Available at: <https://www.gov.scot/publications/building-standards-technical-handbook-april-2024-non-domestic/> (Accessed: 15/01/2026).