

Summary

This type test report documents the results of Class 345 cab & saloon in-tunnel noise tests, carried out on the nights of 8th and 9th of April 2019.

All planned tests have been successfully completed, resulting in a PASS. This is a redacted version of the full report "Q234-BMB-R1-RGN-CR001-51354" with Category III Assurance Acceptance granted on 6/3/2019.

1 Results

Tests were completed at the maximum operational speed in the tunnel, within a tolerance of 5% as permitted in ISO 3095 and ISO 3381. That is 100 km/h +/- 5% i.e. 95 km/h to 105 km/h). The noise data used from these recordings was selected using the following process:

- i. Identify sections where 100 km/h was achieved for more than 20s. This process highlighted five segments at the locations:
 - a. Straight section between Paddington and Bond Street
 - b. Stepney Green Junction
 - c. Victoria Dock
 - d. Near Woolwich
 - e. Plumstead
- ii. Assess these sections for rail squeal or other acoustic features not consistent with normal track. In the absence of any rail roughness data, the quietest section is expected to represent the best track section, and most likely to adhere to the rail roughness requirements in ISO 3095 [5].
- iii. Check the trace line diagrams to ensure the selected track segment is over Standard Track Slab form.
- iv. Compute $L_{Aeq, 20s}$ for the chosen segment

The track between Canary Wharf and Custom House, marked Victoria Dock (14,757m from Paddington) was finally chosen to represent the best segment for noise and repeatability.

Three passes were completed for each test position, checked for repeatability and arithmetically averaged. The stationary noise contribution, including HVAC in full cooling, was then added to the dynamic result.

A summary of the worst-case (highest) sound pressure levels for each type of measurement location is given below in Table 1, rounded to the nearest whole decibel as per the test specification.

Full 3rd Octave data has been reviewed in accordance with ISO 1996-2 [6] to check for tonality. No tonality was identified for these saloon interior tests.

During the tests, no drumming or rattling or squeaking was observed from the interior fixtures and fittings. The interior design is reviewed during the project development phase to ensure sufficient bracing, stiffening and damping is applied to panels and fixtures to minimise the risk of rattles and squeaks.

Table 1 – Summary of test results

Microphone Location (Worst-case result)	Measured Noise Level $L_{pAeq,20s}$ (dB)			
	HVAC Off	HVAC On (Added post test - Full Cooling mode)	TTS Requirement (L_{pAeq} dB)	Pass/Fail
DMS – Seated area	74	74	76	Pass
DMS – Vestibule	76	76	78	Pass
DMS – Gangway	78	78	78	Pass
PMS – Seated area	74	74	76	Pass
PMS – Vestibule	77	77	78	Pass
PMS – Gangway	78	78	78	Pass
MS1 – Seated area	74	74	76	Pass
MS1 – Vestibule	76	76	78	Pass
MS1 – Gangway	78	78	78	Pass
TS(W) – Seated area	75	75	76	Pass
TS(W) – Vestibule	76	76	78	Pass
TS(W) – Gangway	78	78	78	Pass
Cab	73	73	78	Pass

2 Conclusions

The cab & saloon in-tunnel dynamic noise for CL345 has been measured and assessed against the mandatory and customer requirements for cab, saloon seating, vestibule and gangway locations.

- The cab is compliant with the requirement limit of 80 dB(A) with a margin of 5 dB.
- Saloon seated areas are compliant with the requirement limit of 76 dB(A) with a margin of at least 1 dB.
- Vestibule areas are compliant with the requirement limit of 78 dB(A) with a margin of at least 1 dB.
- Inter-car gangways are compliant with the requirement limit of 78 dB(A).