

F.AO. Cormac McGaughey
Design Manager
BAM Construction Ltd

Dear Cormac,

Further to our site visit on 21st-22nd July 2014 to carry out pre-completion acoustic testing at Netley Street Primary School, please find below HRS comments regarding the non-compliances reported in HRS acoustic test report ref. 115451-AC-4v1.

Reverberation Time

The test results show that the reverberation times (in terms of the average mid-frequency, T_{mf}) measured in PR-021 Classroom and PR-018 Classroom were 0.61 and 0.62 seconds respectively; i.e. only marginally exceeding the primary school classroom reverberation time target of <0.6 seconds stated in Building Bulletin 93: Acoustic Design of Schools (BB93). The measured exceedance above the 0.6s criterion is in the order of 0.02 seconds; this margin would be subjectively imperceptible. It should also be noted that in a typical teaching scenario in fully furnished occupied conditions, the additional sound absorption and diffusion provided by tables, chairs, books and all of the typical teaching paraphernalia would result in a lower reverberation time than that measured and would meet the BB93 target under these conditions (NB Testing rooms under furnished conditions is an approach recognised in the recently published updated version of BB93, December 2014 which supersedes the 1993 edition). Based on the above, it can reasonably be concluded that the reverberation times within rooms are of suitable magnitude with regard to the objectives of BB93 and unlikely to have an adverse effect on teaching activity or speech intelligibility. If remedial work to achieve the BB93 is considered, then an area of acoustic absorption panels fixed to walls can be considered, however this may compromise the available teaching display space and should be discussed with the school in the first instance.

Airborne Sound Insulation

The test results for airborne sound insulation (HRS test report ref 115451-AC-4v1) show 4 non-compliances with BB93 criteria for walls separating teaching spaces PR-018 to PR-021. (Walls and floors tested between other rooms comfortably achieved BB93 requirements):

PR-018 Classroom to PR-020 Quiet Room	39dB $D_{nT,w}$
PR-021 Classroom to PR-019 Quiet Room	41dB $D_{nT,w}$
PR-014 Group Room to PR-016 Group Room	38dB $D_{nT,w}$
PR-020 Quiet Room to PR-019 Quiet Room	36dB $D_{nT,w}$

It was noted subjectively on site that sound transmission to the Quiet/Group Rooms was flanking via the ceiling, potentially via mechanical service penetrations and/or via the wall head. From observation of the test results, and based on our current knowledge of the partition constructions, the sound insulation performance at higher frequencies (generally >800Hz) is less than would normally be expected. This would indicate that



there are some gaps/openings or other air leakage paths that are facilitating sound transfer between rooms¹ and thus limiting the sound insulation performance and this is potentially attributable to common ventilation ducting between rooms or weaknesses at the head of the wall. Further investigation of these issues was limited as the ceiling void was not easily accessible to enable inspection.

Where tests have been carried out between Classrooms and Quiet Rooms, the level difference measured is in the order of 4-6dB below the BB93 criterion of $\geq 45\text{dB } D_{nT,w}$. Whilst acknowledging that the results fall below the desired BB93 target, we have been asked to comment on the practical implication of this. Given that noise levels in a typical 'busy' classroom are in the order of $70\text{dB } L_{Aeq}$, then assuming the lowest measured sound insulation of $39\text{dB } D_{nT,w}$ between a classroom and group/quiet room, the transmitted noise level to the group/quiet room would be in the order of $31\text{dB } L_{Aeq}$. The measured indoor ambient noise level in group/quiet rooms is around $29\text{dB } L_{Aeq}$ and therefore the transmitted classroom noise, whilst faintly audible, is not significantly greater than the underlying noise level in the room and therefore may not be considered particularly disturbing. In addition, the indoor ambient noise levels in this scenario are still expected to be below the BB93 upper limit of $35\text{dB } L_{Aeq}$ for these rooms.

Further to the above, it should also be noted that the Quiet Rooms are linked directly to their associated classrooms via a door and vision panel and would be expected to be mostly in use whilst typical classroom activities in the associated classrooms are taking place (e.g. PR-020 and PR-021). In this scenario the dominant sound breaking into in a Quiet Room would be via the door/window/partition from its' associated classroom activity, and this would likely mask any noise transmitting from another classroom via the separating wall.

The level differences measured between Group Rooms and between Quiet Rooms as reported are in the order 7-9dB below the BB93 criterion of $\geq 45\text{dB } D_{nT,w}$, respectively. We note that the WSP Stage 2 Acoustic Design Report does not explicitly state sound insulation between these rooms. The activity noise levels in Quiet Rooms could be expected to be low. The BB93 criteria for sound insulation between rooms with *Activity noise* 'Low' in the source room and *noise tolerance* 'Low' in the receive room is $40\text{dB } D_{nT,w}$ and this is arguably more appropriate than the criterion of $45\text{dB } D_{nT,w}$. This results in a measured $D_{nT,w}$ of only 4dB below the BB93 criteria in the case of Quiet Rooms. Again, as mentioned above, since the Quiet Rooms are linked directly to their associated classrooms via a door and vision panel, and would only be expected to be in use whilst typical teaching activities in the associated classrooms are taking place, any noise from the classroom via the separating wall would be masked by more dominant noise transmitting from the associated classroom via the door / vision panel.

Based on the above, the effectiveness of any remedial work to improve sound insulation from Classrooms to Quiet / Group Rooms and between Quiet/Group Rooms may be limited. Further, the Quiet / Group rooms are less critical in terms of speech intelligibility than for a large classroom where the teacher needs to be suitably intelligible to a greater number students (and vice versa) across a larger space.



As mentioned, it was noted on site that sound transmission to the Quiet/Group Rooms was primarily flanking via the ceiling, potentially via mechanical service penetrations and/or via the wall head. If remedial works are considered, further diagnostic testing would be required, including a review of wall construction details. As also mentioned above, the practical effectiveness of any such remedial works are likely limited due to the existing layout of the Quiet/Group Rooms in relation to their associated classrooms and the classrooms separated via the wall, and the likely source noise levels affecting those rooms.

Please feel free to contact us if you have any queries regarding any of the above.

Yours Sincerely,

James Blakeley

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