

# Proceedings of the Institute of Acoustics

## WAREHOUSE STUDIO ACOUSTICS

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In 1987 the BBC decided for totally differing reasons to convert two warehouses, one at Elstree and the other at Liverpool, into studio facilities.

The first of these at Elstree was originally a paint store, currently derelict, but was considered ideal by the programme-makers for conversion into a permanent indoor set for the "Allo Allo" comedy series. This requirement was brought about by the need to produce at least 26 episodes over the winter of 1987/88, on the basis of recording one episode a week, and the previous open-air set in Norfolk was considered to be unsuitable for winter filming.

At this point the BBC Architectural and Civil Engineering Department were called in and presented with the task of making the area suitable for a permanent set with all the necessary lighting, ventilation and acoustic treatment, but with only four months to complete the venture.

Structural and acoustic surveys were carried out in July when it was found that the building structure was unsuitable for supporting anything substantial from it as the walls, albeit 225 mm thick, stopped at the eaves level with the gable end walls above this level and the pitched roof only being covered with corrugated cement sheets. In addition to this the derelict warehouse was adjacent to a large staff car park with low flying light aircraft passing over at regular intervals.

The internal floor area of the warehouse is 34.08 m x 27.8 m with a height of 5.2 m to the eaves and 8.2 m to the ridge. Approx 6350 m<sup>3</sup> volume with an average reverberation time of 3.31 seconds over the range 250 Hz to 4000 Hz.

The BBC engineers decided that the best solution to the high loading plus long spans required was to opt for one of the structures designed for the North Sea oil rigs for protection against weather. This provided a lightweight structure which was erected in under two weeks.

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A 50 mm thick acoustic blanket, made up from 105 kg/m<sup>3</sup> density mineral wool, reinforced with chicken wire and covered both sides with glass fibre fabric, was fixed to the framework. This treatment proved to be extremely efficient mainly due to the vertical scaffolding structure being a metre thick with a 1.2m fire track being required all round the perimeter of the studio, thus providing a 2.2 m airspace behind the blanket. The blanket was also draped on wires on top of the roof trusses. This produced a measured reverberation time of around 0.5 seconds in the empty studio shell which livened up when the "market square" appeared. This set helped marginally to reduce the noise levels from external sources but even so it was necessary to take a number of programme retakes as car or aircraft noise became audible (fortunately not too often during normal working hours).

Despite the shortcomings of the studio from a noise/sound insulation point of view the sound supervisor pronounced the area as extremely satisfactory for this type of light entertainment programme.

The second studio at Liverpool is situated in one of the former dockside warehouses at the Brunswick Business Park where the BBC leased two warehouse units from the Mersyside Development Corporation. The BBC allocated 557 m<sup>2</sup> of the total 1997 m<sup>2</sup> floor area to a permanent TV Studio with flexible seating for an audience of 150 and the remainder for dressing rooms, workshops, make-up etc and scenery handling areas.

But the main feature is that apart from some rigging, most technical facilities, like scanners and VT equipment, are driven into the warehouse adjacent to the studio and used to provide control room facilities for the studio.

This warehouse studio was constructed in a far more substantial manner than the Elstree studio with solid masonry walls all the way up to the pitched roof. The roof itself had been replaced with a sandwich aluminium decking roof with the fibreglass infill providing sufficient damping to prevent rain noise being heard in the studio. The old warehouse timber roof trusses were originally designed to carry large loads and were currently underloaded with the lightweight roof. Therefore the local authority engineers were only too happy to see additional loads applied to the trusses in the form of lights, acoustic treatment etc.

External noise sources were far quieter than at Elstree with road traffic noise screened by internal storage areas leaving only noises from the waterfront as the one problem area.

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Again the 50 mm acoustic blanket was used, supported off a vertical scaffolding with a significant airspace of at least 1 m behind the blanket and also from the underside of the roof trusses supporting the pitched roof. Here the blanket was supported on wires with a maximum airspace behind the blanket of 7 m to the underside of the ridge. The blanket in front of the walls is protected from damage by a cyclorama spaced approximately 1 metre in front of it.

The structural dimensions of the studio area are 22.45 m x 27.57 m with a height varying from 6.5 m to 13.5 m giving an approximate volume of 6300 m<sup>3</sup>. The measured average reverberation time with audience seating and a studio set is 0.4 seconds over the frequency range 250 Hz to 4000 Hz.

## CONCLUSIONS

Warehouse studios can never be designed to the same standard as traditional TV studios or be used for the same variety of programmes. However they do have a place in the broadcasting chain for light entertainment or audience shows where the background noise levels are not so critical.

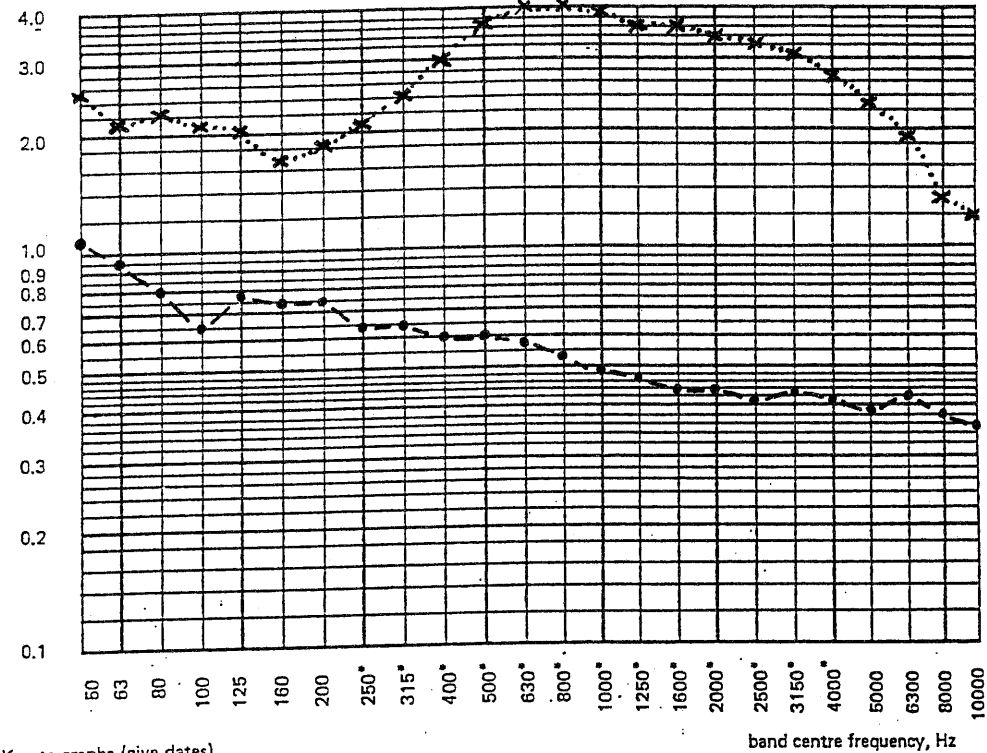
Points to remember:

- (i) Choose a site that is away from noise.
- (ii) External roof must be suitably damped to reduce rain noise.
- (iii) The use of an acoustic blanket can reduce the internal reverberation time to an acceptable level provided that a significant airspace is provided behind the blanket.
- (iv) The blanket must be protected from damage.
- (v) The blanket should be covered with a cyclorama where the acoustic treatment is in shot i.e. behind an audience.
- (vi) Programme re-takes must be budgeted for.

WAREHOUSE STUDIO ACOUSTICS

BBC ARCHITECTURAL AND CIVIL ENGINEERING DEPT.

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Key to graphs (give dates)

● — ● 27.9.89 Acoustic blanket installed.

x — x 24.7.87 Prior to treatment being installed.

△ — △

Volume 6980 m<sup>3</sup>

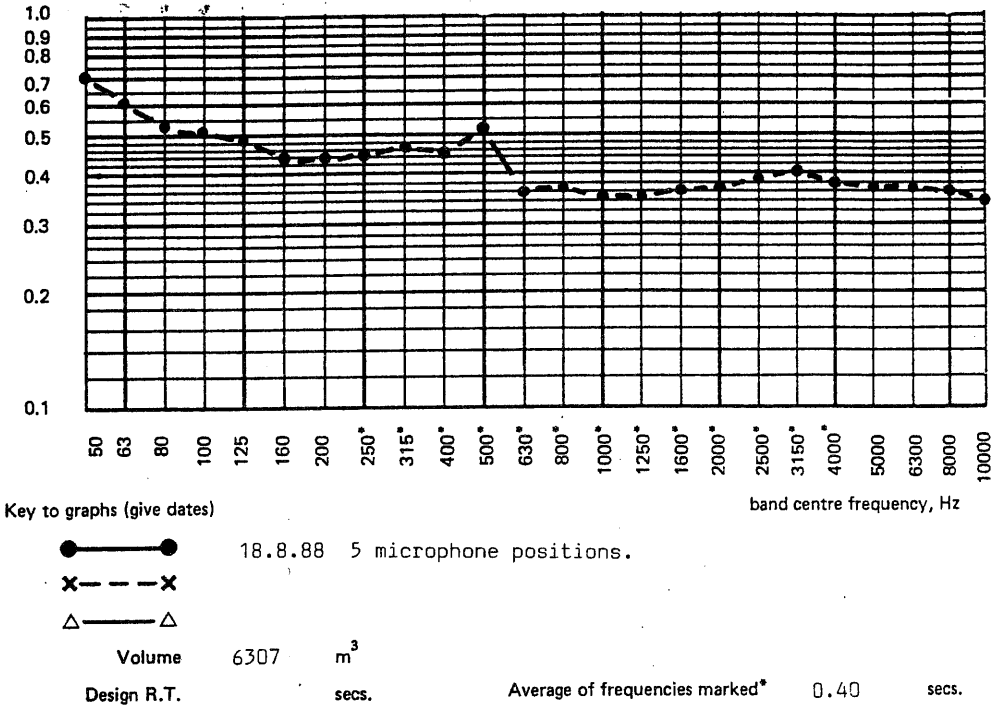
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Average of frequencies marked ●● 0.51

xx 03.31 secs.

ELSTREE. REVERBERATION TIME

WAREHOUSE STUDIO ACOUSTICS



LIVERPOOL. REVERBERATION TIME

