Wembley Indoor Sport Stadium

Acoustic acceptance tests

1 Object

The purpose of the acoustic tests was to assess the efficacy of Monoglass 25 mm acoustic treatment applied to the dome of the Wembley indoor sport stadium located in Johannesburg, Republic of South Africa. The project was undertaken for the Greater Johannesburg Transitional Metropolitan Council.

The 24 000 m^3 stadium, which has a seating capacity of 2 500, was treated acoustically by application of 2 936 m^2 25 mm thickness Monoglass to the entire roof dome surface (2 586 m^2) and to all available side-wall surfaces (350 m^2).

2 Assessment criteria

As explained in Section A, one of the principal acoustic characteristics controlling the suitability of a hall for speech and music, is the reverberation time as a function of frequency. Before installation of acoustic treatment in the Wembley stadium, reverberation times in the mid-frequency range were in excess of 15 s, while the recommended upper limit for this particular multipurpose hall is 2 s.

3 Test method

Reverberation times were measured in accordance with ISO 354.

4 Result

Reverberation times (with 0 % occupancy) measured before and after acoustic treatment of the Wembley stadium, are depicted graphically in Figure C-1. This shows a considerable reduction in reverberation time over the entire frequency range, which has

resulted in a major improvement in speech intelligibility. Before treatment, speech conversation over distances of more than 2 m was very difficult and rather unpleasant. After treatment, even with the hall empty (no audience), conversation over several meters distance may now be conducted without any special effort.

But the hall is by no means perfect yet; reverberation times at low frequencies are still too long and diffusivity is poor.

This, in fact, has been predicted in the initial assessment. It was pointed out in Section A 4 that while the intended treatment of the dome could be expected to drastically reduce reverberation times and greatly improve speech intelligibility, reverberation times at low frequencies would still exceed the recommended upper limits.

It was also predicted in the initial assessment that certain unpleasant effects (flutter echo) due to a lack of diffusivity (caused by the geometry of the hall), would remain. This is particularly notable on the competition floor area directly under the apex of the dome. Elimination of these effects would require installation of low-frequency absorbers and diffusers, which falls outside the scope of the current project.

With the hall fully occupied, reverberation times at low frequencies will be further reduced to the advantage of speech intelligibility, although not sufficiently to eliminate the need for the installation of low-frequency diffusers. Reverberation times expected for the hall after treatment and fully occupied, are shown in Figure C-2.

Installation of a public address system in the Wembley stadium must be planned with great care. The grouping, the physical layout, the directional characteristics, as well as the height and spacing of loudspeakers must be calculated with due consideration of the acoustical characteristics and remaining deficiencies of the hall.

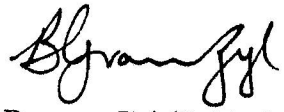

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Figure C-1

Wembley Stadium
(No audience)

Reverberation Times

Measured

Before and After Monoglass 25 mm Dome Treatment

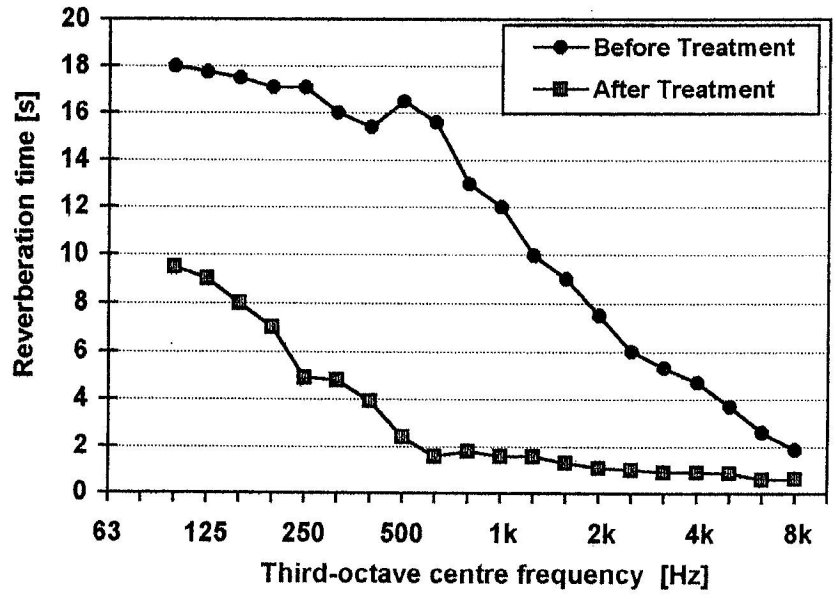

Figure C-2

Wembley Stadium
(100 % occupancy)

Reverberation Times

Measured
In empty hall
Before
Monoglass 25 mm Dome Treatment

and

Expected
For 100 % occupancy
After
Monoglass 25 mm Dome Treatment