ACOUSTIC DESIGN OF THE NEW FORD THEATRE, VANCOUVER

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1.0 INTRODUCTION

The new Ford Theatre, Vancouver, is an 1800 seat venue intended for musical theatre - Broadway shows. The building is being built by Live Entertainment Corporation of Canada, designed by Moshe Safdie and Downs Archambault- project manager Kofman Engineering, and will open in November 1995 with "Show Boat". The auditorium has a dress circle and balcony both of which wrap around the sides. The stage is rectangular with a large proscenium and the orchestra pit is designed for 80 players.

2.0 THEATRE FUNCTION

As a musical theatre it is intended for live music, song and drama with voice and music being of approximately equal importance. All shows will be either reinforced or amplified with a sound system being provided by the show. Consequently a very low background sound level is not necessary because the reinforcement easily allows for adequate signal - to - noise ratio. As voice and music are approximately of equal acoustical importance the reverberation time would be a compromise between the shorter times required for the voice speech intelligibility and the longer times desirable for music. It would also be possible to design for a short reverb time for speech and use electronics to provide the longer reverb times when desired. However, it is the preference of all associated with the venue and the show to use the acoustics of the room to provide the longer reverb time and, so, the design of the auditorium reflects this.

Similarly a house sound system could provide surround sound - lateral reflections, colour etc. However, shows usually do not want to use a house system but would rather provide their own systems: usually stage-mounted speakers right and left, and possibly a central cluster, effects speakers on walls and rear and under-balcony infill. Again the theatre has been designed to use the acoustics of the room as much as possible and consequently reflecting surfaces have been set up to aid voices from on stage and music from the orchestra pit.

Finally, several potential problems were dealt with by the architectural team in a way that not only solved the problem but provided desirable features.

3.0 THEATRE DESIGN

The auditorium is 29m wide at the rear, narrowing at the front to 27m with gently curved side walls. The furthest seat is 27m from the stage apron. The dress circle and balcony both wrap around the sides of the auditorium and are narrow with only 7 rows of seats at the rear and two at the sides. The dress circle rear seats are 6.3m from the balcony edge while the opening is 3.8m deep. The proscenium opening is 9 x 15.3m]. The proscenium opens gradually to the auditorium using two sets of angled reflectors. The reflectors are 3.050 and 2.750m wide respectively and extend to the full height of the proscenium. They are nominally 18 and 21m apart opening out into the room which is 27m wide at the front. Similarly two reflectors are located in the front of the proscenium at the ceiling making a gentle transition between the proscenium arch and the ceiling surface. The stage is 32m wide x 16m deep and is clear to allow complete flexibility in the use of flown and moving sets.

4.0 EXTERIOR NOISE

Exterior noise such as traffic, distant aircraft and even rainfall have been dealt with by providing a double shell construction. The stage house is double wythe concrete block construction while the auditorium side walls are poured concrete. The exit stairwells are outside of this concrete providing a large space between the concrete and exterior cladding. Above the exit stairwells is concrete block with exterior cladding. The roof is metal over insulation and concrete. Extra insulation has been added between the metal and concrete to deal with rainfall impact noise. The ceiling below is suspended providing some additional transmission loss but does contain openings. Lobbies separate the rear of the auditorium from the street while tandem doors separate the auditorium from the lobby.

5.0 REVERBERATION

The deliberately long reverberation time implies less sound absorbing material and more concentrated placement. Consequently sound absorption of the seating and carpet has been somewhat reduced, with upholstered seats and backs, but hard seat back panels and reduced carpet absorption. The ceiling is comprised of panels but lighting openings have been left open to the ceiling plenum. Sound absorbing material has been deliberately placed on the side walls at the rear. The rear side walls are treated with panels with large slots and deep batt insulation covered by open cloth. Soffits have been treated with single layer gypsum board in order to provide more low frequency absorption and spectral balance. Provision has been made in the rear wall for the additional sound panels (if needed for future shows) on well-defined flat surfaces. However, no sound absorption is included in the present design.

6.0 REFLECTIONS AND DIFFUSION

The large proscenium side surfaces incorporate two panel reflectors to direct stage sound from loud speakers and voice more towards centre and rear audience. The panels are each about 3m deep and full height, although openings are provided for lighting. The proscenium arch panel reflectors, also each 3m deep and full width, are placed to direct centre stage voice and orchestra pit sound to the rear orchestra and dress circle seating.

For structural reasons the ceiling is inherently a longitudinal barrel vault. The entire suspended ceiling is comprised of individual panels following the line of the barrel vault. The panels are sloped as reverse splays to direct sound down more to the front to the centre orchestra seating.

All of the above panels have been curved to distribute the reflected sound, to provide multiple reflections at each of the seats and to promote diffusion within the reverberant field. Curving the ceiling panels (about a transverse axis) removes the focus of the barrel vault and diffuses ceiling reflections.

The rear wall follows the natural curve of the seating arranged to face the stage. To avoid the focusing and provide future locations for sound panels the profile has been made saw-toothed. The balcony and dress circle soffits have been given a gentle concave curve, not enough to focus on the seating, but which tends to take rear wall reflections and direct them down to the seating below.

7.0 DESIGN EVOLUTION

The ceiling reflector panels provide an example of how an acoustic difficulty combined with an architectural need evolved into a desirable feature for the venue. The original smooth barrel vault ceiling was seen as a problem for focusing while the architect wished to introduce some texture into the ceiling surface. The structure above is transverse arches. The architect also liked the ideal of downstanding ribs which would tie together architecturally the false columns on the sides. The suggestion of suspended panels allowed the architect to put the panels between the downstanding ribs thus giving texture. Of course, the downstanding ribs where kept short. The panels where then sloped downwards to the rear to provide improved reflections and curved to give more texture and diffuse reflections. To pick up on other aspects of the design the architect wished to make the panels "S" shaped with half of the panel concave. It was possible to accommodate this acoustically by moving the inflection point forward to the quarter point so that the impression of an "S" curve is maintained but the actual amount of concave surface is minimal. Further, the concave surface is almost entirely shadowed regarding sound originating from the stage by the downstanding rib. The use of panels made it easy to provide openings for HVAC diffusers, house and stage lighting and these openings, in turn, are treated as part of the acoustic absorption of the room.

8.0 THE NEW FORD THEATRE

The New Ford Theatre will be an extremely valuable addition to the cultural and entertainment environment in Vancouver. The owners and operators prefer natural acoustics and have worked closely with the acoustic consultant to achieve this goal.