P. A. FACT SHEET NO. 1

SUBJECT:

LARGE AUDITORIUM

SOUTH BEND, INDIANA

Electro-Voice®

PROBLEM

The Morris Civic Auditorium in South Bend, Indiana, is typical of many theaters built in the twenties for movies and vaudeville. Seating capacity is 2,500. The theater is nearly 1/2 block long and the balcony overhangs a large portion of the main floor. (See Figs. 1 & 2.) The interior treatment is ornate, employing plaster designs on the walls and proscenium arch. As a result, the walls and high, domed ceiling are hard; and, because of the ornamental design, acoustical treatment is impossible without a complete modernization of the interior.

In the past fifteen years three attempts have been made to secure satisfactory sound coverage of the main floor and balcony. The initial installation consisted of three velocity microphones placed on floorstands at equal intervals across the stage, a 30-watt amplifier, and one 15" cone speaker in a flat baffle on each side of the stage and raised approximately 10 feet. This system was intended to be used for voice reinforcement, but best coverage was provided by the speakers over the first fifteen rows where it was actually not needed. Any attempt to use higher sound levels to cover the balance of the theater resulted in severe feedback and low frequency reverberation.

The second and third attempts at loudspeaker placement consisted of adding additional 12" cone speakers in baffles along the walls of the auditorium, six to ten feet above the main floor level and balcony floor level. In all 36 loudspeakers were used. However, the low level system which resulted failed to cover the central portion of the main floor and balcony. Feedback and reverberation persisted, except at low sound levels. In addition, the disparity between the true source of sound on the stage and the apparent source (the loudspeakers) caused audience fatigue and dissatisfaction.

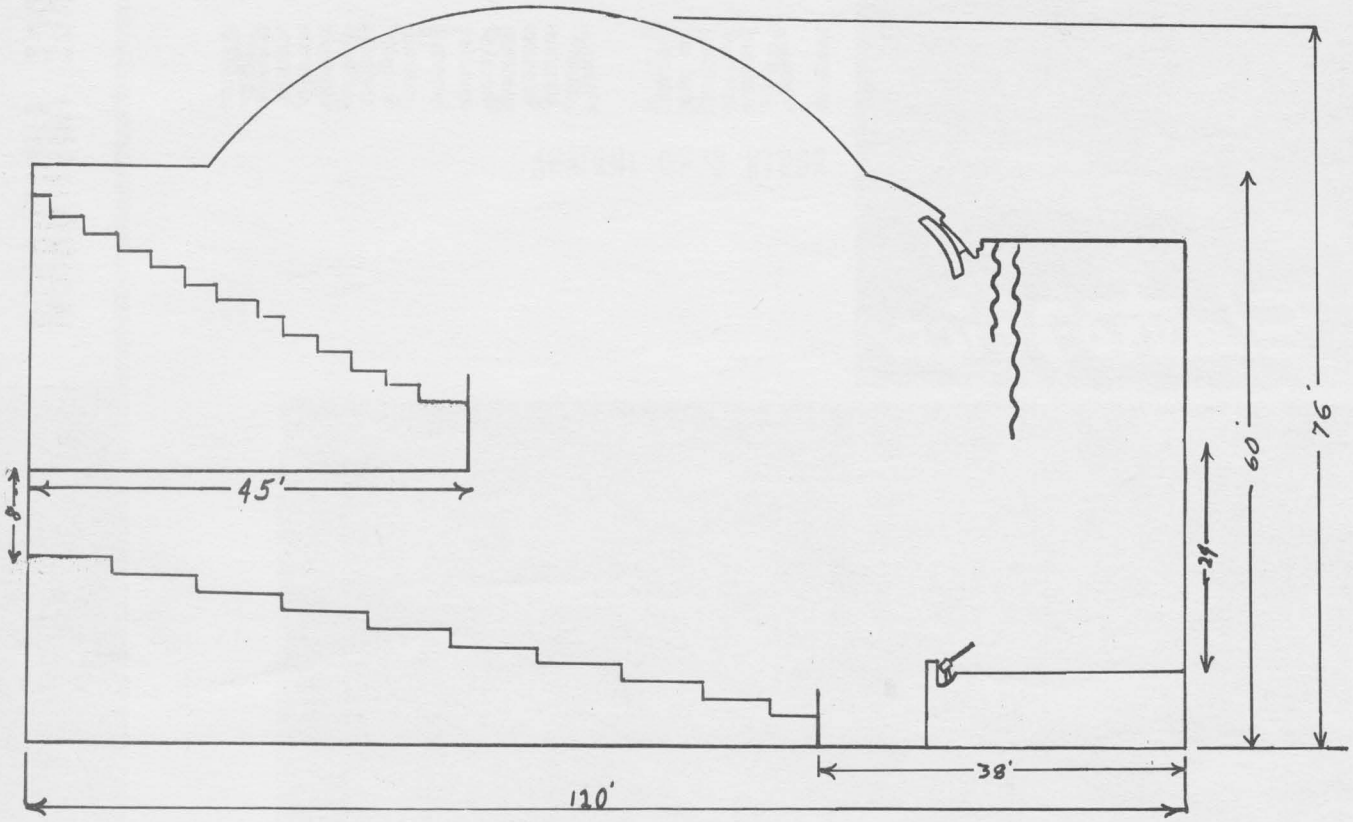

FIGURE 1 - CROSS SECTION

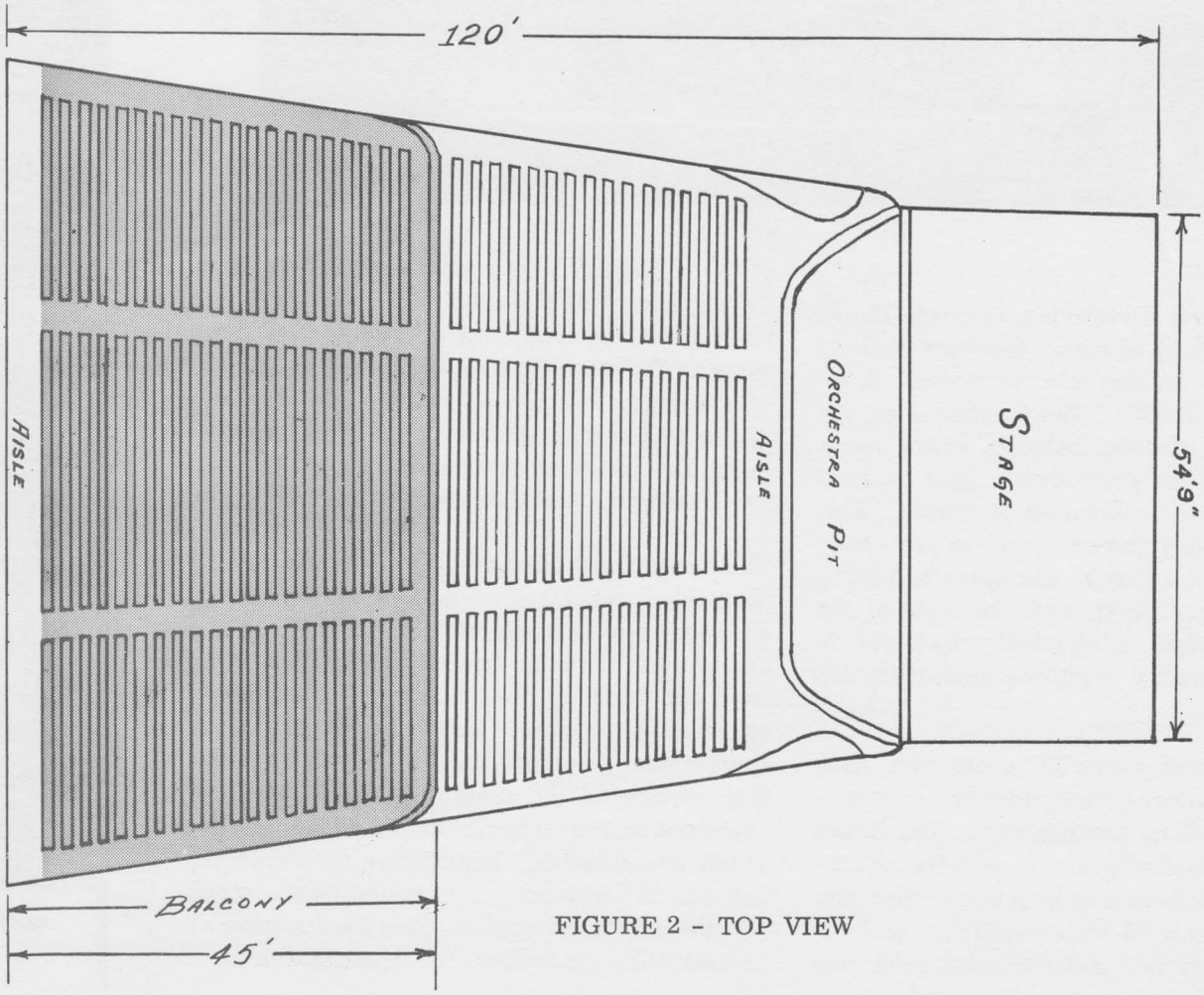

FIGURE 2 - TOP VIEW

SOLUTION

To provide realistic sound coverage of this large auditorium, the speaker system had to fulfill several stringent requirements. It is most desirable in any auditorium or theater to project the sound so that it appears to come from its original source at all times; that is, so the sound appears to originate from the performers rather than from a remote speaker. Ideally, the audience would be unaware that a sound system is being used. Since the human ears are located in a horizontal plane, they will allow a great deal of vertical latitude but are quite critical to movement in the horizontal plane. This means that the speakers can be placed in almost any location low or high as long as they are above the approximate center of the stage. Placement at the sides, however, brings the ears into focus at the side of the stage and the eyes on the stage itself, causing unrealistic reproduction and mental fatigue.

The most critical requirement, of course, was actual distribution of sound. The wide, deep main floor required uniform coverage and this was complicated by the large balcony. The first ten to twelve rows of the main floor required only light voice reinforcement; however, higher levels were necessary deep in the audience without uncomfortably high levels being projected into the front rows. The balcony required highest levels, particularly in the back rows.

High reverberation time limited the level of the low frequencies that could be reproduced, yet the speaker system reproduction was required to be clean and realistic. Another limitation was cost. Since the theater is a civic enterprise, modifications costs were strictly limited.

The solution was placement of two Electro-Voice model LR4 Line Radiators* on the proscenium arch. The broad, flat projection pattern allowed a vertical coverage of approximately 60°. This made it possible to tilt the radiators downward 15° and project the highest sound levels into the middle and rear of the main floor and into the balcony. No power was wasted through reflection of sound off the ceiling. Placement of the speakers high over the stage accomplished two purposes: it provided a null or low-level area on the stage itself, allowing placement of the microphones in the best location for stage pickup and greatest possible elimination of feedback, also, it permitted removing the speakers as far as possible from the microphones, which was of additional benefit in eliminating feedback. The small size and light weight of the Line Radiators made mounting requirements simple and inexpensive.

The broad horizontal coverage characteristics made possible uniform coverage of the entire theater area and reverberation effects were greatly reduced. Actual sound measurements throughout the house with a capacity crowd showed a maximum variation of 3 db.

COMMENTS

To provide best possible pickup coverage of the entire stage, five model 644 Sound Spot microphones were placed at equal intervals in the footlights. These were mounted on heavy desk stands and isolated from floor noises by 2" thick blocks of foam rubber. Electro-Voice model 513 low-frequency cutoff filters were used with each microphone to further assist in eliminating low frequency reverberation. As a result, it was possible for performers to work to the full 30 foot depth of the stage. Since the original 30-watt amplifier was still in good operating condition, it was not replaced.

Installation by: Indiana Electronic Company
1010 Oak Ridge
South Bend, Indiana

Location: Morris Civic Auditorium
South Bend, Indiana

* TRADEMARK