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POST PRODUCTION STUDIO DESIGN AND CONSTRUCTION - TWO CASE HISTORIES

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CASE HISTORY 1: A FOLEY EFFECTS STAGE/MULTI-PURPOSE POST PRODUCTION STUDIO

Introduction (Background Information)

A Foley Effects Stage is used for putting footsteps and other types of sound effects onto film or video material. These sound effects are synchronised with the film action by the Foley Effect Artist who times his actions to coincide with the visual images on the screen in front of him. The role of the effects artist is in some repects like that of an actor; the way in which an effect is presented can have a profound effect on the atmosphere or mood created.

Sound effects can, of course be generated and synchronised digitally, but it is generally recognised that they may lack the subtlety needed to create exactly the correct mood - a dejected man's slovenly walk, for example, might be difficult to achieve.

A Foley Effects stage should exhibit the following basic characteristics if it is to produce material in high quantity, quality and speed:

1) Good Acoustic Ambience (not live)
2) Low background noise level - ideally NR5 or less
3) High acoustic isolation and filtered air conditioning

Acoustic Ambience

The acoustic environment should err on the dead side since sound effects (recordings of footsteps, door bolts being drawn etc) can have reverberation time added digitally or electronically at a later date. As programmes are compiled, the studio will also probably be used for a considerable amount of voice work.

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Low ambient background noise level

A low background level is essential since the acoustic output of footsteps etc is very low. This low background level means that the studio needs a high degree of acoustic isolation from outside sources since at very low background levels, any intruding noise/sound source can be easily heard and identified and (with the amplifier gains being used) will almost certainly end up on the finished material.

High Acoustic Isolation and Filtered Air Conditioning

With the advent of digital sound, the 50-55 dB dynamic range of tape recordings has now been replaced by the 95 dB plus of digital equipment. This results in a yet higher degree of acoustic isolation between areas being necessary.

It is also required that the studio be air conditioned, although there is little space allocated to accommodate plant and ducting. The air conditioning of Foley stages and voice studios is usually of the re-circulation type and this gives rise to a need for filtration. Cigar smoke, for example, continually re-cycles, as does the dust kicked up by a simulated cavalry charge on the Foley stage.

Studio Layout and Location

The layout of the studio is another important area since the mixer, artists, client and Foley effects operator must all have clear lines of sight to the screen, as well as good acoustic definition and intelligibility. The screen should be capable of taking material projected from outside the studio by mechanical projecting, or alternatively, projector television inside the studio.

The location of the studio itself is less than ideal, being in the centre of London with all the traffic noise, tube train vibration and construction noise and vibration this entails.

The building chosen as the site for the studio is not purpose built and - as is common in such cases - it will be necessary to install the studio on the first floor, which has a slab to underside of slab or lowest beam height of just 2.65m.

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In summary then, the client in this case history requires a studio facility which is structurally isolated to the lowest natural frequency, full air conditioning and, for practical purposes, a clear internal height in the studio of 2.4m. Impossible? No!

CONSTRUCTION APPROACH

The Floor

This had to be a pre-fabricated steel box panel floor into which the Foley effect trays could be laid. To preserve the acoustic integrity, the whole structure was reinforced and the base to the Foley effect trays was constructed from heavy plate steel.

The Anti-Vibration Medium

In the 25mm (1 inch) space, it was impossible to install the preferred spring mounts, or even high deflection rubber mounts. Fibre glass and neoprene pads were considered, but their natural frequency was far too high with poor isolation in the base of the available range. After tests, it was decided to mount the studio on special ether foam rubber with a static deflection under load of 50% of the normal thickness, ie. 25mm.

This gave a very low calculated natural frequency. Two foams of different densities were used with high density foams for the high load perimeter and low density foam for the central section. This performed remarkably well and test results are tabulated in Figure 1 where a comparison to the DHSS specification for Audiometric rooms is also shown.

Note: For these tests, the tapping machine was only 125mm from the room under test, as opposed to the specified 1m, due to the inaccessibility caused by the false floor surrounding the area.

Total floor slab to floor slab depth: 125mm.

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FIGURE 1 - ISOLATION IMPACT TESTS

(1) and (2) are different points of measurement on the same floor

F Hz	(1)	(2)	Ref DHSS Spec
50	47	46	47
63	40	41	43
80	35	38	39
100	35	33	36
125	24	27	33
160	28	26	30
200	16	19	27
250	6	9	25
315	5	6	23
400	3	4	22
500	2	3	20
630	2	2	19
800	2	2	18
1k	2	2	17
1.12k	2	3	16
1.60k	3	3	16
2.00k	4	3	16
2.50k	4	4	16
3.15k	5	5	16
4.00k	6	6	17
5.00k	5	5	17
6.30k	6	5	17
8.00k	6	6	17
10.00k	6	6	17

Note: In conducting these tests to topping machine was less than 125mm from slab under test instead of stipulated 1m.

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Walls and Roof

Acoustic Panel Construction: A system of lightweight, high performance, modular - and therefore demountable - panel components now in widespread use for building studios in the television, radio, film, video and post production and recording industries. Panel construction: prefabricated 4" steel and mineral wool sandwich with two flexibly coupled membranes of Gyproc to boost low frequency sound attenuation. Panels are joined together using steel 'H' joiner units to form complete wall and roof structures.

Ventilation System

This comprised an externally sited compressor, with remote air handler metal ducting - for reasons of sound break-out and break-in - and was silenced before entering the outer walls (air velocity = 600 ft per minute). The void between the outer structure and the studio was turned into a supply and return plenum. Supply and extract terminal silencers were installed in the studio walls (selected on airflow of 250 ft per minute) and these also helped to eliminate 'cross talk' to the structurally isolated and independent voice booth.

Interior Decoration

The studios were decorated to a high overall standard, a careful balance being struck between aesthetically pleasing designs and acoustically acceptable furnishings. A pile carpet was used on the floor and a perforated aluminium ceiling contains hidden absorption. This absorption was necessary to compensate for the artificial synthetic suede wall covering, used on the walls, which caused some brightness from 1KHz upwards.

The quadruple glazed windows were constructed using aluminium frames with a 100mm air gap between all panes. Dissimilar glass thicknesses were used throughout, with a minimum thickness of 6mm.

Conclusion

The ventilation system achieved the design criteria by a good margin of safety.

The floor performed admirably in a difficult environment and was very cost effective. However, there were several points to be learned from this particular installation. In order to increase the performance of the floor, the degree of surface coupling would need, in future, to be reduced. This would mean increasing the density of the foam and involve possible changes to the laminations of the foam and perforations, ie. the laminations used to compensate for foam density limitations.

CASE HISTORY 2: AN AUTOMATIC DIALOGUE REPLACEMENT (ADR) STUDIO

Background

An ADR studio is where film is replayed and dialogue recorded by actors/artists in perfect (or near perfect) synchronisation. This particular discipline requires an immense degree of skill and patience, as timing is critical. The tones and inflections in the artists voices are of equal importance. The studio environment should therefore have a neutral quality which will enhance the speech content.

Acoustic Characteristics

As speech tracks are laid down on the master, their quality will depend to a great extent on the signal-to-noise ratio and noise floor of the studio. As with a Foley effects studio, these aspects of performance become increasingly critical with the use of digital recording techniques.

In recent tests on a series of different ADR studios, multiple measurements were taken and these revealed that a background level of NR5 was generally deemed to be satisfactory. Further, they showed that with increases up to around NR20, the operational performance of the studio steadily worsened. To a certain extent, however, these problems could be overcome by the correct selection of microphones and by improvements in the microphone technique of the artist.

To help provide a qualitative assessment of the effects of different levels of acoustic performance, Figure 2 details the typical reactions of a variety of users.

Figure 2

Noise Level	Comments
NR 5-7	Gave no problems in use and was judged to be the required level for future projects. Note: Background level closely matched NR curve from 3.5 Hz.
NR 8-12	Used with care, gave acceptable results for most productions using most microphones.
NR 14-17	Gave problems in use even though spectrum was matched to NR curve. The judicious selection of microphones gave acceptable results.

To achieve these background levels, the degree of acoustic isolation provided by the studio obviously needs to be very high, especially if the studio is situated in a 'noisy' area.

The Anti-Vibration Medium

Even with good structural isolation, and the use of 'box-within-a-box' construction techniques, such background noise levels are rarely achieved above ground floor level if rubber mounts are used. The use of high deflection spring mounts is therefore the rule rather than the exception, unless high deflection foams or rubbers can be found with low damping characteristics.

Construction of Walls and Roof

This was similar to that shown for the Foley effect stage, however, a substantial outer shell was looked for which also provided a buffer zone to the noisy external environment.

Ventilation System

This was based on a system, as previously described in Case History 1 where ventilation, a prime consideration in the design of a studio, had to be installed within the limited amount of available floor space.

Conclusion

Success in terms of the overall design and construction of the ADR studio depended on finding a substantial outer building shell in conventional materials and a quiet base environment.

The studio was constructed from the same high performance system of modular panel components described in Case History No. 1. Air conditioning requirements and interior design/decoration schemes were also similar to those already described.

The reverberation time of the studio was found to err on the dead side (as is desirable) and excellent RT times of 0.2 to 0.25 seconds were recorded (studio volume: $128m^3$).

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First array of footstep surfaces, showing Sand, Gravel, Earth and Paving stones.

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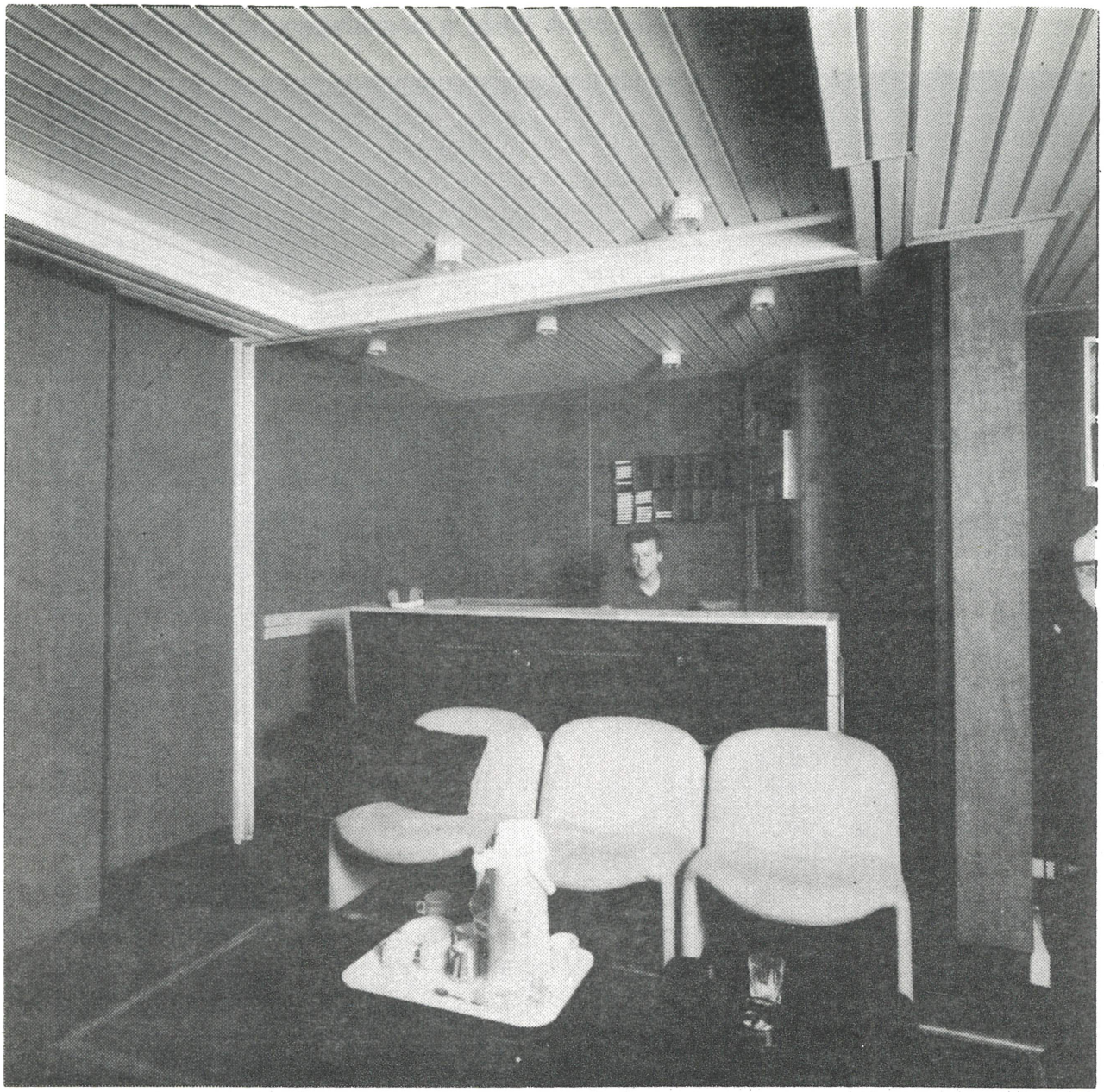

Mixing desk and clients position in foley effect stage area

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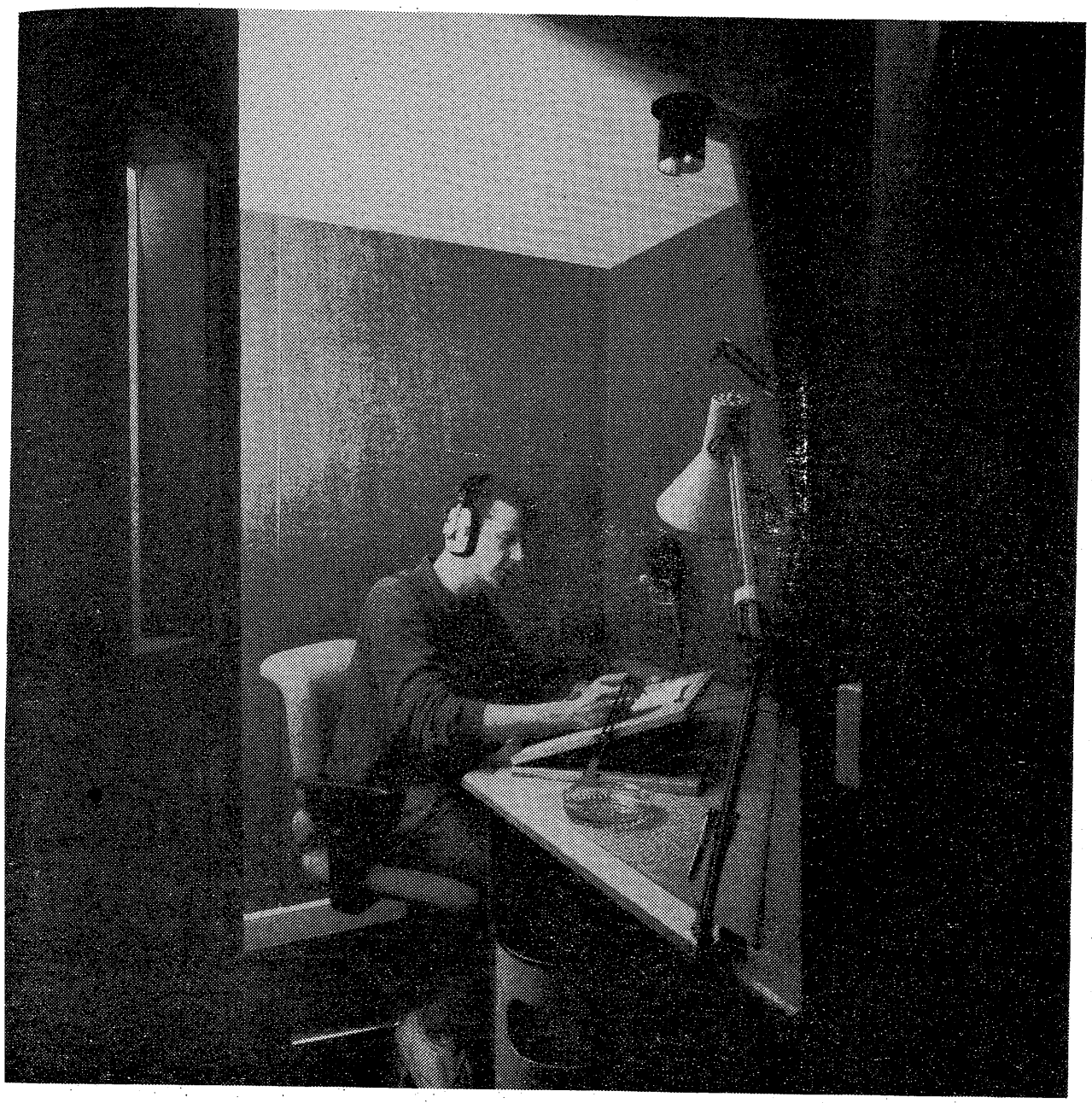

Voice booth for ADR type work.

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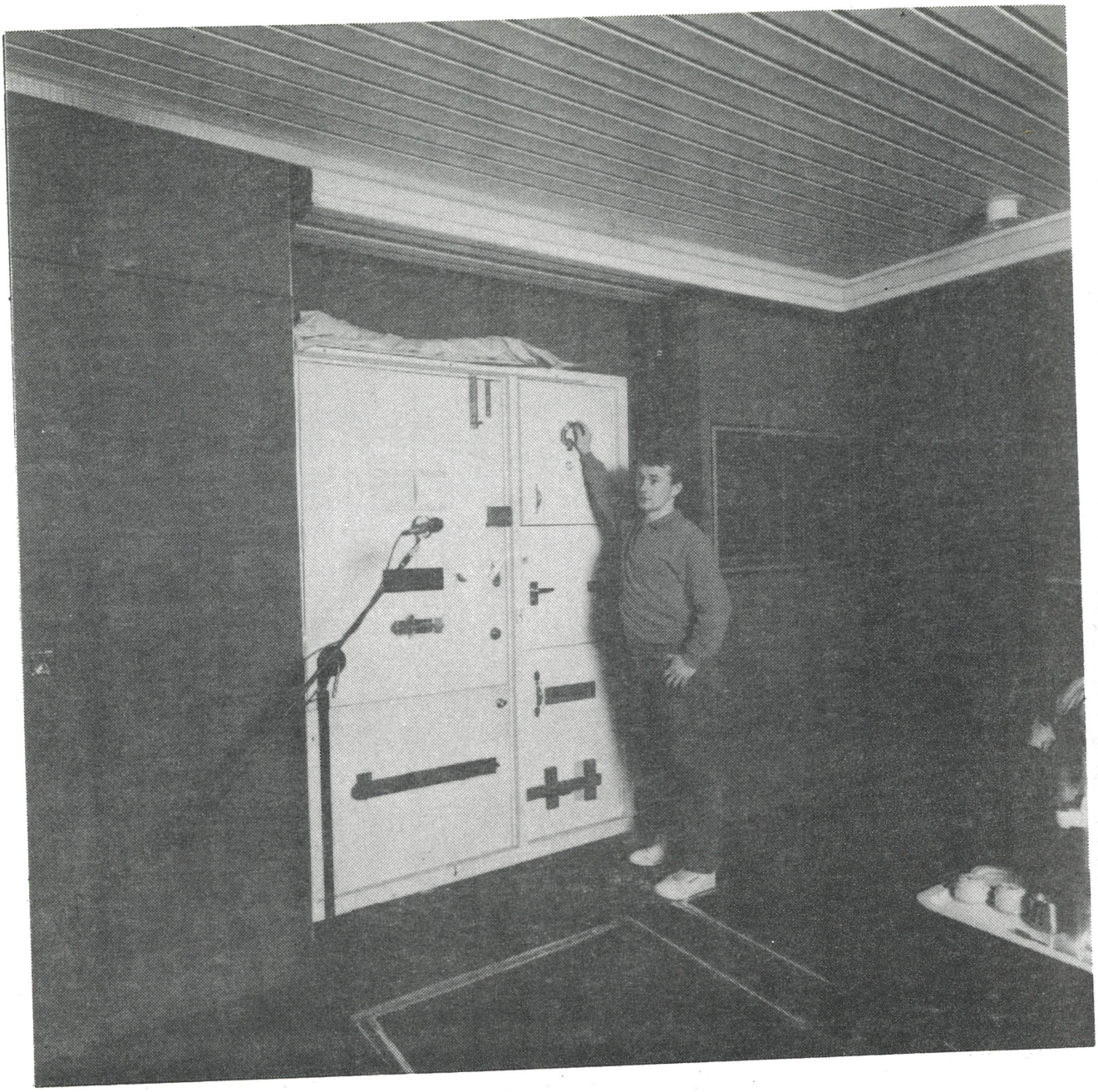

Doors and furniture for use to synchronizing with screen activities

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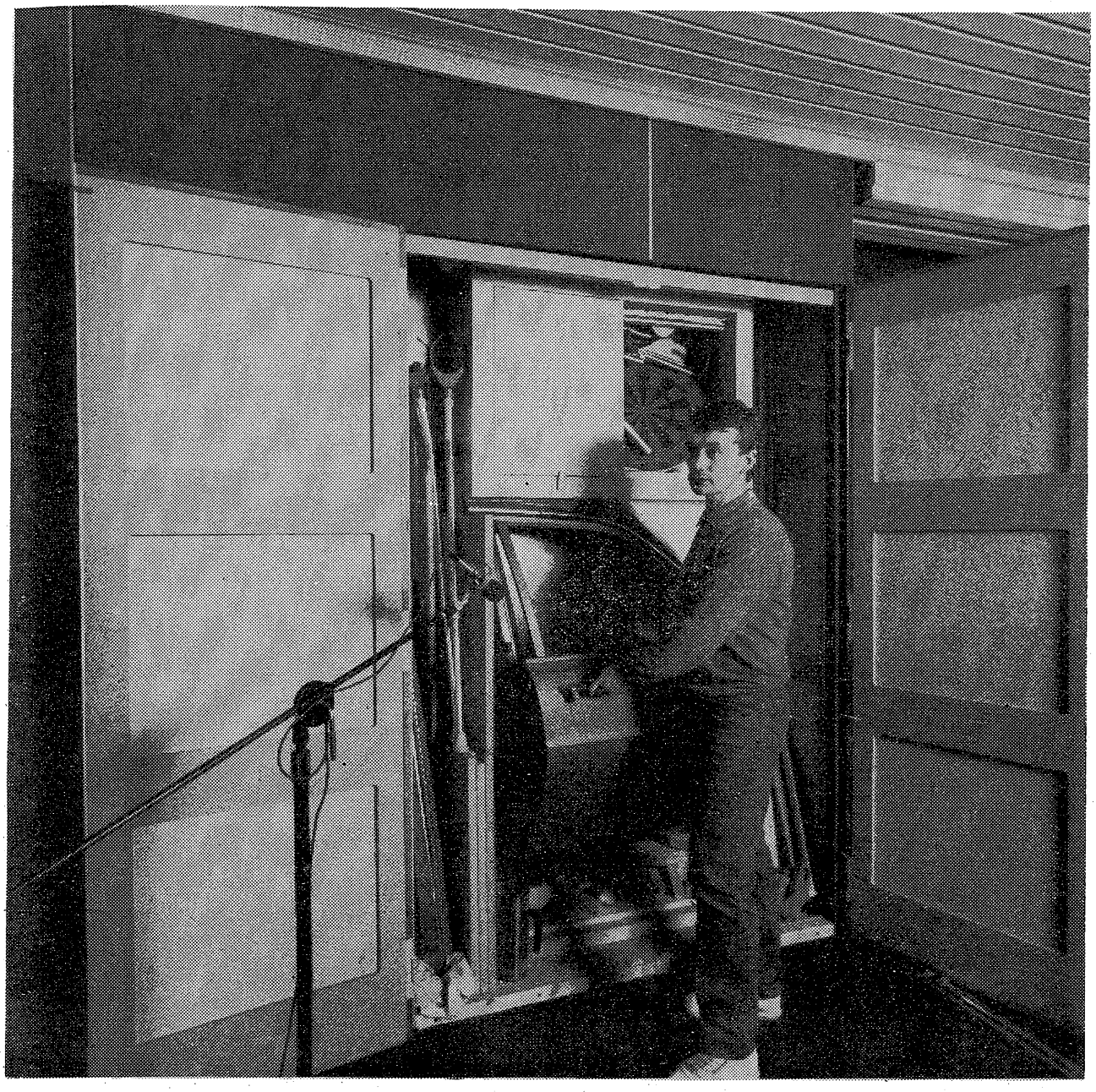

Built in car door being used in synchronization with screen action

Foley Effect Stage in use for footsteps work