THE MODULAR CONSTRUCTION OF TV, RADIO, AND POST PRODUCTION STUDIOS

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ILLUSTRATIONS

THE MODULAR CONSTRUCTION OF TV, RADIO, AND POST PRODUCTION STUDIOS

Section One:
DIFFERENCES BETWEEN 'MODULAR' AND 'CONVENTIONAL' STUDIO CONSTRUCTION

The use of a modular panel system for building studios came about through a need in the media industries for a quick, clean, flexible method of construction which gave guaranteed acoustic performance. Modular studio structures can be installed on green field sites but the benefits of the modular design concept are even more apparent for studios in existing buildings where space is lacking and floor loading limits prevent the use of conventional building materials.

The modular panel design is based on a robust pre-fabricated 100mm thick steel panel sandwich and individual panels are joined to form complete floor, wall and roof sections (see fig 1) by means of special steel jointing units. Virtually any size and shape of studio can be formed in this way and acoustic isolation is achieved by suspending the panel floor on spring or rubber isolation mounts.

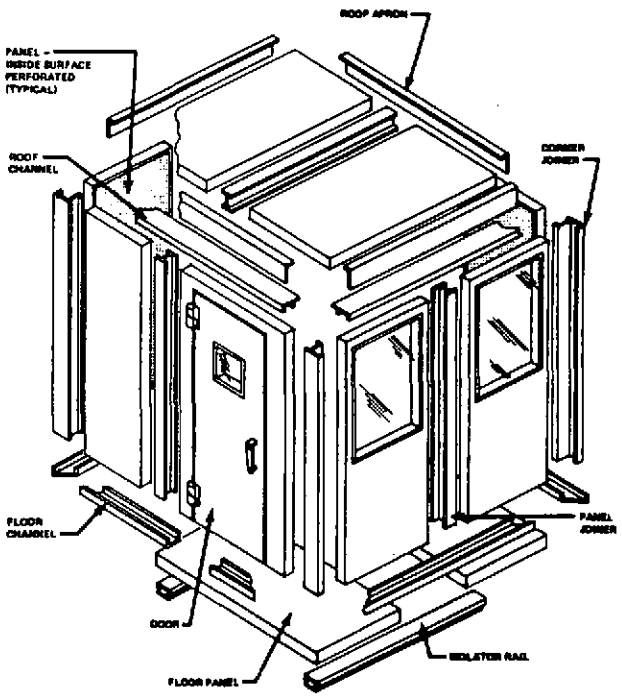

Figure 1: Assembly of Modular Components

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The design of the panel-built structure takes account of existing building and architectural features and should studio usage increase or working practices change, reconfiguration is possible using the same structural components without any major demolition or construction work being necessary.

Conventional construction techniques do not offer this flexibility and the period of commissioning tends to be longer due to the types of (somewhat messy) trades involved and the time taken to ensure that the studios attain their correct design performance.

There are however, certain drawbacks to modular panel construction and these are in essence caused by the prefabricated nature of the design. Following initial discussions on planning and layout, the design of a modular studio is very detailed and precise. This does cause some clients problems who are not used to thinking ahead. Clients are often accustomed to inspecting a facility as it is erected and place equipment etc., once they get a feel for the appearance and space available. The speed with which a modular studio is installed (frequently the carcus is up in a week) and with final decoration following shortly after, means that the client has a very short period in which to ask for amendements, extras, or re-configure his layout.

The acoustic performance of modular studios is sometimes considered vulnerable because of the relatively low mass of the panel components, but against this you have a well proven jointing system (see Fig 2) which can be assembled by unskilled personnel and still achieve the design performance without any remedial measures being necessary.

Fig. 2:

Modular Panel Construction and Jointing system.

A conventional structure frequently suffers from poor jointing, incorrect material useage on site, bridging of isolation materials and poor quality control. Figure 3 (overleaf) shows the relative acoustic performance of two of the most commonly used conventional construction techniques against a modular panel system.

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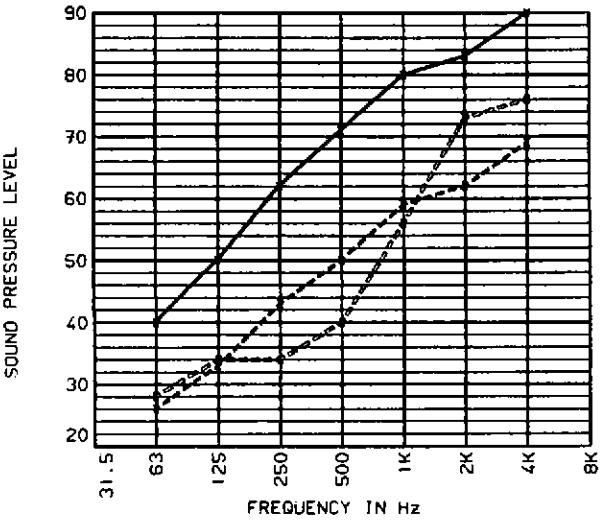

KEY:	Wall Thickness	Samples
Camden twin walls	300 mm	20
Brickwork Cavity Plastered	300 mm	3
Twin modular panel wall	300 mm	13

Frequency in Hz:	63	125	250	500	1k	2k	4k
Camden	26	33	43	50	50	62	69
Brickwork	28	34	34	40	56	73	76
Modular	40	50	62	71	80	83	88

Figure 3: Comparative acoustic performance of different construction materials

Section Two
STANDARDS OF ACOUSTIC PERFORMANCE

When a studio complex is being conceived, one of the most difficult problems is to define what the client requires acoustically; does he want a very high degree of isolation; does he want very low internal ambients, ie. the threshold of hearing which would be well below his threshold, a flat acoustic response down to 20 Hz, or is it an entirely subjective sound he is after, that is only in his mind until he happens to hear it either by design or accident.

In the UK we have some of the most sophisticated studios, both technically and aesthetically. However, a translation of these high standards directly to other parts of the globe would not be welcome, as the prices would be high and standards of programme quality vary considerably, or they are arrrived at in a much more laborious fashion where time is not costed or is less costly.

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When an engineer writes a specification for a studio, he does so in terms that he understands and uses. These are usually dB levels as he interprets them from his equipment calibrations but these are only ratios which mean virtually nothing to the acoustician or design engineer. Therefore, it is important for the engineers to have a guide as to what the acoustic values are and mean.

Figures 4 and 5, show the NR curves for interior noise levels and a table that gives an indication of the NR levels permissable for various types of studio installation.

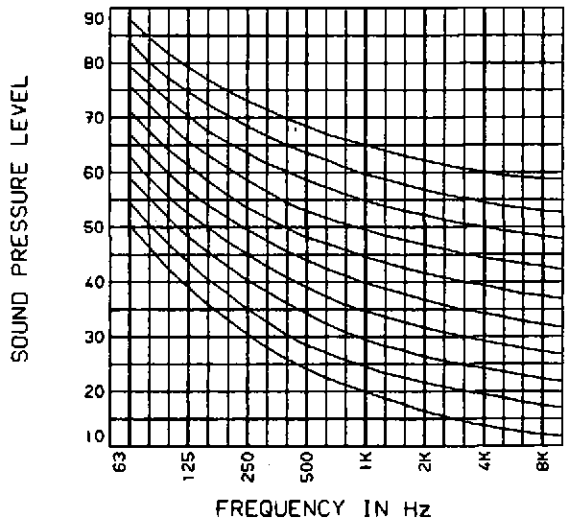

Figure 4: Noise Reduction Curves for Interior Noise Levels

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Type of Studio	Studio Internal Background Sound Level
Studio utilising close microphone techniques (Bass cut may be necessary)	NR 30-35
TV, Cable TV and Production studios	NR 30 (63 - 500 Hz) NR 25 (500 Hz - 8 KHz)
Non-Broadcast Studios, pre-recorded material preparation	NR 25
On-air Broadcast Studio (Radio), Listening Rooms, Music/Sound Studio	NR 15-20
Sound Effects, Dubbing, Post Production	NR 5

Note: Motorised and fan ventilated equipment can frequently generate local sound levels higher than NR 25.

Figure 5: Permissable Noise Levels for Different Studios

Section Three:
ACOUSTIC TUNING

Acoustic tuning is a vital but often misunderstood stage in the development of a studio which frequently leads to immense labour and material costs and a reduction in very valuable floor space. We have all seen studios with vast bass traps in corners, thick walls and ceiling voids concealing other tuning aids. Or alternatively, clients arrived on site to find that the structural dimensions against which they have worked have shrunk by as much as 40 cm (16 inches) due to the 15-20 cm of acoustic treatment applied to each wall surface. This does not occur with modular panel construction as the tuning for most audio applications is built into the 100 mm of the composite pre-fabricated panel; with composite construction it is therefore possible to achieve reverberation time control in a very limited depth.

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The tuning of modular studios differs in several other respects when compared to conventional materials:

High, Mid and Low Frequency Control

Pre-fabricated modular panels have higher natural frequencies of resonance than conventional materials. Typically such panels have highly absorbent internal faces so tuning at mid and high frequencies is more a case of 'blanking off' absorption. The perforated design of the inner faces of the panelwork has been known to cause concern about edge effects but in completed studios the use of fabric facings and other decorative treatments tends to overcome this problem.

With modular construction low frequency control is provided by a range of modular membrane panel absorbers. These are interchangeable and designed around the fundamental frequencies - from 150 Hz downwards - caused by room resonances and eigentones. The absorbers will function effectively down to 40 Hz and the high Q effect is moderated by infill inserted in the cavity behind the absorber. These absorbers are strategically placed around the studio in the most effective positions (e.g. usually in corners). Extra low frequency control can be provided by base traps.

Having considered the effects provided by the wall panels, the floors and ceilings of studios should also receive the same degree of attention: the best walls in the world will produce a poor degree of isolation if these other areas do not provide a similarly high standard of performance.

Once all the major structural items have been balanced acoustically, it is important that the initial good work is carried through with acoustic doors and windows. The acoustic doors should seal properly and windows should be double, triple or even quadruple glazed with glass thicker than that used for picture or domestic applications, ie. 6-9 mm thick.

There are several other often neglected areas to consider; it is particularly demoralising to see studios, of whatever construction, where the true acoustic potential has not been realised due to the non or ineffective sealing of cable entry points/cable raceways, air conditioning duct wall penetrations etc.

I have also visited many studios where clients have mistakenly believed that acoustically absorbent materials automatically produce good attenuation. Similar misnomas are that egg boxes make good absorbers and that walls need not be carried on up to the roof slab once they have passed through a false acoustic ceiling.

Once a studio layout has been derived and the construction and acoustic criteria defined, the next item to consider is the interior design or what it will look like. Unfortunately, hard (and therefore hard wearing) finishes are not good for acoustics and the balance of finishes is very important if the studio is to perform correctly. Therefore the client, engineer or interior designer have to work together to achieve a balance of effect and sound.

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Section Four
AIR CONDITIONING / VENTILATION

The air conditioning or ventilation studios is another important facet of studio design. All too often, clients seem to view air conditioning as an item that can readily be dispensed with if funds are limited. Unfortunately, studios by their very nature contain large expanses of acoustic absorbent material (to achieve the required degree of performance) and this material acts as a very effective thermal insulator. The studio behaves rather like a thermos flask, containing the heat generated by equipment, lighting, human bodies etc., and the studio therefore requires a constant airflow to dissipate or remove the warm air.

Good ventilation is not therefore a luxury item and a ventilation system must incorporate silencers to match the integrity/attenuation provided by the surrounding structure. The most common types of ventilation system are as follows:

a) Scavenged air: air is taken from an adjacent, preferably air conditioned, area and passed through the studio.

b) Air conditioned by plant in the studio: An air handling unit is positioned within the studio with a compressor mounted externally. This should not be considered where low noise levels must be maintained, ie. below NR 30. No studio required to give an acceptable level of acoustic performance, should use a through-wall or window single unit, as this is a major source of noise even when the unit is not in use.

c) Air conditioned by remote plant: This is the most effective method provided that air velocities in the system are kept below 500 cubic feet per minute in ducts, and 250 cubic feet per minute at grilles and diffusers. All airflow entry points should be away from seated personnel and air extraction points should be directly above major heat sources.

The air conditioning equipment should be selected so that it can dissipate the worst potential heat loads that may be expected in the studio and maintain the design temperature. For TV studios, it is common to design the ambient temperature up ot 5° below the normal temperature for other areas, as the lighting in these areas gives off large amounts of radient heat that will be directly felt by the performers/artists and engineers.

Section Five
THE TURNKEY STUDIO CONSTRUCTION PACKAGE & EXAMPLES OF MODULAR STUDIOS

With the increasing sophiatication of studios and equipment, it is no longer possible for the client to engineer all the pieces of equipment he wants together, then co-ordinate this with the studio construction, interior finishing, wiring, building of furniture and desks etc. So there is a growing market for a turnkey facility approach available from companies such as IAC, where the entrepreneur is free to concentrate on gathering the correct staff, organising work loads for the studio and making sure he has got the best equipment available.

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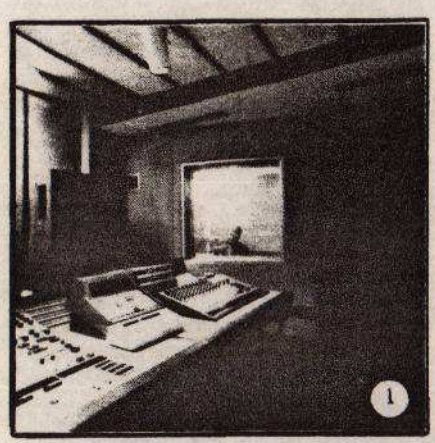
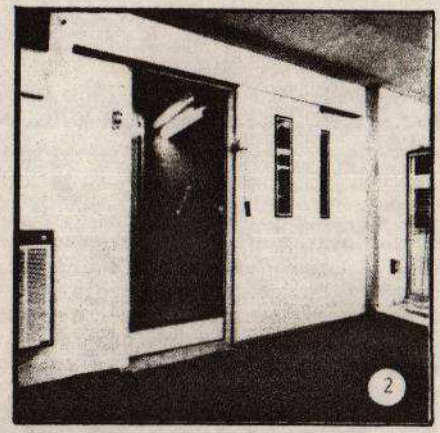
The Modular system of construction has been utilised round the world for Recording Studios, Television Studios, Radio Studios, Voice and Sound Studios, Post Production and special effects areas (for selected illustrations see overleaf Figure 6). Recently a twin skin mobile unit has been designed to give the same degree of acoustic isolation as a permanent concrete facility.





(1) Voice - Over Booth for ITN, London.

(2) Self-Op Studio at LBC, London

(3) Control room in 7-Studio/Control room complex for British Forces Broadcasting, Paddington, London.

(4) Part of a 3-studio/News booth complex for Gwent Broadcasting, Newport, Wales.

Figure 6

EXAMPLES OF SUCCESSFULLY COMPLETED MODULAR STUDIO PROJECTS