The information contained in this report is not intended to convey the complete and detailed fixing and/or application requirements of British Gypsum or other suppliers' materials. For full specification details, please consult the latest relevant Company trade literature

Acoustics Test Report Number 872 Date 14/1/85

LABORATORY AIRBORNE AND IMPACT SOUND INSULATION MEASUREMENTS ON A TIMBER JOIST FLOOR WITH A DOUBLE LAYER GYPROC M/F SUSPENDED CEILING.

Test carried out for

British Gypsum Ltd.,
Marketing Dept.

Acoustics Services Manager

NATLAS
NATIONAL TESTING
LABORATORY
ACCREDITATION
SCHEME
NATLAS REG. NO. 0296

British Gypsum Limited,
Research & Development Department,
East Leake, Loughborough, Leicestershire, England.

Registered in England
Registered Number 209091
Registered Office - Ruddington Hall,
Loughborough Road,
Ruddington,
Nottingham NG11 6LX

ACOUSTIC TEST REPORT 872

CONTENTS

LABORATORY TEST

Test code	Date tested
V66.21,22,29,30	Jul/Aug 84

Type of test

AIRBORNE AND IMPACT SOUND INSULATION

Tested in accordance with

BS 2750 AND ISO 140

Report prepared by	P. ROYLE	

1. INTRODUCTION

This report describes the results of airborne and impact sound insulation measurements on;

Test Code

V66.21,22 Timber floor joists overlaid with 18 mm chipboard.

V66.29,30 Timber floor joists overlaid with 18 mm chipboard with a double layer 12.7 mm Gyproc wallboard ceiling on the Gyproc M/F system fixed to the underside of the joists. An 80 mm Gypglas glass fibre mat in the cavity.

The airborne and impact sound insulation test procedures are outlined in Appendices 1 and 2.

2. DESCRIPTION OF THE TIMBER JOIST SYSTEM

195 mm x 45 mm timber joists at 600 mm centres in the test aperture with 18 mm flooring grade chipboard nailed to the upper face of the joists. The ends of the joists rested on 5 mm thick polyurethane foam in order to minimise impact sound flanking transmission. The perimeter of the chipboard walking surface was sealed with Webbcryl acrylic caulk.

3. GENERAL CONSTRUCTION OF THE GYPROC M/F SUSPENDED CEILING SYSTEM

Gyproc M/F perimeter channel (MF6A) fixed around the aperture perimeter using screws and plugs at the specified height. Strap hangers (MF8) fixed at 1200 mm centres to soffit cleats (P526) fixed to the plasterboard ceiling of the timber joist floor through to the joists. M/F intermediate channel (MF7) fixed to the hangers (MF8) such that the distance from the existing ceiling to the lining on the M/F sections was 150 mm. M/F ceiling sections (MF5), at 450 mm centres, fixed to the intermediate channels (MF7) using 2.64 mm gauge galvanised steel wire connecting clips (MF9). The ends of the M/F ceiling sections (MF5) enter the throat of the M/F perimeter channels (MF6A).

80 mm Gypglas 1000 glass fibre mat placed on the the top of the metal grid. Gyproc wallboard fixed to the M/F ceiling sections (MF5) with 32 mm Gyproc screws at 230 mm centres for the first layer and 36 mm Gyproc screws for the second layer (joints staggered between layers). All joints filled with Gyproc joint filler and reinforced with Gyproc joint tape. The perimeter of the ceiling sealed with Webbcryl acrylic caulk.

See Fig. 1 for views of the M/F suspended ceiling system and Fig. 2 for a plan of the joists and M/F system.

See Appendices 3 and 4 for a description of the products and addresses of material manufacturers/suppliers.

4. THE RESULTS

The results of the sound insulation measurements are presented in the form of an airborne and impact data sheet for each test construction - each data sheet giving a graph and the spectral values together with the single figure ratings. In addition, the spectral values are tabulated separately for the airborne and impact measurements. Finally, all the airborne and impact sound insulation measurements are presented together for comparison purposes in graphical form.

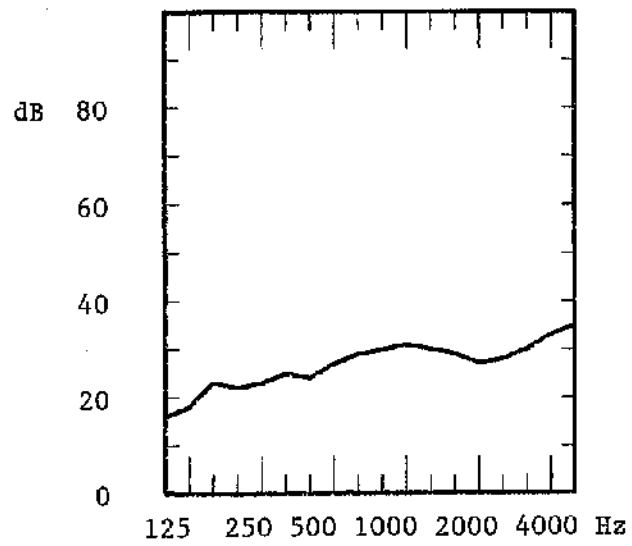
The results are summarised below:

Test codes	Construction	Airborne Rw	Impact Lnw
V66.21,22	Timber joist system	29 dB	89 dB
V66.29,30	With double layer M/F ceiling	60 dB	60 dB

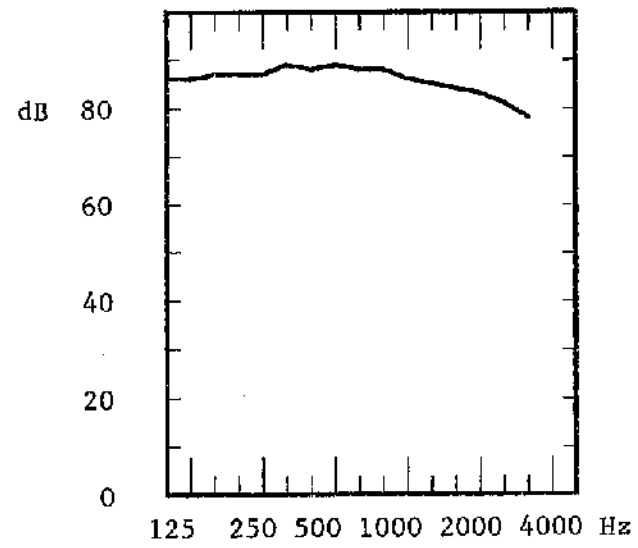
ACOUSTIC TEST DATA SHEET

Laboratory Test Codes V66.21 (Airborne) & V66.22 (Impact)

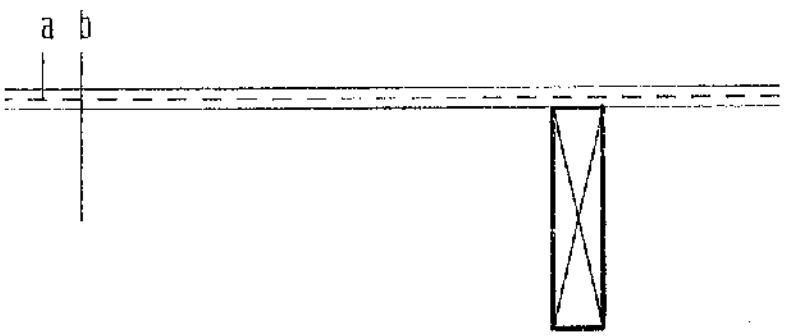
Sound Reduction Index R



Normalized Impact Sound Pressure Level Ln



1/3 Octave Band Centre Freq. Hz	R dB	Ln dB
100	16	86
125	18	86
160	23	87
200	22	87
250	23	87
315	25	89
400	24	88
500	27	89
630	29	88
800	30	88
1000	31	86
1250	30	85
1600	29	84
2000	27	83
2500	28	81
3150	30	78
4000	33	0
5000	35	0
Rw	29	
Lnw		89



a. 18mm chipboard
b. 195mm x 45mm timber joists at 600mm centres

NATLAS NATIONAL TESTING LABORATORY ACCREDITATION SCHEME
NATLAS REG. NO. 0296

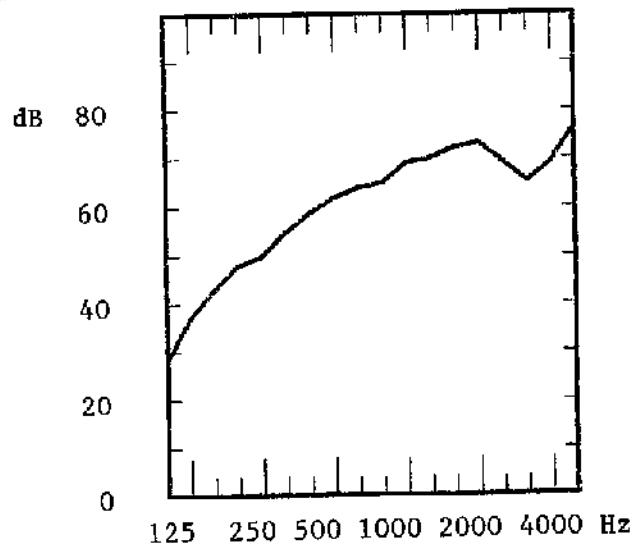
Research & Development Department
East Leake
Loughborough
Leicestershire LE12 6JQ

P. E. JONES
Project Manager (Acoustics)

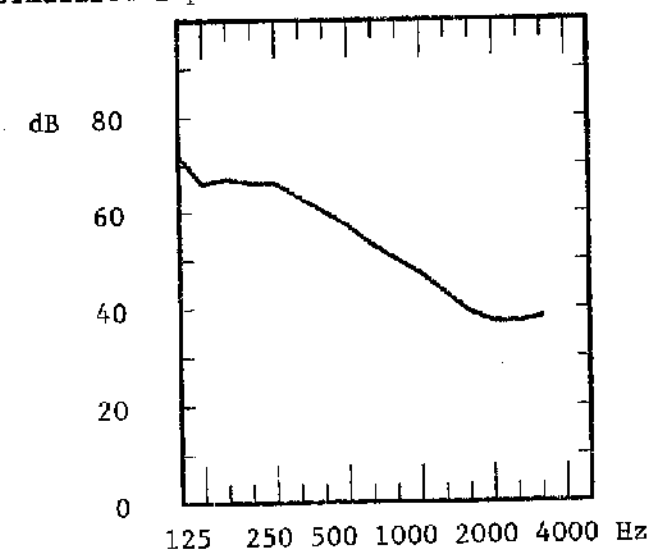
ACOUSTIC TEST DATA SHEET

Laboratory Test Codes V66.29 (Airborne) & V66.30 (Impact)

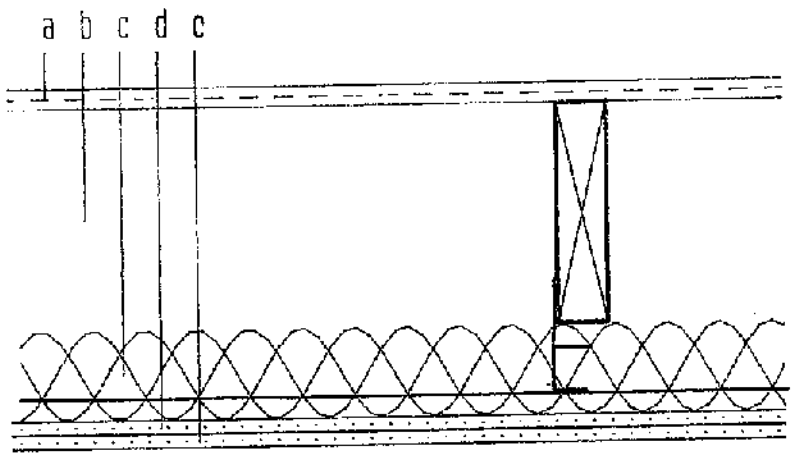
Sound Reduction Index R



Normalized Impact Sound Pressure Level Ln



1/3 Octave Band Centre Freq. Hz	R dB	Ln dB
100	28	72
125	37	66
160	43	67
200	48	66
250	50	66
315	55	63
400	59	60
500	62	57
630	64	53
800	65	50
1000	69	47
1250	70	43
1600	72	39
2000	73	37
2500	69	37
3150	65	38
4000	69	0
5000	76	0
Rw	60	
Lnw		60



a. 18mm chipboard
b. 195mm x 45mm timber joists at 600mm centres
c. 80mm Gypglas 1000
d. 12.5mm Gyproc wallboard on the Gyproc M/F system
e. 12.5mm Gyproc wallboard

NATLAS NATIONAL TESTING LABORATORY ACCREDITATION SCHEME
NATLAS REG. NO. 0296

Research & Development Department
East Leake
Loughborough
Leicestershire LE12 6JQ

P. E. JONES
Project Manager (Acoustics)

AIRBORNE SOUND INSULATION

Sound Reduction Index R dB

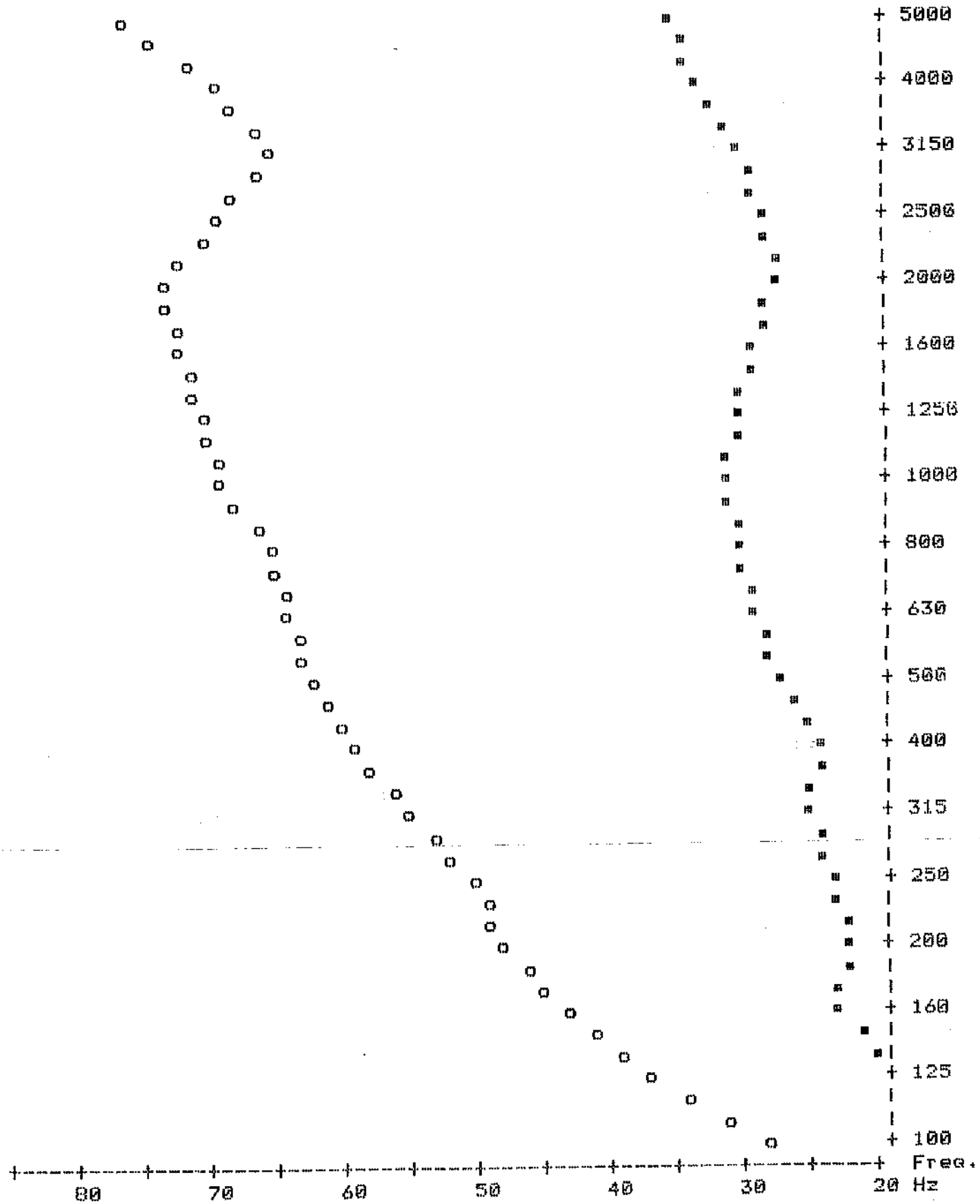
1/3 Octave Band Centre Freq. Hz	V66.21	V66.29
100	16	28
125	18	37
160	23	43
200	22	48
250	23	50
315	25	55
400	24	59
500	27	62
630	29	64
800	30	65
1000	31	69
1250	30	70
1600	29	72
2000	27	73
2500	28	69
3150	30	65
Mean R(100-3150)	26	58
Rw(BS 5821)	29	60

IMPACT SOUND INSULATION

Normalized Impact Sound Pressure Level Ln dB

1/3 Octave Band Centre Freq. Hz	V66.22	V66.30
100	86	72
125	86	66
160	87	67
200	87	66
250	87	66
315	89	63
400	88	60
500	89	57
630	88	53
800	88	50
1000	86	47
1250	85	43
1600	84	39
2000	83	37
2500	81	37
3150	78	38
Lnw(BS 5821)	89	60

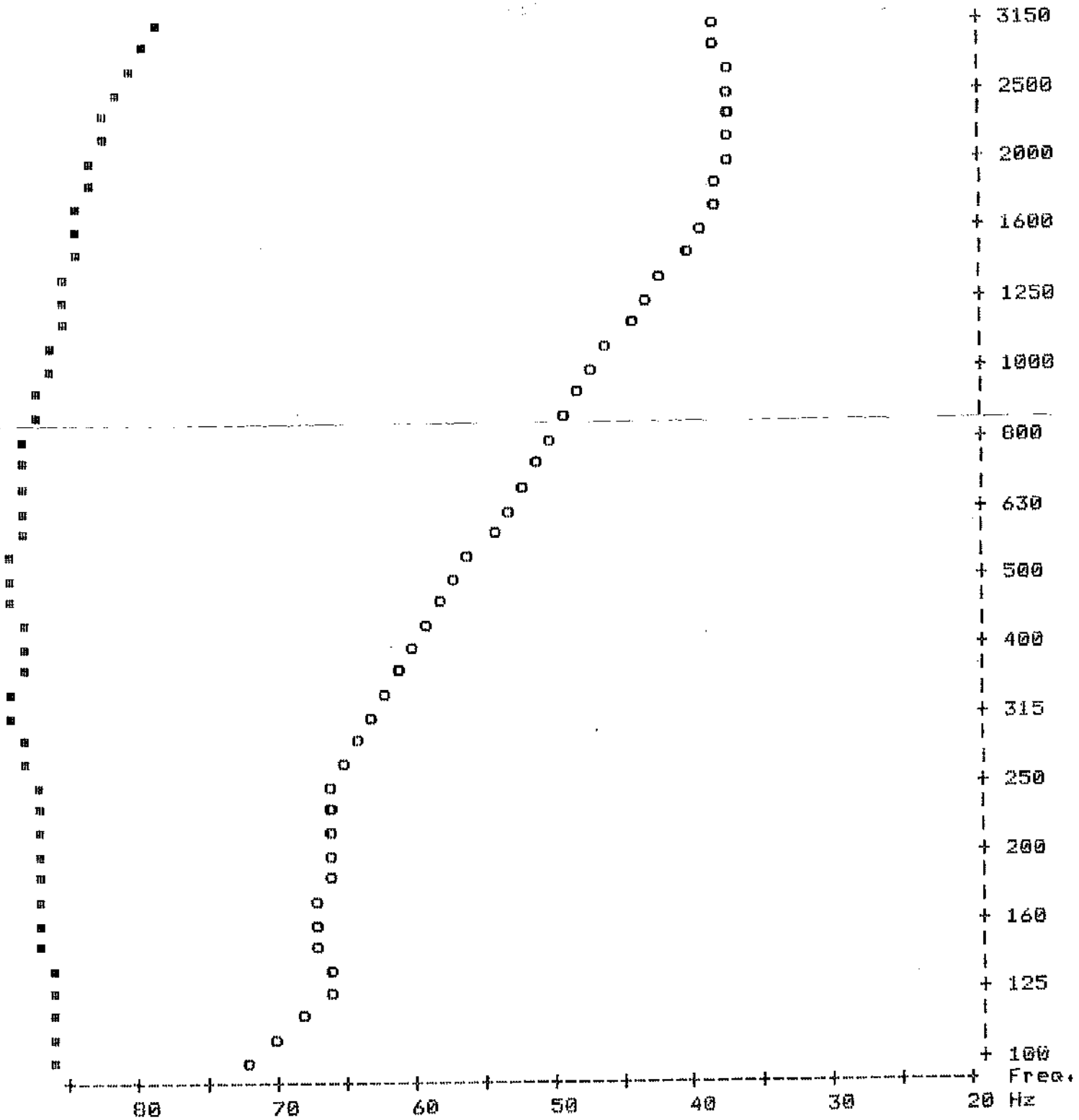
Acoustic Test Report Confidential



Sound Reduction Index dB

V66.21 ▪ No ceiling

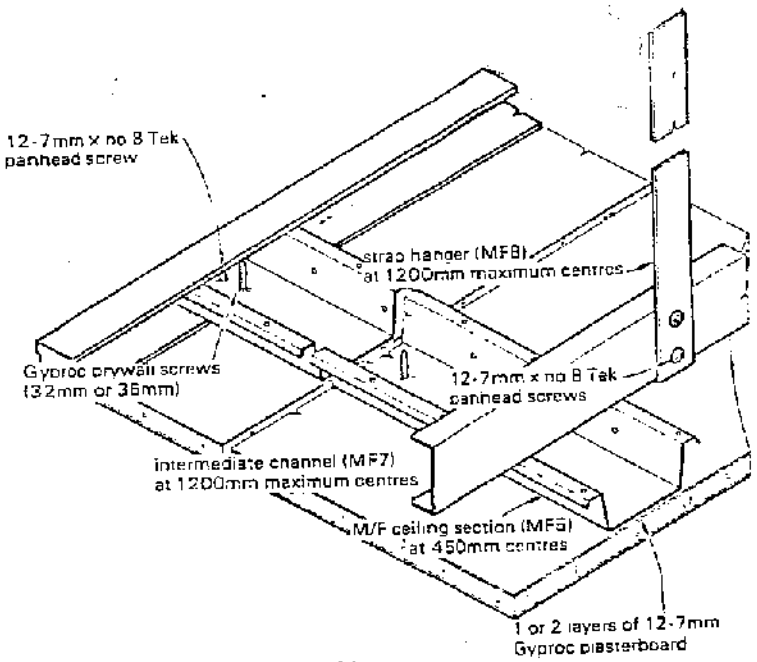
V66.29 o With double layer 12.7 mm wallboard on MF system



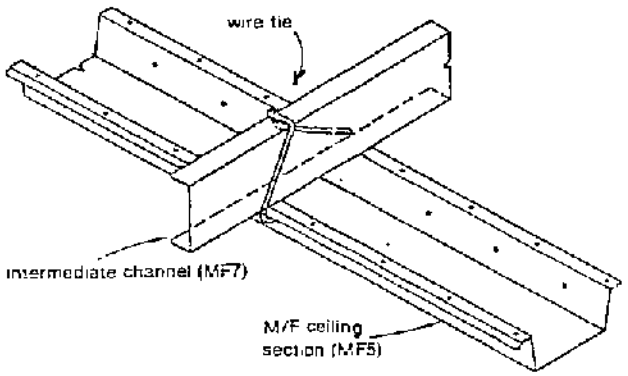
Normalized Impact Sound Pressure Level dB

V66.22 ■ No ceiling

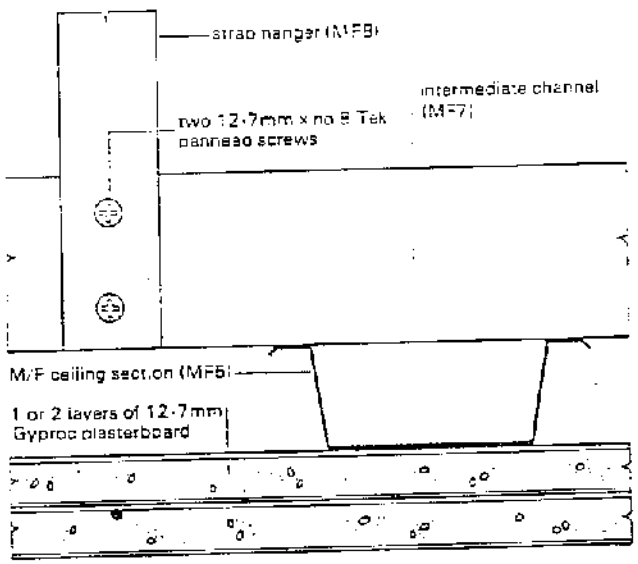
V66.30 o With double layer 12.7 mm wallboard on MF system



General assembly



Fixing M/F ceiling sections to intermediate channels



Typical cross-section

Fig. 1 Gyproc M/F Ceiling Details

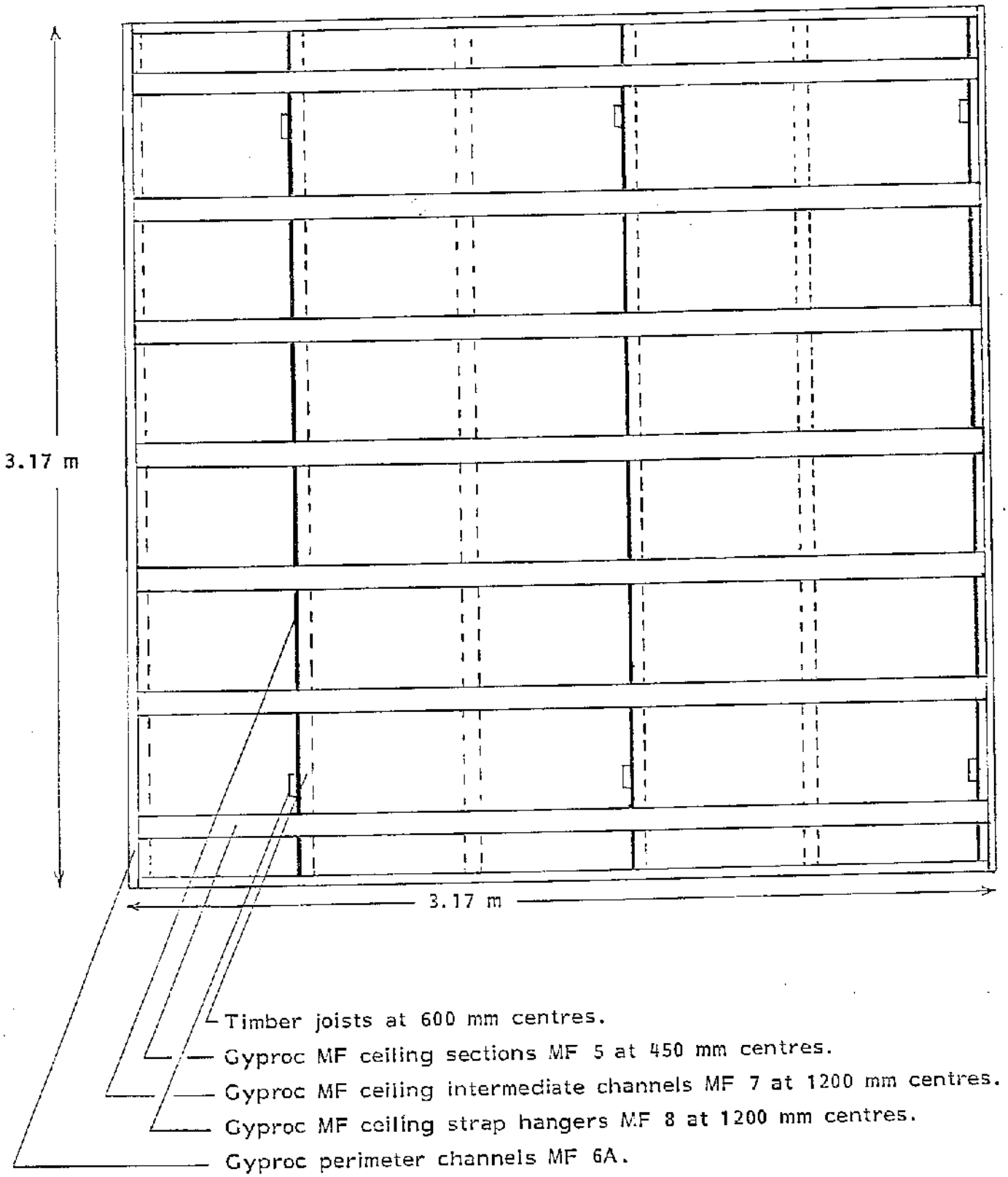


Fig. 2 Schematic Plan of Joist Layout and Gyproc MF Ceiling Grid

APPENDIX 1

VERTICAL TEST SUITE - AIRBORNE SOUND INSULATION

Test method to BS 2750:1980 Part III, ISO 140 Part III and ASTM E90-75. The test rooms are approximately 100 m^3 in volume and the test specimen is 3.16 m x 3.16 m. The level difference at a given 1/3 octave band centre frequency is obtained by measuring the difference in mean sound pressure levels between rooms when one room contains a loudspeaker emitting band limited pink noise. The mean sound pressure level is estimated from the average of the spatial intensities measured within the room. The Sound Reduction Index R for the test specimen is obtained by the addition of the term 10 $\log_{10}$ S/A to the level difference where S is the area of the test specimen and A is the equivalent absorption in the receiving room.

TEST PROCEDURE

With the following test method, the measurement of the sound reduction index of a test specimen meets the requirements of BS 2750:1980 Part II and ISO 140 Part II in terms of repeatability.

Four randomly placed stationary microphones to sample sound pressure levels in each room.

Four reverberation time measurements - at different microphone locations.

The sound reduction index is measured in both directions and the mean result reported.

EXPRESSION OF RESULTS

The Sound Reduction Index R over the 1/3 octave band centre frequency range 100 - 5000 Hz is presented in tabular and graphical form. Four single figure ratings are given; the arithmetic mean of the sixteen spectral vales over the range 100 - 3150 Hz, i.e Mean R, The Weighted Sound Reduction Index R_w evaluated in accordance with BS 5821:1980, the Sound Transmission Class STC evaluated in accordance with ASTM E413 and the single figure rating in dB(A) as used in France.

TEST EQUIPMENT

Norwegian Electronics Sound Insulation Measuring System Type 823 controlled by a Hewlett Packard 9836 microcomputer with Norwegian Electronics Microphone Multiplexers Type 827 with Bruel and Kjaer Type 4166/2619 microphones.

APPENDIX 2

VERTICAL TEST SUITE - IMPACT SOUND INSULATION

Test method to BS 2750:1980 Part VI, ISO 140 Part VI and ASTM E90-75. The test rooms are approximately 100 m^3 in volume and the test specimen is 3.16 m x 3.16 m. The impact sound pressure level at a given 1/3 octave band centre frequency is obtained by measuring the mean sound pressure level in the lower room for several locations of a Bruel and Kjaer Tapping Machine on the test floor above. The mean impact sound pressure level is estimated from the average of the spatial intensities measured within the room for all the tapping machine locations. The Normalized Impact Sound Pressure Level L_n for the test floor is obtained by the addition of the term 10 $\log_{10}$ A/10 to the mean impact sound pressure level where A is the equivalent absorption area in the receiving room.

TEST PROCEDURE

The following test method is expected to give adequate repeatability of the normalized impact sound pressure level of a test floor when the assumption of reasonable homogeneity of impact insulation over the floor is valid.

Four random tapping machine locations over the floor.

For randomly placed stationary microphones to sample sound pressure levels in each room.

Four reverberation time measurements - at different microphone locations.

EXPRESSION OF RESULTS

The Normalized Impact Sound Pressure Level L_n over the 1/3 octave band centre frequency range 100 - 3150 Hz is presented in tabular and graphical form. A single figure rating is given; the Weighted Normalized Impact Sound Pressure Level L_{nw} evaluated in accordance with BS 5821:1980.

TEST EQUIPMENT

Norwegian Electronics Sound Insulation Measuring System Type 823 controlled by a Hewlett Packard 9836 microcomputer with Norwegian Electronics Microphone Multiplexers Type 827 with Bruel and Kjaer Type 4166/2619 microphones. Bruel and Kjaer Type 3204 Tapping Machine.

APPENDIX 3

DESCRIPTION OF MATERIALS

For the addresses of the suppliers of the materials described below see Appendix 4

Gyproc M/F Suspended Ceiling System

Metal suspension grid for fixing one or two layers of Gyproc wallboard to in order to provide a smooth jointless ceiling. Supplied by British Gypsum Ltd.

Gyproc Wallboard

12.7 mm tapered edge Gyproc wallboard (9.4 kg/m^2), 1200 mm x 2400 mm. Gyproc wallboard is a plasterboard drylining panel for internal surfaces manufactured to BS 1230:1970 at British Gypsum's Sherburn-in-Elmet Works. Supplied by British Gypsum Ltd.

Gyproc Screws

Gyproc self-drilling and tapping screws with countersunk Phillips heads. Supplied by British Gypsum Ltd.

Gyproc Joint Filler

Gyproc joint filler is a gypsum based bedding compound for filling joints between Gyproc wallboard. Supplied by British Gypsum Ltd.

Gyproc Joint Tape

A 53 mm wide paper tape used for reinforcing joints between Gyproc plasterboard. Supplied by British Gypsum Ltd.

Gypglas Glass Fibre

80 mm Gypglas 1000 glass fibre mat (12 kg/m^3) in 1200 mm wide roll form. Spun glass fibre supplied by Gyproc Glass Fibre Insulation Ltd.

Webbcryl Acrylic Caulk

Webbcryl acrylic caulk is a water based acrylic sealant. Supplied by ECA Industrial Supplies.

18 mm Flooring grade Chipboard

18 mm flooring grade tongue and groove chipboard manufactured to BS 5669:1979.

APPENDIX 4

ADDRESSES OF MATERIAL MANUFACTURERS/SUPPLIERS

British Gypsum Ltd.,
Ruddington Hall,
Loughborough Road,
Ruddington,
NOTTINGHAM.
NG11 6LX
Tel. 0602 844844

ECA Industrial Supplies,
1 Shipston Hill,
Oadby,
LEICESTER.
Tel. 0533 715530

Gyproc Glass Fibre Insulation Ltd.,
Whitehouse Industrial Estate,
RUNCORN,
Cheshire.
WA7 3DP
Tel. 0928 712627