

REQUIREMENTS FOR TEST ROOMS

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In the measurement of hearing it is necessary to make use of sound isolated rooms to exclude the masking effect of the ambient noise and to establish the best conditions in order to obtain reproducible results. The requirements for the test rooms are dependent on the purpose the rooms shall serve:

- I. Screening audiometry in schools or factories.
- II. Clinical examinations of children and adults.
- III. Scientific research.
- IV. Fitting of hearing aids through a mini-box.

I. Cabins for screening audiometry

In quiet surroundings it may be sufficient to make use of especially big and well fitting head-phones (demonstration). In schools or factories with a considerable noise level it is possible for these short examinations to use transportable prefabricated cabins with no special heating or air-conditioning. They must insulate against vibrations through the floor as well as against air-borne noise, therefore the cabins must be rather heavy and spring or rubber suspended; the door and the window must seal well. The operator is placed with the audiometer in front of the window through which he can follow the patient's reactions.

Especially for examinations of workmen in noisy industries a cabin can be equipped with a certain head-phone constantly giving a 4000 cycles tone with an intensity of 20 db. The workmen then have to check themselves after a schedule and if they cannot hear the tone on each ear separately they have to report for a full pure tone test.

II. Rooms for clinical examinations of children and adults.

Sound isolated rooms for this purpose must be so big that they can take a patient in bed as well as giving space enough for the carrying out of formal and informal hearing tests on small children during play. The rooms must have day-light and air-conditioning with renewal of the volume about 10-15 times per hour; the air-channel being acoustically damped so that it is impossible to hear the ventilator. The room must be insulated from the building through heavy weight and elastic suspension. The walls of the room including door and windows must give an attenuation of 50 db on average ranging from 125-4000cps. It must be possible to operate the test-equipment from an acoustically treated studio in front of the box and follow the patient's reactions

through a window with 3 or 4 layers of rubber-suspended glass; but in examinations of children and ill patients it is necessary to handle the equipment from the room itself in order to have the nearest contact with the patient.

The reverberation time of the room should be about 0,2 sec. and not anechoic; with respect to the fitting of a hearing aid, this corresponds rather closely with the reverberations in a furnished sitting-room.

III. Anechoic chambers for scientific research.

Anechoic chambers are mainly outside the scope of this lecture and further details are omitted due to the shortage of space.

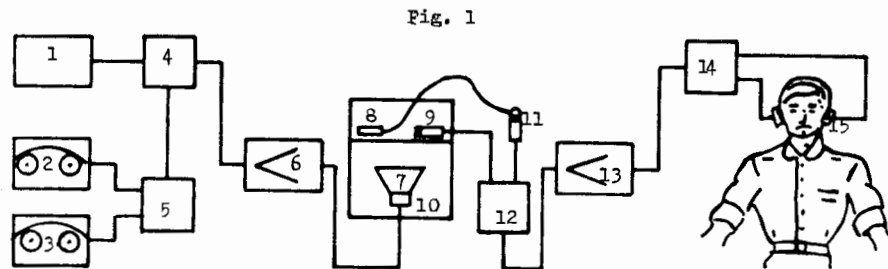
IV. Mini-box for the fitting of hearing aids.

In the so-called "artificial ear", which gives us the frequency response curve of a hearing aid, we use a sound isolated box of which the acoustic characteristics are wellknown. In the frequency range from 100-5000 cps. corresponding to the working range of the hearing aids the measuring results in the mini-box are similar to those obtained in the free field of a big anechoic room.

When we have to examine patients with such a hearing loss that they are not disturbed by the ambient noise it is not necessary to work in a sound isolated room and instead we use the above mentioned mini-box.

In the bottom of the box is placed a loud-speaker which can be fed by pure tones or speech alternately (see figure 1).

First, a pure tone audiogram by air conduction is taken through the box, which is connected with the head-phones. (The values at the different frequencies must be corrected to the international N.P.L.-standard once for



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| 1. Pure tone audiometer. | 8. Hearing aid. |
| 2. Tapé-recorder for numbers. | 9. Condenser microphone. |
| 3. " " " PB-words. | 10. Hearing aid test box (type 4212). |
| 4. Switch for tone and speech audiometry. | 11. Artificial ear. |
| 5. Switch for programme 1 + 2. | 12. Switch for alternately testing with or without hearing aid. |
| 6. Power amplifier. | 13. Amplifier. |
| 7. Loud speaker. | 14. Switch for left and right ear. |
| | 15. Head-phone. |

ever). Then the speech reception threshold and the speech discrimination score is stated through the box and the headphones on each ear separately.

Finally a hearing aid is placed in the mini-box on a certain tone setting and volume, and the receiver is placed in the 2 ccm coupler and switched to either ear alternately. Now when the loud-speaker in the bottom of the box is fed by pure tones from the audiometer, the different frequencies are amplified by the hearing aid and we get the patient's pure tone audiogram through the hearing aid and we are able to state the selective amplification at the various frequencies related to the patient's actual hearing loss.

The speech reception threshold and the discrimination score are discovered through the hearing aid in the mini-box, and it is possible to select the hearing aid with the tone setting and the volume which gives optimal results.

DES CONDITIONS NECESSAIRES POUR DES SALLES D'EXAMEN

Pour les examens en masse dans des écoles et des usines on peut utiliser des cabines insonores transportables, qui doivent être lourdes et placées sur des ressorts en vue d'isoler contre des vibrations des bâtiments. Dans des industries à niveau de bruit nuisible on utilise une cabine insonore avec un téléphone qui donne continuellement un ton de 4000 cps et d'intensité de 20 db, les ouvriers doivent alors contrôler eux-mêmes s'ils peuvent entendre le ton à chaque oreille séparément.

Pour l'usage clinique on construit des pièces insonorisées, régulières, de dimension non pas inférieure à 3×3 mètres. Les pièces doivent avoir de la lumière du jour et être munies d'air-conditioning et isolées du reste du bâtiment par un grand poids et une suspension élastique. Les portes et les fenêtres doivent donner une atténuation d'au moins 50 db en moyenne aux fréquences 125-4000 cps. L'écho ne doit pas dépasser 0,2 secondes.

Pour les recherches scientifiques on utilise de grandes pièces an-échoïques qui doivent avoir une isolation maximum contre des sons venant du dehors.

Des écouteurs miniatures pour l'épreuve d'appareils acoustiques peuvent être employés dans les cas où il s'agit d'examen de personnes si dures d'oreille que le bruit de l'arrière-plan est sans importance. Le box insonorisé de l'oreille artificielle a des propriétés acoustiques bien définies, et ce box est introduit entre le malade et l'audiomètre. D'abord on procède à l'audiométrie tonale et vocale par l'intermédiaire du box **sans** appareil acoustique et ensuite **avec** appareil acoustique à réglage de ton et d'intensité différent.

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