

NRC Publications Archive Archives des publications du CNRC

Noise produced by brakes on Toronto subway trains Northwood, T. D.

For the publisher's version, please access the DOI link below. / Pour consulter la version de l'éditeur, utilisez le lien DOI ci-dessous.

Publisher's version / Version de l'éditeur:

<https://doi.org/10.4224/20338178>

Report (National Research Council of Canada. Division of Building Research); no. DBR-R-49, 1954-10-01

NRC Publications Archive Record / Notice des Archives des publications du CNRC :

<https://nrc-publications.canada.ca/eng/view/object/?id=e6e7245a-e4a7-4446-868f-627569026b1c>

<https://publications-cnrc.canada.ca/fra/voir/objet/?id=e6e7245a-e4a7-4446-868f-627569026b1c>

Access and use of this website and the material on it are subject to the Terms and Conditions set forth at

<https://nrc-publications.canada.ca/eng/copyright>

READ THESE TERMS AND CONDITIONS CAREFULLY BEFORE USING THIS WEBSITE.

L'accès à ce site Web et l'utilisation de son contenu sont assujettis aux conditions présentées dans le site

<https://publications-cnrc.canada.ca/fra/droits>

LISEZ CES CONDITIONS ATTENTIVEMENT AVANT D'UTILISER CE SITE WEB.

Questions? Contact the NRC Publications Archive team at

PublicationsArchive-ArchivesPublications@nrc-cnrc.gc.ca. If you wish to email the authors directly, please see the first page of the publication for their contact information.

Vous avez des questions? Nous pouvons vous aider. Pour communiquer directement avec un auteur, consultez la première page de la revue dans laquelle son article a été publié afin de trouver ses coordonnées. Si vous n'arrivez pas à les repérer, communiquez avec nous à PublicationsArchive-ArchivesPublications@nrc-cnrc.gc.ca.

NOT FOR PUBLICATION

NATIONAL RESEARCH COUNCIL
CANADA
DIVISION OF BUILDING RESEARCH

NOISE PRODUCED BY BRAKES ON TORONTO SUBWAY TRAINS

by T.D. Northwood

ANALYZED

Prepared for the Toronto Transportation Commission

Report No. 45
of the
Division of Building Research

Ottawa
October 1954

PREFACE

As a part of its work with the Toronto Transportation Commission on the construction of the new subway, the Division of Building Research of the National Research Council has been glad to assist with studies of vibrations and sound prior to and following the start of train operations. This brief report by Dr. T. D. Northwood, Head of the Building Physics Section of DBR, is a contribution to these studies.

Ottawa
October 1954

Robert F. Legget
Director

Noise Produced by Brakes on Toronto Subway Trains

by T. D. Northwood

The primary purpose of this report is to compare two types of brake shoes in current use on the Toronto Rapid Transit system. For comparison, some earlier measurements on the original British brake shoes are also included.

Measurements were made with a Scott Type 410 Sound Level Meter, operating on the C Network (flat frequency response). At the levels involved here the human ear has flat frequency response also, and the data may be interpreted as sound pressure levels (in decibels) or loudness levels (in phons). No more refined measurement seemed warranted, in view of various uncontrollable factors affecting the tests.

Two special trains were studied in detail. One of these was fitted with brake shoes made of an asbestos composition, and the other with "Diamond-S" cast-iron shoes. The latter is now standard equipment on all but the one composition-shoe train. The two trains were operated by T.T.C. inspectors, who were instructed to adhere to a standard braking routine. This was done as far as service conditions permitted.

Measurements were taken inside each train and also on a station platform as each train arrived. Measurements inside the trains were made with communicating doors and nearby windows closed. It was found that an occasional open window beyond about ten feet did not significantly affect the readings.

The readings obtained on the special Diamond-S train agreed generally with the readings taken on about a dozen similar trains, and these are all included in the average values reported. Unfortunately the one train wearing composition shoes was available for only about two hours, including the rush-hour period, but it is believed that the brake noise observations obtained adequately represent normal operating conditions.

Observations

1. Train equipped with composition brake shoes

(a) Inside southbound train (lightly loaded, normal speeds)

Level at maximum speed.....92 db.
Gradual decrease in level as brakes applied.

(b) Inside northbound train (heavily loaded, reduced speed)

Level at maximum speed90 db.
Maximum level, during braking93 db.

(c) St. Clair Station, middle of west platform, train southbound

Maximum level90 db.

Comments: There was practically no discernible brake noise, generally, on this train. The noise observed during braking on the northbound trip was a low-pitched rumble suggestive of a slightly flattened wheel rather than simply brake noise.

2. Trains equipped with Diamond-S shoes

(Measurements are average for about a dozen trains, including the specially operated train.)

Results:

(a) Inside southbound trains, lightly loaded

Level at maximum speed 95 db.
Maximum level during braking ... 97 db.

(b) Inside northbound train, half loaded

Level at maximum speed 90 db.
Maximum level during braking ... 93 db.

(c) St.Clair Station, middle of west platform

Average maximum level 95 db.

Comments: Brake noise was mainly an unpitched hissing sound, with occasional slight squeals that did not add significantly to the overall noise level.

3. Trains equipped with original British brake shoes

(Average of readings taken in February and March, 1954)

St. Clair Station, middle of
west platform 98 db.

Comments: Brake noise consisted of a high-intensity squeal, generally sustained throughout the braking operation.

Conclusions

1. The worst noise problem of the original subway trains was the squealing brakes. Both Diamond-S and composition brake shoes are substantial improvements, in that they have eliminated the intense sustained squeal characteristic of the original equipment. The train equipped with composition shoes was significantly quieter than those wearing Diamond-S shoes, producing little brake noise of any kind.
2. It was observed that the train fitted with composition shoes was slightly quieter, not merely during braking, but under all conditions of operation. It has been suggested that

this is related to the special brake shoes. One might speculate that such a relationship is possible; for example the composition brakes may wear the wheels differently than Diamond-S brakes and thus produce a quieter running surface. However, a few observations on only one train are not adequate to settle the matter.