GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION
SPONSORED PROJECT INITIATION

Date: 3/1/78

Project Title: Sawmill Services

Project No: A-2106

Project Director: W. N. Craig

Sponsor: St. Regis Paper Co.

Agreement Period: From 2/6/78 Until 2/28/78

Type Agreement: Ltr. dtd. 2/6/78

Amount: $200

Reports Required: As requested.

Sponsor Contact Person (s):

Technical Matters

Bob Willis
Waycross Resident Mgr.
(912)285-8282

Contractual Matters
(thru OCA)

W. M. Coleman
Special Projects Manager
St. Regis Paper Co.
P. O. Box 26324
Jacksonville, FL 32218
(904)751-0900

Defense Priority Rating:

Assigned to: Technology & Development Laboratory (School/Laboratory)

COPIES TO:

Project Director
Division Chief (EES)
School/Laboratory Director
Dean/Director–EES
Accounting Office
Procurement Office
Security Coordinator (OCA) ✓
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Library, Technical Reports Section
EES Information Office
EES Reports & Procedures
Project File (OCA)
Project Code (GTRI)
Other _____

CA–3 (3/76)

GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION

SPONSORED PROJECT TERMINATION

Date: May 30, 1978

Project Title: Sawmill Services

Project No: A-2106

Project Director: W. N. Craig

Sponsor: St. Regis Paper Co.

Effective Termination Date: 3/7/78

Clearance of Accounting Charges: All Clear

Grant/Contract Closeout Actions Remaining:

TERMINATED

X Final Invoice ~~XXXXXXXXXXXXXXXX~~

_ Final Fiscal Report

_ Final Report of Inventions

_ Govt. Property Inventory & Related Certificate

_ Classified Material Certificate

_ Other _____

Assigned to: Technology & Development Laboratory (School/Laboratory)

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Project Director
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Project File (OCA)
Project Code (GTRI)
Other _____

CA-4 (3/76)

ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE OF TECHNOLOGY

Economic Development Laboratory

Central Georgia Branch
1818 Forsyth Street
Suite 112
P.O. Box 5105
Macon, Georgia 31208
912–744–6190

March 7, 1978

St. Regis Paper Company,
Allied Operations
P. O. Box 26324
Jacksonville, Florida 32218

Attention: Mr. Mark Coleman

Dear Mark:

Enclosed is a brief report on the noise measurements taken at your Waycross Mill on Friday, February 24, 1978. The measurements were confined primarily to two areas, the trim saw operator station and the open area on the ground between the sawmill building and the maintenance shop building. The noise level in these two areas generated by the 48" disk chipper was the subject of the investigation.

As the report and the records show, noise during normal sawmill operations at the trim saw operator station is primarily caused by the trim saws. Once this fact was determined, the question became whether or not relocation of the chipper is justified by noise levels outside the sawmill building. I concluded that the chipper noise problem is of sufficient magnitude to warrant relocation.

If after reviewing the report you have any questions, please contact me.

Sincerely

William N. Craig, Jr., Director
Central Georgia Area Office

WNCJr:msz

Enclosures

cc: Mr. Robert O. Willis
bc: Mr. Sherman L. Dudley

NOISE MEASUREMENT TEST REPORT

48" DISK CHIPPER
WAYCROSS SAWMILL

ST. REGIS PAPER COMPANY
ALLIED OPERATIONS

Test Conducted By: W. N. Craig, Jr.
Test Date: February 24, 1978

NOISE MEASUREMENT TEST REPORT
48" DISK CHIPPER, WAYCROSS SAWMILL,
ST. REGIS PAPER COMPANY

Description of Operation

The Waycross Sawmill produces lumber and veneer logs from pine timber. Logs are first cut to length depending on whether they are to be veneer logs or saw logs. The saw logs are conveyed into the sawmill and are cut into 2" thick lumber. The lumber is trimed to various lengths by a multiple blade trim saw. The slabs are cut into 2' sections by the same trim saw. The trimings, which may be up to 2' in length, and the cut up slabs are dropped onto a conveyor and fed into a chipper. The chips are run through a cyclone separator, a sizing screen, and then loaded into rail cars. Oversized material from the sizing screen is fed back into the chipper.

The chipper is a top-feed 48" chipper. It has six knives and runs at 900 rpm. It is located at the inside corner of the L-shaped building housing the sawmill operation. The spout of the chipper is pointed at one wall of the sawmill building. The trim saw operator station is directly inside this section of the wall. The building, which is elevated 8 to 10' above the ground, has two personnel doors opening into the area where the chipper is located. Also in the area is a maintenance shop with a covered open-sided work area attached. On the test date two maintenance people were working in the open area between the chipper and the maintenance shop and another was welding under the sawmill building beneath the double equipment doors.

Objective

The objective of these tests was to determine the noise levels generated by the chipper at the trim saw operator station and in the open area between the sawmill building and the maintenance shop.

Instruments

The following instruments were used to perform the tests:

Bruel & Kjaer Precision Sound Level Meter, Type 2209
Bruel & Kjaer Octave Filter Set, Type 1613
Bruel & Kjaer Graphic Level Recorder, Type 2306
Bruel & Kjaer Tunable Band-pass Filter, Type 1621
Bruel & Kjaer ½" Microphone, Type 4165
Bruel & Kjaer Pistonphone Calibrator, Type 4420
DuPont Audio Dosimeter, Type D100
DuPont Audio Dosimeter Readout, Type R150
Quest Sound Level Meter, Type 211A
Quest Sound Calibrator, Type CA12

Calibration of the equipment was checked prior to and after the test. Calibration of the DuPont Audio Dosimeter was not checked.

Procedure and Results of Tests

The Bruel & Kjaer equipment was first set up at the trim saw operator station. An octave band analysis (Record No. 2) was performed with all the equipment on, but with no lumber going into the trim saws or into the chipper. The overall A-weighted level was 96-98 dB under these conditions.

Record No. 3 is a narrow band analysis of the noise from the chipper. The measurement was taken during the lunch break at the trim saw operator station. It shows an A-weighted level of 91 dB and shows, as predicted, that the chipper noise in a no load condition is composed mainly of the blade passage frequency (90 hz) and its harmonics.

Record No. 4 and Record No. 5 are time histories of the noise at the trim saw operator station. These two records are the most significant in assessing the contribution of the chipper to the overall noise at the trim saw operator station. Record No. 4 covers the start up of operation after the lunch period. Wood scraps were being dropped onto the conveyor feeding the chipper. The noise from the actual chipping was 98-99 dB(A) as compared to 91 dB(A) for the chipper in a no load condition.

As the conveying equipment and saws were turned on after lunch, the noise floor went from 91 to about 96-98. The highest noise levels shown on Record No. 4 in the area marked "normal operation" were caused by the trim saw and were between 100 and 103 dB(A).

Record No. 5 shows a comparison of the saw noise and chipper noise at the trim saw operator station. To make this comparison, a single slab was conveyed into the trim saw, cut into pieces, and subsequently chipped. No other lumber was allowed to enter the trim saw until this test cycle was completed. As the graph shows, the saw noise measured at the trim saw operator station was about 3 dB higher than the chipper noise.

Record No. 6 is a narrow band analysis of the noise of normal operation measured at the trim saw operator station. It also has a short time history of the overall A-weighted noise level at the end of the record.

Record No. 7 includes an afternoon precalibration record, a narrow band analysis of the chipper noise, and a short time history of the A-weighted chipper noise. The measurement was taken outside approximately 30' from each wall of the sawmill building. Record No. 7 shows the normal operation of the chipper causes a noise level in this area of 95 to 97 dB(A).

An additional record, which is not included in this report, identifies the pneumatic cylinder exhaust at the sawmill in-feed deck kickers as another problem noise source.

Finally, an audio dosimeter was used for about an hour to estimate personnel noise exposure in the open area between the sawmill building and the maintenance shop. Percent of daily allowable exposure was found to be 51%. This dosimeter test cannot be considered reliable by itself, since the calibration was not checked.

Conclusions and Recommendations

In the sawmill the primary noise sources are the trim saws and the lumber conveyors. The chipper is also an important noise source, but is predominant only when the other equipment is not running. Consequently, relocation of the chipper will have minor affect on the noise levels at the trim saw operator station unless noise from the conveyors and trim saws is first treated. If the trim saw noise problem is taken care of, relocation of the chipper would also be required to attain acceptable noise levels at the trim saw operator station.

The chipper noise problem in the open area between the sawmill building and the maintenance shop can be essentially eliminated by relocation of the chipper to the west side of the sawmill building. This area is a particularly important area for several reasons. First, maintenance and cleanup personnel work in the area a great deal of the time. Second, the building geometry and chipper orientation aggravate the noise problem because of reflected sound. Third, everyone entering the sawmill is exposed to the chipper noise.

Finally, relocation of the chipper is technically justified for the following reasons:

(1) Chipper noise exposure, as indicated by the readings of the sound level meter and the audio dosimeter, exceed limits for personnel in the area between the sawmill and the maintenance shop. Admittedly the dosimeter calibration was uncertain and the dosimeter test was only of short duration, but the dosimeter is new and the readings taken with the sound level meter support the contention that the dosimeter accuracy is good enough to indicate a problem exists. (Allowing an error of + 100% still would indicate exposure in excess of allowable limits.)

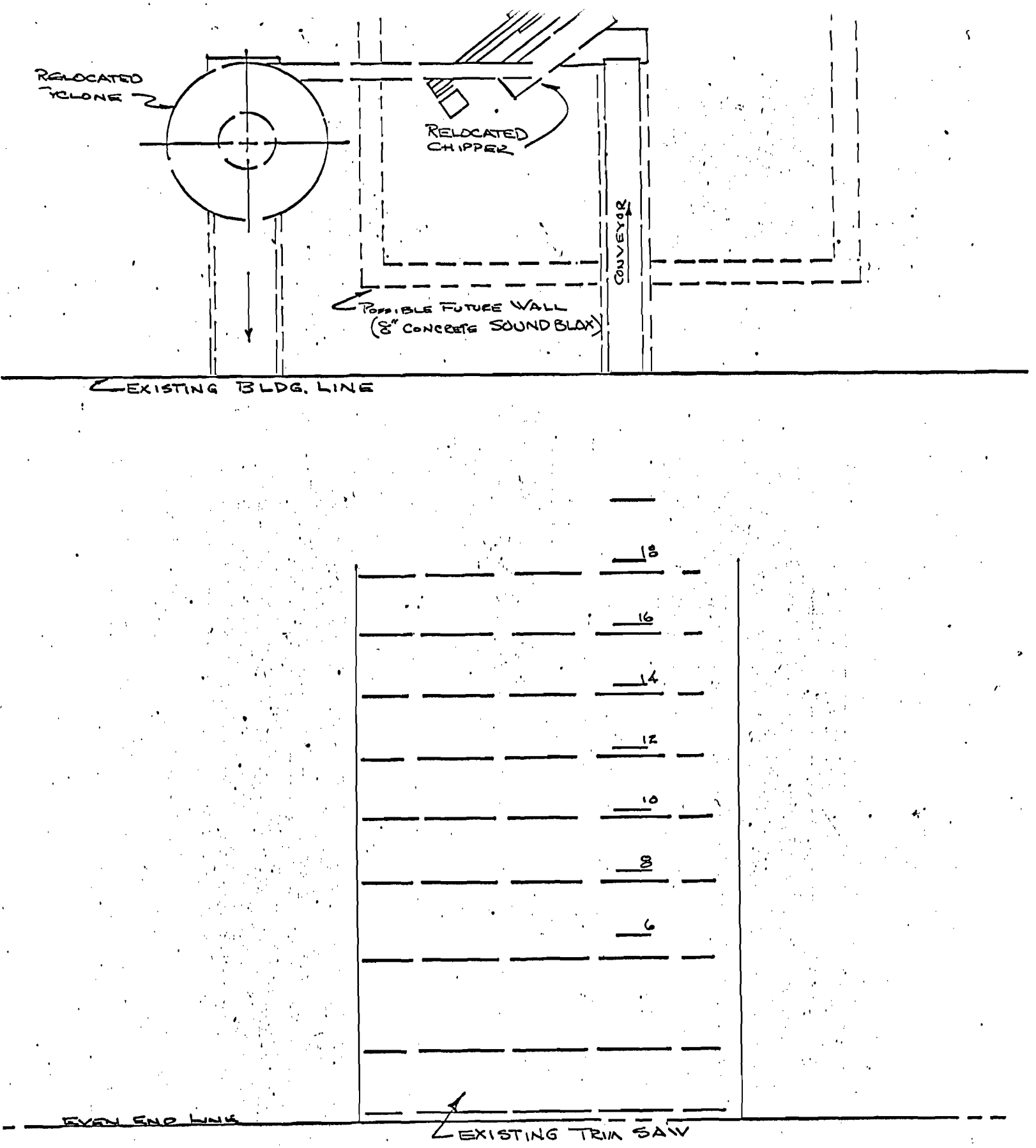
(2) The chipper noise contributes to the noise problem at the trim saw operator station and any work to eliminate the problem at this location will require relocation or acoustical treatment of the chipper.

(3) The proximity of the chipper to the sawmill building personnel doors adds to the daily noise exposure to employees entering or leaving the building and draws the attention of visitors to the chipper noise problem.

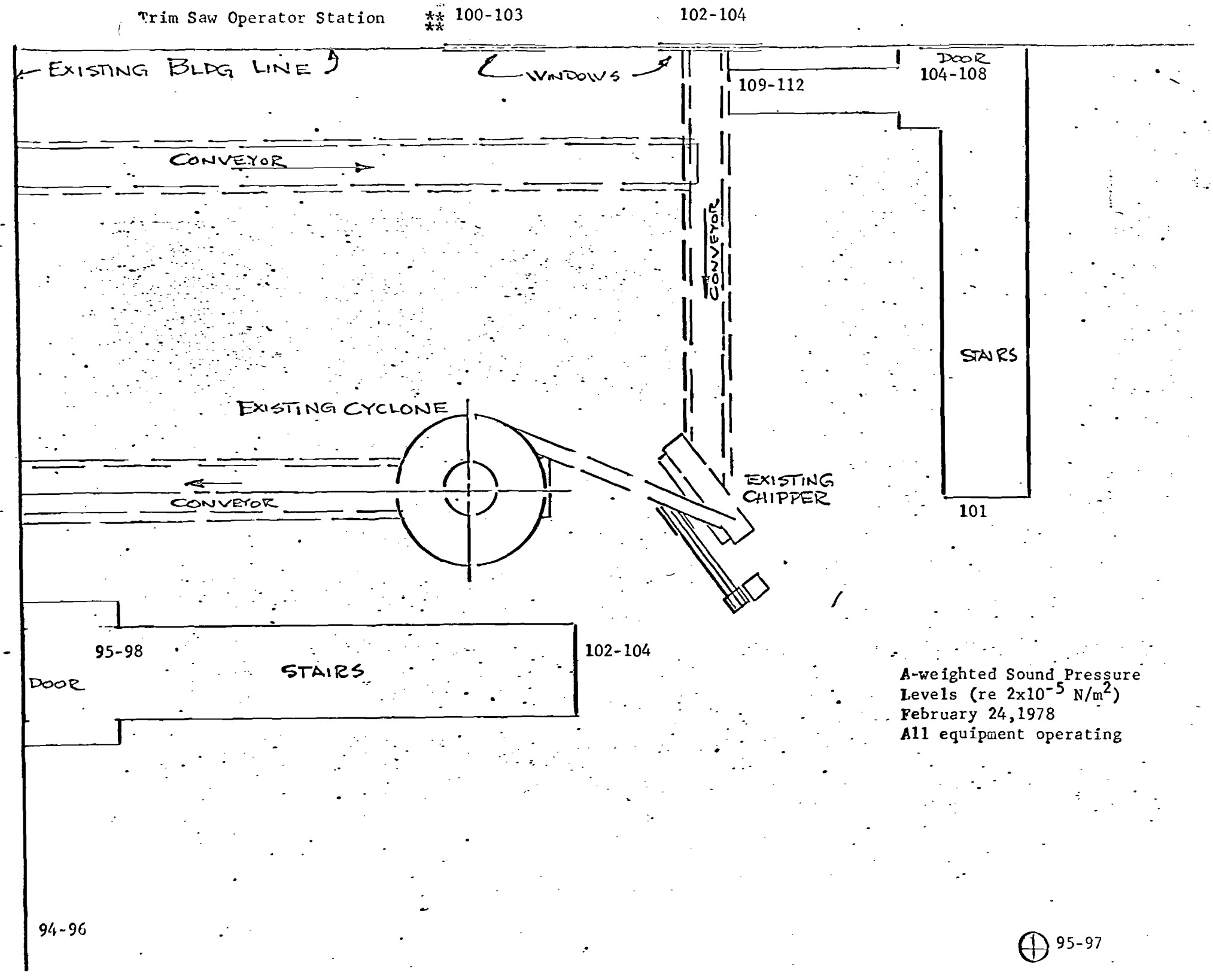
Therefore, the chipper should be relocated to the west side of the sawmill building as shown in the attached drawing. If at all possible, it should be oriented with the spout pointing parallel to the west wall of the sawmill building as shown in the drawing. This relocation will require extending the chipper in-feed conveyor and reversing its drive motor. Additionally, the cyclone would also be relocated and an additional conveyor line added to carry chips to the screen.

The drawing also shows a possible enclosure constructed of 8" concrete SOUNDBLOX and doors of HERCO panels. If the chipper cannot be oriented as shown and the chipper spout must be pointed toward the sawmill building, a barrier wall should be built between the chipper and the sawmill building. This wall should be built of SOUNDBLOX. If adjacent property owners complain about the chipper noise, the enclosure may be required. A possible alternative to building a complete barrier is to construct the wall between the building and the chipper and a second wall where the drawing shows the enclosure doors. Access would be provided by not constructing either end wall.

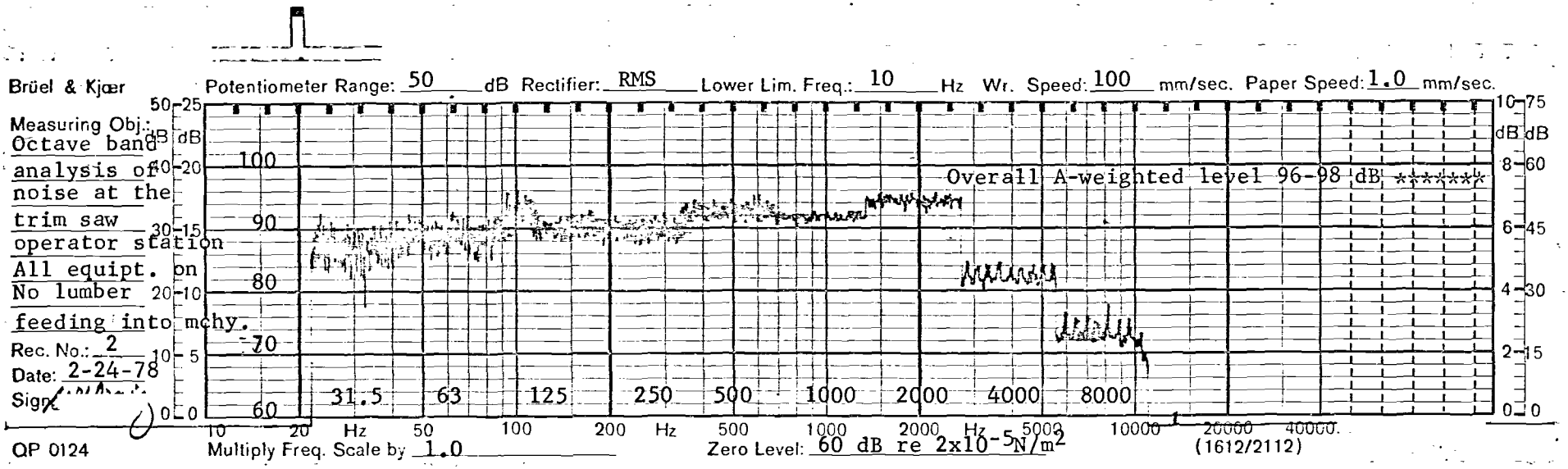
A final recommendation is that exhaust mufflers be installed on the in-feed deck kickers.

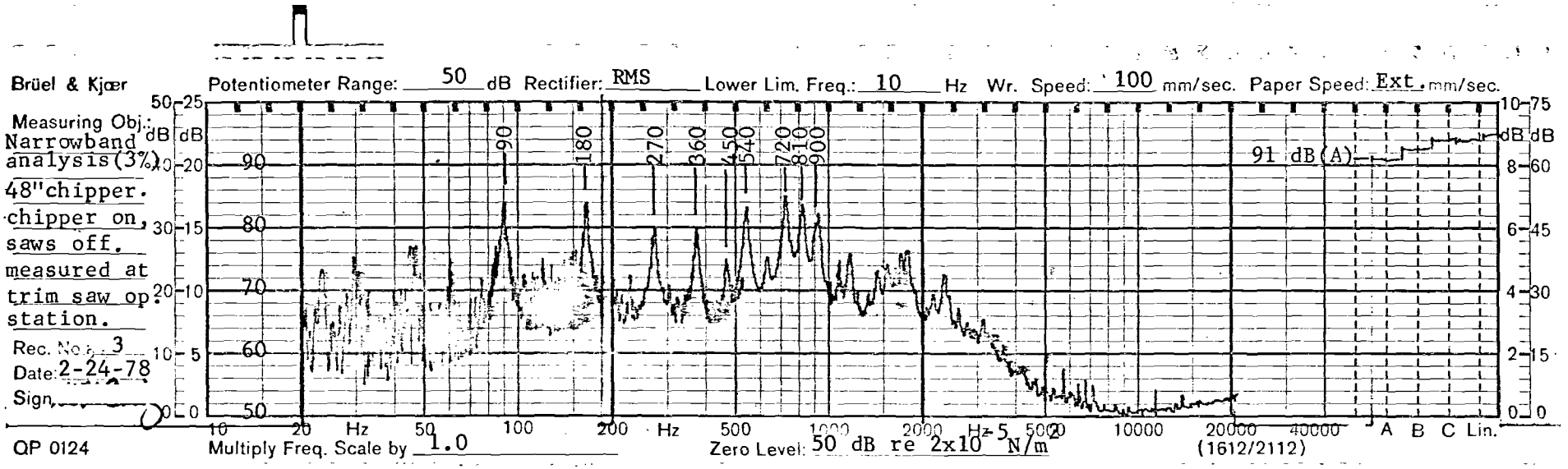


PROPOSED CHIPPER RELOCATION



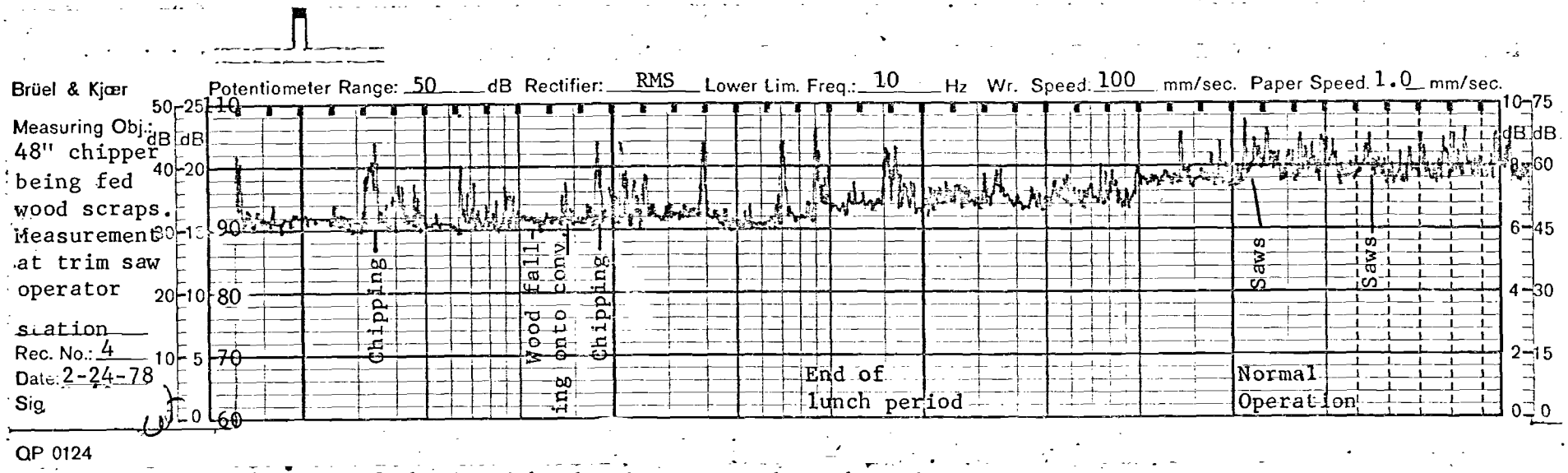
A-weighted Sound Pressure Levels (re 2×10^{-5} N/m^2)
February 24,1978
All equipment operating


Brüel & Kjær
Potentiometer Range: 50 dB Rectifier: RMS Lower Lim. Freq.: 10 Hz Wr. Speed: 100 mm/sec. Paper Speed: 1.0 mm/sec.
Measuring Obj.: Octave band analysis of noise at the trim saw operator station All equipt. on No lumber feeding into mchy.
Rec. No.: 2
Date: 2-24-78
Sign
Overall A-weighted level 96-98 dB ******
100
90
80
70
60
31.5
63
125
250
500
1000
2000
4000
8000
dB
Hz
Multiply Freq. Scale by 1.0
Zero Level: 60 dB re 2x10-5N/m2
(1612/2112)
QP 0124



Description: 48" Top-feed Disk Chipper
6 Knives
Speed: 900 RPM
Manufacturer: Bush

This is a narrow band analysis of chipper noise with the chipper running but with no wood going into the chipper. Measurement was made at the trim saw operator station.

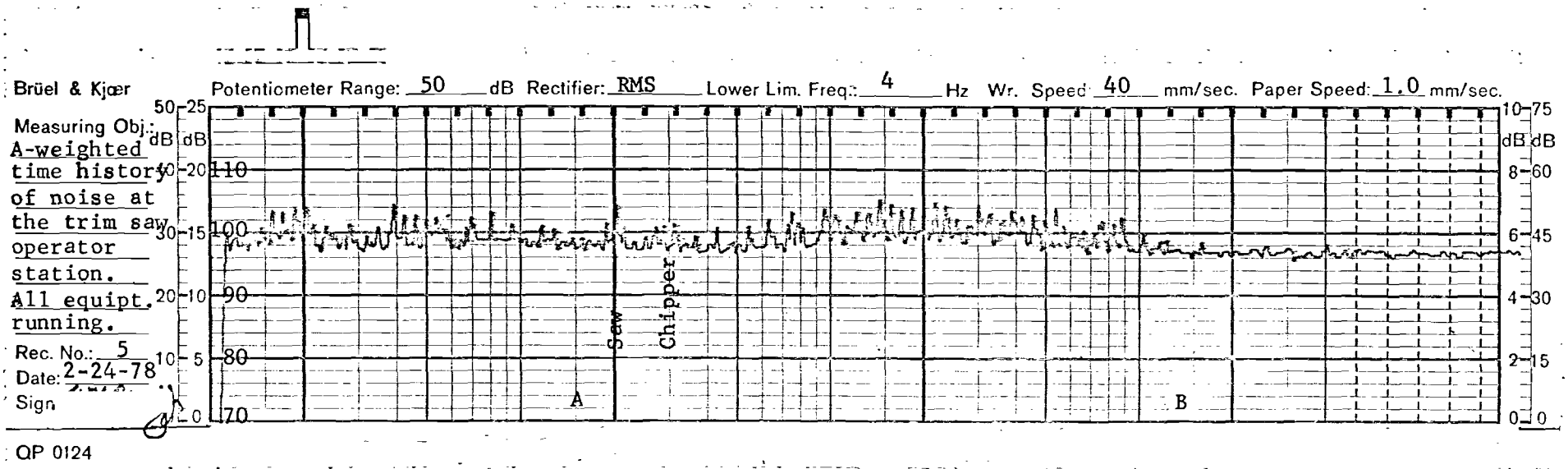


Time history of the A-weighted noise measured at the trim saw operator station. The zero level of the record equals 60 dB re $2 \times 10^{-5} N/m^2$.

The first half of the record shows that the chipper noise is approximately 91 dB(A) when no wood is going into the chipper. The noise level rises to 98-99 dB(A)* when the machine is actually chipping. The higher level spikes occur when wood entered the chipper. (Wood scraps were loaded by hand onto the infeed conveyor.)

As afternoon operations begin, the noise "floor" rises as the chain conveyors and saws are turned on. The peaks in the record of normal operation are caused by the sawing of the wood. The noise of the chipper is masked by the saw noise.

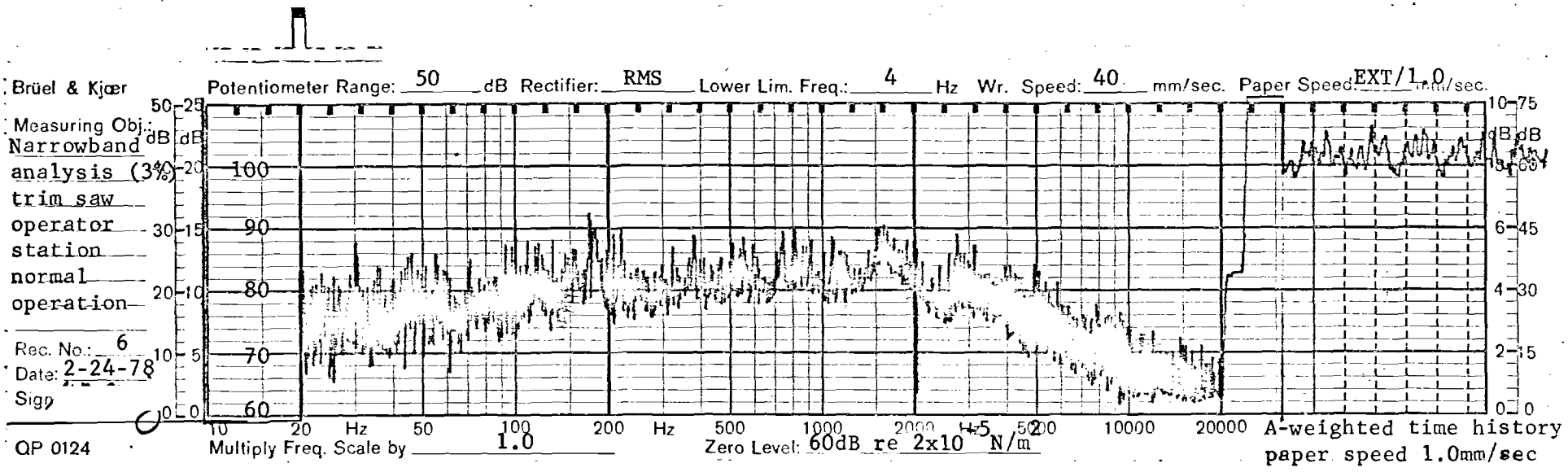
* The noise of the chipper (98-99 dB(A)) was read directly from the SLM set on "SLOW". The record reads higher because of the GLR's writing speed.

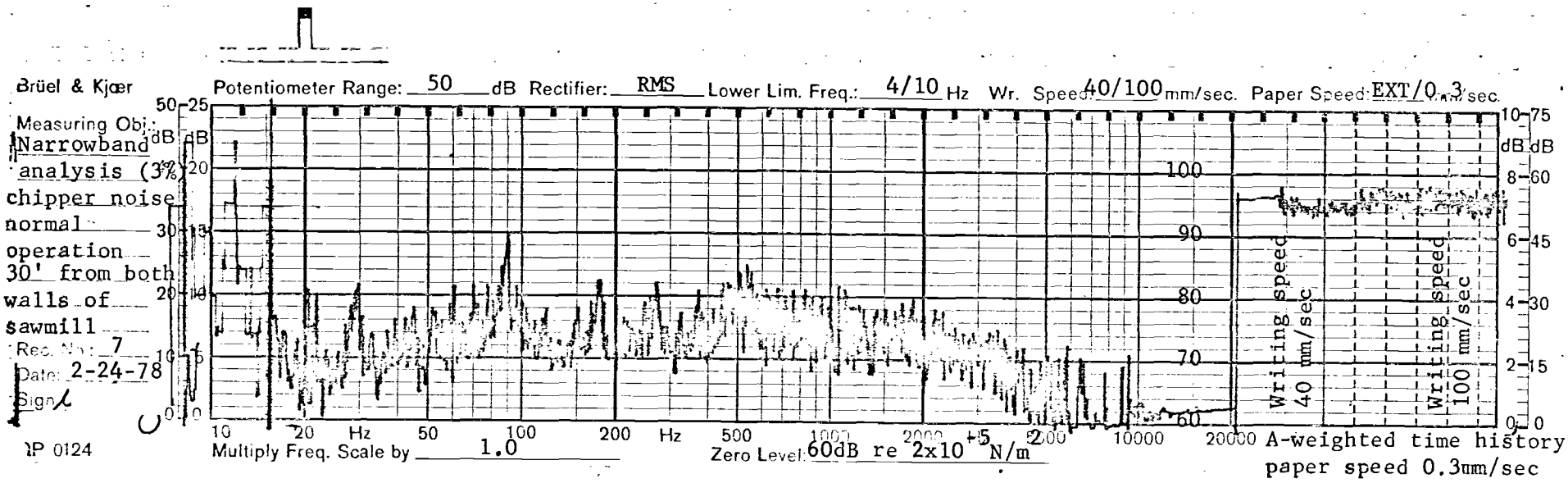


Time history of the A-weighted noise measured at the trim saw operator station. The zero level of the record equals 70dB re 2×10^{-5} N/m^2.

The record shows the noise at the trim saw operator station from the trimming and chipping operation. At point A on the record, the operator allowed only one slab to be trimmed and chipped by itself to compare saw with chipper noise. The saw noise reached 104 dB(A) while the chipper noise reached 101 dB(A).* From point B to the end of the record, all equipment was running but the lumber was not being fed into the saws or chipper.

* The levels on the record read higher than than the levels read directly from the sound level meter on "SLOW" response. This is due to the differences between the recorder's writing speed and the meter's averaging time. Meter readings for the saw and chipper noise were 101 and 98 db(A) respectively.


Brüel & Kjær
Potentiometer Range: 50 dB Rectifier: RMS Lower Lim. Freq.: 4 Hz Wr. Speed: 40 mm/sec. Paper Speed: EXT/1.0 mm/sec.
Measuring Obj.:
Narrowband analysis (3%)
trim saw operator station normal operation
Rec. No.: 6
Date: 2-24-78
Sig
dB
100
90
80
70
60
10 20 Hz 50 100 200 Hz 500 1000 2000 5000 10000 20000
QP 0124
Multiply Freq. Scale by 1.0
Zero Level: 60dB re 2x10 N/m
A-weighted time history
paper speed 1.0mm/sec


Brüel & Kjær
Potentiometer Range: 50 dB Rectifier: RMS Lower Lim. Freq.: 4/10 Hz Wr. Speed: 40/100 mm/sec. Paper Speed: EXT/0.3 sec.
Measuring Obj.:
Narrowband analysis (3%) chipper noise normal operation 30' from both walls of sawmill
Rec. No.: 7
Date: 2-24-78
Sign
50 25 dB dB
30 20
20 10
10 5
0 0
10 20 Hz 50 100 200 Hz 500 1000 2000 5000 10000 20000
100 90 80 70 60
Writing speed 40 mm/sec
Writing speed 100 mm/sec
10 75 dB dB
8 60
6 45
4 30
2 15
0 0
Multiply Freq. Scale by 1.0
Zero Level: 60dB re 2x10 N/m
A-weighted time history
paper speed 0.3mm/sec
P 0124