POLLUTION CONTROL BOARD

NOTICE OF PROPOSED RULES

1) Heading of Part: Measurement Procedures for the Enforcement of 35 Ill. Adm. Code 900 & 901

2) Code Citation: 35 Ill. Adm. Code 910

3)

Section Numbers:	Proposed Action:
910.100	New Section
910.102	New Section
910.103	New Section
910.104	New Section
910.105	New Section
910.106	New Section
910.107	New Section
910.APPENDIX A	
910.TABLE A	New Section
910.TABLE B	New Section
910.TABLE C	New Section
910.TABLE D	New Section

4) Statutory Authority: 415 ILCS 5/25 and 27.

5) A Complete Description of the Subjects and Issues Involved: This rulemaking is explained in more detail in the Board's first notice opinion and order of March 17, 2005, R03-09, available from the address in item 11 below. The Illinois Pollution Control Board opened this rulemaking to update Parts 901 and 910 of its noise regulations found in 35 Ill. Adm. Code Subtitle H. As no one proposed updates to the Board since 1987, many of the sound measurement definitions and techniques in the Board's existing rules do not reflect present scientific standards. This is the second publication of first notice for this rulemaking; the Board withdrew its initial proposal (published on July 25, 2003 at 27 Ill. Reg. 11989) after determining that additional hearings should be held in the noise rulemakings in order to address issues that have been raised in public comments.

The proposed new Part 910 sets forth the measurement procedures for enforcing the Board's noise standards in Parts 900 and 901. These procedures are essentially based upon the Illinois Environmental Protection Agency's noise measurement protocols at 35 Ill. Adm. Code 951. In addition to the measurement techniques, the proposal contains general requirements and specific instrument requirements. The proposed Appendix A includes tables (obtained from extensive measurements) that can be used to determine the

long-term background ambient noise levels in instances where direct measurements cannot be made.

6) Will this proposed rule replace any emergency rule currently in effect? No

7) Does this rulemaking contain an automatic repeal date? No

8) Does this proposed rule contain incorporations by reference? No, but this rule does reference materials incorporated by reference at 35 Ill. Adm. Code 900.106.

9) Are there any other proposed amendments pending on this Part? No

10) Statement of Statewide Policy Objectives: These proposed amendments do not create or enlarge a State mandate as defined in Section 3(b) of the State Mandates Act [30 ILCS 805/3 (1992)].

11) Time, Place, and Manner in which interested persons may comment on this proposed rulemaking: The Board will accept written public comment on this proposal for a period of 45 days after the date of this publication. Comments should reference Docket R03-09 and be addressed to:

Dorothy M. Gunn, Clerk
Illinois Pollution Control Board
James R. Thompson Center
100 W. Randolph St.
Suite 11-500
Chicago IL 60601

Address all questions to Marie Tipsord, at 312/814-4925 or tipsorm@ipcb.state.il.us.

Request copies of the Board's opinion and order in Docket R03-09 from Dorothy M. Gunn, at 312-814-3620, or download from the Board's Web site at www.ipcb.state.il.us.

12) Initial Regulatory Flexibility Analysis:

A) Types of small businesses affected: Any small business that engages in noise consulting or that emits noise beyond the boundaries of its property may be affected by this proposal.

B) Reporting, bookkeeping or other procedures required for compliance: No changes in the reporting, bookkeeping or other procedures will be required for compliance with this proposal.

C) Types of professional skills necessary for compliance: Compliance with this proposed rulemaking may require the services of a professional noise consultant to determine whether any noise it emits beyond the boundaries of its property violates these standards.

13) Regulatory agenda on which this rulemaking was summarized: January 2005

The full text of the Proposed Rules begins on the next page:

1ST NOTICE VERSION

JCAR350910-050525R01

TITLE 35: ENVIRONMENTAL PROTECTION
SUBTITLE H: NOISE
CHAPTER I: ILLINOIS POLLUTION CONTROL BOARD

PART 910
MEASUREMENT PROCEDURES FOR THE ENFORCEMENT
OF 35 ILL. ADM. CODE 900 & 901

Section

AUTHORITY: Implementing and authorized by Sections 25 and 27 of the Environmental Protection Act [415 ILCS 5/25 and 27]

SOURCE: Adopted at 29 Ill. Reg. _____, effective_____.

Section 910.100 General

This Part specifies the instrumentation to be used when conducting acoustical noise measurements and sets forth the specific acoustical measurement techniques to be employed when conducting time-averaged sound level (L_{eq}) measurements. The instrumentation requirements and measurement techniques as more specifically set forth in this Part must be used in determining whether a noise source is in compliance with 35 Ill. Adm. Code 900 and 901.

Section 910.102 Instrumentation

a) Sound Measuring Equipment

1) An integrating sound level meter used alone or used in conjunction with an octave-band or 1/3 octave-band filter set or a real-time sound analyzer (octave-band or 1/3 octave-band) must conform with the following standards incorporated by reference at 35 Ill. Adm. Code 900.106:

A) ANSI S1.4 – 1983 (R2001) "American National Standard Specification for Sound Level Meters", and ANSI S1.4 A – 1985 "Amendment to ANSI S1.4 – 1983."

B) ANSI S1.11 – 1986 (R1998) "American National Standard Specifications for Octave-Band and Fractional-Octave-Band Analog and Digital Filters."

C) ANSI S1.6 – 1984 (R2001) "American National Standard Preferred Frequencies, Frequency Levels, and Band Numbers for Acoustical Measurements."

D) ANSI S1.8 – 1989 "American National Standard Reference Quantities for Acoustical Levels."

E) International Electrotechnical Commission, IEC 804-2000 Integrating/Averaging Sound level meters.

2) A magnetic tape recorder, graphic level recorder or other indicating device used must meet the requirements of the Society of Automotive Engineers (SAE) Recommended Practice J184 "Qualifying a Sound Data Acquisition System," November 1998, incorporated by reference at 35 Ill. Adm. Code 900.106.

3) The laboratory calibration of instrumentation used for acoustic measurement must be traceable to the National Bureau of Standards, and must be performed no less often than once every 12 months.

4) For outdoor measurement, a windscreen must be attached to the microphone.

b) Weather Measuring Equipment

1) An anemometer and compass or other devices must be used to measure wind speed and direction in accordance with the manufacturer's recommended procedures.

2) A thermometer, designed to measure ambient temperature, must be used in accordance with the manufacturer's recommended procedures.

3) A hygrometer must be used in accordance with the manufacturer's recommended procedures to measure the relative humidity.

4) A barometer must be used in accordance with the manufacturer's recommended procedures to measure the barometric pressure.

Section 910.103 Definitions

The definitions contained in 35 Ill. Adm. Code 900.101 apply to this Part.

Section 910.104 Measurement Techniques for 35 Ill. Adm. Code 900

Sound pressure level measurements are not required to establish a violation of 35 Ill. Adm. Code 900.102 (nuisance noise). However, sound pressure level measurements may be introduced as corroborating evidence when alleging a violation of 35 Ill. Adm. Code 900.102. If sound pressure level measurements are collected, manufacturer's instructions must be followed for the equipment used and 35 Ill. Adm. Code 910.105 may be used as guidance in gathering data.

Section 910.105 Measurement Techniques for 35 Ill. Adm. Code 901

Sound pressure level measurements must be obtained in accordance with the following measurement techniques to determine whether a noise source is in compliance with 35 Ill. Adm. Code 901:

a) Site Selection

1) Measurements may be taken at one or more microphone positions within the appropriate receiving land. Measurement instruments must be set up outdoors within the boundaries of the receiving land for the purpose of determining whether a noise source is in compliance with 35 Ill. Adm. Code 901.

2) Measurement instruments must be set up not less than 25 feet (7.6 meters (m)) from the property-line-noise-source. The 25-foot (7.6 m) setback requirement is from the noise source and not the property line unless the noise source is contiguous to the property line.

3) Other measurement locations may be used for investigatory purposes such as, but not limited to, the following:

A) Determining the extent of noise pollution caused by the source of sound;

B) Determining the ambient; and

C) Analyzing those acoustical parameters that describe the sound source.

4) For measurements of sound sources with no audible discrete tones, microphones should not be set up less than 25 feet (7.6 m) from any reflective surface that may affect data. If measurements must be taken within 25 feet (7.6 m), the effect, if any, of the reflective surface on the measured data must be determined.

5) For measurements of sound sources with audible discrete tones, microphones must not be set up less than 50 feet (15.2 m) from any reflective surface that may affect data. If measurements must be taken within 50 feet (15.2 m), the effect, if any, of the reflective surface on the measured data must be determined.

6) Objects with small dimensions (trees, posts, bushes, etc.) must not be within 5 feet (1.5 m) of the microphone position. If measurements must be taken within 5 feet (1.5 m) of such objects, the effect, if any, on the measured data must be determined.

b) Instrumentation Set Up

1) A tripod must be set at the chosen site. The tripod must be extended to a height between 3 feet 8 inches (1.12 m) and 4 feet 10 inches (1.47 m) above ground.

2) A microphone must be attached to the appropriate end of a 5-foot (1.5 m) or longer cable and must be affixed to the top of the tripod. The other end of the cable must be connected to the measuring instrument.

3) The angle of incidence of the microphone must be adjusted to yield the flattest frequency response in accordance with the manufacturer's specifications.

4) The measuring instrument must be separated from the microphone so as to minimize any influence on the measurements. The cable movement must be minimized during the measurement period.

c) Measurement Site Operation and Instrument Calibration

1) Before taking sound pressure level measurements, measure and record (near the measurement site):

A) Wind speed and direction;

B) Ambient temperature;

C) Relative humidity; and

D) Barometric pressure.

2) Turn the measuring instrument on and allow the instrument to stabilize. Monitor and record the battery condition of the calibrator and all measuring instruments.

3) Turn the calibrator on at its appropriate frequency. Allow the calibrator to stabilize and calibrate the measuring system according to the manufacturer's specifications. After the measuring system has been calibrated, remove the calibrator and attach a windscreen to the microphone.

4) Adjust the microphone to the angle of incidence that will yield the frequency response in accordance with the manufacturer's specifications.

5) Measure the sound pressure level data within the limitations of subsection (d) and according to the manufacturer's recommended procedures. Other sound pressure levels may be used for investigatory purposes such as, but not limited to, the following:

A) Determining the extent of noise pollution caused by the source of sound;

B) Determining the ambient; and

C) Analyzing those acoustical parameters that describe the sound source.

6) While sound measurements are being taken, the operator must be separated from the microphone so as to minimize any influence on the measurements.

7) While measurements are being taken, visual and aural surveillance of extraneous sound sources and varying wind conditions must be made to insure that the conditions of measurement are accurately known. Record any variations in these parameters that may affect data. The number and basis for affected data block must be recorded. When using a tape recorder, voice commentary concerning conditions will be recorded on the cue track.

8) To minimize wind effects on the microphone, sound measurements must not be taken when the wind velocity is greater than 12 miles per hour (5.4 m/second) at the microphone position.

9) For the purposes of data correction, the ambient sound at the measurement site must be determined by means of measurement or analysis.

10) After taking sound pressure level measurements, remove the windscreen and attach the calibrator to the microphone. Turn the calibrator on at its appropriate frequency. After allowing the calibrator to stabilize, monitor and record the measuring system response. When the measuring system response varies by more than ± 0.5 dB from the most recent field calibration, the sound pressure level measurements obtained since such most recent field calibration cannot be used for enforcement purposes.

11) Before removing the calibrator from the microphone, turn the calibrator off. If the ambient sound has not been determined by means of measurement, determine the noise floor of the measuring system. If the noise floor is within 10 dB of the measured sound pressure level data, such noise floor measurements must be recorded.

12) At the end of the sound survey, monitor and record the battery condition of the calibrator and all measuring instruments. Near the measurement site, measure and record:

A) Windspeed and direction;

B) Ambient temperature;

C) Relative humidity; and

D) Barometric pressure.

13) Record the physical and topographical description of the ground surface within the vicinity of the measurement site, survey site location, a description of the sound source, a diagram of the area, the location of reflective surfaces near the microphone, and the approximate location of the noise source relative to the microphone position.

14) A magnetic tape recorder may be used to preserve the raw data. Calibration signals must be recorded at the beginning and end of each tape as well as at intermediate times such as when relocating to a new measurement site. Voice commentary concerning local conditions and affected data blocks must be recorded on the cue track. The original tape recording must be preserved for subsequent evaluation. Laboratory analyses may be performed on magnetic tape recorded field data. A description of the laboratory instrumentation and procedures must be recorded. Analyses used in the laboratory must be correlated to field measurement techniques.

d) Limiting Procedures for Specific Types of Data Acquisition

1) For measurements of non-impulsive sound with audible discrete tones, ⅓ octave band sound pressure levels must be obtained in determining whether a noise source is in compliance with 35 Ill. Adm. Code 901.106.

2) For measurements of non-impulsive sound with no audible discrete tones, octave band sound pressure levels must be obtained in determining whether a noise source is in compliance with 35 Ill. Adm. Code 901.102 and 901.103.

e) Correction Factors

If necessary, correction factors rounded to the nearest ½ decibel must be applied to sound pressure level measurements. The correction factors applicable to the measurement system may include, but are not limited to, corrections for windscreen interference and the sound pressure level difference between consecutive field calibrations. Such calibration correction factors must only be used to make negative corrections (subtraction from the field data). In no case must such calibration correction factors be added to the measured sound pressure levels so as to raise the sound pressure level field data. The correction factors applicable to the measurement site may include, but are not limited to, corrections for reflective surfaces and ambient sound.

Section 910.106 Protocols for Determination of Sound Levels

a) The raw data collection procedures for the determination of equivalent continuous sound pressure level (L_{eq}) are described in this Section using as an example the determination of a 1-hour L_{eq} corrected for ambient. The following procedures must be used:

1) Using small blocks:

A) The 1-hour interval is divided into many small blocks of time so that corruption of the data from short-term background, transient sound and loss of data can be limited to the corrupted or bad blocks. The block duration in seconds must remain fixed for any measurement hour. The duration must be neither less than 10 seconds nor greater than 100 seconds. For example, if the block duration is chosen to be 60 seconds (1 minute), then the data collection proceeds for 60, 1-minute periods of measurement.

B) The collected data for each block represents a block duration L_{eq} (or sound exposure level (SEL)) in octave bands (or ⅓ octave bands if prominent discrete tones may be present).

C) Data for any block corrupted by one or more short-term background transient sounds must be deleted.

D) After deleting corrupted data blocks, there will be a fixed number of "good" data blocks remaining. This number is designated as N_{PLNS}, where PLNS stands for Property-Line-Noise-Source. These remaining "good" blocks must be numbered consecutively. The subscript i is used to denote the numbering of the blocks in time order after corrupted data blocks have been deleted.

E) The data for the N_{PLNS} remaining blocks are time averaged on an energy basis by octave (or ⅓ octave band) using Equation 1 below. In this equation, two subscripts are used, i to designate time and j to designate the specific frequency, either an octave-band or ⅓ octave band. The raw, 1-hour L_{eq} in the *j*th frequency band is given by:

$$L_{eqj} = 10\log\left(\frac{1}{N_{PLNS}}\sum_{i=1}^{N_{PLNS}} 10^{\left(\frac{L_{eqij}}{10}\right)}\right) \qquad \text{[Equation 1]}$$

where L_{eq} is the L_{eq} in the *j*th frequency band for the *i*th non-deleted data block.

F) In terms of SEL, the raw SEL in the *j*th frequency band is given by:

$$SEL_j = 10\log\left(\sum_{i=1}^{N_{PLNS}} 10^{\left(\frac{SEL_{ij}}{10}\right)}\right) \qquad \text{[Equation 2]}$$

G) The raw, 1-hour L_{eq} in the *j*th frequency band is given in terms of the corresponding SEL_j by:

$$L_{eqj} = SEL_j + 10\log\left(\frac{3600}{N_{PLNS}\Delta T}\right) \qquad \text{[Equation 3]}$$

Where T is the block duration in seconds, N_{PLNS} is the number of non-discarded data blocks, and 3600 is the number of seconds in an hour.

2) Continuous Data Collection:

A) The measuring instrument must be adjusted to continuously measure sound pressure and accumulate L_{eq} for each block of time. For convenience, the hour may be split into several smaller blocks such as 10, 6-minute blocks or 4, 15-minute blocks, etc.

B) A switch on the measuring instrument must be available to inhibit data collection whenever a short-term background transient sound occurs. This switch shall be used to prevent short-term background ambient sounds from corrupting the data.

C) Data collection must proceed for one hour. The energy average of the several measured L_{eqij} each weighted by the number of seconds actually accumulated during the *i*th block results in the raw, 1-hour L_{eq} in each frequency band given by:

$$L_{eqj} = 10\log\left(\frac{1}{T_{PLNS}}\sum_{i=1}^{N_{PLNS}} T_i 10^{\left(\frac{L_{eqij}}{10}\right)}\right) \qquad \text{[Equation 4]}$$

Where L_{eqij} is the L_{eq} in the jth frequency band for the *i*th large block. T_i is the actual number of seconds of "good" data accumulated in the *i*th block of time (e.g., 6 to 15 minutes); and

$$T_{PLNS} = \sum_{i=1}^{N_{PLNS}} T_i \qquad \text{[Equation 5]}$$

3) Minimum data collection requirements:

A) Initial Measurement Duration. The property-line-noise-source measurements must proceed initially for one hour. Because of correction for short-term background transient sounds, actual reported data collection time T, in seconds, may be less than 3600 seconds (one hour).

i) If small blocks of data are used for data collection, then the total measurement duration in seconds, T_{PLNS}, is given by N_{PLNS} T, where T is the length of each block in seconds and N_{PLNS} is the number of non-discarded blocks. If data inhibition is used for data collection, then T_{PLNS} is the number of non-inhibited seconds during the measurement hour. In either case, T_{PLNS} must be no less than 900 seconds.

ii) If very few blocks were used for data collection, then the duration of each block, T, may be too long and should be reduced.

iii) For either data collection method, sounds considered to be short-term transient may actually be part of the long-term background ambient and should be so redefined.

B) Extended Measurement Duration. If T_{PLNS} is less than 900 seconds during the first hour of measurements, the raw data collection procedures must be appropriately modified and new measurements must proceed for an additional hour. If T_{PLNS} after combining the first and the second hour of measurements is also less than 900 seconds, then the raw data collection must continue using the data inhibition method or method employed during the second hour until T_{PLNS} is greater than or equal to 900 seconds.

4) Correction for Long-Term Background Ambient Sound:

A) The raw 1-hour L_{eq} must be corrected for long-term background ambient sound. The subsection below describes methods to obtain the long-term background ambient sound level in the jth frequency

band. The correction is dependent on the difference (in decibels) between the raw, 1-hour, jth band property-line-noise-source: L_{eqj} and corresponding jth band long-term background ambient sound level. The correction to be applied is as follows:

i) If the difference between the raw 1-hour L_{eq} and the long-term background ambient sound is larger than 10 decibels, then the correction must be set to 0.

ii) If the difference between the raw 1-hour L_{eq} and the long-term background ambient sound difference is less than 3 decibels, then the *j*th frequency-band level, L_{eqj}, must be set equal to 0.

iii) If the difference between the raw 1-hour L_{eq} and the long-term background ambient sound is between 3 and 10 decibels, then the correction given in Table 1 below must be subtracted from the raw, 1-hour property-line-noise-source L_{eqj}

Table 1
Corrections in dB for long-term background ambient sound

Difference (dB)	Correction (dB)
3	3
4	2.3
5	1.7
6	1.3
7	1.0
8	0.7
9	0.6
10	0.5

B) The long-term background ambient corrected level must be the property-line-noise-source L_{eqj} reported for the jth frequency band.

b) Obtaining the background ambient sound level:

1) The background ambient must be measured for the purposes of this Section during a 10-minute interval.

2) Long-term background ambient measurement procedures are similar to procedures to measure the property-line-noise-source itself. Eliminating short-term background ambient transient sounds from the measurement of average long-term background ambient sound proceeds in a manner similar to the measurement of the property-line-noise-source emissions themselves. The two methods for measurement are: to divide the 10-minute measurement into short blocks of data, or inhibit data collection when short-term background transient sounds occur. The same method must be used for gathering both the property-line-noise-source data and the corresponding long-term background ambient data. The measurement procedures for each method are given in subsections (b)(3), (b)(4) and (b)(5) of this Section:

3) Using Small Blocks of Data

A) The 10-minute measurement of long-term background ambient must be divided into short measurement blocks. The duration of these blocks must remain constant during the entire measurement, both when measuring the long-term background ambient and when measuring the property-line-noise-source. The duration of this measurement block in seconds, T, must divide exactly (without remainder) into 600 and must be neither greater than 100 seconds nor less than 10 seconds.

B) All data for any measurement block corrupted by one or more short-term ambient transient sounds must be discarded. The number of remaining, non-discarded measurement blocks is designated N_{BA}, where *BA* stands for background ambient.

C) The L_{eq} for each octave (or ⅓ octave) band are time-averaged on an energy basis over the N_{BA} remaining measurement blocks to obtain average long-term background ambient L_{eq} per band. Equation 1 (see subsection (a)(1)(E) of this Section) is used for this calculation with N_{BA} replacing N_{PLNS} as the number of elemental blocks to be summed. The total duration of the measurement in seconds, T_{BA}, is given by N_{BA} multiplied by T.

4) Continuous Data Collection

A) The measuring instrument must be adjusted according to manufacturer's instructions to continuously measure sound pressure and accumulate (i.e., record) L_{eq}. A switch must be available to inhibit data collection whenever a short-term

495 background transient sound occurs, (and on some instruments, a
496 button may be available to delete the most recent, previous data).
497
498 B) The switches or buttons must be used to prevent short-term
499 background ambient sounds from corrupting the data.
500
501 C) Data collection must proceed for 10 minutes. The result is the 10-
502 minute, long-term background ambient L_{eq} in each band.
503
504 D) T_{BA} is the number of non-inhibited measurement seconds during
505 the 10-minute measurement period.
506
507 5) The minimum duration, for either method, T_{BA} must be no less than 150
508 seconds. If T_{BA} is less than 150 seconds, then the measurement of the
509 long-term background ambient must continue beyond the original 10
510 minutes and until T_{BA} for the total long-term background ambient
511 measurement is greater than or equal to 150 seconds.
512
513 6) Measurement Alternatives. The long-term background ambient noise
514 should ideally be measured at the potential violation site just before
515 measurement of the property-line-noise-source emissions. However,
516 turning off the property-line-noise-source may not always be possible.
517 The following are a hierarchical order of five procedures for obtaining the
518 long-term background ambient noise. The first four procedures involve
519 direct measurement; the fifth procedure provides for use of tables of
520 values obtained from extensive measurements. These are not equivalent
521 procedures but are ordered from what is considered to be the most
522 accurate to what is considered to be the least accurate procedure.
523
524 A) Direct Measurement Procedure-1: With the property-line-noise-
525 source (PLNS) turned off, measure the long-term background
526 ambient noise within the hour before or within the hour after
527 measurement of the PLNS emissions at the location where the
528 PLNS measurements are being taken and with the measurement
529 equipment used for the PLNS measurements.
530
531 B) Direct Measurement Procedure-2: With the PLNS turned off,
532 measure the long-term background ambient during a similar time
533 period in terms of background ambient sound level, within one to
534 24 hours before, or within one to 24 hours after measurement of
535 the PLNS emissions at the location where the PLNS measurements
536 are being taken and with the measurement equipment used for the
537 PLNS.

C) Direct Measurement Procedure-3: With the PLNS turned off, measure the long-term background ambient during some other acoustically similar period within one to 30 days before, or within one to 30 days after measurement of the PLNS emissions. This alternate long-term background ambient measurement time might be a Saturday night or anytime during a Sunday or holiday. The measurements would be made at the location where the PLNS measurements are being taken and with the measurement equipment (or like equipment) used for the PLNS measurement.

D) Direct Measurement Procedure-4: With the PLNS turned off, measure the long-term background ambient noise during some other acoustically similar period within 30 to 90 days before, or within 30 to 90 days after measurement of the PLNS emissions. These measurements would be made at the location where the PLNS measurements are being taken and with the measurement equipment (or like equipment) used for the property-line-noise-source measurements.

E) Tables of Long-Term Background Ambient Noise. Where none of the alternatives can be used, use the applicable long-term background ambient data taken from Tables A through D in Appendix A of this Part. These tables are organized by predominant land use and time of day (daytime or nighttime). There are separate tables for octave and ⅓ octave bands. The background environments presented in the table are based on extensive measurements conducted in the Chicago area and are divided into the five categories given below in accordance with G.L. Bonvallet, "Levels and Spectra of Traffic, Industrial, and Residential Area Noise," Journal of the Acoustical Society of America, 23 (4), pp 435-439, July 1951; and Dwight E. Bishop and Paul D. Schomer, Handbook of Acoustical Measurements and Noise Control, Chapter 50, Community Noise Measurements, 3rd Edition, Cyril M Harris, Editor, McGraw-Hill Book Co., New York (1991).

i) Category 1: Noisy Commercial and Industrial Areas. Very heavy traffic conditions, such as in busy downtown commercial areas, at intersections of mass transportation and other vehicles, including the Chicago Transit Authority trains, heavy motor trucks and other heavy traffic, and

street corners where motor buses and heavy trucks accelerate.

ii) Category 2: Moderate Commercial and Industrial Areas, and Noisy Residential Areas. Heavy traffic areas with conditions similar to subsection (b)(6)(E)(i) of this Section but with somewhat less traffic, routes of relatively heavy or fast automobile traffic but where heavy truck traffic is not extremely dense, and motor bus routes.

iii) Category 3: Quiet Commercial and Industrial Areas, and Moderate Residential Areas. Light traffic conditions where no mass transportation vehicles and relatively few automobiles and trucks pass, and where these vehicles generally travel at low speeds. Residential areas and commercial streets and intersections with little traffic comprise this category.

iv) Category 4: Quiet Residential Areas. These areas are similar to Category 3 in subsection (b)(6)(E)(iii) of this Section but, for this group, the background is either distant traffic or is unidentifiable.

v) Category 5: Very Quiet, Sparse Suburban or Rural Areas. These areas are similar to Category 4 subsection (b)(6)(E)(iv) of this Section but are usually in unincorporated areas and, for this group, there are few if any near neighbors.

Section 910.107 Measurement Techniques for Highly-Impulsive Sound Under 35 Ill. Adm. Code 901.104.

a) Measurement of highly-impulsive sound under 35 Ill. Adm. Code 901.104 can be made in two distinct and equally valid ways, namely the general method and the controlled test method.

b) General Method: The general method is to measure the 1-hour, A-weighted L_{eq} (not the octave or ⅓ octave-band levels) using essentially one of the two procedures described in Sections 910.105 and 910.106.

1) The procedure using small blocks of time to collect data is as follows:

A) The hour must be divided into small blocks and the A-weighted L_{eq} must be measured for each of these small blocks of time. L_{eq} must be measured for the entire hour but data collection must be inhibited whenever a short-term background transient sound occurs.

B) The duration of each block must be held constant during the hour. This duration in seconds must divide exactly into 900 and must be neither greater than 100 seconds nor less than 10 seconds.

C) The data for any block corrupted by one or more short-term background ambient sounds must be discarded.

2) The continuous data collection procedure is as follows:

A) L_{eq} must be measured for the entire hour.

B) Data collection must be inhibited whenever a short-term background transient sound occurs.

3) Correction for the long-term background ambient must be accomplished using all of the other procedures and requirements enumerated in Section 910.105 and 910.106. These requirements must be complied with to determine an A-weighted, 1-hour, background-ambient-corrected L_{eq} for the highly impulsive property-line-noise-source under study.

c) Controlled Test Method: For this method, the following procedures must be used:

1) General Measurement Description

A) The sound exposure per impulse from each separate individual impulsive source is measured.

B) The total sound exposure per hour from each source is the sound exposure per event multiplied by the number of events per hour.

C) The grand total sound exposure (SE) per hour is the sum of the sound exposures per hour from each of the separate individual sources.

D) The reported SEL is obtained from the grand total sound exposure (SE) per hour using the following:

$$SEL = 10 \log (SE) + 94 \quad \text{[Equation 7]}$$

E) The equivalent level, L_{eq}, corresponding to a SEL measured or predicted for one hour (3600 seconds) is given by:

$$L_{eq} = SEL - 10 \log (3600) \quad \text{[Equation 8]}$$

2) Determination of sound exposure per event must be as follows:

A) The sound exposure per event from each, separate, individual source must be determined by measuring the total A-weighted sound exposure for about 10 repetitions of this source. This set of about 10 measurements may be performed continuously over a short period of time, or this set of measurements may be performed over a discontinuous set of measurement periods. In either case, the total measurement duration must be less than 100 seconds.

B) These separate, individual property-line-noise-source-controlled measurements must be free of any short-term ambient sounds. If any short-term background transient sounds occur during these measurements, then the measurement must be repeated until measurement data, free of any corrupting short-term background ambient sounds, are obtained.

C) The total measured A-weighted sound exposure for this group of about 10 repetitions must be corrected for long-term background ambient by subtracting the A-weighted long-term background ambient sound exposure. The sound exposure value subtracted must be the long-term A-weighted background ambient sound exposure per second multiplied by the number of seconds used to measure the several source repetitions.

D) The reported source A-weighted sound exposure per event must be the total corrected sound exposure divided by the number of source repetitions measured.

E) The background ambient must be measured for a short time, at least 30 seconds as near in time to the source measurements as possible, but within ½ hour. The total A-weighted long-term background ambient sound exposure per second is the total measured long-term background ambient sound exposure divided by the number of seconds of background ambient measurement.

F) There must be no short-term background ambient sounds present during the measurement of the long-term background ambient. If any short-term background transient sounds occur during these measurements, then the measurements must be repeated until long-term background ambient measurement data free of any corrupting short-term background ambient sound are obtained.

714 **910.APPENDIX A Tables of Long-Term Background Ambient Noise**
715
716 **910.TABLE A. Daytime long-term background ambient L_{eq} levels in decibels by land use**
717 **categories and 1/3 octave-band level**
718

Octave-Band Center Frequency (Hz)	Background Category 1	2	3	4	5
20	63	56	48	42	36
25	64	57	49	43	37
31	65	58	50	44	38
40	65	58	51	44	38
50	66	59	51	45	39
63	66	59	52	46	40
80	67	60	52	46	40
100	68	60	53	47	41
125	67	59	52	46	40
160	66	59	52	46	40
200	66	58	51	45	39
250	65	58	50	44	38
315	64	57	49	43	37
400	63	55	48	42	36
500	62	54	46	40	34
630	61	53	44	38	32
800	60	51	42	36	30
1000	58	49	40	34	28
1250	56	47	38	32	26
1600	54	45	36	30	24
2000	52	43	33	28	21
2500	50	41	30	25	19
3150	49	39	28	23	17
4000	48	37	25	20	15
5000	46	35	23	18	13
6300	44	33	21	16	10

8000	43	31	19	14	8
10,000	41	29	17	12	6
12,500	39	27	15	10	4

719

720 **910.APPENDIX A Tables of Long-Term Background Ambient Noise**
721
722 **910.TABLE B. Nighttime long-term background ambient L_{eq} levels in decibels by land use**
723 **categories and 1/3 octave band level**
724

Octave-Band Center Frequency (Hz)	Background Category 1	2	3	4	5
20	53	48	43	37	31
25	54	49	44	38	32
31	55	50	45	39	33
40	55	50	46	39	33
50	56	51	46	40	34
63	56	51	47	41	35
80	57	52	47	41	35
100	58	52	48	42	36
125	57	51	47	41	35
160	56	51	47	41	35
200	56	50	46	40	34
250	55	50	45	39	33
315	54	49	44	38	32
400	53	47	43	37	31
500	52	46	41	35	29
630	51	45	39	33	27
800	50	43	37	31	25
1000	48	41	35	29	23
1250	46	39	33	27	21
1600	44	37	31	25	19
2000	42	35	28	23	16
2500	40	33	25	20	14
3150	39	31	23	18	12
4000	38	29	20	15	10
5000	36	27	18	13	8
6300	34	25	16	11	5

8000	33	23	14	9	3
10,000	31	21	12	7	1
12,500	29	19	10	2	

725

910.APPENDIX A Tables of Long-Term Background Ambient Noise

910.TABLE C Daytime long-term background ambient L_{eq} levels in decibels by land use categories and octave-band level

Octave-Band Center Frequency (Hz)	Background Category 1	2	3	4	5
31	70	63	55	49	43
63	71	64	57	51	45
125	72	64	57	51	45
250	70	63	55	49	43
500	67	59	51	45	39
1000	63	54	45	39	33
2000	57	48	38	33	26
4000	53	42	30	25	20
8000	48	36	24	19	13

910.APPENDIX A Tables of Long-Term Background Ambient Noise

910.TABLE D Nighttime long-term background ambient L_{eq} levels in decibels by land use categories and octave-band level

Octave-Band Center Frequency (Hz)	Background Category 1	2	3	4	5
31	60	55	50	44	38
63	61	56	52	46	40
125	62	56	52	46	40
250	60	55	50	44	38
500	57	51	46	40	34
1000	53	46	40	34	28
2000	47	40	33	28	21
4000	43	34	25	20	15
8000	38	28	19	14	8