Sound Level Specification

Global Common

SD-018

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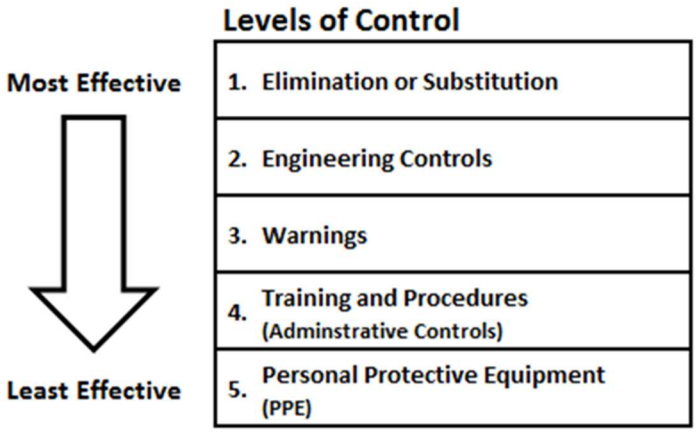
FORWARD

Employee health and safety is a top priority in Nexteer Automotive. The Nexteer Automotive Sound Level Specification is applicable for the purchase of new, rebuilt, and relocated machinery, power tools, and equipment. This specification reflects Nexteer Automotive's commitment to Design-In Health and Safety as a process to provide an employee work environment free of unacceptable sound levels. The fulfillment of this commitment involves a long-term engineering program based on both technological and economic feasibility.

It is expected that Suppliers of machinery, power tools, and equipment to Nexteer Automotive also place a top priority on the health and safety of Nexteer Employees, and will actively pursue the innovation and design of measures that will help Nexteer achieve the commitment of an employee work environment free of unacceptable sound levels.

The "Hierarchy of Health and Safety Controls" establishes standard principles of accident prevention in order of greatest effectiveness and highest priority. Feasible sound level control shall be designed in as an integral part of all new and rebuilt machinery, power tools, and other equipment purchased by Nexteer Automotive. "Designed-In" controls offer the opportunity for cost-effective, innovative approaches. Elimination and/or Substitution, or feasible Engineering Controls must be implemented during the design and development stage in accordance with Manufacturing for Design. The incorporation of sound level controls in the initial design and building of equipment will avoid more costly and less effective retrofitting.



Application of the Nexteer Automotive Sound Level Specification must be a cooperative effort involving the equipment designer, builder, and consultants, as well as Nexteer Automotive Health & Safety, and the Purchasing Manufacturing Engineer. Design concepts, engineering feasibility, alternative controls, and achievable goals must all be considered prior to award of contract. Continued design innovation and design revisions, which result in more cost-effective sound level reductions, must be encouraged and evaluated during the build stage.

Through the total commitment of all the principal's involved, the design-building-installation and maintenance of "QUIET" machinery, power tools and equipment has been, can be, and will be an achievable goal. Sections 7 and 8 of this document are critical and detail the process to attain this goal.

1. Purpose

The purpose of this specification is to:

- ensure the purchase and installation of new, rebuilt, and relocated machinery, power tools, and equipment that supports the Nexteer Automotive Process of providing employees with a "Hear Safe" work environment.
- ensure that sound levels generated by equipment external to a Nexteer Automotive Facility do not have an adverse effect on the external facility environment.
- ensure that feasible means of engineering are applied to equipment with unacceptable noise levels prior to any location change.

In support of this Purpose, Feasible Sound Level Controls:

- shall be considered in all new, rebuilt, and relocated machinery, power tools, and equipment concept development and design.
- shall be incorporated in all new, rebuilt, and relocated machinery, power tools, and equipment build and installation. Reference Appendix H for additional information.
- shall be incorporated in all equipment or process relocations.
  - NOTE: "Rebuilt," for the purposes of this Specification, refers to all machinery, power tools, and equipment that is refurbished, upgraded, etc., in place of purchasing new equipment. SD-018 documentation required for relocated and rebuilt equipment when Safety Tag Process is required per Common Core Element – Machinery / Equipment / Process Sign-Off Procedure, DASCP #16.

2. Scope

This Specification establishes:

2.1 Sound Level Limits for all new, rebuilt, and relocated machinery, power tools, and equipment.

2.2 Measurement procedures, measurement instrumentation requirements, machine operating conditions, and the format for reporting machine certification data.

2.3 Supplier and Purchaser responsibilities.

2.4 Procedures for approving equipment at variance with the specified limit.

3. Technical Requirements

3.1 References

3.1.1 Sound Levels shall be measured in A-weighted decibels (dBA) referenced to 20 micro-Pascal.

3.1.2 Sound power levels shall be expressed in A-weighted decibels (dBA) reference to 10^{-12} watt.

3.1.3 Time-Weighted Average (TWA) sound exposure levels and sound power levels shall be expressed in A-weighted decibels and referenced to an 8-hour steady state equivalent.

3.1.4 Ultrasonic Sound Pressure Levels, Sound Power Levels, and Time-Weighted Average (TWA) Sound Exposure Levels shall be an unweighted (linear) measurement.

3.2 Integrating Exchange Rate

3.2.1 The integrating "exchange rate" used for determining the time-weighted average of non-steady-state sound levels shall be 3dB unless specified otherwise by the purchaser. The machine builder / rebuilder shall record the integrating exchange rate used in the sound level measurement data collection on the Nexteer Automotive Supplier's Sound Data Form and Certification Sheet (Nexteer Automotive – 1676) – Appendix F.

3.3 Lower Limit Threshold Cutoff Sound Level

3.3.1 All integrated sound level measurements shall be made with no Lower Limit Threshold Cutoff Sound Level Restriction unless specified otherwise by the purchaser. The machine builder / re-builder shall record NONE for the Lower Limit Threshold Cutoff Sound Level used in the sound level measurement data collection on the Nexteer Automotive Supplier's Sound Data Form and Certification Sheet (Nexteer Automotive – 1676), Appendix F.

3.3.2 If a Lower Limit Threshold Cutoff Sound Level is specified by the purchaser, it must not exceed 80dB and must be reported by the machine builder / re-builder along with the Sound Level Measurement Data on Nexteer Automotive 1676.

3.4 Criterion Sound Level

All integrated steady-state and cyclic sound level measurements shall be made relative to a 90dBA 8-hour Time-Weighted Average Criterion Sound Level.

3.5 Measurement Instrumentation

All Sound Level measurement instrumentation, including the microphone, used in the collection of sound level data for machine certification in accordance with this specification shall:

- be Type 2 or better (except for Ultrasonic Sound Measurements), and
- be Type 1 or better when measuring the presence of ultrasonic "sound" generated by equipment or processes, and
- meet the performance requirements of ANSI S1.4-1983 (USA) or IEC 651-1978 (Canada) or latest revision.

3.6 Sound Level Measurements and Reporting of Data

3.6.1 Resulting data shall be certified and submitted on the Nexteer Supplier's Sound Data Form and Certification Sheet (Nexteer Automotive – 1676) – Appendix F, subject to the following requirements:

1. Suppliers or Nexteer Engineering providing standard equipment or equipment with validated sound level data shall submit certified sound level data with their quotation.
2. Suppliers or Nexteer Engineering providing equipment without previously validated sound data or who are required by purchase order to measure the sound of each unit, shall perform said measurements in accordance with Section 4 or 5 of this Specification (whichever is applicable) and submit the actual sound data as soon as it becomes available – before "Run-Off" for final machine acceptance, and prior to shipment.
3. Where it is impractical to set up and test a complete machine at the Supplier's facility, arrangements shall be made to perform the test at the purchaser's facility. Under this circumstance, shipment of the equipment does not relieve the Supplier and Nexteer Engineer of the responsibility for meeting the quoted sound level limits.

4. General Measurement Procedures, Sound Level Limits, and Reporting of Data

The measurement procedures and sound level limits specified in this Section apply to all new, rebuilt, and relocated machinery, power tools, and equipment, except those specifically covered in Section 5.

4.1 Measurement Procedure

4.1.1 All machinery, power tools, and equipment shall be tested in accordance with Nexteer Automotive Procedure for Sound Level Certification of Machinery, Power Tools, and Equipment contained in Appendix A, unless otherwise is Section 5, Other Applicable Measurement Procedures.

4.1.2 Measurements shall be made with the equipment operating at no load and under all anticipated and actual production load conditions (material, tooling, parts production rates, speeds, etc.). The Nexteer Purchasing Engineer or Nexteer Engineering will provide a reasonable quantity of parts or related tooling if these are unique to the purchaser.

4.2 Sound Level Limits

4.2.1 Unless specified elsewhere and otherwise in this document, or specified otherwise by the Nexteer Purchasing Engineer, the 8-hour Time-Weighted Average (TWA) A-weighted sound level shall not exceed 80db(A) at any of the designated measurement locations on the machine measurement envelopes and in the Operator's Hearing Zone, during the operating time of the machine.

4.2.2 Impulse sound pressure levels shall not exceed the unweighted true peak value of 130dB at any measurement location on the machine measurement envelops and in the Operator's Hearing Zone, during he operating time of the machine.

4.2.3 Complete Machine / Equipment (Total) System

1. A Supplier or Nexteer Engineering providing a complete machine / equipment (total) system shall comply with the 80db(A) Specification Limit for the Complete Machine / Equipment (Total) System, not the individual components. Tooling and material handling related noise must be included when evaluating compliance with this Specification.
2. Where individual components are purchased separately by the Nexteer Purchasing Engineer or Machine Supplier to be assembled at the Purchaser's site into a complete machine (total system), the individual component sound level limits specified and measured for the individual components shall not exceed an 8-hour Time-Weighted Average (TWA) A-weighted sound level of 80dB(A) at any measurement location on the complete machine (total system) measurement envelope and in the Operator's Hearing Zone during the operating time of the complete machine. Reference Appendix B for an example of the combining of separate sound levels into a total or "combined" sound level by "dB Addition").

4.2.4 In situations where a complete machine is to be installed in an otherwise low sound level area, or run for extended shift periods of time longer than 8 Hrs., at the discretion of the purchaser, the complete machine (total system) specification limit of less than 80 dB(A) 8-Hour Time-Weighted Average may be specified.

4.2.5 Airborne Upper Sonic and Ultrasonic Acoustic Radiation

The exposure to audible high frequency radiation above 10 kHz, (Upper Sonic), when sufficiently intense, appears to result in a syndrome involving manifestations of nausea, headache, tinnitus, pain, dizziness and fatigue, and a perceived squeal type noise. A major factor in whether or not the symptoms will be manifested appears to be the hearing acuity of the exposed person. Also, research suggests that high frequency radiation 20 kHz and above may have possible hearing loss ramifications from the subharmonics of those frequencies.

Where Upper Sonic and/or Ultrasonic acoustic radiation is present, the Permissible Ultrasound Exposure Levels stated in Table 4.2.5 shall apply.

Mid-Frequency of Third-Octave Band (kHz)	One-Third Octave-Band Level (dB) re 20μPa
10	80
12.5	80
16	80
20	105
25	110
31.5	115
40	115
50	115

* Sections 3.1.4 and 3.5 define instrumentation for measurement of Ultrasound. A Type 1 SL meter shall be used.

The levels for the third-octave bands centered below 20 kHz are below those which cause subjective effects. Those levels for 1/3 octaves above 20 kHz are for prevention of possible hearing losses from subharmonics of these frequencies.

5. Specific Application Measurement Procedures, Sound Level Limits, and Reporting of Data

The measurement procedures and sound level limits specified in Section 5.0 apply to NEW, REBUILT and RELOCATED Machinery, Power tools, and Equipment.

5.1 Air Moving Devices

The sound power level of air moving devices shall be measured in accordance with AMCA Standard 300 67, "Test Code for Sound Rating."

Air moving devices (AMD) consist of:

- Central Station Air Conditioning and Heating and Ventilating Units
- Centrifugal Fans
- Industrial, Axial and Propeller Fans
- Power Roof and Wall Ventilators
- Steam and Hot Water Unit Heaters

The code does not isolate the sound power passed directly through the AMD casing. Where this value is required, such as in the case of a fan in an equipment room with both inlet and outlet ducted out of the room, it may be estimated from the transmission loss through the AMD casing and the ductwork.

5.1.1 Sound Power Level Limits

At the specified operating conditions, inlet, discharge and housing radiated sound power levels shall not exceed a combined total of LW = 87 dB(A) Re. 10^{-12} watt.

5.2 Engineered Air Moving Systems

5.2.1 Sound Level Limits

The designers of engineered air moving systems shall insure that the sound level measured due to the operation of the system, including all appurtenances and accessories, shall not exceed 80 dBA TWA at any point 1.5 meters (5 feet) above any in plant operating floor or operator occupied platform.

5.3 Pneumatic Equipment

5.3.1 The sound level of pneumatic equipment shall be measured and reported in accordance with ANSI S5.1 1971 (or latest revision), "Test Code for the Measurement of Sound from Pneumatic Equipment."

5.3.2 Air Compressor Sound Level Limits

Compressors shall not exceed 80 dB(A) TWA at any location on the envelope as defined in Section 7.4.1 of ANSI S5.1 1971.

5.3.3 Pneumatic Tool Sound Level Limits

Pneumatic tools shall not exceed 80 dB(A) TWA at any of the microphone positions specified in Section 5.6.1 of ANSI S5.1 1971. All measurements shall be taken with the tool operating at the air pressure of the manufacturer's specified rating in a free running, no load condition. Tools containing clutches or impact generating devices are also to be tested in the stalled or nearly stalled mode.

5.4 Electric Motors

5.4.1 Electric motor sound power levels shall be measured in accordance with IEEE Publication No. 85, "Test Procedure for Airborne Noise Measurements on Rotating Electric Machinery."

5.4.2 Sound Power Level Limits

Electric motors shall meet Nexteer Automotive's "ELECTRIC MOTOR SOUND POWER LEVEL REQUIREMENTS." (Reference Appendix C).

5.5 Computer and Business Equipment

5.5.1 The sound level of computers and business equipment shall be measured and reported in accordance with ANSI S1.29 1979, "Method for the Measurement and Designation of Noise Emitted by Computer and Business Equipment."

5.5.2 Sound Level Limits

1. General Office Area

   The sound level at the operator's position, as defined in ANSI S1.29 1979, shall not exceed 60 dB(A) when equipment is operating in that mode which produces the highest A weighted sound level.

2. Data Processing Room

   The sound level at any permanent operator position, as defined in ANSI S1.29 1979, shall not exceed 70 dB(A) when equipment is operating in that mode which produces the highest A weighted sound level.

5.6 Transformer

5.6.1 Transformer sound levels shall be measured at the supplier's site in accordance with the conditions outlined in ANSI/IEEE C57.12.90 1980, "Test Code for Liquid Immersed, Distribution, Power and Regulating Transformers."

1. Sound Level Limits

   Transformers shall not exceed the average sound level values given in Tables 0 1 through 0 3 as published in NEMA Standards Publication No. TR1 1980, "Transformers, Regulators and Reactors" (refer to Appendix D).

5.7 H-I-D and Fluorescent Lighting Systems

The Lighting System Noise Criterion (LS NC) Rating, as defined in NEMA Standards Publication No. LE 2 1974, "H I D Lighting System Noise Criterion (LS NC) Ratings," shall be equal to or less than the Preferred Noise Criterion (PNC) level of the room ambient in which the lighting system is to be installed. Refer to table in Section 5.10 of this specification for recommended room PNC Criteria Range.

5.8 Offices, Conference Rooms, Etc.

The background ambient sound levels in offices, conference rooms, etc. shall not exceed the sound level criteria specified by the purchaser at any point 1.2 meters (4 feet) above room floor level. The specified sound level criteria will be based on the recommended Preferred Noise-Criteria (PNC) for steady background noise. The following table lists recommended design goals. Reference Appendix E for PNC Curves.

5.9 Community Sound Limits

Recommended Indoor Design Goals		
Type of Area	Recommended PNC Criteria Range	Approximate Sound Level dB(A)
Offices		
- Executive	25 to 30	34 to 38
- Private or Semi-Private	30 to 40	38 to 47
- Open-Plan	35 to 45	42 to 52
Conference Rooms	30 to 40	38 to 47
Classrooms	30 to 40	38 to 47
Engineering Rooms & Laboratory Areas	40 to 50	47 to 56
General Secretarial Areas	40 to 50	47 to 56
Computer / Business Machine Areas	45 to 55	52 to 61
Power Plant Control Rooms	50 to 60	56 to 66

External plant equipment/systems, upon being installed, shall meet the following specification limits:

5.9.1 A level 3 dB less than the minimum criteria limit stipulated in the local Community or State noise ordinance which specifies receiving land sound levels; or

5.9.2 A 65 dBA daytime (0700 2200 Hr. and a 55 dBA nighttime (2200 0700 Hr.) one (1) hour TWA at the plant property line, in the absence of a local Community or State noise ordinance which specifies receiving land sound levels.

5.9.3 Pure tones generated by the system must be 10 dB or more below the applicable criterion level.

6. Waiver Conditions

6.1 If equipment exceeds the applicable sound limit specified in Section 4.0 or 5.0 of this Specification, or the "best achievable" sound limit quoted and accepted by the purchaser, the vendor shall request written permission to ship the equipment. The vendor must submit in writing, upon request to ship, a detailing of the feasible engineering controls currently designed into and/or installed on the machine/equipment, and the Supplier Authorization to Ship Form (G-1).

6.2 Shipping the equipment does not release the vendor from the responsibility to meet the specified sound limitations. Relief from this requirement must be explicitly stated in writing in accordance with the requirements of the "SUPPLIER'S Authorization to Ship FORM (G-1) and if necessary, the Supplier Waiver Request form (G-2).

7. Supplier Responsibilities

It is the responsibility of the vendor to insure that the "Total Machine," including all appurtenances and accessories, meet the applicable sound level limit specified in Section 4 or 5 of this Specification.

7.1 Request for Quote

7.1.1 Design-In for Health and Safety

It is expected that Machinery / Power tool / Equipment Suppliers fully embrace Nexteer Automotive's commitment to the health and safety of its' employees, and will actively pursue the innovation and implementation of Design-In for Health and Safety measures that will help Nexteer Automotive achieve the commitment of an employee work environment free of unacceptable sound levels.

To this end, it is expected that feasible sound level controls, whether by elimination, substitution, and/or engineering will be an integral part of the safety design and build of equipment -- not an optional add-on at an additional (and often premium) charge. The fulfillment of this expectation on the part of the Machinery/Machine Tool/Equipment builder will be a major consideration in the supplier selection process.

7.1.2 If difficulty is anticipated in complying with the specification limit, after a thorough analysis of feasible engineering noise controls is completed, an exploratory meeting should be set up with the purchaser. Feasible engineering controls and design concepts should be investigated, discussed and evaluated at this meeting.

7.2 Quotation

7.2.1 The quotation shall state the applicable specification sound level limit value being quoted.

7.2.2 If application of "State-of-the-Art" technology is not sufficient to reduce sound levels to the specification limit, the sound level best achievable, utilizing feasible engineering controls, shall be specified.

Note: Machine Builder/Supplier must fully explore feasible noise controls before requesting a variance.

7.2.3 If feasible sound level controls are not an integral part of the equipment design and build, but rather an "add-on" measure, then ALL items and costs required to meet the specification limit shall be grouped in a separate section of the quotation titled NOISE CONTROL. Items and costs must be itemized and sufficiently detailed to permit a complete evaluation by the purchaser.

7.2.4 The supplier shall insure that sufficient time is scheduled at machine runoff to certify sound levels of the equipment and make any additional engineering corrections deemed necessary by the purchaser.

7.3 Engineering Design

Engineering designs submitted to the purchaser for approval shall include quoted and agreed upon feasible sound level controls.

7.4 Sound Level Measurements

Sound level certification measurements shall be the responsibility of the supplier. It is the supplier's responsibility to acquire and use the industrial measurement standard specified for the equipment being purchased.

7.5 Nexteer Automotive Supplier's Sound Data Form and Certification Sheet (Nexteer Automotive – 1676)

The vendor shall submit certified sound data on the "NEXTEER AUTOMOTIVE SUPPLIER'S SOUND DATA FORM AND CERTIFICATION SHEET" (NEXTEER AUTOMOTIVE-1676), Appendix F, prior to initial buy-off and shipping.

7.5.1 Four copies of the Nexteer Automotive-1676 Form shall be provided. Copy one will be provided to the Divisional Purchasing Department, copy two will be provided to the project engineer, copy three shall be provided to the plant safety engineer and copy four shall be furnished with the equipment manuals.

8. Purchaser Responsibilities

8.1 Appropriation Requests

Sound level control shall be considered in the cost estimating preparation which precedes the submitting of an appropriation request.

8.2 Requests for Quote

8.2.1 Nexteer Automotive Specification SD-018 and any supplemental local sound level specifications, shall be issued when the Request for Quotation is issued for all machinery and equipment which generates sound in its normal mode of operation.

8.3 Quotation Review

8.3.1 At the time of competitive bid, the quotation must present a separate line item cost for elimination, substitution and/or feasible engineering controls. When alternate feasible engineering controls exist, separate line items shall be provided for each engineering approach. In a separate section titled "Noise Control", a detailed description of the controls and costs required to meet the sound specification limits must be presented in sufficient detail to allow complete evaluation by the purchaser. These line items are not to be considered as optional. Safety is not an option.

8.3.2 The quoted noise reduction techniques and any recommendations must be reviewed prior to and during the pre-award. Certified sound level data must be reviewed, evaluated and approved prior to machine acceptance and permission to ship. Persons from engineering, production and safety shall be included in the review.

8.3.3 The purchasing engineer shall verify that all noise controls and their associated costs are grouped in a separate section of the quotation titled "NOISE CONTROL," and presented in sufficient detail to permit a complete evaluation.

8.4 Equipment Runoff

8.4.1 If the parts and/or tooling necessary to duplicate production conditions at runoff are unique to the purchaser, the purchaser shall provide a reasonable quantity of parts and/or necessary tooling to duplicate production conditions.

If actual loading is not possible, loading shall be accomplished by simulation. Details of the load simulating device and loading techniques shall be specified and approved by the purchaser.

8.4.2 The process engineer or designated representative should verify sound data of equipment during machine runoff at the supplier's test site prior to shipment.

8.4.3 If certification of sound data is not conducted at the supplier's facility during equipment runoff, certification SHALL be conducted after the equipment is installed and prior to complete release of the supplier from his contractual agreement. Shipment of the equipment does not release the supplier from his responsibility to meet the specified sound limitations.

8.4.4 Documentation of purchased equipment, using the Specification, must include; description of the technique(s), noise levels and costs. Where appropriate, photographs, sketches, diagrams or other visual representations, and material specifications should be included.

8.5 Waiver

Equipment not meeting NEXTEER Automotive Specification SD-018 requirements must be approved by written waiver indicating reason(s) for acceptance and permission to ship. The purchaser shall review and accept the "Supplier Waiver Form" For Nexteer Automotive Sound Level Specification, Appendix G-2 before shipment of equipment and/or releasing the supplier from his responsibility of meeting the quoted sound level limits.

8.5.1 Nexteer Divisional Purchasing shall review the request for waiver with the project Engineer, Noise Control Engineer, Plant Safety Supervisor, and Plant Manager prior to final approval.

References

The latest editions of the following documents form a part of this specification to the extent specified herein.

- "NMTBA Noise Measurement Techniques"

  Association for Manufacturing Technology (National Machine Tool Builders Association)
  7901 Westpark Drive
  McLean, Virginia 22101

- Delphi Corporation Specification No. 7EH- "Standard Specification 7EH for Purchase of High Efficiency Industrial AC Electric Motors; Totally enclosed Types by General Motors Corporation"

  Delphi Automotive Systems Worldwide Facilities Group
  Detroit, Michigan

- IEEE Publication No:.85 "Test Procedure for Airborne Noise Measurements of Rotating Electrical Machinery"

  Institute of Electrical and Electronic Engineers (IEEE)
  345 East 47th Street
  New York, New York 10017

- NEMA Standards Publication No. TR 1 1980 "Transformers, Regulators and Reactors"

- NEMA Standards Publication No. LE 2 1974 "H I D Lighting System Noise Criterion (LS NC) Ratings

  National Electrical Manufacturers Association
  2101 L Street,
  N.W. Washington, DC 20037

- ANSI S1.4 1983 "Specification for Sound Level Meters"

- ANSI S5.1 1971 "CAGI PNEUROP Test Code for the Measurement of Sound from Pneumatic Equipment

- ANSI S1.29 1979 "Method for the Measurement and Designation of Noise Emitted by Computer and Business Equipment"

- ANSI/IEEE C57.12.90 1980 "Test Code for Liquid-Immersed, Distribution, Power and Regulating Transformers"

  Standards Secretariat
  Acoustical Society of America
  335 East 45th Street
  New York, New York 10017

- "AMCA Test Code for Sound Rating," Standard 300 85

  Air Moving and Conditioning Association, Inc.
  30 West University Drive
  Arlington Heights, Illinois 60004

- Nexteer Automotive Forms 1619, 1676, 1677

  3900 Holland Road
  Saginaw, Michigan 48601

Note: Where Reference Documents have been revised or replaced, the latest revision or replacement becomes applicable. Where a Reference Document has been discontinued, but not revised or replaced, said Reference Document requirements and/or procedures are still applicable

APPENDIX A Nexteer Automotive's Measurement Procedure for Sound Level Certification of Machinery, Power Tools and Equipment

A.1 Measurement Envelope and Designated Measurement Locations

The measurement locations, as designated in this NETEER AUTOMOTIVE MEASUREMENT PROCEDURE are adopted from the "NMTBA Noise Measurement Techniques," Second Edition, January 1976. as follows:

A.1-1 Measurements Shall Be Taken In The Hearing Zone(s) of Designated Operator(s) and at the designated measurement locations on the Machine Measurement Envelope.

A.1-2 The Machine Measurement Envelope Shall Be Located 1 Meter (~ 3 feet) From The Projected Floor Plan Of The Machine. Designated Measurement Locations Shall Be Located On The Machine Measurement Envelope At A Height Of 1.5 Meters (~ 5 feet) Above the "Work Access" Floor Level.

- No measurement location shall be more than 3.0 meters (10 feet) from an adjacent measurement location(s).
- A Minimum of four (4) measurements shall be taken on the Measurement Envelope around the machine/equipment. These measurements will include the location(s) with the highest sound level.

An example of a Machine/Measurement Envelope Sketch is shown on the reverse side (page A-2) of this Appendix.

A.2 Measurement Procedure

Measurements shall be made with the equipment operating at no load and under ALL ANTICIPATED ACTUAL PRODUCTION LOAD CONDITIONS (materials, tooling, production rates, etc.) as specified in Sections 4 and 5 of the Nexteer Automotive Sound Level Specification for the Purchase of Machinery, Power tools and Equipment. The Purchaser will provide a reasonable quantity of parts and/or related tooling if these are unique to the purchaser.

A.2-1 Select and setup measurement instrumentation in accordance with the requirements specified in Section 3 – TECHNICAL REQUIREMENTS, of this specification document.

A.2-2 At each of the measurement locations established per the requirements of Sections A1.1 and A1.2 above, determine the A-weighted 8-Hour Time-Weighted Average Sound Level (TWA) due to the background ambient sound in the test area.

- If the background ambient sound level measurement is equal to or greater than (≥) 10 dB below measured level when machine is operating, no correction for background is necessary.
- If the background ambient sound level measurement is less than (<) 10 dB below measured level when machine is operating, sound levels measured when the machine is operating should be corrected for background (reference Appendix B).

A.2-3 At each of the measurement locations established per the requirements of Sections A1.1 and A1.2 above, determine the A-weighted 8-Hour Time-Weighted Average Sound Level (TWA).

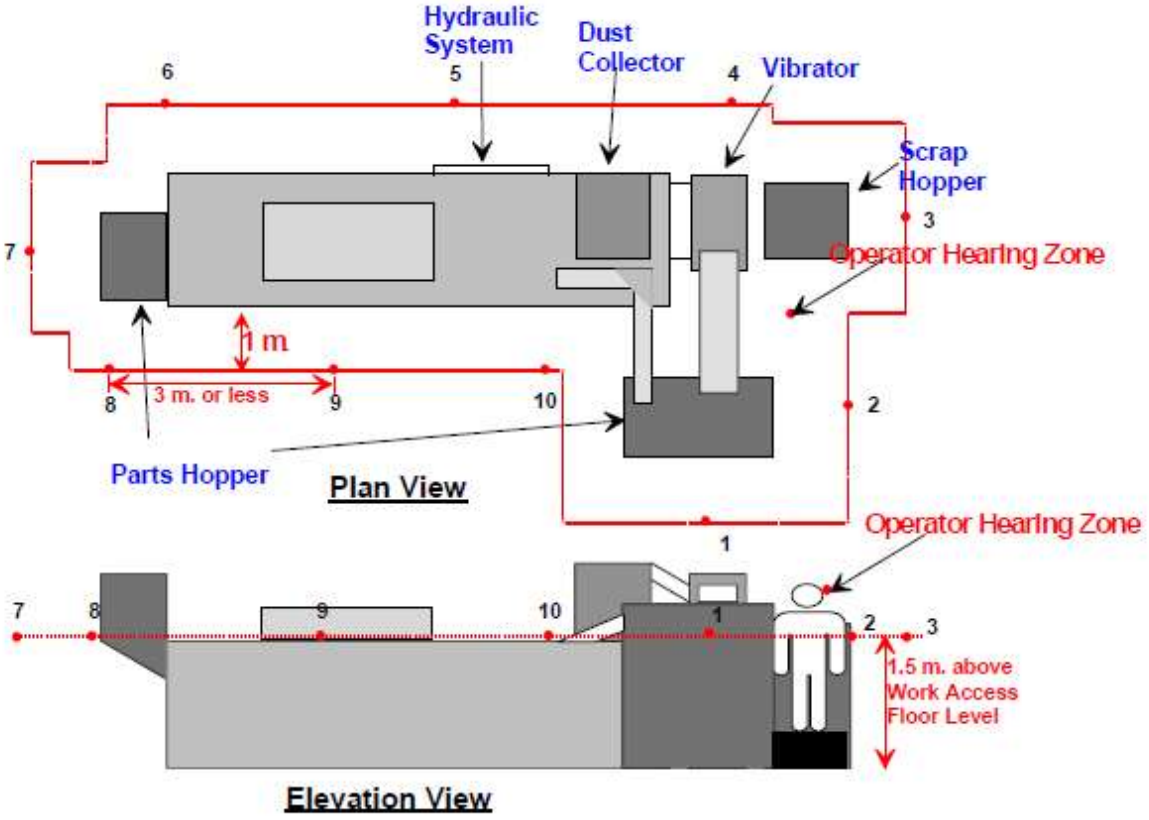
- If machine noise is cyclic or intermittent, data at each measurement location shall be gathered over a time period of sufficient length (three to four complete machine cycles) to insure that the TWA reported and certified is representative of an 8-hour continuous operation of the machine.
- The microphone of the sound measurement equipment shall have a unobstructed "view" of the machine/power tool/equipment. Any barriers, obstacles, etc. not an integral part of the machine must be removed before testing.

A.2-4 Record your sound level measurements from Sections 2.2 and 2.3 above on the "NEXTEER AUTOMOTIVE SUPPLIER'S SOUND DATA FORM AND CERTIFICATION SHEET (NEXTEER AUTOMOTIVE 1676).

EXAMPLE OF MACHINE MEASUREMENT ENVELOPE SKETCH

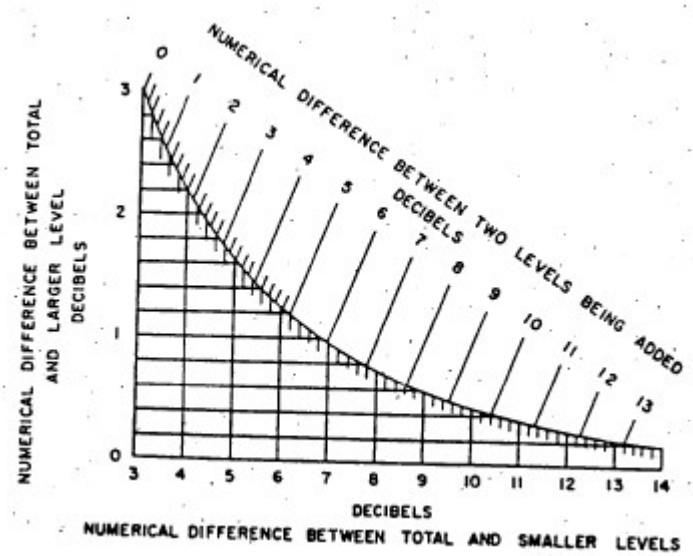
Note: Although 10 designated measurement locations are shown on the measurement envelope in the example below, the actual number of locations used in a given machine runoff may be greater than, or less than, 10.

A measurement(s) SHALL ALWAYS be taken at the Operator's Position(s) (Operator Hearing Zone) in addition to measurements taken on the Machine Measurement Envelope.



Equipment with Measurement Locations

APPENDIX B Chart for Addition & Subtraction of dB Sound Levels



Example: dB Addition

At a given measurement location, the following sound levels were measured for two machines (Machine A & Machine B) when the two machines were operated separately.

- Machine A (On) - Machine B (Off) $L_{A(measured)} = 85$ dBA
- Machine A (Off) - Machine B (On) $L_{B(measured)} = 83$ dBA

If both machines are operated at the same time, what will be the combined sound level measured?

$\Delta L = [L_A - L_B]_{ABSOLUTE\ VALUE} = 85\ dBA - 83\ dBA = 2\ dBA$

Refer to diagonal numbers on chart (NUMERICAL DIFFERENCE BETWEEN TWO LEVELS BEING ADDED) -- Go to the number 2 “Line” intercept on the curve, project horizontally to the left vertical axis, and read (NUMERICAL DIFFERENCE BETWEEN TOTAL AND LARGER LEVEL) -- which in this case is about 2.1 dB.

Since the “Larger Level” measured was 85 dBA, the “Total Level” will be:

$L_{total} = 85\ dBA + 2.1\ dBA = 87.1\ dBA$

Example: dB Subtraction

At a given measurement location, the following sound levels were measured with the machine operating under normal production load conditions, and with the machine turned off (background / ambient)

- Machine Operating (i.e. On) $L_{machine\ On}$ = 82 dBA
- Machine Not Operating (i.e. Off) -- Background/Ambient $L_{Background/Ambient}$ = 78 dBA

What is the sound level generated by the machine?

$\Delta L = [L_{machine}\ On) - L_{Background/Ambient}]_{ABSOLUTE\ VALUE}$ = 82 dBA - 78 dBA = 4 dBA

Since the measured sound level dropped more than 3 dB when the machine was turned off, the background/ambient sound level of 78 dBA must be smaller than the sound level generated by the machine. [Note: the level measured with the machine ON is a combination of the level due to the machine and the sound level due to background/ambient (i.e. the "Total" Level).

Refer to horizontal numbers on chart (NUMERICAL DIFFERENCE BETWEEN TOTAL AND SMALLER LEVELS). Go to the number 4 vertical line intercept on the curve, project horizontally to the left vertical axis, and read (NUMERICAL DIFFERENCE BETWEEN TOTAL AND LARGER LEVEL) -- which in this case is 2.2 dB.

Since the "Total" Level is the sound level measured with the machine operating (i.e. $L_{(Machine\ On)}$), $L_{machine}$ which must be the "Larger Level is:

$L_{machine} = L_{total}$ - 2.2 dB = 82 dBA - 2.2 dBA = 79.8 dBA

Note: In this case, a machine which by direct measurement would seem to have failed to meet the Nexteer Automotive Specification Limit of 80 dBA, does meet that limit when the high ambient background is subtracted out.

APPENDIX C Electric Motor Sound Power Level Requirements

C.1 Test Procedure

C.2 Shaded areas in Tables I, II, III, and IV indicate sound power levels greater than 87dBA, which would result in a measured sound level greater than 80dBA at 1 meter (3 feet). Where a motor is so indicated by a shaded area:

C.2-1 If the motor is to be installed in an area where there are no employee normal work locations, such as inside an enclosed mechanical room, on the roof, etc., the motor may be purchased without additional consideration for noise.

C.2-2 If the motor is to be installed in an area where there are employee normal work locations, then the motor's impact on employee exposure shall be considered per the following equation:

$L_M = L_W + 2 - 20\text{Log}(r)$

- L_M = Measured Sound Level dBA
- L_W = Sound Power Level dBA re 10^{-12} Watt
- r = Distance (feet) from motor to employee work location

C.2-2.1 If L_M is 80dBA or less, no further noise abatement considerations are necessary.

C.2-2.2 If L_M is greater than 80dBA, the motor noise contribution to the work location noise exposure shall be considered. Feasible engineering controls (i.e. alternate "quieter" motor substitution, partial / total enclosure, relocation, etc.) shall be installed to insure the work location eight (8) hour time-weighted average sound level (TWA_8) does not exceed 80dBA due to the motor.

NOTE: Machinery and Equipment Suppliers: Sound Power Level (L_W) specifications, instead of Sound Pressure Level, are used in motor certification tests because Sound Power Level is an absolute value which can be accurately determined in a sound room. Nexteer Automotive Sound Level Specification for Machinery and Equipment, latest revision, is based on sound levels of decibels (dB) referenced to 20 micro-Pascal. For example, the sound level measurement 1 meter (3 feet) from a motor having a sound power level L_W = 85dBA would typically be 78dBA or less in a Plant, depending upon distance (1 meter, in this case), directionally and environment.

C.3 U-Frame Motors ≤ 1800 RPM

C.3-1 The "A" weighted Sound Power Level, for all motors 1800 RPM and below, shall not exceed the dB value listed in Table I below based on a maximum temperature rise by resistance of 60°C.

Table I

*Frame Series	**Guaranteed No-Load Max. Sound Power Level (Reference 10-12 Watts)
Up through 405, incl.	85 dBA LW
440 through 445, incl.	88 dBA LW

*Applies to all Design "B," "C," and "D" motors, except motors above the 445U frame, multi-speed motors, and 3600 RPM motors (See paragraph B4.1 hereinafter).

**Guaranteed Maximum Sound Power Level shall not be construed as averaged expected.

C.4 U-Frame Motors > 445U Frame, Multi-Speed Motors, and 3600 RPM Motors

C.4-1 Design "B" motors above the 445U frame, multi-speed motors, and 3600 RPM motors shall not exceed the dBA sound power level values listed in Tables II and III. Table III values are based on allowing the motor manufacturer to provide a Class F or better – 65°C ambient insulation system with a maximum allowable temperature rise by resistance of 80°C. This will allow reduction of fan size to reduce motor noise so as to comply with the dBA sound power levels (L_W) shown in Table III.

Table II

TEFC Frames Class F – 90°C Ambient (60°C Rise by Resistance Max.)		
Frame Series	Motor Type and RPM***	Guaranteed No-Load Max. Sound Power Level Reference 10^{-12} Watts
Up through 365, incl.	*1800 RPM multi-speed with low speed of 900 RPM and above	85 dBA L_W

*Based upon 1800 RPM top speed.

Table III

TEFC Frames Class F –65°C Ambient (80°C Rise by Resistance Max.)		
Frame Series	Motor Type and RPM***	Guaranteed No-Load Max. Sound Power Level Reference 10^{-12} Watts
Up through 365, incl.	1800 RPM* multi-speed with low speed below 900 RPM	85 dBA L_W
	3600 RPM	85 dBA L_W
404 – 405, incl.	1800 RPM* multi-speed	85 dBA L_W
	3600 RPM	**90 dBA L_W
444 – 445, incl.	1800 RPM* multi-speed	88 dBA L_W
	3600 RPM	**92 dBA L_W
500 125 – 200 HP	1800 RPM	**90 dBA L_W
	1200 RPM and below	88 dBA L_W
500 / 680 250 – 300 HP	1800 RPM	**102 dBA L_W
	1200 RPM and below	**95 dBA L_W

*Based upon 1800 RPM top speed.

**Refer to paragraph C5.0 below.

***Single speed unless specified otherwise.

C.5 "Quiet Motors"

Where quiet motors ($L_W \leq 87$ dBA and below) in the above types are required, the Purchasing Division shall specify a maximum acceptable Sound Power Level ("A" weighted) as an alternate. This also applies to Multi-Speed, 3600 RPM, and Design D motors above the 445-frame series, which are not listed in Tables II and III above. Under this alternate Specification, the manufacturer shall be required to state in this proposal the maximum temperature rise by resistance and class insulation or any other special treatment required to comply with the specified maximum noise level.

C.6 T Frame Motors

C.6-1 Sound Power Level on an "A" weighted scale for all motors shall not exceed the dB value listed in Table IV below when measured at no load with rated voltage and frequency per IEE Standard 85.

Table IV

	Frame	Design	Speed			
			3600 RPM	1800 RPM	1200 RPM	900 RPM
Guaranteed No-Load Sound Power Level (L_W) Ref. 10^{-12} Watts	143-5T	A-B-C	85 dBA	70 dBA	64 dBA	67 dBA
	182-4T		85* dBA	74 dBA	67 dBA	69 dBA
	213-5T		85* dBA	79 dBA	71 dBA	72 dBA
	254-6T		85* dBA	84 dBA	75 dBA	76 dBA
	284-6T		85* dBA	85* dBA	80 dBA	80 dBA
	324-6T		85* dBA	85* dBA	83 dBA	83 dBA
	364-5T		85* dBA	85* dBA	85* dBA	85* dBA
	404-5T		90* dBA	85* dBA	85* dBA	85* dBA
	444-5T		92* dBA	88* dBA	85* dBA	85* dBA
	447-9T		102* dBA	96* dBA	92* dBA	92* dBA

*Value is less than MG1-12.84-3.

APPENDIX D Transformer Average Sound Levels

TABLE 0-1
AUDIBLE SOUND LEVELS FOR OIL-IMMERSED POWER TRANSFORMERS

Column 1 -- Class* OA, OW, and FOW Ratings
Column 2 -- Class* FA and FOA First-stage Auxiliary Cooling**‡
Column 3 -- Straight FOA Ratings, FA, FOA, Second-Auxiliary Cooling**‡

Average Sound Level ††Decibels	Equivalent Two-winding Rating† 350 kV BIL and Below			450, 550, 650 kV BIL			750 and 825 kV BIL			900 and 1050 kV BIL			1175 kV BIL			1300 kV BIL and Above		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
57	700	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
58	1000	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
59	...	...	...	700	...	...	...	...	...	...	...	...	...	...	...	...	...	...
60	1500	...	...	1000	...	...	...	...	...	...	...	...	...	...	...	...	...	...
61	2000	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
62	2500	...	...	1500	...	...	...	...	...	...	...	...	...	...	...	...	...	...
63	3000	...	...	2000	...	...	...	...	...	...	...	...	...	...	...	...	...	...
64	4000	...	...	2500	...	...	...	...	...	...	...	...	...	...	...	...	...	...
65	5000	...	...	3000	...	...	...	...	...	...	...	...	...	...	...	...	...	...
66	6000	...	...	4000	...	...	3000	...	...	...	...	...	...	...	...	...	...	...
67	7500	6250§	...	5000	3750§	...	4000	3125§	...	...	...	...	...	...	...	...	...	...
68	10000	7500	...	6000	5000	...	5000	3750	...	...	...	...	...	...	...	...	...	...
69	12500	9375	...	7500	6250	...	6000	5000	...	...	...	...	...	...	...	...	...	...
70	15000	12500	...	10000	7500	...	7500	6250	...	...	...	...	...	...	...	...	...	...
71	20000	16667	...	12500	9375	...	10000	7500	...	...	6250	...	...	...	...	...	...	...
72	25000	20000	20800	15000	12500	...	12500	9375	...	...	7500	...	...	6250	...	...	...	...
73	30000	26667	25000	20000	16667	...	15000	12500	...	12500	9375	...	...	7500	...	...	6250	...
74	40000	33333	33333	25000	20000	20800	20000	16667	...	15000	12500	...	12500	9375	...	...	7500	...
75	50000	40000	41667	30000	26667	25000	25000	20000	20800	20000	16667	...	15000	12500	...	12500	9375	...
76	60000	53333	50000	40000	33333	33333	30000	26667	25000	25000	20000	20800	20000	16667	...	15000	12500	...
77	80000	66667	66667	50000	40000	41667	40000	33333	33333	30000	26667	25000	25000	20000	20800	20000	16667	...
78	100000	80000	83333	60000	53333	50000	50000	40000	41667	40000	33333	33333	30000	26667	25000	25000	20000	20800
79	...	106667	100000	80000	66667	66667	60000	53333	50000	50000	40000	41667	40000	33333	33333	30000	26667	25000
80	...	133333	133333	100000	80000	83333	80000	66667	66667	60000	53333	50000	50000	40000	41667	40000	33333	33333
81	...	...	166667	...	106667	100000	100000	80000	83333	80000	66667	66667	60000	53333	50000	50000	40000	41667
82	...	...	200000	...	133333	133333	...	106667	100000	100000	80000	83333	80000	66667	66667	60000	53333	50000
83	...	...	250000	...	...	166667	...	133333	133333	...	106667	100000	100000	80000	83333	80000	66667	66667
84	...	...	300000	...	...	200000	...	...	166667	...	133333	133333	...	106667	100000	100000	80000	83333
85	...	...	400000	...	...	250000	...	...	200000	...	...	166667	...	133333	133333	...	106667	100000
86	...	...	...	...	...	300000	...	...	250000	...	...	200000	...	...	166667	...	133333	133333
87	...	...	...	...	...	400000	...	...	300000	...	...	250000	...	...	200000	...	...	166667
88	...	...	...	...	...	...	...	...	400000	...	...	300000	...	...	250000	...	...	200000
89	...	...	...	...	...	...	...	...	...	...	...	400000	...	...	300000	...	...	250000
90	...	...	...	...	...	...	...	...	...	...	...	...	...	...	400000	...	...	300000
91	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	400000

*Classes of cooling (see 2.6.1 of American National Standard c57.12.00-1980).
**First- and second-stage auxiliary cooling (see TR 1-0.02).
†The equivalent two-winding 55°C or 65°C rating is defined as one-half the sum of the kVA rating of all windings.
‡Sixty-seven decibels for all kVA ratings equal to this or smaller.
††For intermediate kVA ratings, use the average sound level of the next larger kVA rating.
§For column 2 and 3 ratings, the sound levels are with the auxiliary cooling equipment in operation.

Table 0-2
AUDIBLE SOUND LEVELS FOR LEVELS FOR LIQUID-IMMERSED DISTRIBUTION TRANSFORMERS AND NETWORK TRANSFORMERS

Equivalent Two-winding kVA	Average Sound Level Decibels
0-50	48
51-100	51
101-300	55
301-500	56
750	57
1000	58
1500	60
2000	61
2500	62

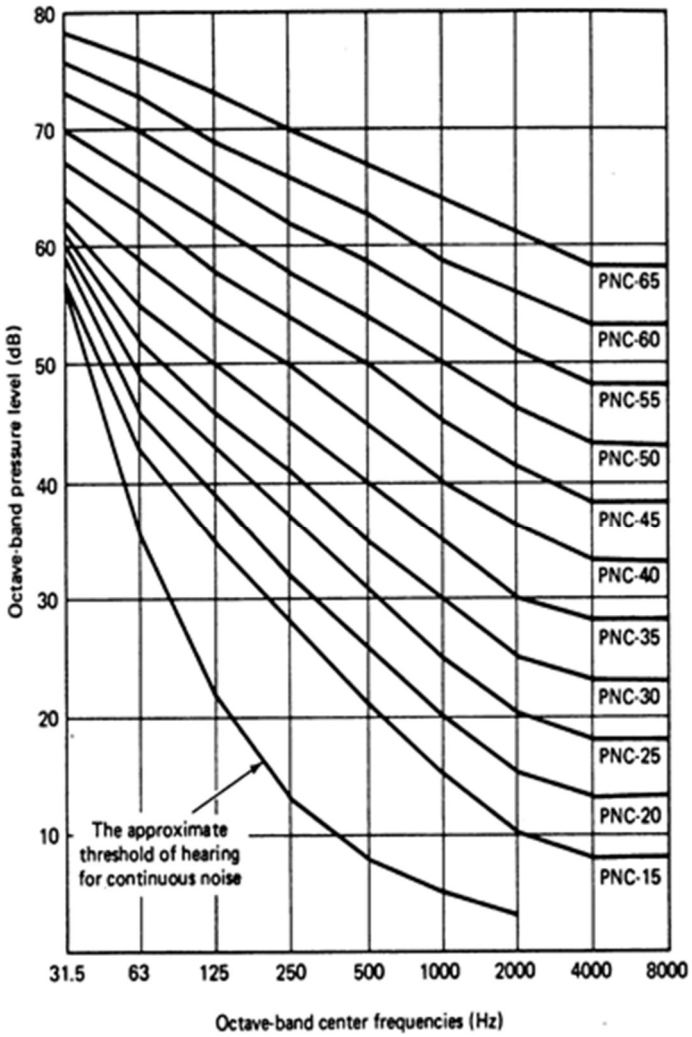
Table 0-3
AUDIBLE SOUND LEVELS FOR DRY-TYPE TRANSFORMERS 15000-VOLT NOMINAL SYSTEM VOLTAGE AND BELOW

Equivalent Two-winding KVA	Average Sound Level, Decibels: Self-cooled ventilated (1)	Self-cooled sealed (2)	Equivalent Two-winding kVA	Average Sound Level, Decibels Ventilated Forced Air Cooled* (3)
0-50	50	50	...	...
51-150	55	55	...	...
151-300	58	57	3-300	67
301-500	60	59	301-500	67
501-700	62	61	501-833	67
701-1000	64	63	834-1167	67
1001-1500	65	64	168-1667	68
1501-2000	66	65	1668-2000	69
2001-3000	68	66	2001-3333	71
3001-4000	70	68	3334-5000	73
4001-5000	71	69	5001-6667	74
5001-6000	72	70	6668-8333	75
6001-7500	73	71	8334-10000	76

Columns 1 and 2 - Class AA rating
Column 3 -- Class Fa and AFA ratings
* Does not apply to sealed-type transformers

Tables 0-1 through 0-3 reprinted from NEMA Standards Publication No. TR1-1980, "Transformers, Regulators and Reactors." © 1981 pages 3-4, with the permission of the National Electrical Manufacturers Association.

APPENDIX E 1971 Preferred Noise Criterion (PNC) Curves



Octave -Band Sound Pressure Level Values for 1971 Preferred Noise Criterion (PNC) Curves

PNC Curve	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1,000 Hz	2,000 Hz	4,000 Hz	8,000 Hz
PNC-15	58	43	35	28	21	15	10	8	8
PNC-20	59	46	39	32	26	20	15	13	13
PNC-25	60	49	43	37	31	25	20	18	18
PNC-30	61	52	46	41	35	30	25	23	23
PNC-35	62	55	50	45	40	35	30	28	28
PNC-40	64	59	54	50	45	40	36	33	33
PNC-45	67	63	58	54	50	45	41	38	38
PNC-50	70	66	62	58	54	50	46	43	43
PNC-55	73	70	66	62	59	55	51	48	48
PNC-60	76	73	69	66	63	59	56	53	53
PNC-65	79	76	73	70	67	64	61	58	58

APPENDIX F Nexteer Automotive Supplier's Sound Data form and Certification Sheet (Nexteer Automotive 1676)

A. MACHINE SPECIFICATIONS

Builder _____

Machine/Equipment Identification Name _____

Purchase Order No. _____ Capital Tag No. _____

TYPE _____ MODEL _____
SERIAL NO. _____ SIZE _____ CAPACITY _____
SPEED _____ HORSEPOWER _____ AUXILIARIES _____

B. INSTRUMENTATION USED FOR CERTIFICATION

INSTRUMENTATION	MODEL	SERIAL NO.	CERTIFIED CALIBRATION DATE
SOUND LEVEL METER			
MICROPHONE			
IMPACT METER			
OTHER			

C. CERTIFICATION

The undersigned certifies that the above equipment was tested in accordance with the "NEXTEER SOUND LEVEL SPECIFICATION FOR THE PURCHASE OF MACHINERY AND EQUIPMENT"
(latest revision)

SOUND LEVEL/SOUND POWER LEVEL QUOTED & ACCEPTED = _____ dBA (TWA)
MEASURED MACHINE SOUND LEVEL/SOUND POWER LEVEL = _____ dBA (TWA)

DATE _____ SIGNED _____

TITLE _____ COMPANY _____

D. SKETCH OF MACHINE AND MEASUREMENT ENVELOPES

TEST _____

TEST SPACE _____

Machine Name _____

E. TEST DATA

NEXTEER Automotive
Capital Tag No. _____

OBSERVER: _____ DATE: _____

TEST POINT	AMBIENT dB(A) (SLOW)	MINIMUM dB(A) (SLOW)	MAXIMUM dB(A) (SLOW)	IMPULSE PEAK dB	FREQUENCY IMPULSES PER HOUR	MEASURED dB(A) STEADY STATE TIME -WEIGHTED AVERAGE	CORRECTED dB(A) STEADY STATE TIME-WEIGHTED AVERAGE
Ambient Conditions (Describe)							
Load Conditions No. 1 (Describe)							
Load Conditions No. 2 (Describe)							

BASIS FOR TIME-WEIGHTED AVERAGING	• Integrating Exchange Rate:	**dB**
	• Lower Limit Threshold Cutoff	**dB**

Machine Name _____

E. TEST DATA (Cont'd)

Nexteer Automotive
Capital Tag No. _____

OBSERVER: _____ DATE: _____

TEST POINT	AMBIENT dB(A) (SLOW)	MINIMUM dB(A) (SLOW)	MAXIMUM dB(A) (SLOW)	IMPULSE PEAK dB	FREQUENCY IMPULSES PER HOUR	MEASURED dB(A) STEADY STATE TIME-WEIGHTED AVERAGE	CORRECTED dB(A) STEADY STATE TIME-WEIGHTED AVERAGE
Load Conditions No. 3 (Describe) _____							
Load Conditions No. 4 (Describe) _____							

BASIS FOR TIME-WEIGHTED AVERAGING	• Integrating Exchange Rate:	**dB**
	• Lower Limit Threshold Cutoff	**dB**

This Data Form follows the guidelines recommended in "NMTBA Noise Measurement Techniques" Second Edition, January 1976

APPENDIX G Supplier Authorization to Ship Form

APPENDIX G-1
SUPPLIER AUTHORIZATION TO SHIP FORM
for
NEXTEER AUTOMOTIVE SOUND LEVEL SPECIFICATION

_____ Division regards compliance with the Nexteer Automotive Sound Level Specification as mandatory. Deviation is regarded as a situation requiring special levels of approval.

MACHINE SPECIFICATIONS

BUILDER _____
MACHINE/EQUIPMENT
IDENTIFICATION NAME _____

SERIAL _____

PURCHASE ORDER NO. _____ CAPITAL TAG NO. _____

SHIPPING AND WAIVER CONDITIONS

The vendor must request and receive written permission to ship any equipment exceeding the Quoted & Accepted Sound Level/Sound Power. Shipping of the equipment does not, in itself, release the vendor from his contractual Responsibility to meet the Quoted & Accepted Sound Level/Sound Power Level specified sound limit. Waiver Requirement must be explicitly stated in writing and approved in written form by the plant Manager.

The vendor must submit in writing, upon request to ship, a detailing of feasible engineering controls currently designed into and/or installed on the machine/equipment.

☐ 1. Sound Level/Sound Power Levels exceed the Quoted & Accepted Specification Limit and Feasible Accepted Sound Level/Sound Power Level specification limit. Vendor must submit a waiver request Form (G-2) and receive acknowledgement before shipping.

☐ 2. Vendor may not ship equipment until further effort is expended to meet the Quoted & Accepted Sound Level/Sound Power Level specification limit.

☐ 3. Vendor may ship equipment, but **IS NOT** released from the contractual responsibility of meeting the Quoted and Accepted Sound Level/Sound Power Level specification limit.

☐ 4. Vendor may ship equipment. Equipment has met the contractual responsibility of this Specification.

AUTHORIZATION FOR SHIPPING EQUIPMENT
Signatures of the Plant or Divisional Project Engineer responsible for authorizing shipment and acceptance of Equipment, the Plant or Divisional Engineer responsible for noise control, and the Plant Safety Supervisor are required for refusing or granting permission to ship equipment that does not meet the Quoted and Accepted Sound Level/Sound Power Level Specification Limit.

Signature _____ Date: _____
(Project Engineer)

Signature _____ Date: _____
(Safety Supervisor)

Signature _____ Date _____
(Plant Manager)

APPENDIX G-2
SUPPLIER WAIVER REQUEST FORM
for
NEXTEER AUTOMOTIVE SOUND LEVEL SPECIFICATION

Supplier: _____, is requesting a waiver from the Nexteer Automotive Sound Level Specifications for the following reasons.

AUTHORIZATION FOR WAIVER

This WAIVER shall be accompanied by a detailing of the feasible engineering controls designed into and/or the machine/equipment, documentation that feasible engineering technology does not exist at this time to correct problem, and a statement by the vendor or project engineer pertaining to the absence of feasible technology to the problem.

Company: Date:

Signature: Title:

The signature of the Plant Manager is necessary for release of the vendor from the contractual responsibility of Quoted & Accepted Sound Level/Sound Power Level specification limit.

Nexteer Automotive has:

Signature _____ Date _____
(Plant Manager)

This form is to be filed in the Plant or Divisional records along with the "NEXTEER AUTOMOTIVE SUPPLIER'S SOUND DATA FORM AND CERTIFICATION SHEET" (NEXTEER AUTOMOTIVE-1676)

APPENDIX H SD-018 Supplement Design-In Sound Level Controls

Sound control should be by design and process selection, compatible with operating and maintenance requirements. The source of the noise should be addressed before any consideration is given for enclosures.

The following Sound Level Controls have been used in industry to reduce machine/process generated noise. The application feasibility of a given control must, however, be evaluated on a specific case basis. Application feasibility of a control measure or technique is not inferred by its' being listed in the following.

Noise control solutions which cause production problems or inefficiencies must be defined and accepted by the purchasing facility before build.

Noise Controls must comply with Nexteer Automotive's Safety & Fire Specifications.

H.1 Machine Design

H.1-1 Compressed air must be controlled. Process selection should minimize the need for air blow-offs, air probes, and air gauges. All blow-offs should be designed with adequate air capacity and physical clearance to permit use of a silence nozzle, timed to operate only when required and operate under the minimum pressure needed to perform the work.

H.1-2 Air movement dictated by the process such as drying, cooling, or chip removal, shall be designed as a complete system by the supplier and shall be controlled in such a manner as to minimize noise.

H.1-3 Compressed air usage for part movement or orientation is greatly discouraged and must have special approval.

H.1-4 All air exhausts must be adequately muffled or plumbed to a suitable manifold chamber.

H.1-5 Equipment acceleration and deceleration must be designed to minimize part and machine noise.

H.1-6 Where machine operation generates significant noise and vibration, the Supplier shall recommend and design suitable vibration isolation mounts. Consult Manufacturing Engineer for approval.

H.1-7 In moving metallic parts, minimize part to part contact and uncontrolled gravity drops.

H.2 Sound Enclosure

H.2-1 Sound enclosures are not considered a desirable solution to noise control problems and should be used as a last resort. All possible efforts should be made to eliminate the noise source. Where enclosures are necessary, the following points must be followed:

H.2-1.1 All enclosures shall be built with adequate strength to withstand usage in a manufacturing environment and withstand three (3) teardown and re-assemble cycles. It should be noted that plant personnel will be working around, and sometimes, on enclosures. Care must be taken to provide enclosures that will not present a safety hazard.

H.2-1.2 All enclosures must provide complete accessibility to all pertinent points of the equipment within and for parts removal or housekeeping purposes.

H.2-1.3 All enclosures that must be disassembled for maintenance or clean-out will be joined by hinges and latches rather than fasteners requiring tools for disassembly.

H.2-1.4 Enclosures must adhere to any required fire safety regulations.

H.2-1.5 Enclosures with heavy side or top panels (75 pounds or more) which have to be removed for maintenance must have eyebolts installed for hoist lift.

H.2-1.6 All sound control materials shall be approved. All panels containing porous acoustical material shall be covered with a vapor barrier to prevent absorption of oil or water.

H.2-1.7 Enclosures shall have provisions for adequate ventilation if required, to prevent a build-up of fumes, mists, or heat.

H.2-1.8 Enclosures where personnel are expected to work shall be adequately lighted.

H.2-1.9 Permanent openings in the enclosure will be kept to a minimum in quantity and size and designed - where possible - to prevent a “line-of-sight’ opening from inside to outside.

H.2-1.10 Sound enclosures with doors for personnel or materials, shall be equipped with proper locking latches and seals around openings.

H.2-1.11 Enclosures shall be designed so that there will be no restrictions in productivity.

H.3 Vibratory Feeders and Vibrators

H.3-1 The use of vibratory feeders particularly with metallic or hard parts should be avoided when the application exceeds the specification limits. Alternate methods of conveyance should be considered, such as mechanical movers, belts, magnetics, etc. If vibrators are used, they should be electromagnetic. Air vibrators are prohibited.

H.3-2 If vibrator feeders are used in conjunction with metal parts or other noise producing parts, urethane or other suitable damped materials should be used in constructing feeder components contacting the fed parts. This is preferred to enclosing feeders to contain noise.

H.3-3 Solid urethane bowls are encouraged. The lining of tracks and bowls with urethane coatings is not acceptable.

H.3-4 Wear plates or part orientation devices inserted into the bowl to enhance feeding or feeder life does not in any way free the Vendor from meeting the noise specifications. All inserts must be secured in such a manner that they will not work loose or cause distortion when tightened.

H.4 Bins and Hoppers

H.4-1 Bins and hoppers used in conjunction with metallic or hard parts should be lined with a damped material, such as urethane or rubber. Metal mesh containers are another method.

Reference: Sound and Vibration (Magazine) for a listing of Product Sources.

RECORD OF REVISIONS

Revision No	Date	Section	Description
001	01OC99	ALL	Initial Release
002	03MR12	ALL	Revised
003	22JA21	ALL	Reformatted entire document, renamed to SD-018 (from SL 1.0)
004			
005			
006			
007			
008			
009			
010			
011			
012			
013			
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019			
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