



Development Services  
Permit Processing 425-452-4898

### Construction Noise Expanded Exempt Hours Permit Application

FOR OFFICE USE ONLY 15-122917 LY  
Permit #

Date 9/10/2015

Site Address E330 - East Link

~~1118 SE 1st Place~~  
~~450 110th Ave NE~~

Construction Permit # \_\_\_\_\_

24 Hr Phone Number \_\_\_\_\_  
Project Name East Link EXT.

Applicant Justin Larson

24 Hr Phone Number \_\_\_\_\_

Applicant Address 401 S. Jackson Street

Description of Work  
CONSTRUCTION of the Downtown Bellevue Tunnel

Location of Work Vic. of Main & 112 <sup>Vic.</sup> to 110th Ave NE & NE 6th

Proposed Date(s) and Proposed Time(s) of Operation  
See application. Approx. 52 months

Reason for Expanded Exempt Hours (see back for allowed activities)  
CONSTRUCTION of ESSENTIAL Public Facilities

I certify under penalty of perjury under the laws of the State of Washington that the foregoing is true and correct. I further agree to comply with all city codes and regulations related to noise control.  
JUSTIN LARSON 9/10/2015  
Applicant Name (Please Print) Date  
Justin Larson  
Applicant Signature

To be completed by City of Bellevue staff

This expansion of normal exempt construction hours is issued under BCC 9.18.020C. and 9.18.040A.4.

Decision (circle one) Approved **Approved with Conditions** (attached) Denied

[Signature]  
Permit Processing Signature

November 9, 2015  
Date

**Received**  
SEP 10 2015

**Permit Processing**

A copy of this approval must be kept on site.

## BCC 9.18 NOISE CONTROL

### 9.18.020 Exemptions.

The following sounds are exempt from the provisions of this chapter at all times if the receiving property is in Class B and Class C EDNAs, and between the hours of 7:00 a.m. and 10:00 p.m. on weekdays and 9:00 a.m. and 10:00 p.m. on weekends if the receiving property is located in a Class A EDNA:

- Sounds created by the repair or installation of essential utility services and streets; and
- Sounds relating to temporary repair, addition or maintenance projects on existing single-family homes, grounds and appurtenances (except that sounds created by heavy equipment will be regulated pursuant to the construction noise exemption contained in subsection C of this section); and
- Sounds created by construction and emanating from construction sites are exempt from the provisions of this chapter between the hours of 7:00 a.m. and 6:00 p.m. on weekdays, and 9:00 a.m. and 6:00 p.m. on Saturdays which are not legal holidays. Sounds emanating from construction sites on Sundays or legal holidays or outside of the exempt work hours are prohibited pursuant to BCC 9.18.040 unless expanded hours of operation are authorized by the applicable department director subject to the following criteria.

Approval of expanded exempt hours may be authorized if:

1. Necessary to accommodate transportation mitigation such as evening haul routes; construction on schools and essential government facilities which cannot be undertaken during exempt hours; construction activities and site stabilization in the fall prior to the onset of winter weather; or emergency work; or

2. Sounds created by construction will not exceed the maximum permissible environmental noise levels contained in BCC 9.18.030 as verified by sound level monitoring conducted before and during construction by a qualified acoustic consultant.

### 9.18.030 Maximum permissible environmental noise levels.

For sound sources located within the city, the maximum permissible sound sources are as follows measured at the property boundary of the receiving property or anywhere within.:

Maximum Permissible Sound Levels by Receiving Property			
EDNA of Noise Source	EDNA of Receiving Property		
	Class A	Class B	Class C
	(dBA)	(dBA)	(dBA)
Class A Residential	55	57	60
Class B Commercial	57	60	65
Class C Industrial	60	65	70

Modifications to maximum permissible sound levels are as follows:

1. Reduce by 10 dBA nights 10:00 p.m. to 7:00 a.m. for receiving property in Class A EDNAs; and
2. Reduce by five dBA for impulsive or pure tone sounds for any receiving property at any time; and
3. Increase for short duration for any receiving property at any time:
  - a. Increase by five dBA for 15 minutes in any one-hour period; or
  - b. Increase by 10 dBA for five minutes in any one-hour period; or
  - c. Increase by 15 dBA for 1.5 minutes in any one-hour period.



November 9, 2015

**Subject:** Downtown Bellevue Tunnel  
15-122817 LY

**Reference Permit:** 14-136642 GD

**Location:** 1118 SE 1<sup>st</sup> Place

### **EXPANDED EXEMPT WORK HOURS**

**Request: Sound Transit requests 52 months of expanded work hours to complete the Downtown Bellevue Tunnel associated with the East Link extension. This request identifies the following activities that must happen on a continuous 24 hour cycle to accommodate tunnel construction; the use of horizontal excavation equipment, SEM initial support systems/toolbox items, shotcrete operation (including concrete batch plant equipment), fresh air circulation fans and dewatering pumps.**

Any future requests that are outside of the scope identified in this approval will be reviewed and evaluated under separate permit applications.

The following conditions are intended to mitigate for expected noise created by construction activities

1. Sound Transit or its agent shall construct an insulated 20 foot tall temporary construction sound wall at the earliest time technically feasible around the south portal site where staging and tunneling activities will occur.
2. Sound Transit or its agent shall establish a 24 hour construction hotline to provide a single point of contact for construction inquiries and complaints per the terms included in your permit submittal. However, complaints received by Code Compliance during work hours and City of Bellevue Police during evening hours will be directed back to the 24 hour hotline. The City of Bellevue and Sound Transit will maintain logs of complaint activity and that information will be shared between agencies. Sound Transit or its agent shall address these noise complaints and implement appropriate measures to resolve these complaints, which may include indoor mitigation measures.
3. A plan for public outreach shall be undertaken by Sound Transit public outreach staff. Once the permit is issued, Sound Transit will be responsible for implementing the plan and a pro-active program of notification and communication identified in the permit application including, but not limited to, an "informational" public meeting attended by both agencies and construction

contractor a minimum of 30 days prior to the start of any heavy civil construction covered by this permit, early written notice of construction activities, hosting public meetings, and communicating with businesses in the vicinity. Sound Transit's contractor will be required to participate in public outreach activities and meetings as appropriate during construction.

4. A minimum of 14 calendar days prior to the commencement of the construction activity related to this request, Sound Transit or its agent shall provide public notice to the City of Bellevue and properties within 1,000 feet of the south portal and mid-tunnel access point sites. The form of the communication shall be developed by consensus between the two agencies.
5. A copy of the public notice described in condition number 4 shall be provided to the Development Services Department at least 14 calendar days in advance of proposed construction outside the normal exempt construction noise hours.
6. Sound Transit or its agent shall be responsible to establish a Noise and Vibration Control Plan per the terms listed in Section 1.06 of the Contract Specifications submitted as part of this extended work hour request. The Noise and Vibration Control Plan shall be submitted to the City of Bellevue Development Services Department for review and approval prior to initiating nighttime construction noise activities.
7. Sound Transit or its agent shall be responsible for establishing a Noise and Vibration Mitigation Plan per the terms listed in Section 1.07 of the Contract Specifications submitted as part of this extended work hour request. The Noise and Vibration Mitigation Plan shall be submitted to the City of Bellevue Development Services Department for review and approval prior to initiating nighttime construction noise activities.
8. Sound Transit or its agent shall be responsible for implementing the Construction Methods for Operations and Construction Methods for Noise Abatement Measures identified in Sections 3.04 and 3.05 of the Contract Specifications submitted as part of this extended work hour request.
9. Sound Transit or its agent shall be responsible to implement the Noise and Vibration Measurement Procedures identified in Section 3.06 of the Contract Specifications submitted as part of this extended work hour request.
10. To mitigate for predicted nighttime construction noise levels exceeding 60 dBA Leq (1-hour) in the immediate vicinity of the south portal site and the 52 month duration of nighttime construction noise, Sound Transit or its agents shall be responsible to offer sound mitigation packages to the eleven properties identified in Exhibit A attached to this report. These parcels are also identified as R4, R5, R8, R9, R10, R11, R14, R15, R19, R20 and R21 in the report prepared by

Stephen Wolf, ATS Consultant in Figure 1-1 submitted with this application. These packages should consider temporary and permanent sound mitigation such as windows, doors, chimney baffles, and air conditioning. Sound Transit or its agent shall provide evidence to the City of Bellevue Development Services Department that offers have been made and whether or not they have been accepted. If monitoring of actual nighttime construction noise reveals that additional single family residential properties are receiving noise greater than 60 dBA Leq (1-hour), additional sound insulation package offers may be warranted.

11. Nighttime project sound levels shall not exceed the proposed limit of 72 dBA Leq (1-hour) as identified in the permit application. This number is based on predicted nighttime noise levels all mitigation deployed.
12. Sound Transit or its agent shall be required to obtain approval from the City of Bellevue Right of Way Use (ROW) Division for nighttime construction activities that impact the ROW outside the scope of this approval such as haul routes and staging activities which have been identified in your ROW Use Permit.
13. This approval of extended work hours shall expire 52 months from the commencement of nighttime construction.
14. If an exceedance of the 72 dBA Leq (1-hour) noise limit were to occur, Sound Transit will require the contractor to cease the specific activity immediately. The exceedance may result in a review or modification of the conditions imposed by this approval.
15. The City of Bellevue or its agent shall conduct a one year review of noise levels and mitigation and may modify the terms and conditions of this approval as needed if it is determined that the current approval and current conditions are not adequately protecting the public health and safety or reasonably controlling or mitigation the construction noise, or that there are more reasonable methods of doing so based on best management practices.
16. A copy of this authorization shall be kept available at the job site.

The conditions established by this permit approval are based on the nature and merits of the request, staff review, and third party peer review. Any change of scope of work or environmental conditions may require review or modification of the conditions contained herein.

Section 1.06 of the Contract Specifications  
Section 1.07 of the Contract Specifications  
Section 3.04 of the Contract Specifications  
Section 3.05 of the Contract Specifications  
Section 3.06 of the Contract Specifications

# Exhibit A - Properties Exceeding 60dBA



The City of Bellevue does not guarantee that the information in this map is accurate or complete. This data is provided for informational purposes only and disclaims all warranties.

**SECTION 01 57 15**

**TEMPORARY CONSTRUCTION NOISE AND VIBRATION CONTROL**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. This Section specifies requirements for complying with applicable noise regulations, and noise and vibration limits

**1.02 REFERENCES**

- A. This Section incorporates by reference the latest revisions of the following documents.
  - 1. American National Standards Institute (ANSI) / Acoustical Society of America (ASA)
    - a. ANSI/ASA S1.4 American National Standard Specification for Sound Level Meters
    - b. ANSI/ASA S2.4 American National Standard Method for Specifying the Characteristics of Auxiliary Analog Equipment for Shock and Vibration Measurements

**1.03 DEFINITIONS**

- A. Construction Site: For purpose of noise and vibration control requirements, the Construction Work Area limits includes Right-of-Way, property, and construction easements, used expressly for construction.
- B. Noise Level Measurements: A-weighted and "slow" response readings from instruments complying with TYPE 1 or TYPE 2 requirements of the ANSI/ASA S1.4.
- C. A-Weighted Noise Levels: Decibels (referenced to 20 micro-Pascal) as measured with A-weighting network of standard sound level meter, abbreviated dBA.
- D. Vibration Measurements: The use of a vibration transducer, amplifier, peak detector, and frequency band filters complying with ANSI/ASA S2.4.
- E. Vibration: Peak particle velocity (PPV) in microinches per second.
- F. Noise Sensitive Locations: Residential areas, institutions, hospitals, parks, and other locations so named herein.
- G. Maximum Sound Level  $L_{max}$ : The maximum recorded root mean square (RMS) A-weighted sound level for a given time interval or event.
- H. Equivalent Sound Level  $L_{eq}$ : The A-weighted level of a constant sound having the same energy content as the actual time-varying level during a specified interval. The  $L_{eq}$  is used to characterize complex, fluctuating sound levels with a single number. Typical intervals for  $L_{eq}$  are hourly, daily and annually.
- I. Vibration Monitoring: Monitoring used to determine if the equipment and methods used to complete the work cause vibrations that equal or exceed threshold values. The data gathered provide onsite feedback of the effects of specific operations and procedures.

RTA 18 14  
CONTRACT 1800  
IFB  
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**SEP 10 2015**  
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#### 1.04 SUBMITTALS

- A. Noise and Vibration Control Plan
  - 1. Prior to work on site, or as specified herein. Do not operate noise generating construction equipment at the construction site prior to Acceptance of the Noise and Vibration Monitoring Plan.
- B. Qualifications of the Acoustic Specialist:
  - 1. Membership in at least one of the following recognized acoustical organizations
    - a. Institute of Noise Control Engineering (INCE): INCE Member. INCE Associate Membership is insufficient.
    - b. Acoustical Society of America (ASA): Member. Student and Associate Memberships are insufficient.
    - c. National Council of Acoustical Consultants (NCAC): Employee of a NCAC Member Firm.
  - 2. Minimum 10 years of experience performing similar work.
- C. Noise and Vibration Monitoring Plan:
  - 1. Prior to work on site, as specified herein.
  - 2. Update and re-submit the Noise and Vibration Control Plan upon all major change in work schedule, construction methods, or equipment operations not included in the most recent Plan.
  - 3. Prepare and submit a scaled plan indicating noise and vibration measurement monitoring locations.
  - 4. Certificates of calibration for monitoring instruments, including updated certificates after repairs to instruments.
- D. Weekly Noise and Vibration Measurement Reports: as specified herein.
- E. Shop and Working Drawings, computations, material data and other criteria, for all noise abatement measures identified in the Noise and Vibration Control Plan.

#### 1.05 RESPONSIBILITIES OF CONTRACTOR

- A. Perform Work within the permissible noise and vibration levels, work schedule limitations, and procedures provided for in this Section and applicable federal, state, county and the local Jurisdiction having Authority codes, regulations, and standards.
- B. Use equipment with effective noise-suppression devices and employ other noise control measures such as barriers and curtains necessary to protect the public.
- C. Schedule and conduct operations in a manner that minimizes, to the greatest extent feasible, the disturbance to the public in areas adjacent to the construction activities and to occupants of buildings in the vicinity of the construction activities.
- D. Compliance with the requirements of this Section may require the use of equipment with special exhaust silencers or enclosures, and construction of temporary enclosures or noise barriers around activities. Use haul routes and staging areas as shown on the Contract Drawings or if not shown as approved by the Resident Engineer, to minimize

noise at residential and other sensitive receptor sites. Noise produced by elevated equipment, including crane pulleys and hoses, must be minimized.

#### 1.06 NOISE AND VIBRATION CONTROL PLAN

A. If construction occurs between the hours of 6 pm and 7 am weekdays and 6 pm and 9 am Saturdays, or anytime Sundays or legal holidays a noise control plan shall be prepared by the Contractor.

B. Requirements

1. Include the following for construction activities that may occur at the construction site:

a. Site Drawing - Prepare a scaled drawing of the construction site indicating the following:

- 1) Contract name and number
- 2) Contractor's name
- 3) Date and hours of work operation
- 4) Scale
- 5) Direction of North
- 6) Identify noise and vibration sensitive locations near the construction site
- 7) Construction equipment locations used, designated by the code letter used in Column (a) in Part A of the Noise Control Plan Form, Exhibit A.
- 8) Locations of the noise levels calculated for the nearest residential, commercial, and industrial areas as specified herein.
- 9) Locations and types of noise abatement measures that may be required to meet codes and regulations as indicated by the calculations.

b. Equipment Inventory - Prepare an inventory of equipment used by providing the following information in the indicated columns of Noise Control Plan Form, Exhibit A.

- 1) Column (a) - Code letter in sketch to indicate position of equipment on site
- 2) Column (b) - Category or type of equipment
- 3) Column (c) - Equipment manufacturer and model, if known at the time of the Plan's preparation
- 4) Column (d) - Unique identifier (ID), such as registration number, if known at the time of the Plans preparation.
- 5) Column (e) - Equipment horsepower
- 6) Column (f) - Estimated noise level at 50 feet, obtained from either the manufacturer or from approved field noise measurements of same equipment

- 7) Column (g) - Estimated date of first use on site
- 8) Column (h) Estimated date of last use on site
- 9) Noise Calculations - Prepare calculations of Lmax noise levels expected at the nearest residential and commercial property lines and identified noise-sensitive locations near the construction site, based on the equipment noise levels given in Part A of the Noise Control Plan Form. Determine the nearest property lines from the noise-sensitive locations. Make the calculations for locations where noise emitted by applicable equipment causes the greatest noise level for each type of land use, if necessary. Provide the results on Part B of the Noise Control Plan Form, Exhibit B, with calculations included below the results, and with the locations for the calculations indicated on the site sketch.

c. Summary of Required Noise Abatement Measures as necessary.

2. Prepared and certified by the Acoustic Specialist.

- C. Noise Abatement Measures - If the results of the noise calculations indicate that noise levels between the hours of 6 pm and 7 am weekdays and 6 pm and 9 am Saturdays, or anytime Sundays or legal holidays exceed the limits in Table 1 of this Section, identify proposed noise abatement measures, their anticipated effects (dBA reductions), and a schedule for their implementation. Re-calculate the noise levels at the nearest sensitive receptor location property lines that include the anticipated noise reduction effects and submit the results on Part B of the Noise Control Plan Form. Include, as backup documentation to Part B of the Noise Control Plan, drawings, sketches, and suitable calculations that demonstrate anticipated noise reduction benefits and that proposed structures or facilities comply with applicable building code requirements.
- D. Noise Reduction Methods - To the extent required to meet the noise limits specified, use reasonable efforts to include noise reduction measures to minimize construction noise emission levels.
- E. Where the maximum allowable sound levels in Table 1 of this Section cannot be met, the Contractor must obtain a Construction Noise Expanded Exempt Hours Permit from the City of Bellevue.
- F. Vibration Control – Provide measures that can be used to reduce vibrations in the event that level limits are exceeded. The measures include changes in construction techniques.
- G. Noise complaints submitted to the Contractor directly will be copied to Sound Transit in writing no later than the following business day. Coordinating with Sound Transit as appropriate, the Contractor shall address noise complaints raised by the community and implement appropriate measures to resolve these complaints.

#### 1.07 NOISE AND VIBRATION MONITORING PLAN

##### A. Requirements

1. Prepare a Noise and Vibration Monitoring Plan specifying the construction activities, monitoring locations, equipment, procedures, characterization of the noise produced with equipment usage, schedule of measurements and reporting methods to be used.

2. Furnish noise and vibration monitoring data to the Resident Engineer on a weekly basis. Include measurements taken during the previous week.
3. If the measured noise levels exceed allowable limits in Table 1 of this Section between the hours of 6 pm and 7 am weekdays and 6 pm and 9 am Saturdays, or anytime Sundays or legal holidays for above ground construction, immediately notify the Resident Engineer and immediately implement additional Noise Abatement Measures as specified in the Noise and Vibration Control Plan. Where necessary terminate the construction activity responsible for the noise limits exceedance until the specified Abatement Measures can be implemented. The goal for groundborne noise levels during underground construction is not to exceed 50 dBA at the interior of residential and hotel buildings.
4. In the event that the measured vibration levels exceed allowable limits, immediately notify the Resident Engineer and immediately implement changes in construction techniques as specified in the Noise and Vibration Control Plan.

**B. Measurement Locations**

1. Vibration monitoring locations shall be selected to represent the closest points to vibration sensitive land uses to the construction equipment being operated. These locations may change during the Contract and the Resident Engineer will provide updates as required.
2. Outdoor noise measurement to be taken at construction site boundaries and at nearby residential and commercial property lines.
3. Indoor noise monitoring to be conducted in unoccupied spaces such as utility or storage closets where there is no human activity or mechanical equipment.

**PART 2 - PRODUCTS**

**2.01 NOISE CONTROL MATERIALS**

- A. Noise control materials may be new or used. Used materials must be sound and free of damage and defects and are of a quality and condition to perform their designed function for the duration of construction of this Contract.

**2.02 NOISE MEASUREMENT EQUIPMENT**

- A. For underground tunneling and excavation activities that occur anytime and above ground construction activities that occur between the hours of 6 pm and 7 am weekdays and 6 pm and 9 am Saturdays, or anytime Sundays or legal holidays, perform noise measurements using permanently installed sound monitoring stations equipped with the following measurement and documentation devices:
  1. Sound level analyzer with the following capabilities:
    - a. Capable of measuring on both the A-Weighted and C-Weighted scales required by regulatory criteria and Noise Level Limits.
    - b. Complies with the criteria for a TYPE 1 (Precision) or TYPE 2 (General Purpose) Sound Level Meter as defined in the ANSI/ASA S1.4.
    - c. Continuous broadband logging on 1-second LAeq, LAmax and LAmin.
    - d. Sound recording and external equipment trigger capabilities in the event of an exceedance.

- e. Sufficient internal memory for one (1) week of logged data and sound recordings.
- 2. For above ground measurements a free-field microphone housed in an environmental shroud providing protection from rain and wind conditions. The environmental shroud is capable of outdoor measurements for at least one (1) year without service or replacement.
- B. Calibrate sound level analyzer, microphones, and calibrators for certified laboratory conformance at least once during the Contract. Submit a current certificate of conformance to the Resident Engineer before using the sound level meter and submit updated certificates following subsequent calibrations upon the completion of repairs to the instrument.

## 2.03 VIBRATION MONITORING EQUIPMENT

- A. Provide portable seismographs for monitoring the velocities of ground vibrations resulting from construction activities. The seismograph has the following minimum features:
  - 1. Seismic Velocity range: 0.005 to 10 inches per second with an accuracy of within 3 percent of the measured peak particle velocity or better at frequencies between 1 Hertz and 250 Hertz, and with a resolution of 0.005 inch per second or less.
  - 2. Frequency response: 1 to 250 Hertz.
  - 3. Multi-channel for vibration monitoring.
  - 4. Two power sources: internal rechargeable battery and charger and 115 volts AC. Battery must be capable of supplying power to monitor vibration continuously for up to 30 days.
  - 5. Capable of internal dynamic calibration.
  - 6. Direct writing to printer and capability to transfer data from memory to a laptop computer or compact disc (CD). Instruments must be capable of producing strip chart recordings of readings on site within one (1) hour of obtaining the readings. Provide computer software to perform analysis, produce reports of continuous monitoring, and to perform zero-crossing frequency analyses of waveform data. Ensure that all reports and analyses are capable of output to a laptop computer or CD.
  - 7. Self-triggering wave form capture mode that provides the following information: plot of wave forms, peak particle velocities, frequencies of peaks.
  - 8. Continuous monitoring mode must be capable of recording single-component peak particle velocities, and frequency of peaks with an interval of 1 minute or less.
- B. Provide all recommended ancillary equipment as recommended by the manufacturer for a complete and functional system.

## PART 3 - EXECUTION

### 3.01 GENERAL

- A. For operation of construction equipment between the hours of 6 pm and 7 am weekdays and 6 pm and 9 am Saturdays, or anytime Sundays or legal holidays, do not exceed the maximum allowable sound levels in Table 1. Where these sound levels cannot be met,

the Contractor must obtain a Construction Noise Expanded Exempt Hours Permit from the City of Bellevue.

- B. For underground tunneling and excavation activities occurring anytime groundborne noise levels, as measured at the interior of the nearest residential or hotel building is 50 dBA.
- C. These limits are for equipment on construction sites, including but not limited to crawlers, tractors, dozers, rotary drills, loaders, power shovels, cranes, derricks, graders, off-highway trucks, ditchers, trenchers, compactors, compressors, and pneumatic-powered equipment
- D. The noise levels should be measured at the nearest noise sensitive receiver.

### 3.02 VIBRATION LEVEL LIMITS

- A. Measures applied to limit noise levels may in some cases limit vibration levels also. Measures specified above for noise levels are applicable. Table 2 contains the maximum threshold vibration limits for construction vibration monitoring.
- B. For all areas, conduct construction activities so that vibration levels at the nearest affected building monitoring points do not exceed the peak particle velocity (PPV) unweighted vibration levels (in/sec) in vertical direction over a frequency range of one to 100 Hertz as listed in Table 2.
- C. Vibration levels at buildings affected by construction operations refer to vertical direction vibration on ground surface or building floor.
- D. Installation of Vibration Monitors:
  - 1. For monitoring in the vicinity of nearby structures or utilities, locate vibration sensors on the ground surface near the structures or utilities. Install geophones level and firmly mount on the surface slab of concrete or asphalt, or firmly anchor in undisturbed soil. Geophones should be oriented vertically closest to the construction activity.
  - 2. For monitoring on structures, install wall mount kit to attach geophones to structure face or columns. Mount geophones level and orient horizontally closest to the construction activity.
  - 3. See Section 31 09 00, Geotechnical Instrumentation and Monitoring of Earthwork, for other installation, monitoring, and reporting requirements.
- E. Conduct daily measurements of vibration during peak vibration generating construction activities. Any activities that may produce vibration levels above values shown in Table 2 whenever a structure is located nearby the construction activity are subject to vibration monitoring.

### 3.03 CONSTRUCTION METHODS – EQUIPMENT

- A. Where possible, use concrete crushers or pavement saws rather than hoe rams for tasks such as concrete deck removal and retaining wall demolition.
- B. Ensure that pneumatic impact tools and equipment used at the construction site have intake and exhaust mufflers recommended by the manufacturers thereof, to meet relevant noise ordinance limitations.
- C. Construction equipment, both stationary and mobile, should be of recent manufacture and incorporate effective noise-suppression design, including features such as shrouds,

baffles, and mufflers or as recommended by the manufacturers. Locate stationary equipment that generates noise away from sensitive receptors and shield with a noise-attenuating barrier or shroud.

- D. Line or cover storage bins and chutes with sound-deadening material. Ensure all vehicles engaged in loading on-site have lined truck beds.
- E. Provide mufflers or shield paneling for other equipment, including internal combustion engines, recommended by manufacturers thereof.
- F. Blasting, impact pile driving, vibratory sheet installation and vibratory rollers are prohibited from use.
- G. As required to meet the noise limits specified in this Section, use alternative procedures of construction and selection of proper combination of techniques that generate least overall noise and vibration. Such alternative procedures include the following:
  - 1. Use electric welders powered from utility main lines instead of internal combustion powered generators/welders.
  - 2. Mix concrete off-site instead of on-site.
  - 3. Employ prefabricated structures instead of assembling on-site.
  - 4. Drilled pile installation methods.
- H. Use construction equipment manufactured or modified to dampen noise and vibration emissions, such as:
  - 1. Use electric instead of diesel-powered equipment.
  - 2. Use hydraulic tools instead of pneumatic impact tools.
  - 3. Use electric instead of air- or gasoline-driven saws.

#### 3.04 CONSTRUCTION METHODS – OPERATIONS

- A. Operate equipment and in particular slurry wall installation equipment and cranes so as to minimize banging, clattering, buzzing, and other annoying types of noises, especially near residential areas.
- B. To the extent feasible, configure the construction site in a manner that keeps noisier equipment and activities as far as possible from noise sensitive locations and nearby buildings.
- C. In no case are above restrictions limiting the responsibility for compliance with applicable federal, state and local safety ordinances and regulations and other Sections of these Contract Specifications.
- D. Maximize physical separation, as far as practicable, between noise generators and noise receptors. Separation includes following measures:
  - 1. Provide enclosures for stationary items of equipment and barriers around particularly noisy areas on site.
  - 2. Locate stationary equipment to minimize noise and vibration impact on community, subject to verification by the Resident Engineer.
- E. Minimize noise-intrusive impacts during the most noise sensitive hours.
  - 1. Plan noisier operations during times of highest ambient noise levels.

2. Keep noise levels relatively uniform; avoid excessive and impulse noises.
  3. Turn off idling equipment and vehicles.
  4. Phase in start-up and shut-down of site equipment.
  5. Avoid simultaneous activities that both generate high noise levels.
  6. Conduct truck loading, unloading and hauling operations so noise and vibration are kept to a minimum.
  7. Do not operate trucks on streets that pass by schools during school hours.
  8. Limit the time that steel decking or plates for street decking or covering excavated areas are in use.
  9. Grade surface irregularities on construction sites to minimize the generation of impact noise and ground vibrations by passing vehicles.
- F. Use warning broadband backup alarms on all equipment in operation at the site, between the hours of 6 pm and 7 am weekdays and 6 pm and 9 am Saturdays, or anytime Sundays or legal holidays.
- G. Limit the use of annunciators or public address systems, except for emergency notifications.

### 3.05 CONSTRUCTION METHODS – NOISE ABATEMENT MEASURES

- A. Install noise abatement measures in locations specified in the Noise Control Plan adjacent to equipment as required to meet the noise limits specified.

### 3.06 NOISE AND VIBRATION MEASUREMENT PROCEDURES

#### A. Noise Measurement Procedure

1. Field calibrate the sound level analyzer using an acoustic calibrator, according to the manufacturer's specifications, before each measurement.
2. Except as otherwise indicated, perform measurements using the A-weighting network and the SLOW response of the sound level meter.
3. Measure impulsive or impact noises using the C-Weighting network and the FAST response of the sound level meter.
4. Fit the measurement microphone with an appropriate windscreen at the location of the sensitive receptor at least 4 to 6 feet away from the nearest reflective surface.
5. Take noise measurements at the nearest property line and agreed noise sensitive locations at least once each week and after a change in construction activity or construction location. Measurement periods: a minimum of 20 minutes.
6. Ensure that construction noise measurements coincide with periods of maximum noise-generating construction activity, and take measurements during the construction phase or activity that has the greatest potential to create annoyance or to exceed applicable noise regulations and restrictions.

7. If, in the estimation of the person performing the measurements, outside noise sources contribute significantly to the measured noise level, repeat the measurements with the same outside source contributions when construction is inactive to determine the background noise level.
8. Submit noise data to the Resident Engineer on a weekly basis using the Noise Measurements Report Form provided in Exhibit C. Note the type of measurement (for example, baseline, on-going construction) on the form.
9. Clearly identify monitoring locations and sketch on the back of the Noise Measurements Report Form, Exhibit C, along with the locations of and distances from any agreed noise-sensitive location.
10. Identify construction equipment operating and characterize the sound being generated during the monitoring period and the locations sketched on the back of the Noise Measurements Report Form, along with the locations and distances to any agreed noise sensitive location.

**B. Vibration Measurement Procedures**

1. Field calibrate the vibration monitoring equipment, according to the manufacturer's specifications, before each measurement.
2. Vibration measurements shall be conducted at the closest building to the construction equipment being operated during times when high vibration activities occur. Measurement periods: a minimum of 20 minutes.
3. Ensure that vibration measurements coincide with periods of maximum vibration-generating construction activity, and take measurements during the construction phase or activity that has the greatest potential to create annoyance or to exceed applicable vibration limits.
4. Submit vibration data to the Resident Engineer on a weekly basis using a Contractor-generated form. Note the type of measurement (for example baseline, on-going construction) on the form.
5. Clearly identify monitoring locations and sketch on the back of the vibration report form.
6. Identify construction equipment operating during the monitoring period and the locations sketched on the back of the vibration report form.

**TABLE 1 MAXIMUM ALLOWABLE SOUND LEVELS FOR CONSTRUCTION<sup>1</sup>**

District of Sound Source	District of Receiving Property	
	Class A EDNA (dBA)	Class B EDNA (dBA)
Class A EDNA	55 <sup>2</sup> /45 <sup>3</sup>	57
Class B EDNA	57 <sup>2</sup> /47 <sup>3</sup>	60

EDNA – Environmental Designation for Noise Abatement

<sup>1</sup> The allowable sound level limits apply to construction between the hours of 6 pm and 7 am weekdays and 6 pm and 9 am Saturdays, or anytime Sundays or legal holidays.

<sup>2</sup> Allowable sound level limits for Class A EDNA receiving district from 6 p.m. to 10 p.m. weekdays and Saturdays.

<sup>3</sup> Allowable sound level limits for Class A EDNA receiving district from 10 p.m. to 7 a.m. weekdays, 10 p.m. to 9 a.m. Saturdays, and any time on Sunday or legal holidays.

**TABLE 2 THRESHOLD VIBRATION LIMITS FOR  
CONSTRUCTION VIBRATION MONITORING**

Building Category	Peak Particle Velocity (in/sec)
Reinforced-concrete, steel, or timber (no plaster)	0.50
Engineered concrete and masonry (no plaster)	0.30
Non-engineered timber and masonry buildings	0.20
Buildings extremely susceptible to vibration damage	0.12

**3.07 EXHIBITS**

- A. Exhibit A: Quarterly Noise and Vibration Control Plan – Part A
- B. Exhibit B: Quarterly Noise and Vibration Control Plan – Part B
- C. Exhibit C: Noise Measurements Report Form

**END OF SECTION**

**SECTION 01 57 15 – EXHIBIT A**

**QUARTERLY NOISE AND VIBRATION CONTROL PLAN FORM – PART A**

**CONSTRUCTION ACTIVITIES AT EACH CONSTRUCTION SITE**

**(DUPLICATE AS NEEDED)**

Contract No.: \_\_\_\_\_ Contract Name:

Contractor: \_\_\_\_\_

Site: \_\_\_\_\_ Date:

Resubmit every three months

(ATTACH SITE SKETCH)

**PART A: EQUIPMENT INVENTORY**

	Equipment				Noise Level	Date	Date
Code	Category	Model	ID No.	HP	At 50 Feet	Begin	End
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)

**SECTION 01 57 15 – EXHIBIT B**

**QUARTERLY NOISE AND VIBRATION CONTROL PLAN FORM– PART B**

**QUARTERLY NOISE AND VIBRATION CONTROL PLAN (DUPLICATE AS NEEDED)**

Contract No.: \_\_\_\_\_ Contract Name:

Contractor: \_\_\_\_\_ Site:

Date: \_\_\_\_\_ Land Use:

Resubmit every three months.

**PART B: CALCULATED CONSTRUCTION NOISE LEVELS AT NEAREST RESIDENTIAL AND COMMERCIAL RECEIVERS FOR EACH CONSTRUCTION ACTIVITY**

<b>Nearest Noise Sensitive Receivers</b>	<b>Calculated Sound Pressure Level (dBA)*</b>	<b>Calculated Peak Particle Velocity Level – in/sec*</b>

**\* EQUIPMENT USED FOR EACH CONSTRUCTION ACTIVITY IS TAKEN FROM PART A OF THE NOISE AND VIBRATION CONTROL PLAN**

**NOISE ABATEMENT MEASURES**

**ANTICIPATED EFFECTS**

CALCULATIONS - attach additional sheet(s) as needed.

**SECTION 01 57 15 – EXHIBIT C  
NOISE MEASUREMENTS REPORT FORM**

Contract No(s): \_\_\_\_\_  
Date: \_\_\_\_\_  
Time: \_\_\_\_\_

Measured By: \_\_\_\_\_ Of: \_\_\_\_\_ (Company)  
Monitoring Address: \_\_\_\_\_ (Provide Sketch on Back)

Location No: \_\_\_\_\_ Wind Speed: \_\_\_\_\_ Km/Hr Direction: \_\_\_\_\_  
(MPH x 1.6)

Location of Sound Level Meter: (No closer than 15 meters from equipment and 3 meters from building)

Monitoring was Conducted: \_\_\_\_\_ Meters from Equipment (\_\_\_\_\_)  
(Type(s): Leave Blank for Baseline)

Land Use:     Residential/Institutional     Business/Recreational     Industrial

Sound Level Meter: Make and Model: \_\_\_\_\_     A - Weighted Sound Level (Slow)

Duration of Measurement:            (20 minutes to 1 hour)

CALIBRATION LEVEL	
Leq	
L90	
L25	
L8.5	
L2.5	
L1	
Lmax	
Allowable Noise Limit	

Field Notes;

Check one of the following:

Ongoing Construction     Post-Construction: \_\_\_\_\_     Baseline Conditions  
(Contract)

(Complete all that apply below)

Active Contract(s): \_\_\_\_\_  
(List all contracts that contribute to measured noise)

Complaint Response: \_\_\_\_\_  
(Describe: Include Log-In Number)

Abatement Follow-Up: \_\_\_\_\_  
(Describe)

**END OF EXHIBITS**