



June 26, 2017

Subject: Central Bellevue Segment
17-102696 LY

Reference Permit: 16-132354 GD

Location: 11804 NE 12th Street

EXPANDED EXEMPT WORK HOURS

SOUND TRANSIT REQUEST

Long Span Aerial Guideway Over I-405 From NE 6th Street to 1116th Ave NE: Sound Transit requests approval of expanded exempt hours of operation for construction activities in this area, for a period of 24 months. For work anticipated to occur in 10-hour to 12-hour shifts, varying in timing across the 24-hour day based on site access as arranged with WSDOT and the City of Bellevue, Sound Transit proposes a maximum noise level of 78 dBA Leq(h) (Equivalent Sound Level over one hour) during expanded exempt hours.

Across NE 8th Street Along BNSF Railroad: Sound Transit requests approval of expanded exempt hours of operation for construction activities in this area, for a period of 1 month. For work anticipated to occur in 10-hour to 12-hour shifts, varying in timing across the 24-hour day based on site access as arranged with WSDOT and the City of Bellevue, Sound Transit proposes a maximum noise level of 58 dBA Leq(h) during expanded exempt hours.

CITY FINDINGS

Staff has completed its review of Sound Transit's request for extended construction noise hours for the Central Bellevue Segment of East Link. In support of this review, Sound Transit submitted a report titled "Contract E335 Final Expanded Exempt Hours of Construction Noise Study," dated December 10, 2016, prepared by HJH. This noise study presents the predicted effects of expanded exempt hours of construction activities at the following identified noise sensitive receivers:

- The Bravern Condominiums at 688 110th Avenue NE
- The Coast Bellevue Hotel at 625 116th Avenue NE
- The Abella Condominiums at 300 110th Avenue NE

Staff review confirms that the noise study for the expanded exempt hours for Construction Noise conforms to industry standards and complies with best practices for evaluation of the potential construction noise levels. Section 5 of City of Bellevue Resolution No. 8903 related to Sound Transit's East Link light rail project authorizing execution of the Amended and Restated Umbrella Memorandum of Understanding between the City of Bellevue and Sound Transit for the East Link Project (Amended and Restated MOU) contains language related to noise mitigation measures. In all cases Sound Transit's noise mitigation plans for the construction of East Link are required to be equal to or better than applicable precedent established in Seattle under DR 3- 2009 and previously issued construction noise variances for Major Public Projects, to the extent permissible by law. This specifically includes, without limitation, standards for installation of permanent and temporary sound walls, limits for interior sound levels measured from the inside of buildings, requirements for noise control and monitoring plans, requirements for compliance with noise variance and other related permit requirements, and requirements for community outreach.

Due to the extremely close proximity of night construction activities to the Bellevue Coast Hotel, staff requested additional information from Sound Transit regarding construction equipment, construction sequencing, and public outreach with this sensitive noise receiver. Sound Transit submitted a memo detailing a list of anticipated construction equipment and construction sequencing. The memo also states that communication with Bellevue Coast Hotel representatives date back to final design when Sound Transit requested rights of entry (ROE) to perform field work on their property. Sound Transit Real Property met with the hotel in acquiring ROEs while Community Outreach coordinated with hotel staff to provide notification and coordination of this effort. The conditions below will provide city authority to require Sound Transit to work with its contractor and the Bellevue Coast Hotel if noise complaints are generated.

The proposed limits of 78 dBA and 58 dBA Hourly L_{eq} are generally consistent with limits allowed on previous Sound Transit projects in the City of Seattle and the City of Bellevue. Sound Transit has provided a chart as Attachment C titled "ST E335 – Comparison of Predicted Mitigated Noise Level/Variance Limits," which compares proposed noise level limits under this application to those approved at the Seattle Northgate Link Maple Leaf Portal and Seattle University of Washington Station.

The following conditions are intended to mitigate for expected nighttime noise created by construction activities in the Central Bellevue Segment of East Link.

1. During the expanded exempt hours of construction, the Contractor will be required to implement mitigation. All of the mitigation techniques listed are in line with industry standards and best practices. Required noise control measures include the following:
 - Noise generating stationary equipment will be partially enclosed
 - Vehicle back-up alarms will be switched to broadband back-up alarms during any expanded exempt hours

- Spoil haul trucks to have beds lined with sound deadening material
 - Concrete crushers or pavement saws will be used instead of hoe rams.
 - Pneumatic tools will have intake and exhaust mufflers.
 - All construction equipment should be of recent manufacture and have effective noise suppression design.
 - Storage bins and chutes will be lined with sound deadening material. All internal combustion engines to have mufflers or other shielding.
 - Noisier equipment and activities should be located as far as possible from the noise sensitive locations.
 - Minimize noisier operation during most noise sensitive hours.
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. Complaints received by Code Compliance during daytime 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.
 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 long span aerial segment and the intersection of NE 8th Street and BNSF railroad. 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 expanded exempt hour construction noise activities.
7. 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 permit request.
8. 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.
9. Expanded exempt hour project sound levels shall not exceed the proposed limits of:

- 78 dBA Leq(h) to construct the long span over I-405 to 116th Avenue NE, and
- 58 dBA Leq(h) to construct the aerial guideway over NE 8th Street.

These numbers are based on predicted expanded exempt hour noise levels with on-site mitigation deployed.

10. If noise levels are determined to be above the respective thresholds defined in number 9, Sound Transit will require the contractor to cease the associated noise-generating activity immediately. Such exceedance may result in a review or modification of the conditions imposed by this approval.
11. Sound Transit or its agent shall be required to obtain approval from the City of Bellevue Right of Way Use (ROW) Division for expanded exempt hour 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.
12. This approval of expanded exempt hours shall expire:
 - 24 months from the commencement of expanded exempt hour construction for the construction of the long span over I-405 to 116th Avenue NE, and

- 1 month from the commencement of expanded exempt hour construction to construct the aerial guideway over NE 8th Street.

13. 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.

14. 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

SECTION 01 57 15

TEMPORARY CONSTRUCTION NOISE AND VIBRATION CONTROL

Received
DEC 4 2017
Permit Processing

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. This 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 inches 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.

1.04 SUBMITTALS

- A. Noise and Vibration Control Plan
 - 1. Prior to work on the site. Do not operate noise generating construction equipment at the construction site prior to Acceptance of the Noise and Vibration Control 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.
 - 2. Update and re-submit the Noise and Vibration Monitoring Plan upon all major changes 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 and monitoring locations.
 - 4. Certificates of calibration for monitoring instruments, including updated certificates after repairs to instruments.
 - 5. Weekly noise and vibration monitoring data, including measurements taken during the previous week.
- D. Weekly Noise and Vibration Measurement Reports:
 - 1. 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 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 shall require the use of equipment with special exhaust silencers or enclosures, construction of temporary enclosures or noise barriers around Work 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, and noise generated on the aerial guideway and elevated structures shall 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. Contractor shall consult with Community Outreach when identifying these sensitive locations.
- 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 exceed the City of Bellevue limits, identify proposed noise abatement measures, their anticipated effects (dBA reductions), and a schedule for their implementation. Recalculate 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. 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.
- F. 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. In the event that the measured noise levels exceed the City of Bellevue allowable limits between the hours of 6 pm and 7 am weekdays and 6 PM and 9 AM Saturdays, or anytime Sundays or legal holidays, 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.
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. The Contractor shall select monitoring locations to represent the closest points to vibration sensitive land uses to the construction equipment being operated.
2. Provide vibration monitoring of utility lines within 50 feet of construction activities that generate ground vibration including but not limited to drilling or driving of foundation and wall elements, demolition activities, and ground improvements. Provide monitoring for all water mains, sanitary sewers, storm drains, gas lines and other pipes that are 6 inches in diameter or greater. Coordinate all vibration monitoring locations with the Resident Engineer and receive Resident Engineer's approval prior to conducting the measurements.
3. If noise measurements are required they shall be taken at construction site boundaries and at nearby residential and commercial property lines.

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 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 construction activities occurring 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, LAmx 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. 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. Capability to transfer data from memory to a laptop computer. 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 vibration monitoring 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, the Contractor must obtain a Construction Noise Expanded Exempt Hours permit from the City of Bellevue.
- B. 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.

- C. The noise levels should be measured at the property line of 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 1 contains the maximum threshold vibration limits for construction vibration monitoring. Utility vibration thresholds are described elsewhere in the contract.
- B. For all areas, conduct construction activities so that vibration levels at the nearest affected building monitoring points do not exceed 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 1.
- C. Vibration levels at buildings or utilities 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 and towards the construction activity.
 - 3. Guidelines regarding geotechnical instrumentation and monitoring of earthwork requirements are stated elsewhere in the Contract Documents, 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 1 whenever a structure is located nearby the construction activity are subject to vibration monitoring.

3.03 NOISE CONTROL MEASURES

- A. All stationary equipment such as compressors, generators, and pumps shall be partially enclosed to reduce equipment noise.

3.04 CONSTRUCTION METHODS – EQUIPMENT

- A. 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 and impact pile driving are prohibited from use.
- G. As required to meet the noise limits specified, 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 shaft 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.

3.05 CONSTRUCTION METHODS – OPERATIONS

- A. Operate equipment 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.
- 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, at all times.
- G. Limit the use of annunciators or public address systems, except for emergency notifications.

3.06 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.

3.07 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 four to six 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 or to continue for as long as the high vibration activity occurs.
 3. Vibration measurements shall 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 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

3.08 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

Nearest Noise Sensitive Receivers	Calculated Sound Pressure Level (dBA)*	Calculated Peak Particle Velocity Vibration Level (in/sec)*

*** 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	
L01	
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

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