CONSTRUCTION NOISE POLICY IN NEW YORK CITY

PACS: 43.50.Rq

Rosen, Stephen; Sachwald, Benjamin
AKRF; 440 Park Avenue South, 7th Floor, New York, NY 10016, United States of America;
SRosen@akrf.com, BSachwald@akrf.com

ABSTRACT
Most municipalities have few or no regulations that limit community exposure with regard to construction activity noise. Typically, construction activities occur for a limited time. Construction activity noise can be annoying and intrusive and for large construction projects occur for multiple years. New York City (NYC) has recognized that construction activity noise affects the resident's quality of life, and recently revised its Noise Control Code with more stringent regulations. The revised provision in the Noise Control Code pertaining to construction activities, along with noise requirements in the NYC Environmental Quality Review process (applicable to projects which require discretionary approvals prior to construction) are expected to have a significant effect in reducing construction noise levels at adjacent locations. The paper discusses construction-related noise requirements in the revised NYC Noise Control Code and applicable construction-related noise requirements in the NYC Environmental Quality Review process, and provides an example of the application of these regulations to a development project in NYC. Noise modeling analyses showing noise levels at multiple adjacent sensitive receptor locations (i.e., residences, schools, etc.) over several years during the proposed construction. The analyses examined ground level and elevated receptor locations, and examined the effectiveness of various construction mitigation options.

INTRODUCTION

In general, most municipalities have very few or no regulations that limit community exposure with regard to noise produced by construction activities. This is because in most cases construction activities occur for a limited time period. However, noise produced by construction activities can be annoying and intrusive, and for large construction projects can occur for a number of years.

Typically, in the United States of America, some federal agencies—specifically, the Federal Highway Administration (FHWA), the Federal Transit Administration (FTA), etc.—and some state agencies—generally, transportation related agencies whose principal source of project funding is federal sources—have specific noise regulations. However, in most cases regarding state and local projects, construction noise is controlled by unreasonable noise provisions in local laws, and/or by nuisance and trespass laws.

New York City has recognized that noise produced by construction activities can affect the quality of life of its residents and has recently revised its Noise Control Code to provide more stringent regulations pertaining to noise produced by construction activities. The revised provision contained in the Noise Control Code pertaining to construction activities, along with noise requirements contained in the procedures of the New York City Environmental Quality Review process (which is applicable to projects which require discretionary approvals prior to construction) are expected to have a significant effect in reducing noise levels at locations adjacent to major construction projects in New York City.

This paper discusses the construction related noise requirements contained in the newly revised New York City Noise Control Code, the applicable construction related noise requirements contained in the New York City Environmental Quality Review process, and provides an example of the application of these regulations to a recent large development project in New York City. For the cited development project, a detailed noise modelling analyses was prepared showing noise levels at a large number of adjacent sensitive receptor locations (i.e., residences,

schools, playgrounds, etc.) over several years when construction activities are expected to occur. The analyses examined both ground level and elevated receptor locations, and examined the effectiveness of various construction noise mitigation options.

NEW YORK CITY NOISE CONTROL CODE

Beginning in the year 2000, New York City began a process of revising the New York City Noise Control Code, which contains regulations that were first enacted in 1972, and over the past 30 years had become outdated. The objective of the revisions was to update the Code to reflect conditions that currently exist in the 21st century, and to prevent noise pollution from affecting the quality of life of New York City residents, workers, and visitors. While the existing Code was pioneering, in effect it had many weaknesses, including the fact that nothing in the Code dealt with what is an acceptable level of noise from construction activities.

On December 29th, 2005 the revised Code was signed into law. With regard to construction the revised Code and subsequent rules established standards and procedures to reduce noise levels from construction activities, and established sound level standards for specific construction-related noise sources. Pursuant to the revised Code, rules have been promulgated which prescribe the methods, procedures and technology that shall be used at construction sites to achieve noise mitigation whenever any one or more of certain construction devices or activities set forth in the rules are employed or performed.

Specifically, the revised Code:

- Requires the development of a Construction Noise Mitigation Plan for every construction site where construction activities take place;
- Specifies noise limits, mitigation strategies, methodologies, procedures, and technology that shall be used at construction sites whenever certain construction devices or activities including impact equipment (such as pile drivers, jackhammers, hoe rams, etc.), earth moving devices (such as vacuum excavators, etc.), construction trucks, stationary devices (such as air compressors, cranes, auger drills, street plates, backup alarms, etc.), manual devices (such as concrete saws), power tools, etc., are utilized; and
- Limits construction activities to weekdays between the hours of 7 AM and 6 PM, with the exception that authorization may be granted for after hours construction work for the following circumstances—emergency work, cases of public safety, City construction projects, construction activities with minimal impact, and for a claim of undue hardship.

What the revised Code does not do is set an absolute “not to exceed” noise limit at noise sensitive receptor locations. The revised Code contains provisions which prohibit unreasonable noise, and places limits on specific construction devices and activities, but does not set a specific level that cumulative construction activities cannot exceed at nearby noise sensitive receptor locations. Consequently, while the revised Codes significantly limits noise levels from specific equipment and operations, construction activities can be in compliance with the revised Code and still result in high noise levels at noise sensitive receptor locations (i.e., residences, schools, hospitals, houses of worship, parks, etc.) in close proximity to construction sites.

NEW YORK CITY ENVIRONMETNAL QUALITY REVIEW PROCESS

While the New York City Noise Control Code represents a very powerful tool for controlling construction noise, projects which require discretionary approval from City agencies are subject to the New York City Environmental Quality Review (CEQR) process. As part of this process, projects are required to perform a noise impact assessment which includes an analysis of potential project related construction noise impacts. In most cases the construction-related effects occur during a relatively short period of time (i.e., 18 months or less). Construction activities may produce noise levels which would be considered noisy and intrusive at locations in close proximity to the construction site such as residences and other noise sensitive receptors. In most cases, because of the limited duration of construction activities, these noise levels are not considered to produce significant noise impacts and detailed construction analyses are not required as part of the CEQR process. However, for large multi-phase projects, where construction activities would occur over an extended period of time—typically two or more years—the CEQR process requires a detailed construction noise impact assessment and uses the following criteria for assessing the significance of impacts:

If the existing one-hour equivalent ($L_{eq(1)}$) noise levels are less than 60 dBA and the analysis period is not a nighttime period, the threshold for a significant impact would be an increase of at least 5 dBA. For the 5 dBA threshold to be valid, the resulting proposed action condition noise level with the proposed action would have to be equal to or less than 65 dBA. If the existing $L_{eq(1)}$ noise level is equal to or greater than 62 dBA, or if the analysis period is a nighttime period (defined in the CEQR criteria as being between 10 PM and 7 AM), the incremental significant impact threshold would be 3 dBA. (If the existing $L_{eq(1)}$ noise level is 61 dBA, the maximum incremental increase would be 4 dBA, since an increase higher than this would result in a noise level higher than the 65 dBA $L_{eq(1)}$ threshold.)

If construction activities result in a significant noise impact, as part of the CEQR process the applicant for (discretionary) approval is required to explore whether there are any feasible and practicable mitigation measures that could be implemented to reduce and/or eliminate these significant noise impacts.

COMBINED EFFECT OF THE NOISE CONTROL CODE AND CEQR PROCESS

The combined effect of the revised Noise Control Code and the CEQR Process is that for projects which require discretionary approvals, noise from construction activities is expected to be severely limited, and where necessary, the feasibility and practicality of utilizing noise mitigation measures (including source, receiver, and path controls) will need to be examined and employed to reduce noise levels at nearby noise sensitive receptor locations.

ATLANTIC YARDS ARENA PROJECT

An example application of the noise requirements discussed above is the work prepared as part of the Atlantic Yards Arena project in Brooklyn, New York. The project is planned for an approximately 22-acre site located in an area bounded by major vehicular thoroughfares and a mass transit hub, but adjacent to a large number of residences. The project, designed by world renowned architect Frank Gehry, would consist of a 150-foot-tall arena (which would serve as the new home for the Nets, a professional basketball team, and also provide space for large concerts and other events) and 16 additional residential and commercial buildings with maximum heights ranging from approximately 184 feet to approximately 620 feet.

Construction of the project was expected to take place over a 10-year time period, beginning in 2007 and ending in 2016. Construction activities would take place not only during typical weekday daytime time periods from 7 AM to 6 PM, but also during weekday nighttime time periods from 6 PM until 11 PM, and on Saturdays from 7 AM to 5 PM. Consequently, it was decided that analyses would be performed to examine potential noise impacts during each of the three time periods when construction would take place, during the three-month time period when the noisiest construction operations are taking place for each of the 10 years of construction.

Noise effects due to construction activities were evaluated using the Cadna A model. The Cadna A model is a computerized model developed by DataKustik for noise prediction and assessment. The model takes into account the noise power levels of the noise sources, attenuation with distance, ground contours, reflections from barriers and structures, attenuation due to shielding, etc. The Cadna A model is based on the acoustic propagation standards promulgated in International Standard ISO 9613-2.

To perform the noise impact assessment for the project, three distinct types of data were required:

- First, detailed construction information had to be developed. Working with the construction engineers, detailed estimates were prepared which showed, for each operation that would occur, the construction equipment (including type and size of the equipment and equipment usage factors) and manpower needed. These estimates were prepared for each three-month (quarter of the year) period for the 10-year construction period. This information was used to determine which quarterly period of each year would have the potential to generate the highest noise levels, and was subsequently selected for analysis. Typically, the quarterly period of each year that was selected for analysis, was the period with the highest quantity of the loudest pieces of construction equipment (i.e., pile drivers, impact drills and wrenches, concrete trucks, dump trucks, jackhammers, etc.).

- Second, detailed geometrical information had to be developed in a form that could be transferred to the model. This included three types of information: 1) geometry of the surrounding buildings for several blocks around the project site, 2) the project buildings for each of the analysis years, and 3) where each piece of construction equipment would be located (in three dimensions) on the project site. Since there were hundreds of pieces of construction equipment operating on the project site during each analysis year and time period, correctly inputting this last piece of information was both time-consuming and difficult. Geometrical data for surrounding buildings and for the project buildings was fairly easily input into the Cadna A model using electronic data files (i.e., GIS, CAD, etc.).
- Third, existing noise level data was needed for the three analysis periods—weekday daytime, weekday nighttime, and Saturday daytime—at each noise sensitive location where there was the potential for significant noise impacts. This information was needed to determine impacts based upon the CEQR construction impact criteria described above. Noise sensitive receptors are classified as any location that noise from unwanted activities, in this case construction noise, would interfere with speech intelligibility, concentration, sleep, prayer, or meditation, etc. Some examples of noise sensitive receptors would be residential dwelling units, schools and universities, houses of worship, public parks, outdoor playgrounds, and cemeteries. In a complex urban environment such as New York City, noise sensitive receptors include both ground-level and elevated receptor locations. Both continuous and short term 20-minute noise measurements were made during the three analysis periods at a large number of ground-level receptor locations. These ground-level noise measurements were used to estimate existing noise levels at elevated receptor locations. In order to obtain conservative results, the lowest measured existing noise levels, within a specific time period, was used for impact determination purposes.

An iterative approach was followed in performing the construction noise analyses. Initially, computations were performed using the Cadna A model assuming typical construction equipment operation, minimal use of sound barriers, and equipment placement on site with no consideration of potential noise impacts. These initial computations were used to determine what the dominant noise sources were, and to explore the feasibility and effectiveness of various mitigation options. Based upon these initial computations, a program was developed to identify and develop practical measures for incorporation into the project to substantially reduce potential construction noise impacts. This program included both source and path controls.

In terms of source controls (e.g., reducing noise levels at the source or during most sensitive time periods), six types of measures were examined and would be implemented:

- The project sponsors have committed to utilizing equipment that not only meets the sound level standards specified in the New York City Noise Control Code, but also in some equipment, including construction trucks, that produces lower noise levels than typical construction equipment (see Table 1);
- Where feasible, the project sponsors would use quiet construction procedures, and equipment (such as generators, hydraulic lift vehicles, trucks, and tractor trailers) quieter than that required by the New York City Noise Control Code;
- Generally, the project sponsors would schedule and perform the most noisy work during weekday daytime hours (and not during weekday nighttime or weekend hours);
- Generally, the project sponsors would schedule equipment and material deliveries during weekday daytime hours, and not during weekday nighttime or weekend hours;
- As early in the construction period as practicable, diesel-powered equipment would be replaced with electrical-powered equipment, such as electric scissor lifts and electric articulating boom lifts (i.e., early electrification); and
- The project sponsors would require all contractors and subcontractors to properly maintain their equipment and have quality mufflers installed.

Table 1 – Construction Equipment Noise Emission Levels

Atlantic Yards Equipment	FTA (or FHWA) Typical Noise Level (dBA) at 50 Feet	Atlantic Yards Analysis Noise Level (dBA) at 50 Feet
Air Monitoring Equipment	70	70
Asphalt Paver	89	85*
Asphalt Roller	74	74

Backhoe	80	80
Bar Bender	80	80
Boom Trucks/MTL Deliveries	85	85
Bulldozer	82	82
Chain Saws	85	85
Cherry Picker 35-55 ton	85	85
Compactor	82	82
Compressors	81	75*
Concrete Pumps	82	82
Concrete/Grout Pumps	82	82
Concrete Trucks (10Cy)	85	80**
Construction Hoist/Elevators	70	70
Crane - Demolition Attachment	88	85*
Crawler Service Crane (100T)	83	83
Diamond Saws	76	76
Drill Rigs	84	84
Drill Rigs 14"- 48" dia	85	85
Dump Trucks	88	80**
Dumpster/Rubbish Removal (30Cy)	85	77*
Excavator .5 - 5 CY	85	85
Excavators	85	85
Excavators w/ Hoe Ram (Pneumatic)	85	85
Excavators/Backhoes	85	85
Front End Loader	80	80
Front End Loader 1- 3.5 CY	80	80
Fuel Trucks	80	80
Generators	81	70**
Generators (25 KVA)	81	81
Hand Tools/Hammers	70	70
Hoe Rams	90	85*
Hyd. Truck Crane 125-160 ton	83	83
Hydraulic Cranes -45t	83	83
Hydraulic Cranes -90t	83	83
Hydraulic Grippers	85	85
Hydraulic Lift Vehicle (Gasoline)	85	63**
Impact Wrenches (Compressed Air)	85	85
Jack Hammers (90lbs. Compressed Air)	85	71*
Lift Booms/Scissor Lifts (Elect)	85	65**
Loader	85	85
Manitowoc 999/2250	85	85
Pavement Milling/Reclaimer	89	85*
Pick-Up Trucks	55	55
Power Actuated Hammers	88	88
Rack Trucks	85	80**
Roller/Compactor	74	74
Rubber Tire Loader	85	85
Saws	76	76
Service/Utility Fuel Trucks	55	55
Sledge hammers	85	85
Sonic Drill Rigs	84	84
Straight Truck 6 wheel Rack/Fuel/Water	85	80**
Street Cleaner	85	85
Tie-Back Drill Rig	84	84
Tower Cranes	83	83
Tractor Trailers	84	80**
Transformer (1000AMP)	50	50
Water Pumps	76	76

Water Trucks	55	55
Welders (480V)	73	73

Note:
* NYC Noise Code, effective on July 1, 2007.
** Project mandated quieter equipment.
Source: Transit Noise and Vibration Impact Assessment, FTA, May 2006, and FHWA Roadway Construction Noise Model (FHWA RCNM), 2006.

In terms of path controls (e.g., placement of equipment, implementation of barriers between equipment and sensitive receptors), three types of measures were examined and would be implemented to the extent feasible:

- Noisy equipment, such as generators, cranes, tractor trailers, concrete pumps, concrete trucks and dump trucks, would be located at locations which are away from sensitive receptor locations and are shielded from sensitive receptor locations (i.e., during the early construction phase of work delivery trucks and dump trucks would be located approximately 20 feet below grade to take advantage of shielding benefits; once building foundations are completed, delivery trucks would be located adjacent to noisy streets, rather than at quieter streets where there are residences; and delivery trucks would operate behind noise barriers);
- Noise barriers would be utilized to provide shielding (i.e., the construction sites would have a minimum 8-foot barrier, with a 16-foot barrier adjacent to sensitive locations, and truck deliveries would take place behind these barriers once building foundations are completed);
- Noise curtains and equipment enclosures would be utilized to provide shielding to sensitive receptor locations[1].

With the source and path noise abatement measures described above, the Cadna A model was used to determine noise levels due to on-site construction equipment operations, and construction-related traffic effects on adjacent ground-level and elevated noise sensitive receptors for each of the three analysis time periods for each of the 10 analysis years.

The analysis results showed that even with an extensive program of source and path noise abatement measures, construction activities would significantly increase $L_{eq(1)}$ noise levels at a large number of receptor sites immediately adjacent to the project site and result in significant noise impacts. This was particularly true at elevated receptor sites, with a direct line of site to the construction site. At a number of receptor sites immediately adjacent to the project site, existing ambient noise levels were low, and this was a contributing factor.

Based upon the noise impact modelling analysis results, the project sponsors have committed to implementing an extensive program of receptor controls to minimize noise impacts at nearby sensitive receptors. This program includes providing window treatment (i.e., storm windows) and/or alternative ventilation (i.e., air conditioning) at residential and other sensitive receptor locations where the project would result in significant noise impacts, and these measures are not available, at no cost for installation.

Lastly, for the Atlantic Yards Arena Project, the construction requirements contained in the revised New York City Noise Control Code along with the requirements of the CEQR process have resulted in the implementation of noise abatement measures that will significantly reduce noise levels at nearby sensitive receptor locations. With typical normal construction practices, a project of this magnitude would be expected to produce $L_{eq(1)}$ noise levels at nearby receptor locations of approximately 85 to 95 dBA. Construction activities with the Atlantic Yards Arena project, with implementation of abatement measures implemented to satisfy the Noise Control Code and CEQR are expected to result in maximum $L_{eq(1)}$ noise levels at nearby receptor locations in the range of 56 to 78 dBA. This would be a considerable reduction when compared to conventional construction $L_{eq(1)}$ noise levels.

[1] Although temporary noise curtains and barriers would be employed where feasible and practical, no credits were taken for the attenuation provided by this measure in terms of the noise analysis.