Construction Noise Control and Regulations: What Works and What Does Not

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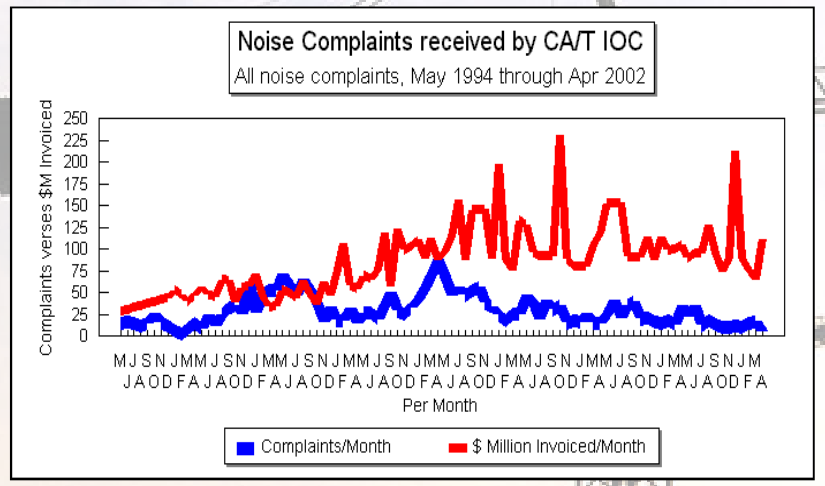
Construction Noise Experience

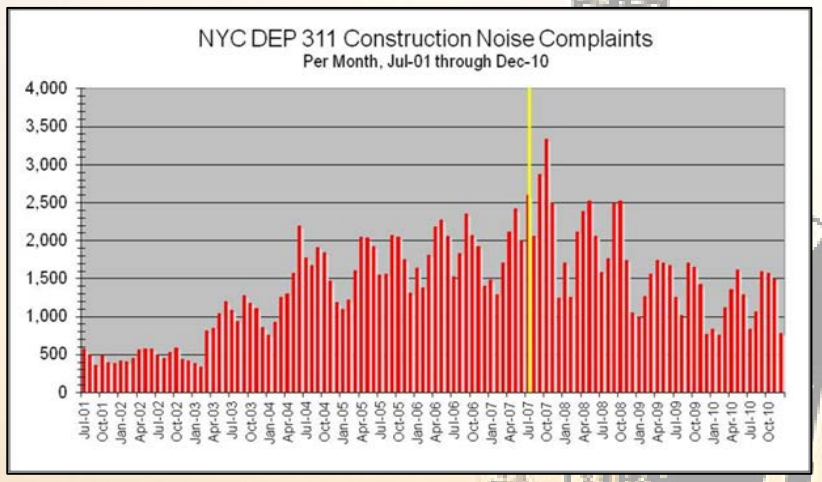
- 40 years of construction noise control experience……..
- Interned at CTA in mid-1980s, MBTA Orange Line construction noise.
- Deer Island Water Treatment Plant in Boston Harbor in early-1990s.
- Noise control manager for the Big Dig in Boston 1996 – 2005.
- Original FHWA RCNM Model (v1) and related handbook in 2007.
- New York City Construction Noise Regulation 2007 – 2017.
- Scores of construction noise projects nationwide by PB / WSP.
- Referenced in *Technology for a Quieter America (2010)*.

Preamble

- Construction noise adversely affects millions of people nationwide.
- Construction noise is going to be heard; that's unavoidable.
- But it is controllable! It is not an "unfortunately necessary impact".
- Must develop "fair and effective" regulations and specifications.
- "Fair" means a balance between the contractor's need to perform the work with the community's need for peace and quiet.
- "Effective" means the mitigation actually achieves its intended outcome at the minimal cost necessary to achieve it.
- Control the "physical noise" to avoid the "political noise".
- Noise control does not help build projects – but it allows projects to be built!

What Works?





- Upper management buy in and support.
- Policy enforcement by Owner/CM team.
- Clear and unambiguous policy language.
- Performance-based specifications.
- Practical to implement in field (KISS).
- Use of source, pathway, receiver controls.
- Receptor and equipment noise criteria.
- Proactive avoidance and reactive abilities.
- Acoustical window treatments.
- Quieter backup alarms.
- Community involvement and respect.

Comprehensive Noise Specs Works

- ***General*** – Overall purpose, applicability, other regulations incorporated by reference.
- ***Definitions*** – Important words/terms, noise metrics, abbreviations.
- ***Submittals*** – Keeps the contractor aware and obligated to implement.
- ***Limitations*** – Receptor and equipment noise criteria, equipment and time restrictions.
- ***Qualifications*** – Independent Acoustical Engineer (not the contractor!).
- ***Noise Monitoring Plan*** – How/where construction noise will be monitored.
- ***Noise Control Plan*** – Proactive predictions and commitments to mitigate if expected.
- ***Materials*** – Ensure that products meet basic acoustical qualities (STC, IL, SD, NRC).
- ***Complaint Procedure*** – Who/what/when/how to respond if a noise complaint is received.
- ***Payment Items*** – Unit prices ($/SF) for contractor payments for noise control items.
- Allows the Owner/CM to manage the contractor, not vice-versa.

Performance Specs Works

- ***Performance*** regulations and specifications tell the contractor what they <u>cannot do</u>.
- ***Prescriptive*** regulations and specifications tell the contactor what they <u>must do.</u>
- Performance-based specs are vastly preferrable for controlling the contractor.
  - Sets allowable noise criteria limits.
  - Restricts equipment or time of use.
  - Defines required submittals (which become commitments when approved).
  - Allows contractor to “solve their own problem”.
  - Places liability for compliance on the contractor, not on the owner or agency.

Proactive & Reactive Approach Works

- Proactive avoidance and reactive abilities.
- The “Velvet Glove, Iron Fist” approach!
- ***Proactive*** controls avoid noise from being produced in the first place.
  - Require an Independent Acoustical Engineer.
  - Submit Noise Monitoring and Control Plans.
  - Prohibit certain equipment or work timeframes.
- ***Reactive*** controls allow the project to direct the contractor for additional noise control as needed.
  - Compliance noise measurements and enforcement.
  - Performance requirements the contractor must meet.
  - At no additional cost to the project for contractor to comply.

Receptor Noise Criteria Works

Noise Receptor Locations and Land-Uses	Receptor Construction Noise Criteria Limits in dBA, RMS slow					
	Daytime (7 AM - 6 PM)		Evening (6 PM - 10 PM)		Nighttime (10 PM - 7 AM)	
	L10	Lmax	L10	Lmax	L10	Lmax
Noise-Sensitive: (Residences, Hospitals, Institutions, Hotels, etc.)	75 or Baseline + 5 *(Whichever is louder)*	85 (Steady) 90 (Impact)	Baseline + 5	85	Baseline + 5 *(If Baseline < 70)* Baseline + 3 *(If Baseline >= 70)*	80 80
Commercial: (Businesses, Offices, Stores, etc.)	80 or Baseline + 5 *(Whichever is louder)*	None	None	None	None	None
Industrial: (Factories, Plants, etc.)	85 or Baseline + 5 *(Whichever is louder)*	None	None	None	None	None

- Cumulative noise affecting receptors.
- Relative increases better than absolute limits
  - One size does not fit all.
- Accounts for different land-uses.
  - Residential, Commercial, Industrial.
- Accounts for different time frames.
  - Daytime, Evening, Nighttime.
- Accounts for continuous vs. impulsive noises.
  - L10 or Leq limit for continuous noise.
  - Lmax limit for impulsive noise (average several).
- Receptor noise limits are able to be enforced.

Equipment Noise Criteria Works

Equipment Description	Lmax Noise Limit at 50 ft, dB(A), slow	Is Equipment an Impact Device?	Acoustic Usage Factor
All other equipment > 5 HP	85	No	50 %
Auger Drill Rig	85	No	20 %
Backhoe	80	No	40 %
Bar Bender	80	No	20 %
Blasting	94	Yes	1 %
Boring Jack Power Unit	80	No	50 %
Chain Saw	85	No	20 %
Clam Shovel	93	Yes	20 %
Compactor (ground)	80	No	20 %
Compressor (air)	80	No	40 %
Concrete Batch Plant	83	No	15 %
Concrete Mixer Truck	85	No	40 %
Concrete Pump	82	No	20 %
Concrete Saw	90	No	20 %
Crane (mobile or stationary)	85	No	20 %
Dozer	85	No	40 %
Dump Truck	84	No	40 %
Excavator	85	No	40 %
Flat Bed Truck	84	No	40 %
Front End Loader	80	No	40 %
Generator (25 KVA or less)	70	No	50 %
Generator (more than 25 KVA)	82	No	50 %
Gradall	85	No	40 %
Grader	85	No	40 %
Horizontal Boring Hydraulic Jack	80	No	25 %
Hydra Break Ram	90	Yes	10 %
Impact Pile Driver (diesel or drop)	95	Yes	20 %
Insitu Soil Sampling Rig	84	No	20 %
Jackhammer	85	Yes	20 %
Mounted Impact Hammer (hoe-ram)	90	Yes	20 %
Paver	85	No	50 %
Pickup Truck	55	No	40 %
Pneumatic Tools	85	No	50 %
Pumps	77	No	50 %
Rock Drill	85	No	20 %
Scraper	85	No	40 %
Slurry Plant	78	No	100 %
Slurry Trenching Machine	82	No	50 %
Soil Mix Drill Rig	80	No	50 %
Tractor	84	No	40 %
Vacuum Excavator (vac-truck)	85	No	40 %
Vacuum Street Sweeper	80	No	10 %
Vibratory Concrete Mixer	80	No	20 %
Vibratory Pile Driver	95	No	20 %
Welder	73	No	40 %

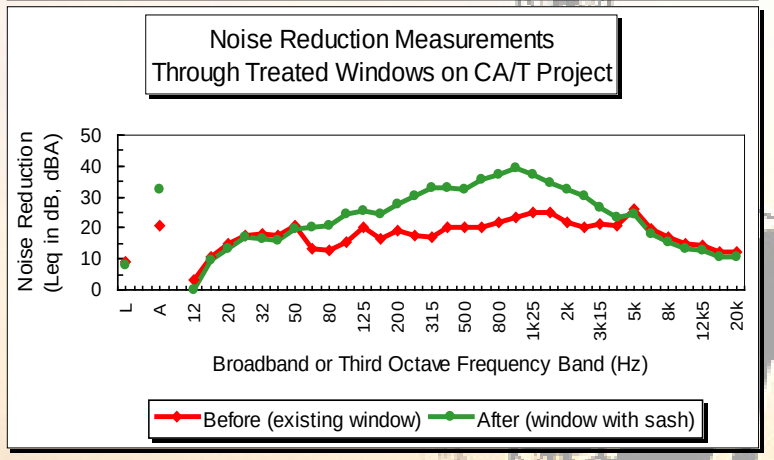
Notes: "Impact" is equipment assumed to produce separate discernable sound pressure maxima.
"Acoustic Usage Factor" represents the percent of time that equipment is assumed to be running at full power while working on site.

- Equipment Lmax noise emissions limit at 50 feet.
  - RCNM 1.1 or RCNM 2.0, FTA/FRA, old ESEERCO Guide.
- Lmax not "fair" for contractor (average several).
- Ensures modern, well-maintained equipment.
- Ensures quality mufflers and closed engine housings.
- Defines impulsive vs. continuous noise sources.
- Provides Usage Factors for computing Leq and L10.
- Equipment noise limits are able to be enforced.

Noise Barriers Works

- Noise barriers around work site perimeter.
- Built as tall as possible for maximum benefits.
- Temporary or semi-permanent barriers.
- Use imagination, wood, plastic, shipping boxes.
- Reduces noise and hides the noise source.
- Beware vehicle access and wind load collapse.
- But barriers are useless for upper-floor receptors.

Window Treatments Works

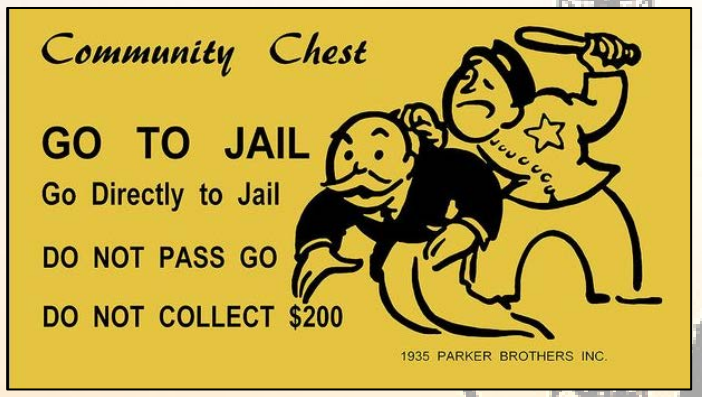


- Install window treatments if all else fails.
- Total window replacements or adding sashes.
- Can easily add 10 dBA noise reduction (OINR).
- Home improvements much appreciated!
- Must be offered via objective policy.
  - In order to avoid “mitigation envy”!
- Doable on HOA and “historic” windows as well.
- Beware Rights-of-Entry, toxics, false accusations.
- You touch it, you own it.

Quieter Backup Alarms Works

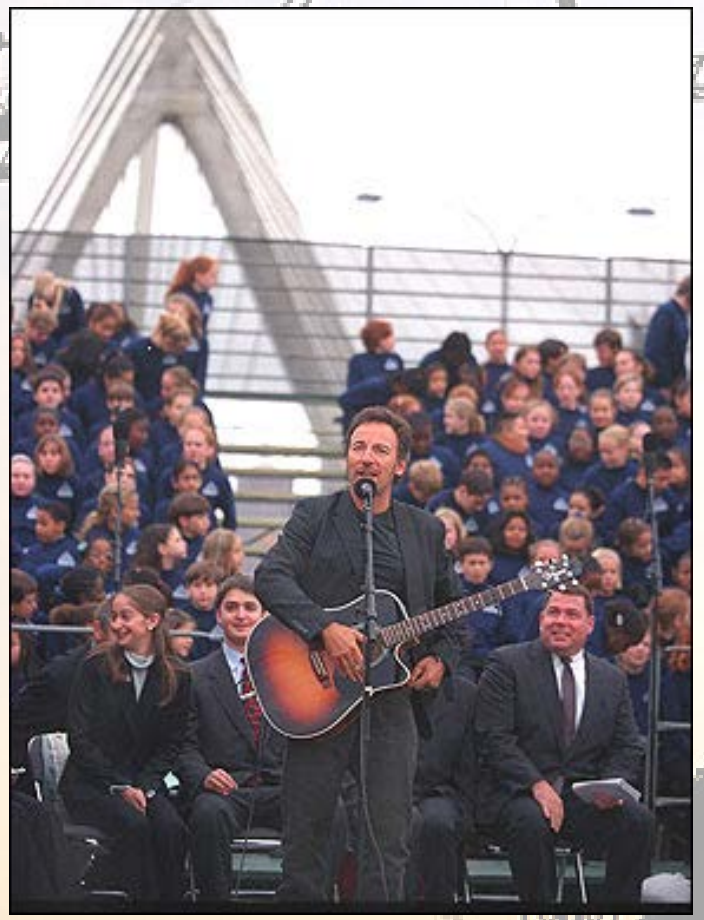
- No. 1 public noise complaint is backup alarms.
- Avoid nighttime work whenever possible.
- Backup alarm comparison test (1995).
- Use ambient-sensitive or manually-adjustable.
- Modern best option is “white noise” alarms.
- OSHA regulations for backup alarms:
  - 29 CFR Part 1926.601(b)(4)
  - No decibel level required (typically 115 dBA at 4 feet).
  - Must be “audible” behind the vehicle.
  - OR the vehicle must be directed by an observer.

Enforcement and Penalties Works



- Noise requirements must be <u>enforced</u> to work.
- Contractual obligation of the contractor to comply.
- Try to work with contractor to resolve (velvet glove).
- But be ready to enforce with penalties (iron fist).
- Noise violation penalties should be severe.
  - Not simply the “cost of doing business”.
- Penalties can take many forms:
  - Withholding of contractor payments.
  - Monetary fines or loss of incentives.
  - Stop work orders. “Time is money” for contractors!

What Does Not Work?



- Ambiguous, extraneous, excessive requirements.
  - Follow the KISS principle.
- Contractor self-monitoring and enforcement.
  - Conflict of interest.
- Prescriptive regulations and specifications.
  - Places liability on the Owner/Agency.
- Special deals or favors with individuals.
  - Misuse of taxpayer money.
  - The public and the press will find out.
- Temporary relocation to hotels.
  - Not worth the trouble, liability, and favoritism.

Any Questions?

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