Challenges of the Emergency Helipad
Handling the Noise of a Relocated Helipad

Featuring:
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Introductions

Ben Davenny, PE
- Principal Consultant, Acentech

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For this session, we will focus on addressing noise and vibration effects on the hospital itself.
Project Background

- Longwood Medical Area in Boston
  - Brigham and Women’s Hospital (BWH)
- Emergency Helipad (1-2 flights per day)
  - Serves BWH and BCH
Project Background

- New Children’s Hospital Building
  - Crane
  - Rooftop equipment
- Relocating helipad to Bed Tower
  - Increase elevation by 58’
  - Move west by 242’
Project Background

- Nearby BCH construction will impede use of existing helipad location
- Incorporate relocated helipad into modernization plan
Design Concerns

- With helicopters operations closer to Tower, will noise and vibration be excessive?

- What is acceptable and not acceptable?

- What can be done to evaluate and mitigate?
Noise and Vibration Standards

Noise
(No specific criteria for helicopter noise)

► Patient Rooms
  ► FGI design criteria of 45 dBA (for MEP noise)
  ► For frequently occurring extreme noise sources - façade = STC 50 (typical façade = STC 35 to 40)

► Speech interference
  ► Typical conversation, normal voice effort at 3’ distance = 65 dBA
  ► As noise increases, people will increase vocal effort or reduce distance

► Sleep interference
  ► WHO recommends no more than 10 events >45 dBA per night
Vibration

- Patient Rooms
  - FGI design criteria of 6,000 micro-inches per second
- Feelable vibration
  - Average human threshold of perception = 8,000 micro-inches per second
Baseline Study

- Measured levels in patient rooms
  - Near existing helipad
  - Exposed to future helipad
- Background period of 10 days
  - Included 6 helipad arrivals/departures
- Logs used to correlate data with helicopter events
Baseline Study

- Vibration
  - Connors 10th Floor
  - Below existing helipad
Simulated Fly-by

- Measured Lmax of 67-73 dBA in Tower rooms during fly-by
# Measured Helicopter Events

## Worst-case Maximum Sound Levels (Lmax) During Helipad Events

<table>
<thead>
<tr>
<th>Building</th>
<th>Room</th>
<th>Maximum 1-second Sound Levels (Lmax, dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Using Existing Helipad</td>
</tr>
<tr>
<td>Bed Tower</td>
<td>16&lt;sup&gt;th&lt;/sup&gt; Floor (Pod A)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>16&lt;sup&gt;th&lt;/sup&gt; Floor (Pod D)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>12&lt;sup&gt;th&lt;/sup&gt; Floor (Pod A)</td>
<td>-</td>
</tr>
<tr>
<td>Connors</td>
<td>10&lt;sup&gt;th&lt;/sup&gt; Floor</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>10&lt;sup&gt;th&lt;/sup&gt; Floor Conference</td>
<td>78</td>
</tr>
<tr>
<td></td>
<td>9&lt;sup&gt;th&lt;/sup&gt; Floor Hall</td>
<td>72</td>
</tr>
</tbody>
</table>
Design Goals

- Measured Lmax of 80 dBA at Connors rooms during helicopter events.

- Goal: Be less than Connors sound level at Tower for new helipad
Window Performance

Connors: 1-inch IGU

Tower: ¼” - 2” air - ¼”
Window Performance

Measured noise reduction of windows using an outdoor loudspeaker on scissor lift

Measured loudspeaker noise outside and inside, subtracted inside from outside levels
Window Performance

Estimated outdoor façade helicopter levels from measured indoor Connors level and measured Connors window NR

Subtracted Tower measured NR from outdoor façade helicopter levels to estimate indoor Tower levels

Predicted 73 dBA in Tower, consistent with fly-by
Window Performance

Recommendation: check seals and caulking gaps around Tower windows

For any significant improvement beyond 73 dBA, add additional glazing with deep airspace
Vibration Assessment

Primary forces from helicopter are due to pressure pulses at start of liftoff and right before touch down.

Pressure force is approximately 10%-12% of helicopter’s weight.

- Helipad structure did not need isolation (supported by Tower columns).
Questions?

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