



MEMORANDUM

DATE: March 17, 2025

TO: City of Des Moines Economic Development Committee, City Manager Katherine Caffrey

FROM: Daniel Hopp, Building Official

SUBJECT: Analysis and Recommendations for Updating Des Moines' Sound Transmission Code and Possible Future Adoption

Introduction

This memo summarizes recommendations for updating Des Moines' sound transmission code as a follow-up to the Economic Development Committee's initial meeting on June 27, 2024. The City of Des Moines currently lacks a sound code, as the original ordinance (Ordinance 1407), adopted in 2007 to mitigate aircraft noise from SeaTac Airport, was repealed in 2012. This memo aims to provide a path for a new sound code while balancing effective noise reduction with economic feasibility.

Note: See Appendix A for definitions, neighborhood comparisons, and other information.

Background

- **Ordinance 1407 (2007):** Required sound mitigation in two noise zones for most buildings near SeaTac Airport. It addressed a gap in state building and energy codes, which focus primarily on interior sound control and energy efficiency.
- **Repeal in 2012 (Ordinance 1539):** The ordinance was repealed due to quieter aircraft, improved building codes, developer concerns about cost, and a focus on promoting development.
- **Current Gap:** There are no specific requirements for exterior noise mitigation in new construction or remodels. Interior sound control is only required between dwelling units in commercial structures under the Washington State Building Codes.

Summary of Recommended Approach

Engage a Sound Engineering Consultant

While ordinance 1407 was effective in its time, advancements in state building codes, as well as practices from neighboring jurisdictions like Burien and SeaTac, offer opportunities to modernize Des Moines' sound transmission code. To support the successful development and implementation of an updated sound code, it is recommended that the City engage a sound engineering consultant in a targeted and advisory role.

Depending on budget constraints and the cost-based approach chosen, below is a more detailed look at what the consultant's key tasks could include:

1. **Drafting the New Sound Code:**

- Assist City staff in establishing STC targets and ensuring compatibility with the Washington State Energy Code (WSEC).
- Focus on validating and recommending pre-tested ASTM assemblies (e.g., from USG, UL, GA files) to streamline compliance and reduce the need for custom prescriptive development.
- Ensure the sound code aligns with regional, state, and federal standards while offering practical compliance options for developers and builders.

2. **Conducting a Cost Analysis and Feasibility Study:**

- Evaluate the financial impact, identify cost-effective noise reduction solutions, and recommend incentives or phased implementation to ensure affordability and feasibility for all stakeholders.

3. **Evaluating and Redefining Noise Zones:**

- Evaluate previous zones and the potential impacts of creating a multi-zone framework that includes a third zone and that reflects current and projected noise conditions, offering tiered standards for different areas.

4. **Developing Prescriptive Compliance Methods:**

- Propose prescriptive methods based on tested assemblies (UL and GA files), detailing specific construction requirements for walls, windows, doors, roofs, and ventilation systems. This would be for both new and existing structures.
- Create visual aids and compliance guides for applicants to clarify requirements and simplify the review process.
- Use ASTM E90 (laboratory testing) and ASTM E336 (field-testing) to measure the sound attenuation performance of current wall and ceiling assemblies required by the Washington State Energy Code. Analyze results to determine how these assemblies contribute to noise reduction.
- Alternatively, assist City staff in adopting a mostly performance-based approach using pre-tested STC-rated assemblies to reduce administrative complexity and testing requirements. This would be similar to Burien's approach, but would offer specific assemblies to streamline compliance.

If needed, the consultant may also collaborate with additional experts (such as financial consultants) to support the cost analysis and feasibility study. This approach ensures that Des Moines will adopt a modern and effective sound transmission code that serves the community's long-term needs.

Advancements in Modern Codes

The 2021 Washington State Residential Energy Code has significantly improved sound attenuation through, but is not limited to the following:

- Airtight construction.
- Continuous insulation for walls.

- Improved Roof and Ceiling Insulation.
- Energy-efficient windows.

While these improvements raise the baseline for noise reduction, their full impact on sound attenuation is unclear without independent studies. Engaging a sound engineering consultant will ensure a thorough evaluation and provide updated prescriptive methods.

A new sound code should focus on enhancing walls, roofs, windows, and ventilation systems based on sound engineer recommendations. This could include additional insulation, thicker drywall, and sound-dampening techniques like 90-degree bends in exhaust piping.

Targeted Approach for Remodels and Alterations

Since much of Des Moines is already built out, the updated code should include targeted sound mitigation for major remodels, which can have the most meaningful impact for residents. While Ordinance 1407 did address alterations, it did so only through IRC 104.11 and IBC 104.10 and 104.11 (alternative materials and methods), relying on the Building Official's discretion. The new code can improve upon this by adopting clear prescriptive measures for key improvements.

Prescriptive Approach: Major remodels—particularly when exterior walls are opened or significant systems like windows or HVAC are replaced—offer the best opportunity for sound upgrades. Prescriptive measures can rely on ASTM-tested solutions, such as those found in resources like the USG Acoustical Assemblies Guide, to ensure compliance without requiring custom testing.

Expert Guidance and Flexibility: Specific prescriptive measures could be developed with input from a sound engineering consultant to ensure practicality and effectiveness. A prescriptive framework will create clarity and consistency while still allowing limited flexibility for unique cases under existing code provisions for modifications.

Integrate Federal and State Resources for Existing Structures

While the updated Noise Exposure Map (NEM) has limited coverage within Des Moines, partnering with the Port of Seattle and FAA could still provide valuable support for future noise mitigation efforts. The [Port's recent \\$5 million pilot program](#) for repairing and replacing noise insulation packages may not significantly impact Des Moines initially, but maintaining this partnership could:

- Provide access to technical expertise and noise mitigation tools.
- Position Des Moines for future funding opportunities if the program expands.
- Support community outreach and education on available sound mitigation resources.

Modernize Noise Control Zones

Reassess the two original noise zones to reflect current and projected noise impacts more accurately.

- **Area 1:** Focus on higher-noise areas, such as north of South 252nd Street.
- **Area 2:** Target moderate-noise areas with appropriate mitigation requirements.

Alternatively, consider introducing a third tier or using an updated sound exposure map, similar to models used by Burien and SeaTac, for a more precise approach.

Land Use Considerations

- Ensure compliance with DMMC 18.135.060 (1)(e), which requires new construction in Pacific Ridge zones to meet FAA Part 77 regulations for airspace compatibility.
- Use FAA guidelines (AC 150/5190-4B) for additional land-use compatibility planning.

Anticipate Future Challenges

- The Sustainable Airport Master Plan (SAMP) outlines future improvements at SeaTac Airport, including new terminals, expanded cargo facilities, and roadway realignments.
- While no new runways are planned, increased flight operations are expected, which could raise surrounding noise levels. Future noise mitigation efforts should anticipate these impacts.

Conclusion

While the City of Des Moines does not currently have a sound code, Des Moines' original sound ordinance provided a strong foundation for noise mitigation. To enhance its effectiveness, the City could update the ordinance by refining area definitions, incorporating best practices from Burien and SeaTac, and crafting a comprehensive, adaptable framework that balances community welfare with economic feasibility.

By leveraging advancements in the Washington State Energy Code, addressing future challenges identified in the SAMP, and consulting sound engineering experts, the City can ensure cost-effective implementation and maximize community benefits. These updates would enable Des Moines to tackle current and future noise issues while maintaining alignment with neighboring jurisdictions.

Appendix A

Definitions:

- **Sound Transmission Control (STC)** is a single number rating for describing sound transmission loss of a wall, roof, floor, window, door, partition or other individual building components or assemblies.
- **“Noise reduction level” (NRL)** is the decibels (dB) of sound decrease required (35 dB, 30 dB, or 25 dB).
- **“Noise reduction coefficient (NRC)”** is the arithmetic average of the sound absorption coefficients of a material at two hundred fifty (250), five hundred (500), one thousand (1,000), and two thousand (2,000) Hz.
- **Performance-Based Compliance**
Performance-based compliance focuses on achieving a specific sound reduction target, such as an STC (Sound Transmission Class) rating, without dictating how that target must be met. Builders have the flexibility to select materials, assemblies, or construction techniques, as long as they can demonstrate compliance through documentation or testing.
 - This method allows for innovation and customization while ensuring that the end result meets the required standard. Builders may rely on pre-tested and certified assemblies (e.g., GA or UL-rated wall assemblies) or conduct field testing (ASTM E336) to verify that the design achieves the desired sound attenuation.
- **Prescriptive Compliance Method**
Prescriptive compliance provides specific construction requirements and material specifications that must be followed to achieve the required sound attenuation, without the need for field testing or further verification. Builders meet compliance by constructing assemblies exactly as detailed in the code.

Examples of Prescriptive Requirements:

- **Walls:** Double-stud wall construction with 1-inch sheathing, R-channel resilient clips, and 5/8-inch gypsum board on both sides, filled with sound-absorbing insulation.
- **Ceilings:** Use of suspended ceilings with resilient channels and 5/8-inch drywall to reduce sound transmission from upper floors.
- **Windows:** Multi-pane windows with laminated glass and STC-rated frames, designed to meet the required STC ratings for the noise reduction zone.
- **Doors:** Solid-core exterior doors with weather-stripping and soundproof thresholds to prevent air and sound leakage.
- **Ventilation:** Installation of 90-degree bends, rigid exhaust ducts with R-11 insulation, and self-closing dampers to minimize sound transmission through mechanical systems.

Impact of Ordinance 1407

Residential Buildings (IRC-Regulated): Ordinance 1407 required sound attenuation for the exterior envelope of single-family homes and townhomes—something not covered by either the base IRC or Appendix AK.

Multifamily and Commercial Buildings (IBC-Regulated): Similarly, Ordinance 1407 provided exterior sound mitigation requirements for multifamily units and commercial buildings, filling the gap left by the IBC's limited focus on internal noise control.

Option to Adopt IRC Appendix AK

Appendix AK of the International Residential Code (IRC) provides specific sound attenuation requirements for walls, ceilings, and floors between attached dwelling units (e.g., townhomes or duplexes), similar to the IBC requirements. It aims to reduce interior noise transfer but does not address sound mitigation for the building envelope (exterior walls, windows, and roofs).

If adopted, Appendix AK could enhance interior noise control for new construction of attached units, but it would not offer the comprehensive exterior noise protection needed for mitigating aircraft noise in high-noise areas like those near SeaTac Airport.

Neighboring Cities Comparison

Understanding how neighboring cities address sound mitigation provides valuable insights for improving Des Moines' original sound transmission code. Both Burien and SeaTac have established frameworks that reflect their unique priorities, offering a range of compliance options and strategies. Comparing these approaches can help Des Moines refine its code to achieve a balance of clarity, flexibility, and effectiveness.

Burien: Three-Zone Framework with a Performance-Based Focus

Framework: Burien's code uses a three-zone noise reduction system based on noise exposure levels. The zones require 35 dB, 30 dB, and 25 dB reductions, with areas defined by proximity to the airport.

Compliance Approach: Burien relies heavily on a performance-based approach, requiring specific STC ratings for walls, windows, doors, and other building components.

- Unlike SeaTac and Des Moines, Burien offers minimal prescriptive guidance, meaning developers must identify and use pre-tested assemblies (UL or GA files) or provide field verification to meet the required sound attenuation standards.

Ventilation Requirements: Burien specifies detailed requirements for ventilation systems, such as minimum duct lengths, 90-degree bends, and R-11 insulation for rigid exhaust ducts. This ensures sound transmission through mechanical systems is minimized.

Strengths and Challenges:

- **Strength:** Burien’s performance-based approach provides flexibility and encourages innovation in meeting noise reduction standards. The inclusion of a third noise zone allows for less stringent requirements in lower-noise areas, benefiting both developers and residents by reducing unnecessary costs.
- **Challenge:** The reliance on performance-based compliance without detailed prescriptive guidance can be difficult for small-scale projects or less experienced builders, who must engage professional consultants or conduct field tests to verify compliance. However, ASTM-tested assemblies, such as those listed in the USG Acoustical Assemblies Guide, offer pre-tested solutions that could simplify compliance. Incorporating similar prescriptive options could reduce this challenge and provide practical alternatives for developers.

SeaTac: Balanced Two-Zone System with Multiple Compliance Options

Framework: SeaTac adopts a **two-zone system**, offering three noise reduction levels (35 dB, 30 dB, and 25 dB) based on FAA-approved Noise Exposure Maps (NEMs). These maps define boundaries with updated noise contours, providing greater precision in identifying affected areas.

Compliance Approach: SeaTac offers a **balanced approach**, with both prescriptive and performance-based options for compliance.

- **Prescriptive Options:** Clear construction guidelines are provided, detailing specific requirements for walls, ceilings, floors, windows, and ventilation systems.
- **Performance-Based Compliance:** Developers can also meet noise reduction standards through custom designs, provided they submit verified documentation or field test results.

Visual Aids and Clarification: SeaTac’s code includes detailed figures and diagrams illustrating prescriptive methods, helping applicants understand and implement the requirements accurately.

Strengths and Challenges:

- **Strength:** Offers flexibility while providing clear guidance for less experienced builders. The visual aids help reduce errors and streamline compliance.
- **Challenge:** Although the use of the Sound Exposure Map is clear and concise, it limits impact for residents outside those areas.

Des Moines’ Original Ordinance 1407: Balanced but Outdated Framework

Framework: Des Moines’ original ordinance used a **two-area system**:

- **Area 1 (North of S. 252nd Street)** required a 35 dB reduction.
- **Area 2 (Remaining parts of the city)** required a 30 dB reduction.

Compliance Approach: The ordinance provided a balanced approach, with both prescriptive and performance-based compliance methods. Builders could follow detailed construction requirements or achieve compliance by meeting target STC ratings.

Geographic Definitions: Unlike SeaTac, Des Moines relied on less precise geographic definitions for its noise reduction areas, which created inconsistencies in enforcement and coverage.

Strengths and Challenges:

- **Strength:** Provided multiple compliance options, giving developers the flexibility to choose the most cost-effective approach.
- **Challenge:** The lack of updated prescriptive options can add unnecessary costs to developers and residents. The wide-reaching “Area 2” could potentially add costs in the form of design, materials, and labor where minimum noise exposure exists.

Comparison Table

Category	Burien	SeaTac	Des Moines (Original)
Purpose	Safeguard life, health, welfare, and property, and public welfare, by reducing airport noise	Safeguard life, health, welfare, and property, and public welfare, by reducing airport noise	Safeguard life, health, welfare, and property, and public welfare, by reducing airport noise
Areas of Application	Three-tier system: 35 dB, 30 dB, 25 dB areas. West of 1 st Ave, between 1 st and 12 th and East of 12 th .	Two noise areas: Neighborhood (35/30 dB) and Standard (30/25 dB), with exceptions. Uses Noise Level Reduction Map.	Two-area system: Area 1 (north of S. 252nd St.) and Area 2 (remaining areas).
Scope	Applies to new construction for human occupancy, with exceptions.	Applies to human occupancy and buildings in the Noise Remedy Program, with exceptions.	Applies to all living and working areas, including businesses and residences, with exceptions.
Exceptions	(1) Additions under 500 sq. ft. not used for sleeping rooms. (2) Remodels based on valuation.	Alterations and repairs.	(1) Additions under 500 sq. ft. not used for sleeping rooms. (2) Remodels based on valuation.

Floor Requirements	N/A	Prescriptive – Fully enclosed basement/ crawl space or slab on grade. NRL 35 dB – No crawlspace. Floors over fully enclosed garage – STC 35 (30 dB)/ STC 40 (35 dB)	Prescriptive - Fully enclosed basement/ crawl space or slab on grade.
Wall Requirements	STC 40 (35 dB) / STC 35 (30 dB) / STC 30 (25 dB)	STC 40 (35 dB) / STC 35 (30 dB) / STC 30 (25 dB) or prescriptive	STC 40 (Area 1) / STC 35 (Area 2) or prescriptive
Roof/Ceiling Requirements	STC 49 (35 dB) / STC 44 (30 dB) / STC 39 (25 dB)	STC 49 (35 dB) / STC 44 (30 dB) / STC 39 (25 dB) or prescriptive	Roof/Ceiling -STC 49 (35 dB) / STC 44 (30 dB) or prescriptive Ceiling - Prescriptive
Window Requirements	STC 38 (35 dB) / STC 33 (30 dB) / STC 28 (25 dB)	STC 36 (35 dB) / STC 33 (30 dB) / STC 28 (25 dB) or prescriptive	STC 38 (35 dB) / STC 33 (30 dB) or prescriptive
Door Requirements	STC 33 (35 dB) / STC 33 (30 dB) / STC 26 (25 dB)	STC 33 (35 dB) / STC 33 (30 dB) / STC 26 (25 dB) or prescriptive	STC 33 for exterior doors or prescriptive
Ventilation Requirements	90° bends, 10-ft duct lining, gravity vents, and dampers	90° bends, R-11 insulation, and damper plates	Rigid exhaust ducts, 90° bends, insulated ducts, and self-closing dampers
Air Leakage	N/A	N/A	Prescriptive
Compliance Options	Performance-based (STC Ratings only)	Prescriptive or performance-based	Prescriptive or performance-based