



AURALIZE – Theatres for Practical Sessions

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Erasmus+ KA210-VET – Small-scale Partnerships in Vocational Education and Training

Croatian National Theatre, Zagreb

Architects: Ferdinand Fellner & Hermann Helmer (1895)

Type: Neo-Baroque horseshoe opera house

Capacity: \approx 765 seats | **Plan:** U-shaped (17.6 \times 17.6 m)

Architectural Overview

A landmark of Croatian cultural heritage, the National Theatre combines Viennese elegance with local craftsmanship. Its gilded dome, rich red-and-gold décor, and three seating levels create an intimate yet majestic environment. The stage (24 \times 15 m) includes a revolving platform and adjustable orchestra pit, typical of late-19th-century opera design.

Acoustic Characteristics

- **Reverberation (EDT/T30):** Stable between 2022 and 2025, confirming long-term consistency.
- **Clarity (C80):** Slightly higher in the stalls, modestly lower in the boxes, indicating improved balance for speech and music.
- **Definition (D50):** $>$ 0.5 above 500 Hz in stalls \rightarrow excellent intelligibility.
- **Spatial Impression:** Uniform late field with enhanced early reflections near the stalls.

Learning Value

Students learn **comparative monitoring** of heritage acoustics: identical measurements repeated over time show how small maintenance or material changes influence clarity and definition—skills essential for preservation acoustics.

Vatroslav Lisinski Concert Hall – Large Hall, Zagreb

Architects: Marijan Haberle, Minka Jurković & Tanja Zdvořak (1961–1973)

Type: Modern “shoebox” concert hall

Capacity: \approx 1,848 seats | **Volume:** \approx 42,000 m³



Architectural Overview

Croatia's principal symphonic venue, the Large Hall features a broad, column-free "shoebox" design with two balcony tiers and a 25×13 m stage. Hardwood wall panels, suspended plywood reflector clouds, and timber floors ensure both diffusion and warmth. A steel-arch truss spans the hall, maintaining an unobstructed acoustic volume.

Acoustic Characteristics

- **Reverberation (EDT/T30):** 1.8 – 2.2 s (500–2000 Hz) → ideal for symphonic repertoire.
- **Speech Clarity (C50):** $-5 \rightarrow 0$ dB; slightly below optimal but consistent.
- **Music Clarity (C80):** $\approx 0 \pm 2$ dB → balanced blend and definition.
- **Definition (D50):** 0.30 – 0.44 → moderate speech intelligibility.
- **Spatial Uniformity:** Excellent across > 30 receiver points.

Learning Value

Students explore how **modern geometry and materials** provide even reverberation and spatial envelopment. The hall illustrates ISO 3382-1 measurement practice and large-volume acoustic benchmarking.



Vatroslav Lisinski Concert Hall – Small Hall, Zagreb

Type: Chamber / recital hall (fan-shaped)
Capacity: ≈ 305 seats | **Volume:** $\approx 2,000$ m³

Architectural Overview

The Small Hall occupies the eastern wing of the Lisinski complex. Its asymmetric fan-shaped plan, timber-lined walls, and micro-perforated panels provide intimate acoustics with adjustable drapery for variable reverberation. The 12×7.5 m stage and stepped seating ensure close proximity between performers and audience.

Acoustic Characteristics

- **Reverberation (EDT/T30):** 1.2 – 1.6 s (500 Hz–4 kHz) → suited to chamber and speech use.
- **Clarity (C50):** $-2 \rightarrow 0$ dB (speech); **C80:** $+1 \rightarrow +3$ dB (music).
- **Definition (D50):** ≈ 0.45 → near "excellent" intelligibility.
- **Spatial Impression:** Wide stereo image (IACC ≈ 0.21 at 4 kHz).



Learning Value

Students compare **Small vs. Large Hall** conditions, identifying how room volume, shape, and surface treatments influence clarity, warmth, and intimacy—ideal for convolution, spatial mixing, and creative auralization experiments.

Teatro Masini, Faenza (Italy)

Architect: Giuseppe Pistocchi (1780–1788)

Type: Historic Italian “horseshoe” opera house

Capacity: ≈ 520 seats | **Main Hall Volume:** $\approx 2,330$ m³

Architectural Overview

A jewel of Italian neoclassicism, Teatro Masini features a compact horseshoe plan with four balcony tiers, ornate columns, and statues of muses beneath a painted dome. The 20×12 m stage and velvet-lined boxes combine craftsmanship with acoustical finesse.

Acoustic Characteristics

- **Reverberation (EDT/T20):** Shortened by ≈ 0.15 – 0.20 s since 2020, improving clarity while preserving warmth.
- **Speech Clarity (C50):** Within $-2 \rightarrow +2$ dB range \rightarrow high intelligibility.
- **Music Clarity (C80):** $2 - 6$ dB \rightarrow ideal for opera and orchestral detail.
- **Definition (D50):** > 0.50 above 500 Hz.
- **Spatial Field:** Strong lateral reflections from box fronts and focused ceiling returns creating a distinct sense of height.

Learning Value

Participants witness how **historic geometry and material restoration** influence acoustic behavior. The theatre’s surveys teach array-based spatial mapping and minimal-intervention strategies for heritage performance spaces.



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Comparative Summary

Venue	Type	Volume (m ³)	Seats	EDT/T20 (s)	C50 (dB)	C80 (dB)	D50	Character
National Theatre (Zagreb)	19th-c. horseshoe	≈ 3,000– 4,000	765	1.5 – 1.8	—	+2 → +4	> 0.50 (stalls)	Historic balance, speech friendly
Lisinski Large Hall	1970s shoebox	42,000	1,848	1.8 – 2.2	-5 → 0	0 ± 2	0.30 – 0.44	Symphonic warmth, uniformity
Lisinski Small Hall	Chamber fan	2,000	305	1.2 – 1.6	-2 → 0	+1 → +3	≈ 0.45	Clear, intimate, articulate
Teatro Masini (Faenza)	18th-c. horseshoe	2,330	520	1.0 – 1.8	-2 → +2	+2 → +6	> 0.50	Warm, immersive, heritage venue