Norsk musikkråd

Musikkens studieforbund

The acoustics of rooms for music rehearsal and performance – the Norwegian approach

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Norway is a relatively small country

- 5,2 mill people
- but a very rich and widespread music life
  - Lots of local amateur groups
- Up to 500.000 people playing, singing or arrange concerts in one week

We use **MANY** rooms

- Each week – in Norway we use **more than 10.000 rooms**
  - Most of theese rooms not originally designed for music, but are schools, youth clubs, churches, local civic houses etc
- Music matters – and the acoustics in the rooms matters
- Each week – **40 million choir singers** in Europe og to choir rehearsals
- Mostly **rehearsal purposes**, also many **concert rooms**
  - Concert halls > 500 seats not included

- **85% not suitable for their music use**

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The importance of suitable **rehearsal** rooms

- Rehearsal room is the main basis for the activity – «home ground»
- Most important: hear **myself** and the **others**
- Acoustics in the room **suited** for my kind of activity

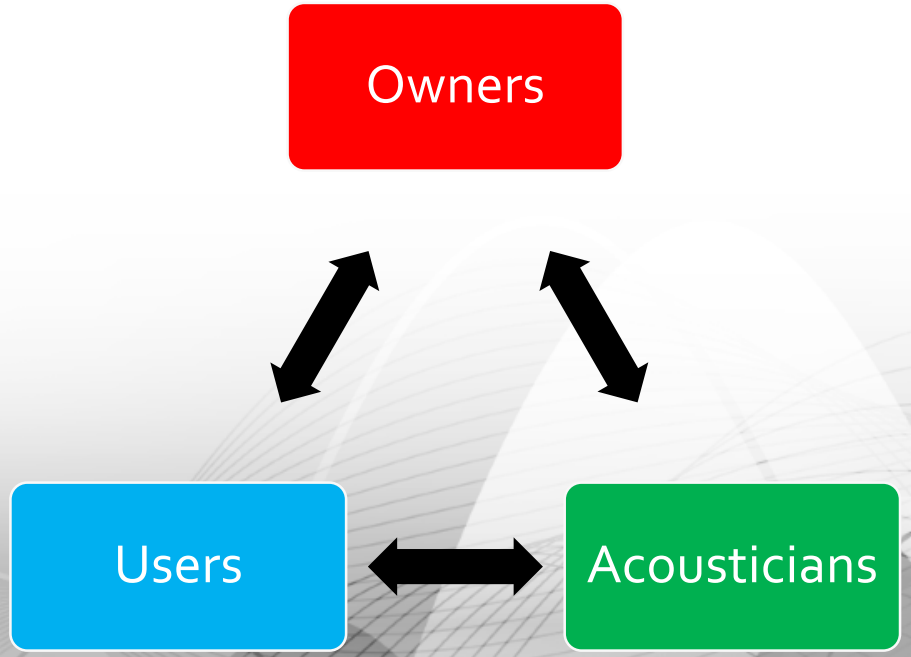
- The **joy of** playing and singing
- Acoustics crucial for the **musical quality of the ensemble**
- For **recruiting** new members

The importance of suitable **concert** rooms

- The concerts are our «show rooms» – we want to present ourselves well for the community, our friends, the public
- Our pay-back to the society
- Good local happenings, events, performances – contributes to a good life in our community, a good place to live
- An important arena for recruitment

Our succes criterion no 1:
a close longterm relationship between the users, the owners and acoustic consultants

Our Golden triangel



- **Owners:**
  Municipalities, local governments, organizations, school owners etc.
- **Users:**
  Choirs, bands, accordeon groups, music school, professonal musicians, audience
- **Acousticians:**
  Knowledge about music, about rooms and sound in room

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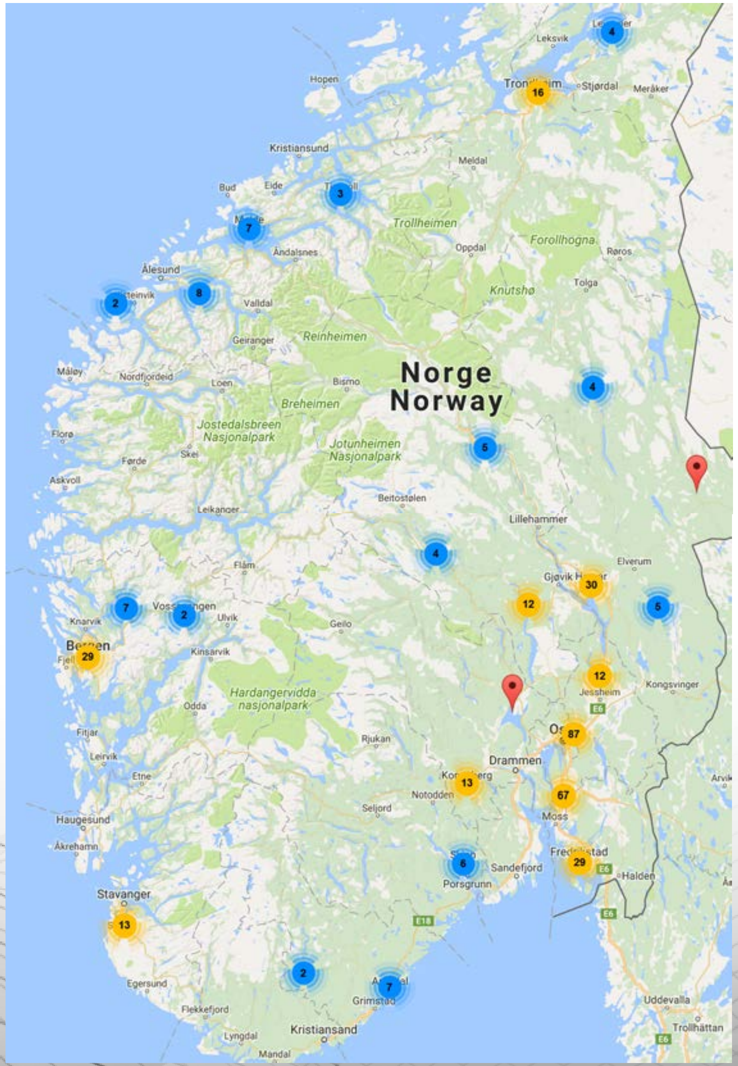
http://database.musikklokaler.no/map

- 600 room acoustical measurement reports
- Covering 13 counties
- Standardized method and report – including reverberation time and room strength (G)
- Registered in a joint database – 440.000 data
- All reports in google map, for download (in Norwegian)
- Working on a «light version» - hope to cover as many rooms as possible



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Norwegian Standard NS8178:2014

Acoustic criteria for rooms and spaces for music rehearsal and performance

Target groups

- Municipalities and local governments
- Architects and advisors
- Construction companies
- Acoustic consultants
- Music organizations, conductors and concert organizers
- Amateurs and professional musicians

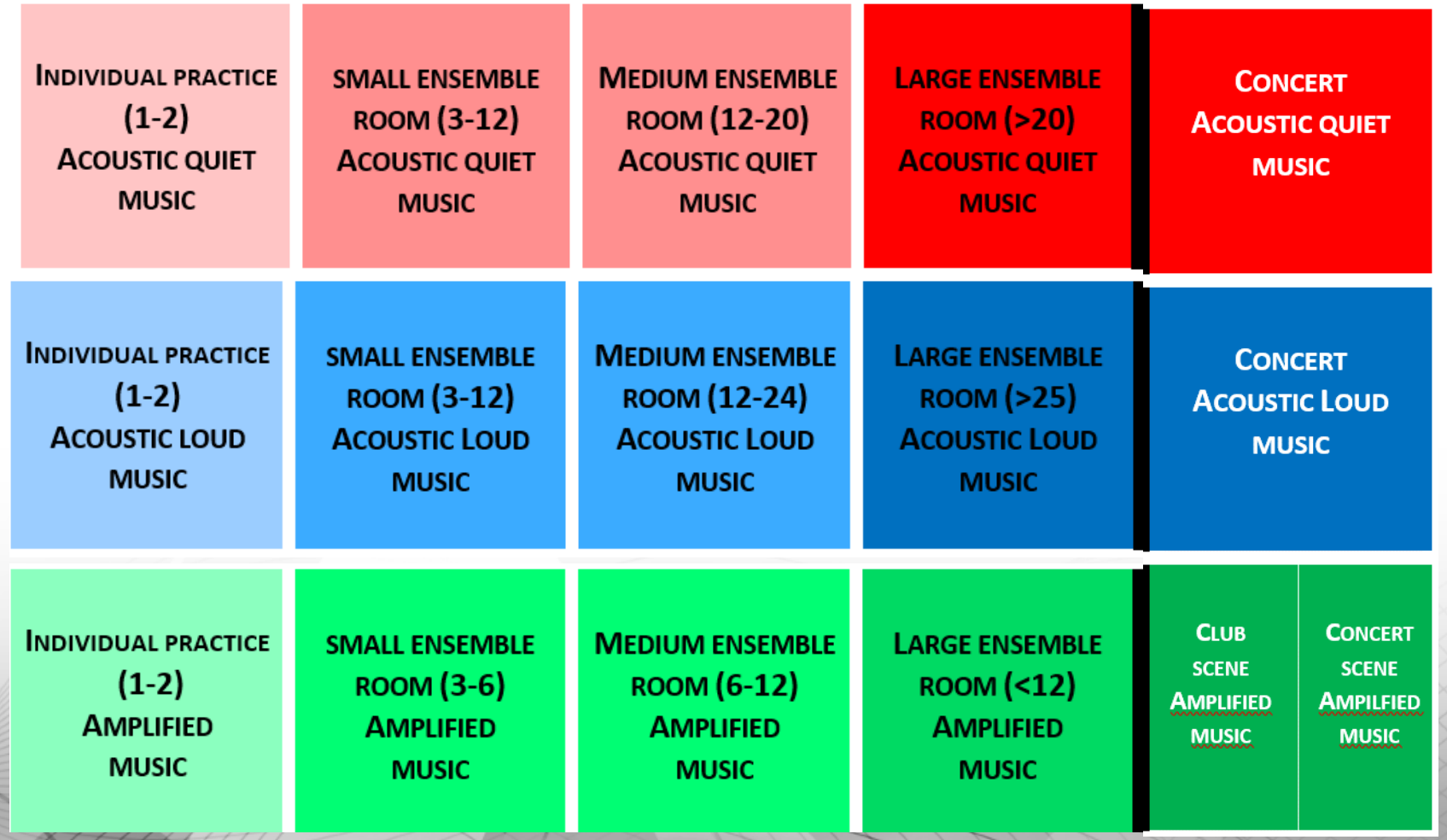
Norwegian Standard NS8178:2014
From small rehearsal room to 500 seats concert

- Rooms that are used for live music
  - For practice rooms, teaching, rehearsals with/without conductor
  - For concert rooms, club scenes and rooms up to 500 seats/1000 standing
- In all kind of buildings
  - Schools, civic houses, community centres, youth clubs, culture houses, churches, congregation rooms etc
- NOT specific concert halls, opera houses, or concert arenas for more than 500 seats

Norwegian Standard NS8178:2014 Overview

- According to the MUSIC GENRE and ENSEMBLE SIZE there are specific demands for
  - ROOM VOLUME, DIMENSIONS AND GEOMETRY
  - ACOUSTC TREATMENT of the room surfaces (walls/ceiling)
  - REVERBERATION TIME
  - BACKGROUND NOISE LEVEL
  - STRENGTH (G) is also discussed

NS8178 – 3 genres, 5 room categories



15 room categories in all

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ROOM VOLUME – criterion no 1:
600 acoustic reports:
Too small rehearsal rooms – Also concert room problem

- Acoustic soft ensembles
  - NS8178 choirs: min 700 m^3
- Acoustic loud ensembles
  - NS8178 wind bands: min 1000 m^3 - min 30 m^3 pr musician
    – CMON recommend: +50% for adults
    NB: min 1500 m^3 **for brass bands, min 1800** m^3 **for symphony orchestras**
- Studios and teaching rooms in music schools – also too small
  - NS8178: use small ensemble room category for education, not practice cell

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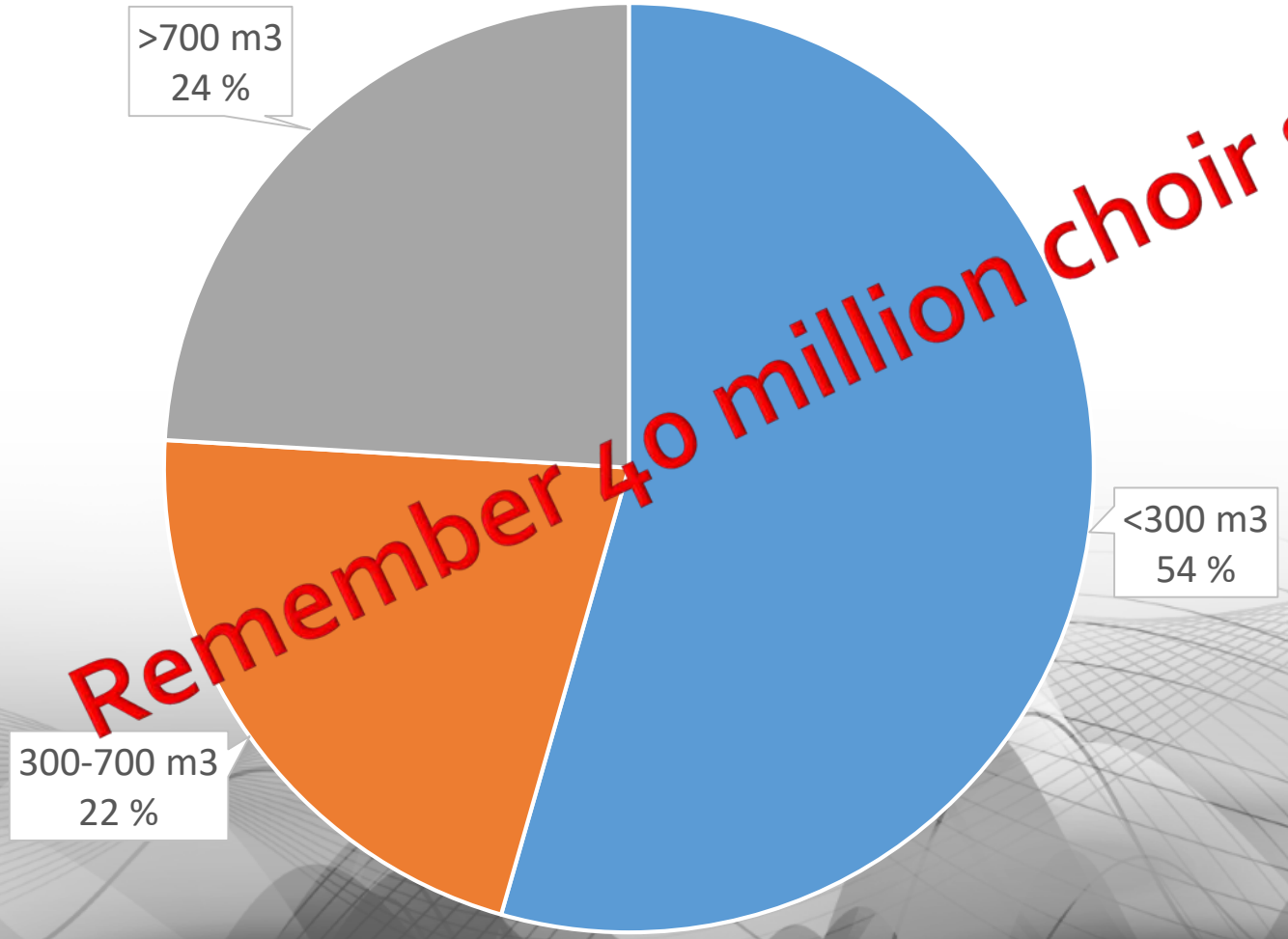
Choir rehearsal room in Norway – mostly too small

survey Norsk sangerforum (Norwegian singers organization), spring 2016



Remember 40 million choir singers in Europe

- 54% way too small
- 22% too small
- 24 % more or less ok size

- The choirs use what they can get
- Ex: Classroom, 6x4x2,5 (60 m^3), 43 singers, 1,4 m^3 pr person, «The acoustics are quite ok»)

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NS8178 – VOLUMES for rehearsal

	Individual practice	Small ensemble and teaching	Medium Ensesmble	Full ensemble
Acoustic soft	1-2 musicians	3-12 musicians	12-20 musicians	>20 choir, string orch 20-35
	>30 m^3	>45 m^3 - 120 m^3	>200 m^3	>700 m^3
Acoustic loud	1-2 musicians	3-12 musicians	12-24 musicians	>25 musicians
	>40 m^3	>45 m^3 - 360 m^3	>360 m^3 >500m^3 - bigband	>1000 m^3 >1500 m^3- brassband >1800 m^3- symph For all min >30 m^3 pr musician
Amplified	1-2 musicians	3-6 musicians	6-12 musicians	>12 musicians
	>25 m^3	>60 m^3	>180 m^3	>400 m^3

NS8178 – VOLUMES for concert

	Audience	Volume	Volume pr person
Acoustic soft	100 – 500 audiece	>1500 m^3 – 6500 m^3	12 m^3/person incl musicians
Acoustic loud	100 – 500 audience	>2000 m^3 – 6500 m^3	10 m^3/person incl musicians
Amplified - club	100 – 500 audience	>300 m^3 – 800 m^3	
Amplified – scene	200 – 1000 audience	>600 m^3 – 1000 m^3	

ROOM GEOMETRY – criterion no 2
600 acoustic reports: Some problems

- Enough room height (not as problematic as one might expect)
  - NB: Choirs rehearsing in rooms with way to low room height
- Some rooms too long and narrow
- NO NARROW THEATRE STAGE OPENING !
- Concert rooms with retractable seat construction, too low height above the rear seats

NS8178 – DIMENSIONS

	Individual practice	Small ensem and teaching	Medium ensem	Full ensemble	Concert
Acoustic soft - height	2,7 m	>3,5 m	>4,5 m	> 5 m	6 – 12 m
Area	15 m²			>120 m² + 2 m² pr musician	Stage >75 m²
Acoustic loud – height	2,7 m	>3,5 m	>4,5 m	> 5 m	8 – 12 m
Area	15 m²			>120 m² + 2 m² pr musician	Stage >100 m²
Amplified – height	2,7 m	>2,7 m	>3 m	> 4 m	Club scene: 4-6 m Concert room: 4-10 m
Area		>20 m²	>60 m²	>100 m²	Club scene: 100-200 m² Club scene, stage: > 30 m² Concert room: > 150 m² Concert room, stage: > 50 m²

REVERBERATION TIME – criterion number 3
600 acoustic reports: **Major** problems

- Main challenge in concert rooms: to **PRIORITIZE ONE MAIN USE**

- **Main challenge 1: «Narrow theatre stage opeing» (should be BANNED)**
- **Main challenge 2: Soft acoustic ensembles much too short reverberation time**
- **Main challenge 3: : Loud acoustic ensembles much too long reverberation time**
- **Main challenge 4 : Amplifired music - too long bass reverberation (125 Hz)**

- Good news: If criteria 1+2 is ok, not too expensive to fix the conditions in rehearsal rooms

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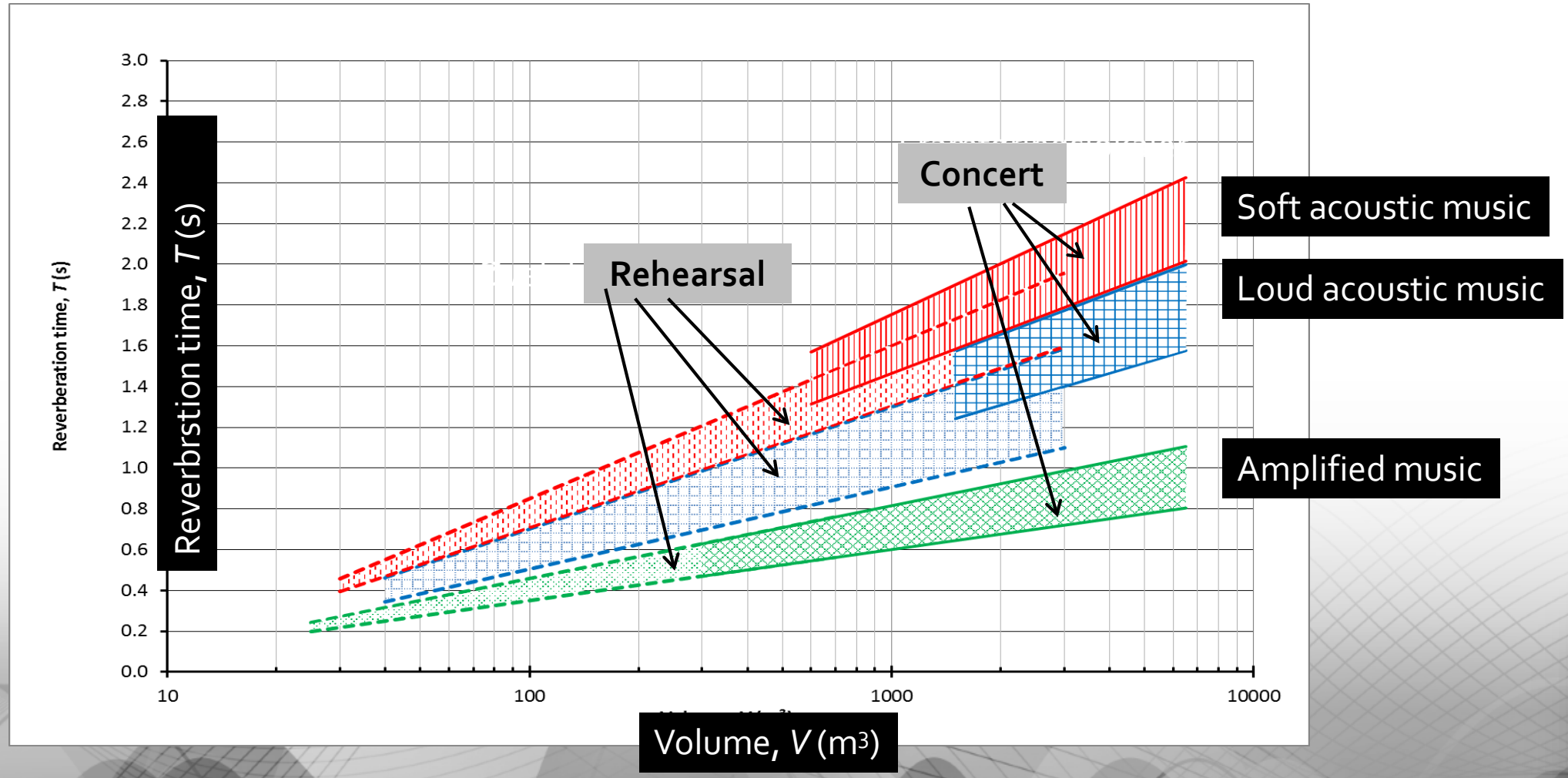
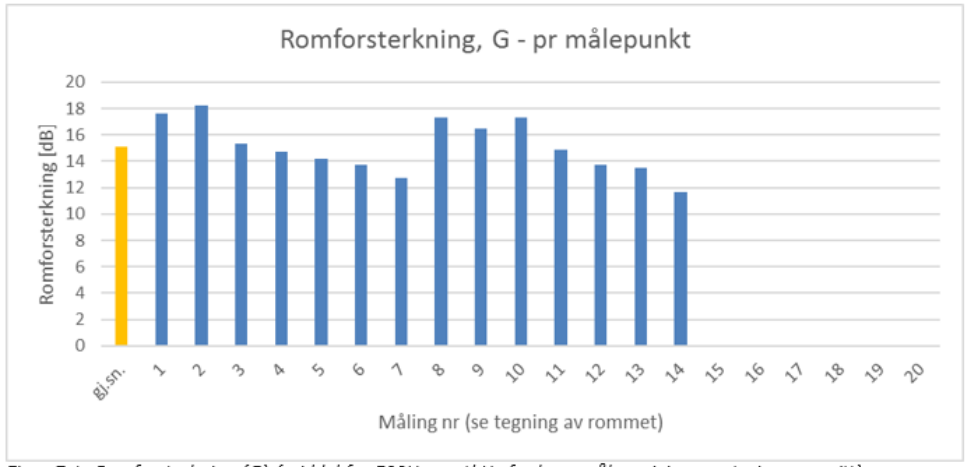
NS 8178 – Reverberation time at mid frequencies



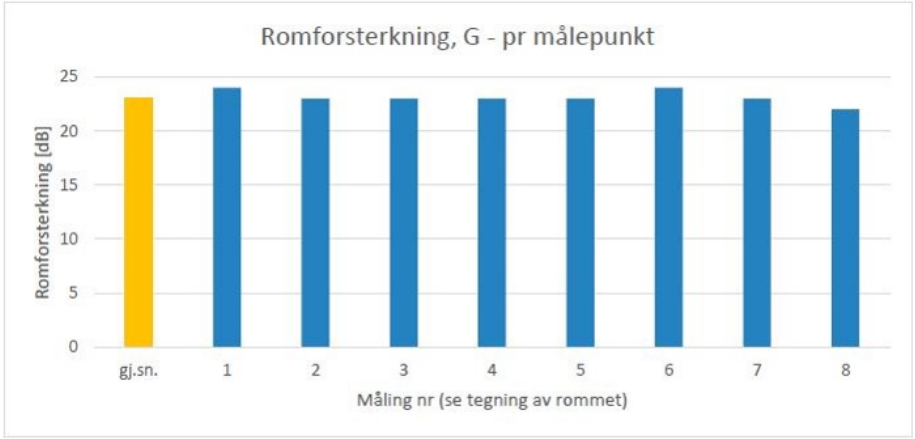
Room strength – G (dB)

- Contribute much to a good acoustic description of music rooms – in rehearsal rooms as well as in concert rooms
- Our measurments includes calibratied G in all rooms for acoustic music
- Correlation net volume, medium absorpsion factor and absorption sureface area
- **How to balance reverberation time versus strength**
- LOUD music – not too much room strenght
- SOFT music – enough room strenght

Room strength rehearsa rooms – 2 exemples



Figur 7.1: Romforsterkning (G) (middel for 500Hz og 1kHz for hver måleposisjon samt gjennomsnitt)



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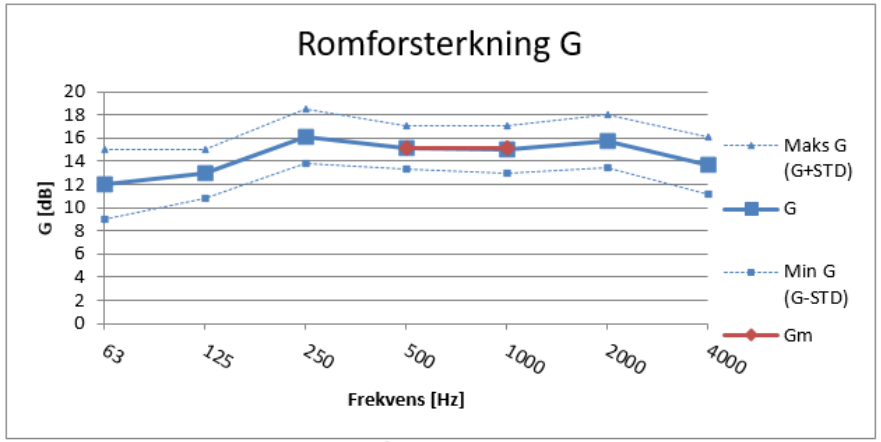
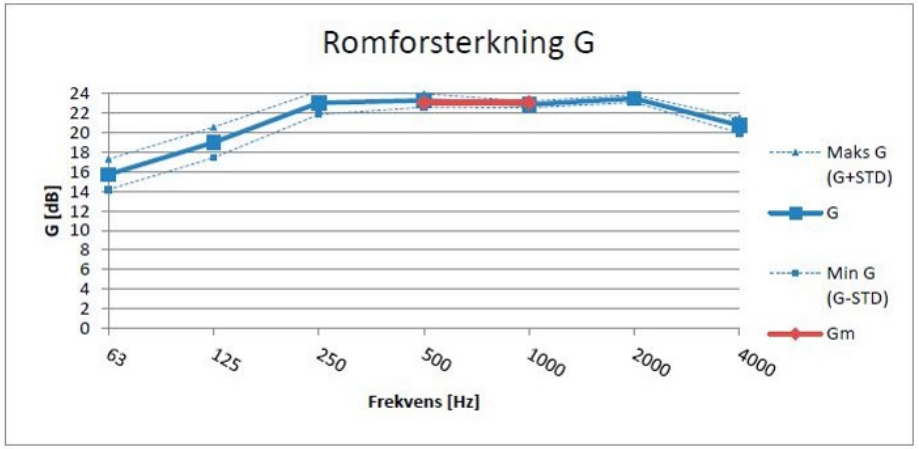


Figur 7.2: Romforsterkning (G) pr frekvensbånd, samt standardavvik



Figur 7.2: Romforsterkning (G) pr frekvensbånd

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ACOUSTIC ADAPTATION – criterion number 4
600 acoustic reports: Big variations througout the room

- Many rooms have little diffusion
- Echo effects, medium bothersome
- Retractable seats in concert rooms:
  - Significantly different acoustical conditions with seats out or in. Retracted seats: strong echoes + much longer reverberation time
  - Too small room height on top of the rear seats
- Other type of complex acoustic problems

BACKGROUND NOISE – criterion number 5

600 acoustic reports: High background noise levels

- Most rooms have too high background noise level according to NS8178/NS8175
  - Rooms 500-2000 m^3 an average of 36 dBA, 30% above40 dBA, only 20% 30 dBA or lower
- Main problems: Ventilation and heat pumps
- Light transformers AS WELL in rehearsal rooms as in concert rooms
- Tonal character of the noise especially disturbing
- Partly poor sound insulation – sound getting ***into*** the room as well as sound ***from*** the room disturbing others


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