

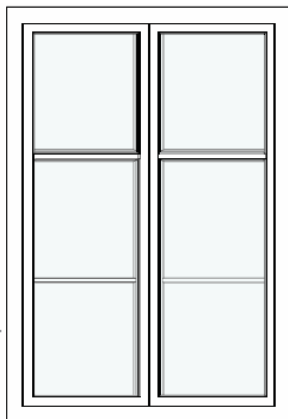
NAS Høstmøte 2012

# Forbedring av bevaringsverdige vinuder

Hva kan oppnås?

Anders Homb  
November 2012

# Energieffektive, bevaringsverdige vinduer



Studie av U-verdi,  
Lydisolasjon etc. før og  
etter oppgradering

Målinger  
Beregninger

Åpen rapport 1. Juni 2012 (NO)  
Anders Homb, Sivert Uvsløkk



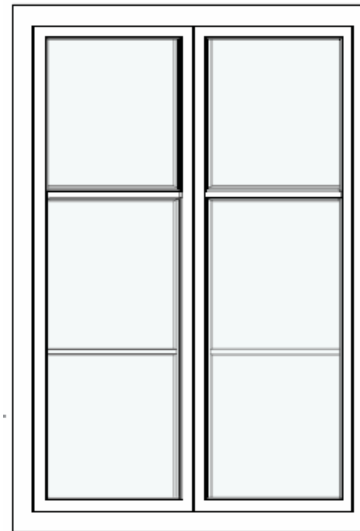
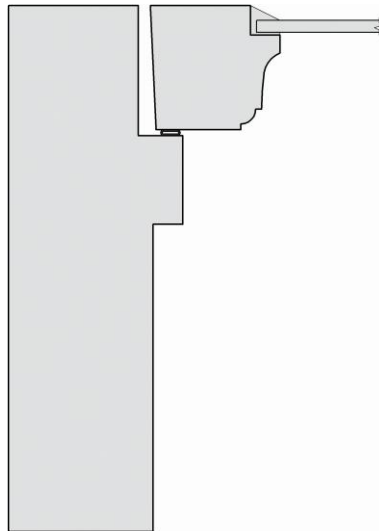
Bilder som viser vinduet:  
Sett fra innside, til venstre



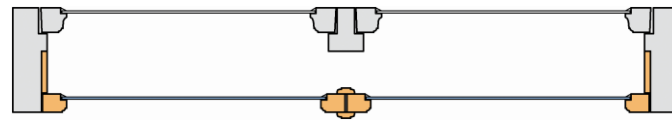
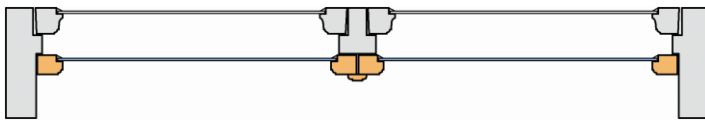
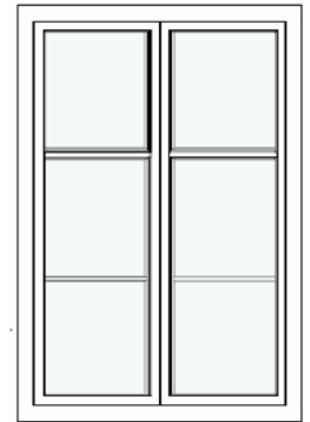
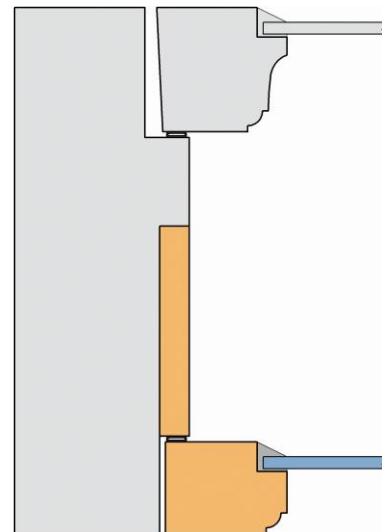
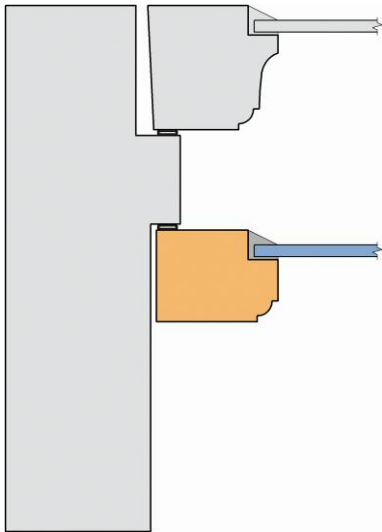
og fra ytterside, til høyre



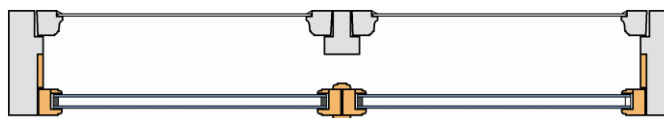
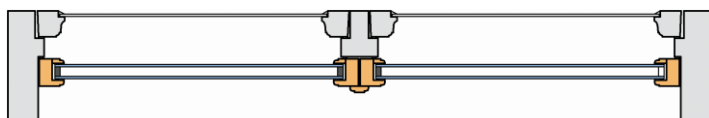
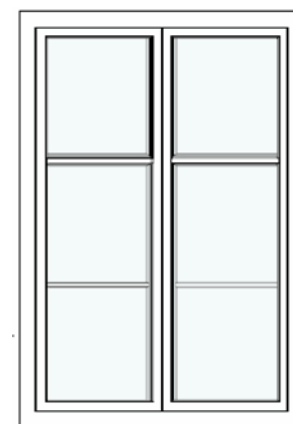
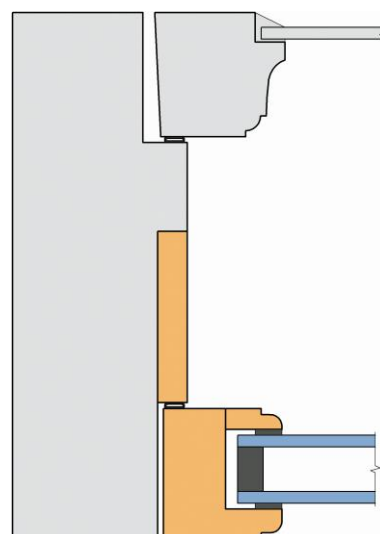
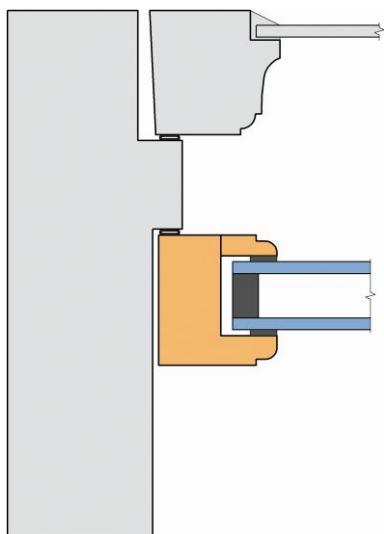
Opprinnelig vindu, 1120 mm x 1448 mm  
Karmdybde 180 mm



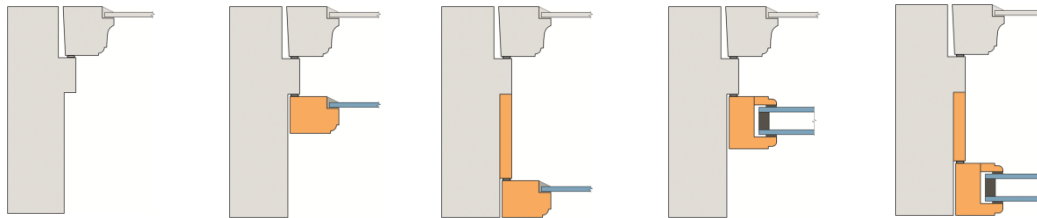
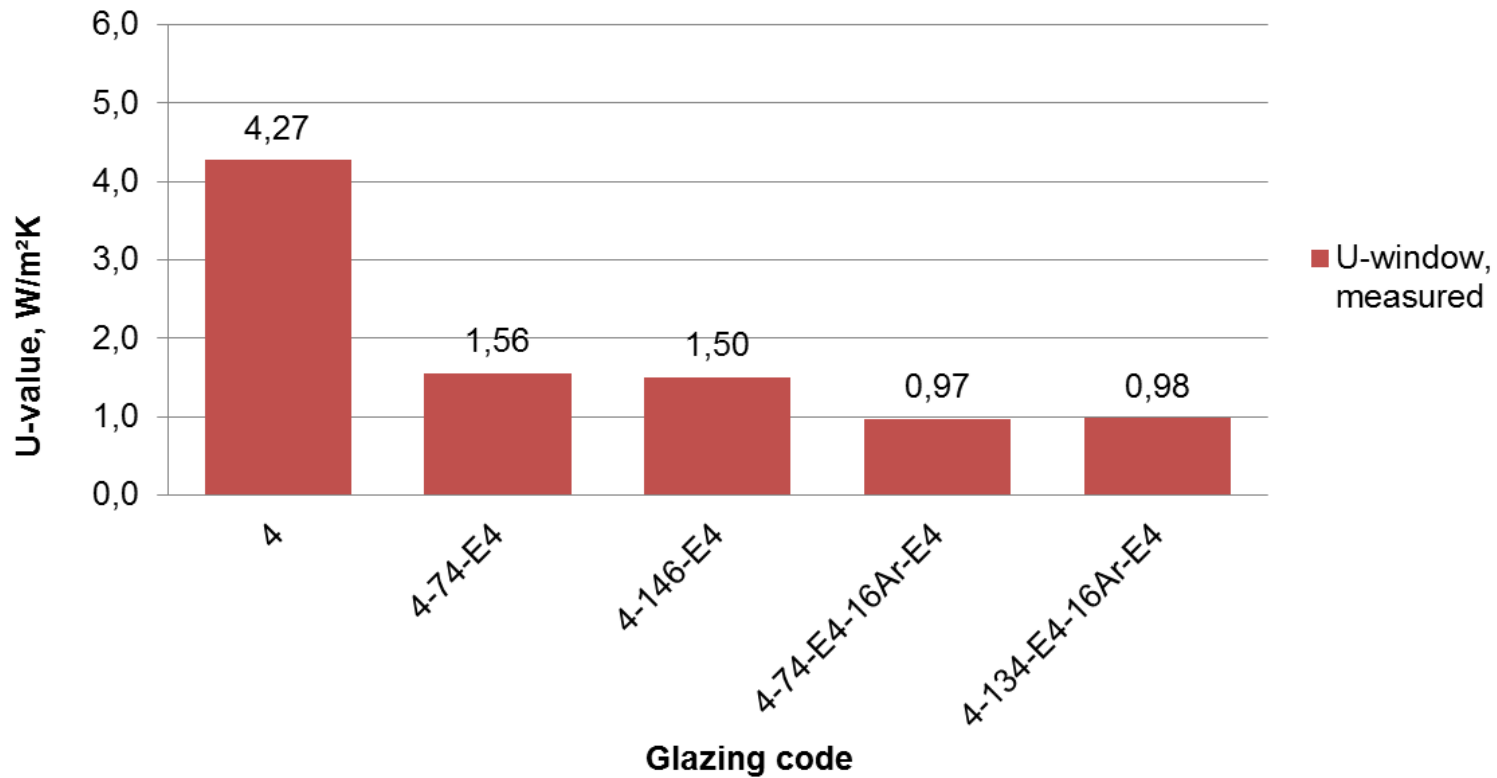
Opprinnelig vindu + innvendig varevindu som har ett glass med hardbelegg: Glass-kode **4-74-E4** og **4-134-E4**



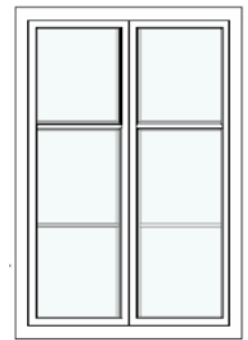
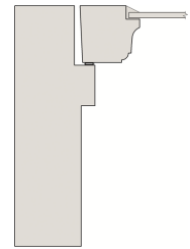
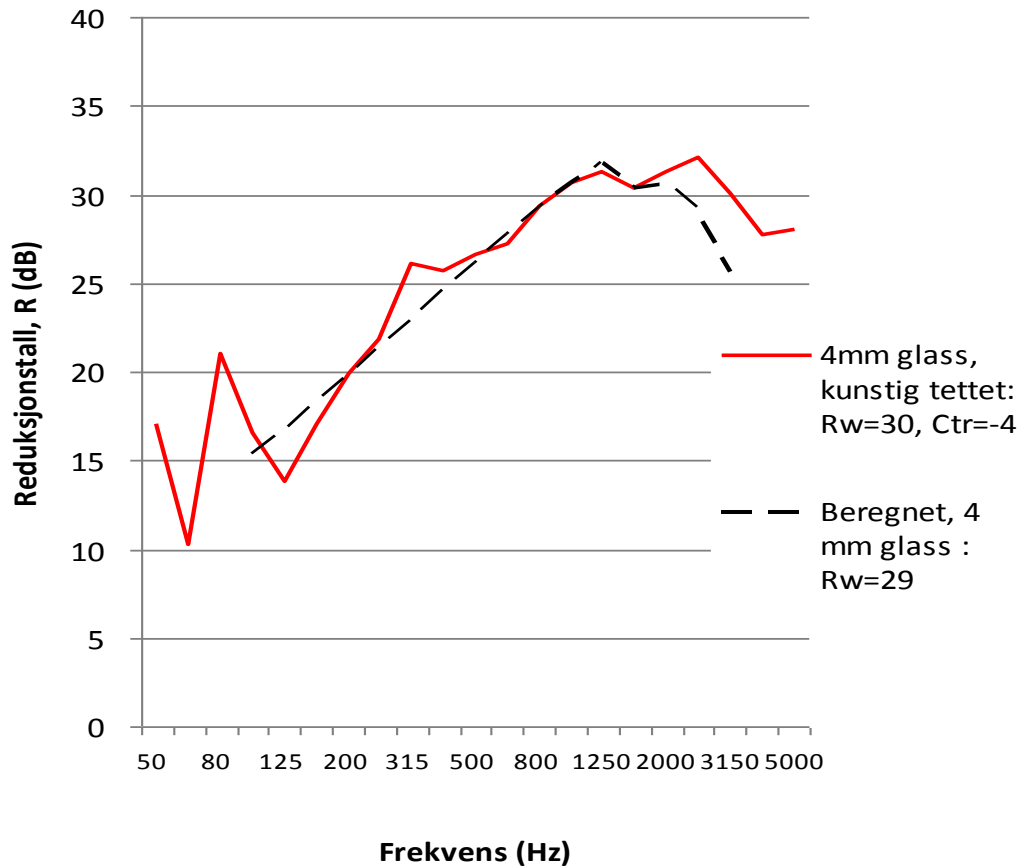
Opprinnelig vindu + innvendig varevindu som har tolags isolerrute:  
Glass-kode **4-74-E4-16Ar-E4** og **4-134-E4-16Ar-E4**



## Measured U-values, the whole window

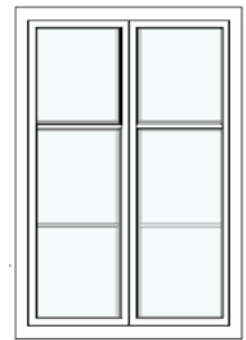
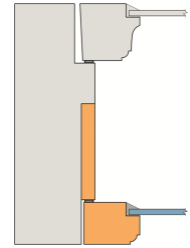
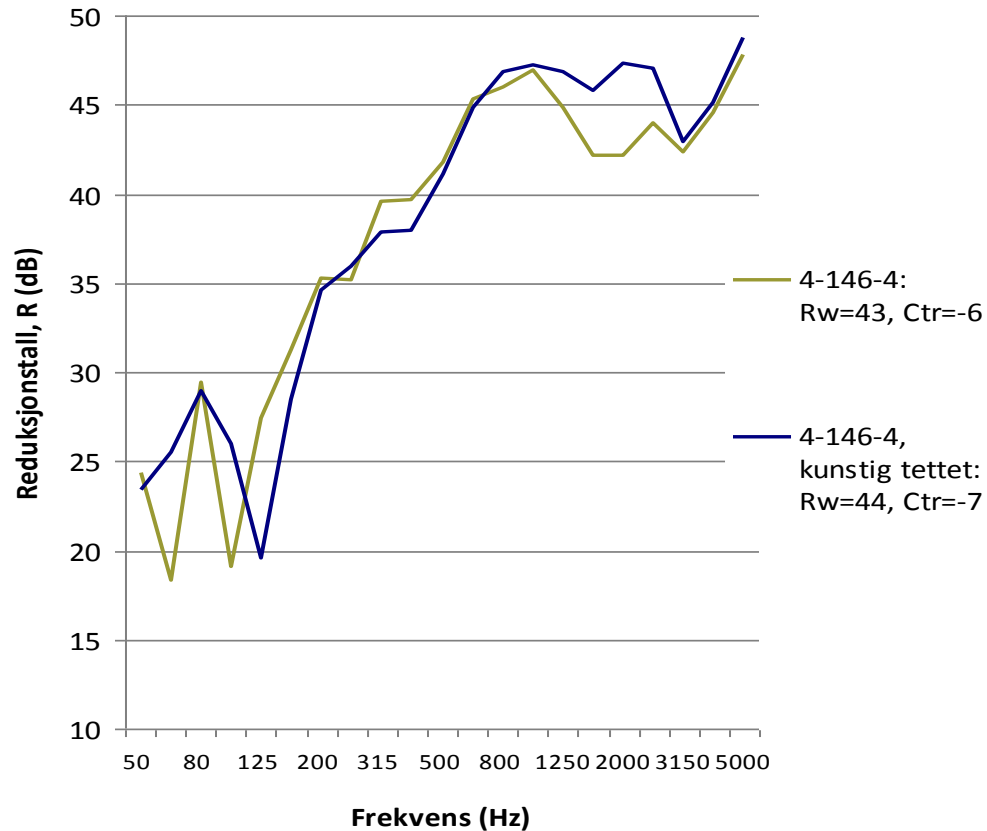


# Laboratoriemålt lydisolasjon – opprinnelig vindu

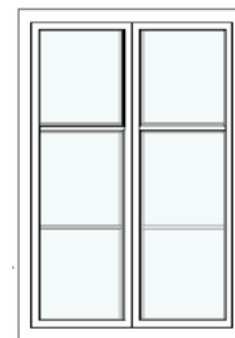
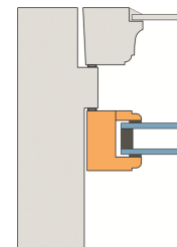
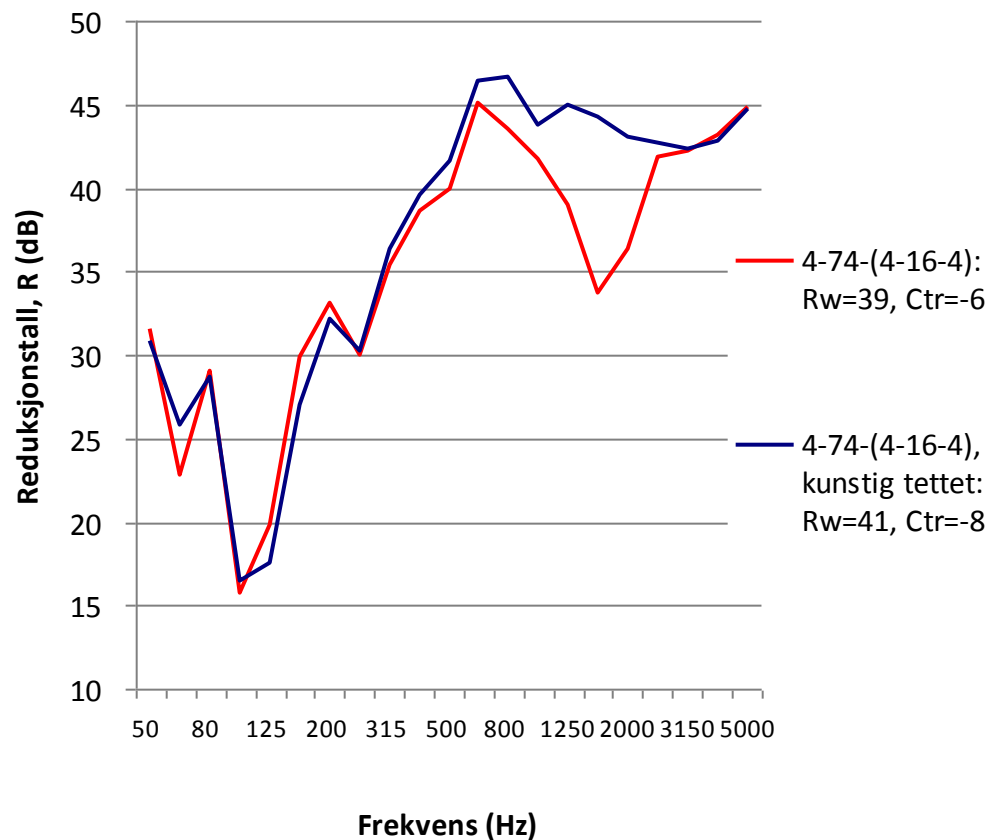




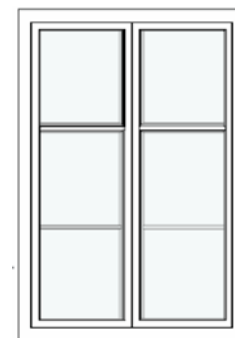
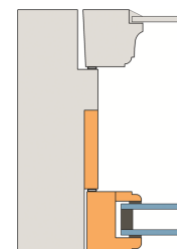
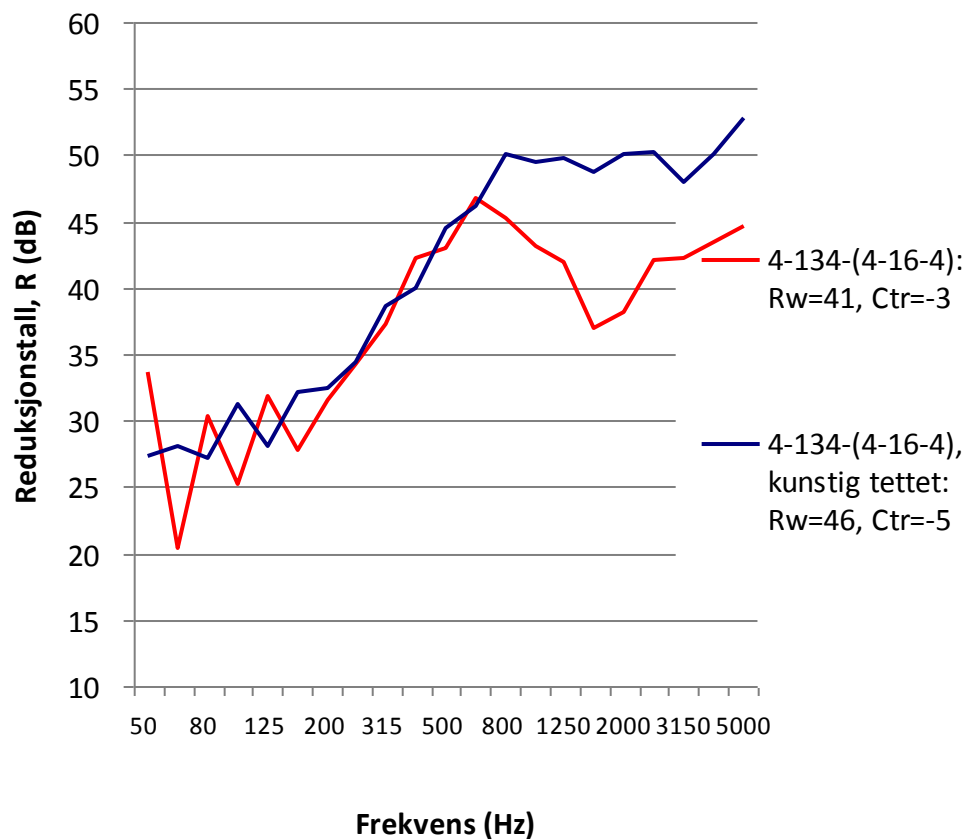
# Innvendig vareramme – enkelt glass



# Væreramme i midtre posisjon – 2-lags isolerrute

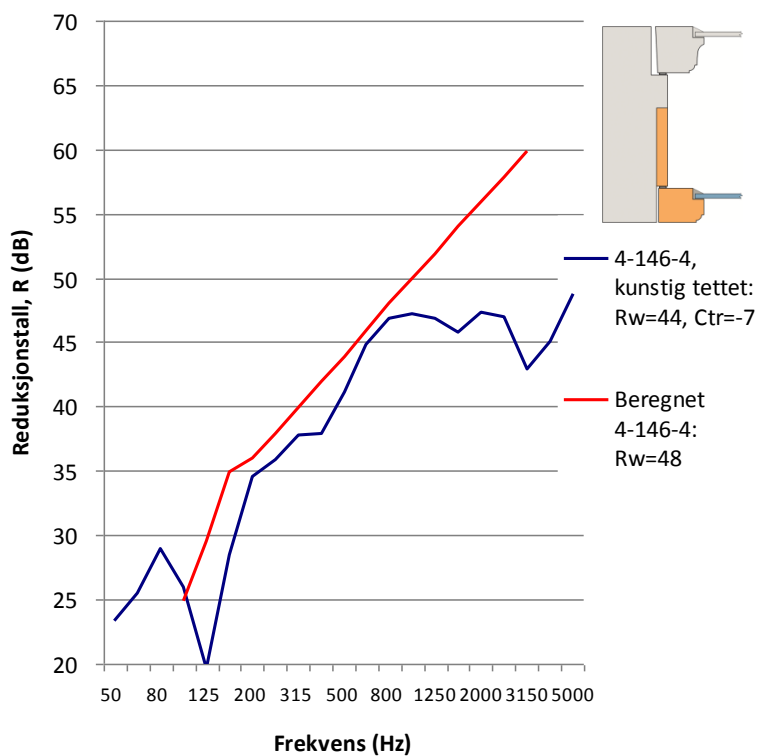


# Vareramme i indre posisjon – 2-lags isolerrute

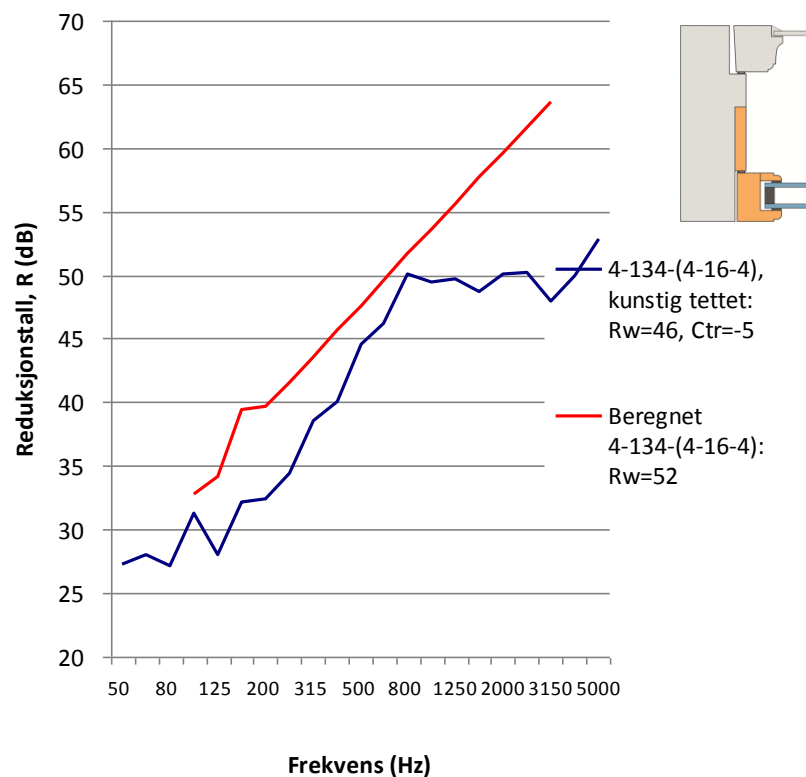


# Målt og beregnet verdi

## Enkelt glass i vøreramme

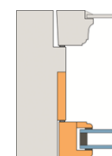
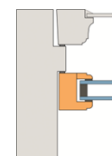
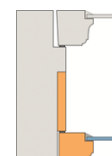
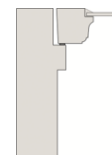


## Isolerrute i vøreramme



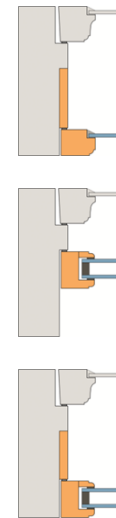
## Hovedresultater - laboratoriemålinger

Variant	Laboratoriemålt luftlydisolasjon, $R_w + C_{tr}$ (dB)	
	Tettelst levert	Kunstig tetting
Opprinnelig vindu	25	26
Varevindu med enkelt glass, 146 mm avstand	37	37
Varevindu med isolerrute, 74 mm avstand	33	33
Varevindu med isolerrute, 134 mm avstand	38	41



## Forbedring med vareramme

Referanse, opprinnelig vindu, kunstig tetting	Luftlydisolasjon, $\Delta R_w$ ( $\Delta C_{tr}$ ) (dB)	
	Målt	Beregnet
Varevindu med enkelt glass, 146 mm avstand	14 (-3)	19 (-5)
Varevindu med isolerrute, 74 mm avstand	11 (-4)	-
Varevindu med isolerrute, 134 mm avstand	16 (-1)	23 (-4)



# Oppsummering

- Ikke kast ut brukbare vinduer – motiver byggherrene
- Kan "lett" oppnå  $R_w + C_{tr} > 40$  dB med ekstra vaseramme på innvendig side
- Stort potensial for forbedring av  $R_w$ -verdien med bedre tettelist
- Vanlige tettelist gir liten innflytelse på  $R_w + C_{tr}$ -verdien
- Vanlige, enkle beregningsmetoder overestimerer luftlydisolasjonen ved doble vindusløsninger
- Vindusprodusenter produserer enkelt på mål