



Energy Efficient Buildings: Example of a House Renovation in Tokyo

Seminar at ICU
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October 22nd, 2014

Content

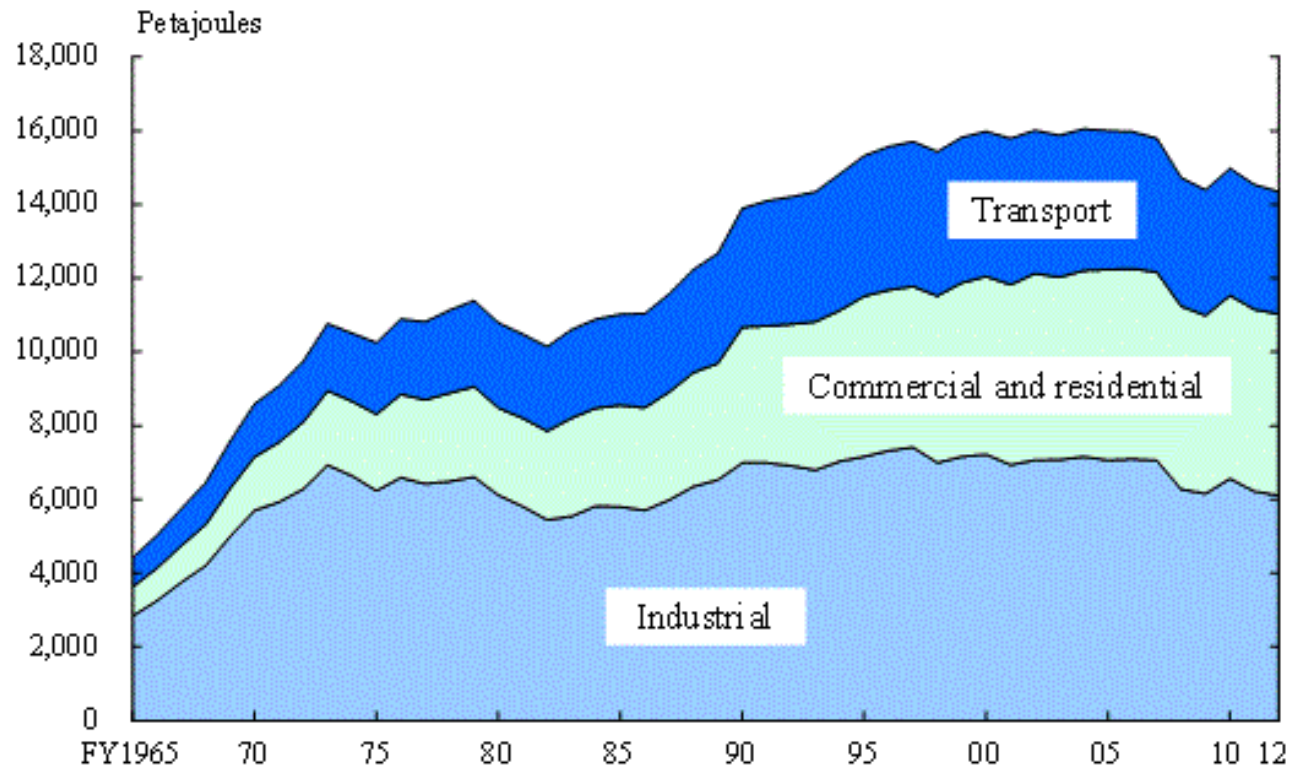
Introduction: Energy Efficient Buildings
R&D Trends
Practical Example: Renovation
Conclusions

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Why low energy houses?

Trends in Final Energy Consumption by Sector ¹⁾



Energy Consumption in the Building Sector in Japan up by 41,9% !! (1990-2012)

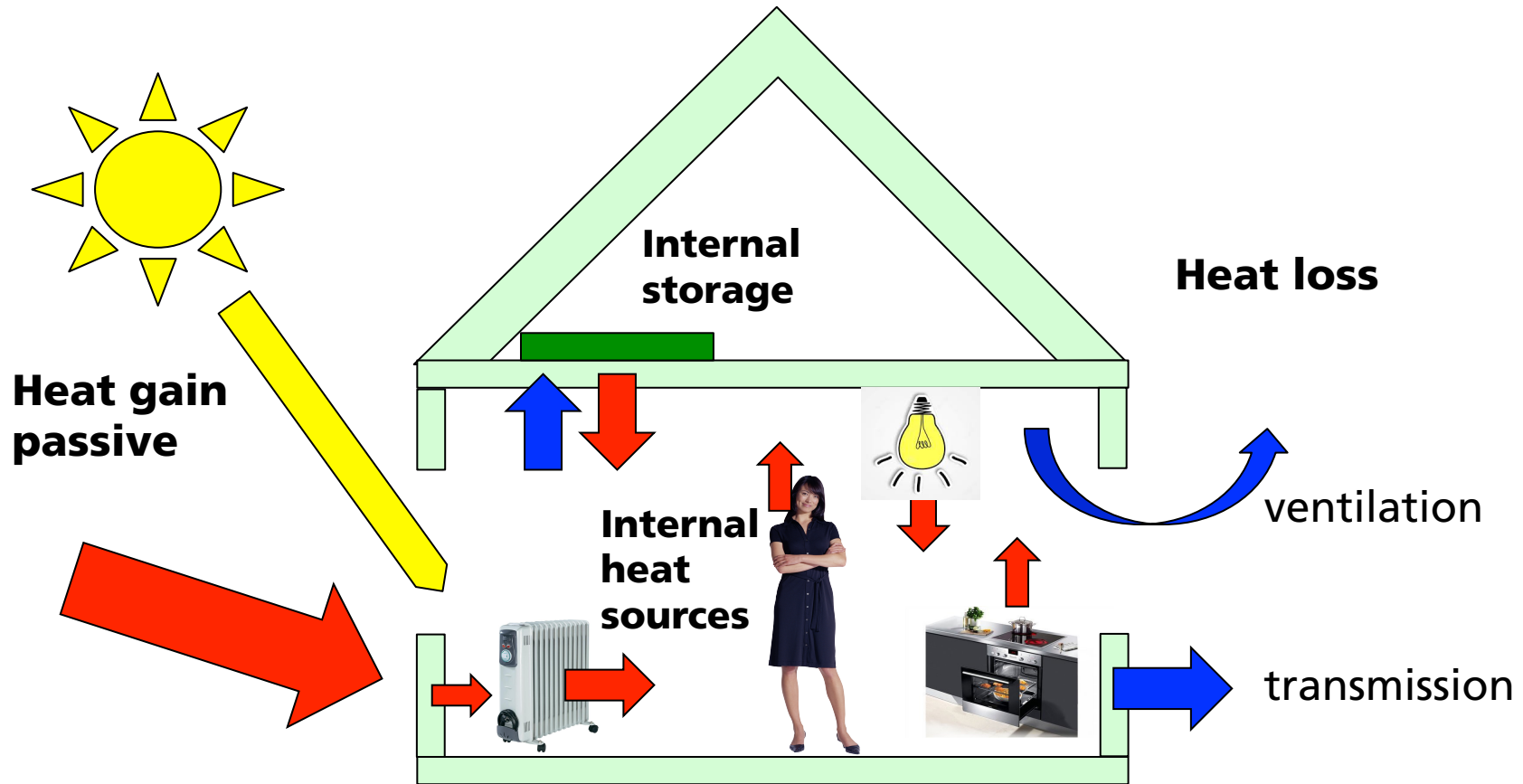
1) A different statistical method was used for figures of fiscal 1989 and prior.
Source: Ministry of Economy, Trade and Industry.

(Statistical Handbook of Japan 2014, Statistics Bureau)

Reasons for Increase of Energy Consumption in Commercial / Residential Sector

- ▶ Why increase by 41.9 %:
 - (i) Rise in residential floor space
 - (ii) Large-scale retail stores
 - (iii) Increase in air conditioning / lighting used there
 - (iv) Extending opening hours
 - (v) Rise in the total floor area of office buildings
 - (vi) Growth of office automation
- ▶ Countermeasures:
 - 1) Energy efficient buildings
 - 2) Energy efficient building equipment (heating, cooling, lighting, smart buildings)

Energy efficient house



Heat gains and losses and internal heat sources determine indoor temperature

Energy efficient house

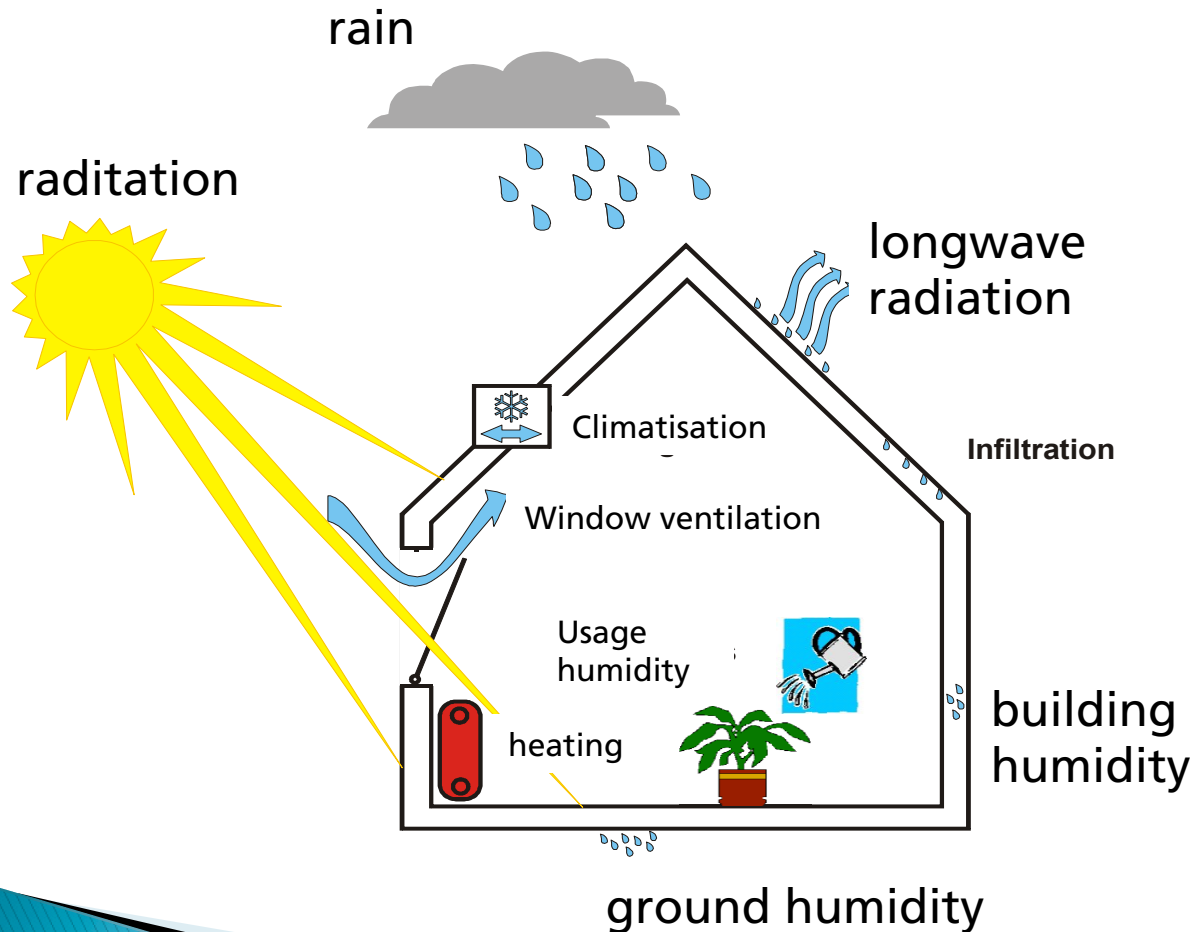
- ▶ Low use of energy through efficient devices:
 - efficient lighting (LEDs), use of daylight
 - efficient heating/cooling equipment
 - Home Energy Management System (HEMS), etc.
- ▶ Reduction of heat and cold loss through:
 - better / outside insulation of walls
 - better insulated windows/window frames
 - air tight building envelope
 - ventilation system with heat exchanger

Content

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Important: hygrothermics

better energy performance = higher risk of moisture problems



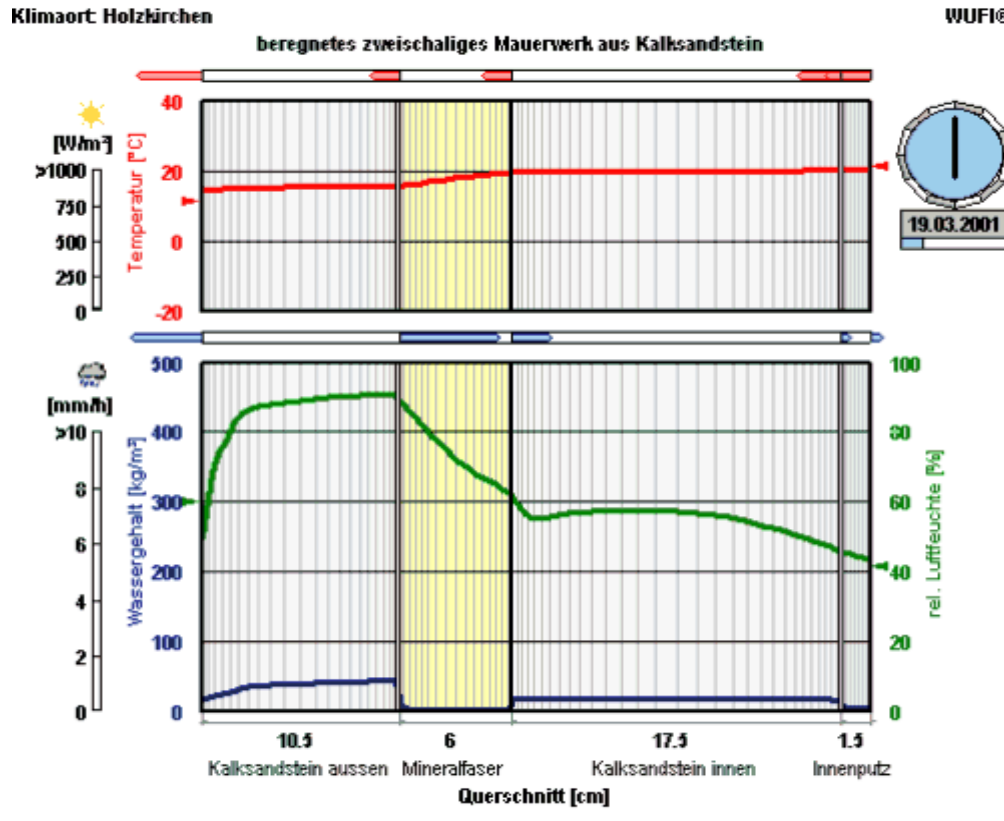
Moisture Control and Climate Specific Design

Moisture control assessment based on simple diffusion calculations (Glaser, dew-point method) not sufficient.

Effective moisture control design must consider all loads including construction moisture, summer condensation, effects of wind-driven rain

Courtesy of Fraunhofer IBP, ©Fraunhofer IBP

Software for Hygrothermics



Fraunhofer WUFI® Pro 1D film viewer

WUFI : Datenbank Materialien

Quelle: Fraunhofer Institut für Bauphysik

Katalog: Alle Kataloge

Bezeichnung	Dichte [kg/m³]
Vollziegel, alt	
Vollziegel, extrudiert	
Dämmplatte DP	
DÄMMSTATT's CI040, KLIMA-TEC-FLOCK, Poesis-Floc, ISC	
FERMACELL Gipsfaser-Platte	
HOIZ® S 45 Hobelspänedämmung	
INTELLO	
isofloc L	
Pavatex Diffutherm	

Schicht/Materialkenndaten

Schicht/Materialname: Roxul CavityRock

Hersteller: Roxul Inc., 551 Harrop Drive, Milton, ON, Canada, L9T 3H3

Datenquelle: IBP Eigenuntersuchungen, Wärmeleitfähigkeit nach Herstellerangabe, Standardwert für temperaturabhängigen Wärmeleitfähigkeitszuschlag.

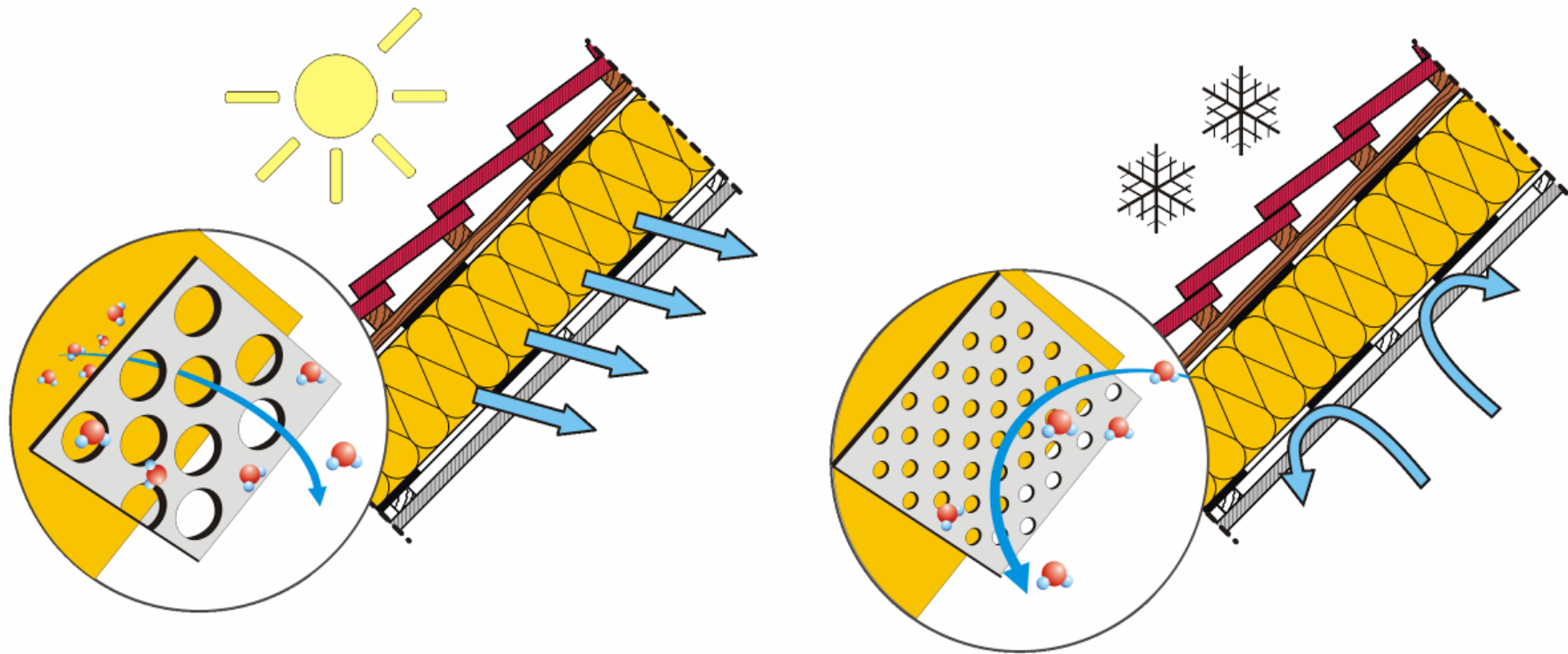
In DB eingefügt: 12.04.2010, Letzte Aktualisierung: —

Produkt+Weblink: **ROXUL CavityRock**

Dicke [m]: 0.3, 0.45, 0.6

WUFI® Material Database

Functional principal of the adaptive vapor barrier



Courtesy of Fraunhofer IBP, ©Fraunhofer IBP

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House before / after



Construction: frame



Construction: windows



Construction: inside insulation



Construction: outside insulation



Construction: heating / cooling



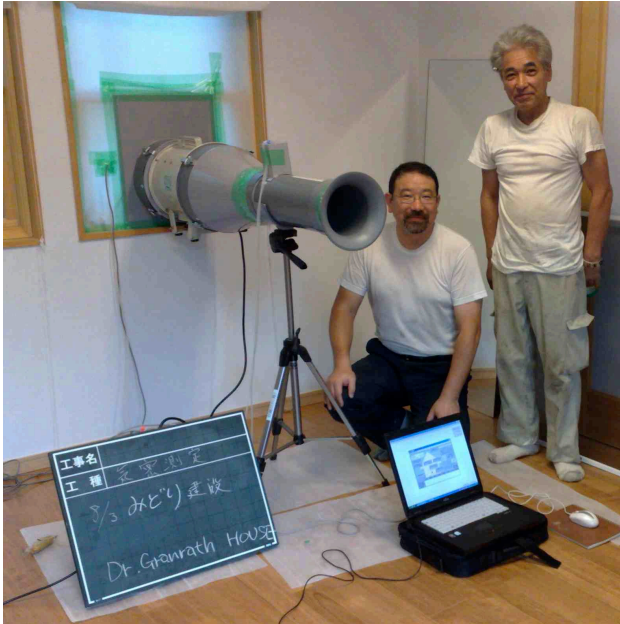
Construction: vapor barrier / plaster board



Construction: wall paper / interior



Blower test



Content

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