

DOCKET
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Insulation CASE Report

PG&E Codes & Standards Program

October 25, 2005



**Pacific Gas and
Electric Company**

Codes & Standards Enhancement Project

Overview of proposal

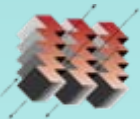
- Update the 2008 envelope criteria
- Move to a U-factor approach
- Create a separate category for Retail
- Climate zone groupings



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Description of changes to life cycle costing

- Savings in TDV rather than kWh and therms
- 30-year life cycle used for envelope measures
- Present value of TDV of \$0.129 (will be updated to be consistent with the life-cycle cost methodology report)



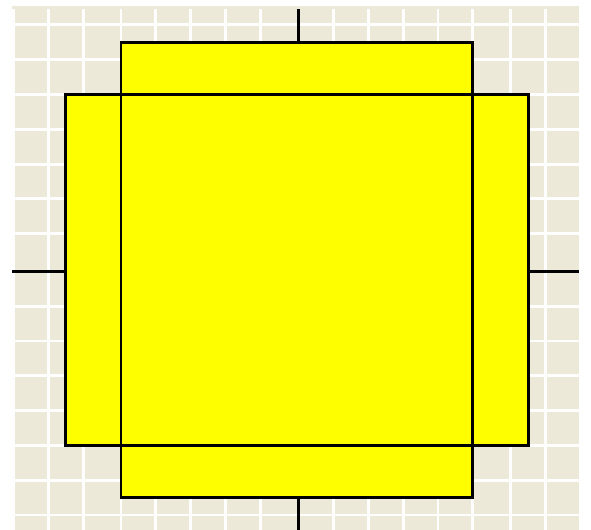
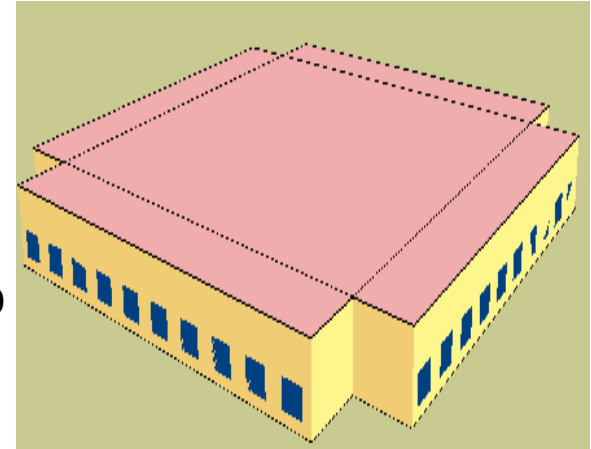
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Description of simulation models

■ Geometry

- A 5-zone model
- Four exterior zones (100 ft X 15 ft) with windows on the long facades, no skylights
- One interior zone (100 ft X 100 ft) without windows
- Space height 13 ft

- ## ■ Fenestration: The fenestration is set to 30% for daytime and 24-hour occupancy and 10% for retail occupancy.



Description of simulation models

■ HVAC systems

- One packaged single zone (PSZ) system for each zone. Ducted return.
- Cooling EER 9.5 (COOLING-EIR = 0.2846), fan power at 0.35 W/cfm
- Integrated air-side economizer
- Outside air 0.15 cfm/ft²
- Gas heating



Description of simulation models

■ Operation schedules

- Daytime only (typical for office buildings). Annual operating hours 4300
- Retail (typical for retail stores). Annual operating hours 5475
- 24-hour (typical high-rise residential). Annual operating hours 8760

■ Internal Loads

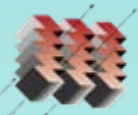
Internal Gain	Daytime	Retail	24-hour
Lighting Power Density	1.25	1.5	0.5
Equipment Power Density	0.75	0.94	0.50
Occupancy	29 persons / 1,000 ft ²	29 persons / 1,000 ft ²	5 persons / 10000 ft ²



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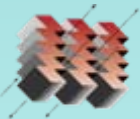
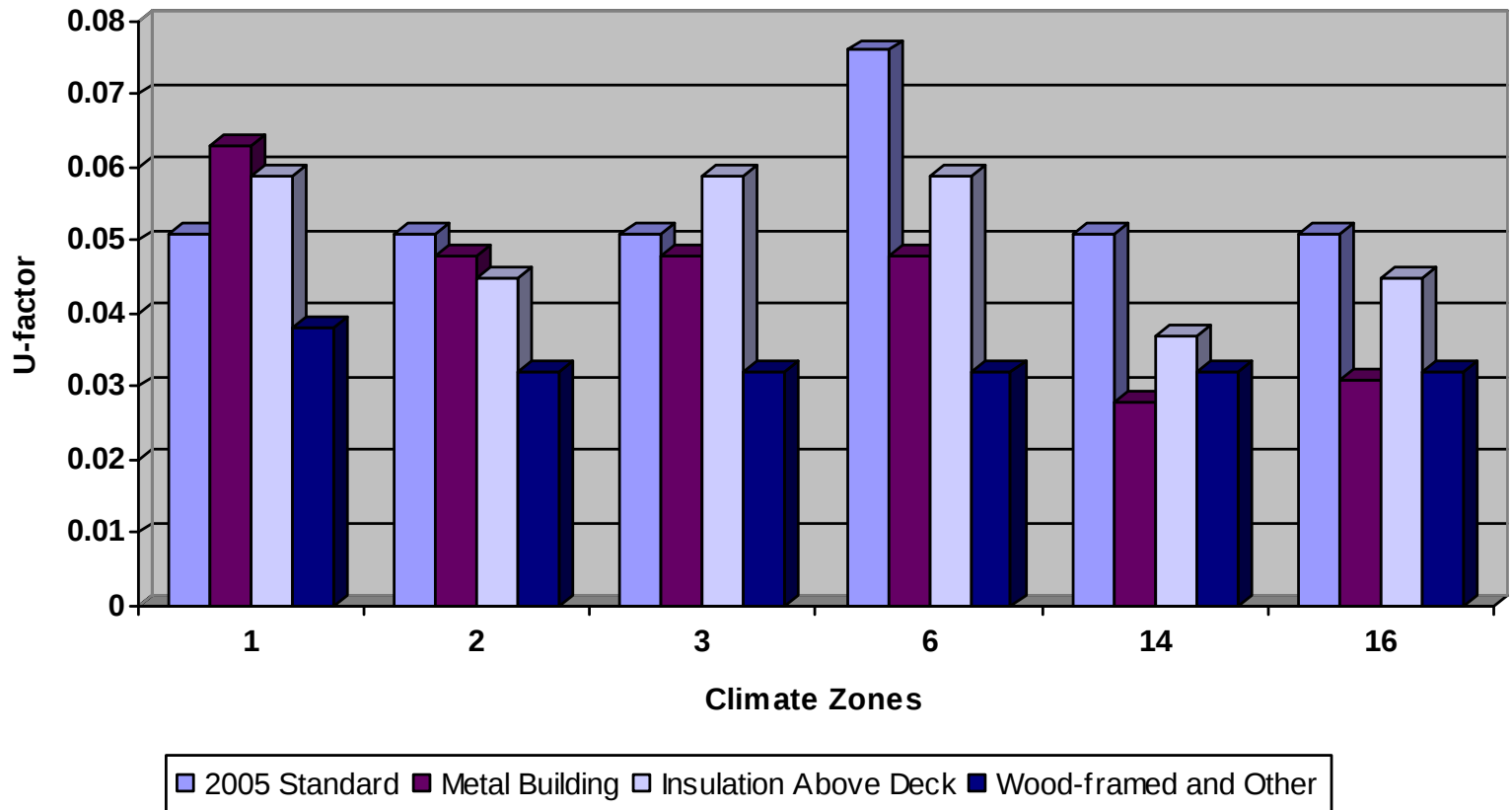
Incremental pricing and impact of insulation thickness on wall and roof

- Cost data from R.S. Means 2005
- 30% operating and profit markup
- 1.088 California adjustment factor
- Regression analysis for missing values



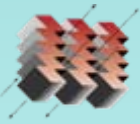
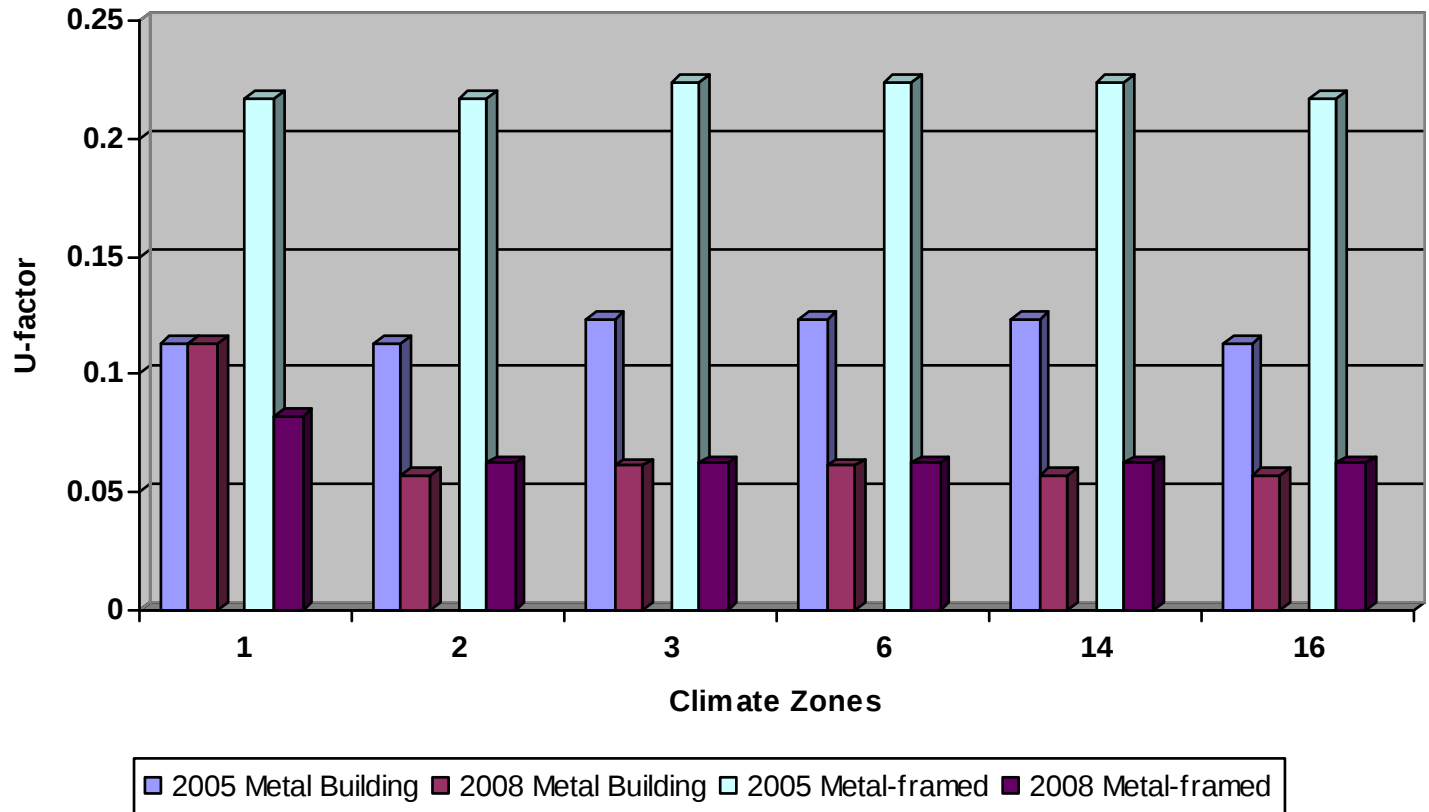
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Roofs – daytime



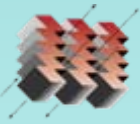
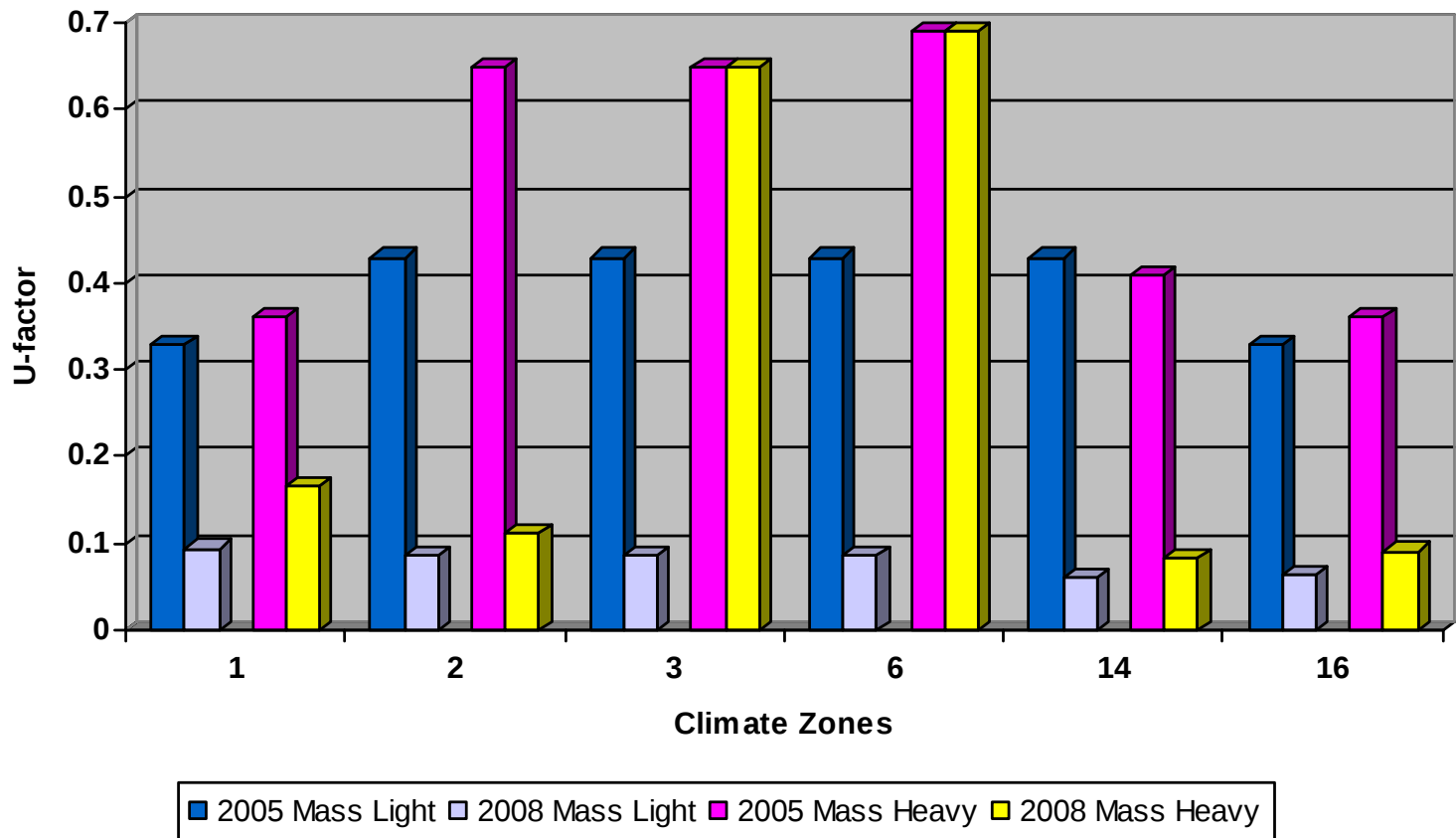
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Metal building walls – daytime



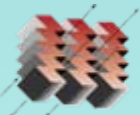
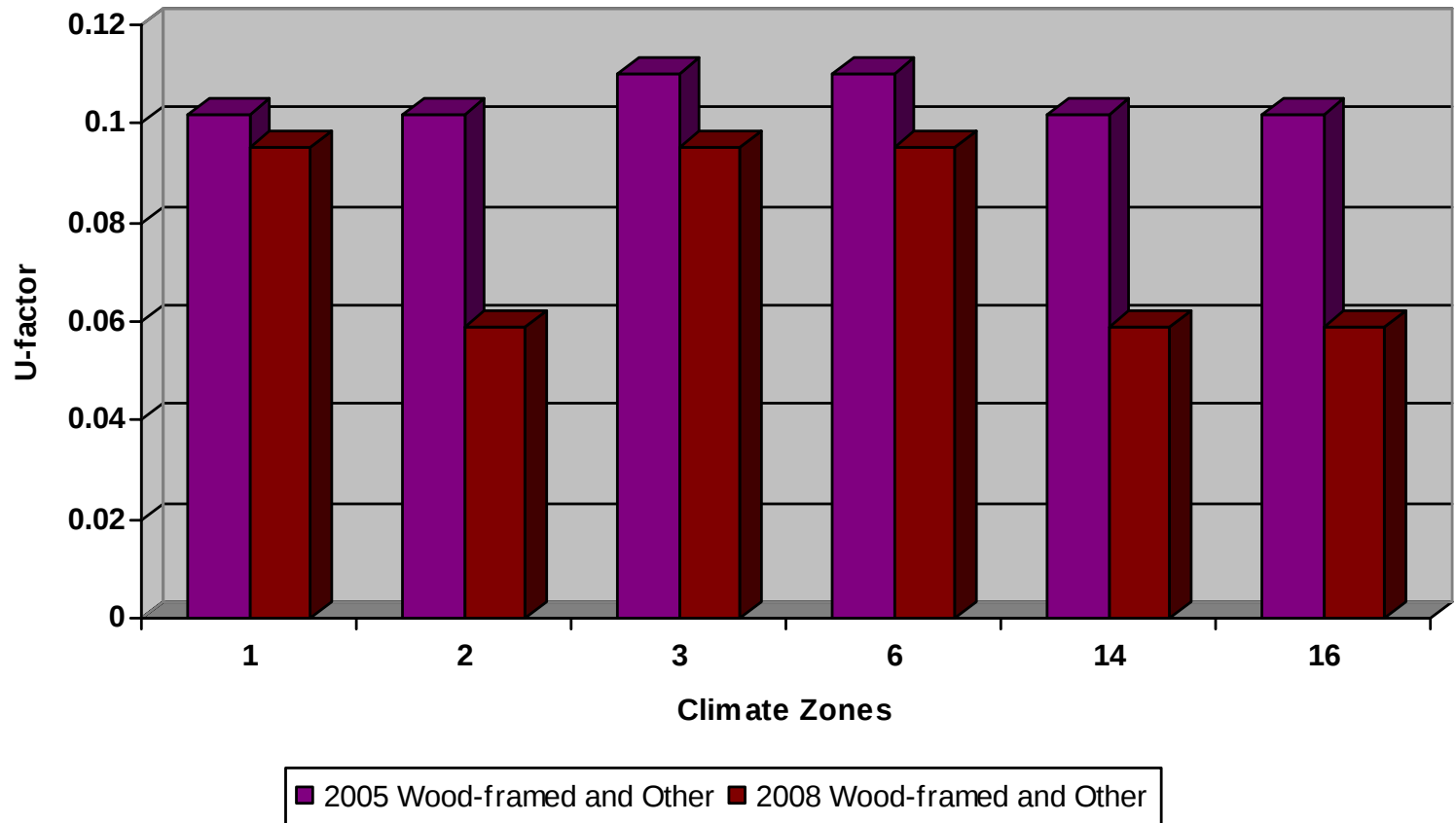
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Mass walls – daytime



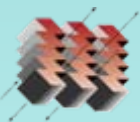
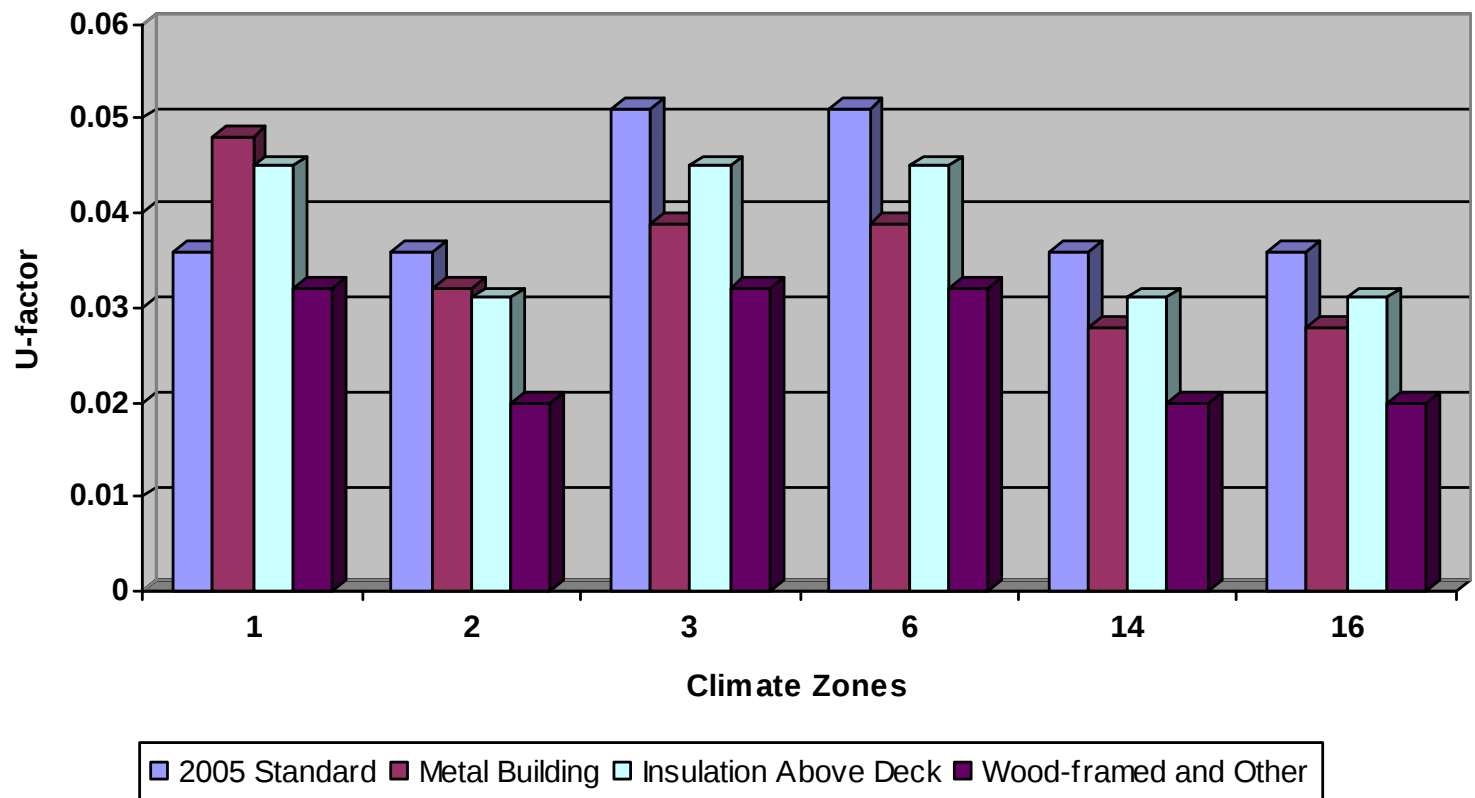
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Other walls – daytime



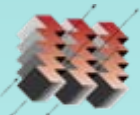
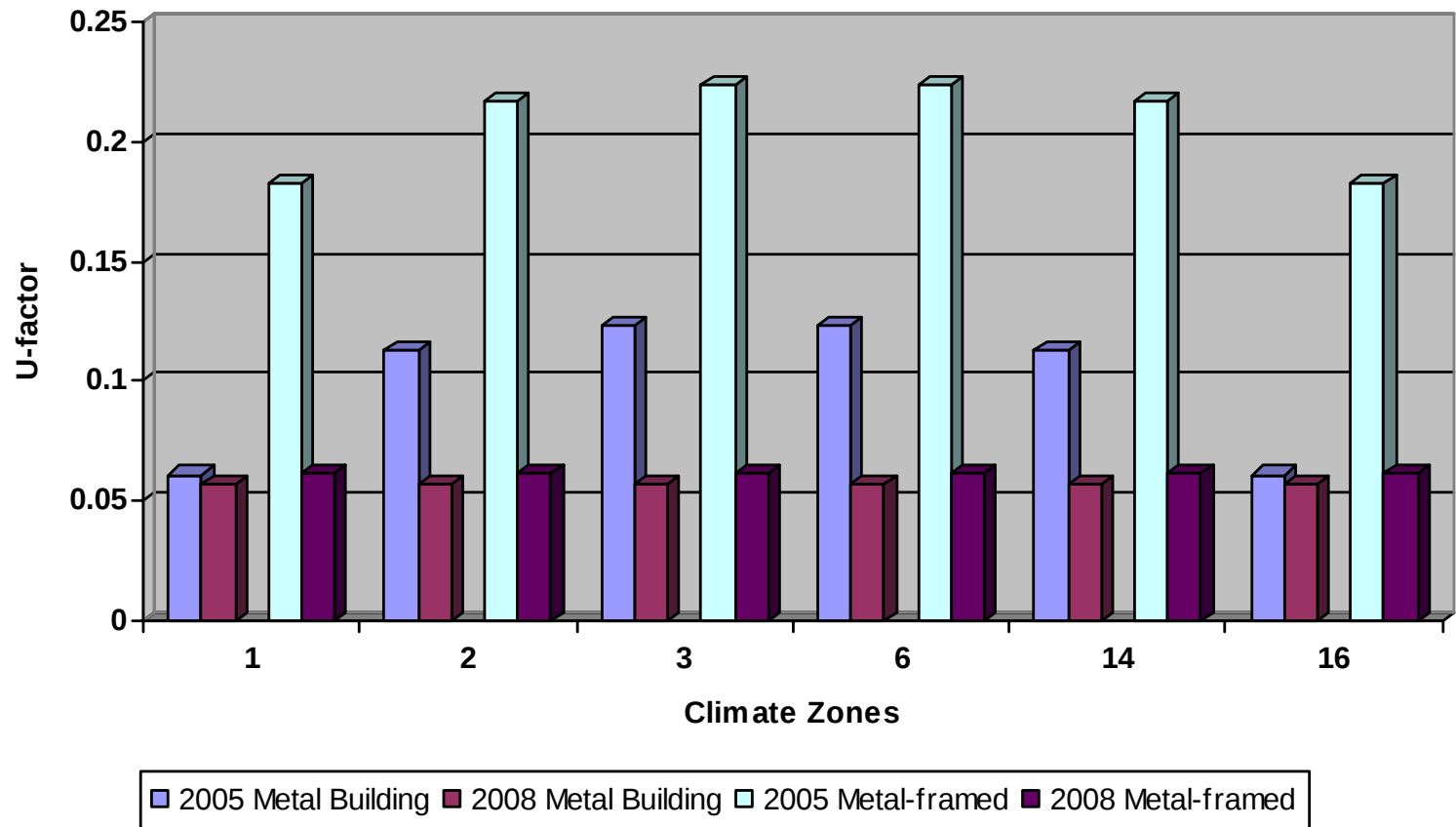
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Roofs – 24-hour



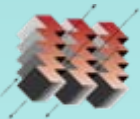
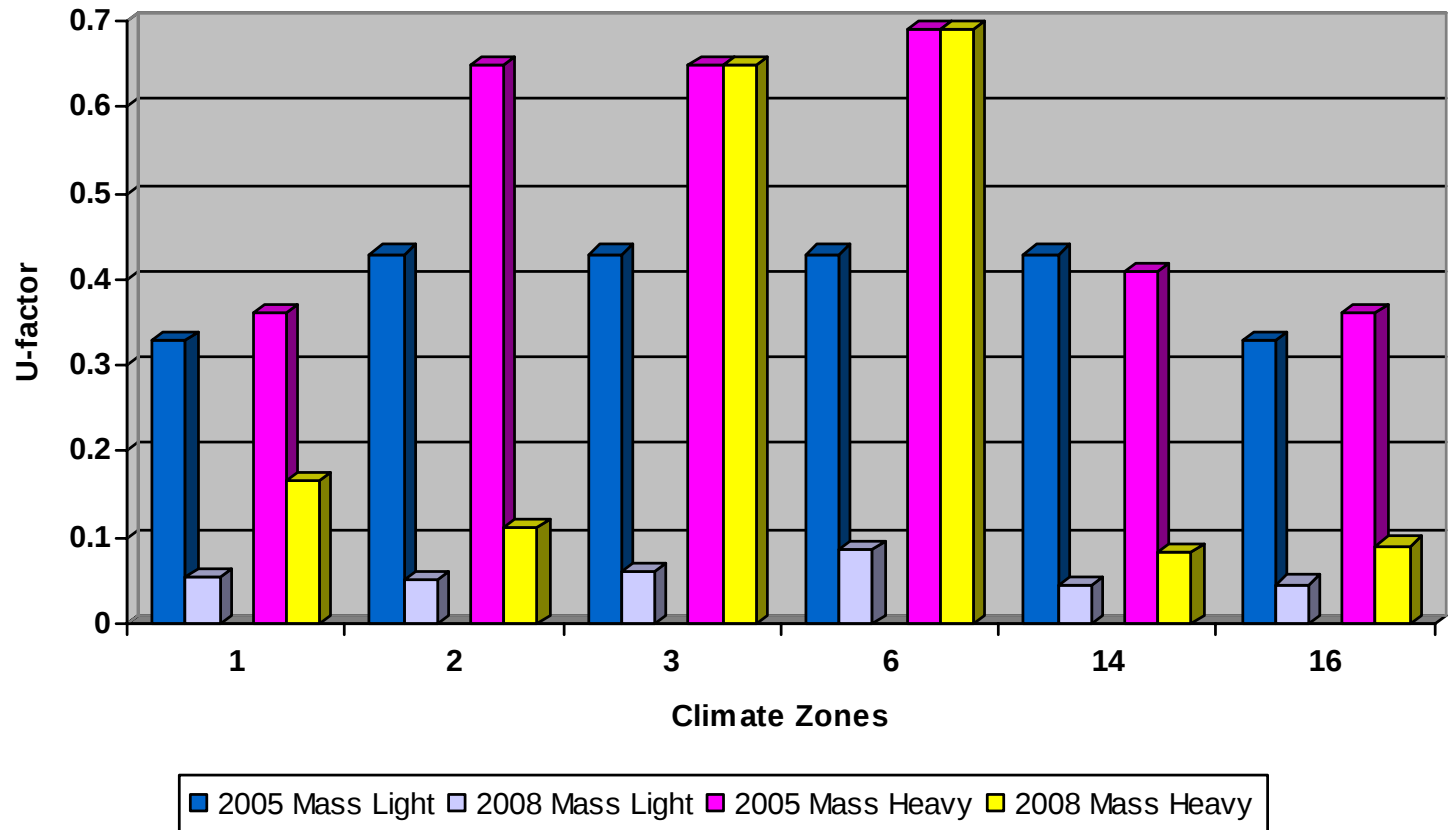
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Metal building walls – 24-hour



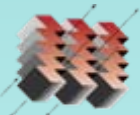
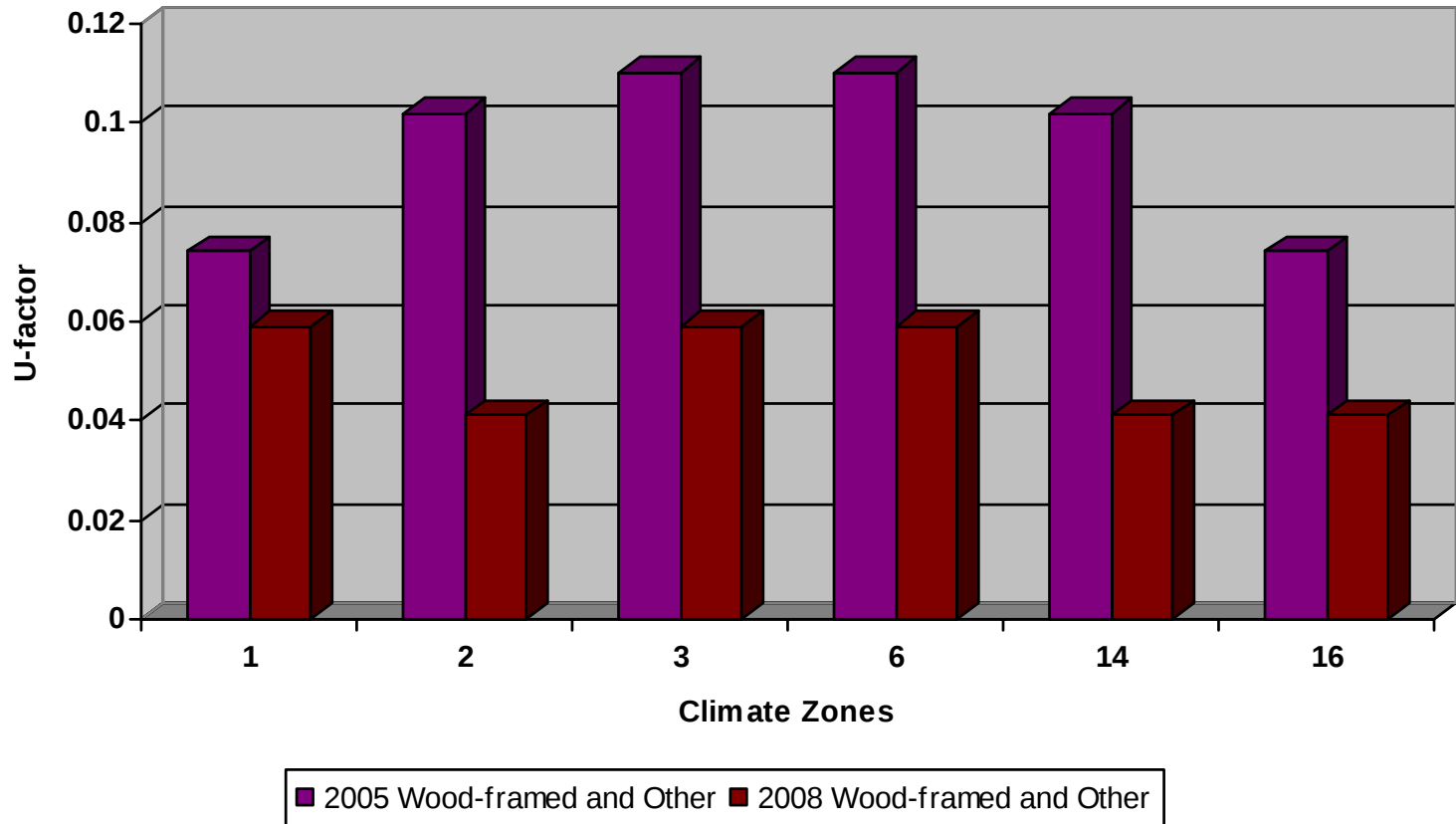
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Mass walls – 24-hour



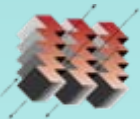
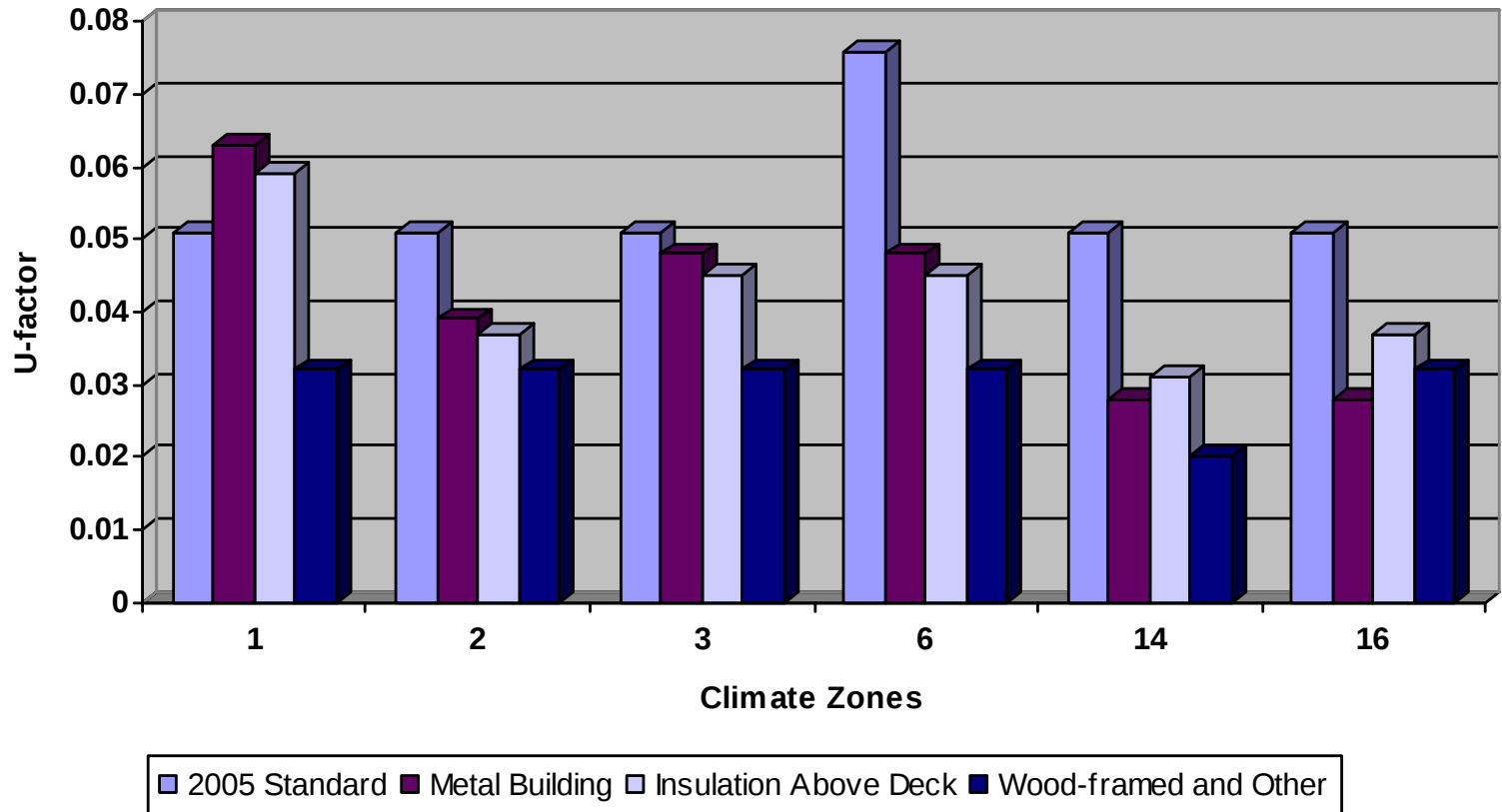
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Other walls – 24-hour



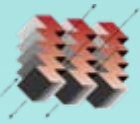
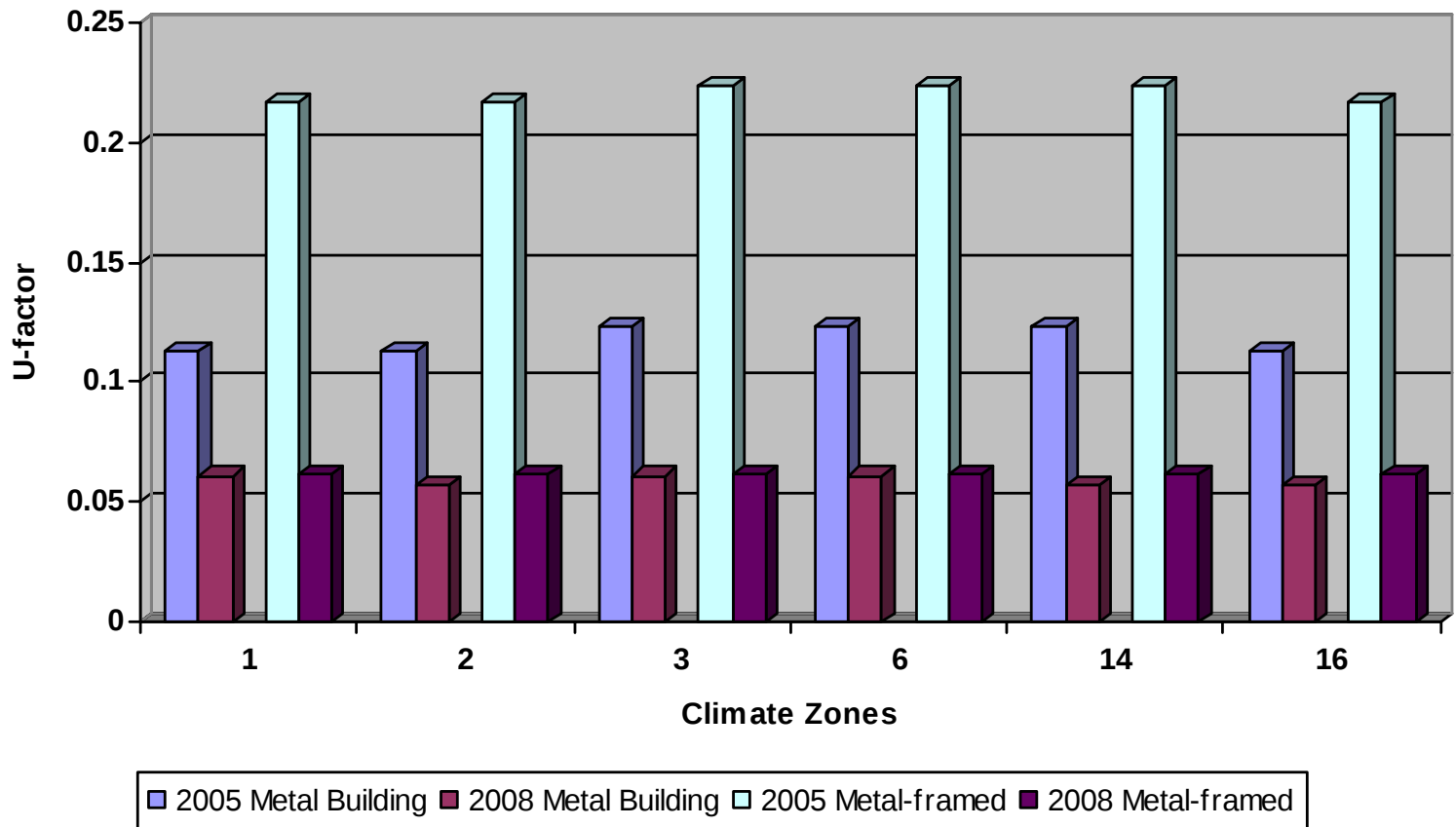
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Roofs – retail



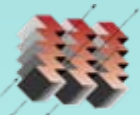
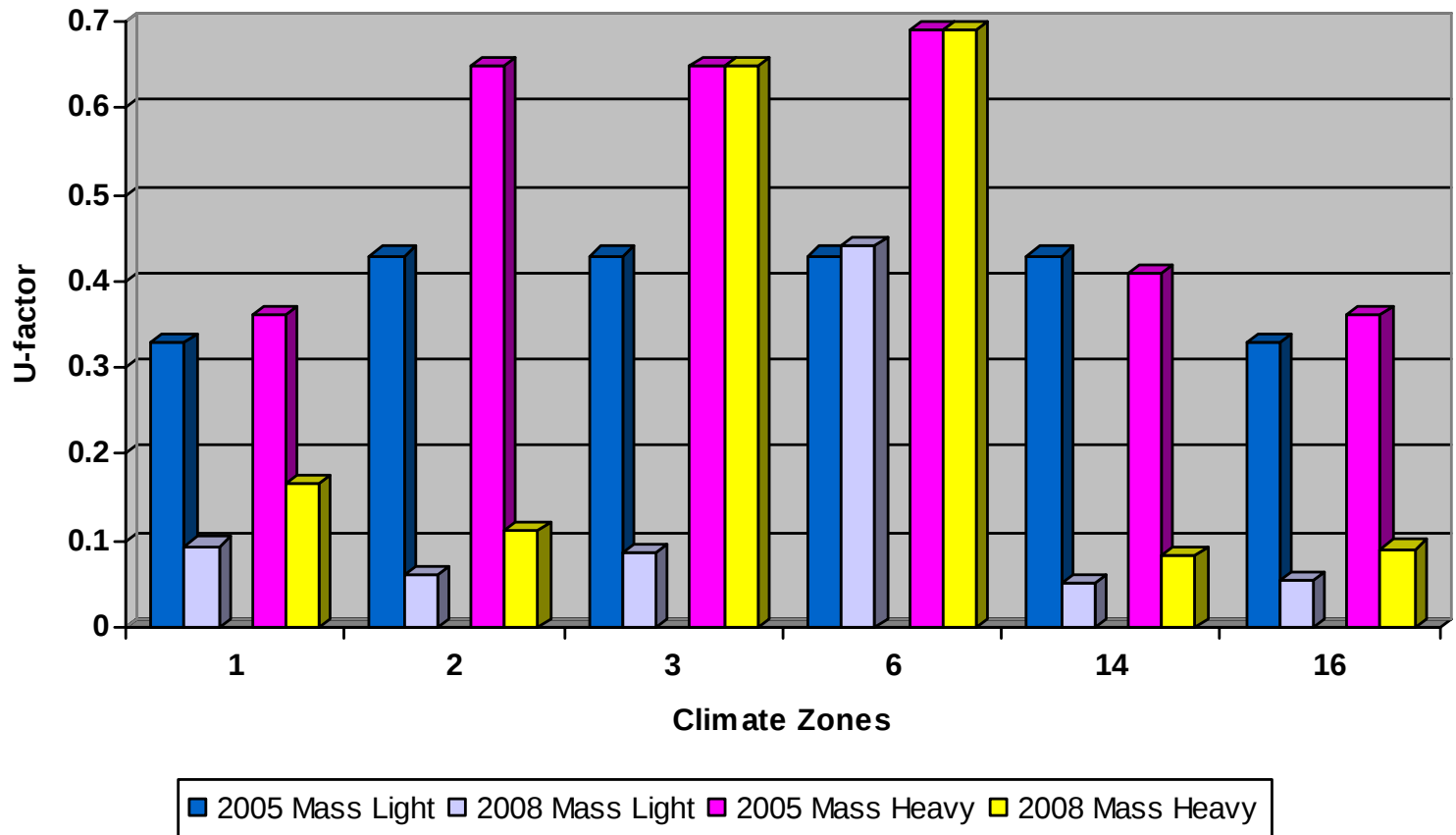
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Metal building walls – retail



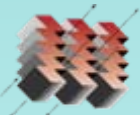
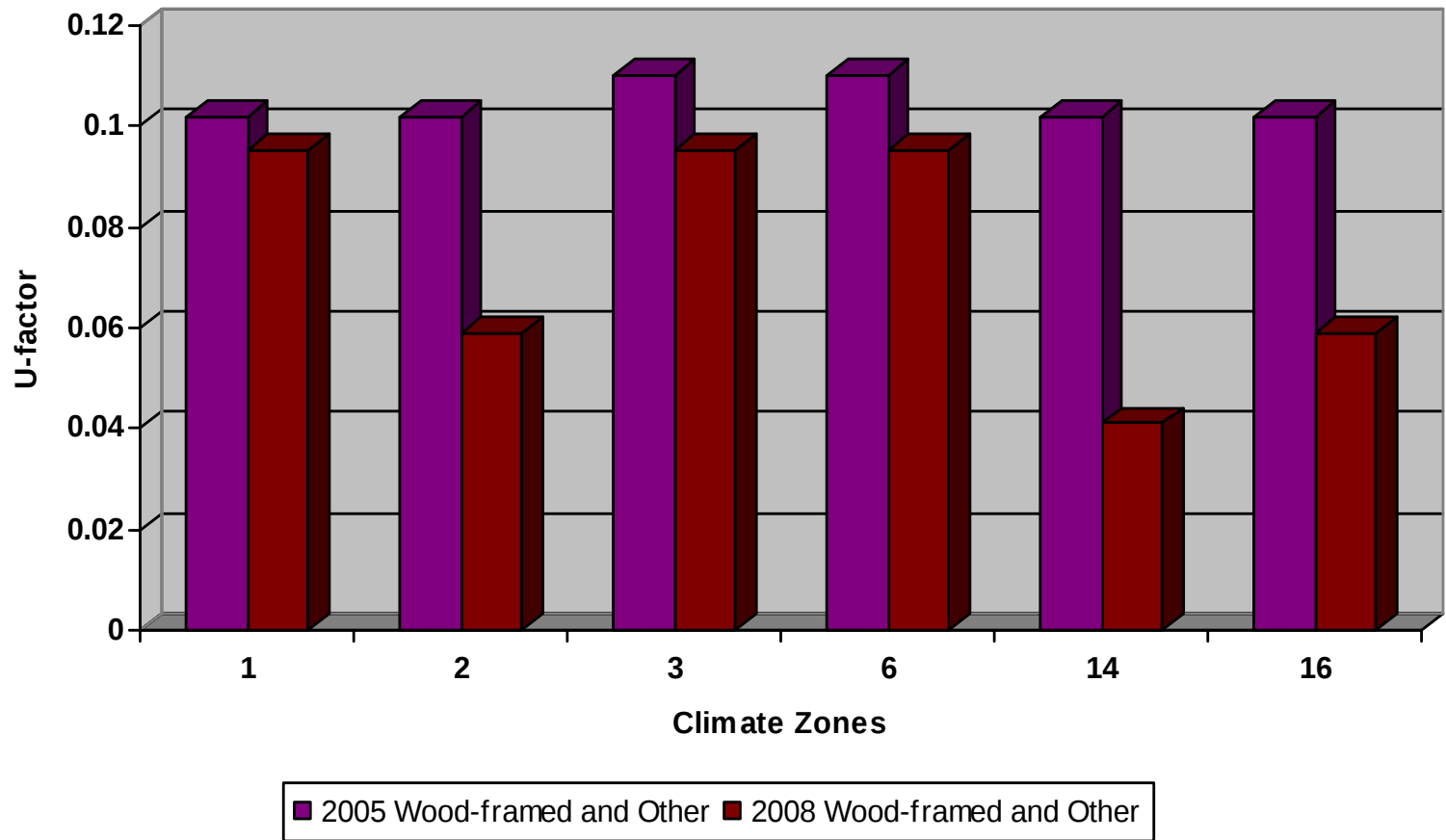
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Mass walls – retail



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Other walls – retail



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Recommendations – daytime

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Recommendations – 24-hour

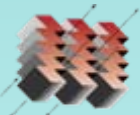
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Recommendations – retail

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Impact on current construction practices

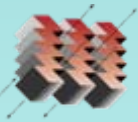
- More rigid insulation use, especially in metal-framed and metal buildings
- HVAC load reduction from insulation



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Punchlist of report improvements needed

- State energy impact
- Revised floor stringency analysis
- Updated life-cycle cost numbers
- Climate zone groupings



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