

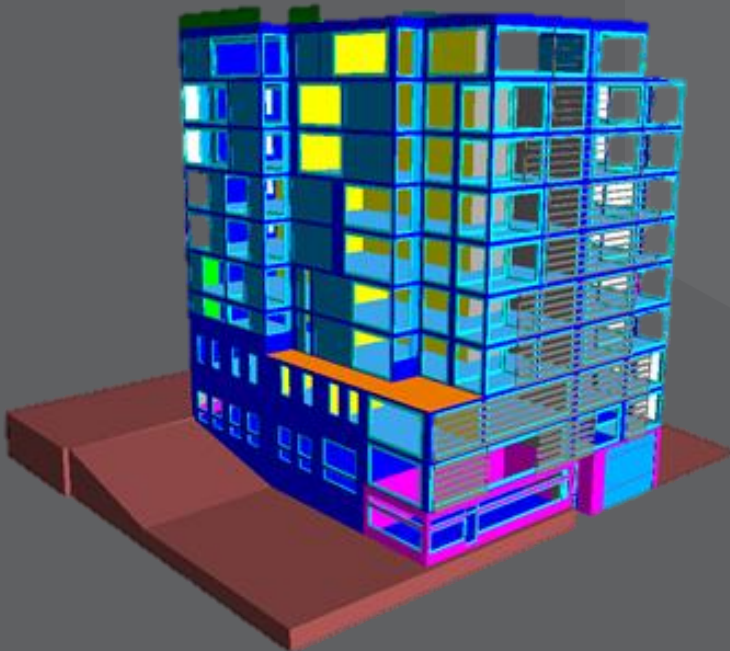
II Casino

INSIDEOUT Case Study

Background

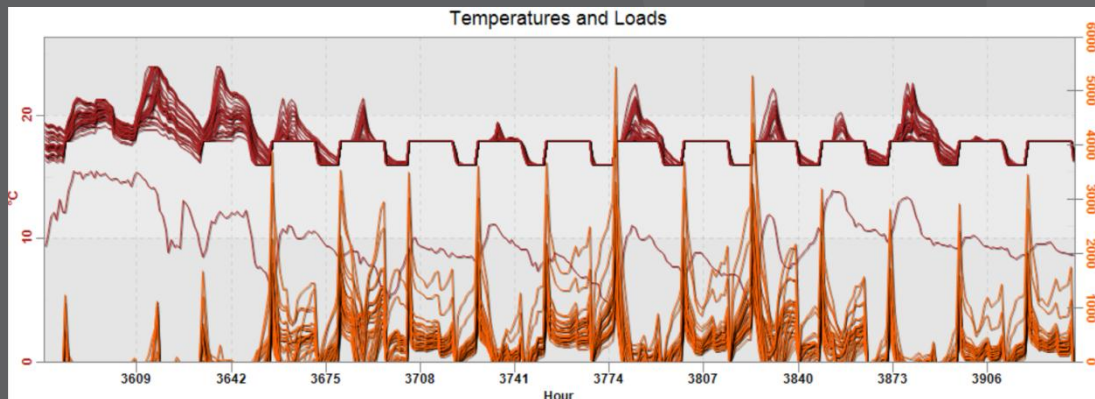
- Pre-2008 design and budget
- 2008 NZGB H1 update
 - thermal envelope changes
- 2012 Project restart

How to progress...?



Challenges

- Double glazing throughout?
- Meeting budget
- Applying NZBC H1
 - NZS4243 or NZS4218?
- Schedule / Calculation / Modelling



Compliance Issue

- **NZS:4243**
 - Commercial buildings $> 300\text{m}^2$
 - Not housing
- **NZS:4218**
 - Commercial building $< 300\text{m}^2$
 - Housing
- **Apartment buildings**
 - Housing AND $> 300\text{m}^2$ with commercial construction



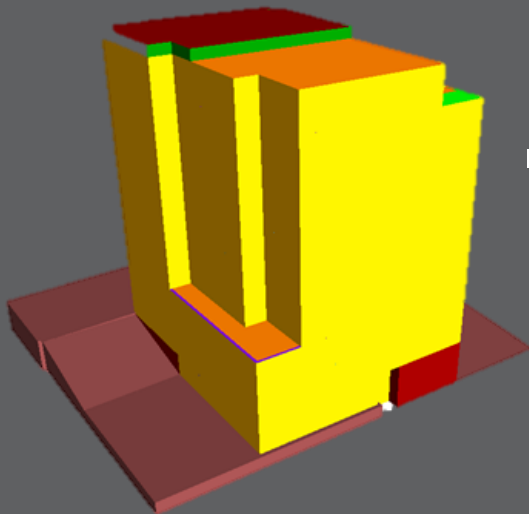
Decisions

- Building Control
 - NZS:4218 – Small Building Envelopes
 - Each apartment to comply
 - Whole building to comply
- Reason
 - Building Act H1 to encourage energy efficiency
 - An noncompliant apartment would be “a perversion of the meaning of the Act”



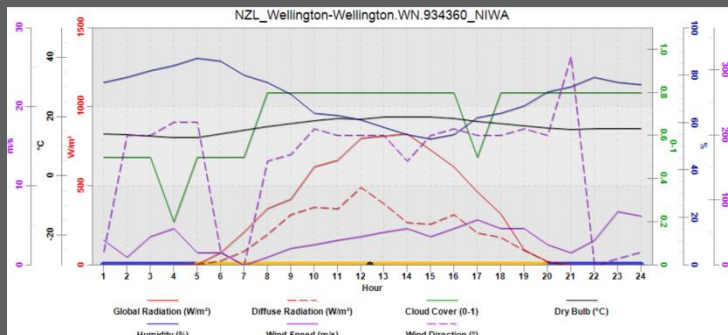
NZS:4218 Method

- Schedule method
 - Glazing <30% WWR
 - All elements have r-values \geq those in the schedule
- Calculation method
 - Glazing <40% WWR
 - Allows trade-offs between r-values of elements
- Modelling method
 - Glazing >40% of the WWR
 - Wall area includes external walls or walls to non-conditioned spaces; External shading



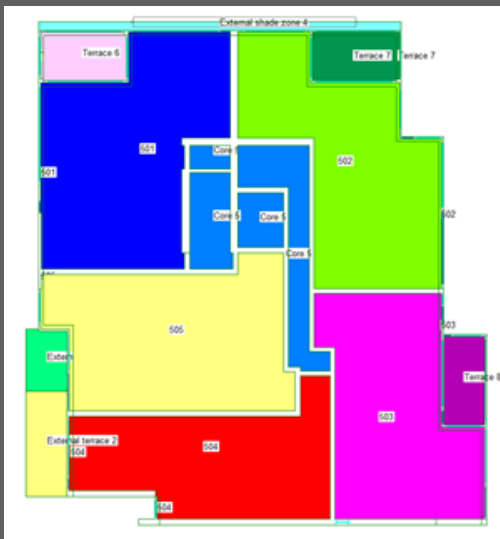
Modelling Method

- Dynamic thermal modelling (DTM)
- Local climate for every hour of the year (8760)
- Orientation specific includes for solar gain
- Full physical description of materials including glazing
- Heat transfer conduction, convection, radiation and latent
- Full energy model for heating & cooling
- Detailed analysis indoor environmental comfort



Glazing for Il Casino

- Cheapest compliant solution
- Acoustics report
 - 6.38 / 8.38 / 10.38 mm laminated single glazing
- Optimise integrated performance of opaque and transparent elements



Blanket Approaches

Blanket Solution	Comments
Single glazing (noncompliant)	Could have complied before the 2008 NZBC changes
Clear IGU (noncompliant)	Would be the schedule method solution if the building was assessable in this manner
LowE IGU (compliant)	A blanket, but costly, solution for the whole building

Engineered Solution

- Glazing types
 - 6.38mm laminate
 - 8.38mm laminate
 - 10.38mm laminate
 - Clear IGU (float/laminate)
 - LowE IGU (float/laminate)
- Engineered solution finds the optimal type for each apartment

11 Casino Apartments
1001 STREET, WILLOWDALE, ONT. M2H 3G9
JOB: 1001-11

H1 Requirements for apartments Revision 5 - 14 December 2012

Apartment	W4	W5	Additional Floor Insulation	Glazing	Notes	H1	Rev.
Level 1							
101	R1.5		ultra concrete parking 10.7	as currently documented		✓	
Level 2							
201	R1.5	R1.5	ultra concrete parking 10.7	6-12-75duplance air filled low E IGU Plasmatherm (M2) and 6-12-65duplance air filled low E IGU Plasmatherm (M2) and 6-12-65duplance air filled low E IGU Plasmatherm (M2)	selection due to window size	✓	5
202	R1.5	R1.5	ultra concrete parking 10.7	6-12-75duplance air filled low E IGU Plasmatherm (M2)		✓	5
Level 3							
301	R1.5	R1.5		as currently documented		✓	
302	R1.5	R1.5		6-12-75duplance air filled low E IGU Plasmatherm (M2)		✓	5
303	R1.5			6-12-75duplance air filled clear IGU and 6-12-65duplance air filled clear IGU	selection due to window size	✓	5
304	R1.5			6-12-75duplance air filled low E IGU Plasmatherm (M2)		✓	5
305	R1.5			as currently documented		✓	
306	R1.5			as currently documented		✓	
Level 4							
401	R1.5	R1.5		as currently documented		✓	
402	R2.5			6-12-75duplance air filled clear IGU and 6-12-65duplance air filled clear IGU and 6-12-65duplance air filled clear IGU	selection due to window size	✓	5
403	R1.5	R1.5	ultra concrete parking 10.7	as currently documented		✓	3
404	R1.5		ultra concrete parking 10.7	as currently documented		✓	
405	R1.5	R1.5	ultra concrete parking 10.7	6-12-75duplance air filled clear IGU and 6-12-65duplance air filled clear IGU	selection due to window size	✓	5
Level 5							
501	R1.5	R1.5		as currently documented	not with clear IGU double glazing	✓	
502 (option deleted)				as currently documented			2
503	R1.5			6-12-75duplance air filled low E IGU Plasmatherm (M2) and 6-12-65duplance air filled low E IGU Plasmatherm (M2) and 6-12-65duplance air filled low E IGU Plasmatherm (M2)	selection due to window size	✓	5
504	R1.5	R1.5		as currently documented		✓	3
505	R1.5	R1.5		as currently documented		✓	
506	R1.5	R1.5		minimum 10.38 laminated		✓	
Level 6							
601	R1.5	R1.5		6-12-75duplance air filled low E IGU Plasmatherm (M2) and 6-12-65duplance air filled low E IGU Plasmatherm (M2) and 6-12-65duplance air filled low E IGU Plasmatherm (M2)	selection due to window size	✓	5
602	R1.5			6-12-75duplance air filled low E IGU Plasmatherm (M2) and 6-12-65duplance air filled low E IGU Plasmatherm (M2) and 6-12-65duplance air filled low E IGU Plasmatherm (M2)	selection due to window size	✓	5
603	R1.5	R1.5		6-12-75duplance air filled low E IGU Plasmatherm (M2) and 6-12-65duplance air filled low E IGU Plasmatherm (M2) and 6-12-65duplance air filled low E IGU Plasmatherm (M2)	selection due to window size	✓	5
604	R2.5	R2.5		as currently documented		✓	3
605 (option deleted)				as currently documented		✓	2
606	R1.5			as currently documented	not with clear IGU double glazing	✓	
Level 7							
701	R2.5	R2.5		10.38 laminated	not with clear IGU double glazing	✓	
702 (option deleted)				as currently documented			2
703	R1.5			6-12-75duplance air filled low E IGU Plasmatherm (M2) and 6-12-65duplance air filled low E IGU Plasmatherm (M2) and 6-12-65duplance air filled low E IGU Plasmatherm (M2)	selection due to window size	✓	5
704	R1.5	R1.5		6-12-75duplance air filled low E IGU Plasmatherm (M2) and 6-12-65duplance air filled low E IGU Plasmatherm (M2) and 6-12-65duplance air filled low E IGU Plasmatherm (M2)	selection due to window size	✓	5
705	R1.5			as currently documented		✓	3
706	R1.5			as currently documented		✓	
Level 8							
801	R1.5	R1.5		minimum 10.38 laminated		✓	
802	R1.5			6-12-75duplance air filled low E IGU Plasmatherm (M2) and 6-12-65duplance air filled low E IGU Plasmatherm (M2) and 6-12-65duplance air filled low E IGU Plasmatherm (M2)	selection due to window size	✓	5
803	R1.5			as currently documented		✓	
Level 9							
901	R1.5	R1.5		as currently documented		✓	
902	R1.5			6-12-75duplance air filled low E IGU Plasmatherm (M2) and 6-12-65duplance air filled low E IGU Plasmatherm (M2) and 6-12-65duplance air filled low E IGU Plasmatherm (M2)	selection due to window size	✓	5
903	R1.5			as currently documented		✓	
Level 10							
1001	R1.5			6-12-75duplance air filled low E IGU Plasmatherm (M2) and 6-12-65duplance air filled low E IGU Plasmatherm (M2) and 6-12-65duplance air filled low E IGU Plasmatherm (M2)	selection due to window size	✓	5
1002	R1.5			as currently documented		✓	

Pass and Fail

- Single - 20 apartments pass
- Clear IGU - 3 further apartments pass
- LowE IGU - final 11 apartments pass
- Nota Bene
 - 3 apartments comply at a lower cost glazing solution because of improved insulation r-values in the wall
 - 3 apartments comply with single glazing but would fail with a Clear IGU
 - Correctly designed LowE IGU would be the most economic blanket solution



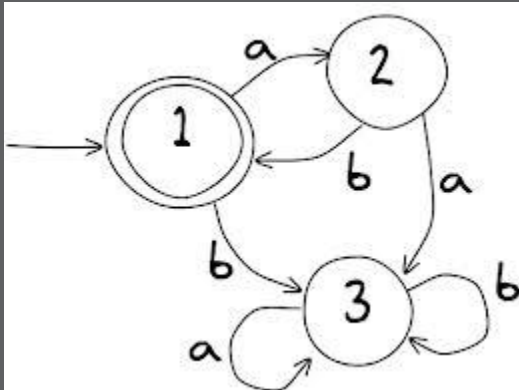
Glazing cost savings

- Comparing a *blanket approach* with an *engineered solution*
- Engineered solution also compliant with: NZBC(H1), Falls, Acoustics, Wind loadings

	Engineered solution Costs
Clear Single (noncompliant)	47% more
Clear IGU (noncompliant)	10% less
LowE IGU (compliant)	27% less

Indoor comfort

- Air temperatures
 - typically 18-24 °C range
 - heating and cooling
- What if...
 - ...the apartments are unconditioned?
- Thermal comfort
 - Resultant temperature (T_{res})
 - air and radiant temperatures
 - good indicator of occupant comfort



Better Comfort (Engineered Solution)

Blanket Solution	Closed windows (24/7)	Openable windows
Single glazing (noncompliant)	41% when heating 6% when neither heating or cooling	41% when heating 41% when neither heating or cooling
Clear IGU (noncompliant)	26% when heating 91% when neither heating or cooling 68% when cooling	24% when heating 32% when neither heating or cooling 91% when cooling
LowE IGU (compliant)	3% when heating 35% when neither heating or cooling 65% when cooling	3% when heating 44% when cooling

Percentage of apartments more comfortable

Integrated Design WINS



- Reduced costs
- Reduced energy consumption
- Better thermal comfort
- Viable project

INSIDEOUT

BUILDINGS THAT WORK

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