Taituarā
Local Government Professionals Aotearoa

Building Code Update 2021

A submission to the Ministry of Business, Innovation and Employment on proposals to increase energy efficiency in buildings, introduce HVAC requirements and natural light for high-density housing.

June 2021

What is Taituarā?

Taituarā — Local Government Professionals Aotearoa thanks the Ministry of Business, Innovation and Employment (the Ministry) for the opportunity to submit on the consultation, Building Code Update 2021 (the Consultation).

Taituarā — Local Government Professionals Aotearoa is a professional society of approximately 880 members made up of local government chief executives, senior managers, and council staff.[1] We are an apolitical organisation that can provide a wealth of knowledge about the local government sector, and in particular knowledge of the technical, practical, and managerial implications of legislation and policy.

Our vision is:

> *To enhance professional local government management, leading staff and enabling communities to shape their future.*

Our primary role is to help local authorities perform their roles and responsibilities as effectively and efficiently as possible. We have an interest in all aspects of the management of local authorities from the provision of advice to elected members, to the planning and delivery of services, and other important support activities such as election management and the collection of rates.

1 As at 22 June 2020.

Contents

Part One: General Comments

The consultation for the Building Code update 2021 supports MBIE's Building for Climate Change, and Higher Density work programmes. One of the purposes of local government is to promote community well-being.

Local communities need houses to be environmentally sustainable, and economic to heat so people can stay warm and healthy. The cost of improvements needs to borne in mind, particularly that the costs of building and heating are affordable and return value to the owner. There is a point of diminishing returns on investment and a threshold over which additional gains in insulation provide minimal increases in heat retention. Taituarā supports having the right amount of regulation which achieves balance in social, environmental and economic well-beings.

MBIE has provided a lot of technical detail for consideration in the Consultation, however, there has not been attention to the overall impacts and outcomes. We have questions about whether the ends go far enough, are they justified by the means, and how are the whole of life benefits weighed in relation to upfront building cost increases. These are important questions in New Zealand's current situation of rising building costs and decreasing affordability.

To answer these questions about housing affordability, we have taken the energy saving data and construction cost data from the Consultation, and applied them to a notional $500,000 new build and $2,000 p.a. average electricity use, (as per Stats NZ data). The resultant data tables are attached to this submission, see Appendix 1.

We support increased insulation for housing to international standards, option 2 at a minimum. We also support option 3 and note that it will provide further energy savings, particularly in the colder zones. Both scenarios will provide health benefits and energy savings over the short and long-term. The additional costs of building will be recovered over the long-term, approximately 20 years.

We consider that the proposals have not gone far enough. Passive solar design should be incorporated into housing design. Good passive solar is energy saving, both for heating and cooling.

We support increased insulation for large buildings. It is unclear how large the additional costs will be when set against the energy savings. The option of 20% energy savings can be achieved with our current building technologies. However, option 2 does not bring us up to international standards of insultation except for in our coldest zone. Even then, the window insulation is below international standards.

Option 3 for large buildings has more onerous construction demands and will require New Zealand to build differently and at a greater cost. Some of these costs appear significant, up to 27% greater than current costs. However, option 3 would bring our three coldest zones up to international standards.

Our preferred position for large buildings is to have a mix of option 2 and 3 which would achieve international standards and retain some current building technologies for roofs and underfloor:

- option 2 for roof and underfloor insulation
- option 3 for windows and walls

We support having energy-saving HVAC (heating, ventilation, air conditioning) systems, and also natural light for high density housing.

Finally, we note that the proposed HVAC and natural light code parts will require additional capability, expertise and computer software for local authorities to consent. We ask that MBIE consider how it would support Building Consent Authorities, particularly the smaller ones to regulate these parts of the code.

Part Two: Recommendations

In this section we provide comments on specific provisions in the Consultation and other issues (such as matters that may have been omitted from the Consultation). We also note that our comments in this section are subordinate to our general comments.

PROPOSAL 1: ENERGY EFFICIENCY FOR HOUSING AND SMALL BUILDINGS (H1/AS1)

We support improving the health of the community through having warm, dry homes and that raising the level of insulation would help achieve this goal. However, the cost of building to code also has to be considered because building has to be economically viable.

We also support increasing the number of climate zones to enable a finer level of response to the range of environmental conditions found in New Zealand. It is important that this is able to be done simply without making consenting more difficult.

We agree that splitting the existing approved solutions between small and large buildings will make the Building Code easier to navigate for designers and consenters.

There are demonstrable health benefits from having warmer, drier houses. There are increased risks of illness when people live in cold, damp, poorly heated houses. We concur with the Consultation, *"Buildings need to have adequate insulation in roofs, windows, walls and floors to keep people warm, dry and healthy and to make sure that energy is being used efficiently*[2]*"*.

Long-term benefits

The proposals offer long-term intergenerational benefits over decades of time. They will benefit our future children because they will live in houses we build today. The Building Code requires that houses last for 50 years, and we expect them to last a lot longer than that. Increasing the warmth of our homes will improve the health of our communities, or otherwise stated, will improve our social well-being. But what are the financial costs for homeowners to put in additional insulation? How will the changes affect our financial well-being?

[2] MBIE Consultation Document Building Code update 2021 pg 6
https://www.mbie.govt.nz/dmsdocument/13808-consultation-document-building-code-update-2021

Lowering the cost of housing is something the country is striving for, so increasing the building standards will make it more expensive to build.

Analysis of costs and benefits
We undertook an analysis to evaluate how long it would take for the energy savings to cover the increased cost of construction, see Appendix 1.

There are small increases in building costs and small savings in energy under option 1 which do not appear significant. We support increased insulation to a level comparable with international standards (option 2) which will provide intergenerational health benefits and long-term energy savings. At construction the increased building costs will be passed on to the homeowner. This will cost between $14,700-24,200[3] depending on which climate zone is being used.

For option 3, energy savings remain significant over the long-term therefore, we also support option 3 particularly for the colder zones. Option 3 will cost between $18,900-50,100 depending on the climate zone.

Windows and R values

R values of generic windows - H1/AS1 Appendix D:
This is a useful addition as this information is not readily available from manufacturers now.

We note from the tables that double-glazed aluminium framed windows with thermal breaks do not perform thermally as well as comparable windows in wood or PVC frames. Under option 2, the aluminium windows would only comply with zone 1, all other zones would need wood or PVC frames to comply. Therefore, under options 2 and 3, New Zealand will be moving away from aluminium to PVC or wooden window frames.

This would be a major change for building in New Zealand where we use a lot of aluminium framing and there is a hesitancy to use PVC. We are unsure of the reasons why New Zealanders have not embraced PVC in the same way the United Kingdom has, however, it is worthwhile to point out that we have higher amounts of ultraviolet light than the northern hemisphere. Our different conditions may alter our perception of the product, or there may be other reasons. PVC windows have been in the country for a couple of decades, so there may be data available on which could help inform on questions of sustainability. We recommend there be further data assessments for MBIE to ascertain longevity and sustainability of PVC window frames in New Zealand conditions, and which may assist a transition to different products.

[3] MBIE Consultation Document Building Code update 2021 pg 19
https://www.mbie.govt.nz/dmsdocument/13808-consultation-document-building-code-update-2021

Transition period and impact on BCAs
Building Control Officers and the wider sector will need training on the new requirements. BCAs will need sufficient time to update compliance documents.

Passive solar
The proposals do not go far enough to reduce energy use. Further reductions in energy use without expense can be gained from passive solar heating. We propose this be made mandatory in stand-alone houses. It would lower the need for heating and ensure more light came into interiors. Making passive solar design compulsory now would provide long-term health and energy saving benefits and can be a cost-neutral construction cost.

Recommendations:
We recommend that:

1. there be increased levels of insulation as per option 2: insulation comparable to international standards,
2. we also support option 3 which would provide greater energy savings particularly in colder zones,
3. the R value table additions to H1/AS1 Appendix D be adopted because the information is not readily available from manufacturers,
4. MBIE notes that under the proposals, New Zealand will be moving away from aluminium window frames to PVC or wooden frames, and
5. MBIE undertakes further data assessments to ascertain longevity and sustainability of PVC window frames in New Zealand conditions, and which may assist a transition to different products,
6. that passive solar heating be included in the building code for stand alone houses, for the reason that good passive solar design saves energy for both heating and cooling costs.

PROPOSAL 2 - ENERGY EFFICIENCY FOR LARGE BUILDINGS (H1/AS2)

The proposal is to increase insulation levels and energy efficiency of large buildings. Large buildings include a range of building types:

- Office buildings: tall and narrow with a large proportion of façade to footprint therefore large energy losses
- Retail: single storey big box with a large footprint, therefore, heat loss is through the ceiling
- School: single storey with group classrooms.
- Healthcare: three storey low-rise that is occupied 24/7 and has high energy demands

We note that there are complexities in providing different insulation levels for different building types. The Consultation asks for submissions on whether large buildings have a reduction in energy use of 10%, 20% or 25%.

We agree with the objectives to improve people's health and reduce greenhouse gas emissions. Workers, school children, shoppers and patients spend many hours in these buildings and they should be warm, be able to be cooled, and use energy efficiently.

Insulation levels

A comparison of the differences between the R ratings for houses and large buildings is in the following table.

	Houses (comparable to international standards)	Large Buildings (20% reduction in energy use)	Large Buildings (30% reduction in energy use)
Roof	R 5-7.4	R 3.0-5.3	R 3.5-7.0
Windows	R 0.39-0.62	R 0.21-0.43	R 0.31-0.62
Walls	R 2.4-3.8	R 1.8-3.5	R 2.2-4.4
Under floor	R 1.9-3.6	R 2.1-3.1	R 2.2-3.2

Analysis

Option 1 a 10% reduction in energy costs could be easily achieved, and will require 2% - 8% increase in construction costs

Option 2 a 20% reduction in energy costs are easily achievable with conventional construction methods, and will require 3% - 15% increase in construction costs

Option 3 a 25% reduction in energy costs would require novel construction technology, and will require 5% - 27% increase in construction costs, and a phased implementation period

Costs and Benefits

We are unable to determine a cost-benefit financial comparison because the costs given are a percentage of unknown building costs and the benefits are a percentage of unknown energy costs.

Auckland, being in zone 1, would have minor increased costs compared to Southland which is in zone 6. Southland would have significant increases in costs if Option 3 were adopted, however, they would also have the highest energy savings.

Schools and retail have the highest increased costs to comply so this proposal will adversely affect these sectors. The construction cost increases will be passed onto the building owners and thereby increase the price of building ownership.

Option 3, a 25% reduction in energy use would be ideal if cost was not a barrier. It would bring our coldest three zones up to international standards for roof, window, wall and floor insulation.

Option 2, to have a 20% reduction in energy use, zone 6, our coldest zone would have insulation up to international standards, except for the window insulation. Our current window technology does not meet international standards unless we move to Option 3. Option 2 is less demanding on construction technology.

In summary, a mix of options 2 and 3 is our preferred position:

- option 2 for roof and underfloor insulation
- option 3 for windows and walls

The benefit of this arrangement is that our three coldest climate zones would meet international standards for roofs, walls, windows and floors and that current construction methods could be used for roofs or floors. However, new methods of construction would be required for windows and walls.

Transition period and impact on BCAs

The impacts are the same as for proposal 1. Building Control Officers and the wider sector will need training on the new requirements. BCAs will need sufficient time to update compliance documents.

Recommendations:
We recommend that:

1. there be a mix of options 2 and 3 as follows:
   - option 2 for roof and underfloor insulation
   - option 3 for windows and walls

   for the reason that our three coldest climate zones would meet international standards for roofs, walls, windows and floors, without new construction technologies for roofs or underfloor.

PROPOSAL 3 – HVAC SYSTEMS EFFICIENCY (H1/VM3)

This is a new verification method. We do not have HVAC (heating, ventilation, air conditioning) engineering knowledge, however, we approve of the principle of making HVAC plant as energy efficient as possible.

Impacts for Building Consent Authorities

This additional code requirement will require more checking of consent documents by specialist engineers and therefore will be an increased cost for councils. We ask that MBIE consider how it would support Building Consent Authorities, particularly the smaller ones to regulate these parts of the code.

Transition period

Building Control Officers and the wider sector will need training on the new requirements. BCAs will need sufficient time to put in place new specialists and update compliance documents.

Recommendations:
We recommend that:

1. there be a building code part for energy efficient HVAC systems in commercial buildings,
2. MBIE consider how it would support Building Consent Authorities, particularly the smaller ones to regulate specialist engineer consenting for HVAC systems.

PROPOSAL 4 – NATURAL LIGHT FOR HIGHER DENSITY HOUSING (G7/AS2)

We support the changes needed for the provision of natural light in higher density housing. There will be staffing and resource implications for BCAs to assess building consent applications against the new Acceptable Solutions. We ask that MBIE consider how it would support Building Consent Authorities, particularly the smaller ones to regulate these parts of the code.

Transition period

Building Control Officers and the wider sector will need training on the new requirements. BCAs will need sufficient time to put in place systems which support new specialists with appropriate software.

Recommendations:
We recommend that:

1. there be code provisions for natural light in higher density housing,

2. MBIE consider how it would support Building Consent Authorities, particularly the smaller ones to regulate specialist computer modelling officers to consent buildings for natural light.

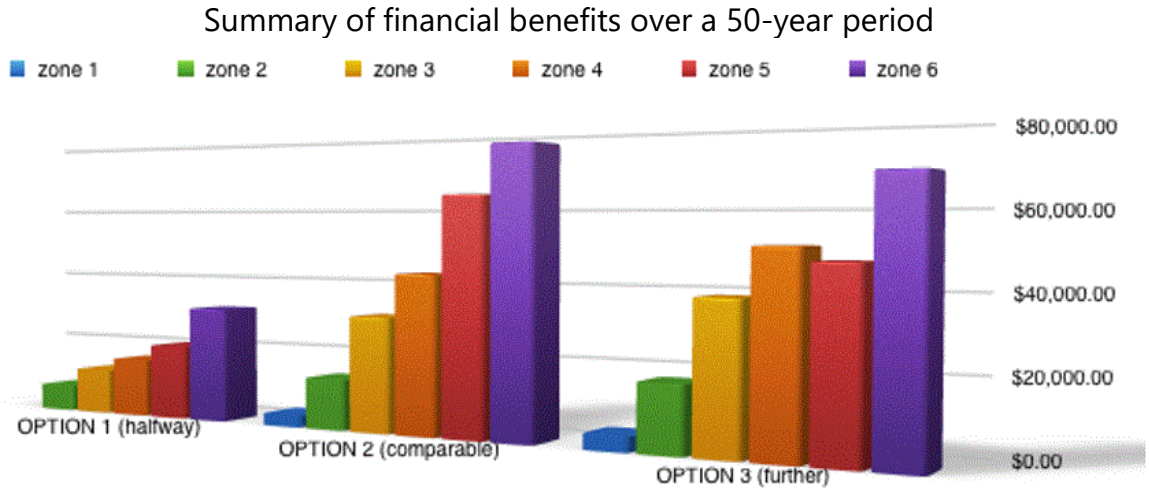
Appendix One

The discussion document provides percentage values for energy savings and costs of building. These values are not comparable because they are percentages of different factors. Greater insulation poses a cost to homeowners and it is unclear how the energy savings and increased building costs relate to each other. Therefore, we have undertaken an analysis, using absolute values to better evaluate the significance of the building costs. Our analysis looks at cost recovery over the long-term, 20-50 years. It uses present day costs and does not discount future benefits and costs.

For this analysis we used notional annual heating expenses of $1,000 to $3,500 per annum, then compiled all of the savings data from the consultation document to calculate energy savings over time, for all of the options.

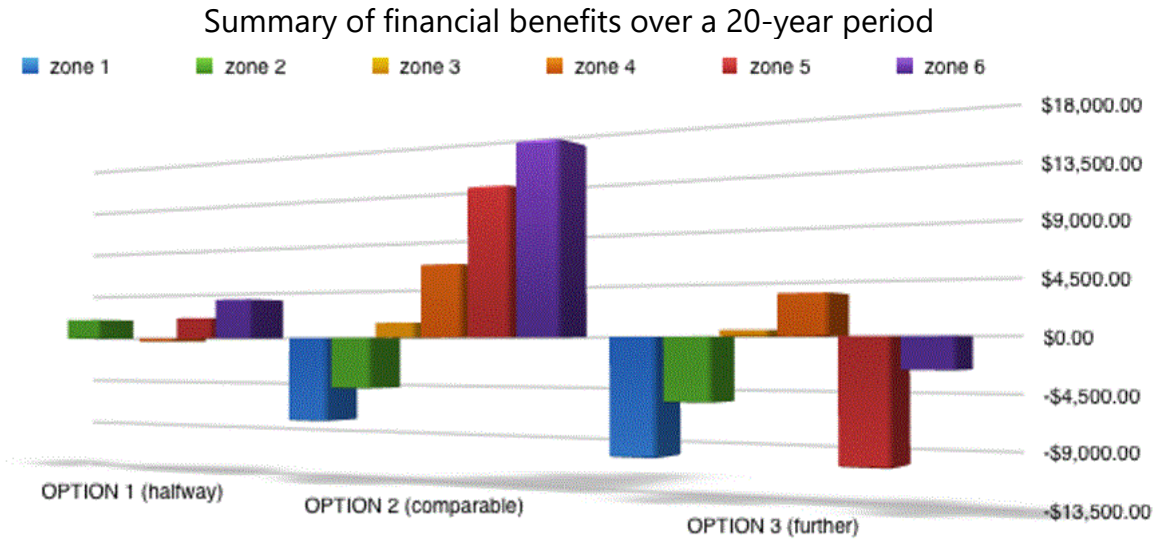
Financial savings over a 50-year period

With differing amounts of heat used in all six zones, there were significant energy savings over 50 years. The result is small savings if we insulate halfway to international standards, significant savings if we insulate to international standards, and then the returns start to diminish if we insulate further than international standards. See Table 1.



Financial savings over a 20-year period

Over 20 years there is more-or-less a recovery of building costs through energy savings. The building costs are greater in colder climates, but the health and financial gains are also greater. Twenty years appears to be the break-even period, see Table 2.



Financial costs over a seven-year period

A seven-year timeframe shows that energy savings have not yet recovered the additional cost of building. See Table 3.

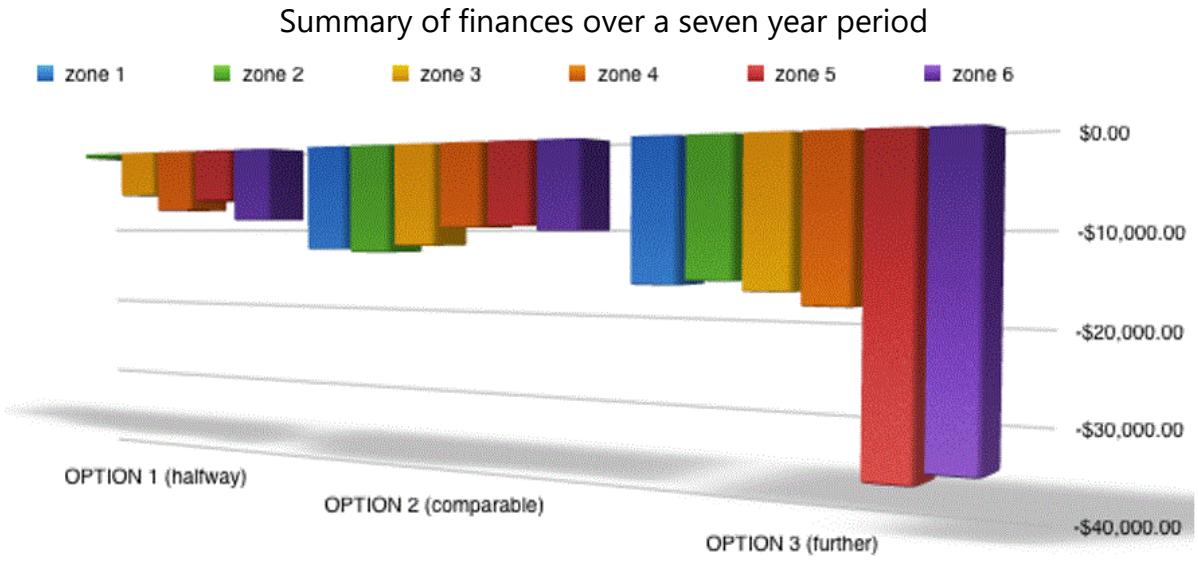


Table 1: Insulation v. energy cost (variable energy cost, 50-year ownership)

	zone 1	zone 2	zone 3	zone 4	zone 5	zone 6
average energy usage	$1,000.00	$1,500.00	$2,000.00	$2,500.00	$3,000.00	$3,500.00
life of building (yrs)	50	50	50	50	50	50
OPTION 1 (halfway)						
energy saving	-	12%	21%	22%	21%	27%
energy saving $		$9,000.00	$21,000.00	$27,500.00	$31,500.00	$47,250.00
constr. cost	-	$1,760.00	$8,400.00	$11,300.00	$10,700.00	$15,300.00
profit		$7,240.00	$12,600.00	$16,200.00	$20,800.00	$31,950.00
OPTION 2 (comparable)						
energy saving	36%	41%	50%	49%	57%	58%
energy saving $	$18,000.00	$30,750.00	$50,000.00	$61,250.00	$85,500.00	$101,500.00
constr. cost	$14,700.00	$16,800.00	$18,700.00	$18,200.00	$21,400.00	$24,200.00
profit	$3,300.00	$13,950.00	$31,300.00	$43,050.00	$64,100.00	$77,300.00
OPTION 3 (further)						
energy saving	46%	51%	64%	64%	64%	68%
energy saving $	$23,000.00	$38,250.00	$64,000.00	$80,000.00	$96,000.00	$119,000.00
constr. cost	$18,900.00	$20,500.00	$25,100.00	$28,700.00	$48,200.00	$50,100.00
profit	$4,100.00	$17,750.00	$38,900.00	$51,300.00	$47,800.00	$68,900.00
BENEFIT						
OPTION 1 (halfway)	$0.00	$7,240.00	$12,600.00	$16,200.00	$20,800.00	$31,950.00
OPTION 2 (comparable)	$3,300.00	$13,950.00	$31,300.00	$43,050.00	$64,100.00	$77,300.00
OPTION 3 (further)	$4,100.00	$17,750.00	$38,900.00	$51,300.00	$47,800.00	$68,900.00

average energy use is Statistics NZ's annual household expenditure on electricity, rounded up. (actual figure is $37.70 per week) with the variation between zones estimated for a better simulation.

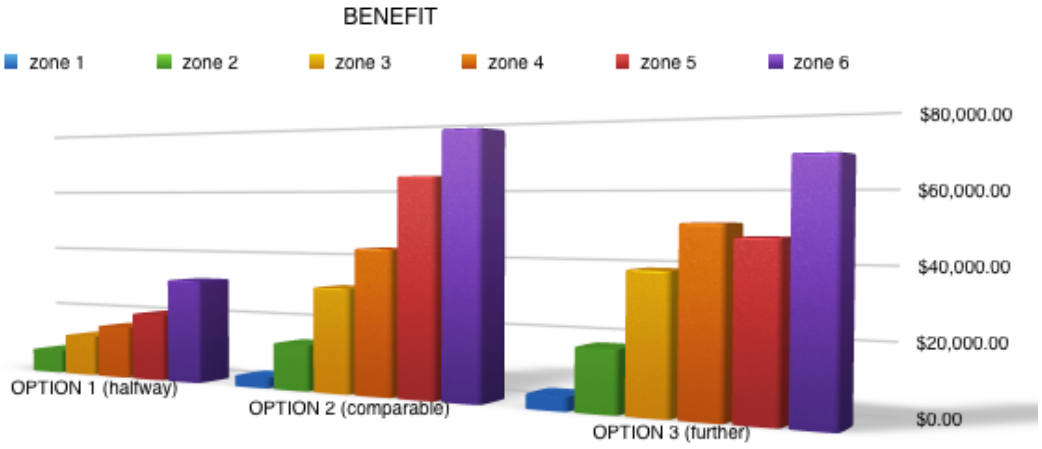


Table 2: Insulation v. energy cost (variable cost, 20-year ownership)

	zone 1	zone 2	zone 3	zone 4	zone 5	zone 6
average energy usage	$1,000.00	$1,500.00	$2,000.00	$2,500.00	$3,000.00	$3,500.00
life of building (yrs)	20	20	20	20	20	20
OPTION 1 (halfway)						
energy saving	-	12%	21%	22%	21%	27%
energy saving $		$3,600.00	$8,400.00	$11,000.00	$12,600.00	$18,900.00
constr. cost	-	$1,760.00	$8,400.00	$11,300.00	$10,700.00	$15,300.00
profit		$1,840.00	$0.00	-$300.00	$1,900.00	$3,600.00
OPTION 2 (comparable)						
energy saving	36%	41%	50%	49%	57%	58%
energy saving $	$7,200.00	$12,300.00	$20,000.00	$24,500.00	$34,200.00	$40,600.00
constr. cost	$14,700.00	$16,800.00	$18,700.00	$18,200.00	$21,400.00	$24,200.00
profit	-$7,500.00	-$4,500.00	$1,300.00	$6,300.00	$12,800.00	$16,400.00
OPTION 3 (further)						
energy saving	46%	51%	64%	64%	64%	68%
energy saving $	$9,200.00	$15,300.00	$25,600.00	$32,000.00	$38,400.00	$47,600.00
constr. cost	$18,900.00	$20,500.00	$25,100.00	$28,700.00	$48,200.00	$50,100.00
profit	-$9,700.00	-$5,200.00	$500.00	$3,300.00	-$9,800.00	-$2,500.00
BENEFIT						
OPTION 1 (halfway)	$0.00	$1,840.00	$0.00	-$300.00	$1,900.00	$3,600.00
OPTION 2 (comparable)	-$7,500.00	-$4,500.00	$1,300.00	$6,300.00	$12,800.00	$16,400.00
OPTION 3 (further)	-$9,700.00	-$5,200.00	$500.00	$3,300.00	-$9,800.00	-$2,500.00

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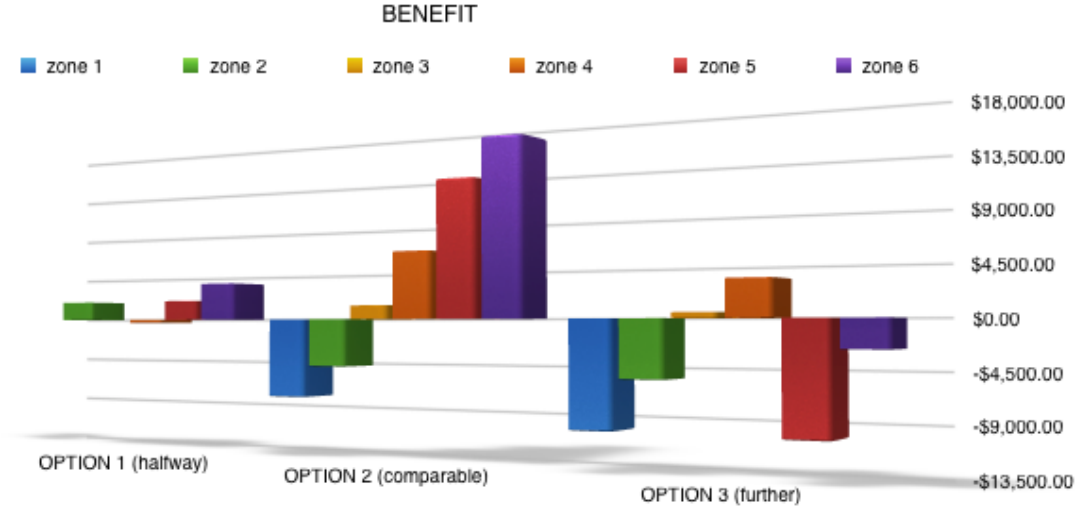

Table 3: Insulation v. energy cost (variable energy cost, 7yr ownership)

	zone 1	zone 2	zone 3	zone 4	zone 5	zone 6
average energy usage	$1,000.00	$1,500.00	$2,000.00	$2,500.00	$3,000.00	$3,500.00
life of building (yrs)	7	7	7	7	7	7
OPTION 1 (halfway)						
energy saving	-	12%	21%	22%	21%	27%
energy saving $		$1,260.00	$2,940.00	$3,850.00	$4,410.00	$6,615.00
constr. cost	-	$1,760.00	$8,400.00	$11,300.00	$10,700.00	$15,300.00
profit		-$500.00	-$5,460.00	-$7,450.00	-$6,290.00	-$8,685.00
OPTION 2 (comparable)						
energy saving	36%	41%	50%	49%	57%	58%
energy saving $	$2,520.00	$4,305.00	$7,000.00	$8,575.00	$11,970.00	$14,210.00
constr. cost	$14,700.00	$16,800.00	$18,700.00	$18,200.00	$21,400.00	$24,200.00
profit	-$12,180.00	-$12,495.00	-$11,700.00	-$9,625.00	-$9,430.00	-$9,990.00
OPTION 3 (further)						
energy saving	46%	51%	64%	64%	64%	68%
energy saving $	$3,220.00	$5,355.00	$8,960.00	$11,200.00	$13,440.00	$16,660.00
constr. cost	$18,900.00	$20,500.00	$25,100.00	$28,700.00	$48,200.00	$50,100.00
profit	-$15,680.00	-$15,145.00	-$16,140.00	-$17,500.00	-$34,760.00	-$33,440.00
BENEFIT						
OPTION 1 (halfway)	$0.00	-$500.00	-$5,460.00	-$7,450.00	-$6,290.00	-$8,685.00
OPTION 2 (comparable)	-$12,180.00	-$12,495.00	-$11,700.00	-$9,625.00	-$9,430.00	-$9,990.00
OPTION 3 (further)	-$15,680.00	-$15,145.00	-$16,140.00	-$17,500.00	-$34,760.00	-$33,440.00

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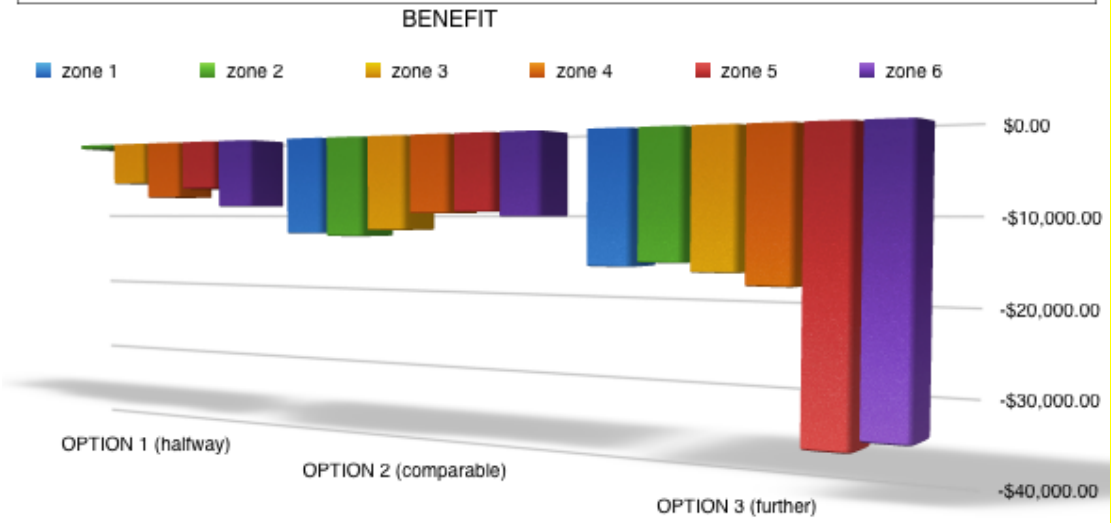

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Professional excellence in local government

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