WHAT ARE THE OBSTACLES THAT PREVENT CHURCHES IN THE IRISH BUILDING STOCK FROM BEING RENOVATED, AND WHY IS PRESERVATION SO CRUCIAL?

01 INTRODUCTION

As the world faces the urgent and ongoing threat of climate change, the role of architects in mitigating its impact has become more important than ever before. As technologists we are familiar with detailing green roofs and using renewable building supplies.

But the biggest contribution to carbon emissions of a building, is when its built. A modernist way of thinking would suggest that a building is ecological when its using ecological materials. However, is a building not more ecological when it is built to last?

The preservation of our buildings is extremely beneficial for reducing carbon emissions and will play a massive role in the near future when the cost of carbon becomes a requirement.

"While we generally think that preserving historic buildings is a way to honor our past, it's time to understand that it is also a way to protect our future"

(Richard Moe, President of the National Trust for Historic Preservation)

03 OBJECTIVES:

AIM:

To suggest a retrofitting system that holds the abilty to convert churches and chapels in ireland to a more appropriate energy retaining environment.

1. To investigate the heating demands of an opporational church.
2. To analyse the internal envelopes abilty to retain heat.
3. To present data findings in a visual manor using appropriate programs.
4. To propose energy saving solution to an opporational church.

OBSTACLES:

Historic Preservation:
If the church is designated as a historic landmark, it can limit the extent to which the building can be altered or renovated.

Aesthetics:
Insulation materials may not always blend seamlessly with the existing design of a church.

Financial Constraints:
Renovating a church can be expensive and many churches may struggle to find funds necessary to complete the project.

Safety Concerns:
Some type of insulations, such as spray foam cellulose types can pose safhey hazards to the internal environment of the church, promoting mould growth.

02 MOTIVATION

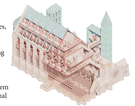
The 'Thirty Three churches' development plan submitted by the Archdiocese of Dublin plans on converting an operational chrruch into a multifunctional primises, catering for emergency accomodation.

Since homelessness in ireland is a prevailing issue paired with the current housing crisis, renovating churches within the greater dublin area would alleviate the pressure of creating new builds to accomodate for these demands.

Before looking at an efficient way of creating duplex apartments and inserting them into these churches, They must ensure that they wont be damaging to the oringinal structure.

So how do we preserve an old building while constantly linking back to the idea of a change of use project to take place?

I am going to investigate the delicate approach that is encountered when retrofitting a church with the goal to improve its thermal performance.



LITERATURE REVIEW

"Optimal Energey Retrofit Plan for Conservation and Sustainable use of Historic Campus Building"

- Author (Hyun Mi Cho)
- "The report addresses the challenges associated with retorfitting historic buildings".
- "Frequently uses technical evidence, such as temperature loggers and thermographic photos, to support claims stated in report".

"Comparison of Thermal Response Times of Historical and Modern Building Wall Materials"

- Author (Yuksel)
- "The author compares the thermal behaivour of various materials used in traditional and contemporary construction".

1 Energy Bill

Existing Energy Bill (1 month): 487 units kWh, €182.9

= Jan23-Feb23 (36 days) = 1.38 kWh saving in a cold climate. 0.8 kWh saving in a cold climate.

(divided) by (number of days)= 13.52 kHh per day (cold climate) 36

Un-insulated: Qf - 34232; Qh - 685735424; Hdd - 1992

Insulated: Qf - 14485; Qh - 290163520; Hdd - 1992

Qf x Qh x HDD x 24 / 1000

(minus) Un-insulated from Insulated

11% increase in effiecienty

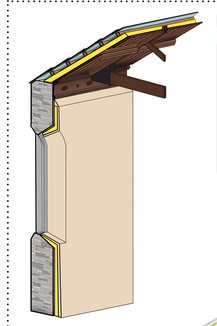
Annual Oil savings

4800 liters (Cold Climate)	€4944 (Cold Climate)
1232 liters (Warm Climate)	€1268.96 (Warm Climate)

(minus) -11%

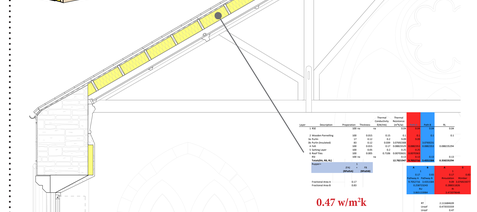
528 liters (Cold Climate)	€543.84 (Cold Climate)
135.52 liters (Warm Climate)	€139.58 (Warm Climate)

8 Energy Saving Solution



INTERNAL OBSTACLES (SOLUTION)

- Wooden panneling reinstated
- Insulation feathered out to appropriate angle where cornice is present.
- Insulating plaster to surround window reveal.
- Radiators, speakers and painting frames to be reinstated after insulation fitting.
- wooden ceiling pannells removed to allow for blow in woodfibre. Access from external also being an option



0.47 w/m²k

1.9 w/m²k

GUTEX Thermoroom

NATURALLY MADE FROM WOOD

- Regulates humidity and is vapour diffusion permeable
- Available in multiple thickness (mm) 20 40 50 60 80 100
- 1200x500mm
- μ = 3 Vapour Diffusion
- λ = 0,039 W/mK
  - 40mm = 1.0 m2 K/W
  - 100mm = 2.55 m2 K/W

Size & Weight: Length (mm) 1200; Width (mm) 500; Actual cov.length x width 1200 x 500

Insulation properties: Nominal thermal conductivity λg (W/mK) 0.039; Nominal thermal resistance (Rg) (m²K/W) 2.55

Diasen Diathonite (Thermactive.037)

- Diathonite Thermactive.037 is formulated with highly porous materials. Air fills the empty gaps in the structure enhancing the thermal insulation.
- Insulated plaster applied at 15mm thick layers.
- 71% Porosity
- μ = 3 Vapour Diffusion
- λ = 0.037 W/mK
  - 40mm = 0.270 m2 K/W
  - 100mm = 0.675 m2 K/W

Final performances		Unit	Regulation	Results
Thermal conductivity (λ)	0.037	W/mK	UNI EN 1745	category T1
Thermal resistance (R) for 1 cm 2.4 m thickness	0.270	m² K/W	UNI 10355	-

SelectGlaze

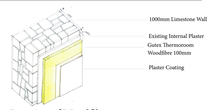
Secondary Glazing

Recommended maximum frame sizes (mm)

	Height (max)	Width (max)
Single	2200	1200
Double	2200	2200
Inward Open	1200	1200

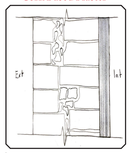
Glazing Range: 4 mm to 6.4 mm

HINGED CASEMENT: Slimline HL (HC); Heavy Duty HL (HC); Heritage VT (HC); Security HL (HC)



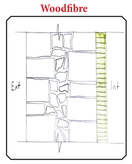
Layering of Woodfibre

Current wall + 100mm Cork Based Plaster



Average U-Value between High/Low K value level : 0.271w/m²k

Current wall + 100mm Woodfibre



Average U-Value between High/Low K value level : 0.286 w/m²k

Current wall +30mm Diathonite + 100mm Woodfibre

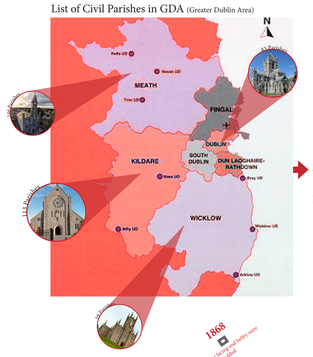
Layer	Description	Thickness (m)	Thermal Conductivity λ(W/mK)	Thermal Resistance (m²K/w)
1	Rai	na	na	0.04
2	Rai Render	0.015	0.93	0.016
3	Limestone Wall	0.6	1.005	0.719
4	Internal Plaster	0.012	0.58	0.021
5	Diathonite	0.03	0.037	0.811
6	Woodfibre		0.04	2.5
7	Rai	na	na	0.13
	Total R			4.242
	U-Value			0.232 w/m2k
	U-Value			0.232 w/m2k
	Overal Wall Thickness	1.157		

Average U-Value between High/Low K value level : 0.232 w/m²k

CASE STUDY INVESTIGATION:

Holy Trinity Ratoath Parish Church

List of Civil Parishes in GDA (Greater Dublin Area)


N
Kells UD
Navan UD
MEATH
Trim UD
FINGAL
DUBLIN
KILDARE
SOUTH DUBLIN
DUN LAOGHAIRE-RATHDOWN
Naas UD
Bray UD
WICKLOW
Arklow UD
Wicklow UD
Athy UD
Ashbourne
Swords
Balbriggan
Malahide
Howth
Skerries
Donabate
Rush
Lusk
Portmarnock
Baldoyle
Sutton
Howth
Clontarf
Raheny
Kilbarrack
Coolock
Ballyfermot
Ballymun
Finglas
Cabra
Glasnevin
Phibsborough
Drumcondra
Ballybrack
Killiney
Dalkey
Shankill
Stillorgan
Blackrock
Monkstown
Dun Laoghaire
Dalkeith
Lucan
Clondalkin
Rathfarnham
Templeogue
Terenure
Rathmines
Rathgar
Harolds Cross
Crumlin
Kimmage
Walkinstown
Ballyboden
Tallaght
Ballycullen
Firhouse
Knocklyon
Rathcoole
Saggart
Newcastle
Lucalen
Donaghmede
Clonmel
Ballyhaise
Ballyjamesduff
Kilmainhamwood
Kilmore
Moybologue
Castlerahan
Lavey
Castlepollard
Fore
Multyfarnham
Killucan
Rathwire
Taghmon
Castlelyons
Rathcormac
Templemichael
Kilmeen
Templenoe
Templeglantine
Templeathea
Templetuohy
Templemore
Templeorum
Templeshanbo
Templeudigan
Templeusk
Templeville
Templeyel
Templeyelle
Templeyhan
Templeyjohn
Templeyle
Templeyn
Templeyo
Templeyrone
Templeyrus
Templeyry
Templeyse
Templeyshee
Templeyshee
Templeyshee