

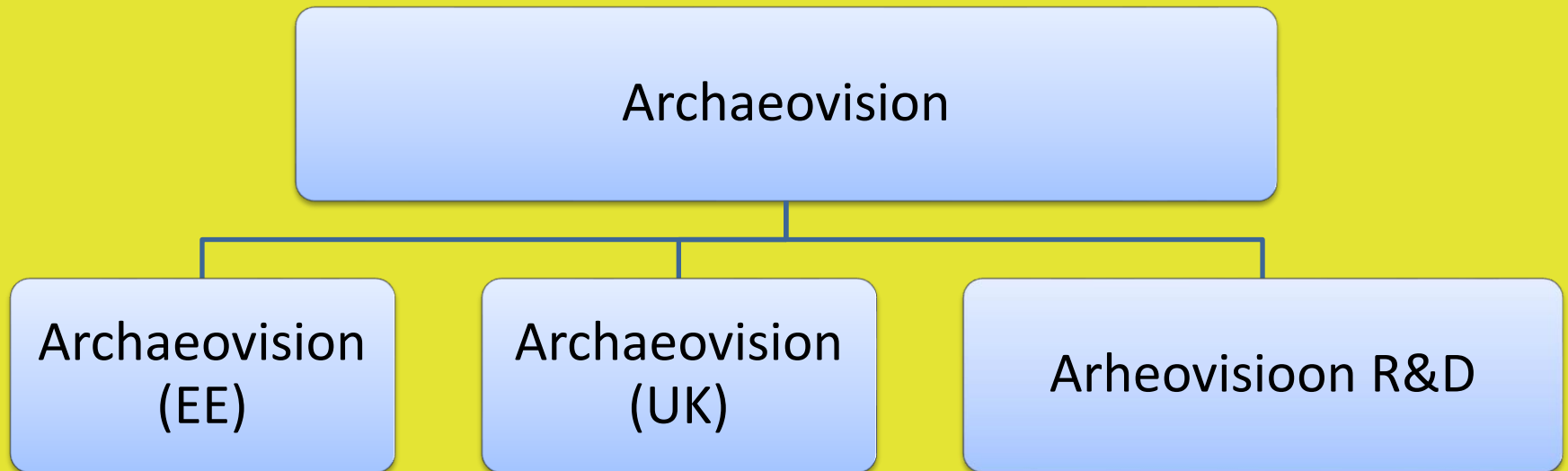


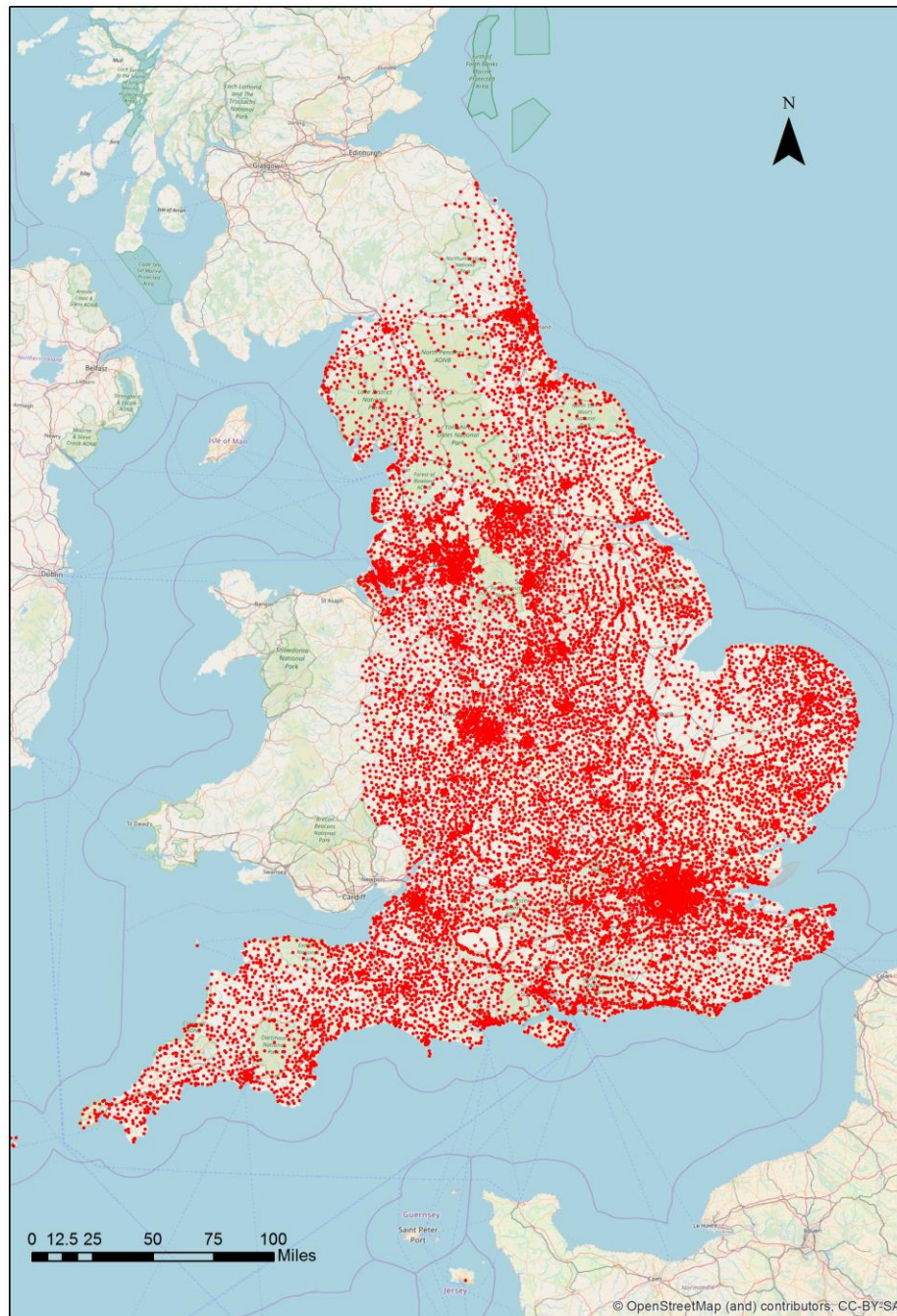
archaeovision

# The possibility that technology offers: The potential of HeritageBIM

James Miles

# Archaeovision





# BIM model

- BIM is a process that involves creating and using an intelligent 3D model to inform and communicate project decisions.
- Design, visualisation, simulation and collaboration
- Purpose of BIM :
- inventory
  - simulations;
  - calculations;
  - control.



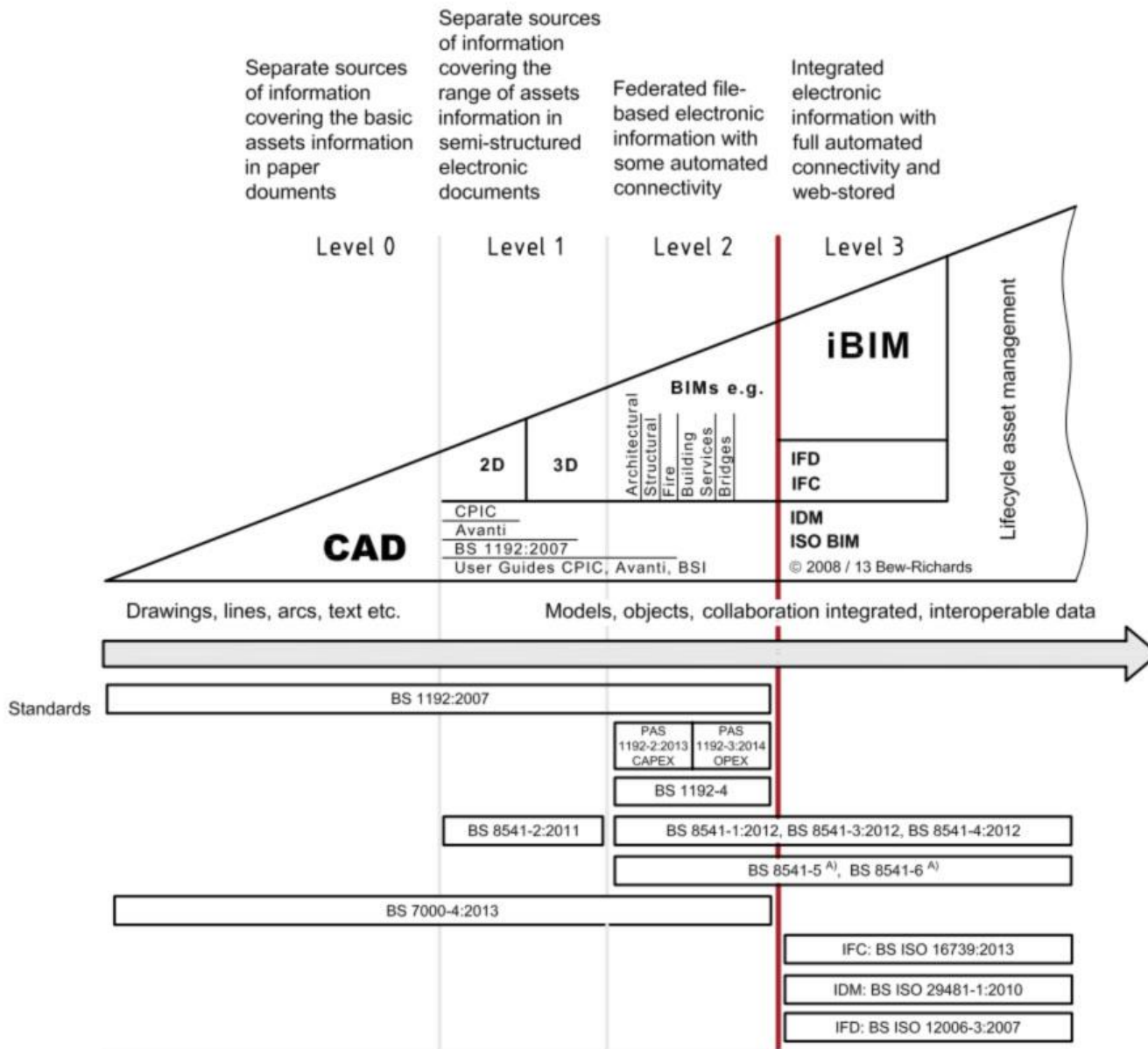


- UK BIM Task Group
- Survey4BIM
- BIM4 Conservation (BIM4C)
- The Royal Institute of Chartered Surveyors (RICS)
- The Royal Institute of British Architects (RIBA)
- The Survey Association (TSA)
- Historic England 'Metric Survey Specification for Cultural Heritage'



- Conservation bodies
  - Institute of Historic Building Conservation (IHBC)
  - Institute of Conservation (ICON)
- Professional conservators
- Trainees
- Academic departments.





4D

5D

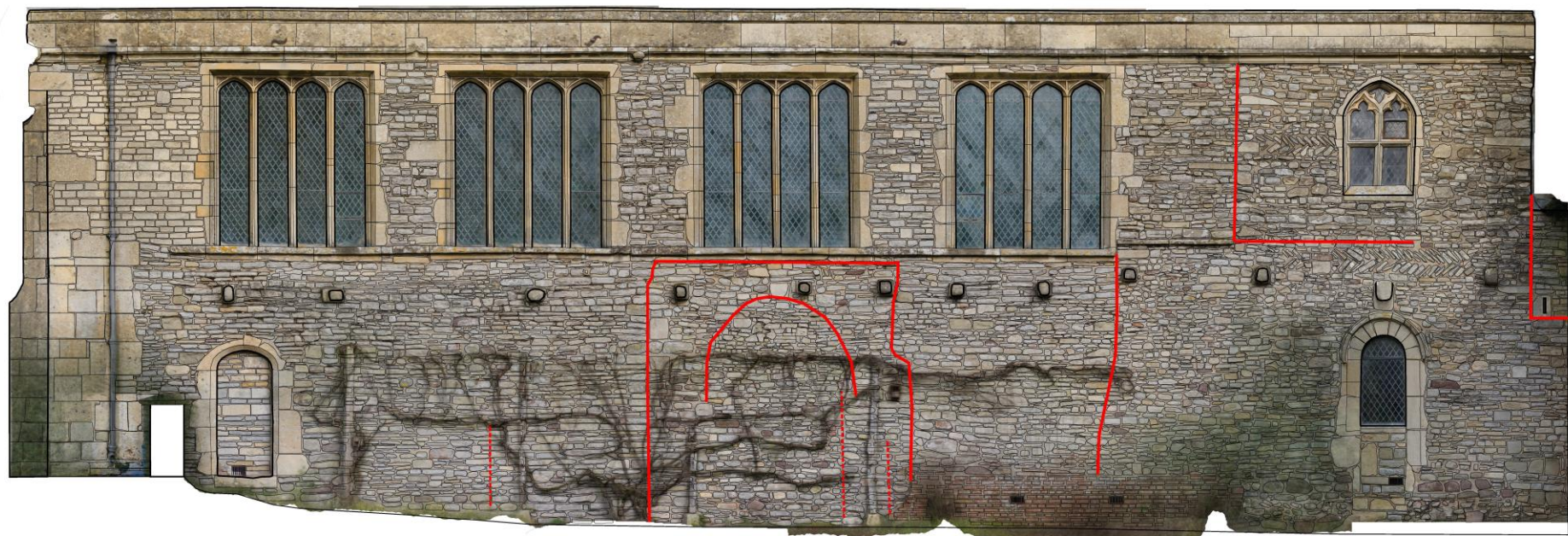
Integrated BIM



# Deerhurst Church









# Iron Gate Lock at Sheffield Park, UK

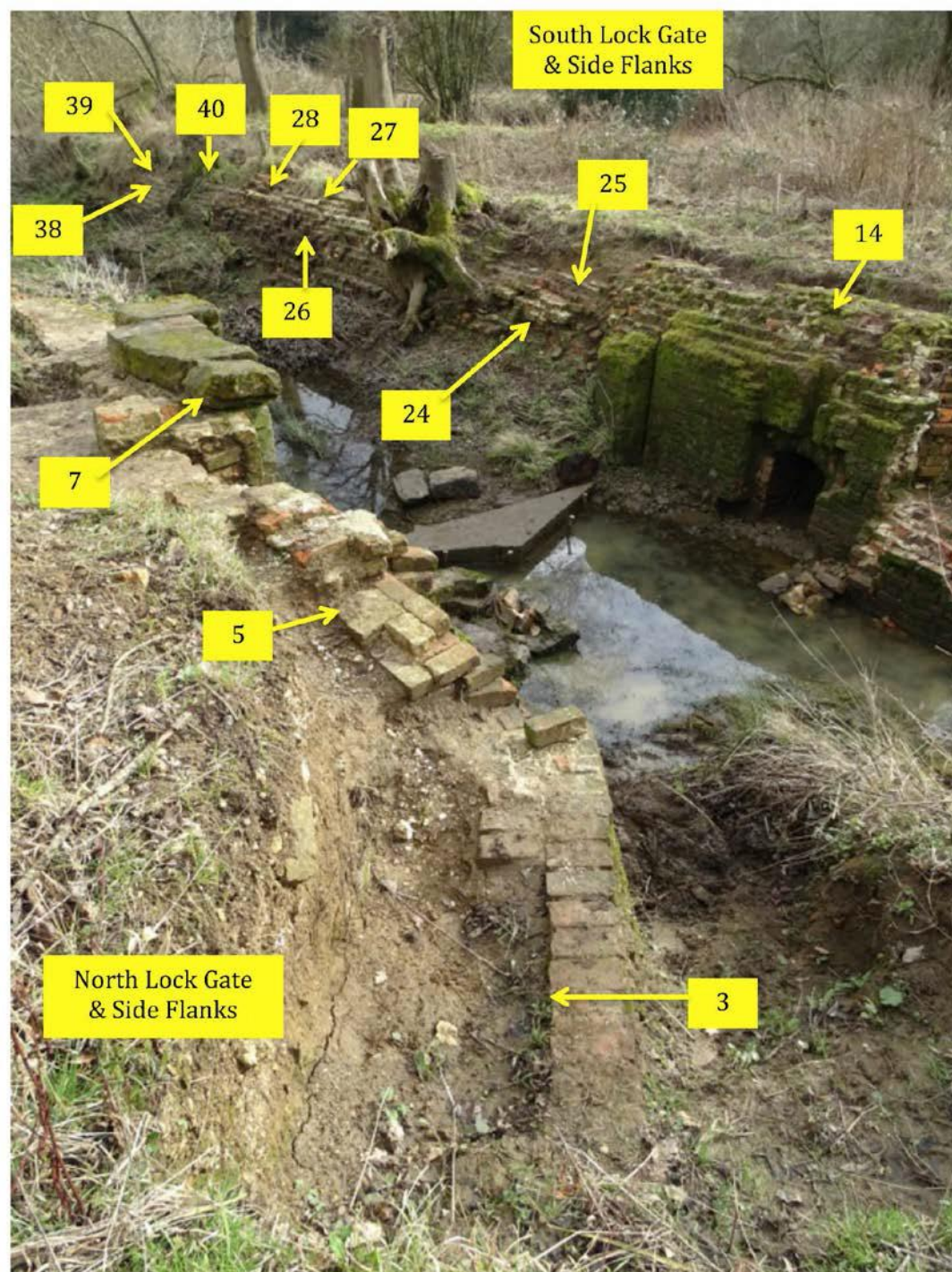












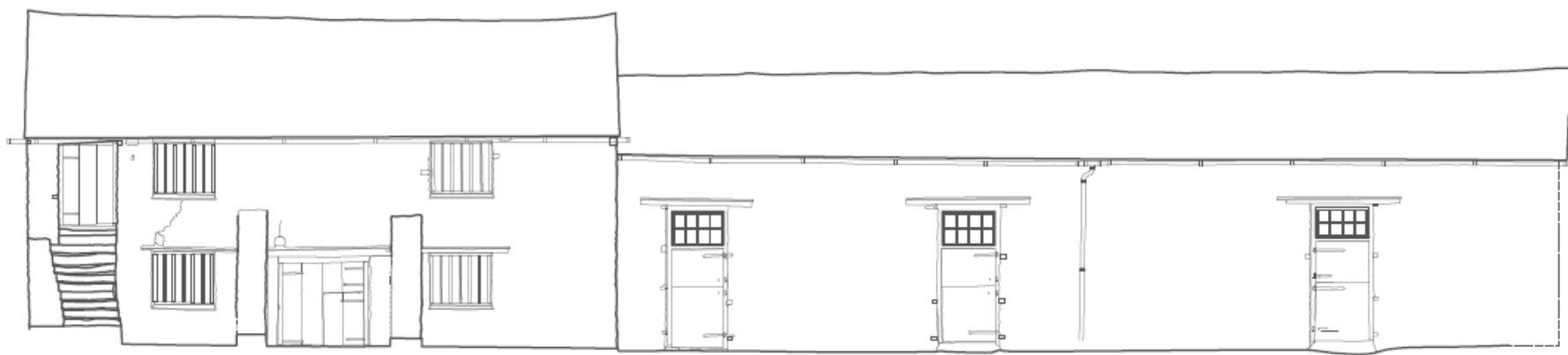


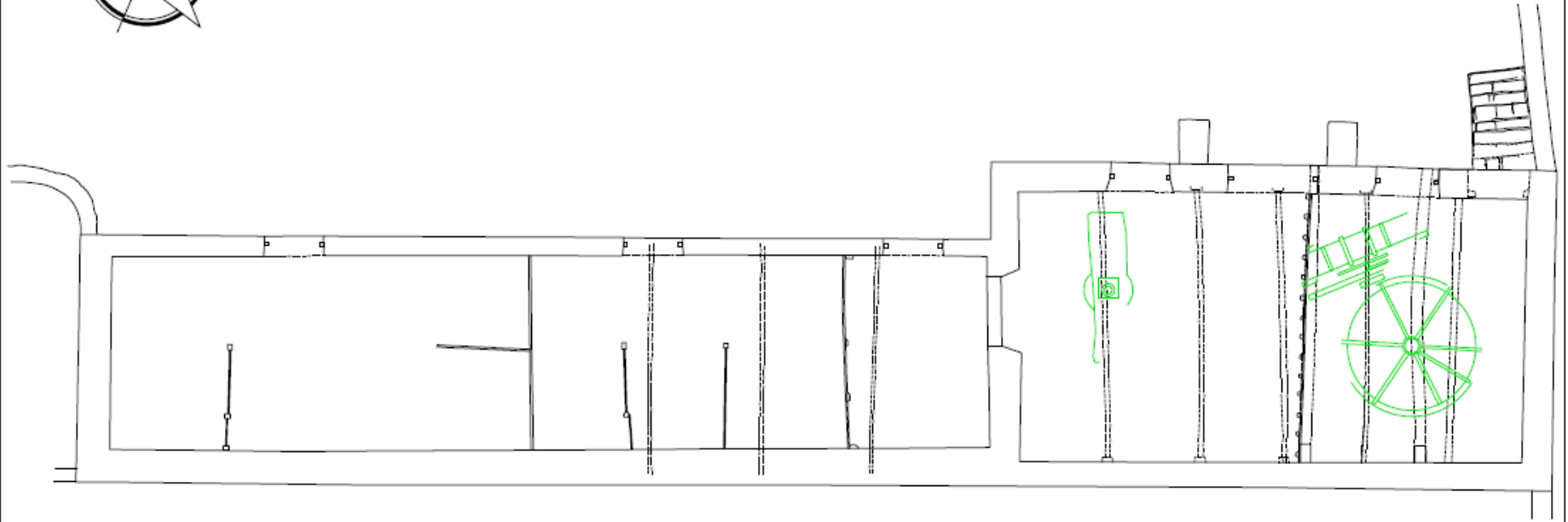
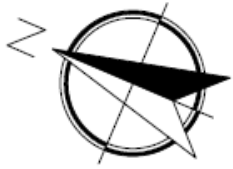
# Bradley Manor, UK













# Insula Dell'ara Coeli

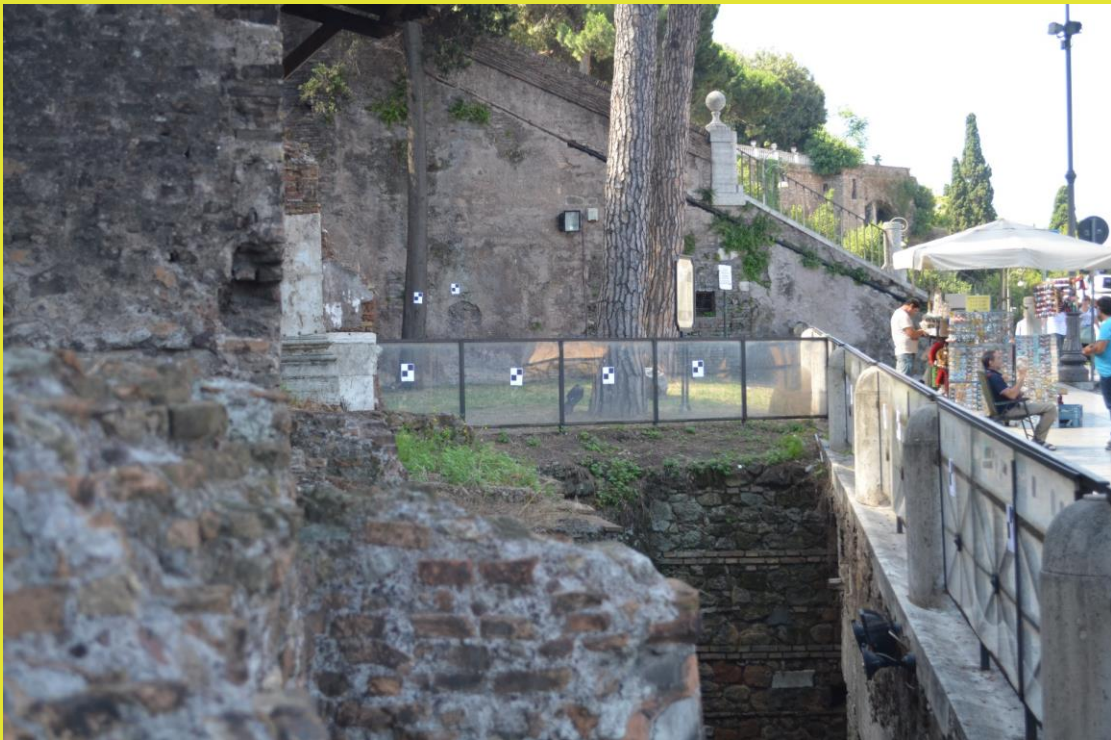


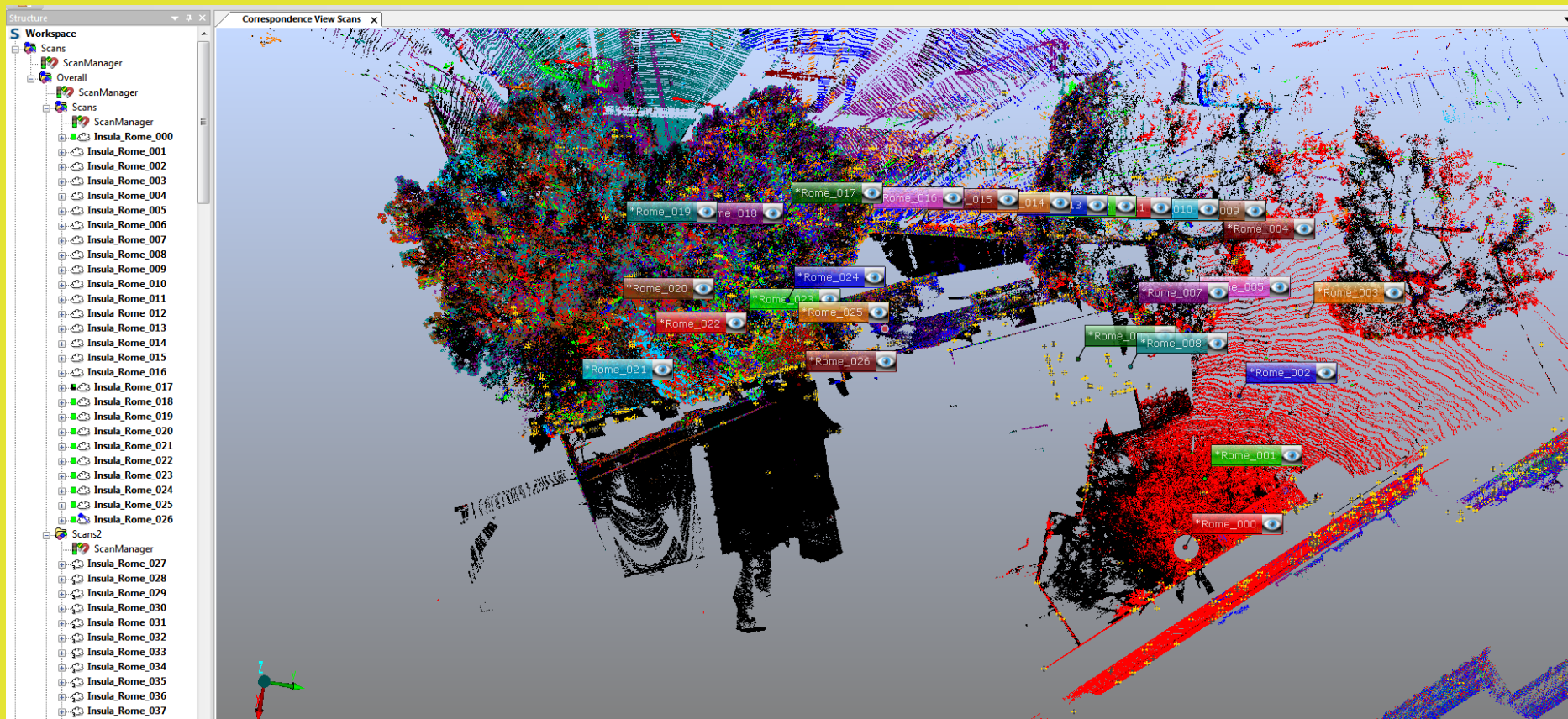












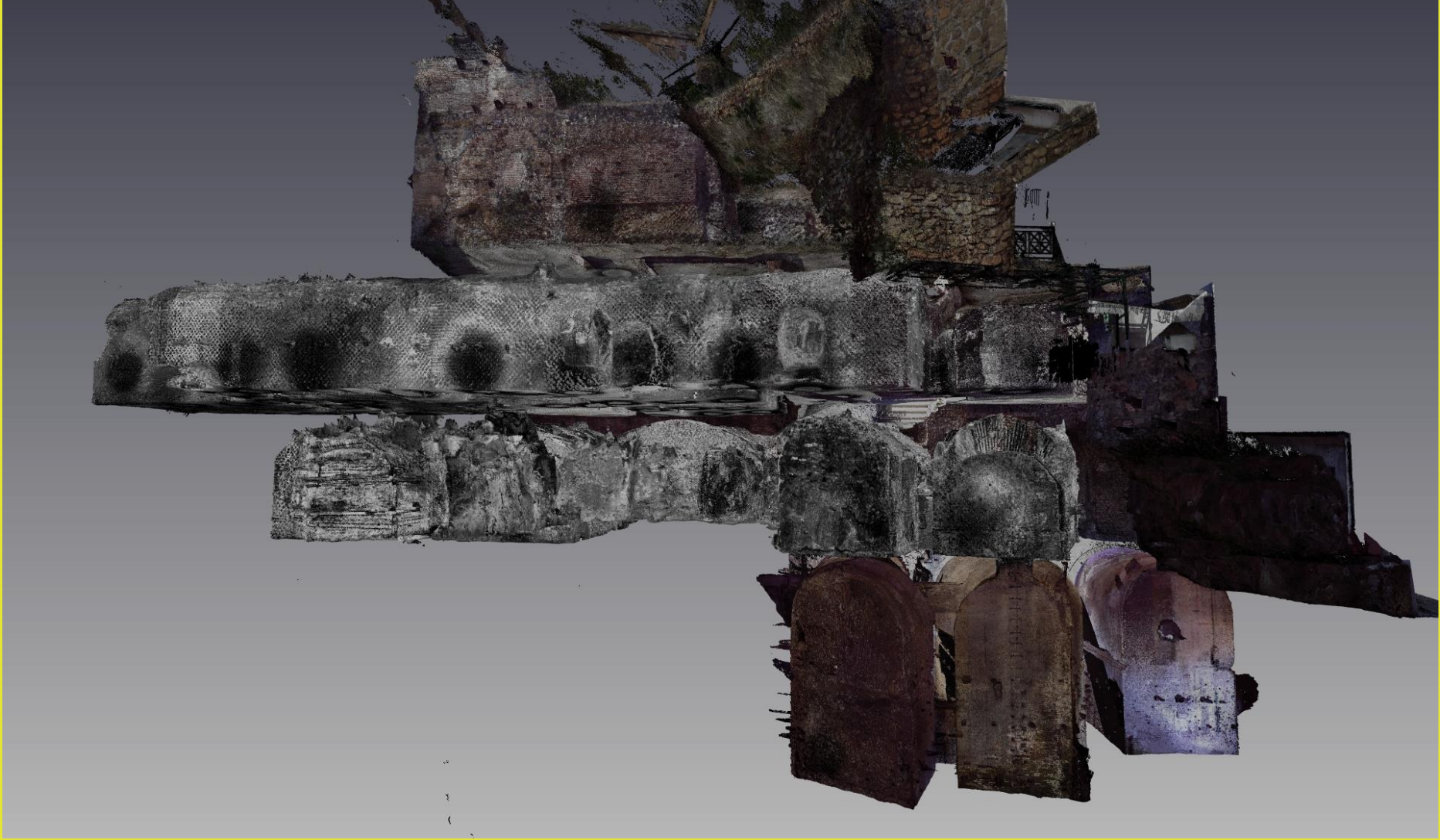








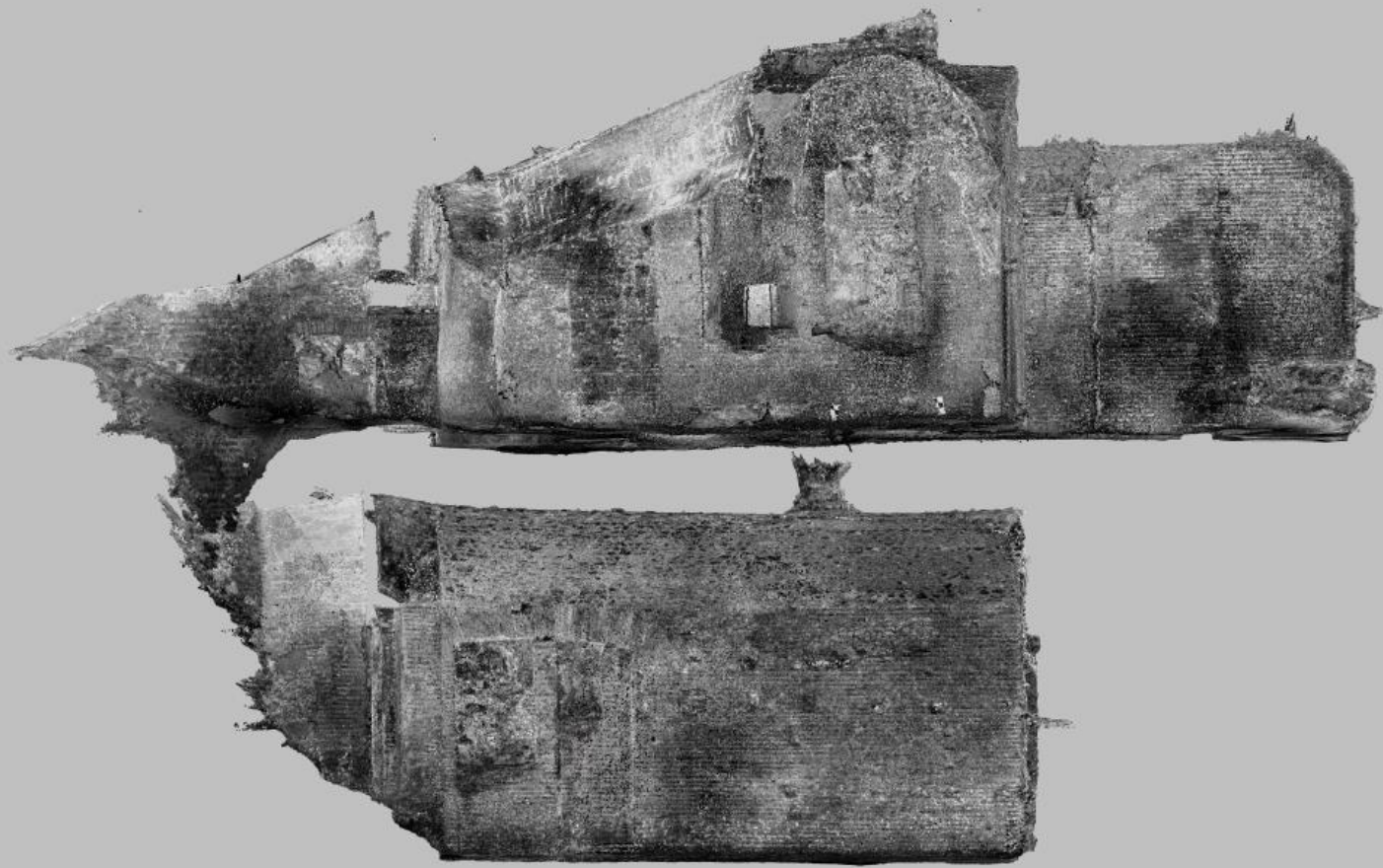


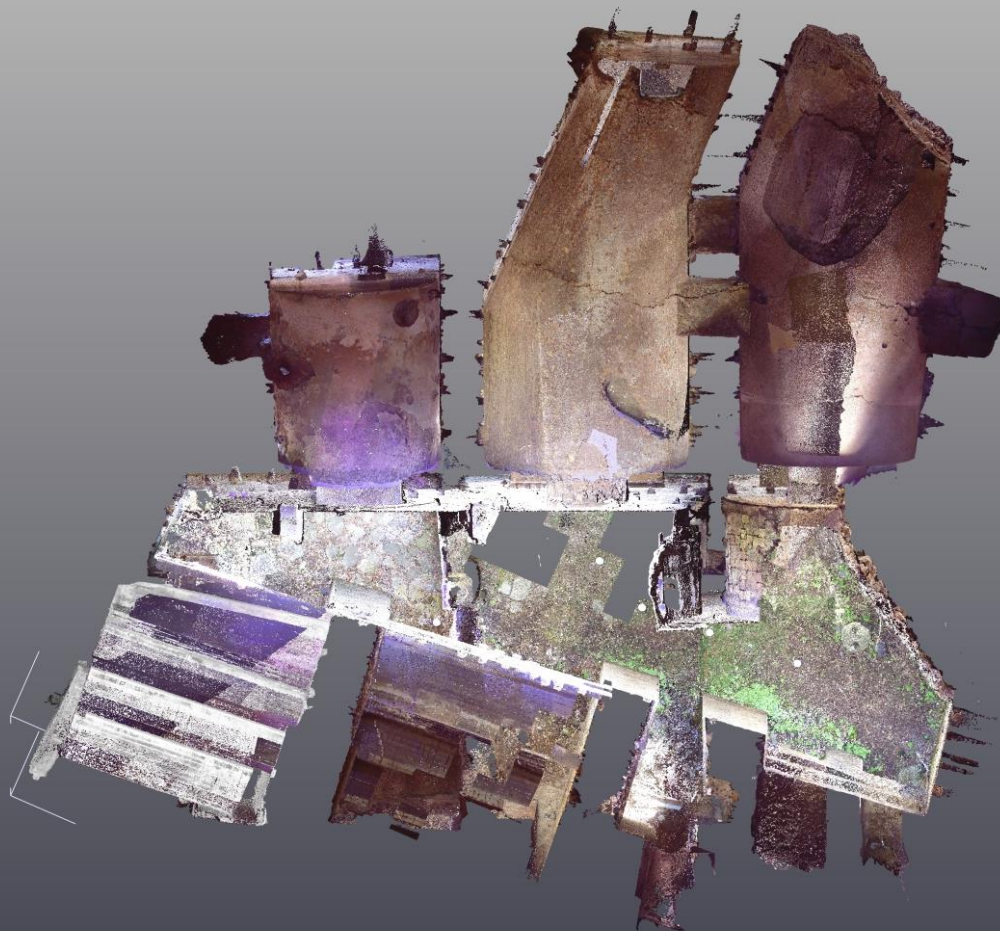


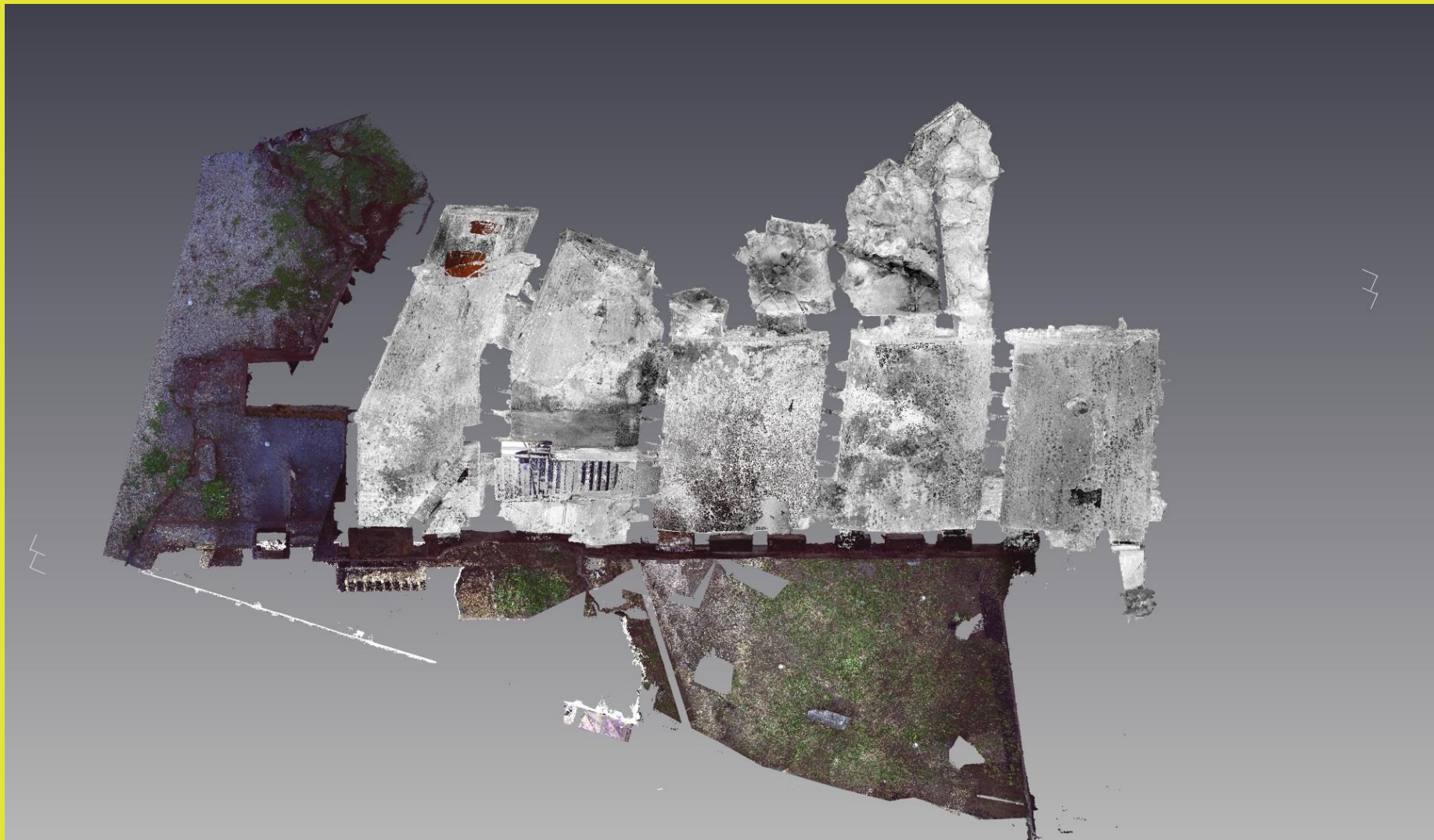




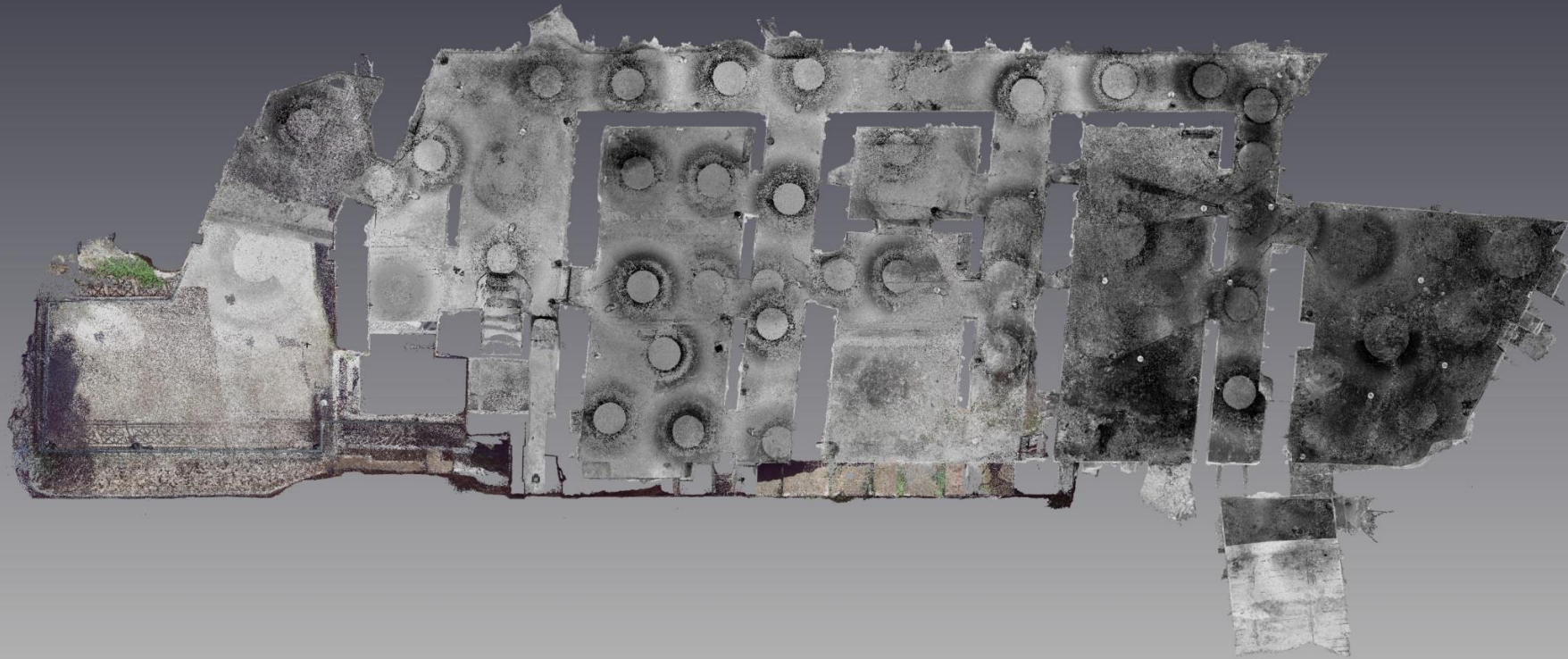


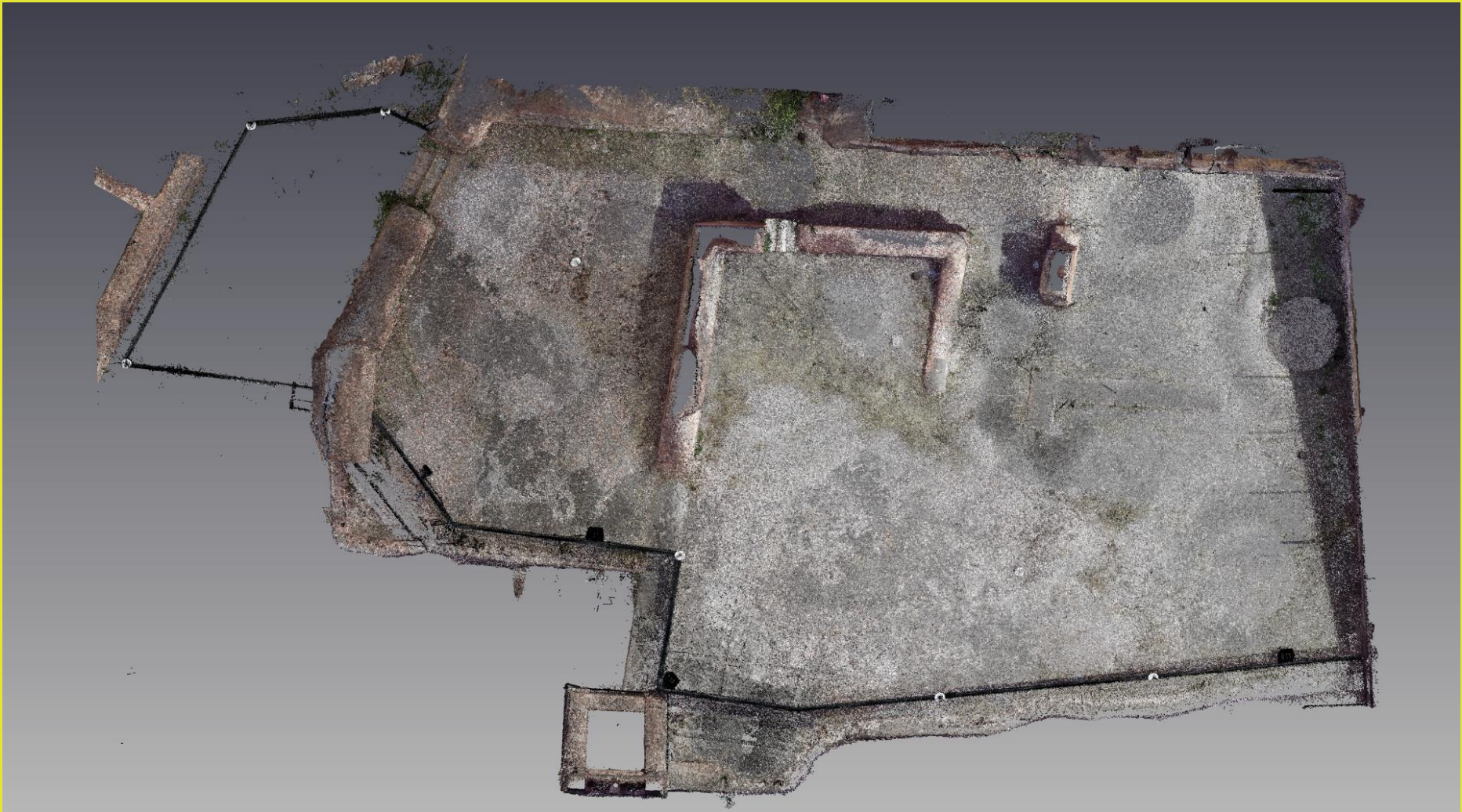






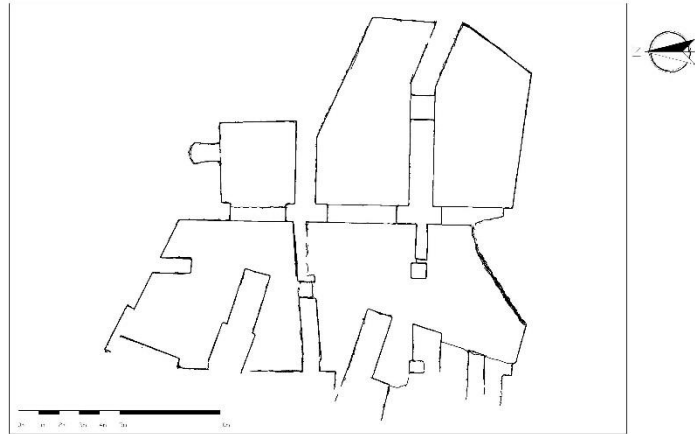




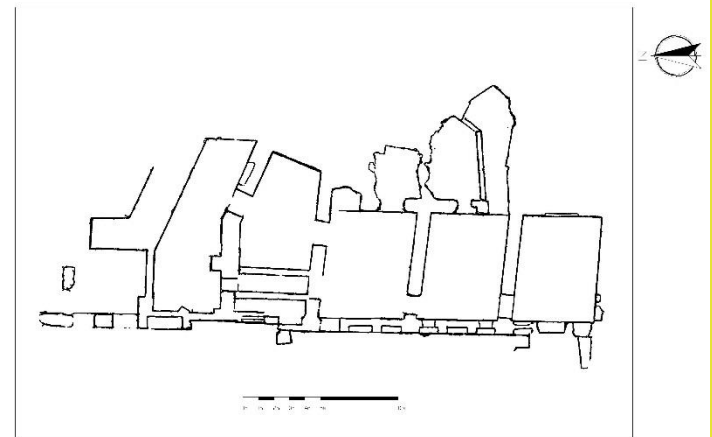




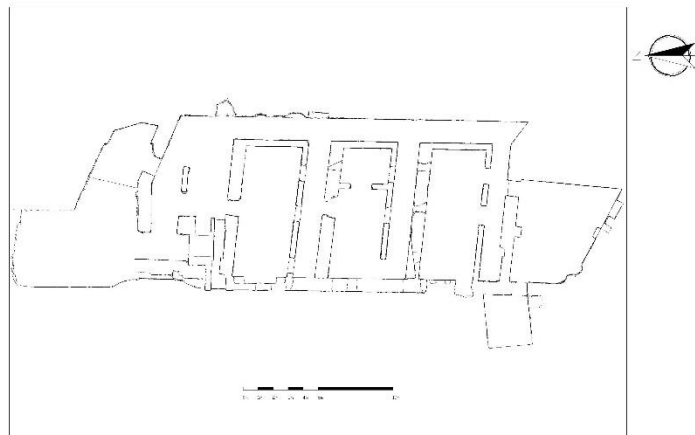
Isola dell'Ana Caeli Basement Floor / piano Seminterrata



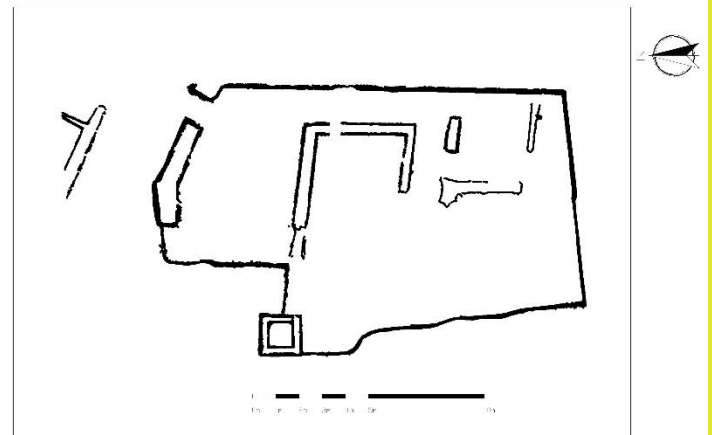
Isola dell'Ana Caeli Third Floor / Terzo piano

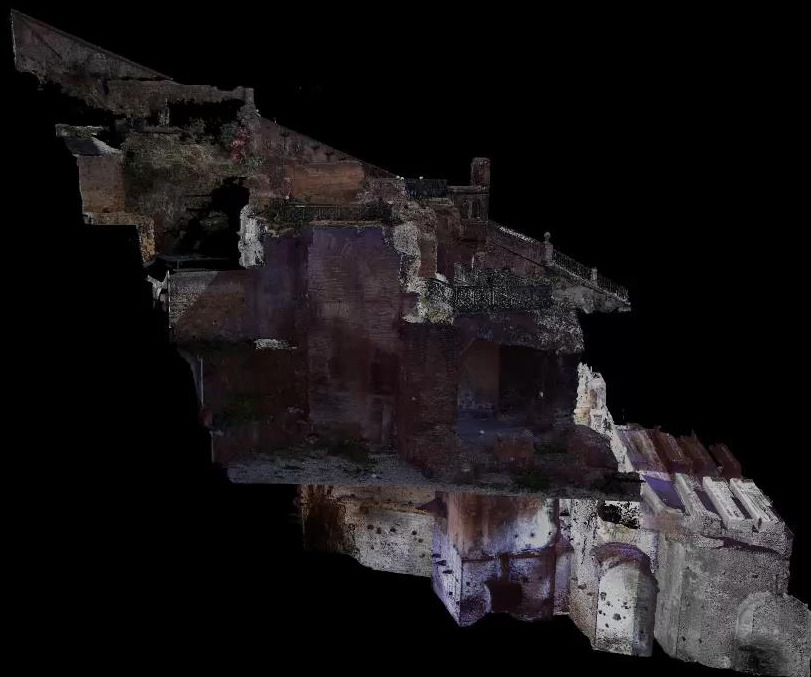


Isola dell'Ana Caeli Fourth Floor / Quarto piano



Isola dell'Ana Caeli Fifth Floor / Quinto piano





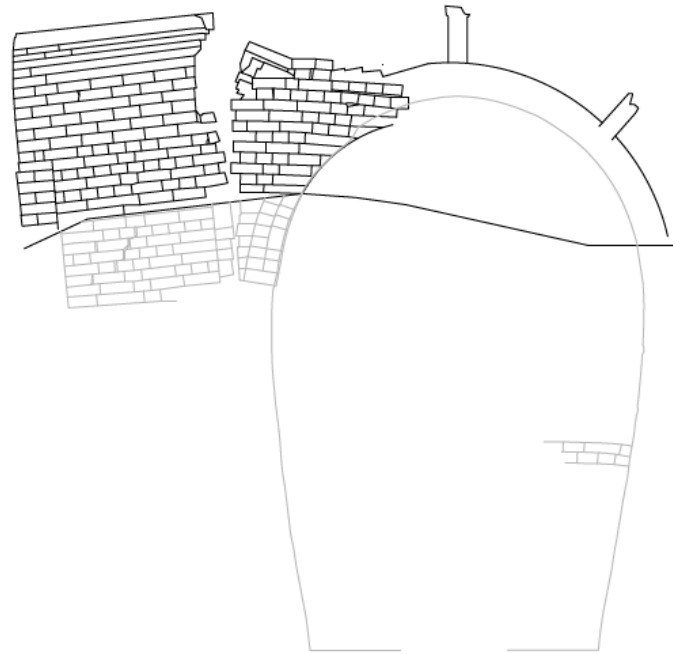


# Ice House, New Forest, Uk



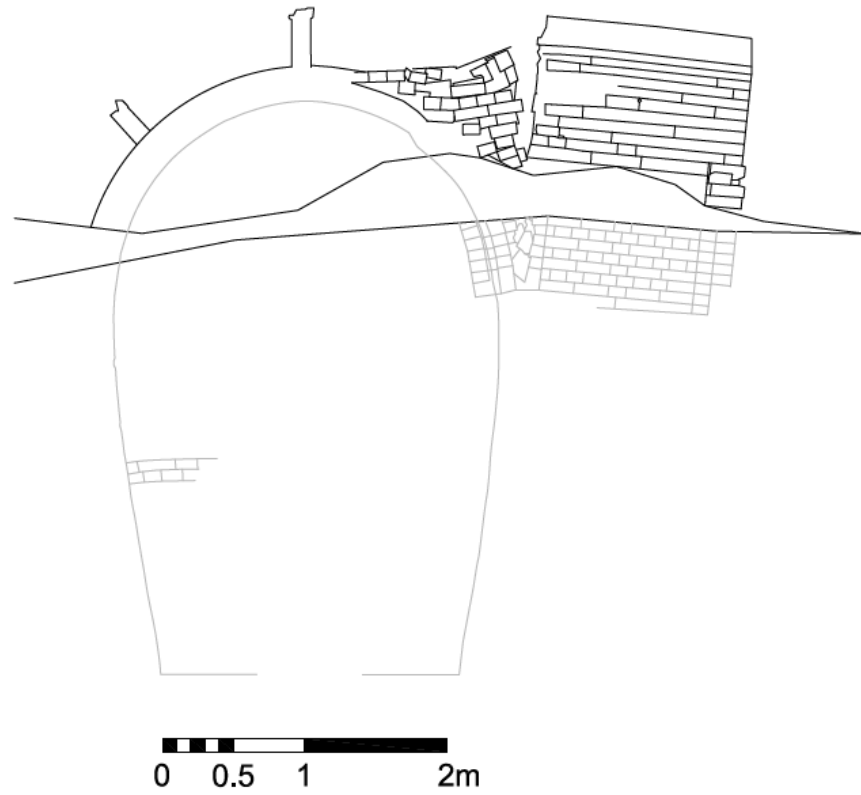






0 0.5 1 2m





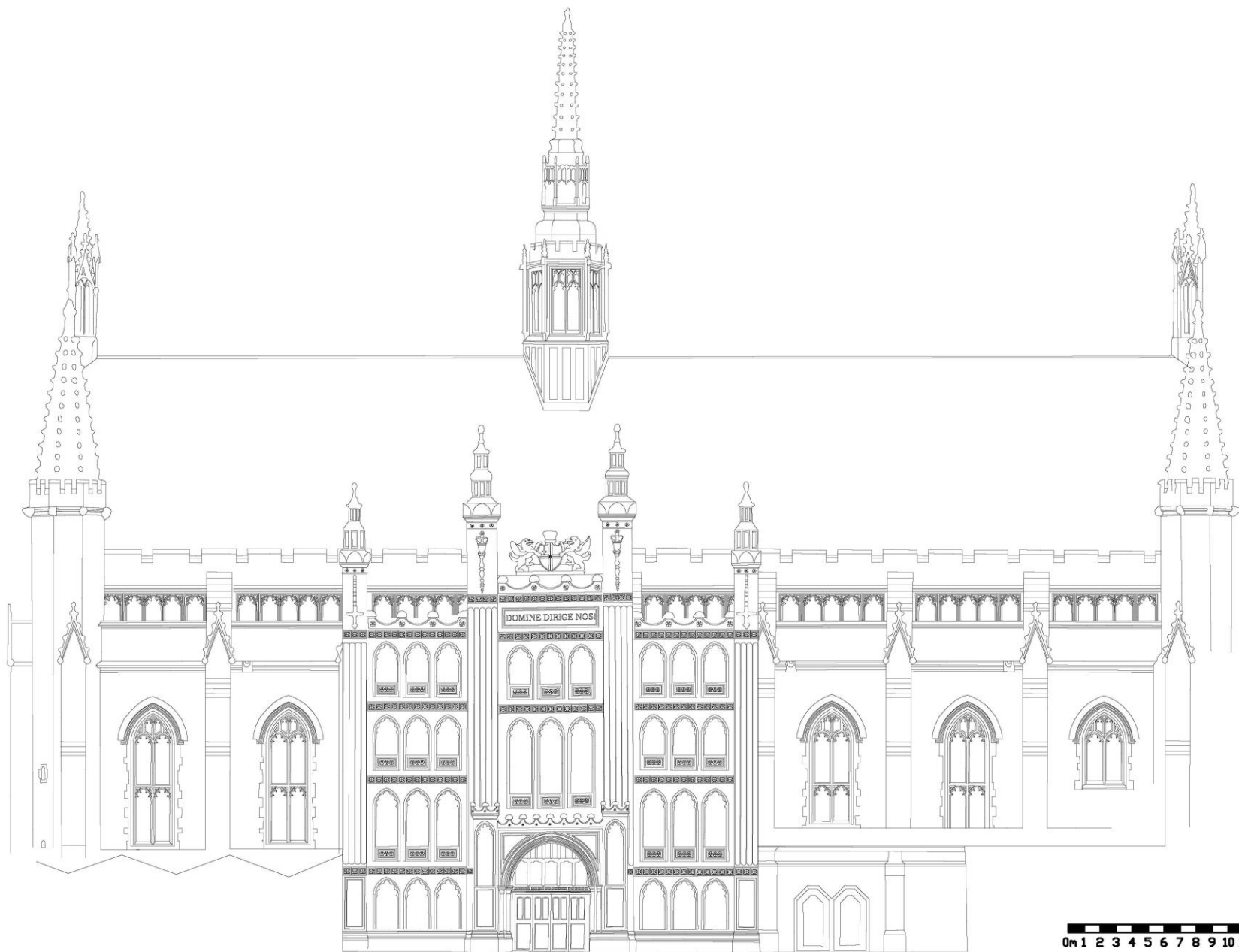




# City of London Guildhall







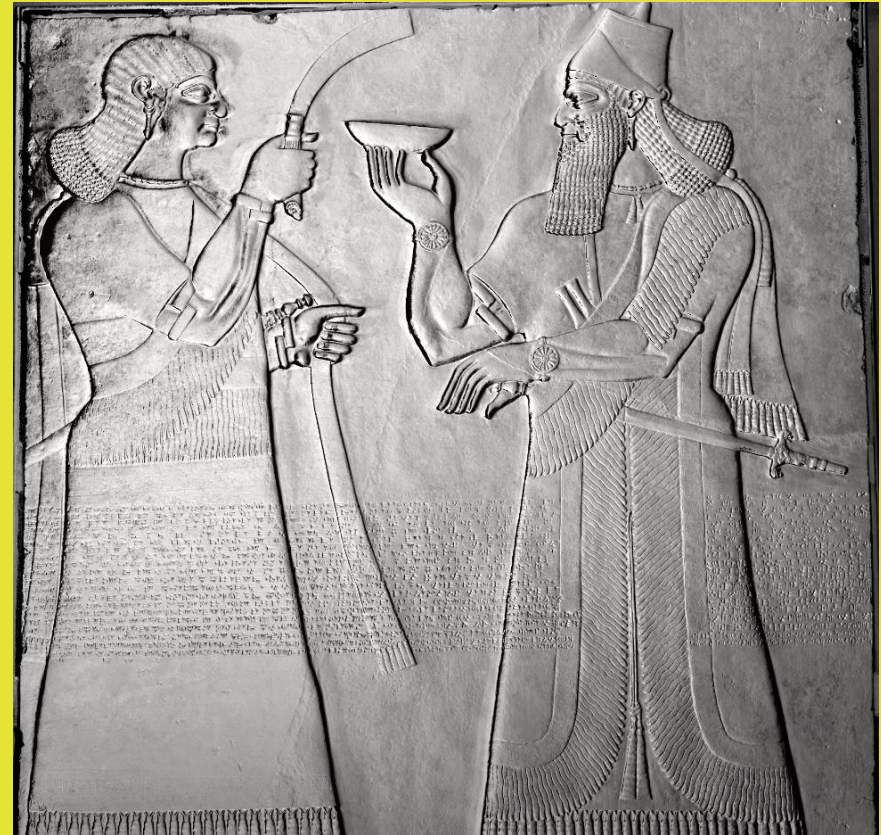
0m 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15



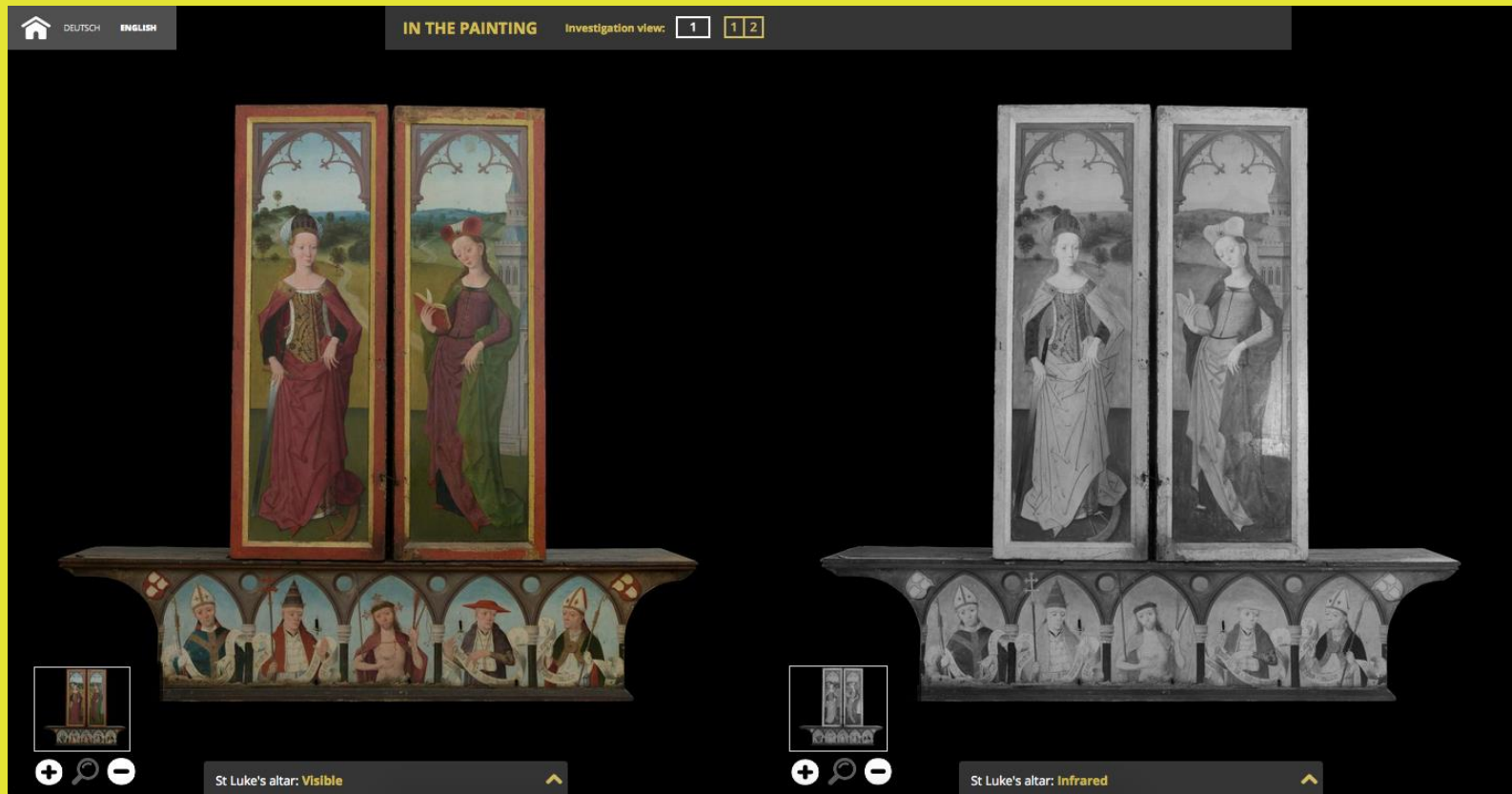




# National Museum of Scotland



# Hermen Rode Altarpiece



<http://archaeovision.eu/demo/rode/>





# Selby Hoard



© 2014





# Salisbury Cathedral Chapter House Frieze

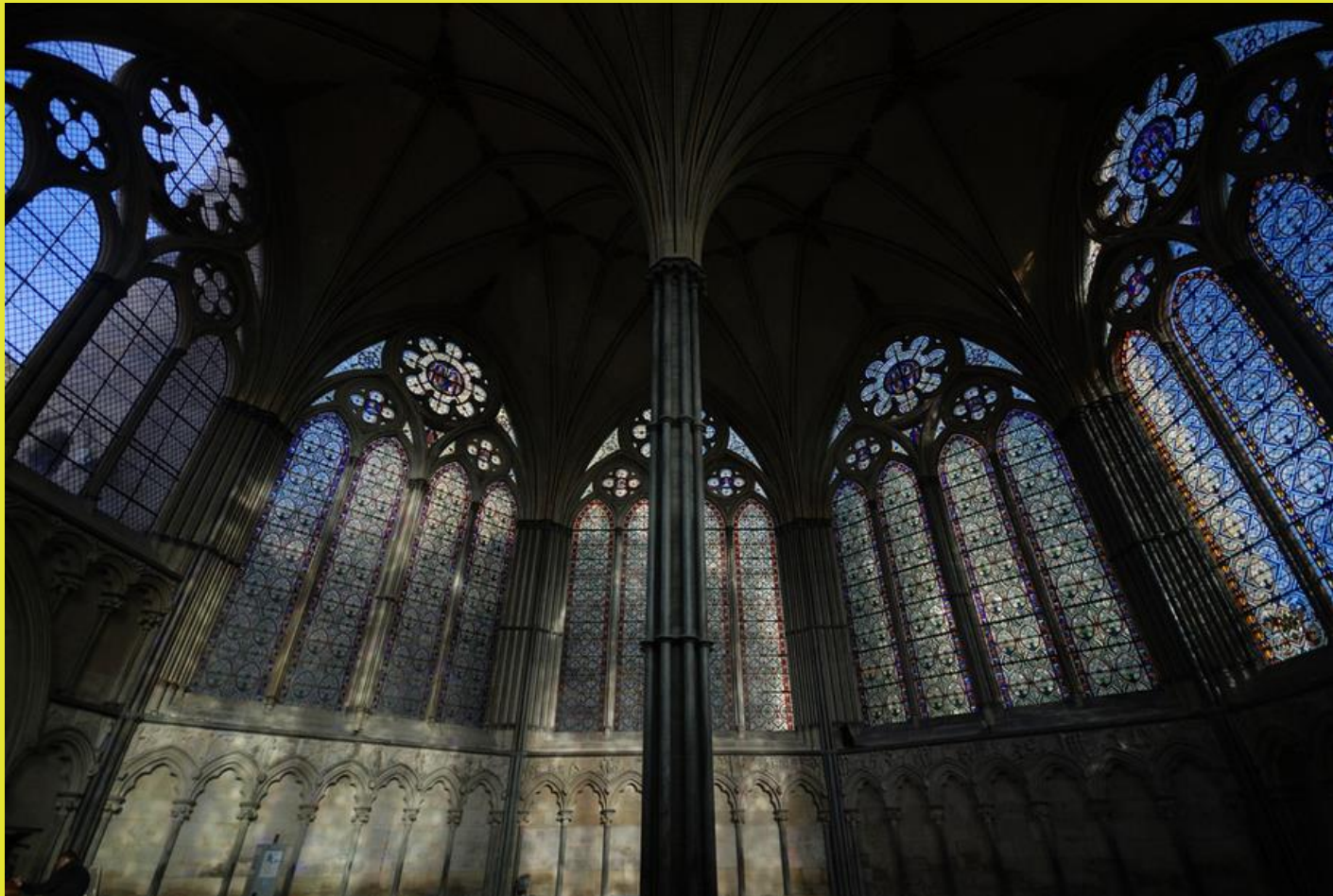


Image: Paul Cripps



Images: Paul Cripps









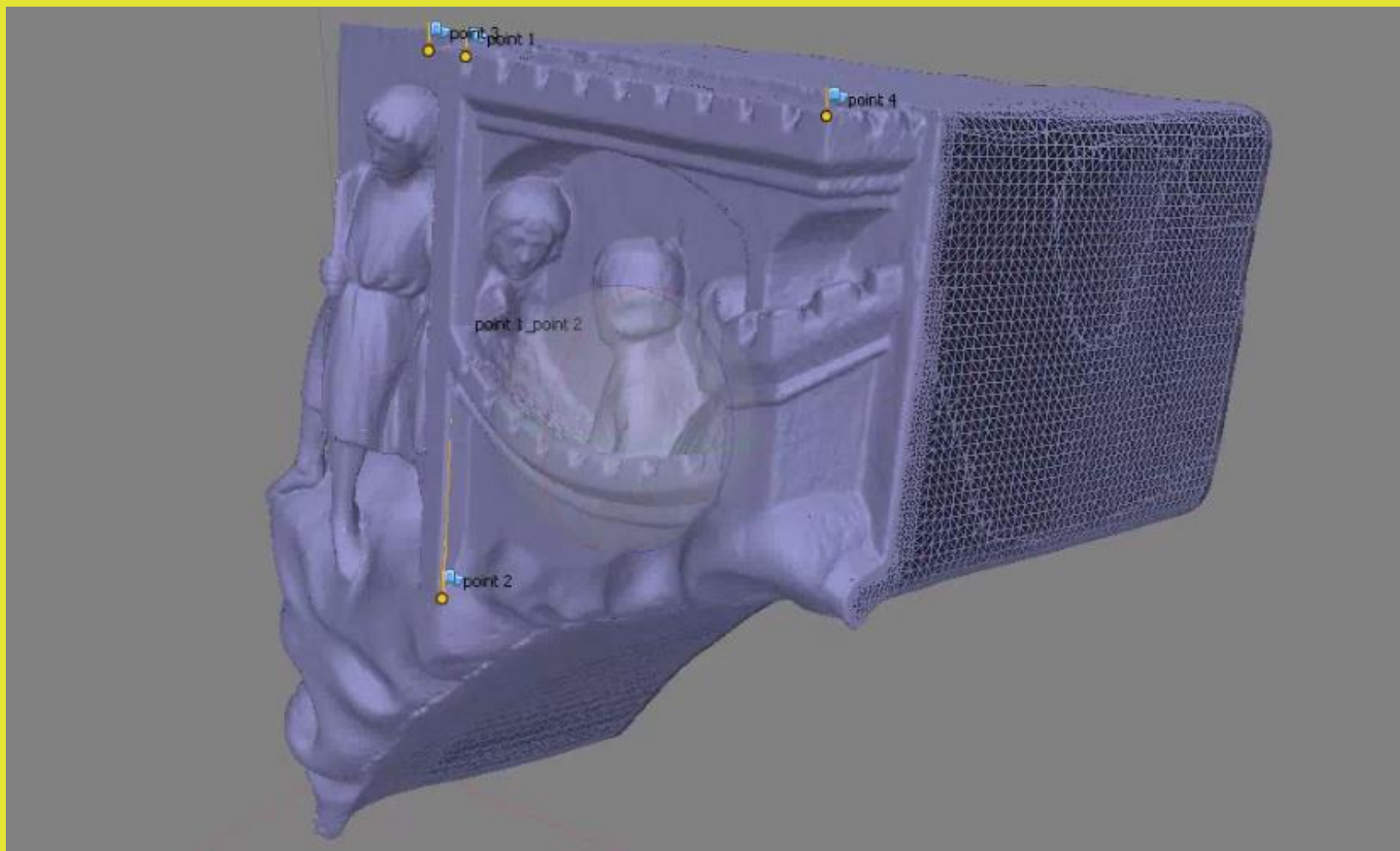










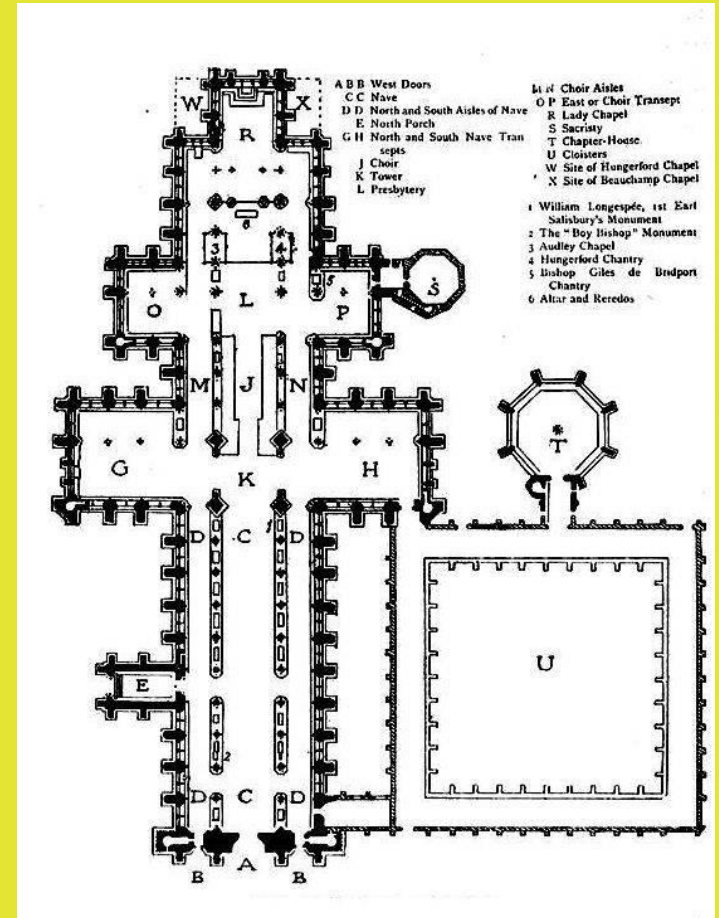








# Salisbury Cathedral Civil War

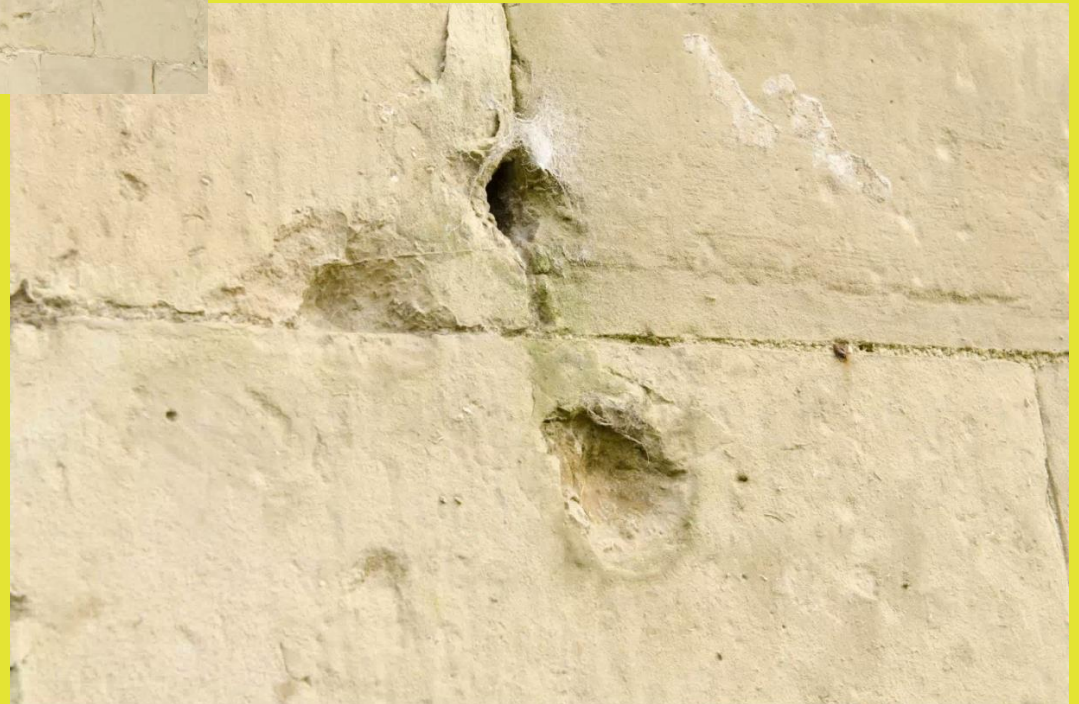


P. H. Ditchfield. 1902. The Cathedrals of Great Britain. P124













## Matchlock musket

- Usually a 12-bore
- Musket ball weighed  $\frac{1}{12}$  of a pound
- Fired using a piece of smouldering cord



## 18<sup>th</sup> Century Firearm Calibres, weights & diameters.

Type	Bore of shot (service size)	Weight of shot (Imperial)	Weight of shot (Metric)	Diameter of barrel (Imperial)	Diameter of shot (Imperial)	Windage (inches)	Diameter of barrel (Metric)	Diameter of shot (Metric)
Land Pattern Flintlock (Post 1752)	14.5 (Blackmore, Muller 1768, 14)	1.1034482ozs	31.28275647 g	0.76' (Blackmore 1961, 50)	0.693' (Muller 1768, 14)	0.067'		17.6022 mm
Carbine (post 1752)	20 (Muller 1768, 14)*	0.8ozs	22.68g	17 bore 0.66' (Blackmore 1961, 50)	0.615' (Muller 1768, 14)	0.045'		15.621 mm
Pistol	34 (Muller 1768, 14)**	0.4705882ozs	13.34117547 g	24 bore 0.594' (Blackmore 1961, 50)	0.517' (Muller 1768, 14)	0.077		13.1318 mm



Data indicates that the musket ball would have probably averaged, at the muzzle, about 1500 fps.(457 m/s).

Table 2.2: X and Y co-ordinates from a velocity of 400 m/s. (Eyers, 2006)

Time Elapsed (S)	X Distance (M)	Y Drop (m)
0.1	40	-0.04905
0.2	80	-0.1962
0.3	120	-0.44145
0.4	160	-0.7848
0.5	200	-1.22625
0.6	240	-1.7658
0.7	280	-2.40345
0.8	320	-3.1392
0.9	360	-3.97305
1.0	400	-4.905

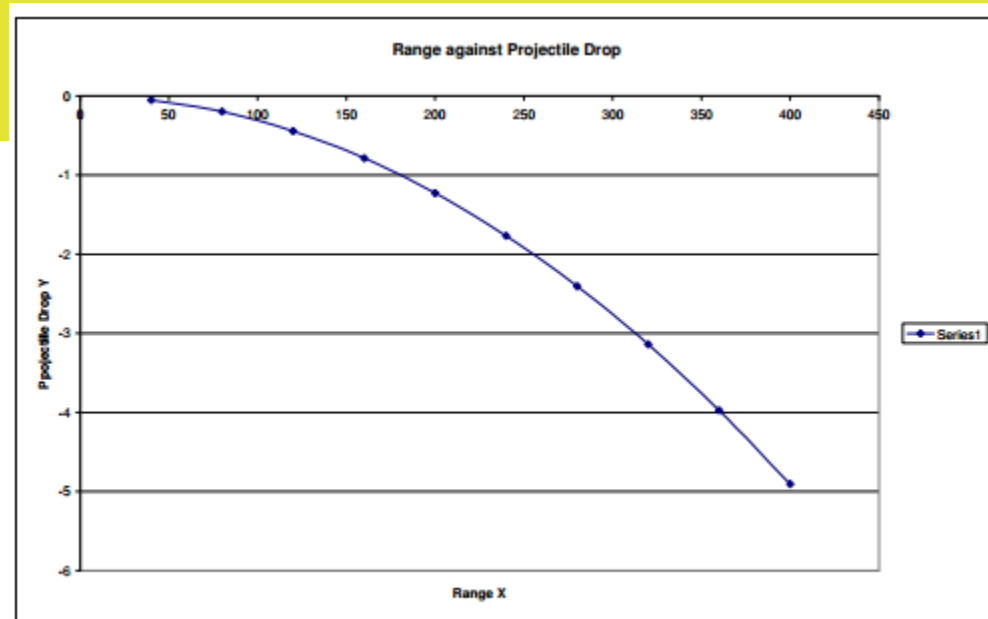
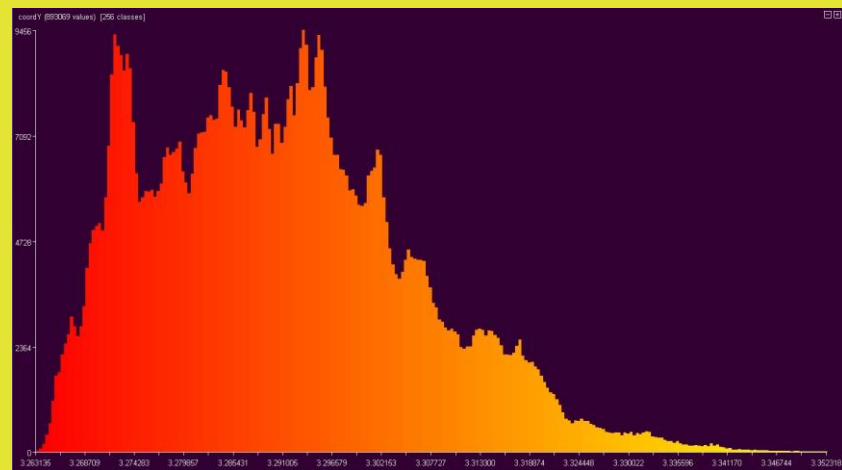
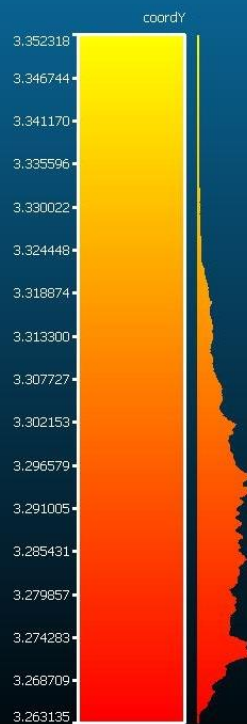
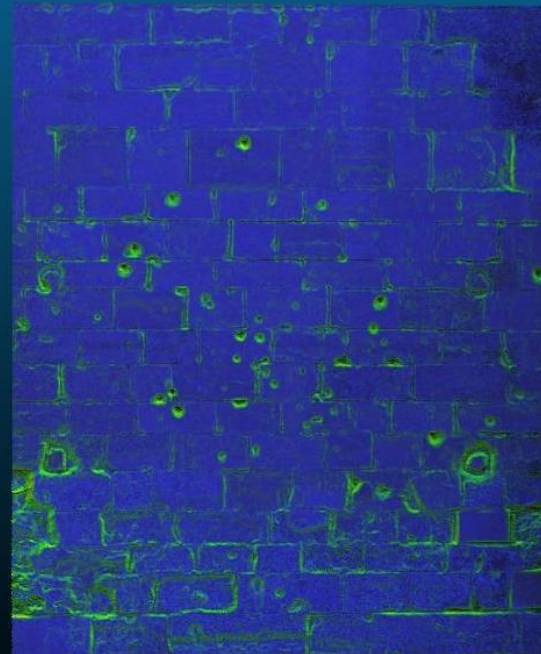


Figure 2.6: A graph to show range against projectile drop. (Eyers, 2006)









Gradient norms(coord.Y.gradient)

0.558042  
0.533214  
0.508386  
0.483559  
0.458731  
0.433903  
0.409076  
0.384248  
0.359421  
0.336964  
0.314508  
0.292051  
0.269595  
0.247138  
0.224682  
0.202226  
0.179769  
0.157313  
0.134856  
0.112400  
0.089943  
0.067487  
0.045031  
0.000118



LS-DYNA keyword deck by LS-PrePost

Time = 0  
Contours of Effective Stress (v-m)  
min=0, at elem# 101541  
max=0.0117188, at elem# 26476

Fringe Levels

1.172e-02

1.056e-02

9.375e-03

8.203e-03

7.031e-03

5.859e-03

4.687e-03

3.516e-03

2.344e-03

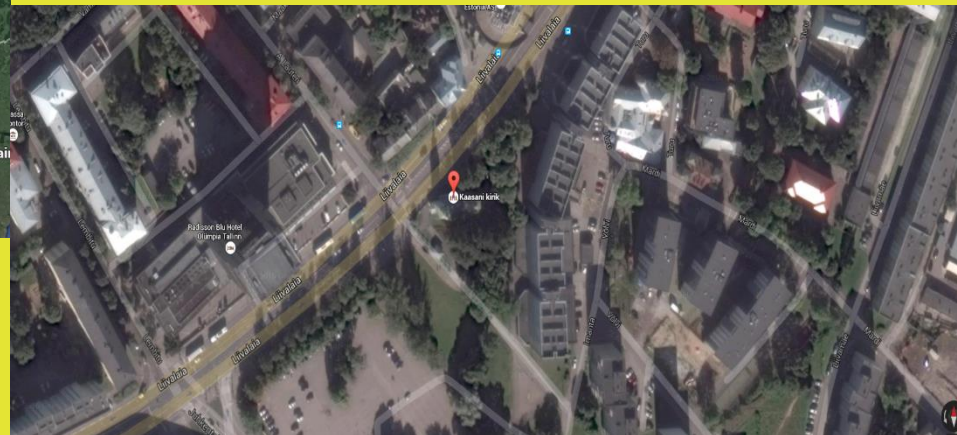
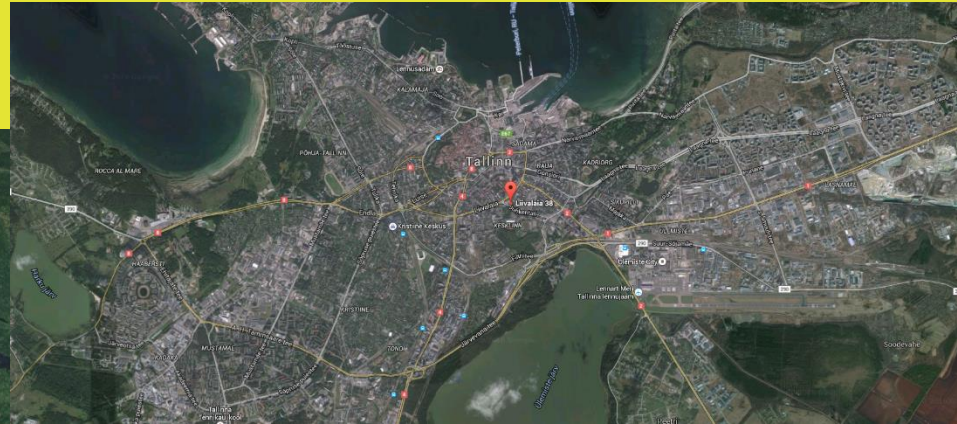
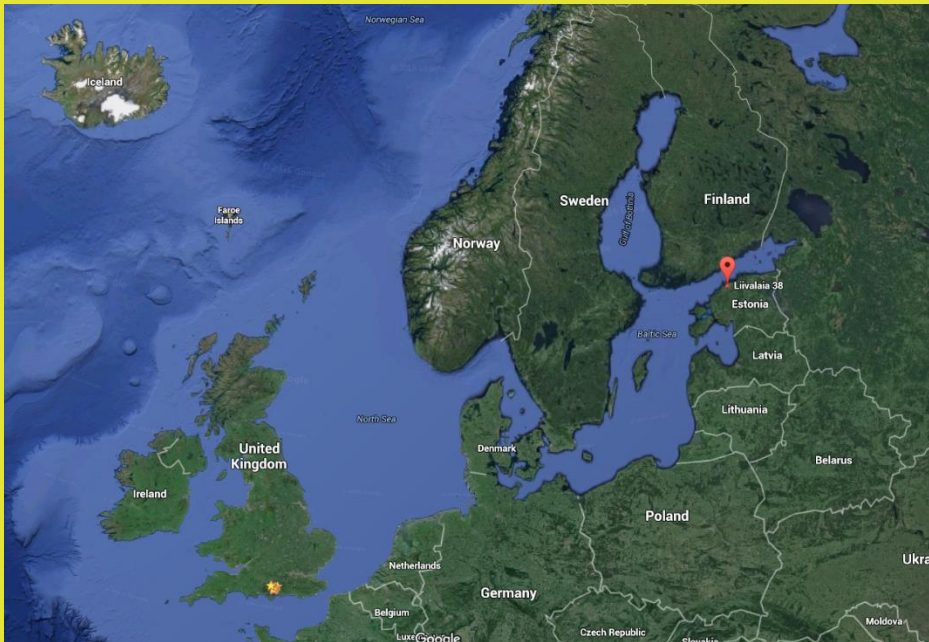
1.172e-03

0.000e+00





# Church of Our Lady of Kaasan



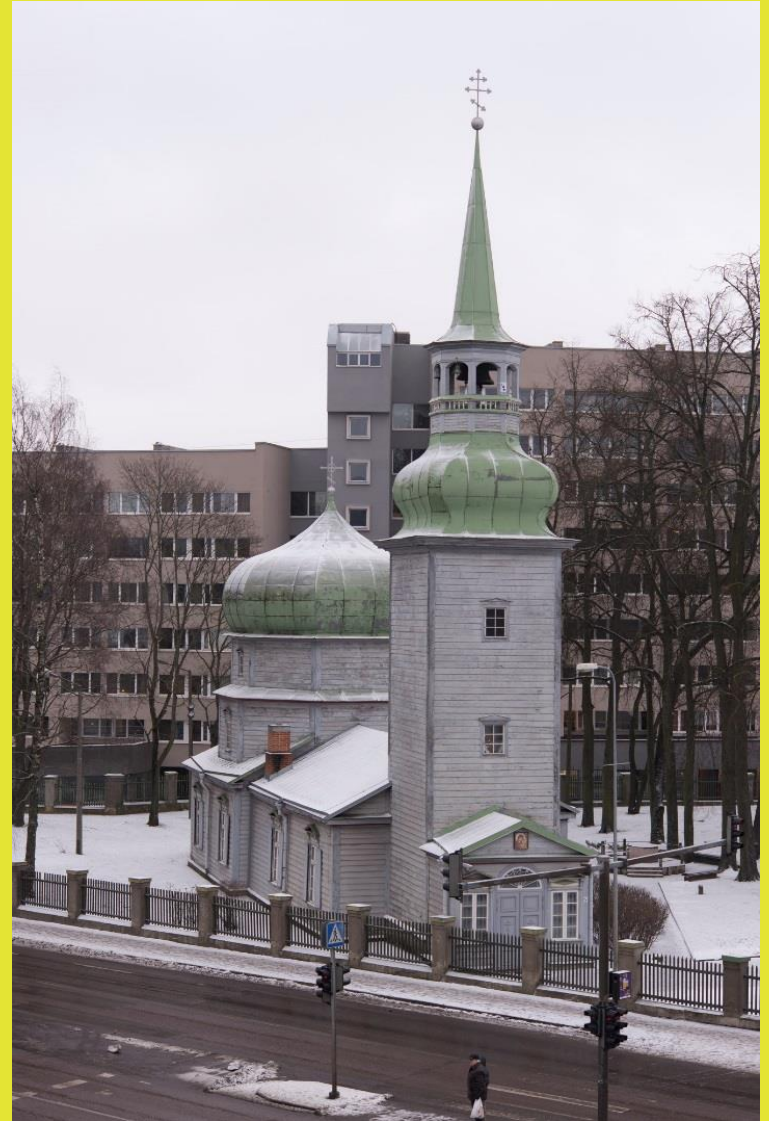


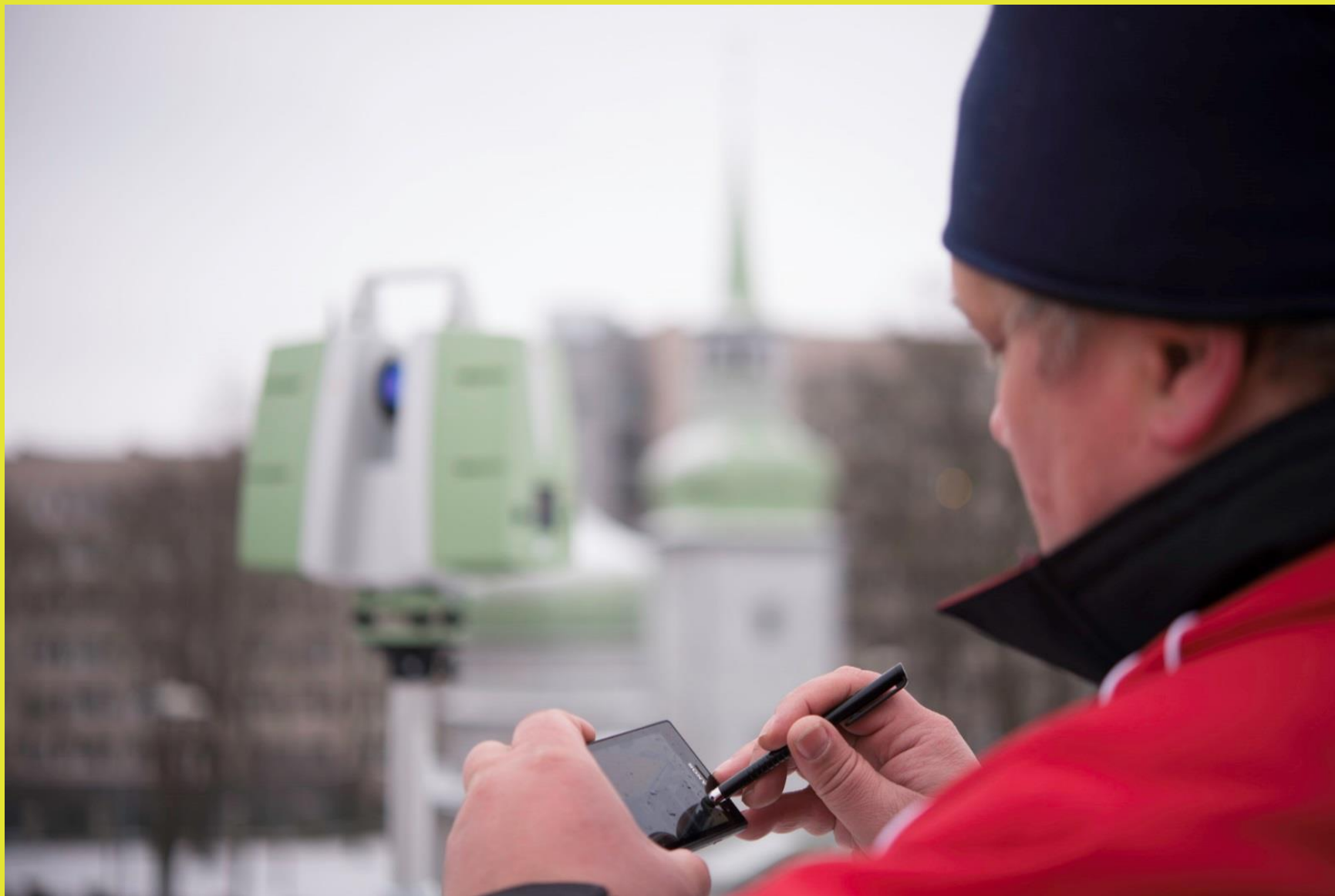




Foto: Archaeovision, 2015









**OlyBet**  
Sports Bar



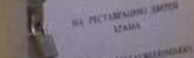








Foto: Archaeovision, 2015



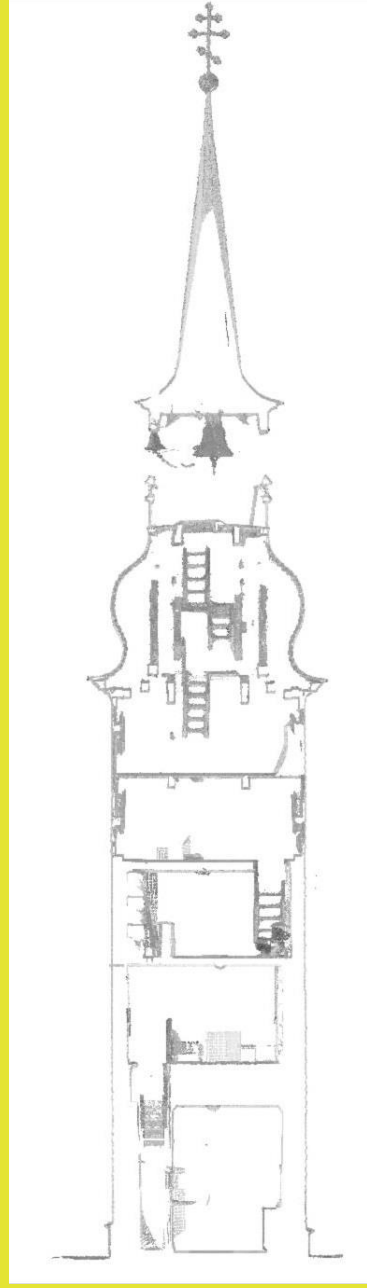


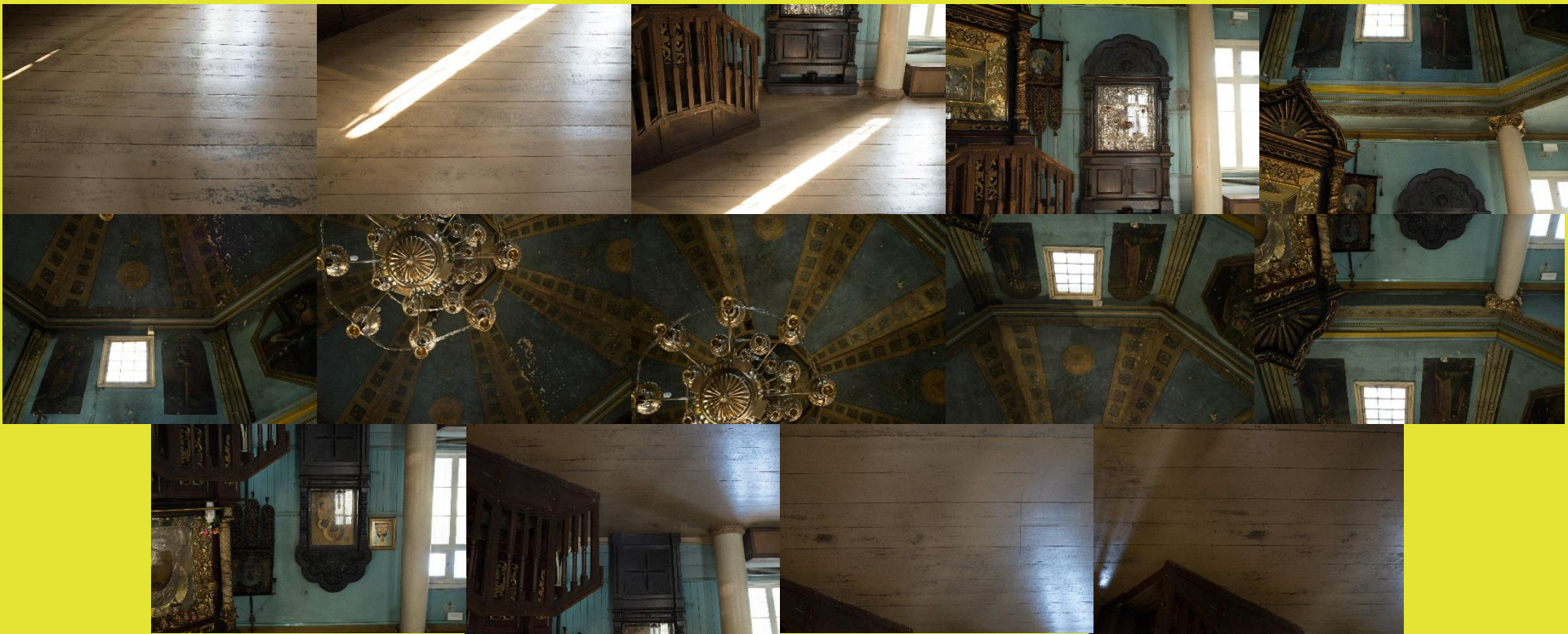






Foto: Archaeovision, 2015





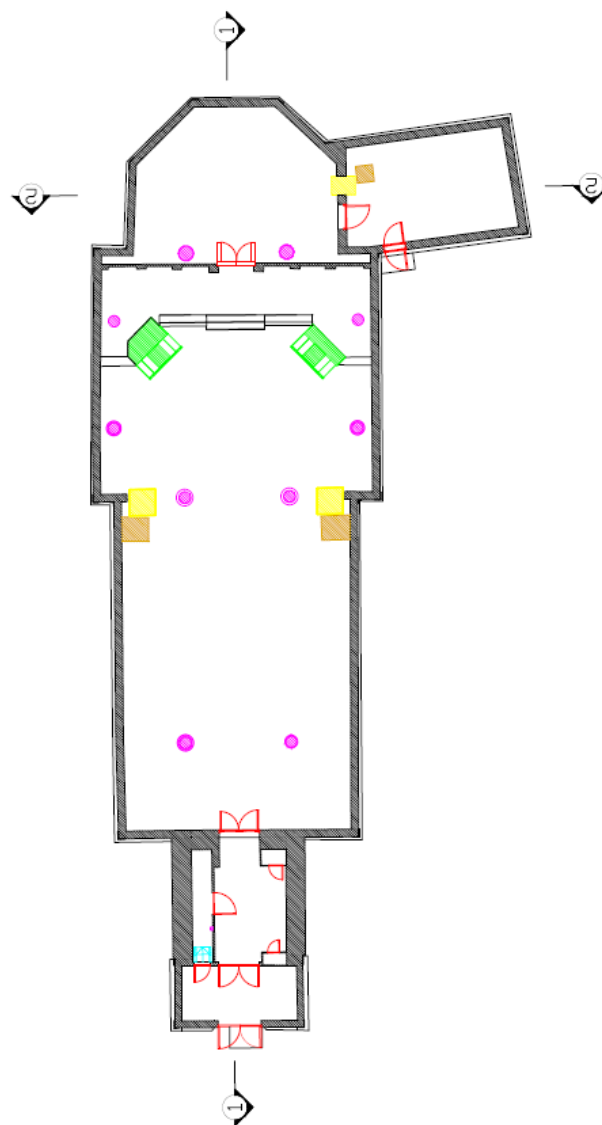




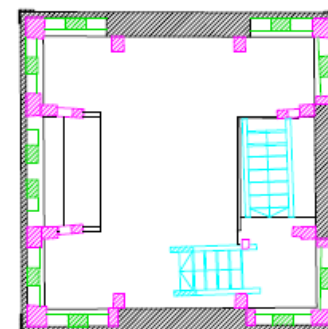




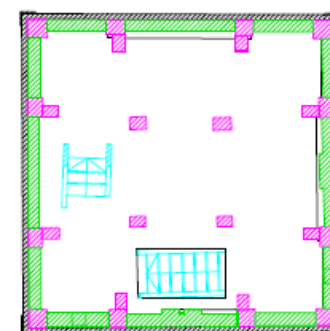




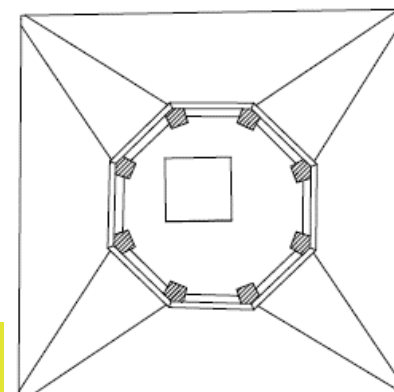
3. KORRUSE PLAAN



4. KORRUSE PLAAN



PLATVORMI PLAAN



# BIM model

- Should be defined by 'alert' or 'constraint' flags - relevant built heritage information.
- Non-specialists
- Interaction

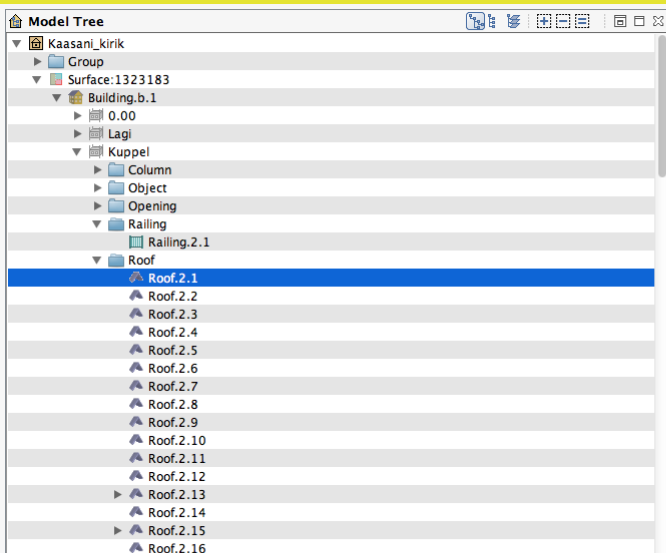


# BIM model

- COBie system
- Metadata
- BIM-ready
- Visualisation not as important



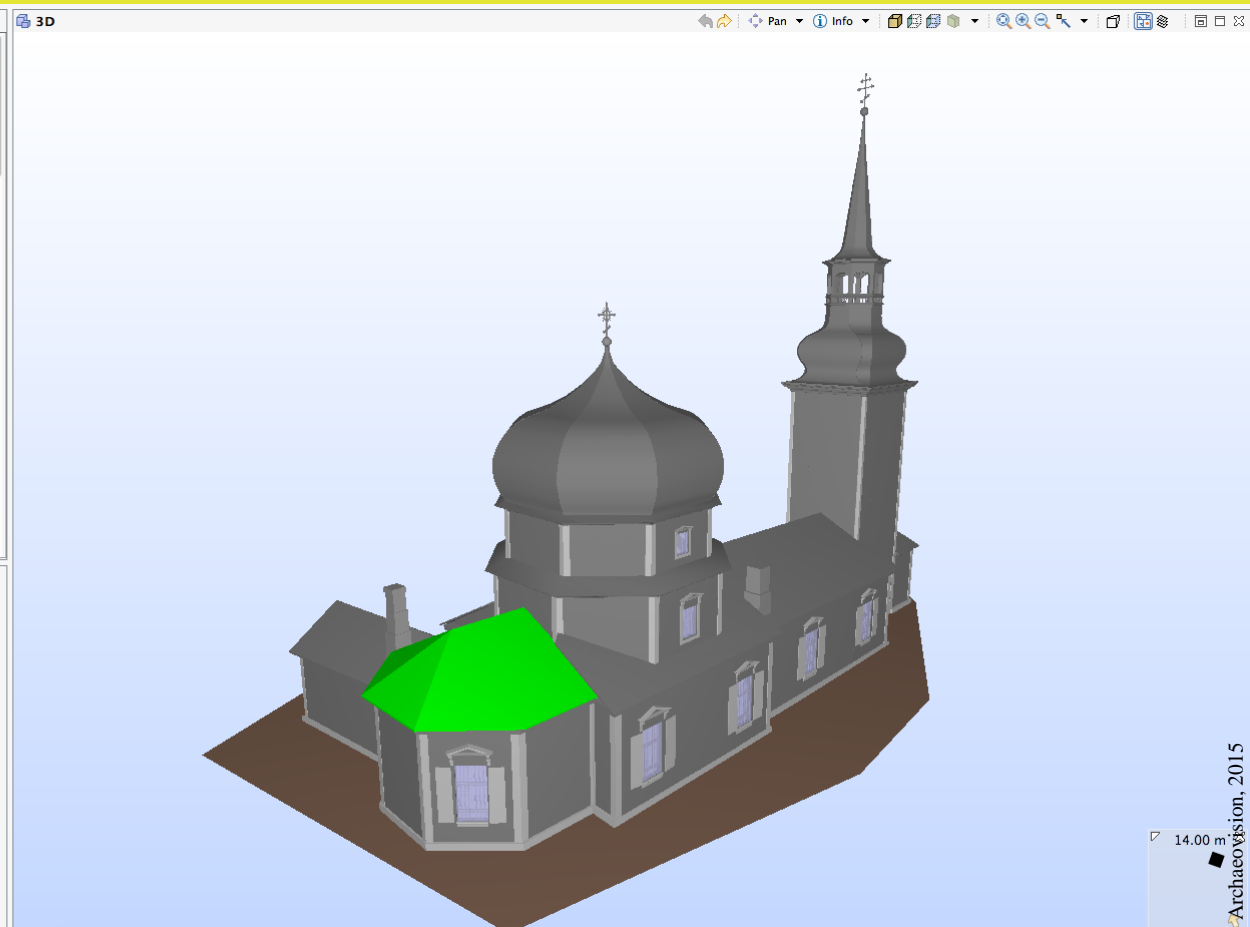


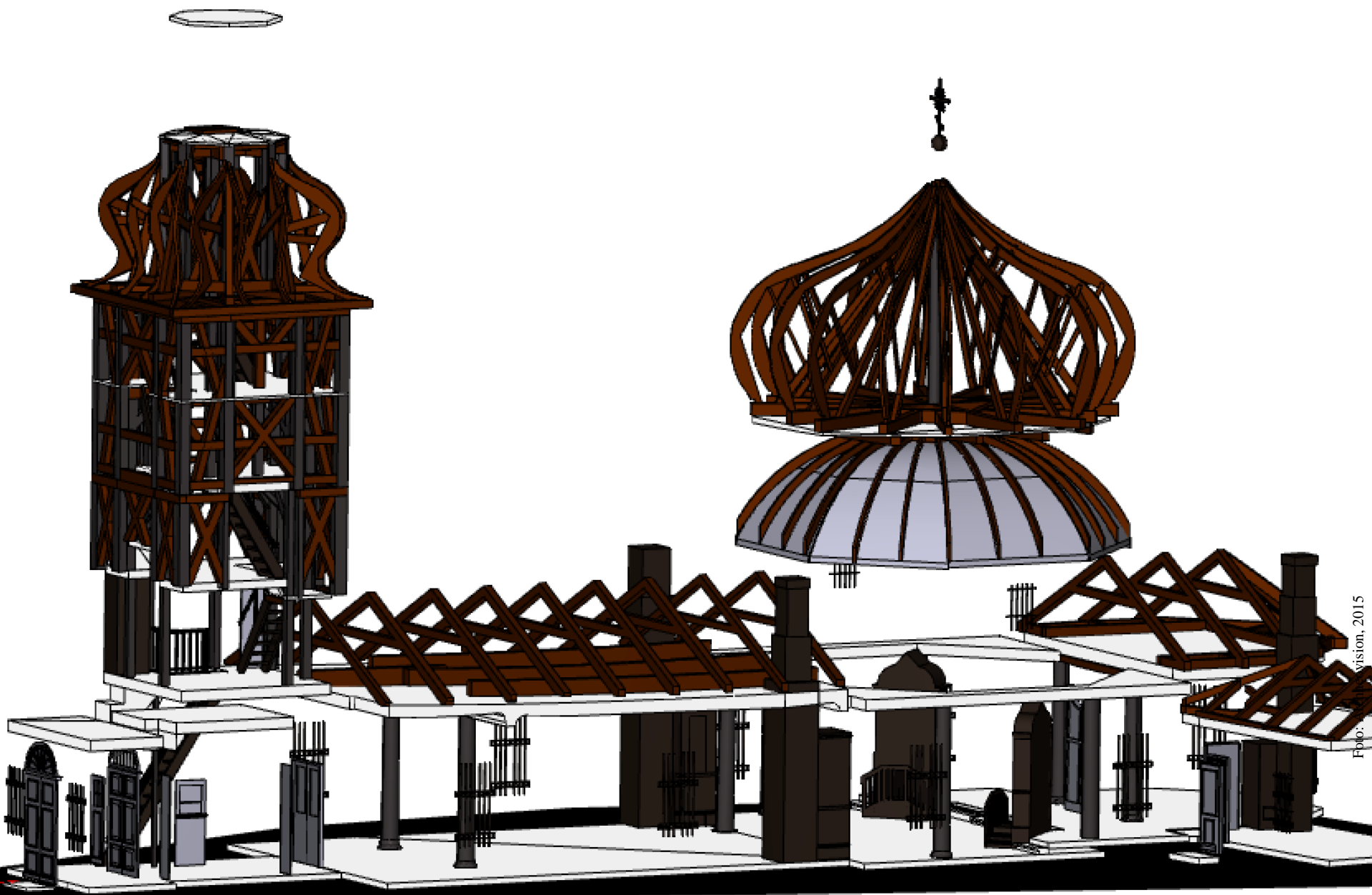


**Info**

Roof.2.1

Identification	Location	Quantities	Material	Relations	Classification
Property			Value		
Model			Kaasani_kirik		
Discipline			Architectural		
Name			Basic Roof:KL_70mm:907939		
Phase					
Type			KL_70mm		
Description					
Material			Default Roof		
Layer			A-ROOF-OTLN		
System					
Geometry			Boundary Representation		
Application			Autodesk Revit 2015 (ENU)		
GUID			270b0DuAX2FgR_2QyEq3cC		
BATID			907939		





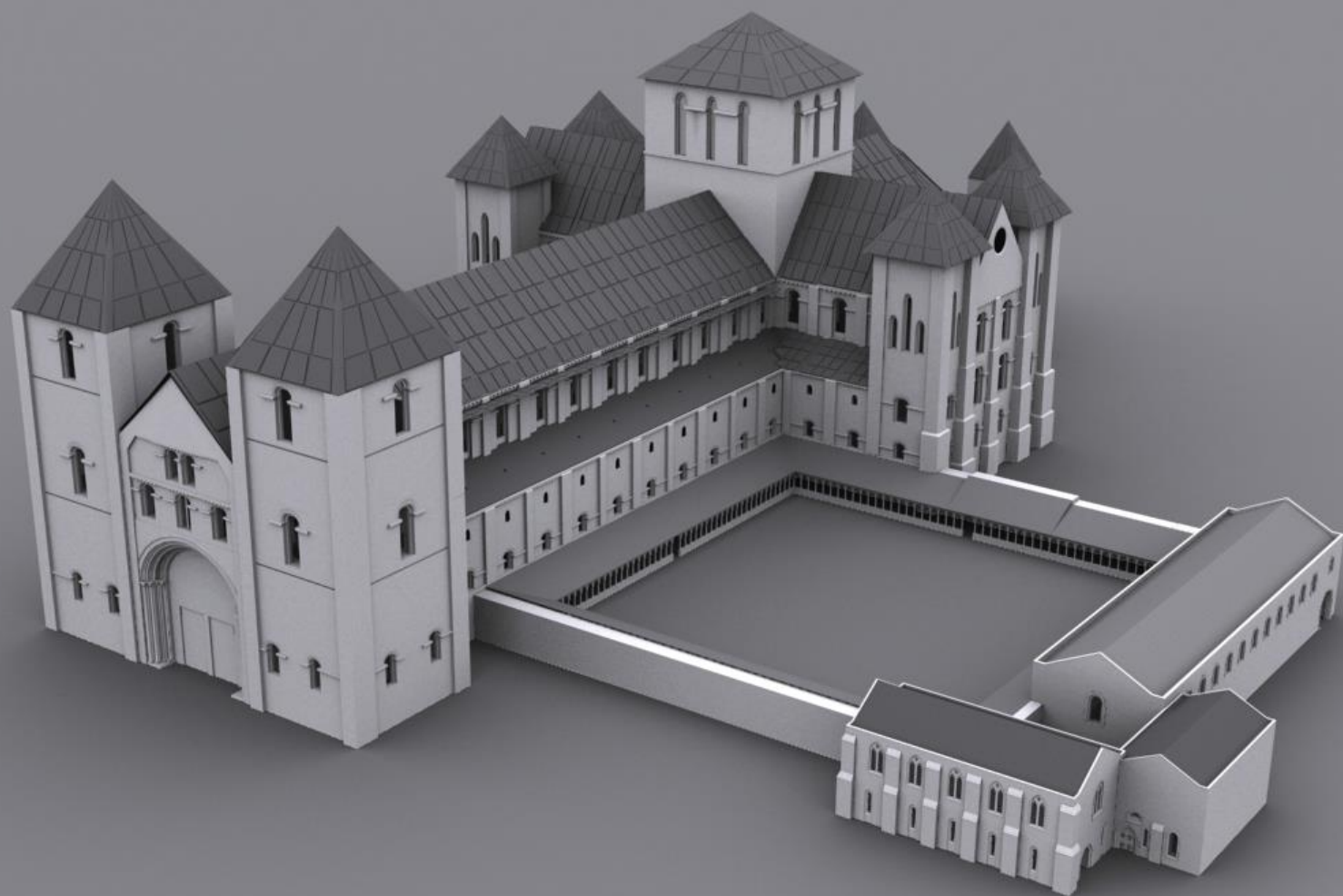






# Winchester Cathedral



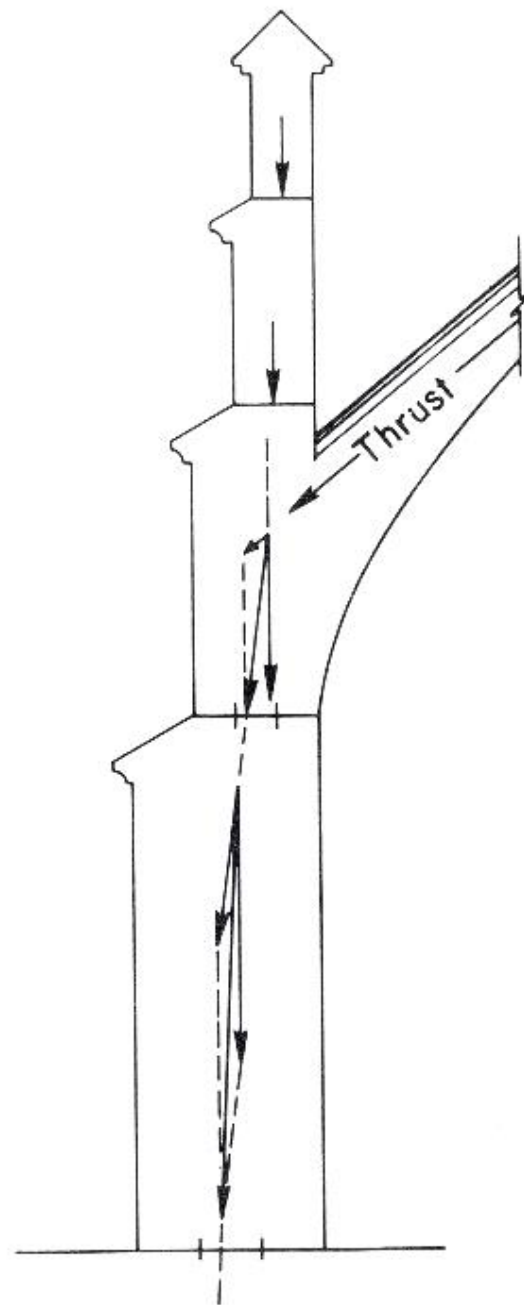
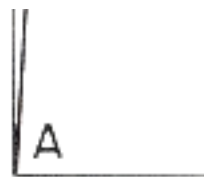






Load

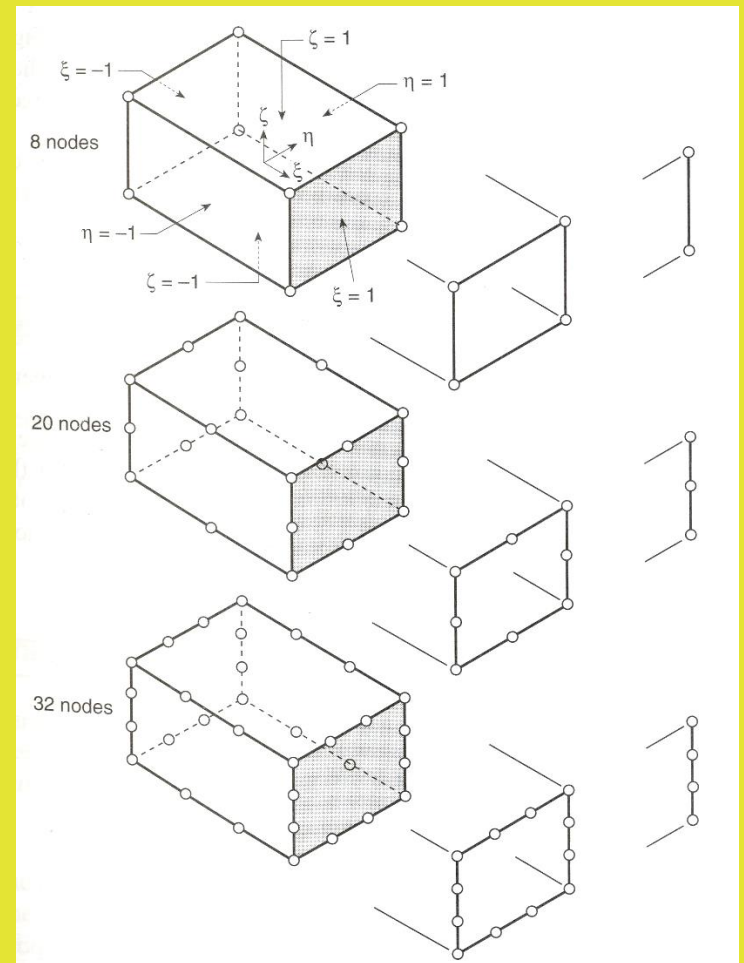
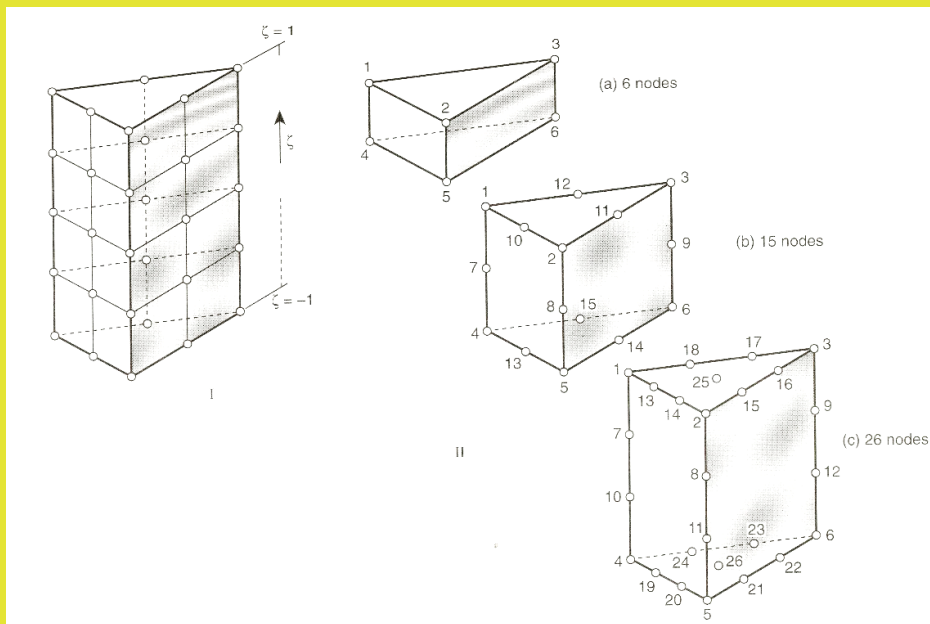
$$\sum F_x = 0$$

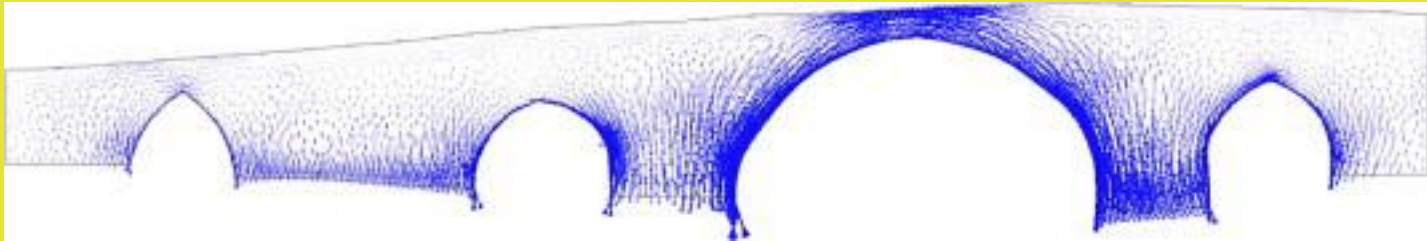


Middle Third

$$\sum M_z = 0$$







Arias et al., 2007: 1453



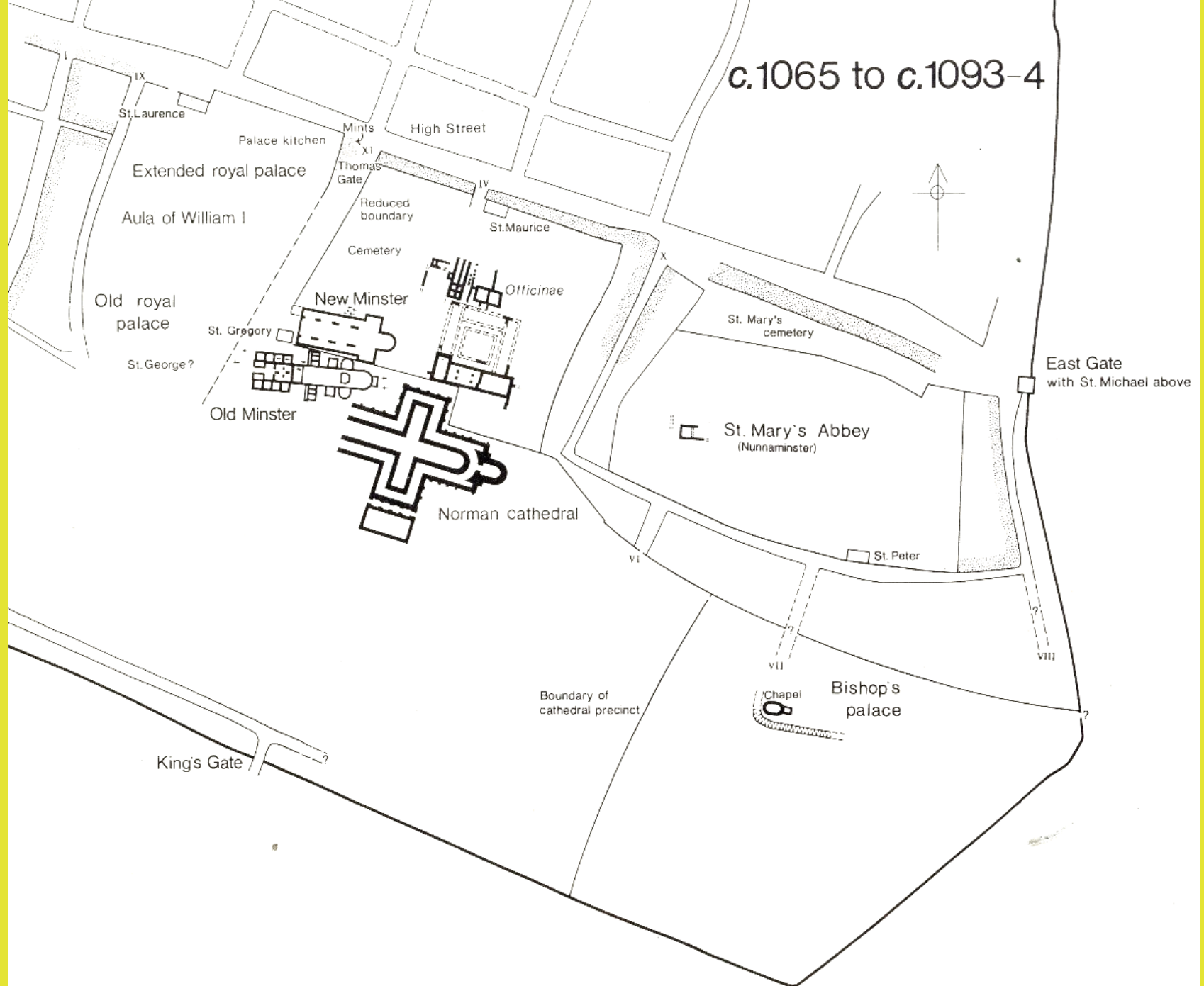
Brandonisio et al., 2013: 711



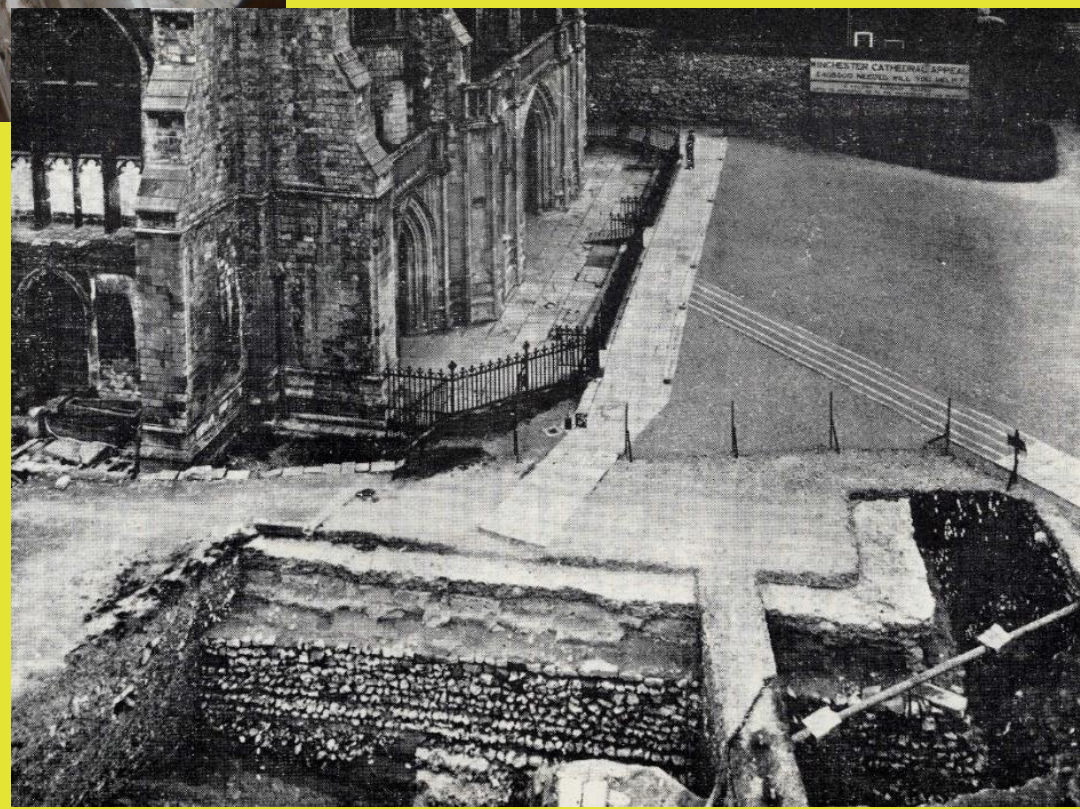
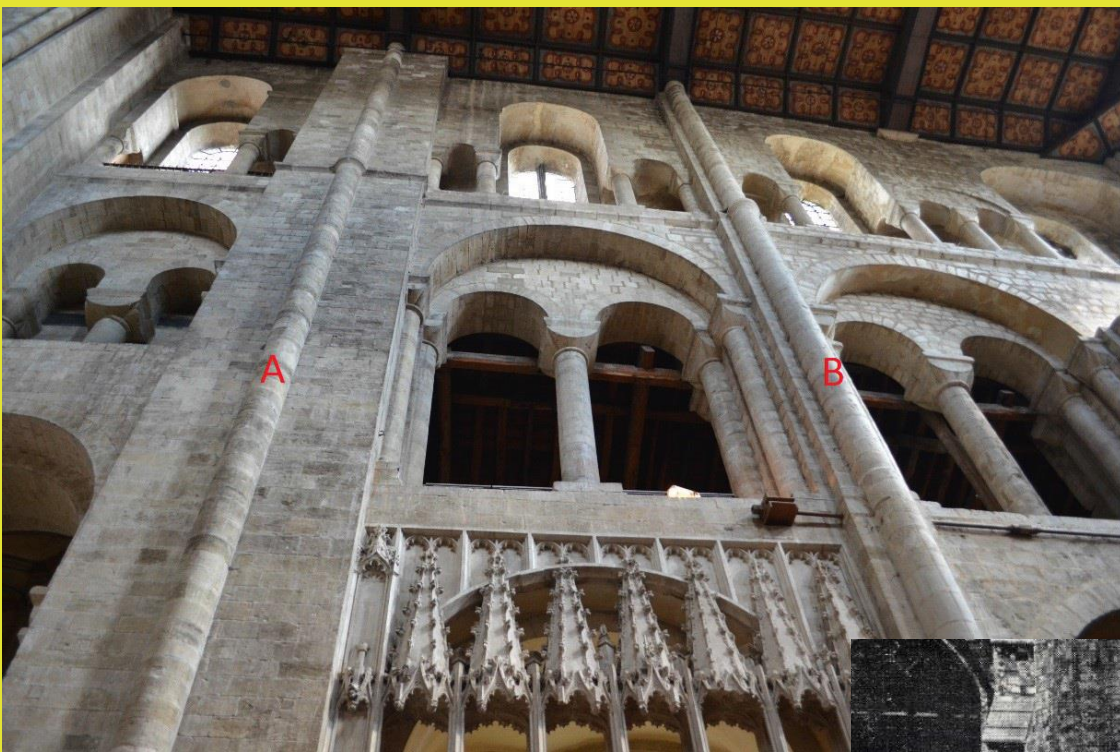




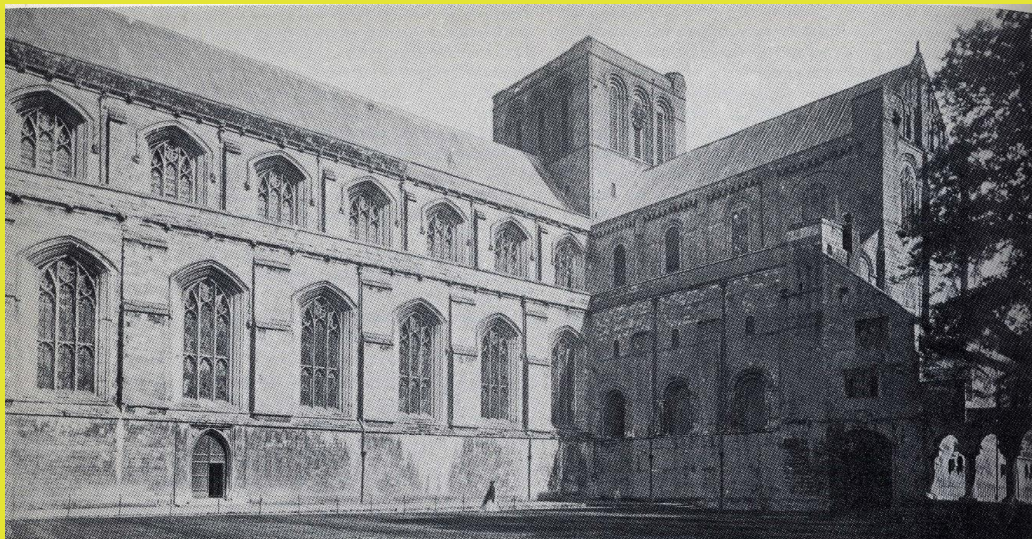
c.1065 to c.1093-4



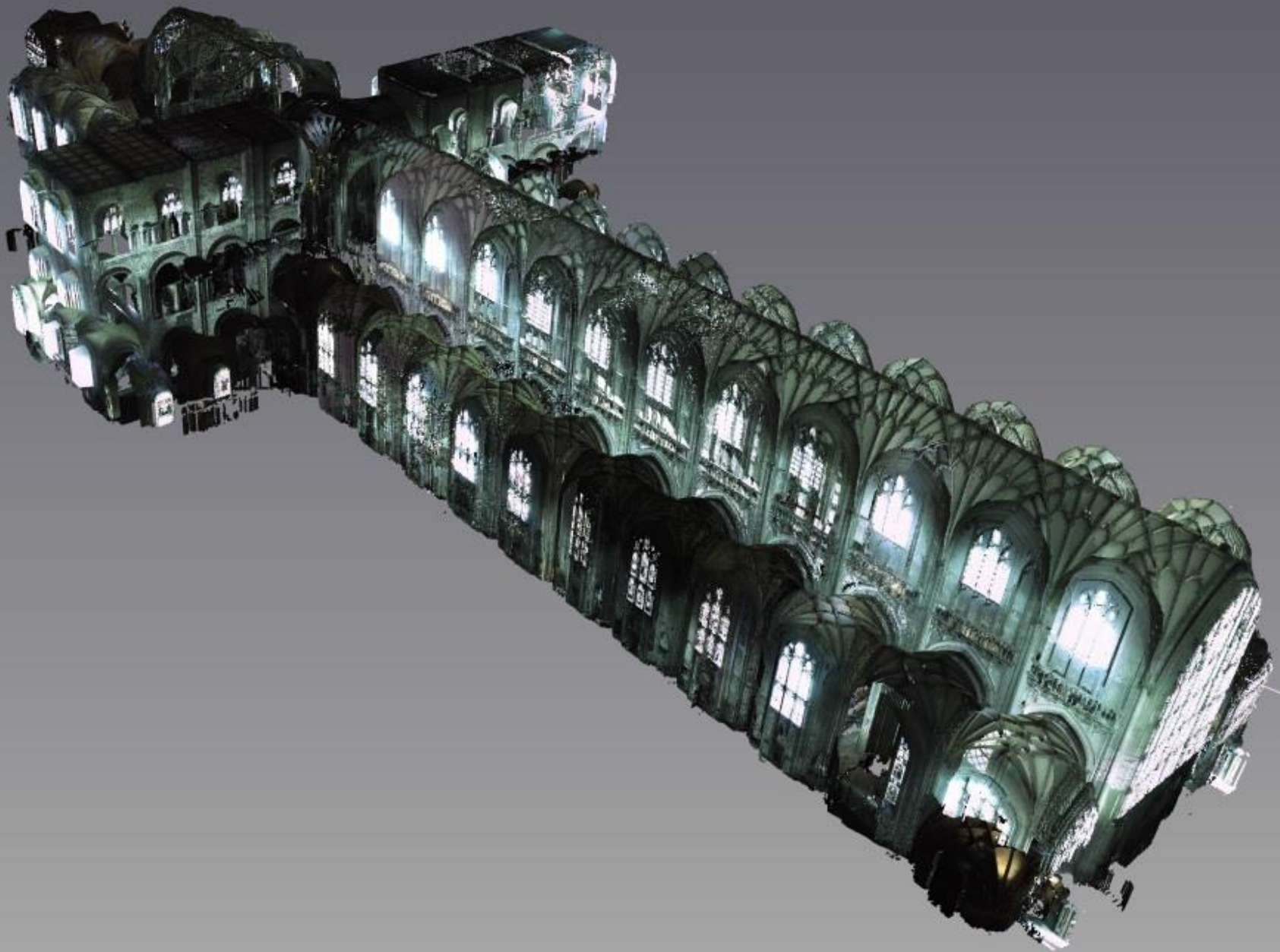


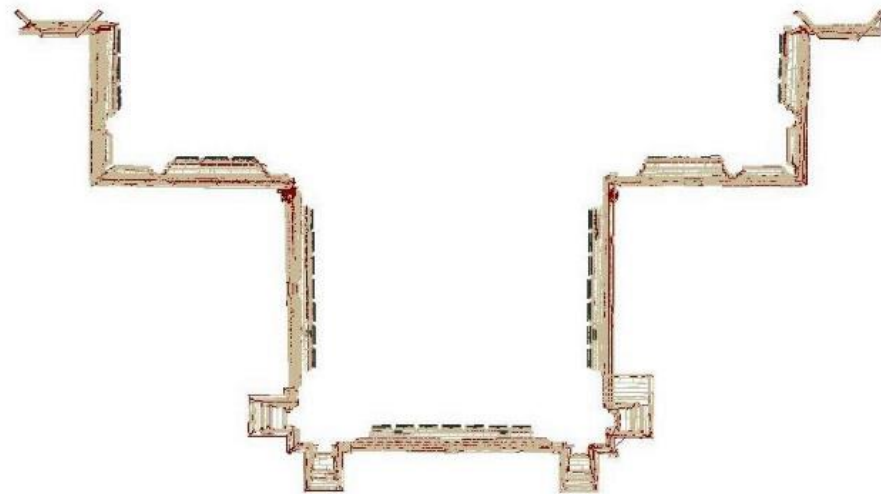
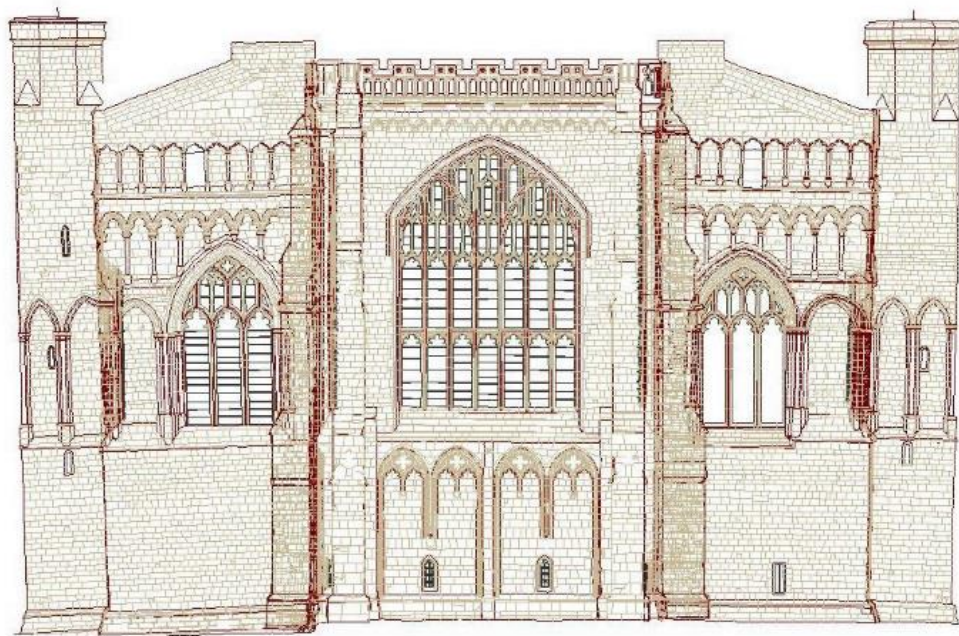




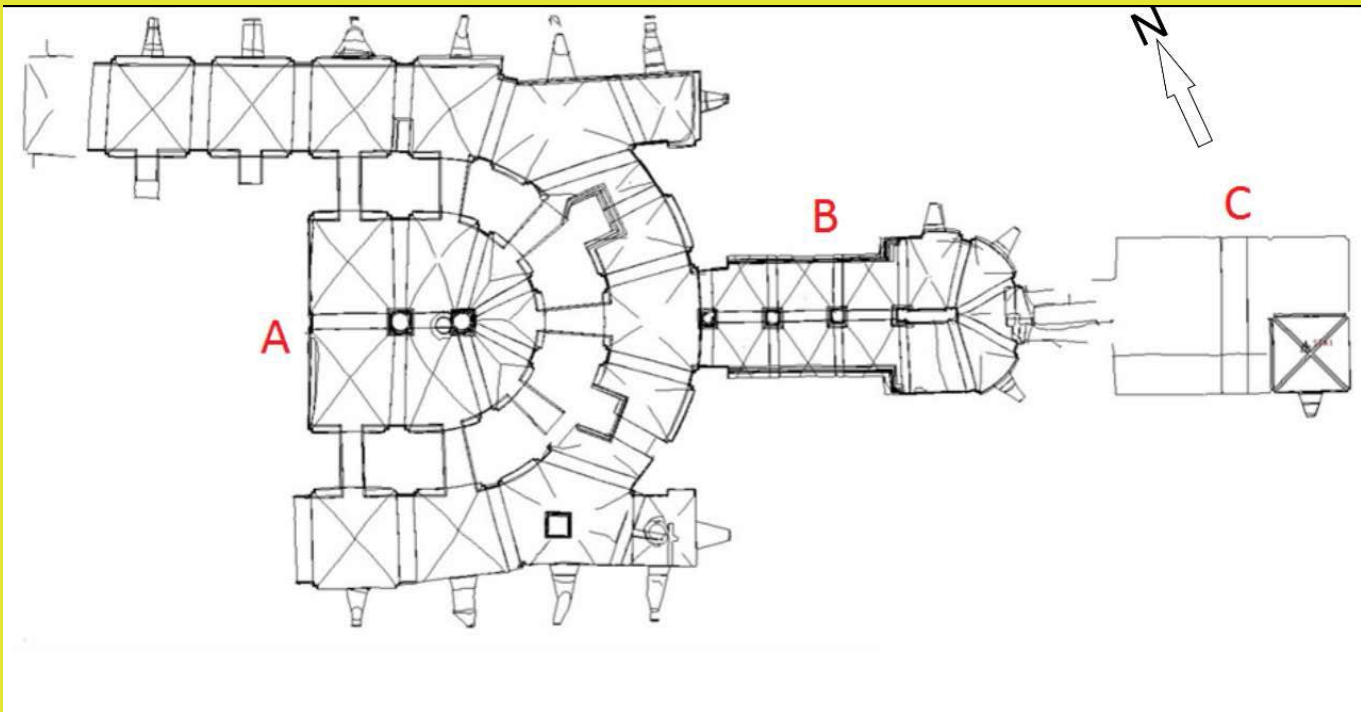


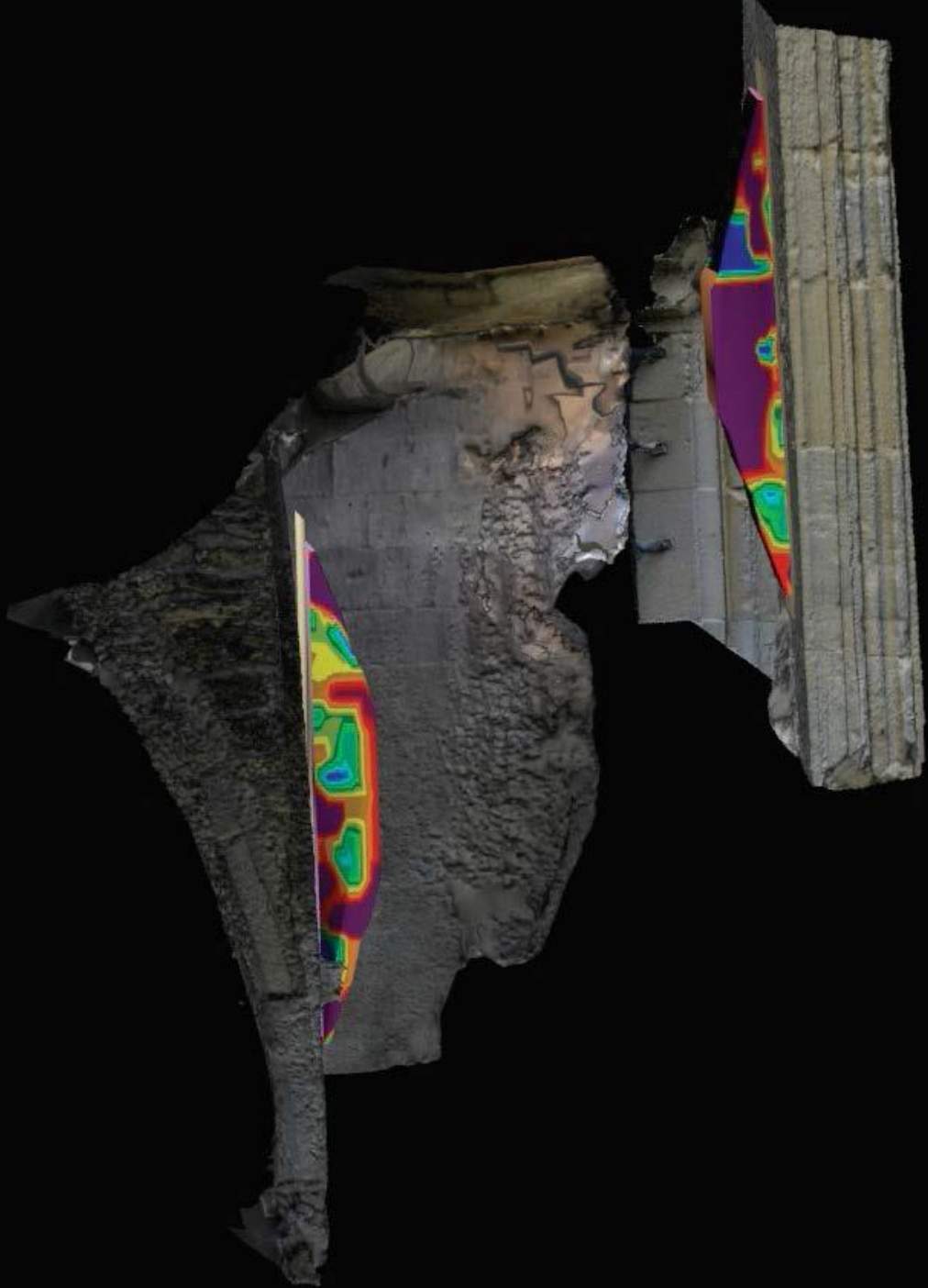












Materials used in Models	Modulus of Elasticity	Mass Density	Poisson Ratio	Compressive Strength	Tensile Strength
Quarr	20GPa	2300 kg/m <sup>3</sup>	0.2	81MPa	3.58MPa
Oak	13GPa	702 kg/m <sup>3</sup> (at 12 % moisture content)	0.35	61MPa	90MPa
Pine	11GPa	520 kg/m <sup>3</sup>	0.3	55MPa	104Mpa
Purbeck	28GPa	2500 kg/m <sup>3</sup>	0.25	120MPa	8 pa
Wattle and Daub	2.5GPa	1700 kg/m <sup>3</sup>	0.15	2.55MPa	0.8MPa



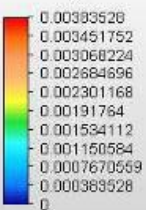




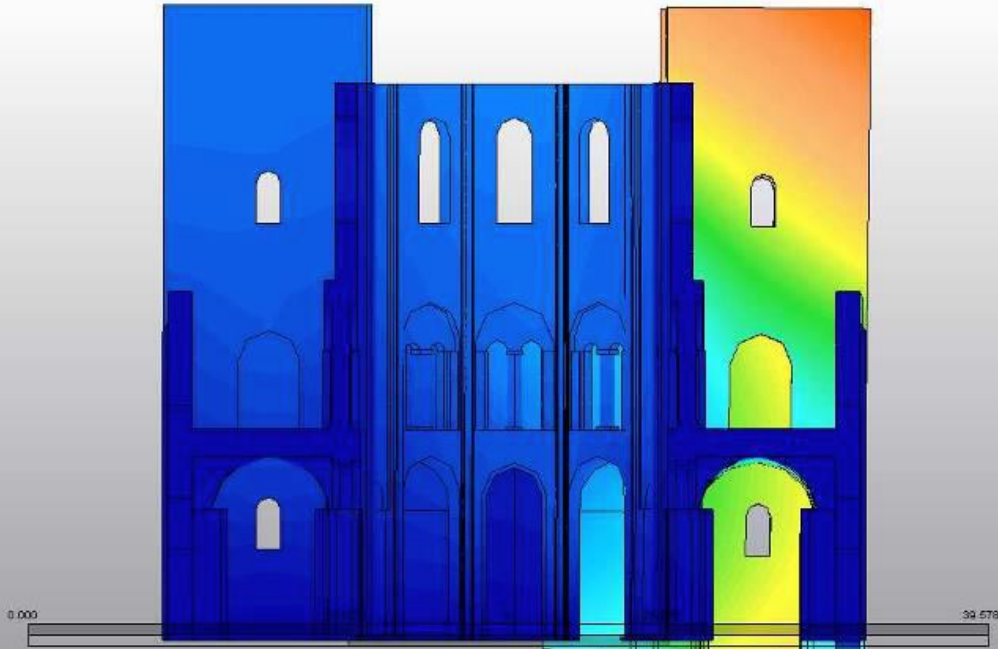




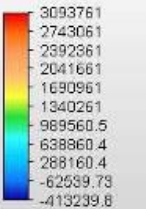
Displacement  
Magnitude  
m



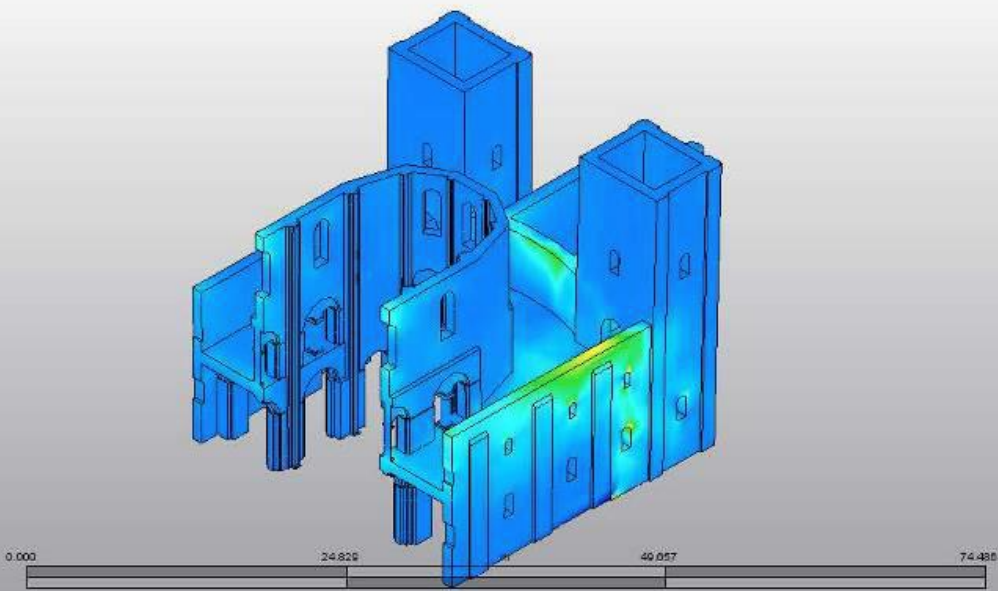
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Minimum Value: 0 m  
1 < Design Scenario 1 >



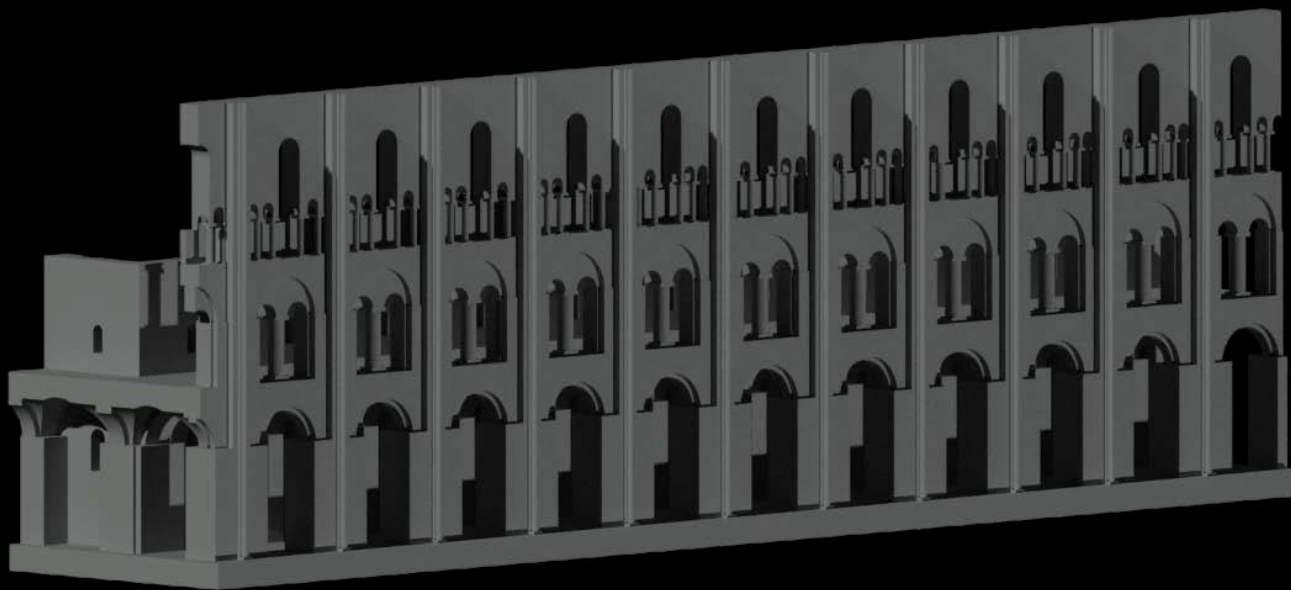
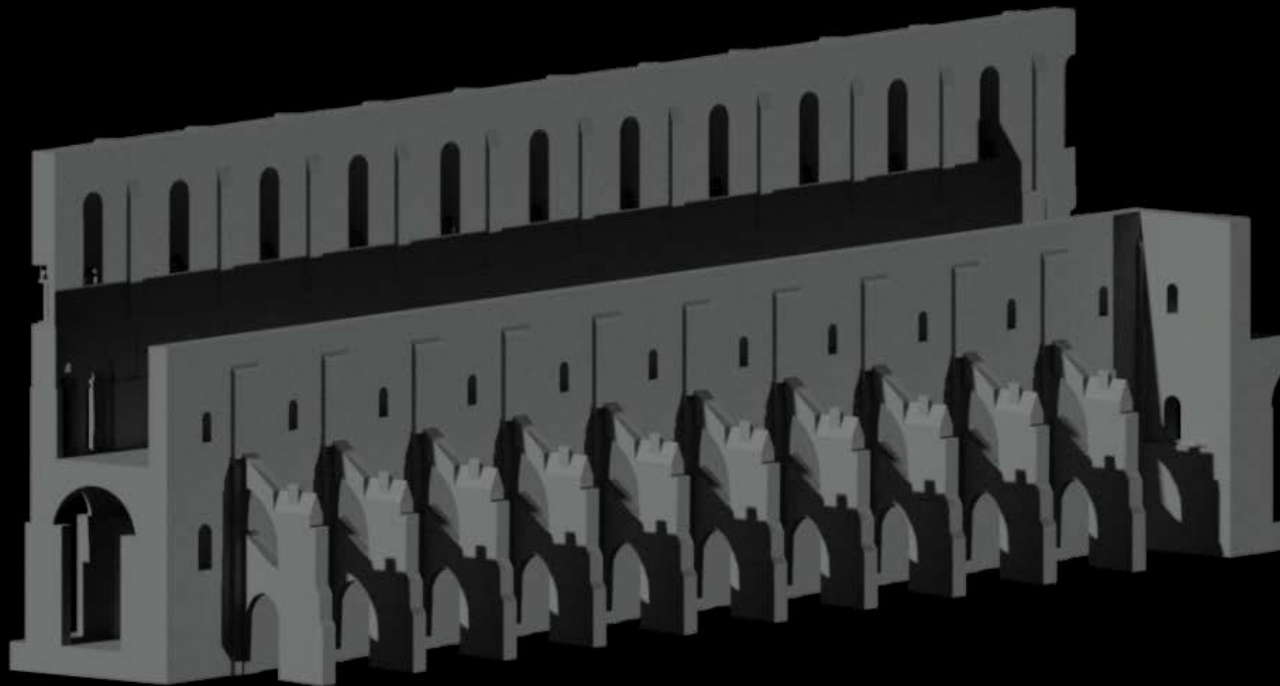
Stress  
Maximum Principal  
N/(m<sup>2</sup>)



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Minimum Value: -413240 N/(m<sup>2</sup>)  
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Stress  
Minimum Principal  
N/(m<sup>2</sup>)

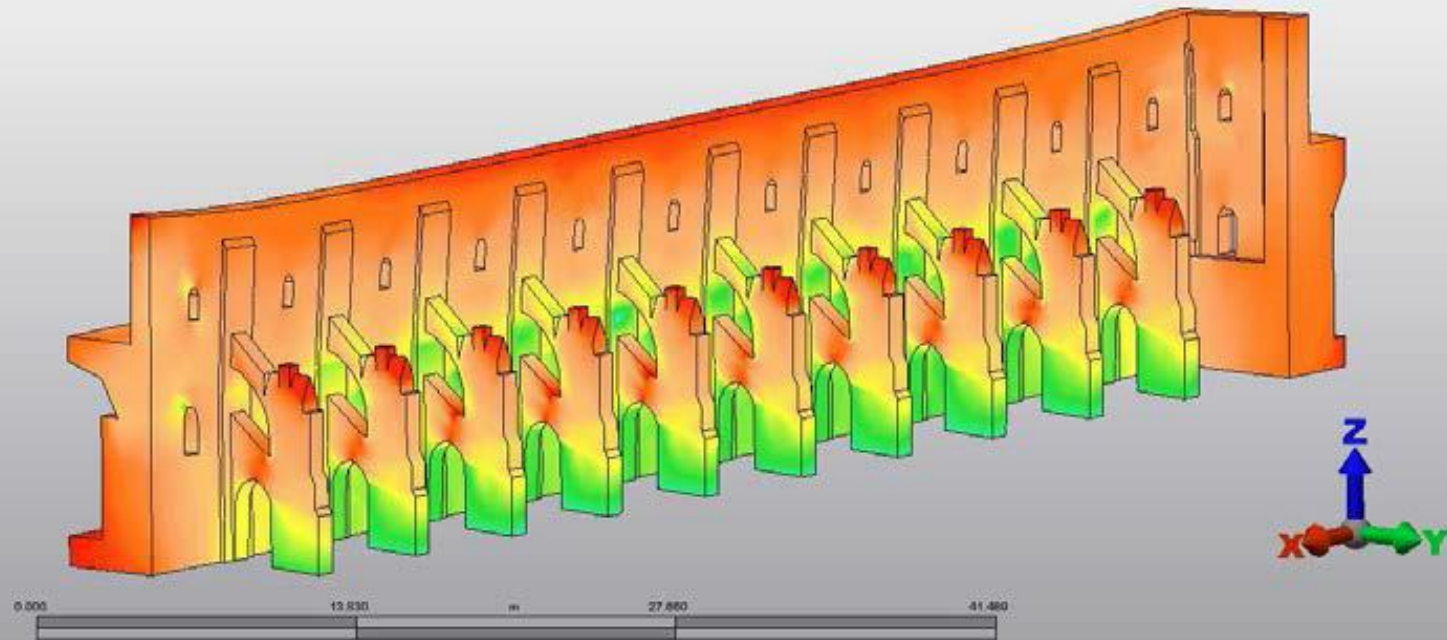


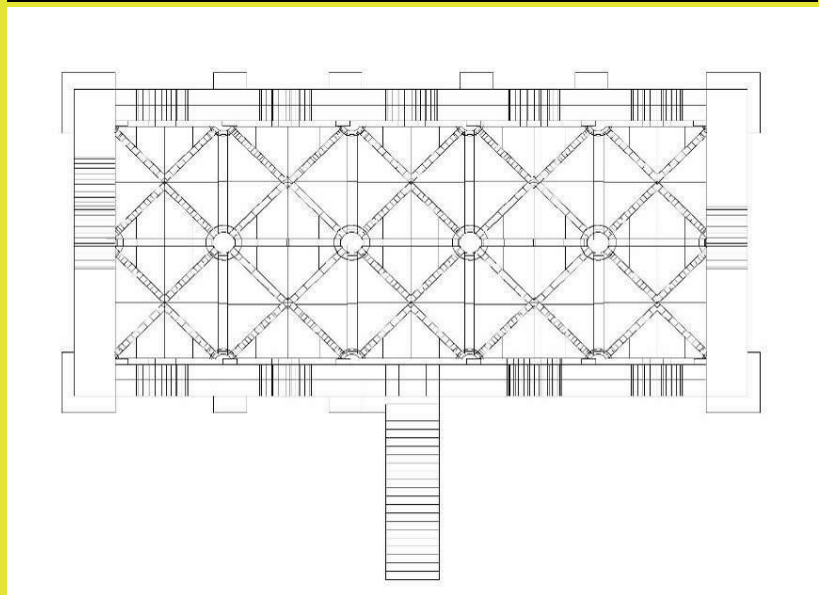
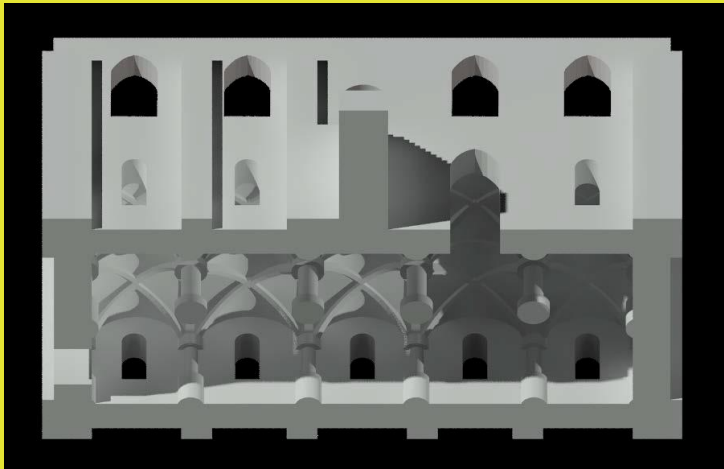
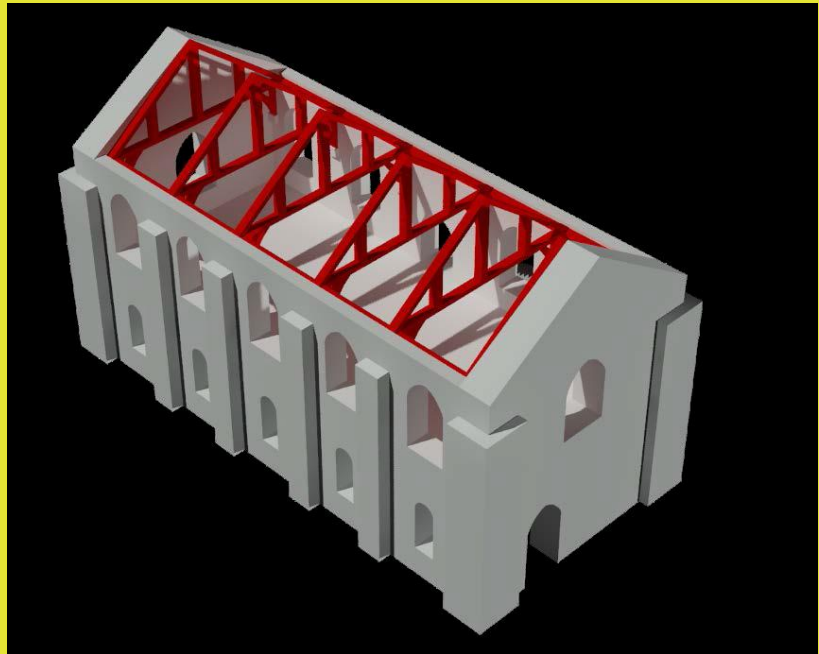
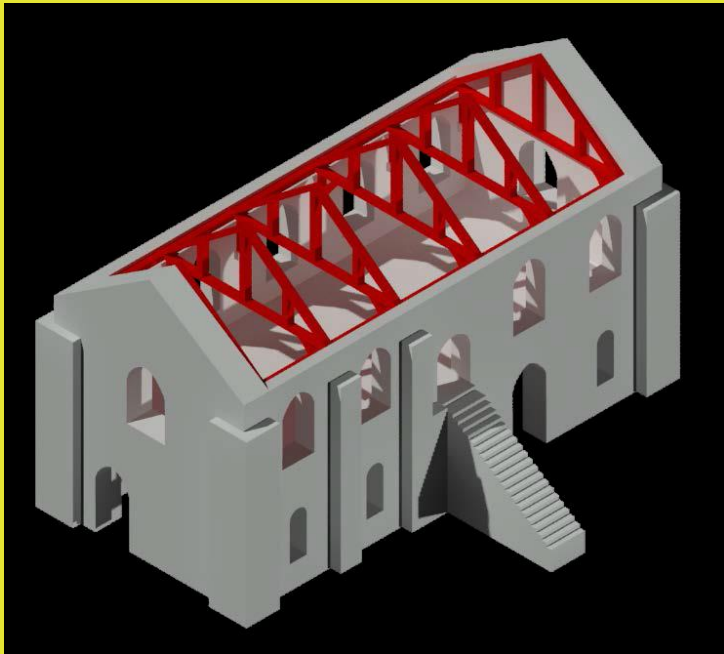
Load Case: 1 of 1

Maximum Value: 9837.2 N/(m<sup>2</sup>)

Minimum Value: -372472 N/(m<sup>2</sup>)

1 < Design Scenario 1 >

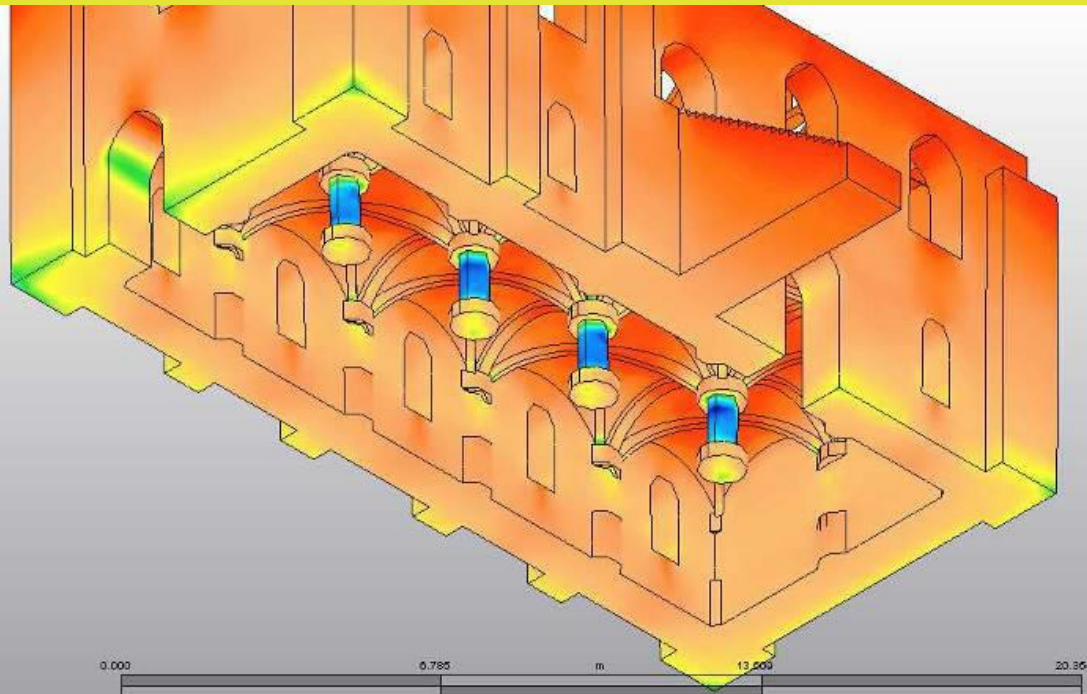






Stress  
Minimum Principal  
N/(m<sup>2</sup>)

35042.05  
-32029.42  
-99100.88  
-156172.4  
-233243.8  
-300315.3  
-367386.8  
-434458.2  
-501529.7  
-568601.2  
-635672.6



Load Case: 1 of 1

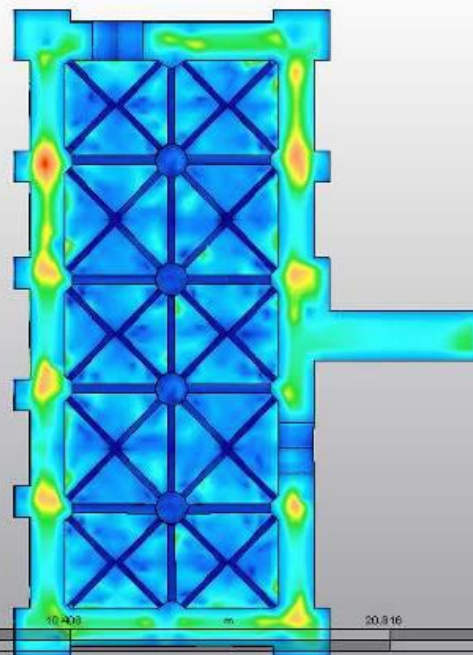
Maximum Value: 35042 N/(m<sup>2</sup>)

Minimum Value: -635673 N/(m<sup>2</sup>)

1 < Design Scenario 1 >

Applied Force  
Magnitude  
N

1933.493  
1740.143  
1546.794  
1353.445  
1160.096  
966.7466  
773.3973  
580.0481  
386.6989  
193.3496  
0.0003878416



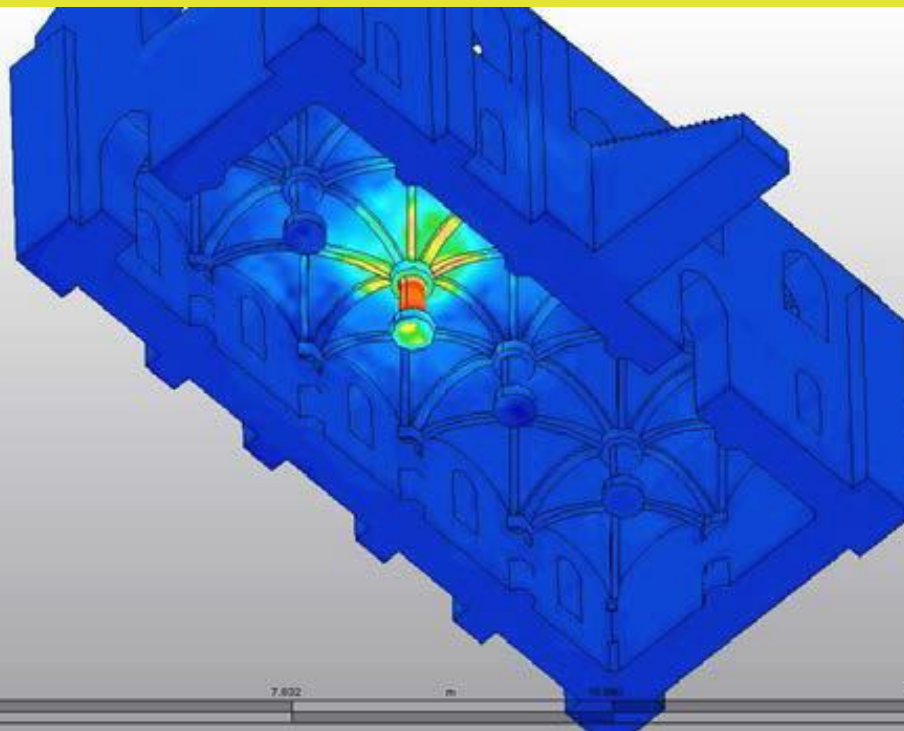
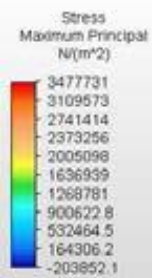
Load Case: 1 of 1

Maximum Value: 1933.49 N

Minimum Value: 0.000387842 N

1 < Design Scenario 1 >



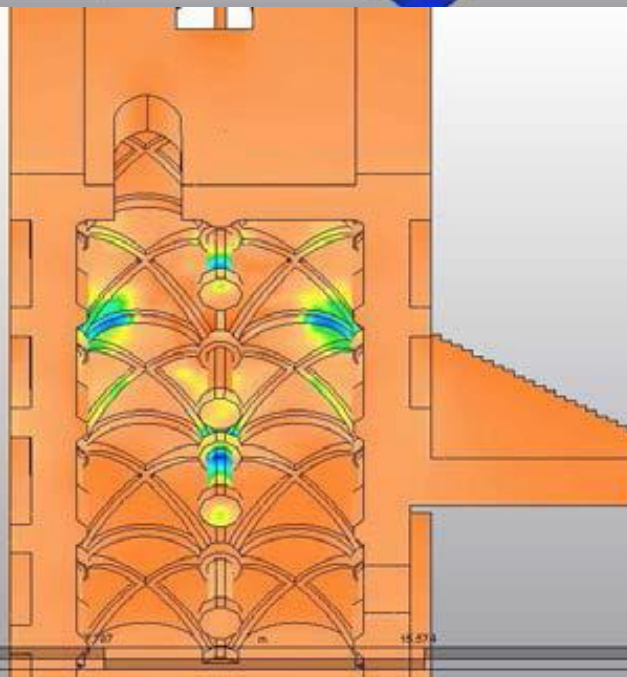
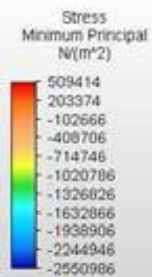


Load Case: 1 of 1

Maximum Value:  $3.47773\text{e}+06 \text{ N/m}^2$

Minimum Value:  $-203852 \text{ N/m}^2$

1 < Design Scenario 1 >



Load Case: 1 of 1

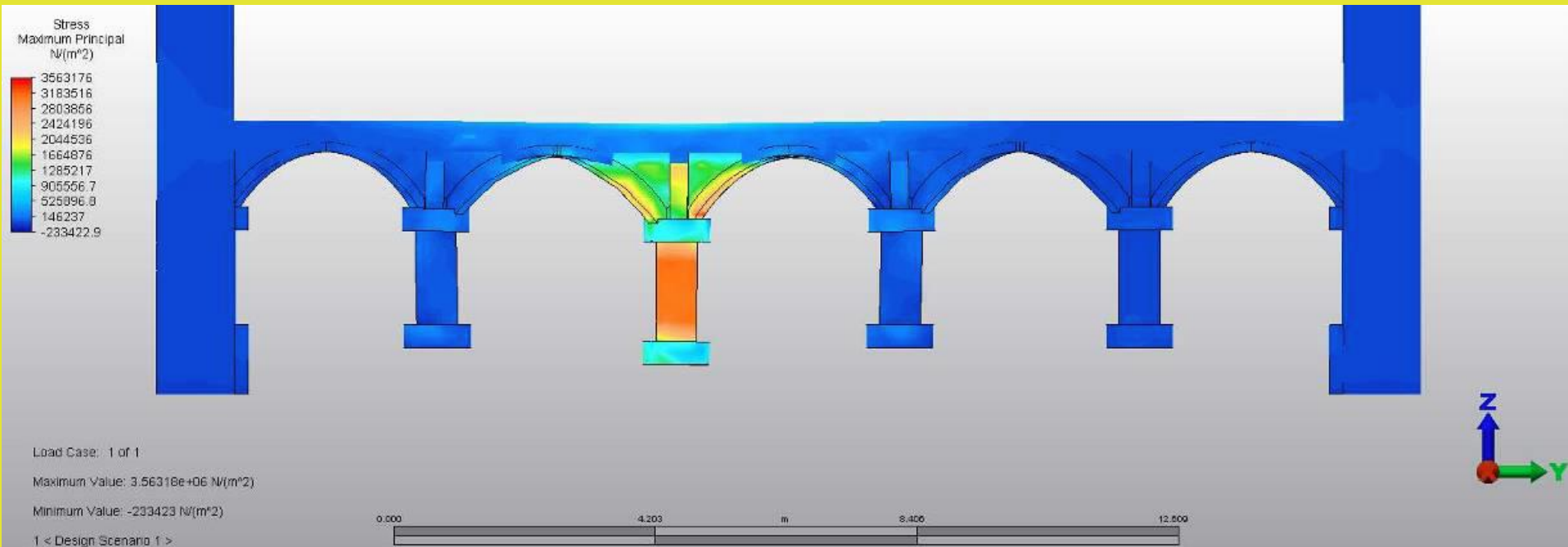
Maximum Value:  $509414 \text{ N/m}^2$

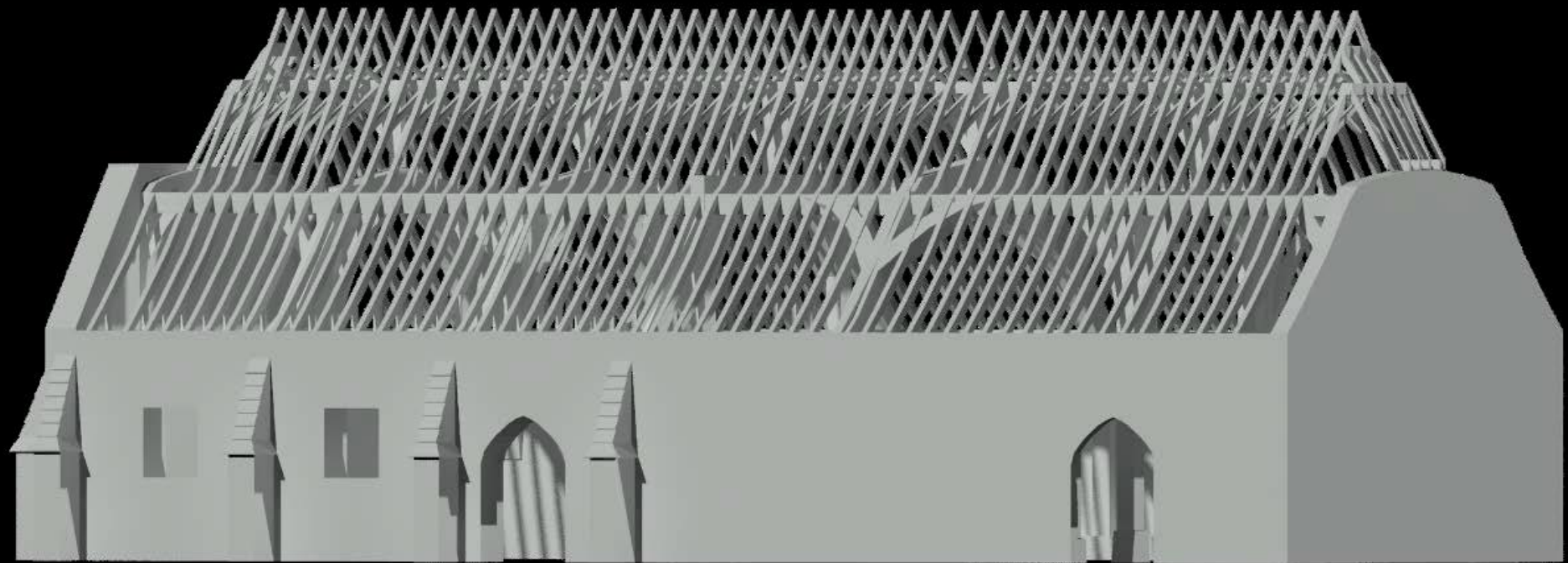
Minimum Value:  $-2.55099\text{e}+06 \text{ N/m}^2$

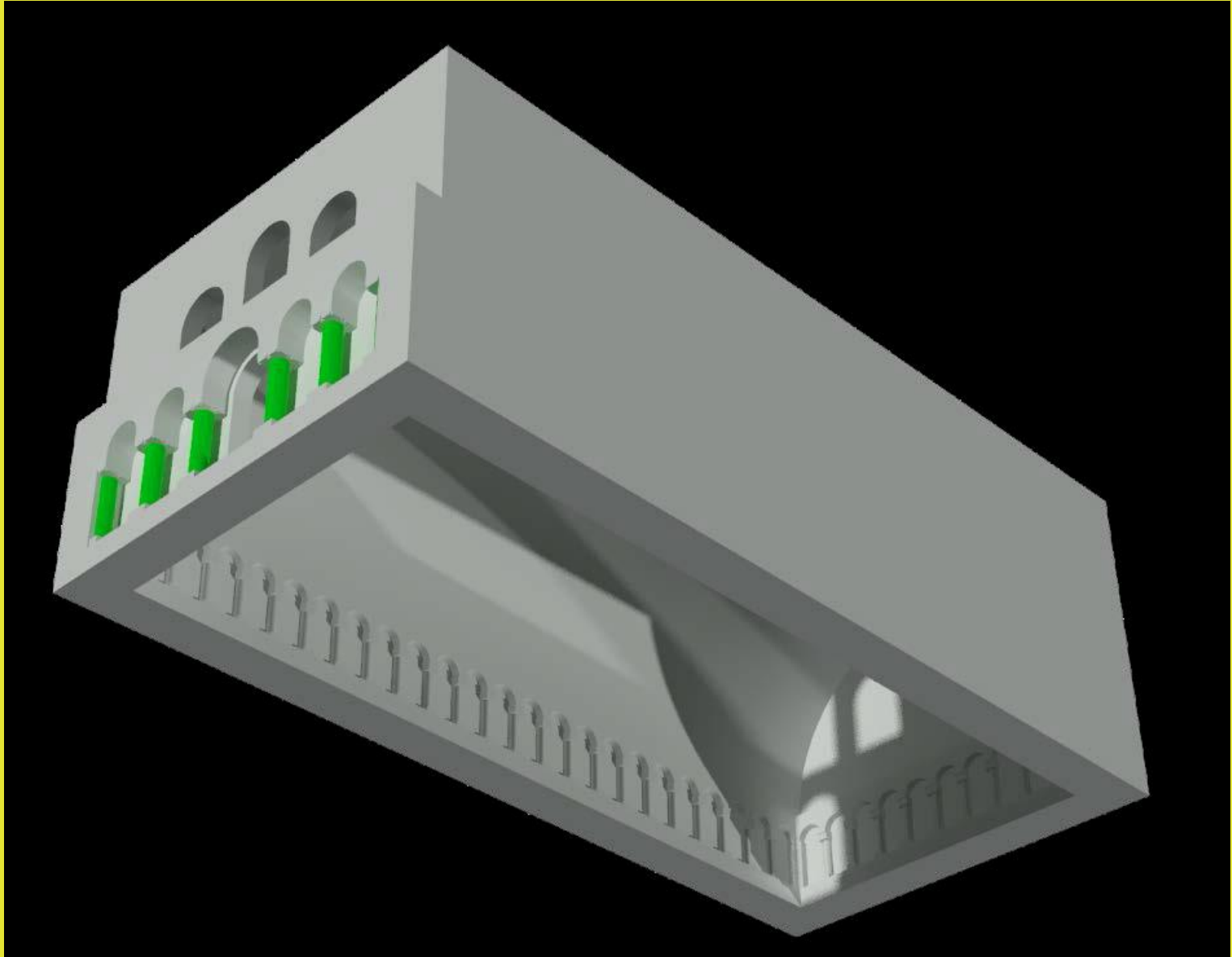
1 < Design Scenario 1 >



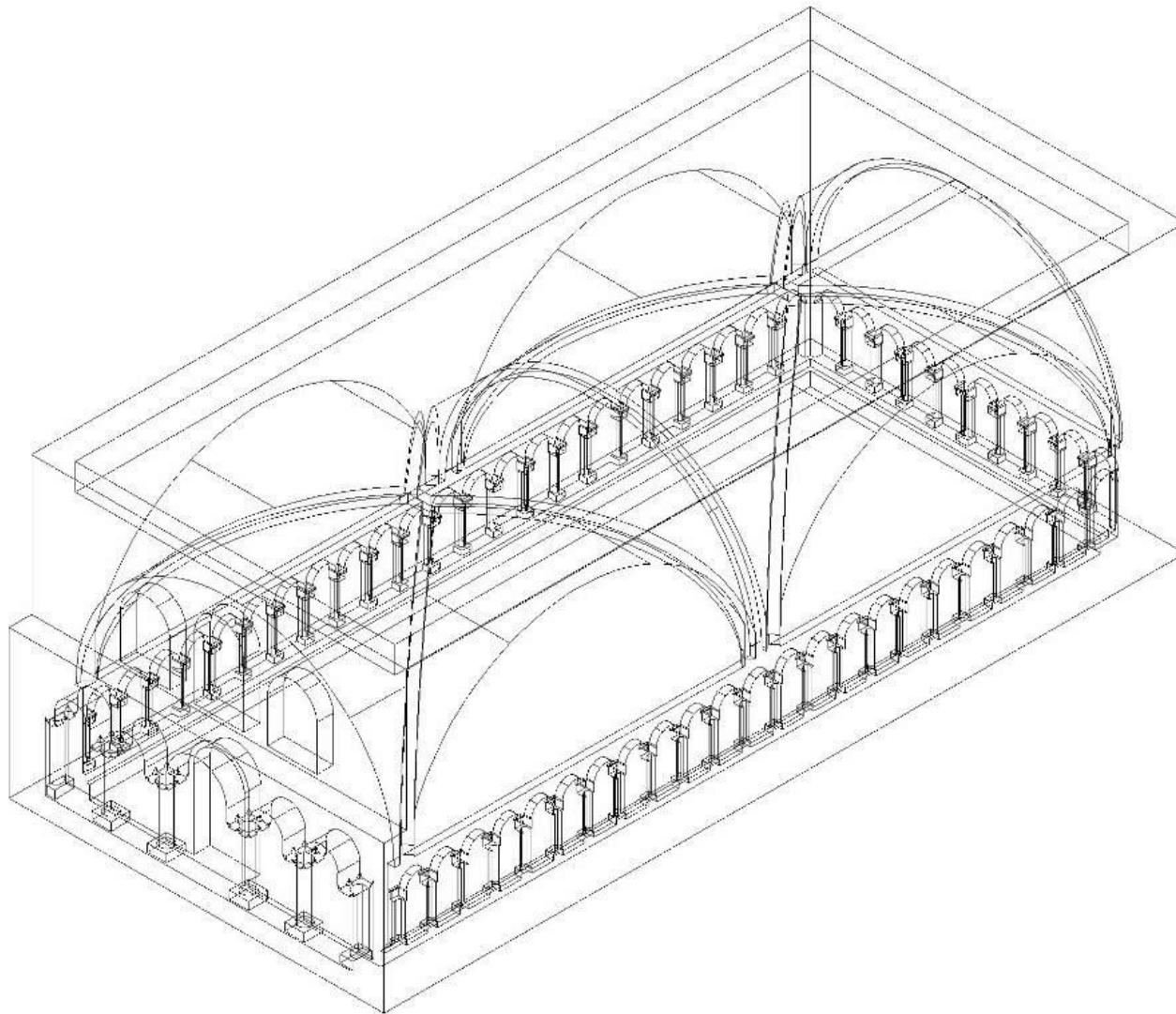












# Future of BIM?

- 3D models should be created but not developed as a set level 2 or level 3 procedure
- Heritage requires increased detail
- Initial design model from which structural/architectural or service changes or additions to the structures could be developed
- Built to support ongoing maintenance of structures
- Greater integration of survey data
- Phasing method - layering system
- Confined via software choices





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