CRIME CAMPUS GARTCOSH

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[fig.1] View of the Scottish Crime Campus in Gartcosh.

CONTENT

0.0 INTRODUCTION

0.1 Background

"The science of building, the rationalisation of construction and assembly, however vital in themselves, remain in the world of literal action. It is only when the architect seizing this world, organises it according to the logic of symbolic forms that architecture results." [1]

The Scottish Crime Campus is a new Government initiative to enhance collaboration between various anti-crime agencies. It brings together the Scottish Crime and Drug Enforcement Agency, Serious Organised Crime Agency, Her Majesty's Revenue and Customs, Scottish Police Services Authority Forensic Services, Crown Office Procurator Fiscal Service and UKBA into a single campus at Gartcosh to support the work of Police Scotland. The commission for the Scottish Crime Campus was won by the team of GMA (Gordon Murray Architects) and BMJ in a competition run by the Scottish Government. GMA's principle expertise has been in office design, and BMJ's in laboratory design. This project is the single largest investment in a public building project by the Scottish Government since the building of the Scottish Parliament ten years ago. Professor Murray was Lead Consultant on one of the runner up teams competing for that project.

0.2 Introduction

The Campus was envisaged as a centralised facility for detection and prevention of serious crime, bringing together various detection agencies under one roof to develop ideas of collaboration, exchange and participation in dissemination of information and methodologies for co-operation. It would principally be an office complex of about 12,600 m2, with laboratories, accommodation and other support facilities. It is a significant component in a wider exploration of architectural quality on government buildings working to parameters set out in the Government's Architecture Policy. The project was led by BMJ Architects as lead consultant and fit-out architects.

Gordon Murray Architects (later to become GMA|Ryder) were architects for all external works and the shell and core of the building. In addition, Professor Gordon Murray, the Project Design Leader for GMA|Ryder was also Client Design Champion for the project. Appointed to this role by the Government specifically to ensure continuity and that the design quality established in the concept design and the outcomes from the present research were consistently maintained through the design of project and through all elements of the construction phase.

Appendix A illustrates the site and context in Gartcosh, North Lanarkshire where there are layers of historical precedent but little in the way of built form to influence the design of any new building. The historical centre for North Lanarkshire when it was the focus of high quality steelmaking, the site was remediated in the late 1990s. Its regeneration as a business park focuses on its links to upgraded transport systems – road and rail. As a consequence we looked to a functional analysis of the brief as means of defining form through a metaphorical or allegorical interpretation of the key elements as visual cues to generate new forms. Forms which will resonate with the users, adding layers to a positive productive internal environment. Whilst accessibility is not a key driver in a secure building nevertheless legibility and liveability are important factors for the occupants.

Historically, except where building mass has functioned inadvertently to attenuate heat gain, passive control of environment via the envelopes of building has been achieved by "thin" facades – layers, overhangs, brises-

[1] Symbolic and Literal Aspects of Technology (Architectural Design 11/62) Alan Colquhoun.

soleil. Using 'thick' facades to modulate temperature, shading and intrinsically suggesting a semiology for the building is an area of particular interest to the author. As the use of such systems is rare – constructionally unitisation also results in flatness which in turn is predicated on lightness.

Manufacturing procedures combined with factory production techniques in controlled environments offer new possibilities for materials and structures, such that new concrete products now offer choices of surfaces which can replicate other materials in appearance, performance and light reflectance. Supporting or contrasting with broader objectives of fenestration patterns and the overall scale of the building, the envelope becomes both skin and volume, whose details reflect a visual orthodoxy in terms of scale and grain on facades as one approaches the building.

The design of the facades and surfaces were required to visually embed the ethos of the design solution for the 'Institution' as a highly contextual approach in terms of site, accommodation, objectives and the character of the various institutions as one organisation. Correspondingly it was considered that such a building should have a gravitas in which thin-ness was felt to be inappropriate. The flimsy, the transient, were not a part of the language of the design. Essential, internally, for the functioning of the institution to accommodate change but not in the defining of its syntax.
The design approach would have to synthesize all aspects of design from spatial organisation to detailed fabrication. From this starting point came the principal research questions:

1. What form would a passive environmental control system take, if based on the appropriate pattern language of the external form?
2. How can prefabricated technologies and repetitive elements be employed in bespoke architectural assemblies to define a suitable syntax?

0.3 Objectives

- To investigate possible strategies for the design of the roof and wall systems which would intrinsically support a passive approach to environmental controls.
- To investigate construction technologies which would support Objective 1 whilst developing new techniques for the formation of large scale structural, decorative and symbolic features in contemporary buildings.
- To investigate the integration of a sustainable architecture with three dimensional surfaces.
- To investigate a pattern language which both supports a passive low carbon design and also gives meaning to the institutions within the building.
- To define a process of design which integrates 3D CAD outputs with the hand made, through sketching and model making.

0.4 Context

The brief and accommodation schedule for the building was extremely complex in terms of adjacencies and a hierarchy of levels of security and non-contamination of evidence. Cross-contamination of evidence was to be avoided by locating the forensics in a separate leg of the building. This created a complex network of relationships. Collectively it was a principal objective of the client to attempt to simplify the strands of this network by encouraging common purpose and collaboration through exchange- the agora or marketplace (of information) -was defined as the atrium space. The atrium is used to foster a clear inside outside connection, with glazing taken down to the lower floor of the space opening up the view to the north, helping to prevent the building from feeling too insular. This is further enhanced by the use of similar materials either side of the atrium glazing and by the continuation of some landscape features into the building.

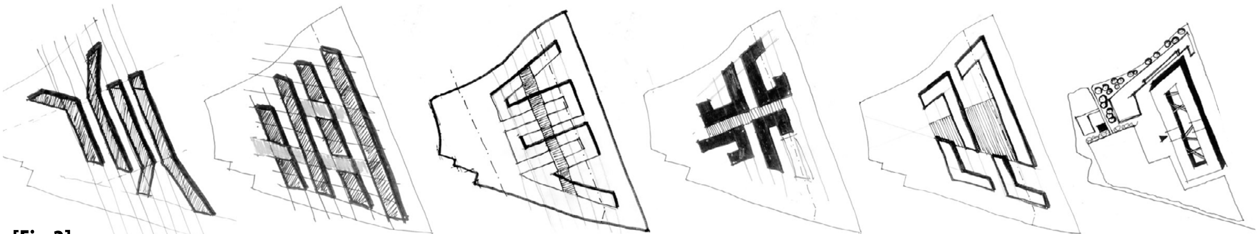
All elements of the offices that can be, are open to the atrium, further reinforcing the shared nature of the building and the contact across the space. Building wings are also physically connected to each other with the bridge elements through this space. The atrium can be used for large gatherings, multiple breakout and informal meeting areas as well as allowing the canteen to spill into the space if desired. It therefore becomes the social hub of the building. The floor of the atrium is stepped up over accommodation on the lower floors creating a greater degree of privacy and quietness through the shared space. The atrium is also key to the ventilation strategy in the building. Warm air rises to the top through natural stack effect; heat is mechanically removed through a heat exchanger and then recalculated back into the office spaces. This allows clean air to be preheated for the office spaces and dirty air to vent naturally through the atrium space.

1.0 RESEARCH METHODOLOGY

1.1 Design selection

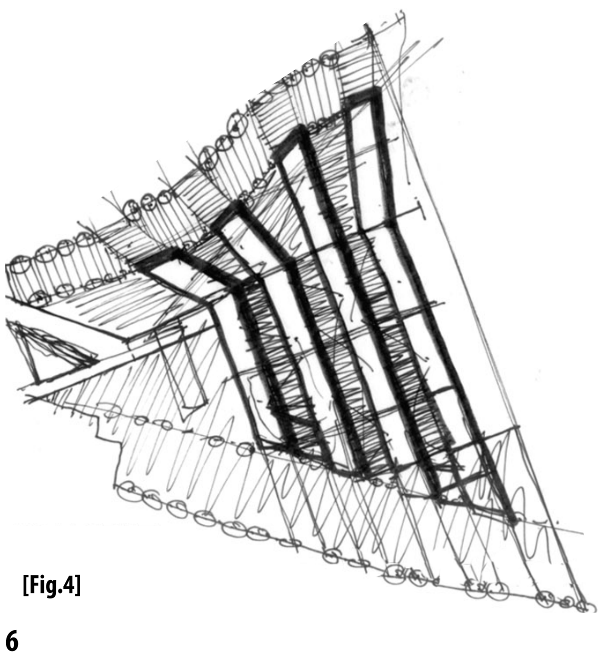
Numerous visits to the site and to comparable institutions in the UK and Europe provided a basic tool kit and reference points for the development of a design strategy for the building. See Appendix B for Precedents.

Extensive discussions were held with the various client bodies to unlock the solution, itself a synthesis of the objectives of six disparate organisations. Context, precedent and metaphor were combined with these analyses to develop a physical manifestation of the essence of the development in a semiology which would be capable of being read at various levels and provide building users with a way to understand the nature of the building. The idea was developed of a series of buildings in the ground plan form of the legs of a chromosome – arranged around a common space sitting above the exposed geology of the site which formed a base internally embodying and enclosing secure spaces. Rootedness, Security, Stability, Confidence, Intelligence, Vision, Meaning, Legibility, Quality were all essential characteristics of the Brief

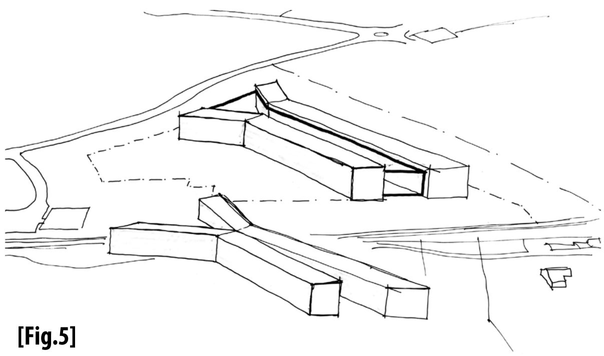


[Fig.2]

[Fig.3]



[Fig.4]



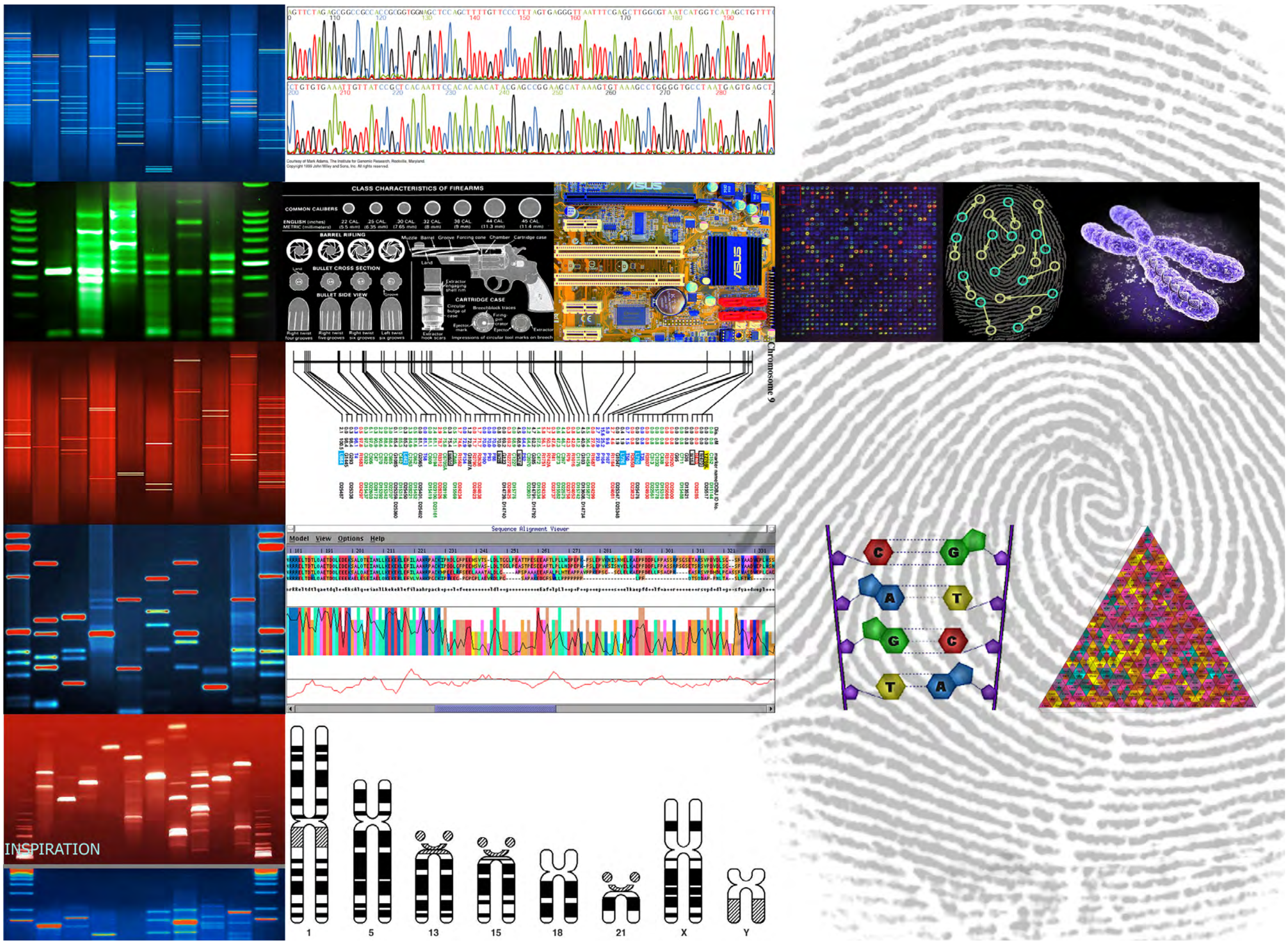
[Fig.5]

[Fig.2] Sketch plans for the development of the swing possible option;

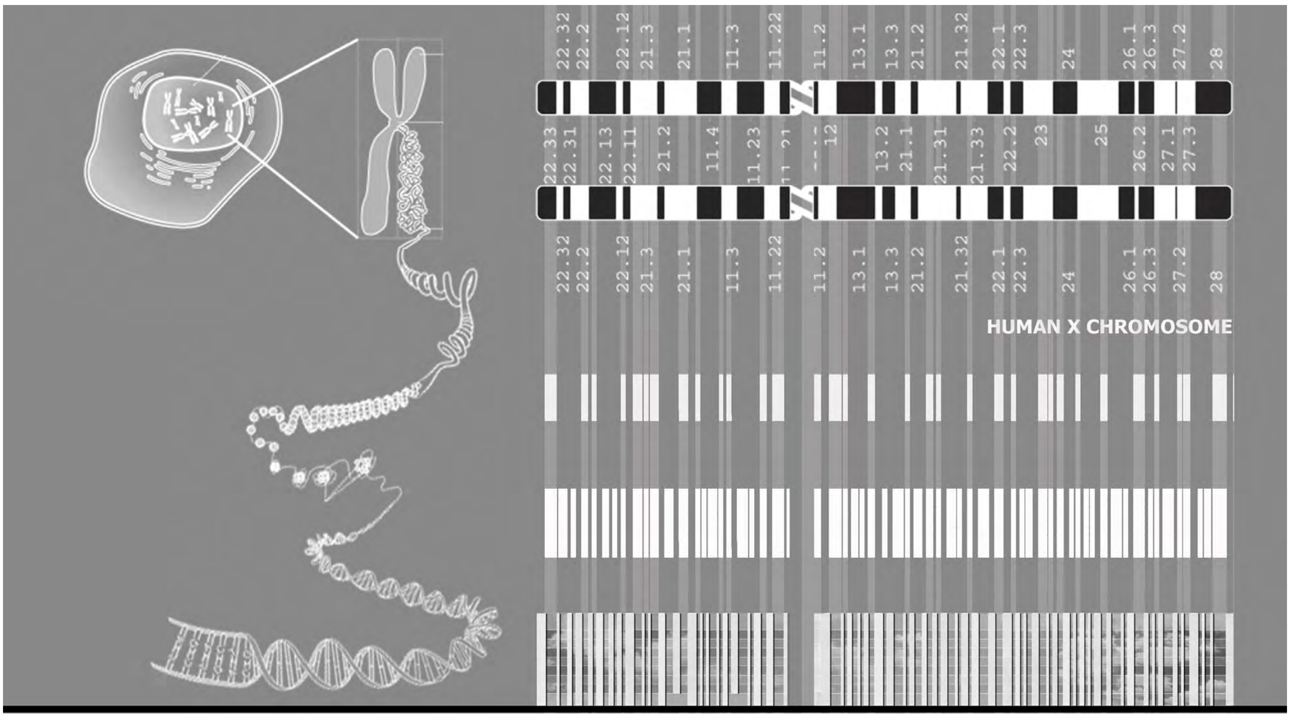
[Fig.3] Sketches of the volumes and masses possible configuration;

[Fig.4] Final sketch idea for site.

[Fig.5] Axonometric sketch of the possible configuration



[Fig.6]



[Fig.7]

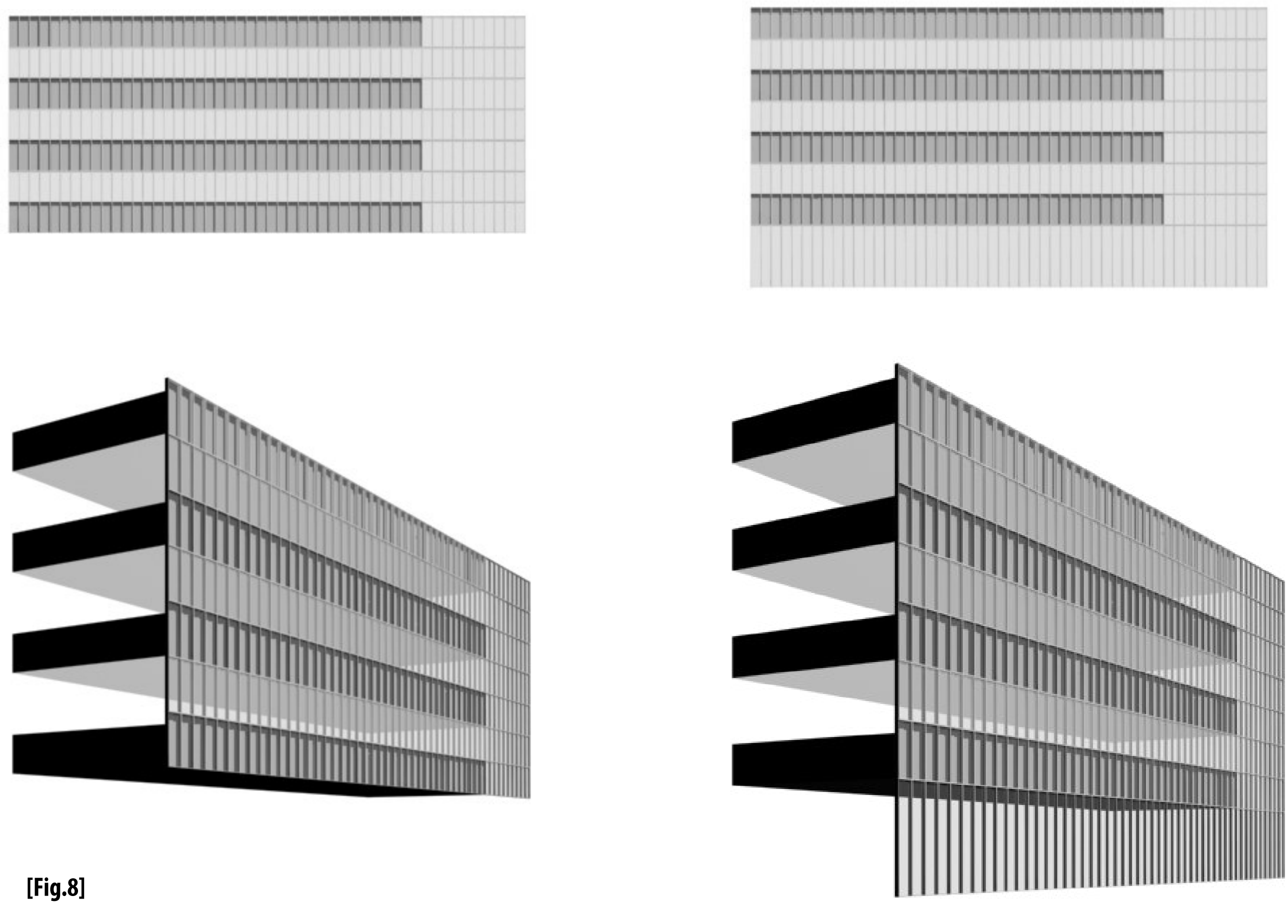
[Fig.6] Chromosome pattern;

[Fig.7] Abstraction from chromosome to facade pattern via intermediate option which looked at percentage solid to void, solar gain, daylight levels, etc.

which required to be embodied in the building's design solution.

The dynamic nature of the plan evolved from the geometry of the site boundaries, such that the principal entrance would be on a diagonal route, parallel to the railway, as is the secondary entrance to the east and it is intended this would allow connection through to future expansion wings. These geometries generate a language and dynamism entirely appropriate to the nature of the agencies operating inside the campus facility.
These form the starting point for the building shape which, along with the syste matic analysis of the buildings programme or brief, as evolving in multi-faceted aspects of performance, informs the fundamentals of a specific approach. It was important that a strong design ethos was established for this building which not only supported the objectives of the brief but would also make manifest, in its built form, some of the principles behind the technologies used in crime detection. DNA and chromosome biology were selected as important new technical tools of detection with their corollary in determining the rigor of the process of determining guilt and innocence. These concepts are basic principles of existence enshrined in human rights and rule of law.

The primary circulation is at the centre of the building at the point where the two chromatids would touch. Connecting bridge elements through the atrium were also initially inspired whilst considering diagrams of DNA chain connections. These concepts were the starting point for iterative processes whereby design options were tested in terms of accessibility, legibility, internal ambiance, environmental performance and structural expression which ultimately permitted a solution with some depth and purpose. The early concept studies, of chromosome shapes and other genetic forms remain detectable in the overall design. These technologies were selected for their subtle but explicit exposition of the detection process as themes to influence the design of the structural support devices and shading, solar control and ventilation



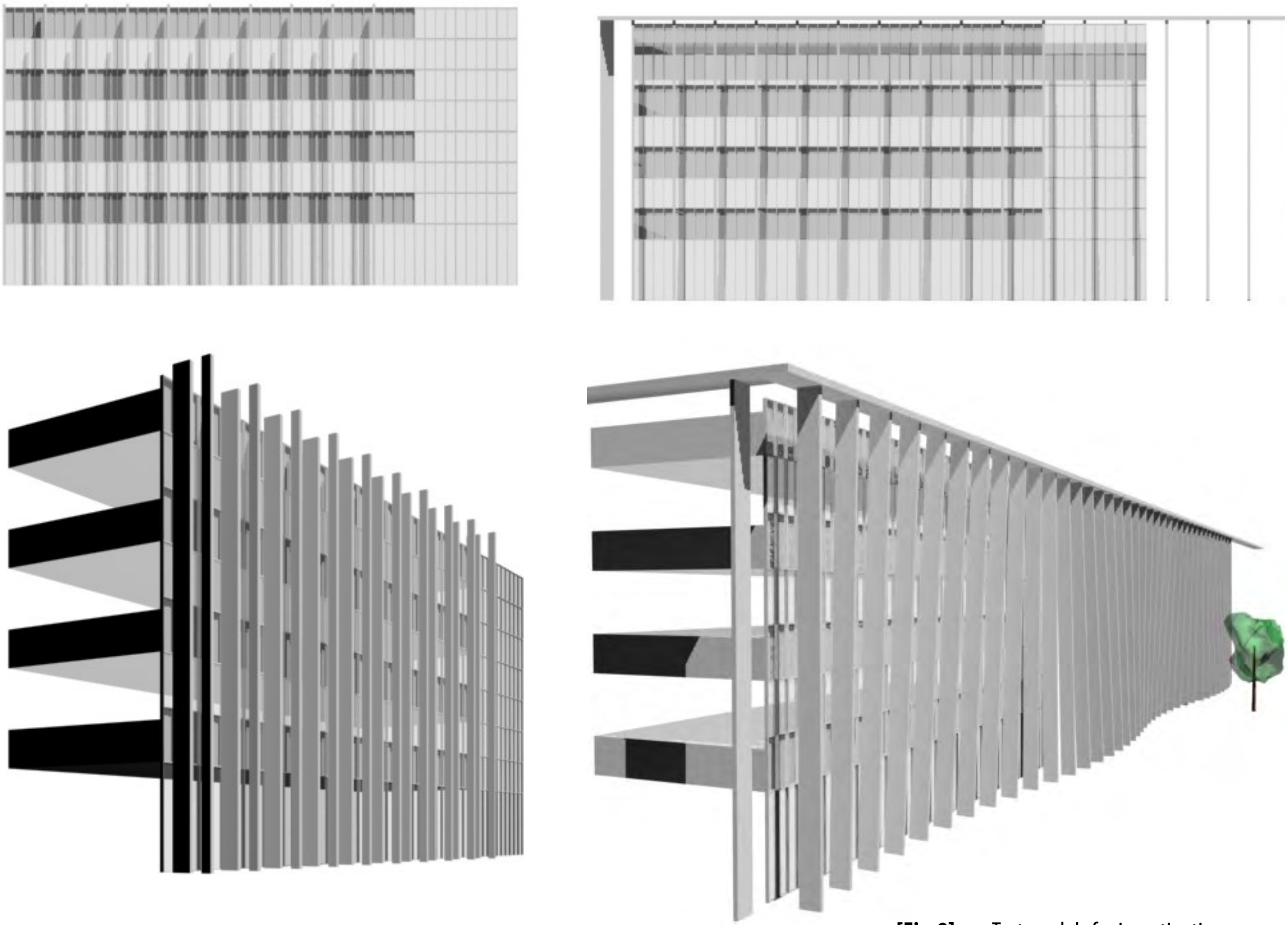
[Fig.8]

systems to support a sustainable approach within an envelope design. Concurrently, a variety of programmatic solutions and spatial permutations developed alongside the detailed three-dimensional design, whose complexities were tested through model-making, animations and other forms of visualisation. The essence was to translate the abstraction of the idea into a concrete form, options of which were tested to optimise the environmental performance of the façades and surfaces. The design of the facades and surfaces were required to embed the ethos of the design solution for the 'Institution' as a highly contextual approach in terms of site, accommodation, objectives and character of the institutions as one organisation.

The design approach permeates and synthesizes all aspects of design from spatial organisation to detailed fabrication. Façade engineering, as seen through the repetitive use of a small number of components or sub-sets of components, has encouraged manipulation of the facades through the use of pattern making. Thus both light and shadow provide difference opportunities for modulating the facades and thus the internal environment of the building. The façade was developed to perform a multitude of functions - a multivalent approach – a series of proportional progressions to exemplify content and meaning; a method for bringing in daylight and capturing of views outside; a profile to enhance solar shading and environmental performance; a distribution network for services across the building vertically and/or horizontally; a decorative response at a detailed level which would encompass and portray the building's purposes.

1.2 Material & technology selection

Various façade and roof systems might be capable of achieving this design. However it was important they also supported the objectives of the construction programme, merging both decorative and symbolic features with effective shading devices and prefabricated structural elements. The DNA image

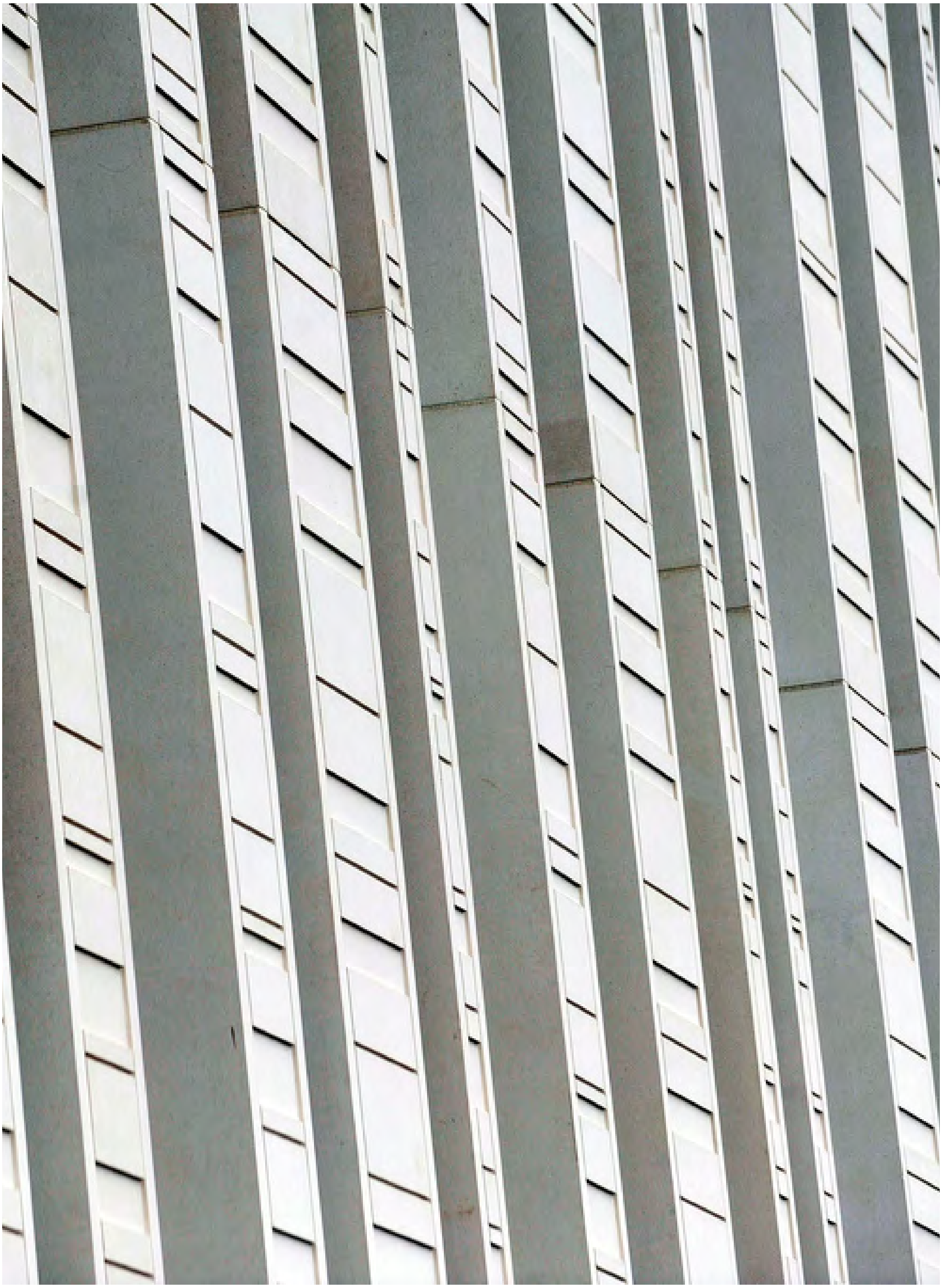


[Fig.8] Test models for investigating possible strategies for facades using layers and deep reveals, built with language and syntax not fully determined. Pre-cast concrete was a possibility a this stage.

[Fig.9]

[Fig.9] DNA bar-code pattern translated to roof enclosure.

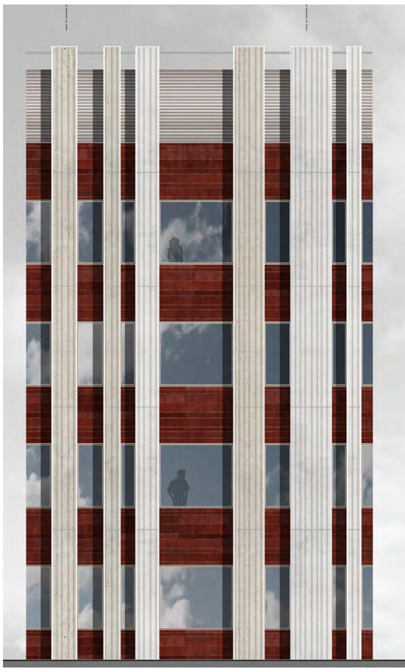
ETFE "pillows" on tubular steel structure. Exhibition of identical semiology to facades but more overtly as a shading device, which will cast similar pattern across internal "facades" in atrium



[Fig.10]

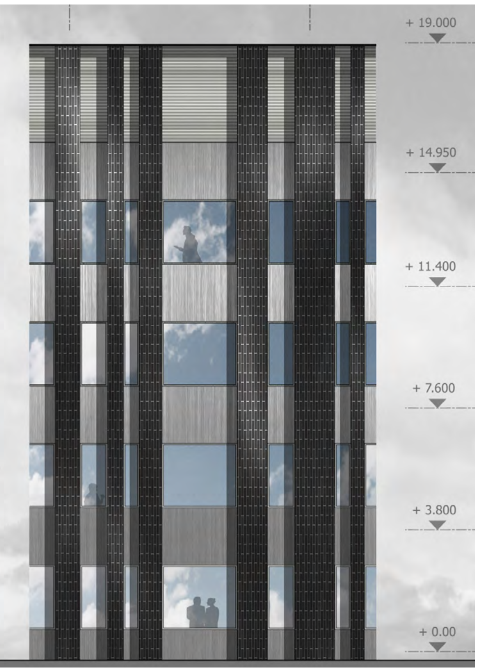
[Fig.10] Final pattern language of pre-cast concrete facades. Three part series of solid and opening reflecting chromosome's DNA "bar-code". This is vertical on elevations as a whole and horizontal in a similar pattern on pre-cast concrete "piers" themselves partly to disguise construction joint. Only two lifts of contract to expedite programme.

OPTION 1A



OPTION 1B

OPTION 1C



Option 1A: U-shaped ribbed and coloured (white and sand) precast concrete panels (in varying sizes, 3800x1500, 1000, 500mm). Recommended manufacturer: Trent Concrete. TECU oxid copper standing seam system in a series of variable widths (max. width 600mm). Recommended manufacturer: KME.

Option 1B: Baggeridge white & Helsinki smooth brick laid vertically in a brickbond pattern (dimensions 240x115x50mm). Recommended manufacturer: Taylor Maxwell. Insulated spandrel panel in glass using Technal frame system (no horizontal caps required). Recommended manufacturer: TECHNAL.

Option 1C: Large format GIMA black glazed roman bricks (490x56x90mm) laid vertically in a brick bond pattern. (glazed colour:50735). Recommended manufacturer: James & Taylor. Anodized aluminium insulated infill panel (max size 2400x1850mm & min thickness 3mm). Recommended manufacturer: CGL Systems.

OPTION 2A

OPTION 2B

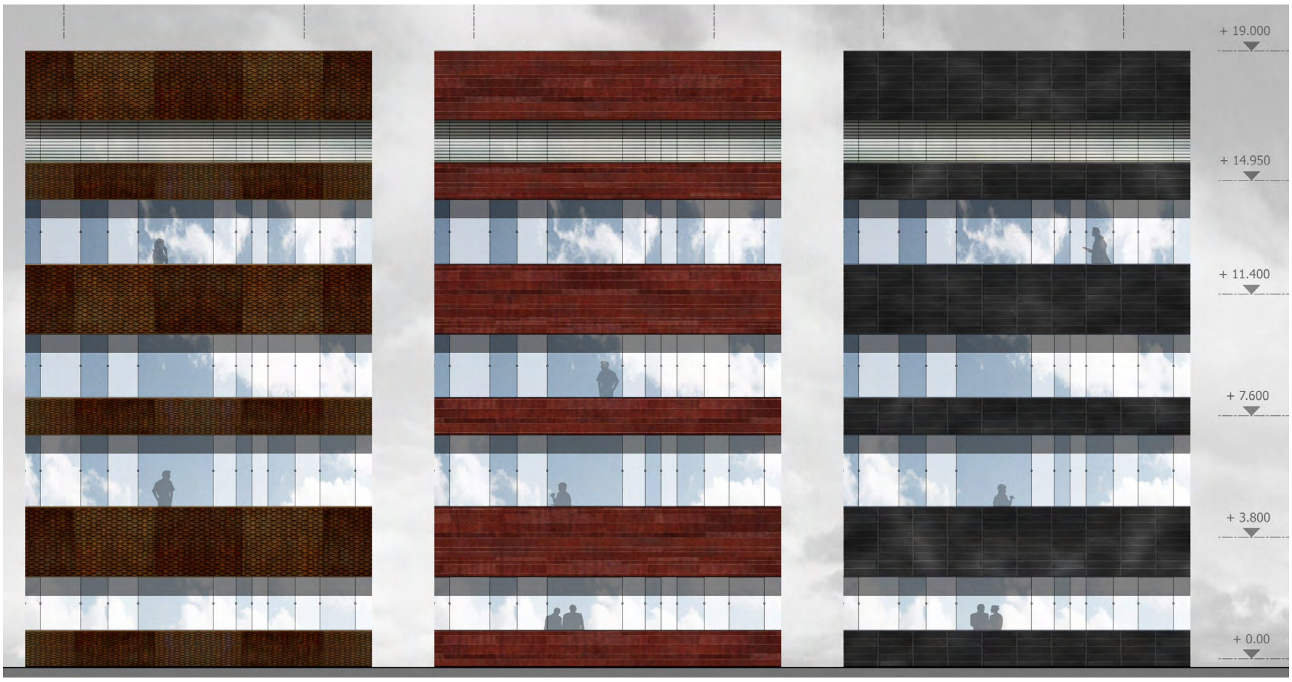
OPTION 2C

Option 2A: Large format GIMA black glazed roman bricks (490x65x90mm) laid in a horizontal brick bond pattern, (glazed colour: 50735). Recommended manuacturer: James&Taylor. Polyester powder coated aluminium (RAL1019 melon yellow) soffit, reveal, cill & insulated infil panel (max size 2400x1850mm & min thickness 3mm).

Option 2B. GIMA black glazed roman bricks (214x65x90mm) laid in a horizontal brick bond pattern glazed colour 50835). Recommended manufacturer: James & Taylor. Polyester powder coated aluminium (RAL 5012 light blue) soffit, reveal & cill.

Option 2C. Large format GIMA glazed white roman bricks (490x65x90mm) laid in a horizontal brick bond pattern (glazed colour 50769) Recommended manufacturer: James & Taylor. Anodized aluminium soffit, reveal, cill & insulated infil panel (max size 2400x1850mm & min thickness 3mm) Recommended manufacturer: CGL System.

OPTION 3A **OPTION 3B** **OPTION 3C**



Option 3A: Expanded metal anodized aluminium raised mesh 3mm thick, colour: anolock, (max panel size 2500x1250mm), type: Bilbao, recommended manufacturer: The Expanded Metal Company.

Option 3B: TECU oxid copper standing steam system in a series of variable widths (max width 600mm). Recommended manufacturer: KME.

Option 3C: TERRART - large smooth & glazed (black) terracotta rainscreen system, (max size 600x1800mm, hollow chamber 40 mm). Recommended manufacturer: NBK.

strategy was manipulated in two ways – firstly so that the form of the chromosome might inform an outline concept for the layout of the building – connecting and enclosing securely, by transposing this coded data into a unique bar code. This bar code was used to develop a pattern language which moved through the rhythm and positioning of large-scale deep-reveal precast panels on a serial proportion system, itself based on the Fibonacci number series. The principle of the barcode pattern, as developed for the façade concept reduced the number of variations on the pattern from which to choose. Selection was based principally upon aesthetic considerations, in order to achieve the correct scale and contrast between the bars and yet to have the pattern appear to be random whilst repeating. Gordon Murray tested options, using parameters in the 3-D model. Once the target shading coefficient had been agreed with the building services engineers, achieving the environmental control factor was then relatively straightforward. There were challenges due to the quality of the building services' model with its tendency towards conservatism. Initial runs of the model would originally have made the ETFE roof entirely opaque, so it was necessary to insist that the densities of the translucent and clear materials on the barcode were taken into account, and then having the manufacturers of these materials (Vector Foiltech) verify the shading coefficient actually achievable with the ink densities used for the coatings.

Overall the walls of the building have relatively low percentage glazing to solid elements. Solid elements are higher to maximise the insulation potential of the building. Conversely, all internal areas have a high percentage window to the external wall when viewed from the inside. This is to maximise the available views out and day lighting potential.

The pattern is repeated on the surfaces of both the precast panels and the glazing and the unique ETFE roof panels providing daylight to the central atrium space. Research into potential roofing materials resulted in the selection of Ethylene Tetrafluoroethylene (ETFE), a transparent plastic material, which was selected for its durability as it is unaffected by atmospheric pollution

Options 1A to 3C: Part elevation studies of alternative pattern language and semiology for the building, looking not only at materials and proportions, but also at the "image" evoked by the building: pleasant, art, neutral, sinister, dark, night significant civic and UV light, and does not deteriorate over time. The lightweight material was chosen as an alternative to glass in the atrium roof allowing a fine, lightweight structure. The membrane is formed into inflated pillows to provide a roof covering to the shared atrium space which is also a supporting structure aligned to enhance the dynamic geometry of the building and atrium. Several shading systems were investigated. These were based around movable horizontal and/ or vertical elements or planes and the impact of each on solar gain control and ventilation where modelled using computer 3D systems based around sun path and orientation. Each has varying impacts on the visual language of the exterior of the building, in some cases based around quite complex support systems and shading technologies. However, if we extruded both vertical and/or horizontal elements to create 'thick' facades much of the work of passive control could be achieved by similar and more cost effective means. The thick façade permits overhangs and deep reveals working with glass technologies to articulate the façade in a much more sophisticated and architectonic manner. It also permits the facade to be used as services risers and to be structurally self supporting in large scale prefabricated units. Issues of buildability, quality and programme are also improved upon over more traditional forms of construction.

We also investigated horizontally continuous channel forms where a large overhang provided a strong architectural language, shading, structural support and services distribution. We then looked at superimposing this on a vertical system to create a unitised grid providing the above utility but with the potential to be clad in a variety of sheet materials, clay tiles, vitreous panels, corten-steel, etc. However, this created a unity and a homogeneity which whilst satisfying at a rational level did little for the specifics if identity of this building which we believed should reflect its own unique pattern language as a means of defining the personality of the building embedding its utility in the memories of its users.

In his essay, Symbolic and Literal Aspects of Technology (Architectural Design 11/62) Alan Colquhoun defines the essence of the argument and the basis of our approach:

"The science of building, the rationalisation of construction and assembly, however vital in themselves, remain in the world of literal action. It is only when the architect seizing this world, organises it according to the logic of symbolic forms that architecture results."[2]

The principle of a concrete or steel frame sheathed in some form of curtain wall is often such a meagre translation of the ideals of the Modern Movement as the application of an apparently logical and functional system that the essential features of good architecture are being overlooked. It is still possible to achieve the effect of mass, which is not a necessarily a product of programme and its structural interpretation. "Massiveness" in such construction can be exaggerated to embody enclosure, protection and civic authority reminiscent of a walled town. We have sought to exemplify this approach.

Colquhoun poses a further problem:

"if buildings are to retain their quality of uniqueness as symbols, how can they also be the end products of an industrial system whose purpose is to find general solutions. We have a confusion between technology as a means to construction and technology as the content of the building form itself".[3]

The distinction is false he suggests as it ignores the fact that architecture belongs to a world of symbolic forms in which every aspect of building is presented metaphorically not literally.

Semiotics, includes analogy and metaphor, in a series of symbolic signifiers as a means of determining visual communication. Semiotics are seen as having anthropological dimensions, with Umberto Eco3 suggesting all cultural phenomena can be studied as communication. These signs have psychological and biological roots.

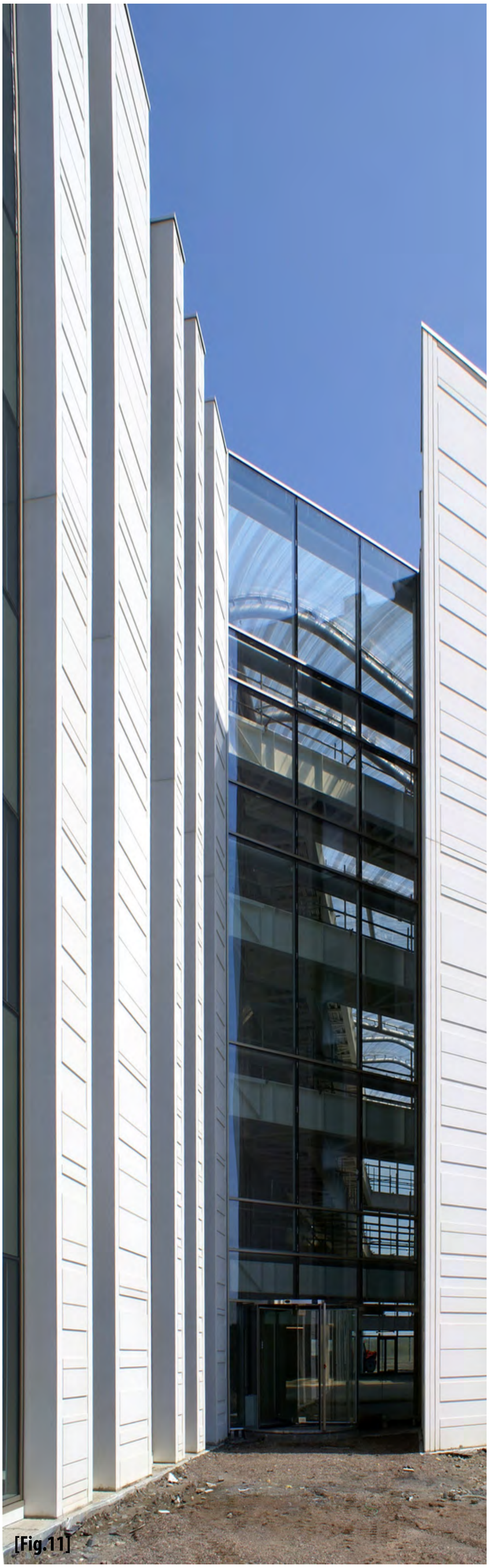
This pattern language can be simplistic or complex visual mathematics to enrich the meaning or understanding of the complexities of the building codified in a manner that aids that understanding. The pattern language and its variants are exhibited in different forms and contexts.

Appropriate detailing and construction technologies are essential and must be based on an intellectual theoretical approach to making of the building. Adapting decorative techniques to suit materials which in turn create a formal innovation. The final outcome has been the result of several iterations of collaboration

2 , Symbolic and Literal Aspects of Technology (Architectural Design 11/62) Alan Colquhoun from the collected essays of Alan Colquhoun.

3 Caesar, Michael (1999). Umberto Eco: Philosophy, Semiotics, and the Work of Fiction. Wiley-Blackwell. p. 55.

between the design team, the principal contractor, the precast cladding manufacturer and the ETFE roofing contractor. In particular, numerous trial pieces and experimental tests were developed between GMA and Tech-Crete to investigate surface quality, pattern, stability in casting construction technology – support and transportation as well as final assembly. This test programme was to ensure that the pre-cast concrete pieces could be fabricated without loss of detail to accurate tolerances and then erected speedily on site. CAD information developed in the design stage can be input into a CAD CAM proportion process with no loss of detail or design intent, together with the benefits of the precision achieved in factory production techniques.



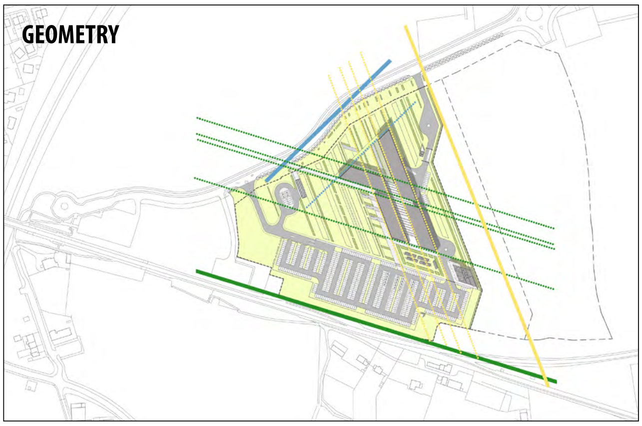
[Fig.11] Final construction image

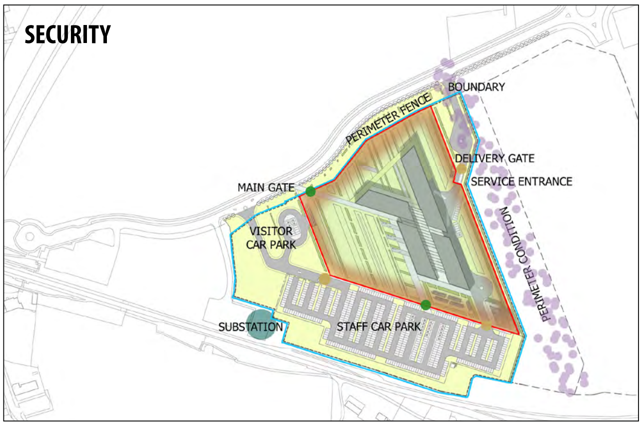
2.0 PROPOSED DESIGN

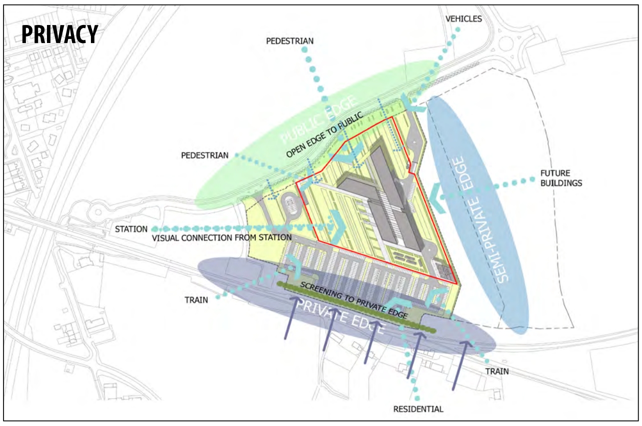
[Fig.12]

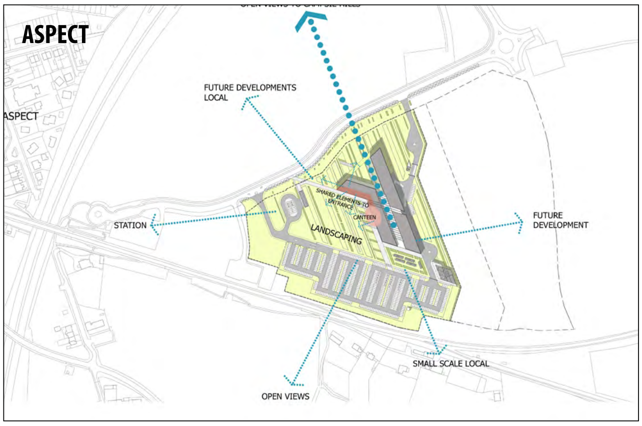
[Fig.12] Model configuration.

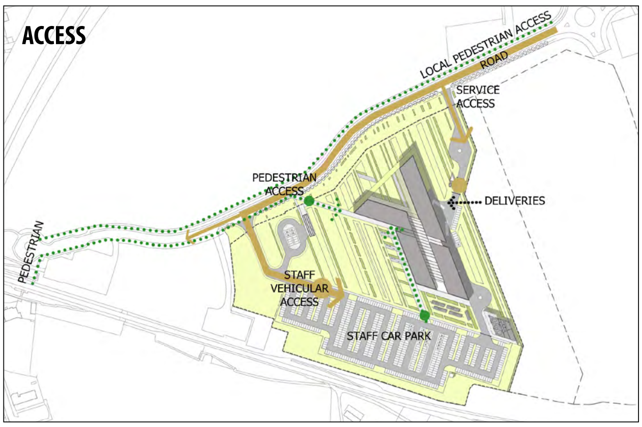
1. Vehicle access
2. Visitor parking
3. Staff parking
4. Boundary fence
5. Pedestrian access
6. Service access
7. Deliveries gate
8. Loading area
9. Garage facility
10. Main entrance
11. Bicycle store
12. Generator compound
13. Perimeter fence

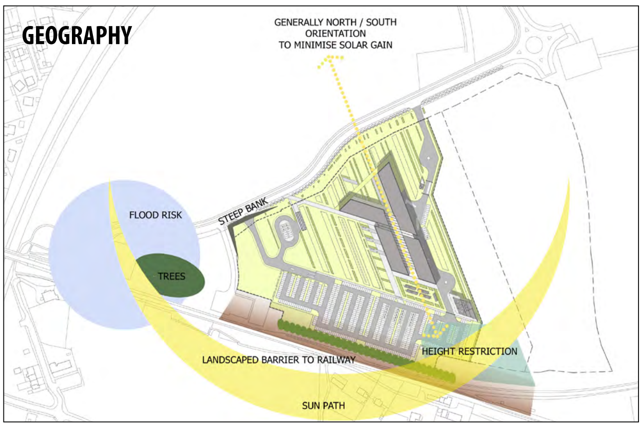




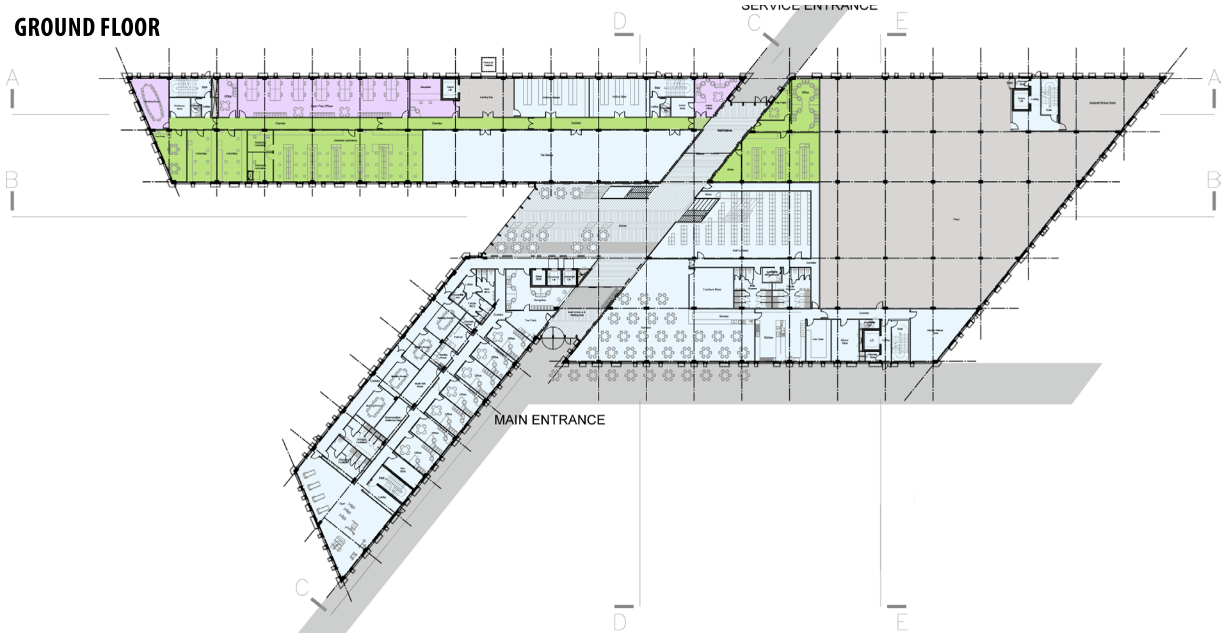




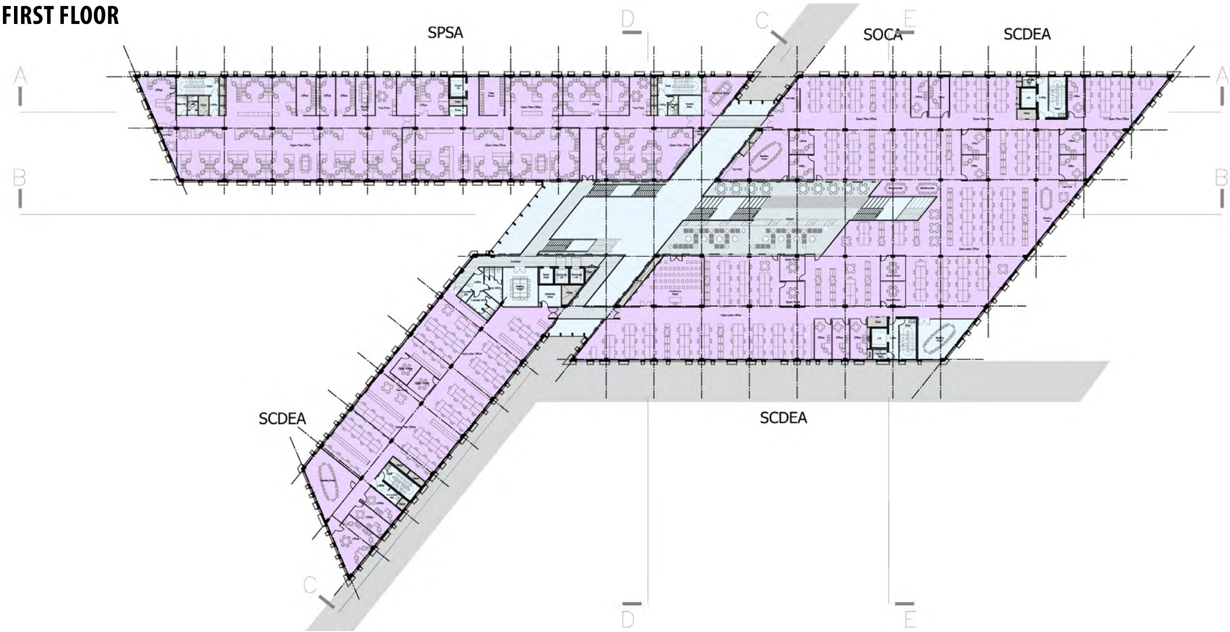




GROUND FLOOR



FIRST FLOOR



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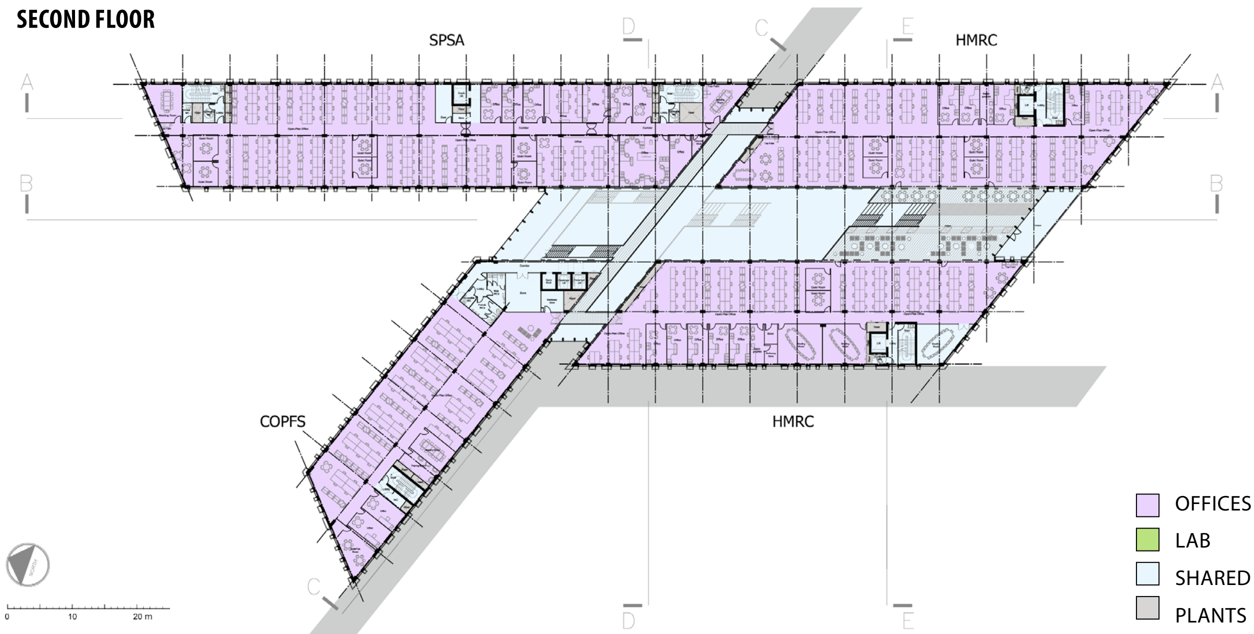
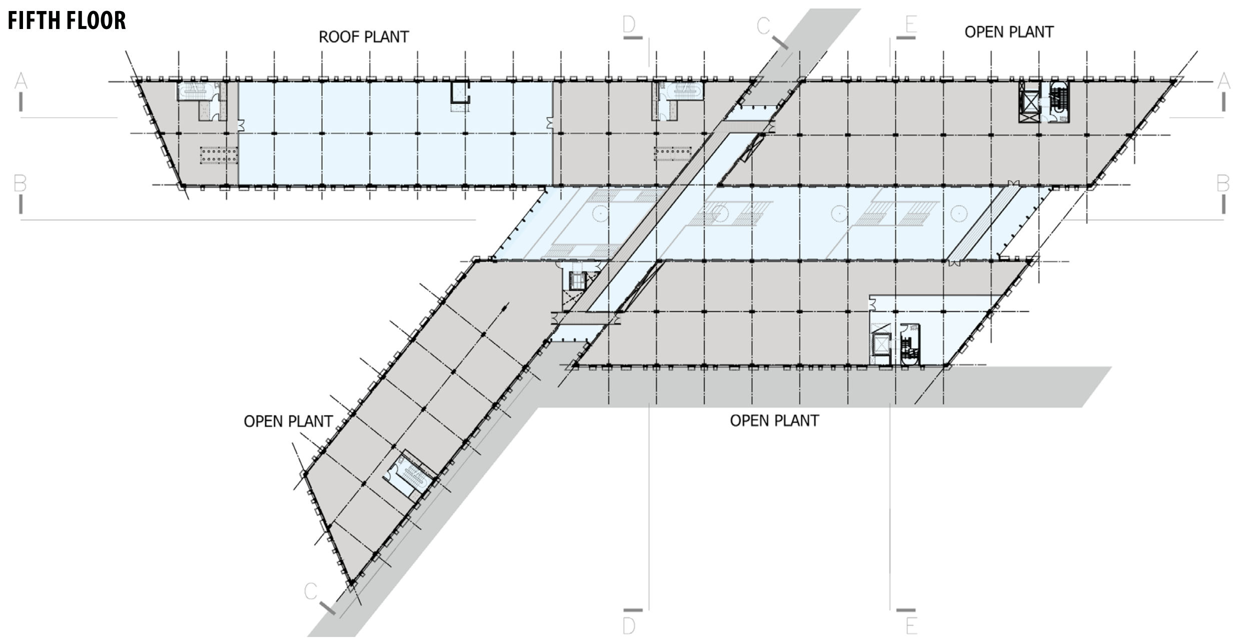


[Fig.13]

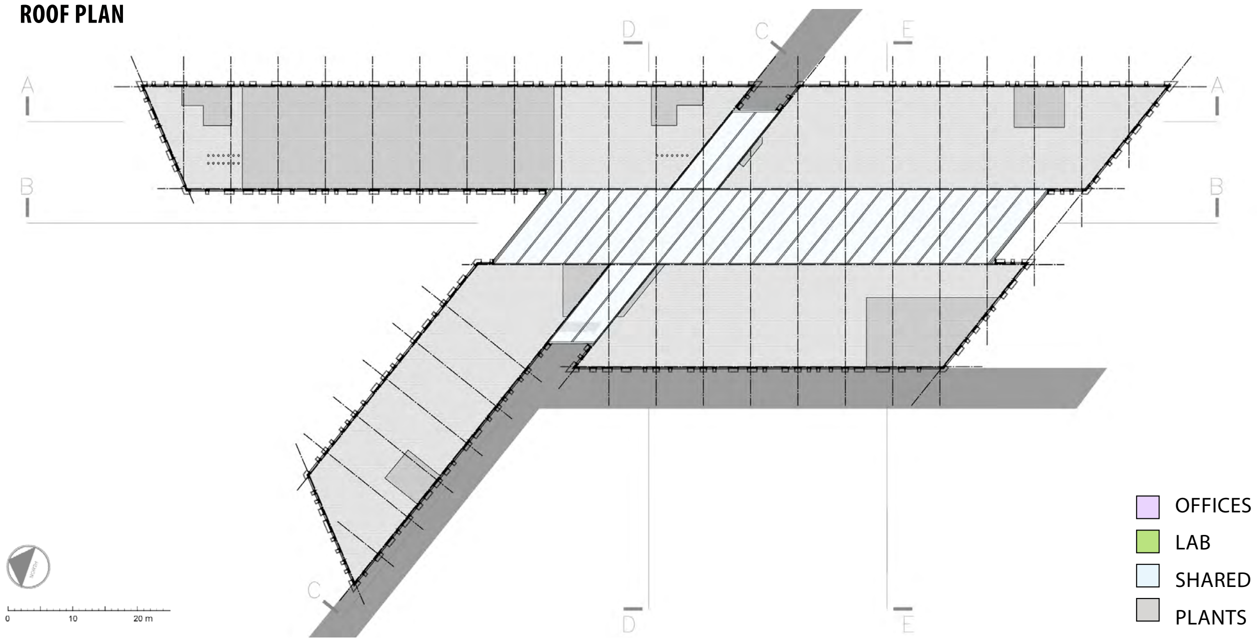
[Fig.13] View inside atrium - south

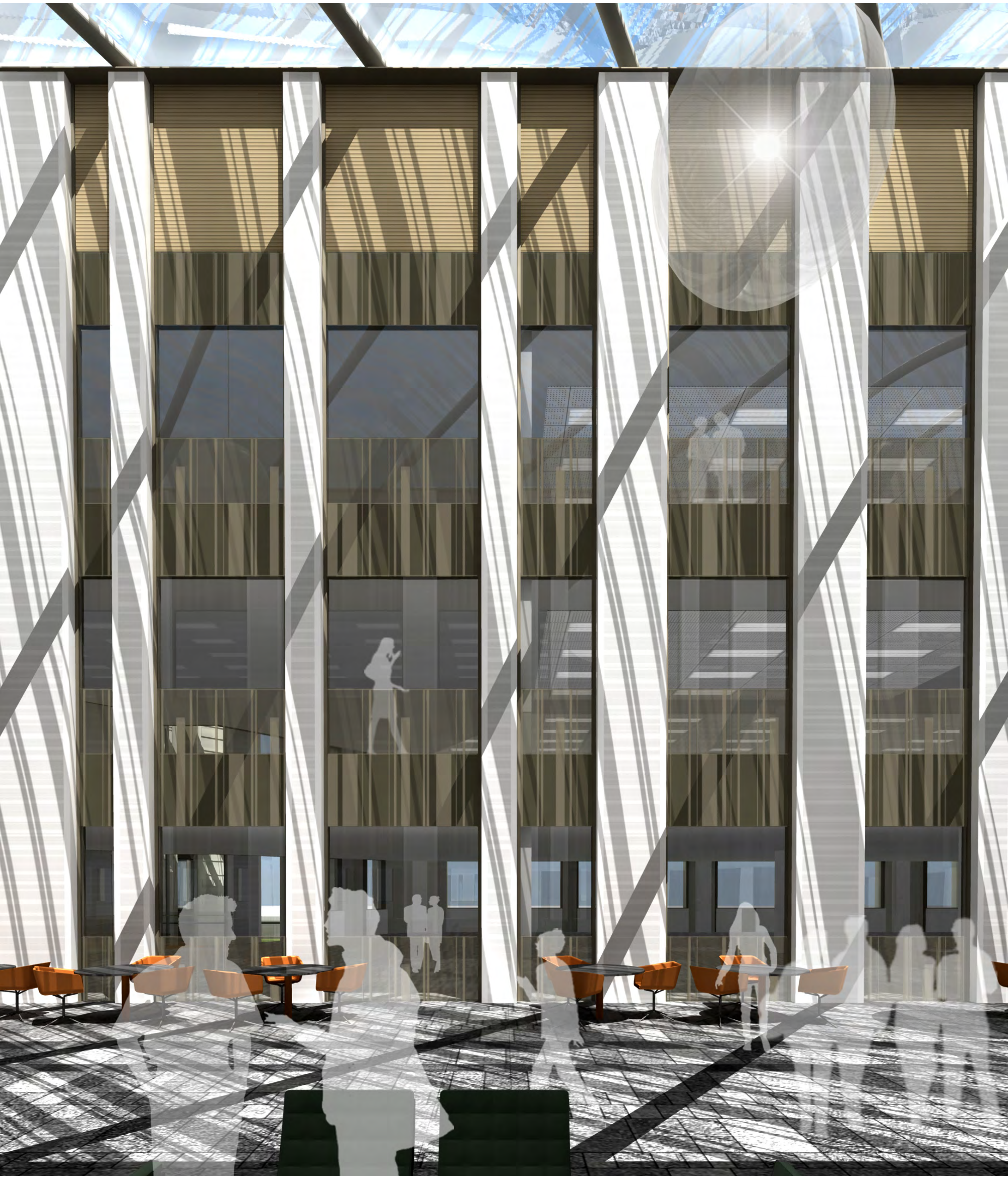
THIRD FLOOR

FIFTH FLOOR



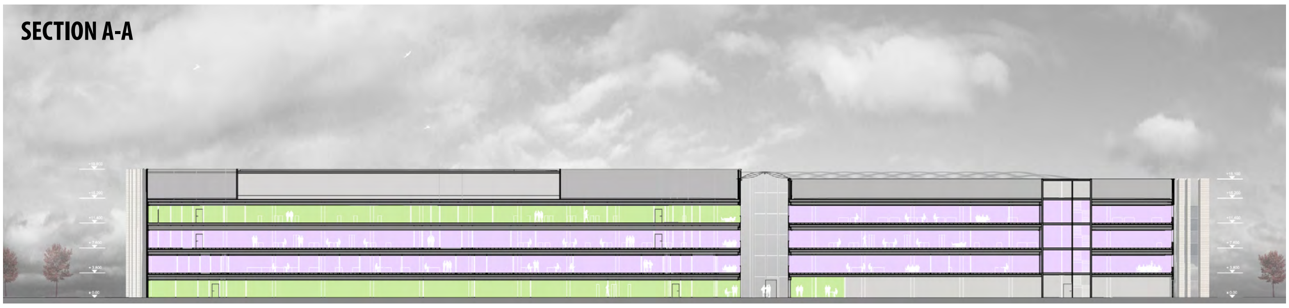
ROOF PLAN

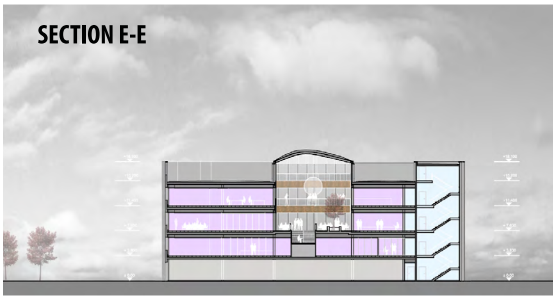




[Fig.14]

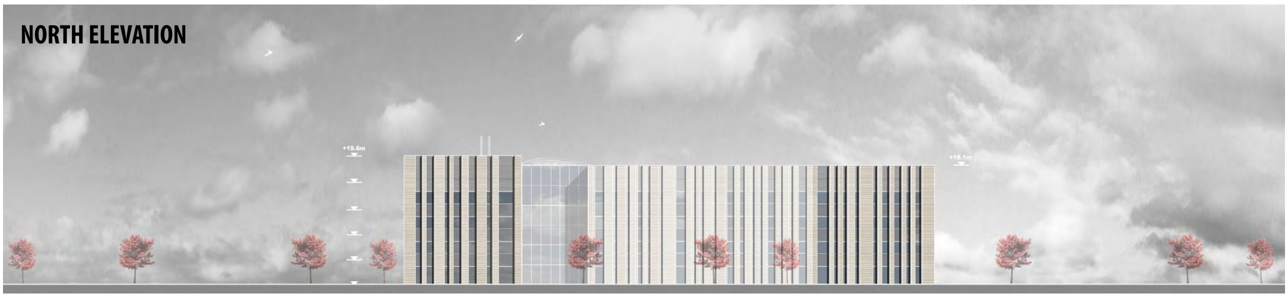
[Fig.14] View inside atrium - north. Final CGI modelling of interiors with shading patterns. Modelling based on sunpath was also a feature of the final design solution.





[Fig.15] View inside the entrance

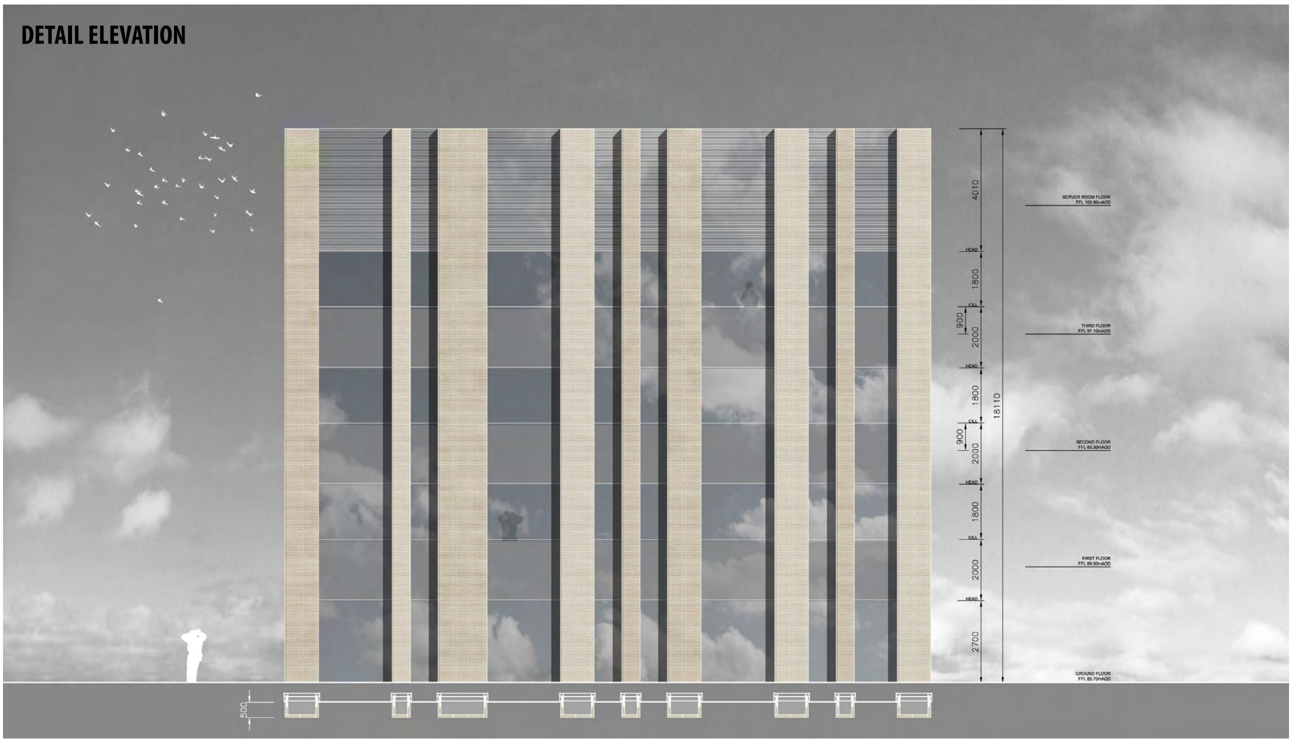
[Fig.16] View outside the entrance



[Fig.17] View of the new Crime Campus

[Fig.18]

[Fig.18] View inside atrium - north




[Fig.19]


[Fig.20]

DETAIL ELEVATION Final section of facade language. Three parts solid and void based on Fibonacci series simplifying and reducing language to maximise impact. Depth of facade and sequences illustrated.

Materials: White smooth brick piers, opaque spandrel panels, dobule glazed curtain wall, anodised aluminium louvres, etfe atrium roof, all glass revolving doors, flue extract ducts

[Fig.19] View from roundabout

[Fig.20] View from the station

3.0 CONCLUSION

3.1 Dissemination

The building is in the final stages of completion for fitting out by the occupying organisations. This will take place in November 2013. During design and construction stages it has been written about and exhibited. It was featured in the Architects Journal of 09.05.13 (AJ V237/N17) illustrating our winning of best new practice of the year in AJ100 Awards.

Most recently, in the NORD designed exhibition of the work of GMA and Ryder celebrating 60 years of the practice. This has toured from the opening at the Briggait Arts Centre in Glasgow in May 2013; to the Building Centre in London-June 2013, RIBA NW in Liverpool and then Baltic Arts in Newcastle. It is also featured in the newly launched Scottish Government Architecture Policy document and web site as an exemplar project on the objectives of the policy in architecture, urban design and place making.

Scottish Government Architecture Policy– Creating Places: First Life; then Spaces; then Buildings :http://www.scotland.gov.uk/Publications/2013/06/9811/4 http://www.creatingplacesscotland.org/

We have also given presentations to both the Government Project Boards and Programme Board . One in Victoria Quay, Edinburgh in Jan 2012 and one in St Andrews House, Edinburgh in June 2012. The Project Board is made up mostly of civil servants following an OGC model, where the project sponsor, project owner and the Investment Decision Maker sits. Included is representation from finance and procurement as well as a representative from the occupiers acting on their behalf. It is this board who are ultimately responsible for ensuring the building is delivered on time and within budget etc. The Programme Board is made up of senior civil servants but also senior representatives from all the occupying agencies. The idea is that this entire project is about much more than a change of post code but rather for the SG investment to achieve requirements the agencies must demonstrably achieve other goals such as collaborative working leading to better performance and outcomes.

3.2 Conclusion

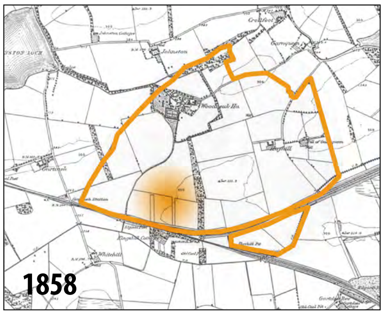
The concept developed for the research project was to find an architectural form and pattern language which would provide a semiological basis for the essence of the building's operational techniques and also give outstanding environmental performance. This was achieved in the choices of both external and internal enclosing surfaces and the forms generated from them. The outcome of the research into these shapes and materials led to the design decisions for four blocks in a formal arrangement around a common gathering space – itself a series of horizontal and vertical planes. The organisation of the internal facades enclosing this space reflected the semiology contained in the external facades which enclose the buildings as well as on the roof surface of the Atrium. This is seen in pattern-making on the EFTE roof surfaces which also echo the formal resolution in the facades.

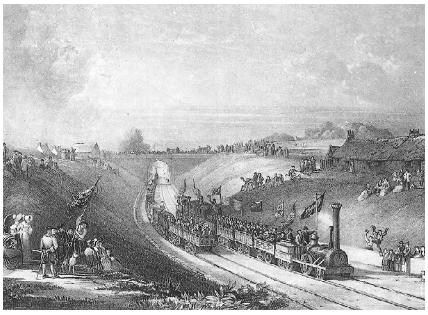
The questions we set out to answer in this research programme have been successful visually, programmatically and constructionally. Defining a new semiology for buildings which reflect the ethos behind the brief, which satisfy the technological requirements of the brief in terms of built environmental performance and offered constructional advantages in terms of cost. programme savings, higher consistency in constructional quality by emphasising factory fabrication techniques.

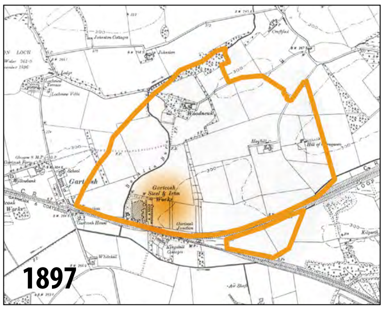
We have taken this technology further on a subsequent government project in Aberdeen where similar advantages and benefits have been achieved as outcomes from a shared basic ethos and design objectives.

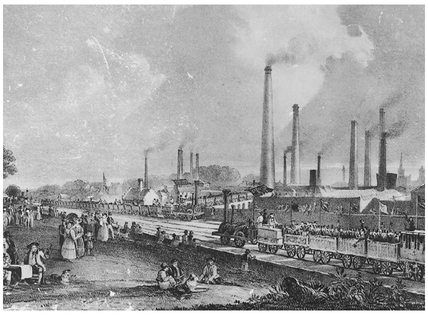
APPENDIX A:
SITE APPRAISAL

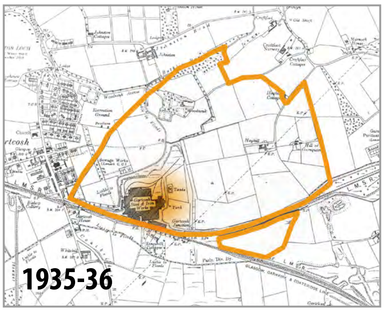
SITE HISTORY

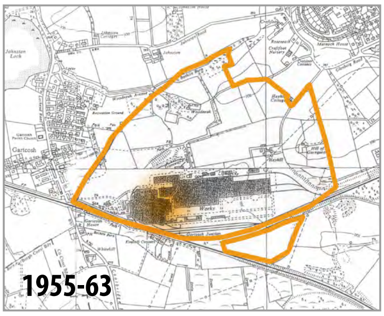












PRE 1858
The site was predominantly agricultural.

1858 TO 1960
The Gartcosh Steel and Iron works was constructed between 1856 and 1872. In 1865 the site was the home of Woodneuk Iron Works owned by William Gray & Co. It was bought by Smith & McLeans in 1872 and subsequently Colville's steel mills.

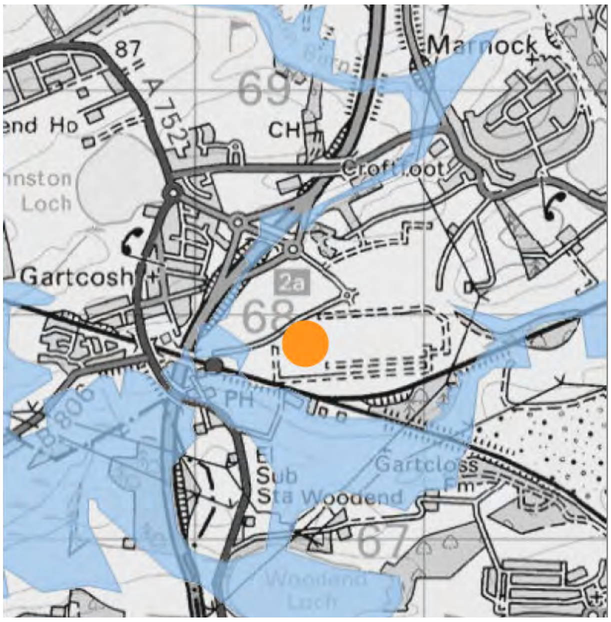
1960 TO 1986
The site remained largely unchanged until 1960/61 when the Gartcosh Sheet Rolling Mill was constructed. British Steel took ownership of the Colville's steel mill in Gartcosh in 1962 and was in operation until its closure in February 1986.

1986 TO PRESENT
All remaining buildings and the majority of hard standing/services to the rolling Mill have been demolished and a newt conservation area created to the north of the site. Several phases of remediation have taken place principally to mitigate asbestos contamination risks, remove hot spots of hydrocarbon contamination/ alkaline slag. Development infrastructure in the form of industrial access roads, drainage and landscape infrastructure have been implemented.

GARTCOSH BUSINESS INTERCHANGE

MASTERPLAN EXECUTIVE SUMMARY
Gartcosh Business Interchange was granted outline planning consent in 2002. The masterplan concept is to create an industrial park and single user site for user classes 4,5, and 6. The overall employment creation potential for the entire site is predicted to be 3600 to 4780. The concept includes a phased development and land release programme. Central to the masterplan has been the need to achieve long term balance between environmental issues and economic development, employment and accessibility. The masterplan is underpinned by a series of research of site, surrounding area/community, ecological and environmental studies, sustainability audit, and economic assessment.

MASTERPLAN STRATEGY AND OBJECTIVES
The masterplan strategy seeks to secure a development



in accordance with the Gartcosh Regeneration Partnership objectives which embrace sustainable development goals offering economic, social, and environmental benefits. The key determinant for the strategy is the need to secure an economically viable site which maximises opportunities for integrated transport and employment creation. Two other key elements of the strategy are development flexibility and a programme of phased land release to enable response to changes in industrial market demand over time.

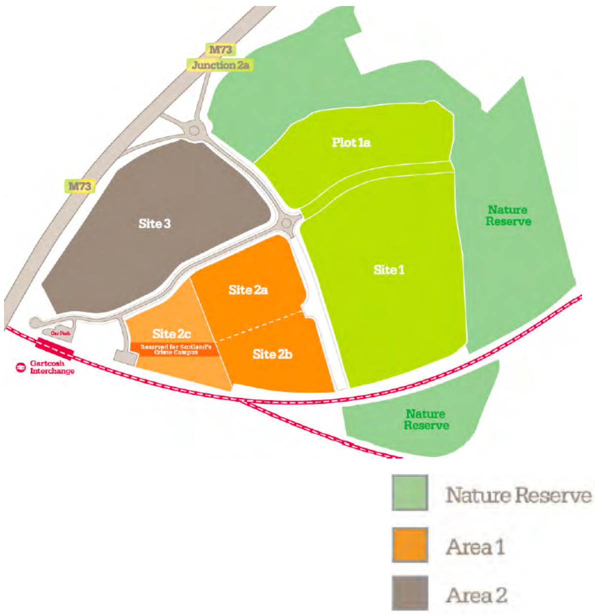
SITE AREA

The Crime Campus facility is primarily located on the site numbered 2c on the masterplan. The client has purchased sites 2a and 2b to ensure adequate future development land will be available for expansion. The site area totals 6.4Ha and a potential expansion area to a total 13.0Ha including sites 2a and 2b.

CURRENT SITE CONDITIONS

PHOTOGRAPHS SHOWING SITE

The primary image shows the view looking East across the site. The site is currently vacant of buildings. It is a Brownfield site and very much a blank canvas and gives us a great opportunity to create something special and distinct. The bottom left image shows the view of the site from Gartcosh Station – directly adjacent to the site. There is some scrub to the perimeter and some weed growth. There is no adequate soil for quality plant growth. The top left image shows a view across the sie looking South. The site is relatively flat and retains areas of shallow surface water.

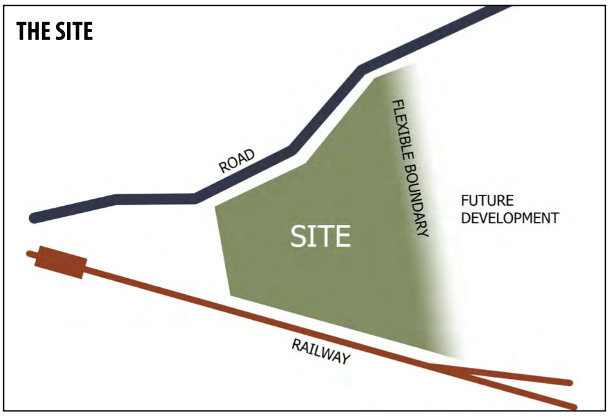


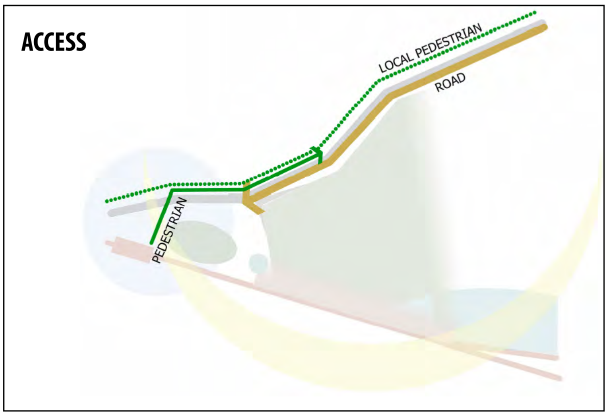
TOPOGRAPHY

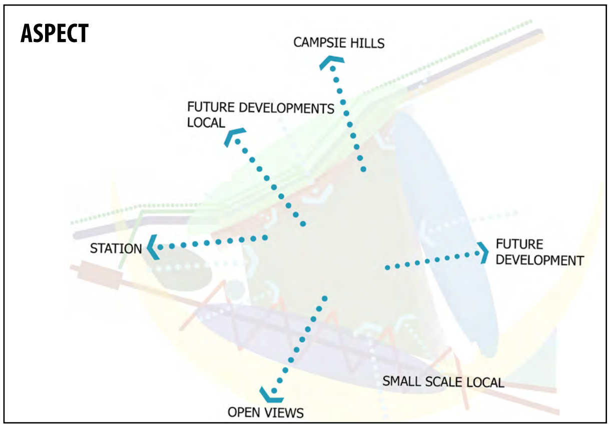
The site area was subject to a detailed topographic survey during 2004. The topography of the site is generally level with ground levels varying from around the 85 metre contour in the north west corner to 86 metre contour on the south east corner. A site development platform of around 85.5 metre contour is envisaged. Earth mounds and planting to the south of the site will require remodelling to proposed parking. Site 2C is not in an area identified as subject to potential flooding on the SEPA flood map (shown left).

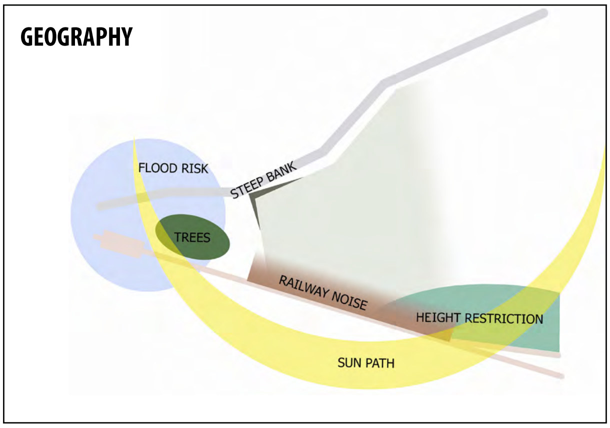
2.5 CONTEXT ANALYSIS

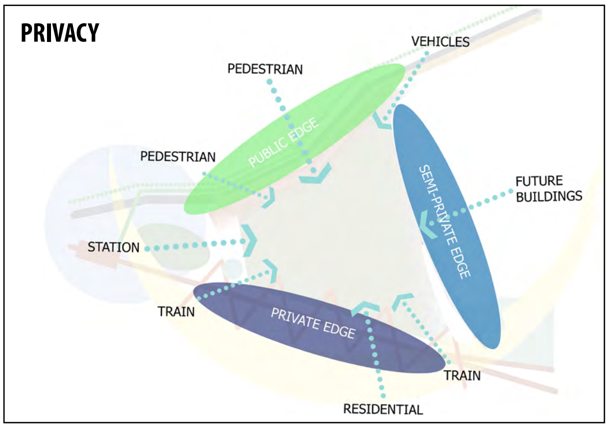
This initial diagram shows the basic site constraints. The site is generally triangular. It is bounded to the North by the Business park internal access road connecting the roundabout to the North East to the station on the South West. It is bounded to the south by the railway which splits to the South East. The Eastern edge is defined by the extent of the current proposals only as the client owns the adjacent plots, secured for future expansion.











APPENDIX B: PRECEDENTS

spanish pavillion, zaragoza expo 2008:
francisco mangado

girls grammar school,
brisbane: m3architects

central signal box, basel:
herzog + de meuron

umbra concept store, toronto:
kohn shnier architects

mexican embassy, berlin:
francisco serrano cacho

town hall, murcia:
rafael m oneo

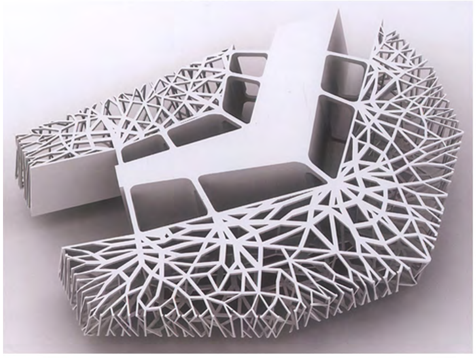
1000-bed hospital, kortijk:
baumschlager + eberle

nagasaki prefecture art museum, nagasaki:
kengo kuma architects

social housing, gent:
neutelings riedijk

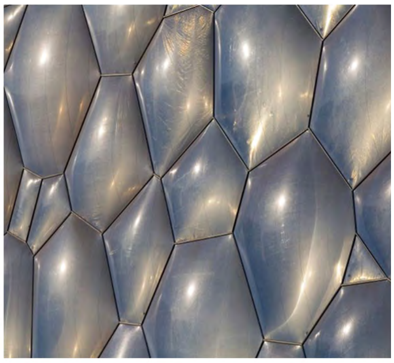
one omotesando, tokyo:
kengo kuma + associates

The precedent images express the intent with the vertical banding on the building. Deep window reveals generate a columnar or pilastered effect on the facades providing considerably more shading than a flat facade. This both minimises solar gain and provides relief to the otherwise regular and long facades.



czech national library, prague (competition):
scheffler + partner architects/OCEAN

amazon court, prague:
schmidt hammer lassen architects

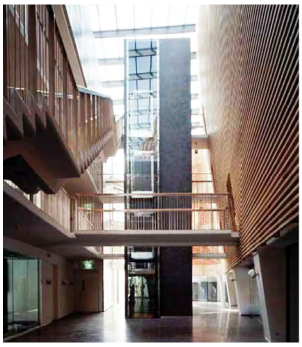


national aquatics centre; beijing:
ptw architects

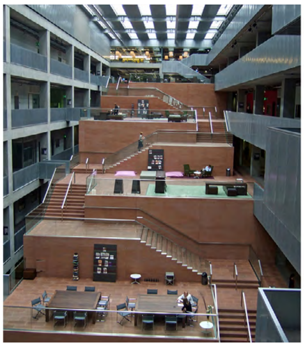
federal agency for the environment, dessau:
sauerbruch hutton

it university, copenhagen:
henning larsen

westminster academy, london:
alford hall monaghan morris



dutch embassy, berlin:
oma



bbc hq, glasgow:
david chipperfield

30 the bond, sydney:
ptw architects

1234 howard street, san francisco:
natoma architecst inc.

The atrium is used to foster a clear inside outside connection, with glazing taken down to the lower floor of the space opening up the view to the north, helping to prevent the building from feeling too insular. This is further enhanced by the use of similar materials either side of the atrium glazing and by the continuation of some landscape features into the building.
All elements of the offices that can be, are open to the atrium, further reinforcing the shared nature of the building and the contact across the space. Building wings are also physically connected to each other with the bridge elements through this space. The atrium can be used for large gatherings, multiple breakout and informal meeting areas as well as allowing the canteen to spill into the space if desired. It therefore becomes the social hub of the building. The floor of the atrium is stepped up over accommodation on the lower floors which creates a greater degree of privacy and quietness through the shared space. The atrium is also key to the ventilation strategy in the building. Warm air rises to the top through natural stack effect; heat is mechanically removed through a heat exchanger and then recalculated back into the office spaces. This allows clean air to be pre-heated for the office spaces and dirty air to vent naturally through the atrium space.

APPENDIX C: SUSTAINABILITY

SUSTAINABLE DESIGN STATEMENT

EXECUTIVE SUMMARY

This report provides an overview of the sustainable design initiatives being considered, to reduce energy and water consumption, for the proposed Crime Campus Gartcosh development. It outlines the benchmarks and measures to be undertaken in the development in order to demonstrate the sustainability of the project with regard to resource consumption.The report addresses how the design for the Crime Campus is being developed to respond to national, regional and local planning policy. The following outlines the Sustainable Design Opportunities considered for this development:

Sustainable Design Opportunities	Electrical Energy Reduction	Thermal Energy Reduction	Potable Water Reduction
Passive Chilled Beams	✓		
Solar Hot Water Heating		✓	
Biomass		✓	
Rainwater Collection			✓
Ground Source Heat Pump	✓	✓	
4PFC (fre cooling)/VRF (air source heat pump)	✓		
Co-generation/Tri-generation	✓		
Passive Design Strategies	✓		

GENERAL

This report presents an overview of the Sustainable Design Opportunities being considered for the proposed Crime Campus Gartcosh development.

The design options that could potentially reduce the buildings operational energy and resource consumption are described along with the benchmarks and criteria that the project will aim to achieve in order to demonstrate the overall sustainability. This report has been produced on the understanding that the goal is to demonstrate a high level of sustainability and energy efficiency for the development. The opportunities listed demonstrate the sorts of initiatives which if implemented, could clearly demonstrate that goal.

APPROACH

The design approach adopted is as follows:

- Target energy and water efficiency measures to reduce resource demand through best practice design and passive design strategies.
- Locally offset the minimised resource demand through effective supply from Low and Zero Carbon (LZC) technologies and water recycling.

OBJECTIVE

The objective of this report is to demonstrate the potential for a highly achieving green building design solution in response to Planning Policy and Section 6 Compliance, and bring early consideration of:

- Passive design strategies that have to be considered early in the project so that they are integrated with the architecture;
- Client aspirations beyond mandatory legislative compliance;
- The design opportunities available to reduce operational energy and water consumption.

LIMITATIONS

The project is currently at Scheme Design stage. This report is based on preliminary information only. The design strategies will therefore be developed and refined as the design progresses.

PROJECT DETAILS

The project intends to bring together various Police and Government Agencies into a single campus in an attempt to increase cross-Agency collaboration. The campus will consist of mainly office space but will also include a forensic lab area, a data centre and various other facilities associated with the functions of the Agencies.

LEGISLATIVE COMPLIANCE

The following mandatory requirements will be incorporated into the minimum benchmarks set for the project with regard to energy consumption.

BUILDING REGULATIONS COMPLIANCE WITH SECTION 6: ENERGY (SCOTLAND)

This legislative standard was established to reduce carbon dioxide emitted by the built environment and all new commercial developments must comply with the energy performance requirements. Carbon dioxide emissions are reduced by at least 23-28% on previous standards.

There are 5 mandatory compliance criteria that have to be achieved:

1. CO2 emissions for the Actual Building need to better the calculated Target Emission Rate (TER) determined by application of both an improvement factor and renewable energy contribution to the emission rate of the Notional Building.
2. The performance of the building fabric, heating, hot water, fixed lighting systems and services must meet minimum standards.
3. Where areas do not have cooling, means must be provided to limit solar gains in summer.
4. The quality of construction and commissioning must be ensured.

5. Information must be provided to enable building users to operate buildings in an energy efficient manner.

ENERGY PERFORMANCE CERTIFICATES

Energy Performance Certificates (EPCís) have been introduced into the UK market and are a mandatory requirement for all new buildings. The EPC will display the building energy consumption in kWh/m2 and a label from A (Excellent - Low Running Costs) to G (Very Poor - High Running costs). The aim is to understand building performance and encourage investment in and development of energy efficient buildings.

PLANNING POLICY

Government Level. The SPP 6 and subsequent PAN 84 documents provide guidance on moving towards low and zero carbon developments through the use of energy efficient, microgenerating and decentralised renewable energy systems. The use of renewable and low carbon technologies to contribute at least a 15% reduction in CO2 emissions beyond the 2007 Building Regulations CO2 emissions levels is recommended in these documents.

Local Planning Authority. To date there have been no discussions with the Local Authority however from past experience there has been no requirement from North Lanarkshire Council to achieve carbon emission reductions beyond the requirements of SPP6. Dialogue with NLC will happen as part of the Planning and Building Warrant process.

BENCHMARKING

BREEAM Rating. BREEAM is an environmental assessment tool developed by the Building Research Establishment (BRE) to provide a measure of a developments environmental impact. During the design and development of the building environmental measures are applied that provide an overall environmental rating for the building. The BREEAM rating encompasses many environmental categories including, Environmental Management, Health & Wellbeing, Energy, Water, Transport, Land Use & Ecology, Pollution, Materials and Innovation.

This development is to be benchmarked against a 'Very Good' rating, under the 2008 scheme, with the environmental measures provided by the BREEAM rating tool through each of these categories.

Target Energy Performance. The predicted energy performance will be benchmarked against BREEAM credit Ene1 - Reduction of CO2 emissions.

**EPC rating in England and Wales. Approximate to a B under the Scottish EPC rating scheme or 20-30 kg CO2/m2/yr as assessed against Section 6.1.*

A minimum CO2 Index of 40 will be targeted for the new building. This represents industry best practice and is the

BREEAM Credits	New Building CO_2 index (EPC Rating*)
0	4C

minimum energy performance required to achieve a

BREEAM Excellent rating.

Target Water Consumption. The predicted water consumption will be benchmarked against BREEAM credit Wat1 - 'Water Consumption',

- Taps, urinals, WC's and showers will be specified to reduce water consumption to 4.5-5.5m3 per person per year or less.

BEST PRACTICE DESIGN

The following measures will be considered for the development as a minimum in line with best practice building services design:

HVAC:

- Where mechanical ventilation is required outdoor air rates to be 12 l/s/person and supplied via a variable flow system based on occupancy detection.
- Energy recovery on all exhaust air streams.
- Optimised high performance facade to minimise summer solar gain, minimize winter heat loss and maximise daylight penetration.
- High efficiency, modularised, variable flow, central plant providing water for heating and cooling.
- Thermal zoning with individual time and temperature controls.

Lighting:

- T5 or T8, energy efficient lamps, with high frequency ballasts to supplement da lighting.
- Consideration of LED luminaires where appropriate.
- Control of artificial lighting via user friendly manual and automatic control by means of photocell, time clocks, PIR, localised ëon/offí and dimmable switching.
- Efficient external lighting that switches off automatically. Building access lighting to be a minimum of 50 lamps lumens/watt and car parks 70 lamps lumens/watt.

Potable Water:

- Flow restrictors on sanitary ware and shut off valves to toilet blocks to reduce potable water consumption.

Metering:

- Metering of substantial energy and water uses to allow monitoring and targeting of resource consumption.

Materials:
- Insulation to have a Global Warming Potential (GWP) and Ozone Depleting Potential (ODP) of zero.

PASSIVE DESIGN STRATEGIES

Passive design strategies will be considered in order to reduce energy demand associated with cooling and mechanical ventilation by offsetting building cooling loads whilst proving fresh air for occupants. Successful passive design relies on early coordination between the architect, structural and services engineers. This co-ordination has been ongoing through early stages. Although the building is not suitable for openable windows, consideration has been given to night time purging of the offices via the atrium. The thermal mass of the structure will also be considered as a possible heat sink to store energy which can then be released slowly over time in order to stabilise internal room temperatures and reduce heating and cooling demands. Early discussions with the architect and structural engineer led to the proposal for a concrete construction building.

This strategy will be enhanced by operating a night purge cycle to effectively remove heat from the structure outside of operational hours. Facade performance and solar shading has been considered as part of the early design to optimise thermal performance while maintaining a good level of daylight.

With regard to daylight the building façade will be analysed to aid the selection of an appropriate glazing type and the positioning of fenestration with the objective of maximising daylight penetration.

The target daylighting performance will be a daylight factor of 2% or more for at least 80% of the occupied floor area, where the daylight factor is a ratio of the available daylight outside to that inside the space. The large atrium rooflight will assist in achieving this.

ENERGY EFFICIENT BUILDING SERVICES

HVAC Strategies. A number of HVAC strategies were considered during the early stages of scheme development. Following preliminary environmental simulation a system of 4 pipe fan coils are currently being considered. Those considered but ruled out included:

System	Discussion
Passive Chilled Beams	Couldn't achieve cooling requirements of high occupancy density
Active Chilled Beams	Suitable for some areas but not suitable for areas of high occupancy density
Displacement Ventilation	Increased floor void required. Couldn't achieve cooling requirements. Lack of local control

These will be connected to high efficiency gas fired boilers and external chillers and dry air coolers which will offer elements of free cooling. As an alternative a variable refrigerant flow (VRF) system is also being considered. Both systems offer the cooling capacities required by the areas of high occupancy density.

Artificial Lighting Strategies. Energy efficient lighting and controls will be considered for the development to reduce electricity consumed by artificial lighting. A suitable lighting system with T8 or T5 linear fluorescent lamps or compact fluorescent lamps will be considered. Luminaires having high frequency dimmable ballasts will be designed for the majority of areas. LED and fibre optic light sources will be considered for suitable applications where decorative lighting is required.

Artificial lighting will be zoned in areas of 100m2 or less and will not provide more than 400 Lux across 95% of the floor area. Local switching will be provided for occupant use to supplement a level of automatic control. Enclosed offices, toilets and similar will be controlled through presence detectors. Perimeter areas will be controlled via daylight sensing allowing the perimeter lights to be switched off when daylight levels are sufficient.

LOW CARBON TECHNOLOGIES

Solar Water Heating. Solar hot water heating will be considered for the development as there is year round domestic hot water demand, during daytime occupied hours. Solar thermal panels will be roof mounted, ideally south facing at an angle between 30 º and 40 º, and will capture solar energy to generate domestic hot water. The system comprises of; thermal panels, distribution pipework, pumps and storage cylinder. A gas fired standby system will also be included to ensure supply and avoid a legionella risk. Solar panels are being considered for the roofs of the toilet blocks.

Ground Source Heat Pumps. Ground Source Heat Pumps (GSHPís) will be considered for the development to reduce the central plant heating and cooling loads. An underground network of piping will allow the earth to be used as a heat source/sink. Energy recovered or removed from the earth will be upgraded via an electrically driven heat pump in order to generate useful water temperatures for both heating and cooling.

The heat pumps can be central and the water loop connected to terminal fan coil units and/or an under floor heating system etc.

A closed loop system will be considered. The closed loop system circulates water through a system of buried pipework exchanging heat with the earth. The client has undertaken a contract with ENERG to undertake a thermal response test. These tests are ongoing and results awaited.

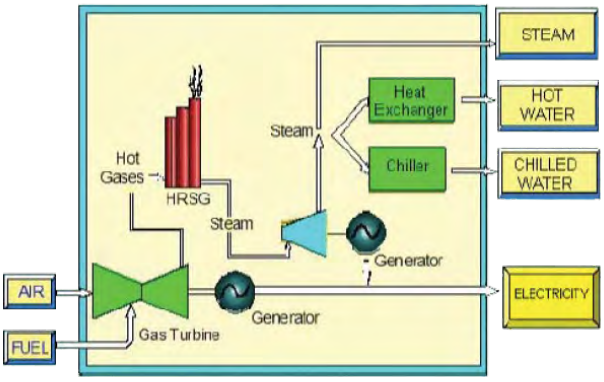
Co-generation/Tri-generation. Co-generation will be considered for the development to reduce the site CO2 emissions. Co-generation is the production of electricity on site using a reciprocating gas engine combined with the effective use of the heat produced in the electricity generation process. It is considered suitable for this application as the waste heat recovered can be used to meet the space heating and domestic hot water demand consideration will also be given to the waste heat being coupled with an absorption chiller, in tri-generation mode, to generate chilled water to meet the (continual) cooling demand.

Co-generation is a very efficient way of generating electricity, heat and cooling from natural gas, which has the lowest greenhouse gas co-efficient of the fossil fuels, a 15-40% energy saving is achieved compared with the separate production of electricity and heat. The associated CO2 emissions are further substantially reduced when bio-fuels are considered.

Biomass. Biomass will be considered for the development as an alternative fuel to gas for the boilers. Biomass fuel is typically either wood chips or wood pellets and as a replenishable source which absorbs CO2 it is considered a carbon neutral fuel. Wood chips or wood pellets will be used in the boiler to directly generate hot water for space and domestic hot water heating.

The following should be noted:

- Large fuel storage area required.
- Increased local particulate pollution.
- Ash storage and removal required.
- No local biofuel source.
- Transport access for fuel and ash could be an issue for a secure site.



Wind Power. Electricity generation via wind power will be considered for the development as a CO2 free method of generation. A building mounted wind turbine or a standalone wind turbine can be considered.

Wind power is a very effective method of electricity generation and outputs range from Watts to Megawatt outputs. The rotation of the blades drives a generator either directly or via a gearbox using a DC to AC inverter to supply the development directly, charge batteries for future consumption or supply the grid.

Excess electrical consumption can be sold back to the grid which will improve the system payback or alternatively stored. A grid connection will be provided as back up as wind power is an intermittent supply.

Previous studies for a standalone wind turbine have been undertaken by Scottish Enterprise. The results suggest that a large scale (>800kW) turbine is not commercially viable. Small scale building mounted turbines have also been rejected due to possible radio interference with building systems and recent studies suggesting poor performance in urban areas.

Photovoltaics. Electricity generation via Photovoltaics (PV) will be considered for the development as a CO2 free method of generation. Electricity will be generated from solar energy via semiconductor cells mounted on roof (and/ or) facade integrated. These will be ideally south facing at an angle between 30° and 40°. Multiple PV connected modules will be required, with a maximum achievable efficiency of 15-18%. The DC output will be converted into an AC output through an inverter for direct use or to charge batteries. A grid connection will be provided as back up as it is not expected that the PVís will meet the whole building load. The amount of energy generated by photovoltaics is likely to be small in comparison to demand. Therefore, payback and commercial viability are likely to rule photovoltaics out.

WATER RECYCLING

Low Flow Fixtures. Low flow sanitary water fixtures will be considered as the primary method to reduce the buildings annual mains water consumption. Flowrates are suggested in the table below:

Rainwater Collection. Rainwater collection will be considered for development to offset potable water demands for toilet and urinal flushing. Rainwater will be collected from the roof of the development filtered and then stored in a tank. The storage tank will be topped up with mains water when the collected rainwater cannot meet demand. The mains water top will be controlled by an electronic level indicator and will also incorporate an overflow to the sewer during times of high rainfall.
The system will reduce potable water use and subsequent water and sewer charges.

Grey Water Collection. Grey water collection could be combined with rainwater collection to increase the volume of water available to offset potable water demands for toilet and urinal flushing. Rainwater and grey water from; wash hand basins, sinks and showers could also be collected and treated before being stored as above. The system could reduce potable water use and subsequently water and sewer charges.
Grey water requires additional treatment over and above rainwater. The ongoing liability for this treatment means a grey water recovery scheme is not preferred.

SUSTAINABLE DESIGN OPPORTUNITIES

In summary the following Sustainable Design Opportunities are being considered for the development:
Passive design strategies are an ideal way of increasing the buildings performance, while the design is at an early stage. This in turn can reduce both the thermal and electrical energy required. Ground Source Heat Pumps can

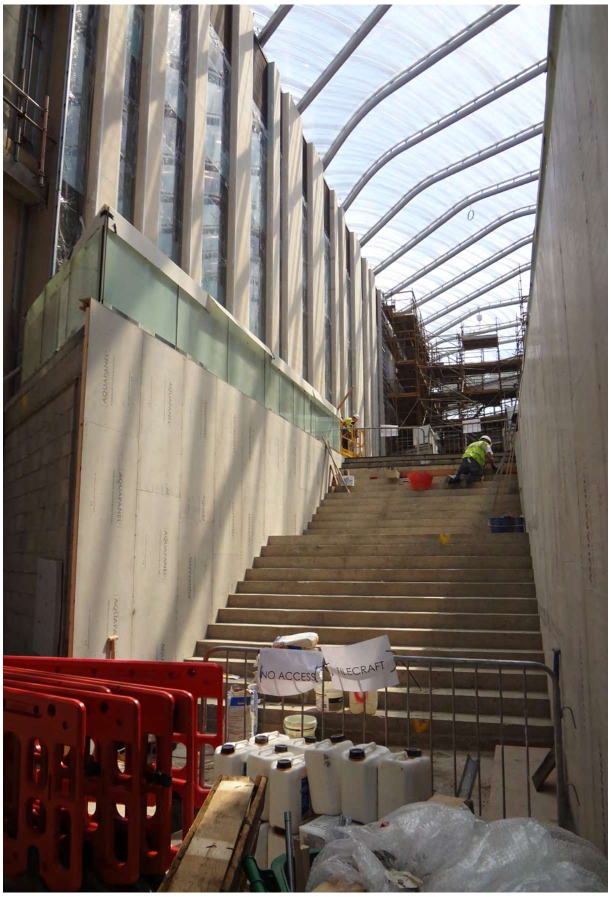
Sustainable Design Opportunities	Electrical Energy Reduction	Thermal Energy Reduction	Potable Water Reduction
Passive Chilled Beams	✓		
Solar Hot Water Heating		✓	
Biomass		✓	
Rainwater Collection			✓
Ground Source Heat Pump	✓	✓	
4PFC (fre cooling)/VRF (air source heat pump)	✓		
Co-generation/Tri-generation	✓		
Passive Design Strategies	✓		

easily be incorporated into an active chilled beam or 4PFC system to reduce both electrical and thermal energy. The low temperatures used in an underfloor heating means it is also ideal for use with ground source heat pumps.
Solar Hot Water Heating would also be beneficial as the demand for hot water is during the daytime. This is when the system is most effective. However, a suitable location for the collectors will have to be found. One of the main benefits to using VRF is that the air source heat pumps are classed as a Low or Zero Carbon Technology, which will need to be incorporated to meet SPP6 requirements.
Rainwater collection is a very effective method of reducing the potable water supply required, thus reducing water charges. However the benefits will have to be weighed up against the capital cost and storage implications.
Tri-generation could be used to meet the year round cooling demand with the use of absorption chillers. When in co-generation mode, it will be able to meet the underfloor heating requirement for the atrium.

APPENDIX D:
PROJECT GALLERY

Pattern language of facades under construction relationship to floors, main frame and percentage of openings can be clearly seen.

Strip supporting facade elements ease construction, simplify jointing elements, provide stable parapets etc to minimise secondary structure.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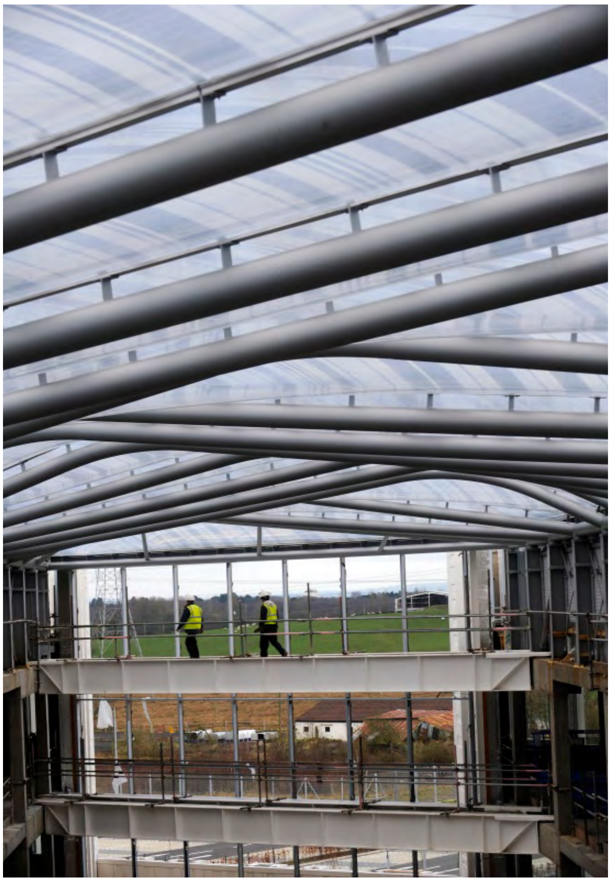


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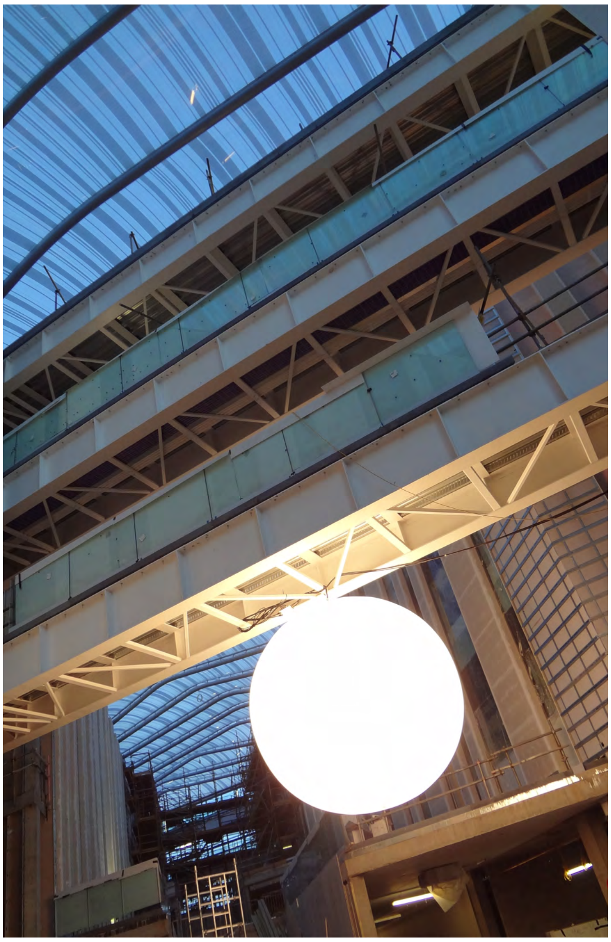
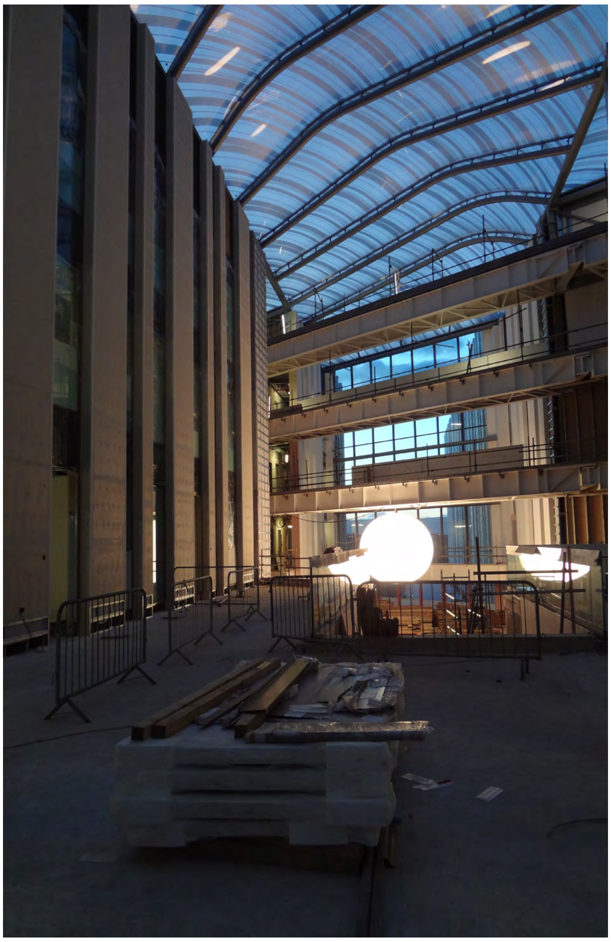



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APPENDIX E:
CURRICULUM VITAE

CVs
Ryder Architecture

Gordon Murray
BSc BArch PPRIAS RIBA RIAI RTPi MCIArb
Partner

Role
As partner Gordon will direct the design team throughout the project and will ultimately be responsible for the quality of all services provided by Ryder.

Profile
Gordon has practiced in Glasgow for over thirty years. “Reduced to the maximum” is his personal ethos towards architecture. Since becoming a partner in Cunningham Glass Architects in 1987 he has developed a number of practices which have been widely regarded throughout the UK and internationally for projects which are thoughtful yet thought provoking. He was awarded the Royal Scottish Academy medal in 1990 and his work has been exhibited at the Royal Institute of British Architects in London, at the Royal Scottish Academy and RIAS in Edinburgh, the Lighthouse in Glasgow and Rotterdam, Marseilles and in the 2004 Venice Biennale.
Appointed Professor of Architecture and Urban Design and Head of School at the University of Strathclyde in 2007. He has, over the last ten years, been a guest lecturer in Schools of Architecture in Glasgow, Edinburgh, Cardiff, Belfast and at the Bauhaus in Dessau.
In 2008 he participated in a conference and workshop in Auckland, New Zealand on behalf of Scottish Government and OECD in Paris on Inclusion and Integration through Innovation.
Gordon was President of The Royal Incorporation of Architects in Scotland from 2003 to 2005; Trustee of the Lighthouse, Scotland’s National Centre for Architecture, Design and the City from 2003 to 2009; and Chair of The Committee of Heads of Schools of Architecture across the UK from 2010 to 2012. He has been a member of Architecture and Design Scotlands Design Review and Enabling Panels since 2007.

Relevant Experience
Scottish Youth Theatre, Glasgow
Scottish Crime Campus
Glasgow Central Station
Copenhagen House, Glasgow
Western Club, Buchanan Street, Glasgow
Hazelwood School, Glasgow
College of Piping, Glasgow
Glasgow Harbour Masterplan
Community Health and Care Partnership South West, Glasgow
Commonwealth Games Village, Glasgow
Wick Schools
Grampian Police
Edinburgh Sick Children’s Hospital
John Knox Street Units, Glasgow
Axis Business Park Masterplan, Edinburgh
Forth Energy Masterplan, Dundee Leith, Rosyth and Grangemouth