AN EXPLORATION OF THE DEVELOPMENT OF HUDDERSFIELD'S 1970 MARKET HALL: ARCHITECTURAL DECORATION WITH CHEAP GREENS; AN ARCHITECT'S DREAM?

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ABSTRACT

An exploration of the origins and development of Queensgate Market; a 1970 covered retail market in Huddersfield in the United Kingdom.

The market's roof of glazed reinforced concrete asymmetric hyperbolic paraboloid shell umbrellas and prominent artwork have led to never ending controversy. Proposed demolition of the building in 2003 and its listing on grounds of its architectural or historic importance in 2005 accentuated the community's dichotomy over the market's qualities.

Can the building be better understood by examining antecedents and historical practice?

Through a review of markets and market architecture and design, hyperbolic paraboloid shell roofs engineering, retail design and public art the research aims to explore aspects of the development of Queensgate Market;

- the trajectories of art, engineering and architectural practice
- the transfers of awareness, knowledge, empowerment and actualisation
- the mechanisms and vectors at play in such transfers; education and autodidactic learning and dissemination through publication and migration.
- the connections based on proximity, employment, meeting and travel.

It was carried out by site visits, primary and secondary sources and interviews with people involved with design and construction.

Queensgate Market is identified as the unique nexus and climax in the expression of markets, hyperbolic paraboloid shells and civic art.

The study concludes that the vagaries of human migration, challenge, proximity, education and friendship are informal but important vectors in addition to technology, commercial, legislative and societal norms to the realisation of the project.

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Abbreviations

BoE	*Buildings of England*
EPDM	ethylene-propylene-diene monomer
GPO	General Post Office
hypar	hyperbolic paraboloid
ICE	Institution of Civil Engineers
IStructE	Institution of Structural Engineers
NABMA	National Association of British Market Authorities
NCO	non-commissioned officer
RIBA	Royal Institute of British Architects
WYAS	West Yorkshire Archive Service

Introduction

Figure 1-1 Thomas Cole, The Architect's Dream, 1840
http://www.backtoclassics.com/images/pics/thomascole/thomascole_thearchitectsdream.jpg

"Once upon a time an architect had a dream. The curtain of his bourgeois parlour was rent, and he found himself reclining on top of a colossal column overlooking a great port. On a nearby hill, the spire of a gothic cathedral rose above pointed cypresses in a dark wood; on the other side of the river, a Corinthian rotunda and the brick arches of a Roman aqueduct were bathed in golden light, The aqueduct had been built on top of a Grecian colonnade, in front of which a procession led from the waterside to an elaborate Ionic shrine. Further away the form of a Doric temple crouched beneath an Egyptian palace, and behind them all, veiled in a haze and a wisp of cloud, was the Great Pyramid.

It was a moment of absolute stillness. A perspective in time had become a perspective in space as the past receded in an orderly fashion, style by style, from the parlour curtain of the present all the way back to the horizon of antiquity. The Dark Ages partially obscured classical splendour; Roman magnificence was built on the foundations of Grecian reason; the glory that was Greece lay in the shadow of ur-architecture of Egypt. The array of buildings formed an architectural canon, each example dispensing inspiration, advice, and warning to the architect from the golden treasury of history"
(Hollis, 2009) p 3. Edward Hollis interprets *The Architect's Dream* by Thomas Cole,1840

1.1. The problem of modern market hall architecture

Many modern public buildings have only a short history of building type. Their design and construction methods are innovative, seen by some as bold, democratic and rational and by others as or 'concrete monstrosities' (see Figure 1-2).

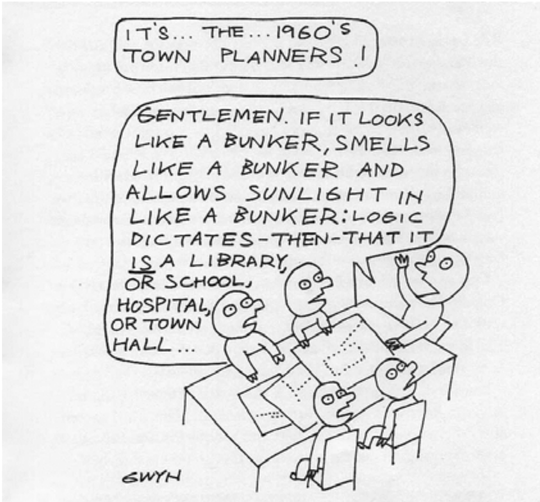


Figure 1-2
Cartoon by GWYN from Jordison & Kieran *Crap Towns* (Boxtree 2002)

Market halls can be seen as being in a low order of environmental and design quality as Norman's 2009 essay *Cover aversions* lyrically epitomises (see Appendix E). The architectural historian, Sir Nikolaus Pevsner's[1] aphorism about a bicycle shed being a building and Lincoln Cathedral being a piece of architecture is apt (bike sheds and churches will feature in this study) and relevant.

"Nearly everything that encloses space on a scale sufficient for a human being to move in is a building; the term architecture applies only to buildings designed with a view to aesthetic appeal."(N. Pevsner, 1942)

The design and aesthetics of market halls range from the low order of banality to decorated gothic glory. Meades writes that architecture is about aptness and aesthetic certainties and not about a hierarchy of uses. "Churches can be (often are) duff, while toilets (more useful than churches) can be landmarks"(Meades, 2012). There is by this reasoning no need to consider bike sheds or market halls as a design type to be held below the salt. An exposition of this is the author's encomium of a 1968 Accrington toilet(Marsden, 2012).

[1] b. Leipzig 30 January 1902, d. London 18 August 1983

Market hall are also little discussed in contrast with many other ‘public’ projects. Such a well-documented building of the time is the Metropolitan Cathedral Christ the King, Liverpool. Frederick Gibberd[2], its architect, wrote in his introduction his book that was to “describe the design” of the building.

“Architecture is an art, imagination or feeling enters into the making of it and off all buildings, a cathedral is expected to be the most imaginative in conception. In the last resort the aesthetic value of the building depends on the imagination of the architect. I have tried to explain why I made the design decisions I did about function, environment and construction but since intuition enters into so much of the design, some of my reasoning may be retrospective. I have, too, stopped short of attempting to reveal any subconscious motives, albeit, I suspect my publishers would have welcomed a more revealing story of the human situation”(Gibberd, 1968)

Only fragments of architects’ explanations of any British post-war market hall design have been found!

1.2. Introducing opinion on Queensgate Market Hall

Huddersfield’s 1970 Queensgate Market is a case study of a modern public building that both challenges and delights. The architectural critic, Colin Amery and the architectural historian, Dan Cruickshank captioned a photograph of the building’s Queensgate elevation; “Developer’s pretension on the rear elevation of the new Ravenseft shopping centre. What is it?” (Amery & Cruickshank, 1975). Schmiechen & Carls, the historians of British market halls described Queensgate Market as a ‘large, drab, cheap-looking utilitarian’ box (Schmiechen & Carls, 1999).

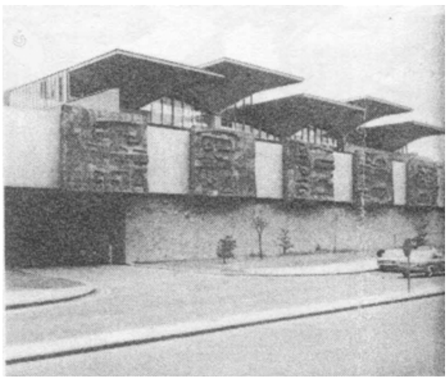


Figure 1-3 photo captioned “Developer’s pretension on the rear elevation of the new Ravenseft shopping centre. What is it?” From The Rape of Britain by Amery & Cruickshank (1975)

[2] b. Kenilworth 7 January 1908, d. Harlow 9 January 1984

Pevsner's famous *Building Of England* (*BoE*) series includes some references to market halls. On Queensgate Market there is no assessment. Pevsner didn't visit Huddersfield after working on the 1959 and 1967 editions of the *West Riding* volume in the series so there was no opportunity for its inclusion. However his co-author, for two of the *BoE* volumes, Ian Nairn[3] did and recorded;

"The one place where modern architecture has really thought about the inner Huddersfield is in the new market hall. The designer here had a really difficult problem. It was a sloping site in which he had to fit this market hall. Although the outside was a bit glam, he really went to work on the inside. The firm was J Seymour Harris who do a lot of town centre schemes up and down the country, and whoever was the designer in that firm really did Huddersfield proud here. To cope with the slope and to fit everything in he used concrete mushroom columns at intervals - mushroom because they splay out at the top and this could have been a structural gimmick; but here that are used to define spaces, to relate them, to bring the light in from the top so that you at one with the building itself. That combined with the fact that the stalls are not regimented has made it a marvelously human place, the opposite of most indoor shopping centres. It is in-fact, and this is pretty rare in Britain-a real modern market." (Nairn, 1975)

In 1993-4 English Heritage made a thematic study of commercial and retail buildings. In it Queensgate Market was identified as a building of special interest that should seriously be considered for listing, potentially at grade II* when it had reached 30 year of age (English Heritage, 2005).

In July 2003 regeneration proposals for Huddersfield's town centre that included the demolition of the market were announced. That August a local newspaper columnist cited a local opinion;

"Here we have a building that is finer than London's South Bank complex or the Tate Modern that folk are going gooey over, that was built without Arts Council, Lottery or sponsorship; a building that houses the most proletarian of activities – a produce market here in Huddersfield.

"What I find most extraordinary is that a building of such importance was built in northern mill town in the late 1960s and its glory continues to go unnoticed by both its users and aesthetes."(Kilcommons, 2003)

At a public meeting in early 2004 (Campling, 2004) a director of Kirklees Council dismissed the building as outdated and architecturally of little significance. That July a local historian published an article titled *Why I hate the Market Hall! 'Dark, cold, mazy and ugly'* (Kipling L, 2004).

[3] b. Bedford 24 August 1930, d. London 15 August 1983

Several months later, following an application for the building to be listed because of its architectural or historical importance, the same council sought expert opinion from Neil Jackson, then Hoffman Wood Professor of Architectural Engineering at the University of Leeds. His report opened with;

“When initially approached by Kirklees Metropolitan Council, the Queensgate Market was not a building I knew but, on visiting it for the first time...it was immediately apparent to me that here was something special. (Jackson, 2004).

For a 2004 view of the market see Figure 1-4.

Figure 1-4 Queensgate market interior, 2004 (Author)

In August 2005 the Department for Media Culture and Sport, the UK government ministry, designated Queensgate Market a listed building at grade II for these principal reasons:

“* It shows innovative use of cutting edge technology in its application of freestanding asymmetric hyperbolic paraboloid shells in its construction
* Its patent glazing method is both technically innovative and visually pleasing
* It incorporates very high quality decorative ceramic sculptures by a noted sculptor, Fritz Steller, both externally and internally
* The sculpted ceramic and metal artworks are integrated into the overall design and form what may be the largest ceramic sculpture in the world
* The design is imaginative and intelligent, making full use of the site and creating a visually pleasing structure with a dramatic roofscape”.(English Heritage, 2005)

The building received further recognition of its significance in November 2007 when the building was awarded the Concrete Society's Certificate of Excellence for a Mature Structure. The judges commented;

"The structure is a very interesting combination of inverted cantilever shell roof elements, which at the time pushed the boundaries of the construction method developed by Candela. In many ways the method of construction was significant and the forerunner to several other structures" (Anon, 2007)

This record of opinions and judgments indicate an unusual building, one that is both vehemently disparaged and unstintingly praised.

1.3. Why this study?

The author first saw the striking exterior of Queensgate Market, as a schoolboy in 1973, crossing Queensgate to attend class in a technical college building. After dark in December 1978 he visited the interior for the first time; the market roof confused him, it seemed to make no structural sense. A visit to the Huddersfield Local History Library led to a 6 page newspaper supplement of 6 April 1970 that eventually referred to hyperbolic paraboloid roof shells. A term that was both new and confusing to him. There was also a souvenir booklet from the opening but not much explanation of the market's design.

In 2003 when demolition of Queensgate Market was mooted the author felt that the building was of such potential interest it ought to be studied and saved. He found that many others were hostile to the building and some appreciated it. That lead to his realisation that opinions on the Queensgate Market are strongly expressed yet it is a building that has been little understood, little known of and has been an enigma to those who have considered it. This has not prevented considerable coverage and comment by many in the local newspaper.

Academic and peer reviewed work on the building has been limited to two papers, both by the author, one on its ceramic sculpture and one on its roof shells (Marsden, 2007, 2008). The latter when presented at the International Association for Shell and Spatial Structures (IASS) symposium, in Mexico in 2008, introduced Queensgate Market's engineering to an international audience that was intrigued. Not only were these apparently unique shells unknown to the delegates, they were surprised to learn that they were celebrated through art articulating their structure. The delegates included Dr Marisella Mendoza who was motivated to visit Huddersfield and is currently preparing a paper, for which she received a RIBA Research Trust Award in 2010; *Candela's Legacy: An investigation of Felix Candela's work and its legacy to the socio-cultural heritage and public identity of the contemporary society in Mexico and the UK* (RIBA, 2010).

The author observes that architectural criticism, engineering, town planning and, social & art histories are separate disciplines where each is generally a pure study. The study of market halls, as Schmiechen & Carl's history showed, crosses disciplines.

Perhaps there is something peculiar to market halls that makes them complicated to assess.The architect Sir Frederick Gibberd said there was no ultimate in architectural expression and that much depends on the nature of the building. Just because every building is a subject for conveying an aesthetic experience it does not have to be an original art work. Buildings have, for the most part, developed from an original into the vernacular so that the design issue is not about their architectural expression but about their relationship to their place(Gibberd, 1968). Market halls have, commonly, not been exceptions to this. As in our society every public architectural project is achieved by a team of people in a nexus of fashion, technology, norms and regulation the freedom for the realisation of an original artork is constrained. There is also group interests to take account of. If there is a single client, user group or interest then designer has a clear decision making process and line of accountability. A public building such as a market, if it is to be accepted for mass participation must be able to accommodate disparate interests. Tenants have varying needs – fish sellers and carpet merchants may share the same building but their requirements are quite different. The owners have both commercial and civic interests. Local tax payers have, perhaps competing, interests. All these must mitigate against originality.

If Queensgate Market is, as the author asserts, really worthy of study as an original rather than a vernacular design then can we, as Thomas Cole's architect, achieve a perspective showing how the past leads to the nexus of this building? The strength of opinions on the building indicate that greater understanding is needed not only to reduce the dichotomy of understanding and appreciation but to resolve the enigma of how did Queensgate Market come about?

The current research aims to explore the development of Queensgate Market through four fields;

- the development of the architectural thin shell concrete hyperbolic paraboloid
- market hall architecture.
- the use of public art as articulation of public building use.
- the spread of shopping centres

Chapters 2 to 10 of this work explores these four fields; the development and use of the hyperbolic paraboloid shell, the history of market halls, the popularisation of public art and the spread of shopping centres. These four themes will be illustrated to show their convergence that resulted in the realisation of a series of projects that demonstrate convergence some of these themes and then Huddersfield's Queensgate Market where all four are uniquely realised. Unique, in that not only do the four themes coincide but also in that in no other project is the resulting gestalt achieved.

Queensgate Market was a project that in turn became history as the flow of time and events led to projects with other materials and technologies elsewhere. Can echoes of Queensgate be found in subsequent projects?

1.4. Research methodology

The author's search for sources and research has been both routine and exotic.

In repeated literature reviews the standard abstracts and indices in the fields have been used; *Avery Architectural Index* being the most significant[4]. The academic ones have had disappointingly few and slight results.

With the help of members, and the staff of, the libraries of RIBA, ICE and IStructE have been exploited. Online searching, bulletin boards and blogs such as *Between Channels* (http://betweenchannels.blogspot.com) have been powerful keys to grey

[4] Until the University of Huddersfield ceased subscribing to it

material. The author, a professional librarian and seasoned literature searcher, has also had to forgo the comfort of the desk search and become a sleuth along chains of people who have memories and personal contacts of events forty, fifty and sixty plus years ago.

Researching post-war British markets, public art and concrete shells has revealed just how little recorded these works are. To discover during the course of the study that this was the reality was trying. By way of an example, one Accrington building, a 1962 market with concrete roof shells and ceramic art; the lack of discussion and appreciation of all aspects was profound and it was demolished without a record being made.

Monographs on modern British market halls are not to be found. Maillard's beautifully illustrated *25 hall de marché* (Maillard, 2004) is primarily an architect's survey of the best French market halls but includes a few Italian and Spanish examples. The introductory essays look at market hall architecture since the C16 and across the world, none British. The few that have written about British markets have observed that little has been written about markets. The only significant monograph on British market halls is the useful Schmiechen & Carls *The British market hall; a social and architectural history* (Schmiechen & Carls, 1999); however the authors did not attempt to identify post-war market halls unless they were replacements for earlier market buildings, to allow comparison with the earlier buildings. Other monographs include Addison in *English fairs and markets;* this stated it was odd that so little has been written about fairs and markets in England and even less about markets in general. Then, in 199 pages, he devoted two sentences to market halls (Addison, 1953). In 1974 Brockman simply observed that the most grandiose of Victorian industrial buildings were public markets, which because of their prominent city sites were architect designed (Brockman, 1974). Anderson in *Markets & fairs of Great Britain*, her 'selective collection' of markets, that was a guide to existing markets included market halls that she specifically dated in the period 1945-1970 (J. Anderson, 1988).

The architectural journal coverage and comment on market halls can be very slight and even major buildings have been found to completely absent from sources of record. The *BoE c*ounty guides can omit markets or be curt to the point of an almost pointless listing. Town planning, engineering and specific product trade journals such as for wood, steel and concrete have all been found to be useful in some cases. It is probably significant that no record of a British market hall project having being awarded an architectural prize has been found. There have been valuable sources on British markets that have been both challenging and impossible to exploit. This includes NABMAG, the magazine of NABMA and NABMA's annual reports. NABMA being the organisation that has represented, supported and coordinated the interests of member organisations for many decades, established an archive of its publications and papers at its Wigan secretariat's office. On the secretariat's transfer to Oswestry in 2006 the collection was discarded. It was only through the support and kindness of the NABMA CEO and his colleagues that copies of the NABMA annual reports have been found in market offices across the country and been made freely available. NABMAG copies have remained untraced and unconsulted. NABMA had also kept records of post-war market undertakings; in 1968 the NABMA president announced the establishment of a library of retail market development that she thought would benefit authorities contemplating such work. In 19968 the NAMBA honorary secretary was said to have written to authorities who had taken any kind of redevelopment in the past few years inviting them to supply particulars of their schemes and advice that they could advance as a result of their experience (M. Lewis, 1968). A year later the NABMA Hon secretary reported that he had invited the 26 NABMA member authorities who had redeveloped or constructed new retail markets in post-war years to supply copies of specifications and plans. Nine were said to be held by him and named (T. G. Morris, 1969). However no indication of project type is given. The library was lost by 2006.

Another pertinent potential resource has been *Market Trader* (and its variant titles) which has been either a weekly newspaper or a supplement to the weekly *World's Fair*, published in Oldham, since 1920. The publisher's archive is in storage and unavailable to the public. Through a loophole in the British Library's otherwise rigorous cataloguing system it proved difficult to identify its holdings and location of *Market Trader*. However Colindale Newspaper Library's holding of *World's Fair* was found to contain *Market Trader* for all the years consulted.

Generally market halls, shell structures and public art have been identified by references in reports, architectural indices and catalogues, architectural guides, newspaper cuttings, word of mouth, visits and serendipity. It has been this informal group of sources that has been the mainstay of the author's learning of shell projects (the markets at Casablanca and Sète were 'found' by acquaintances holidaying) and other works. Friends of friends, photos, cuttings and remembrances of projects from decades earlier have been kept by buildings' clients, tenants, engineers, artists or architects and their families.

Very few British provincial markets have received national press attention on their opening. Leicester's market of 1971 seems to be the notable exception. Markets have otherwise been incidentally mentioned in newspapers of record when a shopping centre opening, a market is part of, has been covered, such as the Bull Ring, Birmingham and the Victoria Centre, Nottingham.

Local newspapers have been a mainstay of garnering the fragments of design details for many new markets. As these newspapers are inevitably not indexed the author has often taken opening dates from market's commemorative plaques. Some public libraries have collected materials such as commemorative brochures, newspaper supplements and cuttings on their local shell structures, market halls and their builders. Other public library staff and the RIBA library have been courteously surprised by the author's enquiries and have opened collection files.

1.5. Summary

Regular exhaustive literature searches have been the foundations of this study however the fields covered are apparently considered to be below the salt for authors, historians and critics. An unexpected reliance on grey literature and ephemera has been rewarding. The serendipity of personal contacts has also led to significant information. Since early 2004 many of the author's interviews with the people associated with Queensgate Market's design and construction were made without this work in mind. Many more interviews and much correspondence, in the course of this work, with people involved with art and shells and market construction from as early as the 1950s have been a rich seam and a pleasure to undertake.

Chapter 1 Introducing Queensgate Market

To introduce the key aspects of Queensgate market this chapter simply outlines its nature and with early drawings and photographs illustrates the building. In studying aspects its development subsequent chapters will focus on the use of architectural hyperbolic paraboloid concrete shells, market halls, public art and shopping centres.

Huddersfield Borough Council opened Queensgate Market, then known as the New Market Hall in April 1970 as a retail market undertaking trading six days a week. The new building replaced the function of the town's 1880 market hall that closed as the new one opened. The official opening commemorative booklet of 1970 described the new market hall. One of the main features said to be the "roof form" (see Figure 1-6 and Figure 1-7). It explained that the architects' conception was that the roof should express the market's trading areas; the rough board shuttering of the columns gave vertical emphasis and the direction and texture of the shells accentuated movement through the hall. The hall was also said to have the maximum amount of natural lighting. Another feature was said to be the use of contrasting materials and surfaces that enhanced the shell roofs. (County Borough of Huddersfield, 1970) (see Figure 1-8 and Figure 1-9). It was the appearance of the shell roofs that teased passers-by and visitors to the market during construction, at the opening and ever since. Contemporary sources generally referred to them either in the vernacluar as either mushrooms or umbrellas. There were also enigmatic references to inverted asymmetric hyperbolic paraboloids; not many bothered with this. In Chapter 2 we shall be introduced more formally.

The market's design can be seen in the plans, elevations, sections and drawings (see Figure 1-1 to Figure 1-5) of the architects, the J Seymour Harris Partnership and contemporary photographs.

The market was part of phase II of a IV phase comprehensive development scheme (see Figure 11-1). This phase included, to the north, a block of 16 developer owned retail units of various sizes that bordered a landscaped piazza and provided an arcade to the market, one of five public entrances (see Figure 1-10).

The market was built on the edge of the development site, with a council built and owned multi-storey car park and the town's new ring road to the lower sides. This allowed uncompromised vehicle access for discrete efficient servicing and a basement for traders’ storage, preparation areas and rest rooms (see Figure 1-2). The fourth side is single storey with clerestory display windows to Peel Street with the town hall across the road.

The high ceilinged hall had a roof of 21 independent column supported roof shells giving clerestory light from all directions (see Figure 1-4). There were mezzanine floors in the market, to the east a restaurant giving access to a roof terrace (see Figure 1-12 and Figure 1-13) and to the centre, market offices (see Figure 1-6). The north wall of the market had a steel figurative relief above the stalls (see Figure 9-21 and Figure 9-22). To the external Queensgate elevation were large ceramic relief panels (see Figure 9-20).

The market’s stalls were permanent, built on terrazzo upstands. The market floor was terrazzo tiled and ribbed-rubber tiled to the portals.

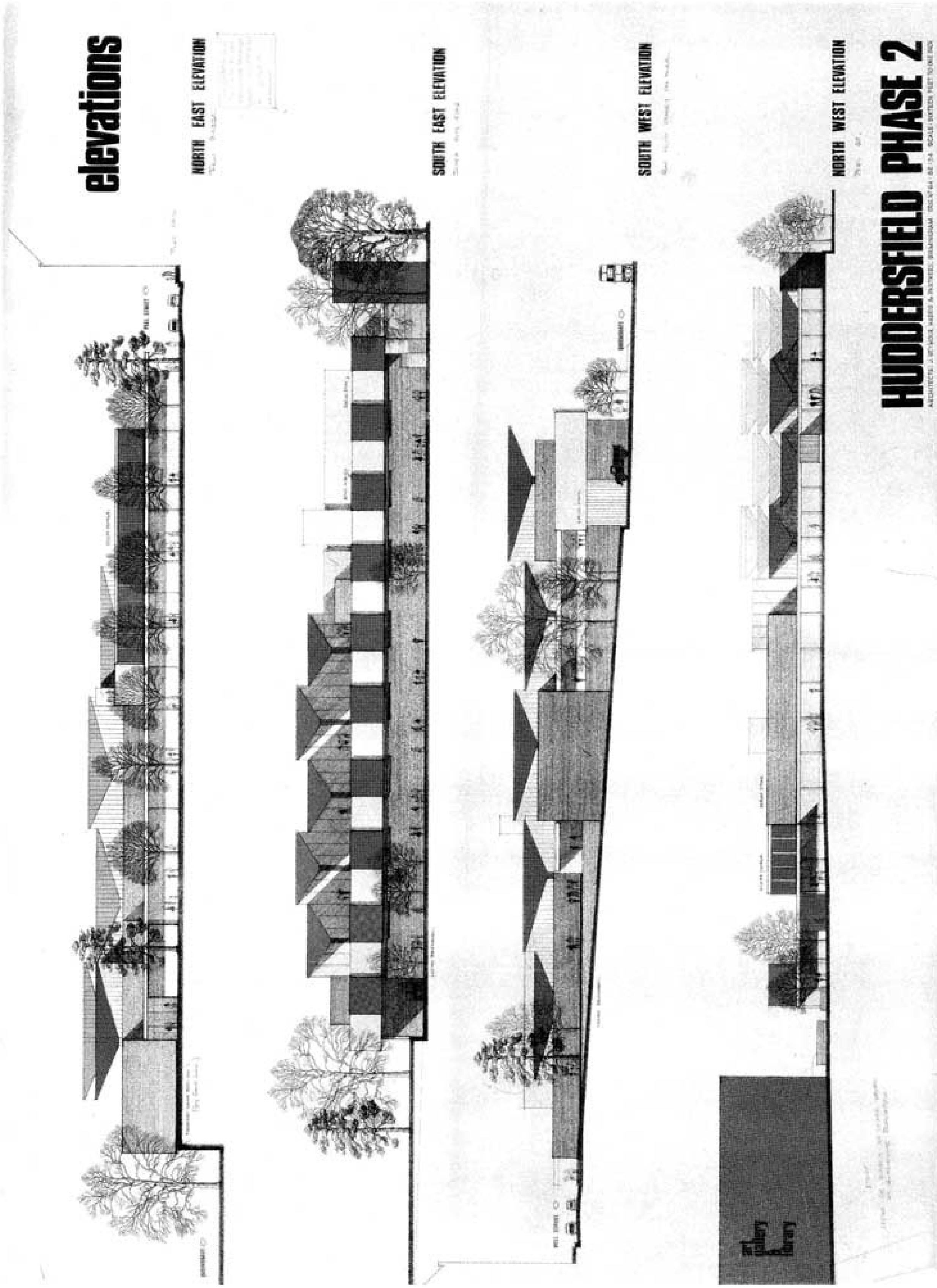


Figure 1-1 Undated elevations from planning application TP16842 dated 18 January 1967 by J Seymour Harris Partnership to Huddersfield County Borough Council (Kirklees Council, courtesy Seymour Harris Architecture)

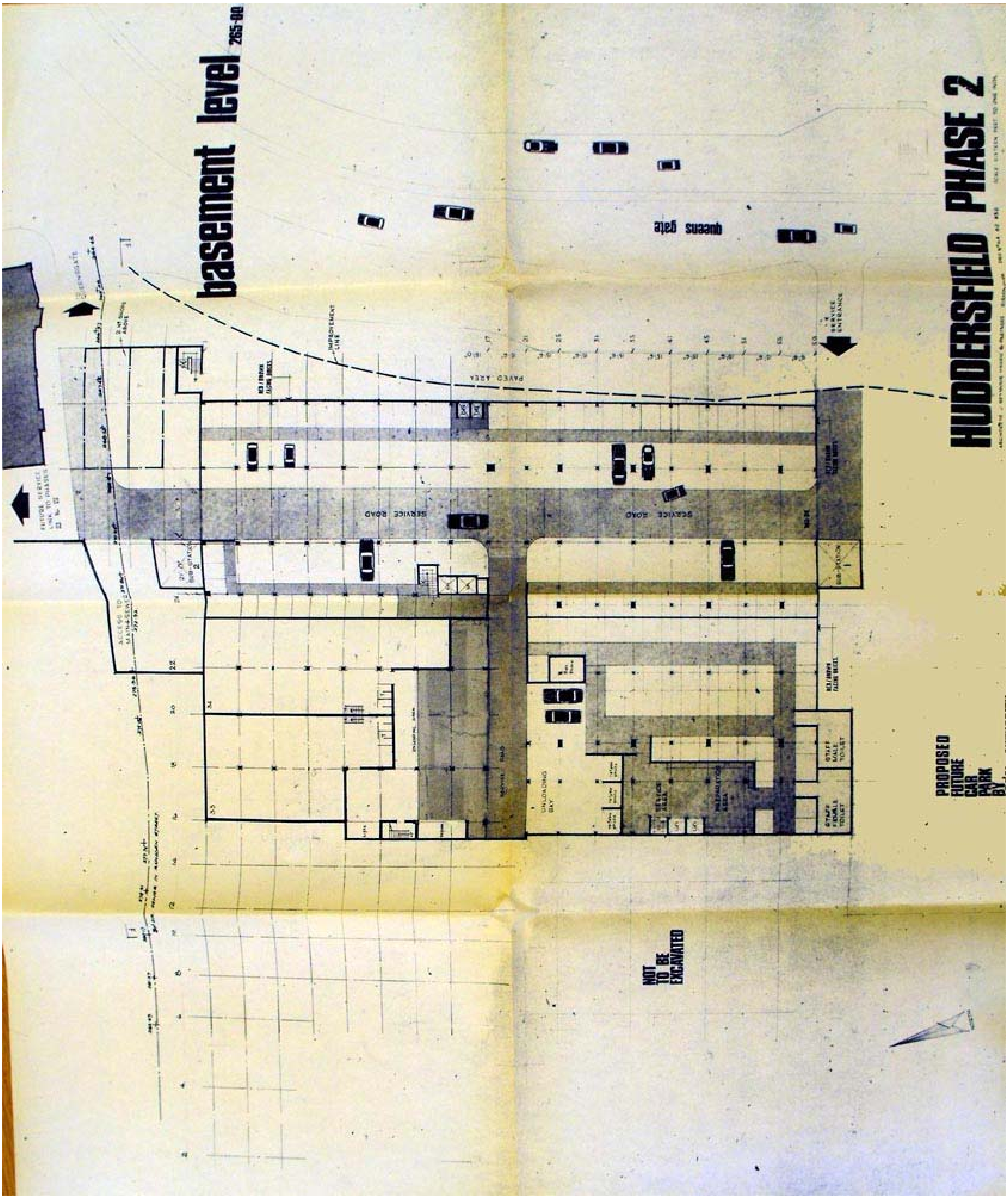


Figure 1-2. Undated plan of basement level, from Clifford Stephenson Archive. Presumed to be similar to a missing plan that would have been in planning application TP16842 dated 18 January 1967 by J Seymour Harris Partnership to Huddersfield County Borough Council (WYAS, photo author, courtesy Seymour Harris Architecture)

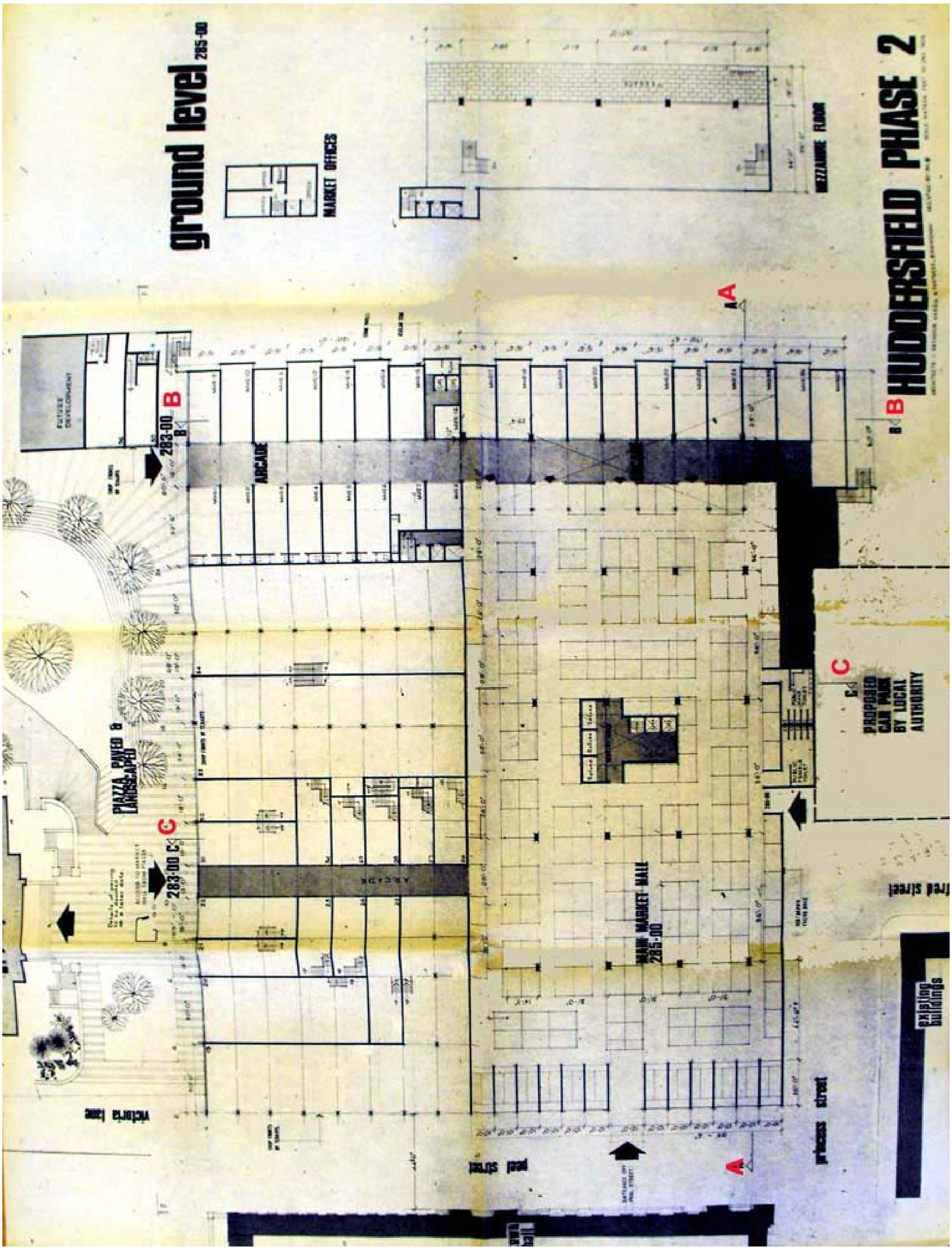


Figure 1-3. Undated plan of ground level, from Clifford Stephenson Archive. Identical to a plan in planning application TP16842 dated 18 January 1967 by J Seymour Harris Partnership to Huddersfield County Borough Council. Annotated in red to show section references (see Figure 1-4).
(WYAS, Photo author, courtesy Seymour Harris Architecture)

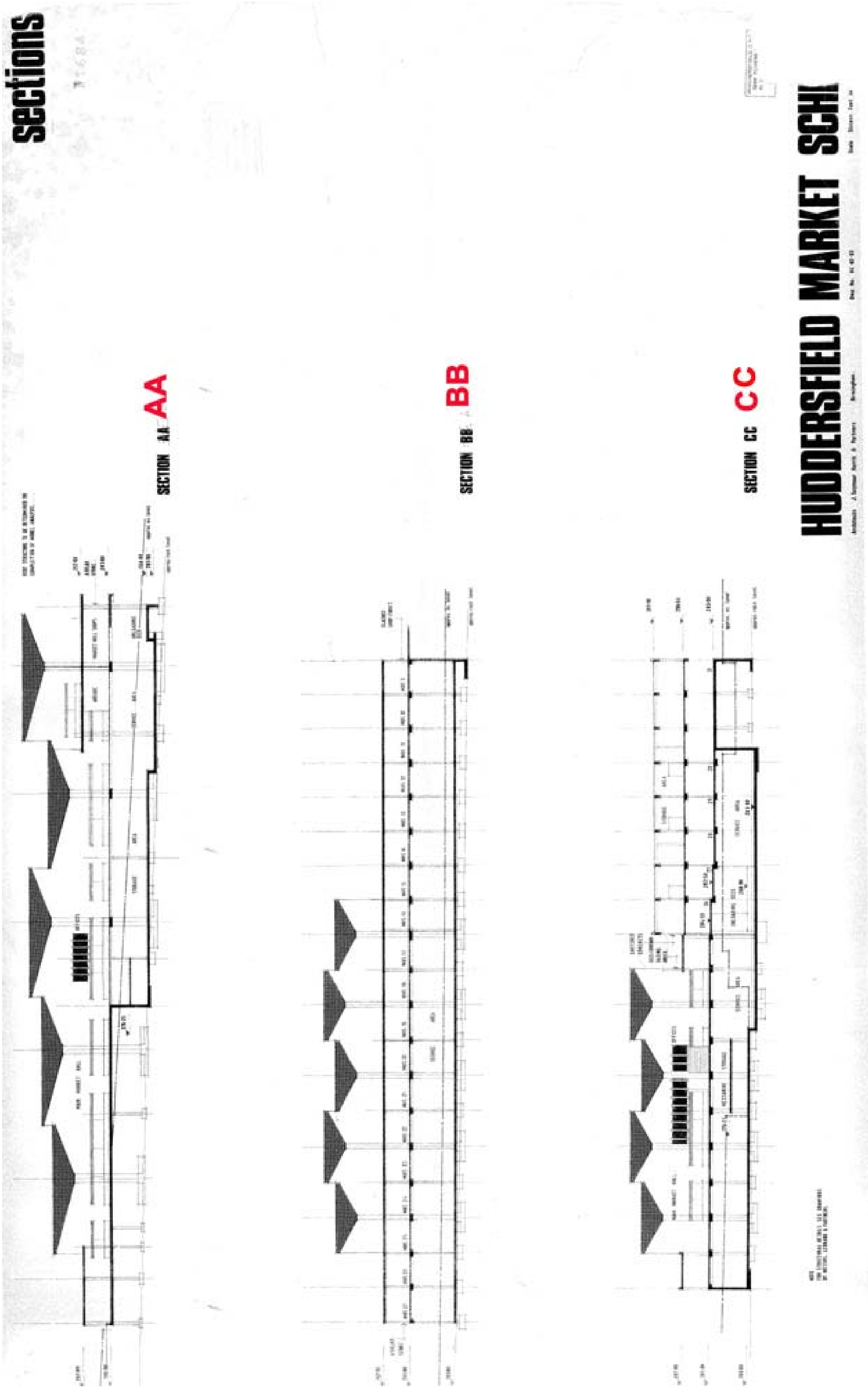


Figure 1-4 Undated sections from planning application TP16842 dated 18 January 1967 by J Seymour Harris Partnership to Huddersfield County Borough Council. Annotated in red to show plan references (see Figure 1-3). (Source Kirklees Council, courtesy Seymour Harris Architecture)

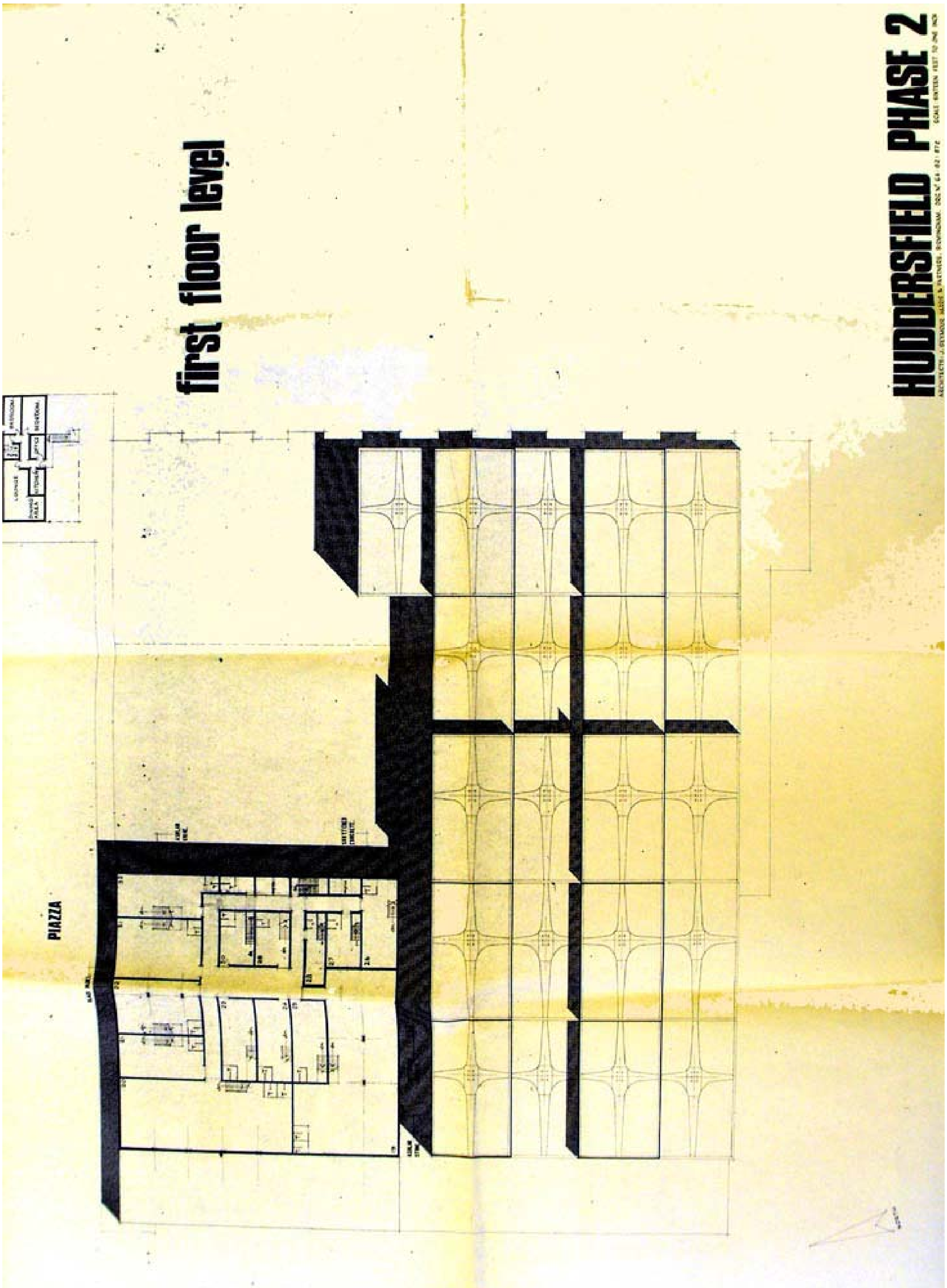


Figure 1-5 Undated plan of first floor level, from Clifford Stephenson Archive. Identical to a plan in planning application TP16842 dated 18 January 1967 by J Seymour Harris Partnership to Huddersfield County Borough Council, (Source WYAS, photo author, courtesy Seymour Harris Architecture)

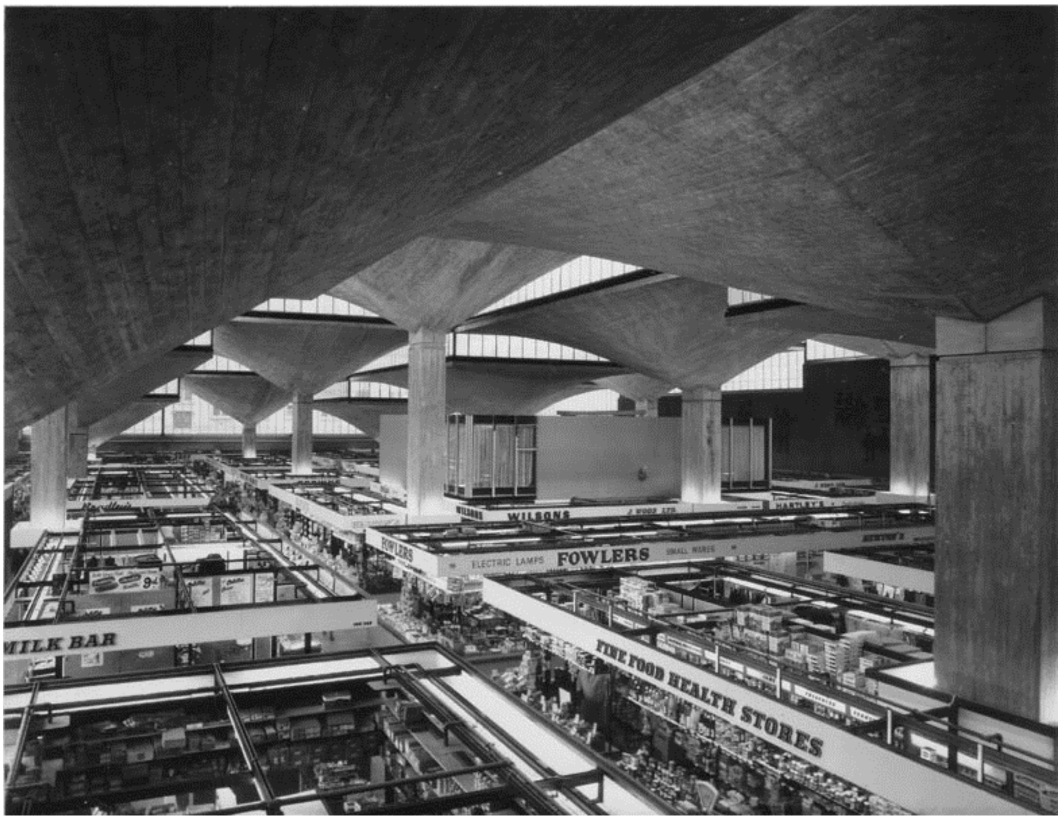


Figure 1-6 Queensgate Market from restaurant mezzanine, 1970
(photo Lion Studios, courtesy G. Crowther

Figure 1-7 Queensgate Market trading floor, 1970
(photo H E Meyer, Author's collection)

Figure 1-8 Queensgate Market from Queensgate, 1970
(Courtesy Sir Robert McAlpine)

Figure 1-9 Queensgate Market from Queen Street, 1970
(Photo Eric Drake, courtesy Kirklees Image Archive)

Figure 1-10 Murrayfield Phase II From Princess Alexandra Walk, 1974. Entrance to arcade to market on right (J Mahönen, University of Huddersfield)

Figure 1-11 Murrayfield Phase II, with incomplete phase IV on left from Princess Alexandra Walk, 1974 (J Mahönen, University of Huddersfield)

Figure 1-12 Queensgate Market restaurant mezzanine 1970, before the fitting of sprinklers (courtesy Huddersfield Daily Examiner, Ref 5724/70)

Figure 1-13 Queensgate Market roof terrace, 1970 (courtesy Huddersfield Daily Examiner, Ref 5723/70)

This brief introduction may, and hopefully it has, raise questions about the building that need to be addressed. Chapters 2 and 3 will look at the significance and use of the hyperbolic paraboloid. Subsequent chapters will explore market halls, public art and shopping centres.

Chapter 2 The Hyperbolic Paraboloid

The hyperbolic paraboloid is of great importance in discussion of Queensgate Market. This chapter will explore the development of the form to show how the type used at Huddersfield was derived, its precedents and that they are unique.

It follows that an understanding of the hyperbolic paraboloid is needed. A hyperbolic paraboloid results when a surface is made from straight lines joining two skewed lines. This chapter expands on this and introduces its significance in shell construction.

A shell is a curved membrane where its thickness is significantly smaller than its length or width. A cylinder is a shell.
When using a shell to form a structure bending stresses are to be avoided since they can lead to rupture or buckling. The load upon the shell should be carried through the membrane which means the stresses are evenly distributed across the membrane. Properly designed a shell can carry great loads that would otherwise need a much more massive structure.

A doubly curved shell has two curves in the form, either synclastic or anticlastic. A synclastic shell has the curves running in the same direction; a dome is a synclastic shell. An anticlastic shell has the curves running in opposite directions. The classic round ‘waisted’ cooling tower is an anticlastic shell.

Some anticlastic shells can be drawn using straight lines. These are described as the tongue-twisting ‘hyperbolic paraboloid’ often familiarly abbreviated to ‘hypar’ (which is often used in this study). It is a shell type that has unusual properties. Hypars have been widely used in the construction of shell structures. Surfaces of this nature are able to distribute loads on them through direct compression and tension only.

It is routinely stated in introductions to the term hypar that it is simple. JD Bennett wrote “the equation defining a [hypar] surface is the simplest possible equation of any doubly curved surface p733 (Bennett, 1961). Jürgen Joedicke wrote “it is an immense help for the architect in his work that is shape as a ruled surface can be easily demonstrated and simple to grasp" p179 (Joedicke, 1962). Felix Candela[5] wrote that it is "is the only warped surface whose equation is simple enough to permit stress calculation by elementary mathematics" p.226 (Faber, 1963).

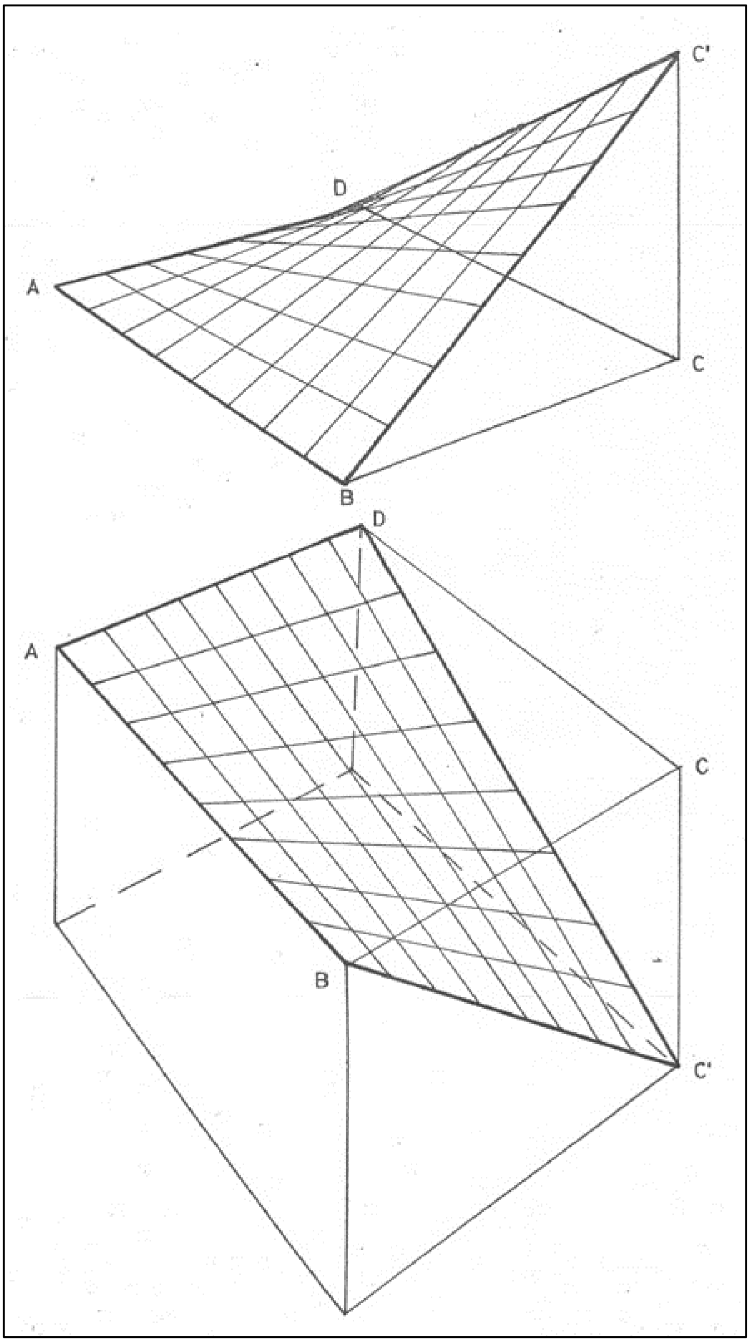


Figure 2-1 The generation of a hypar. Point C is raised or lowered to convert rectangle ABCD into hyperbolic paraboloid ABC'D (Prior, 1969)

The hypar can be formed by two sets of lines. In Figure 2-1 the movement of point C up or down warps the plane of rectangle ADCD and produces a convex curve along

[5] Candela, a significant figure in this work is introduced in section 3.6.

the diagonal B/D and a concave curve along the diagonal A/C’. Because the shape can be ruled with straight lines parallel to the generators it is relatively cheap to build either a hypar shell or a mould for a cast hypar in timber. This, as Candela said, makes it the easiest and most practical shell to build.

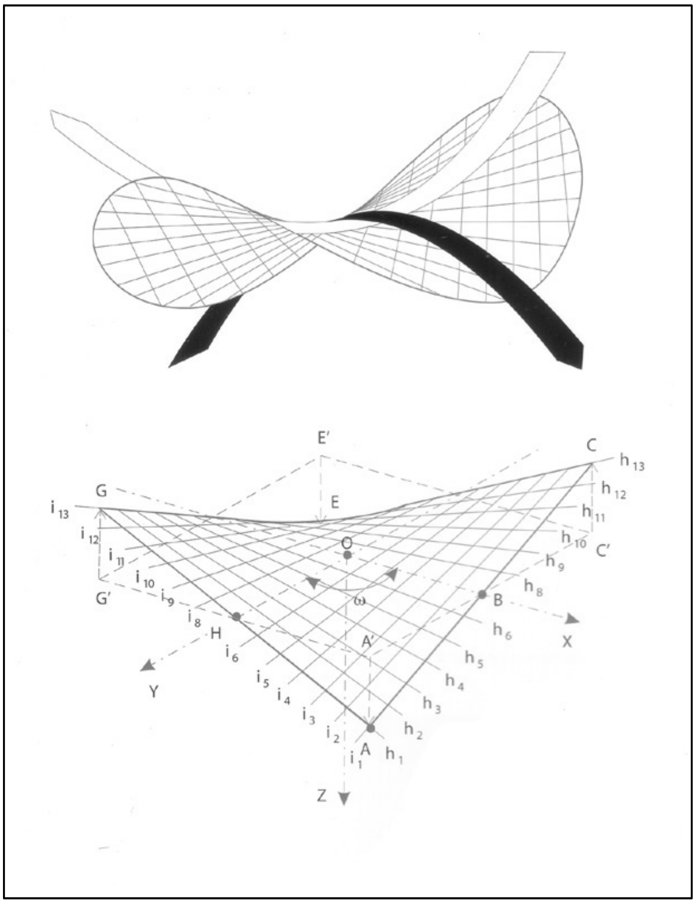


Figure 2-2. Top, hypar with curved edges; bottom hypar with straight edges (Garlock & Billington, 2008)

Single simple hypar shells can be used as roof forms in construction. These can often be seen as saddle-like forms as at Markham Moor (see Figure 3-58). Hypars can also be linked to form more complicated structures that are useful too. Hypars can be used to make umbrella like structures with the high point at the centre; this is little used architecturally because the support has to be substantial at the perimeter and this is costly. Structurally more useful is the inverted umbrella (Figure 2-4). The umbrella form is usually regular in plan and has four hypars (each forming a discrete tympan) however it can be of three, five or more tympans as at Harborne where they had six (see Figure 3-67). It is the inverted umbrella with four regular tympans that became well known as Candela mushrooms (after Felix Candela). Excepting that the tympans are irregular this is the type that formed the 21 roof units of Queensgate Market (Figure 2-5). The steel fixers on the Queensgate market site in 1968 called them Candela shells (Arthur Paul, personal communication, 6 September 2004). We will see how this shorthand was almost certainly a misnomer.

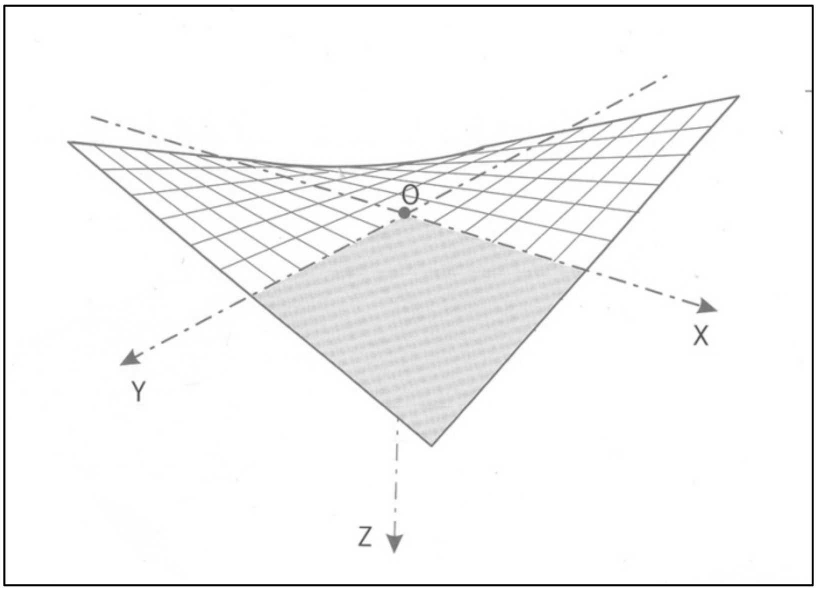


Figure 2-3 A straight edge hypar with one quadrant shaded (Garlock & Billington, 2008). Such a shaded quadrant can be seen in

Figure 2-4

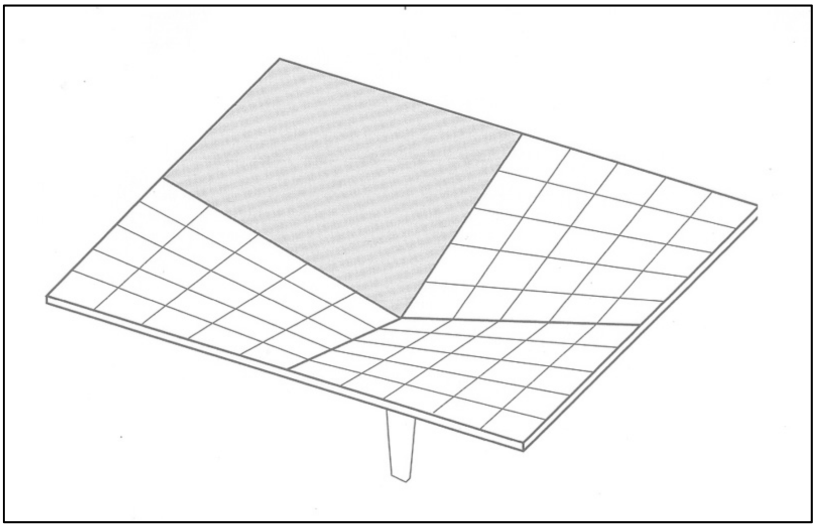


Figure 2-4 An inverted symmetrical umbrella of four hypars (Garlock & Billington, 2008)

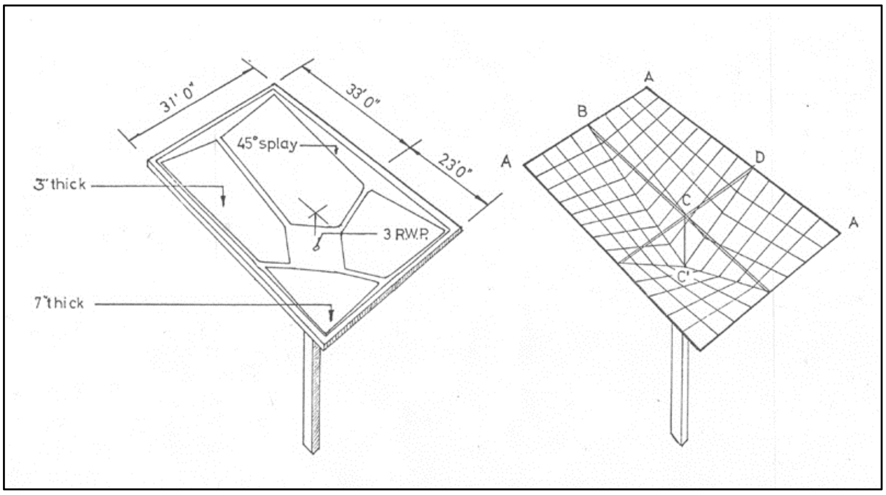


Figure 2-5 A Huddersfield market roof type asymmetric umbrella shell (left) is formed by joining four hypar shells of two pairs of ABC'D of differing sizes (Prior, 1969).

As we shall see the Huddersfield style shells came towards the end of the development of the hypar in construction. The origin of the form was much earlier.

Chapter 3 Hyperbolic paraboloid shell art and architecture

"Appearing like some sort of giant wing sitting above buildings outer walls, the Hyperbolic Paraboloid roof structure was a startling and exciting addition to the town and cityscape of the late 1950's. Its origins are somewhat mixed but stem from what was called the "poetic building" – essentially a construction which is 'unique', a never to be repeated moment, often designed in an attempt to embody an idea or abstract thought."(G. Smith, no date)

Realisations and expressions of the hyperbolic paraboloid through most first half of the twentieth century were made in many media and places. Did the work of a designer or artist in one medium influence work in another medium elsewhere? This may be a rhetorical question but underlying it is an enquiry.

This chapter traces the development of the hypar in architecture and art to points where the architecture becomes art and the art architectural. This was observed by two architects in the late 1950s

"... the new shape architecture is not simply providing solutions to structural-functional problems and it is certainly not done frivolously. It may mark the beginning of warmer collaboration between architecture and engineering" (Boyd, 1958)"

"Candela's achievement is unique...he has explored and exploited its possibilities as a plastic tool in a way which has a parallel only in Naum Gabo's work on similar forms in sculpture". (N.M., 1959)

The correlation between shell structures and art has been summarised as the

- the definition of form; the perception of geometric form
- the appreciation of form as an aesthetic element
- the use of aesthetic elements in art (Melaragno, 1991)

Taking Melagrano's observations we can see how an art movement, Constructivism, used the geometric form.

3.2. Constructivism

Thin shell structures that are apparently hypars appeared in the Constructivist art movement. Constructivism was an influential movement. Artists who went on to become famous for free-flowing, organically inspired and nostalgic forms such as

Barbara Hepworth[6] and **Henry Moore**[7]—for a time espoused a harshly geometrical abstraction (Octavo Books, 2011).[8]

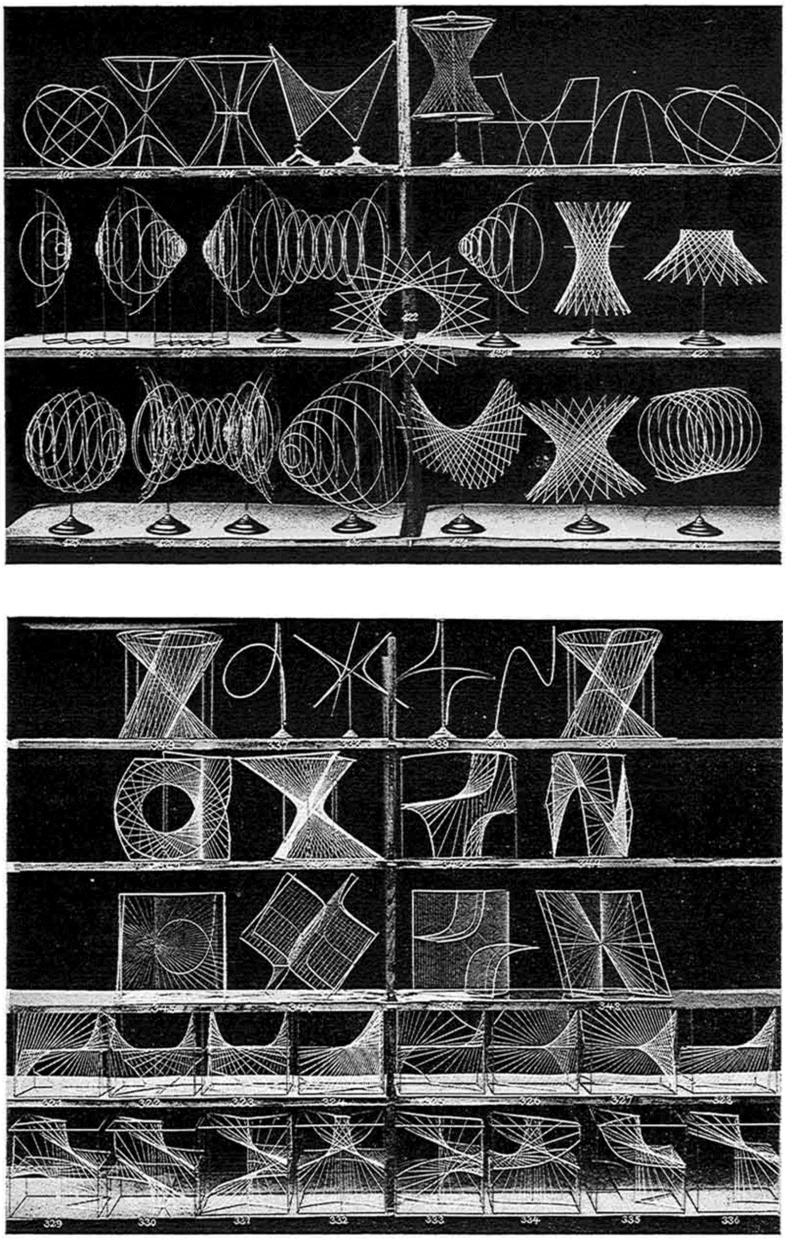


Figure 3-1 Plates III & IV of ‘H. Wieners und P. Treutleins sammlungen mathematicher modelle’
(H. Wiener’s and P. Treutlein’s collection of mathematic models) published by Teubner in 1912 (http://uihistoriesproject.chass.illinois.edu/cgi-bin/rview_browsepdf?REPOSID=8&ID=7976&pagenum=32)

[6] b. Wakefield 1903, d. Trewyn, Cornwall 1975
[7] b.Castleford 1898, d. Much Hadham 1986
[8] Note. In this chapter the first appearance of a personal name is in bold, subsequent citations of the name is generally by surname alone.

Constructivism was founded by **Vladimir Tatlin**[9] in Russia around 1913. The constructivists believed art should directly reflect the modern industrial world, the underlying theory being that a work of art should be an autonomous object with a life of its own and that it should reflect economy and precision. The style being non-objective, the materials often iron, tin, wood, glass, plaster and plastic, was an attempt to bring everyday life and art together. Constructivist art was mostly three dimensional and often related to the artist's proletarian beliefs.

Antoine Pevsner[10] was an older brother of the artist **Naum Gabo**[11]. Until the 1920s Pevsner was a painter. He joined Gabo in Oslo 1915-17 and was greatly impressed by his sculpture and ideas. Pevsner began to make sculpture c.1923-4, encouraged by Gabo and modelling his first experiments on some of his brother's earlier works. (Alley, 1984)

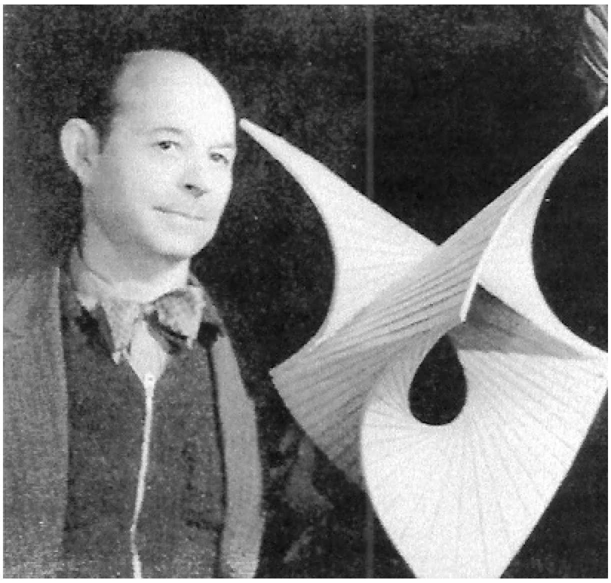


Figure 3-2 Pevsner with his 1938 sculpture "Developable Surface"
http://www.findagrave.com/cgi-bin/fg.cgi?page=pv&GRid=23693192&PIpi=8859460

[9] b. Kharkiv, Ukraine 1885, d. Moscow 1953
[10] b. Orel, Russia 1884, d. Paris 1962. He studied at the School of Fine Arts, Kiev 1902-9, then at the Academy of Fine Arts, St Petersburg.
[11] b. Naum Pevsner in Briansk, Russia 1890, d. Waterbury, USA 1977

Figure 3-3 Developable Surface (Surface développable), 1938–August 1939, Antoine Pevsner
http://www.guggenheim-venice.it/inglese/collections/artisti/dettagli/pop_up_opera2.php?id_opera=270&page=

Figure 3-4 Developable Surface (Surface développable), 1941, Antoine Pevsner
http://www.guggenheim-venice.it/collections/artisti/dettagli/opere_dett.php?id_art=125&id_opera=271

At an engineering school in Munich Gabo met **Wassily Kandinsky**[12] the abstract painter and theorist usually regarded as the originator of abstract art. In 1913 Gabo went to Paris to visit Pevsner, who introduced him to friends in modern art.

In 1917-22 the brothers were in Moscow with Tatlin and Kandinsky. In 1920 Gabo wrote and co-signed with Pevsner in August 1920 the Realistic Manifesto condemning cubism and futurism and proclaiming the tenets of pure Constructivism.

“They believed that space was given form through implications of depth rather than volume, and they rejected mass as the basic sculptural element. Line, rendered dynamic through directionality, established kinetic rhythms.”(Peggy Guggenheim Collection, 2008)

Russian artists who followed Tatlin's ideas were calling themselves Constructivists and in 1923 a manifesto was published in their magazine, Lef:

'The material formation of the object is to be substituted for its aesthetic combination. The object is to be treated as a whole and thus will be of no discernible 'style' but simply a product of an industrial order like a car, an aeroplane and such like. Constructivism is a purely technical mastery and organisation of materials.'(Tate)

The works of Pevsner and Gabo portray the geometry of thin shells (see Figure 3-2, Figure 3-3 and Figure 3-4). Pevsner’s Abstraction (1927) Construction (1933) and Construction for an Airport (1937) are all cited as demonstrating hypars (Melaragno, 1991).

In 1922 Gabo left Russia, spending the next ten years in Berlin. His work developed architectural characteristics and monumentality. We shall revist his work and his influence on others in section 3.8 and later.

3.3. Engineering origins of the architectural shell

Although the roof shells of Queensgate Market were novel it raises questions on how they were conceived, their engineering and their finish.To explore the heritage of thin shells this chapter reviews their history.

The development of thin shells is not straightforward. At about the same time artists were using hypars, architects and engineers in several countries were experimenting with the concept and developing technologies.

[12] b.1866, d.1944

Billington (1983) describes three prominent ‘national schools’ of thin shell construction with the great shell engineers coming from Germany, Italy and Spain.

In this model the German school is mathematical and scientific, characterised by the reliance on basic geometrical forms amenable for mathematical treatment, e.g. cylindrical shells. The Italian school is characterised by more intuitive design; shell shapes derived from ancient arches, vaults and domes are re-designed in reinforced concrete. The Spanish school, rooted in an artisan building traditions stands for shell shapes primarily motivated by aesthetics tending to use double curved shapes, as hypars, instead of stiffening ribs.

This seems to deny the significance of other schools; French, Swiss, Czech, Irish, Mexican, American, British and more for which evidence of their significance is considered below. It is recognised that for Mexico and the United States the technologies were introduced by European engineers but the technologies developed freely. Taking Billington’s schools as threads they are considered here.

3.4. German thread

The thread begins with **Franz Anton Dischinger**[13] and progresses with his assistants and pupils in Germany, however his work will be seen to influence others abroad very quickly.

3.4.1. Dischinger

The first designs of shell roofs seem to have been by Dischinger with the Munich construction company Dyckerhoff & Widmann. The first attempts are said to have failed because of the difficulties of the mathematical computations involved. In 1922-3, with the Zeiss Corporation, Dischinger designed the 1925 Zeiss Planetarium in Jena using a thin shell concrete hemispherical roof. The system was patented and became known as the Zeiss-Dywidag method (Billington, 1983). The first major application of the method was for Frankfurt wholesale market in 1926-8 (Joedicke, 1962) (see Figure 3-5). This was soon followed by Leipzig wholesale market (1927-9).

[13] b.1887, d.1953. Graduated in civil engineering from Karlsruhe Technical University in 1913

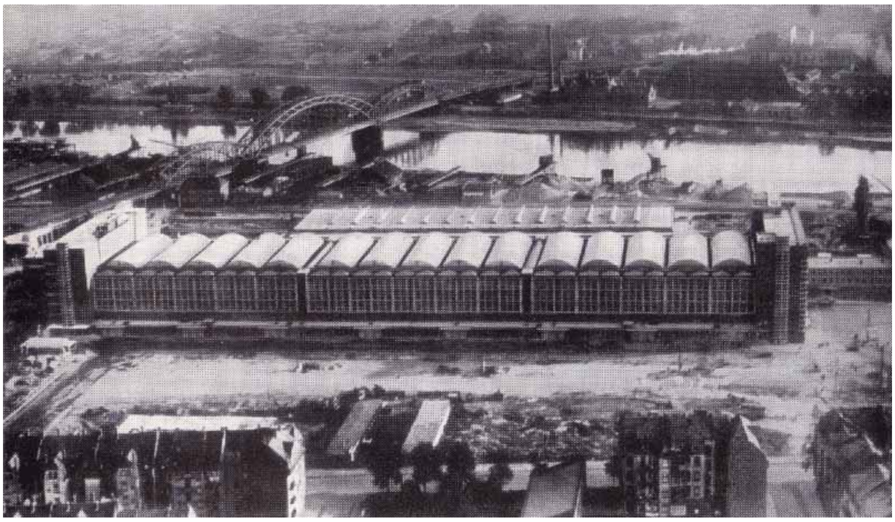


Figure 3-5 Frankfurt wholesale market (1928) (Joedicke, 1962)

An international symposium was held in Berlin in October 2012 to honour 125th anniversary of the birth of Dischinger. It was held on the premise that many aspects of Dischinger's work are unknown, such as the wider context of his activity on thin concrete shells and that research on pre-war thin concrete shell construction has usually focused on national engineering heroes. It was seen that the extensive exchange of information on the latest technical improvements makes it "fairly implausible that these engineers were unaffected by the developments in other countries"(Berlin, 2012). Much of the rest of this chapter explores this hypothesis.

3.4.2. Hajnal-Kónyi

Kálmán Hajnal-Kónyi[14] was a Hungarian Jew (Wikipedia, 2011b). He worked in Hungary and Germany 1924-36 where he had much practical experience of the Zeiss-Dywidag method of concrete shell construction with Dyckerhoff & Widmann including supervision of the 1927 tests of 40' roof shell models for Frankfurt Market Hall (Hajnal-Kónyi, 1944; Hajnal-Kónyi 1946). He left Nazi-ruled Germany in 1936 and went to Britain. From 1945, for some years, he was retained by Twisteel Reinforcements Ltd trading as BVR (Barrel Vault Roof) as a consultant on shell design (Anchor, 2001). He also practised as a consultant structural engineer. Subsequently we shall see how the principal engineer for Queensgate Market was a junior with Hajnal-Kónyi from 1950 to 1954 (see sections 3.17.3 and 3.17.5). Hajnal-Kónyi contributed much in developing the theory, materials and technology of

[14] b.1898 Budapest, d.1973 London. Graduated from Budapest Technical University

reinforced and prestressed concrete. His theoretical and experimental studies were widely published from early 1930s to late 1940s (Tassi & Balázs, 2009).

3.4.3. Tedesko

Anton Tedesko[15], post graduation, was in the United States 1927-9. From 1930 with Dyckerhoff & Widmann, working with Dischinger. In 1932 he was sent by the company to work in Chicago aiming to profit from some of its thin-shell patents and in doing so introduced thin-shell construction to America. (Janberg) (see section 3.12).

3.4.4. Silberkuhl

Helmut Homberg[16] studied civil engineering at the Technical University of Hannover and the Technical University of Berlin where his teachers included Dischinger. He set up his own practice but was later the structural engineering expert of the Silberkuhl enterprise(Silgat, 2004). The German engineer **Wilhelm Silberkuhl**[17] studied architecture at the Technical University of Hanover (Silgat, 2004). Silberkuhl patented a variety of concrete shell roof designs that led to his Essen based architecture and engineering business promoting and exploiting the use of precast roof shells, including for two British market halls, one visted by and one associated with the architects of Queensgate Market; the J Seymour Harris Partnership (see section 3.17.4).

3.5. Italian thread

Italian engineeers pioneered the hypar shell and the aesthetic thin shell.

1934 saw the first hypar shell; it was by **Giorgio Baroni**[18] for a Milan foundry, a whole series formed a warehouse in Milan and then the first hypar umbrella shells in 1938 that roofed a warehouse in Ferrara (Joedicke, 1962).

Pier Luigi Nervi[19] practised in civil engineering. From 1932, after twenty years of experience of reinforced concrete work in Italy, he produced a series of domes and barrel structures projects that were won on competitive pricing yet;

[15] b. Germany 1903, d. Seattle 1994. Diploma in civil engineering from Vienna Technical University,1926
[16] b.1909, d.1990
[17] b. Castrop 1912, d. Bad Wiessee 1984 (see also Appendix 8)
[18] Bologona University1915-19

"...he was an engineer who centred his entire career on aesthetics. There is no doubt that he saw himself as an artist whose mission it was to create beautiful objects."
" Nervi .. saw that structure could be art when it rose out of correct form, careful construction practice and a conscious aesthetic intention".p33(Garlock & Billington, 2008)

This is an early example of the thin shell engineer being conscious of the technology's aesthetic use.

3.6. Spanish thread

The origins of the hypar in Spain seem at first sight unlikely but the significance of the aesthetic on later Spanish engineers is apparent.

Antonio Gaudi [20] trained as an architect in Barcelona 1874-8. In 1884 he started work on Church of the Sagrada Familia (which had been started in 1875) in Barcelona. This is said to have free-form concrete shell work with conoidal and saddle-like forms. In 1900 he worked on a suburban housing development. For two of the three houses he used hypars to roof them. He also used the saddle form to roof a school at the church in 1909, the roof of was of laminated tiles (see Figure 3-6).

Figure 3-6 Gaudi's parish school of the Sagrada Famlia (1909)
http://www.american-buddha.com/provision.school.1.htm

This new form was of great interest to Gaudi; the visible form was load bearing and it was of a "higher order and greater complexity that those of the middle ages"

[19] b.1891, d.1979. Graduated from the University of Bologna,1913
[20] b. Reus 1852, d. 1925

Religious significance is attributed to Gaudi's interest – as a Catholic he saw "holy properties to the trinity of straight lines" which determine a hypar (Billington, 1983).

Ildefonso Sánchez del Río y Pisón[21] the municipal engineer for Oviedo from 1924 to 1940 combined technological innovation with a profound architectural understanding. In 1925 he developed his first personal work, a concrete umbrella for a dairy market in Oviedo (see Figure 3-7).

Sánchez del Río's 1928-30 food market in Pola de Siero was on a triangular plot. The concrete vaulted market has large skylights which give vertical planes along with a generous glazed facade. The distribution of the stalls and circulation responds to the use of the building; the wide central aisle and perimeter routes following the three side arcades (Cassinello & Revuelta) (see Figure 3-8).

Sánchez del Río's published on his work. His 1931 paper on umbrellas was in the Spanish architectural press.

Figure 3-7 1925 Market umbrella in Oviedo (2010)
http://oviedo.for91days.com/

[21] b. La Rioja 1898, d. Madrid 1980 Graduated from the Madrid School of Civil Engineering,1922

Figure 3-8 1930 Pola de Siero market hall
http://www.unanocheenlaopera.com/viewtopic.php?f=5&t=15582&start=30

Santiago Rey Pedreira[22] and **Antonio Tenreiro**[23] built the 1930-2 San Agustín market hall in La Coruña (see Figure 3-9 and Figure 3-10). The market looks like and uses the same technology as used by Freysinet for Reims Market (Figure 4-1) and the earlier Leipzig market.

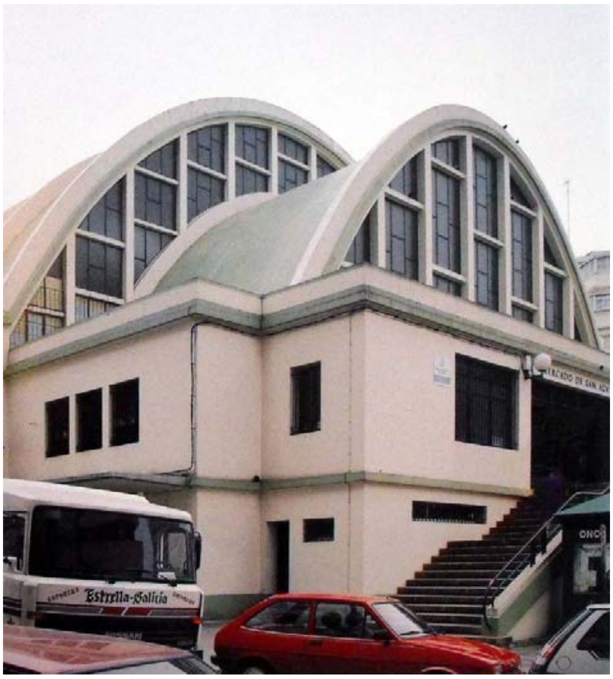


Figure 3-9 San Agustín market La Coruña, Exterior (Costa & Landrove, 1996)

[22] b. Santiago de Compostela1902, d. 1978
[23]b. La Coruña 1893, d. 1972

Figure 3-10 San Agustín market, La Coruña, interior(Costa & Landrove, 1996)

Eduardo Torroja y Miret[24] was a Spanish structural engineer and pioneer in the design of concrete-shell structures. His first large concrete shell was the 156' span dome roof, supported on eight tied columns, for Algeciras Market Hall (1933) (Figure 3-11). This was followed by the cantilevering grandstand roof shells at La Zarzuela racecourse, Madrid (1935) (Figure 3-11). In 1936 the Frontón Recoletos (a pelota stadium), was roofed with a combination of two cylindrical shells of different radii spanning 55m, longitudinally arranged with glazed triangular lattice of part for the length of both (Figure 3-12) (Morice & Tottenham, 2001).

[24] b. Madrid 1899, d. Madrid 1961

Figure 3-11. Two Eduardo Torroja projects; top, Zarzuela Hippodrome (1935), bottom, Algeciras Market Hall (1934) (Garlock & Billington, 2008)

Félix Candela[25] trained as an architect in Madrid from 1929. In his sixth year he developed an interest in shells. Examples of thin shells were appearing in trade magazines and Torroja was building the Frontón Recoletos; the student Candela went to see him.

“I found Torroja on top of the formwork and asked him to explain in general terms how the enormous barrel vault would function. He did not answer me very affably which hurt my feelings. Later he gave a conference at which he described with a grand array of equations the calculations he had made, but like most of the audience I could understand practically nothing”(Faber, 1963).

Nevertheless, Candela felt that the key to understanding shell structures was mathematics; he started a bibliography of shell works.

[25] b. Madrid 1910, d. Durham, North Carolina 1997de Anda Alanis, H. X. (2008). *Candela*. Cologne: Taschen.

Candela graduated in 1935. In 1936 he won a travel scholarship; his winning essay was, *The influence of new trends in reinforced concrete techniques on architectural form*. He decided to go to Germany with a letter of introduction to Dischinger, he had a rail ticket for 18 July 1936. The uprising that started the Spanish Civil War was on 17 July. Candela never used his ticket.

Candela joined the republican cause. After a retreat he ended up in a concentration camp in Perpignan. A Society of Friends' refugee ship allowed him to leave Europe. He arrived in Mexico on 13 June 1939 (see section 3.11).

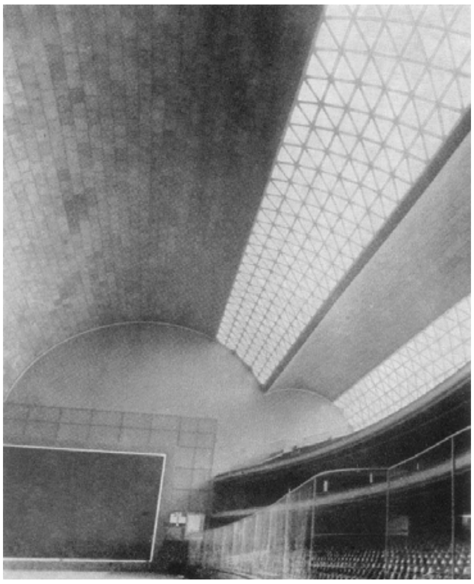


Figure 3-12 Pelota Court, Madrid (1936). (Joedicke, 1962)

Candela was to take with him to Mexico his training and experience of concrete developments and his profound interest in thin shells. The work of Gaudi, Sánchez del Río, Rey Pedreira, Tenreiro and Torroja were familiar to him and he had hoped to visit the German engineers.

3.7. Swiss thread

Robert Maillart[26] trained as a civil engineer at the Federal Institute of Zurich 1890-4. In 1902 he founded Maillart & Co, designers and builders of reinforced concrete.

Maillart did not excel in academic theories, but believed in the necessity to make assumptions and visualise when analysing a structure. The overuse of engineering calculations annoyed him, he preferred to stand back and use common sense to

[26] b. Bern 1872, d. Geneva 1940

predict performance. This attitude towards design and construction provided him with innovative designs.

In 1908 he designed a new type of column supported floor system, primarily for warehouses. The system has a floor slab resting on columns with exposed capitals, eliminating all beams. For Maillart the rational system was a capital with a hyperbolic profile, not because the engineering efficiency was significant at the scale Maillart was working, but the one which appealed to him most visually; the one where the transition was smoothest (Billington 1983).

Maillart produced a thin shell vault for the Cement Hall for the Swiss National exhibition of 1939 in Zurich (Figure 3-13).

"The thinness of his pure roof structure is visible over the entire profile of the building, the walls and roof are one, and the main vertical load is carried by four central columns tapered from arch ribs down to hinge like supports. Thin slabs provide horizontal restraint at the shell edges, and the two arch ribs stiffen the parabolic shell. The primary aim was to express structure and this stimulated Maillart to invent a form that was thin, integrated and contrasted sharply with its setting." p170 (Billington, 1983)

Later we will see how Felix Candela found the work of Maillart particularly influential.

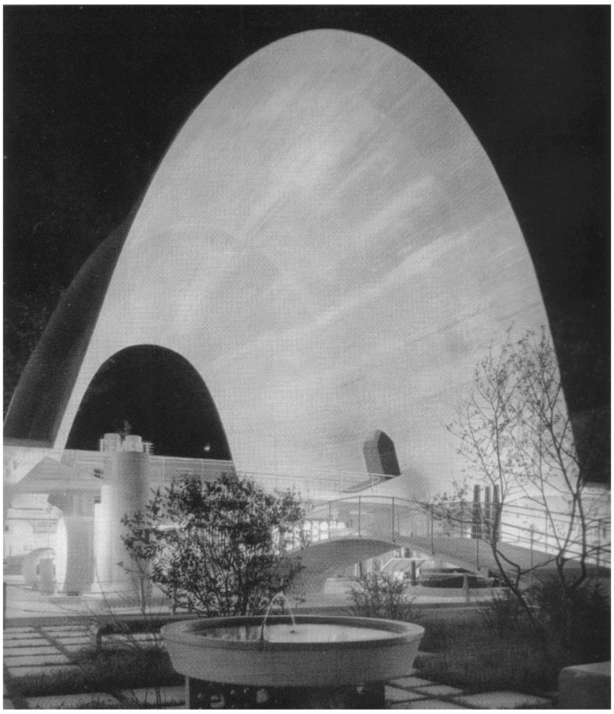


Figure 3-13 Cement Hall for the Swiss National exhibition (1939) (Joedicke, 1962)

3.8. French thread

In 1933 **Fernand Aimond** published a paper (Aimond, 1933) that introduced the notion of the concrete hypar. His 1936 paper gave precise calculations for hypar shells (Aimond, 1936). This was the first published suggestion and illustration of a hypar umbrella; a structure where a number of shells spring from a single column and cantilever out (Figure 3-14).

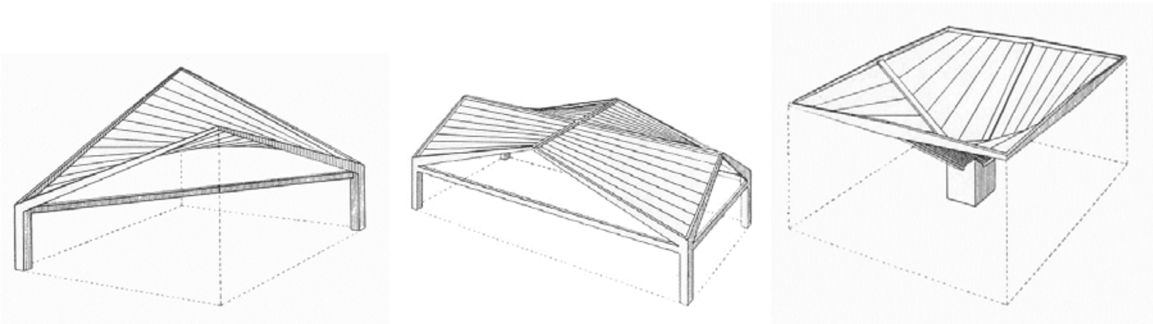


Figure 3-14 Proposed shells in the form of hypars by F Aimond (1936)(Joedicke, 1962)

Bernard Lafaille [27] was an engineering graduate of the Ecole Centrale Paris. From 1929 he was engaged in the construction of shells in the form of ruled surfaces, erecting in 1931-3 a variety of projects. Lafaille responded to Aimond's 1933 paper with two contributions in 1933(Lafaille, 1934) and 1935(Lafaille, 1935) with reports on his experiments and early projects.

In 1932 the sculptor Nuam Gabo moved from Berlin and lived in Paris until 1935, exhibiting with the Abstraction-Création group. (Novelguide.com, 1998). An example of his work of the time is in Figure 3-15.

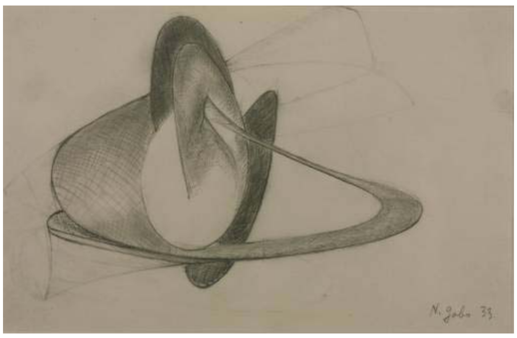


Figure 3-15 Sketch for a Stone Carving 1933 Naum Gabo http://www.tate.org.uk/servlet/ViewWork?cgroupid=999999961&workid=4827&searchid=9662&tabview=image

[27] b.1900, d.1955

Gabo's later work is discussed in the British thread (section 3.13).

French architect **Auguste Perret**[28] was a world leader, specialist and teacher of reinforced concrete construction. Although Perret saw concrete as a superior form of construction to masonry he viewed each element separately; not using concrete to form a structural whole. However many of his pupils including; **Le Corbusier**[29], **Guy Lagneau** [30], **Berthold Lubetkin**[31], **René Sarger** [32] and **Jean Le Couteur**[33] went on to be artists in concrete structures and thin shell concrete.

Le Couteur's best known project was the dramatic board-marked concrete shells of Cathédrale du Sacré-Cœur in Algiers (1955-1963) (Figures 3-16 & 3-17) with an interior form reminiscent of Felix Candela's 1955 Iglesia de la Virgin Milagrosa (Figure 3-28). Le Couteur's colleague was fellow Perret disciple, **Paul Herbé**[34] and the project engineer was Sarger who went on to produce the 1956 Royan Market (see section 6.3) and 1956-9 Caen-La Guérinière château d'eau-marché (see section 6.6) (Cité de l'architecture et du patrimoine; Gandini, 2003; Le Couteur, 1957).

Figure 3-16 Cathédrale du Sacré-Cœur, Algiers. Exterior (2010)
http://fr.wikipedia.org/wiki/Fichier:Cath%C3%A9drale_du_Sacr%C3%A9-Coeur,_Alger,_vue_int%C3%A9rieure_2.jpg

[28] b. Ixelles 1874, d. Paris 1954
[29] b. as Charles-Édouard Jeanneret, La Chaux-de-Fonds 1887, d. Roquebrune-Cap-Martin 1965
[30] b. 1915, d.1996
[31] b. Tiflis 1901, d. Bristol 1990
[32] B. Paris 1917, d. Villejuif 1988. Sarger worked in the office of Bernard Lafaille 1946 -1954
[33] b. Brest 1916, d Paris 2010
[34] b. Reims 1903, d. Paris 1963,

Figure 3-17 Cathédrale du Sacré-Cœur, Algiers. Interior (2010)
http://commons.wikimedia.org/wiki/File:Cath%C3%A9drale_du_Sacr%C3%A9-Coeur,_Alger,_vue_int%C3%A9rieure_2.jpg

Le Couteur was also the architect of the 1966-9 fish auction, Criée Aux Poissons, at Sète. The project engineer was **Miroslav Kostanjevac** [35]. By 1956 Kostanjevac was in France, working for Sarger. In the early sixties he joined **Jacques Allegret**'s[36] adventurous L'AUA (l'atelier d'urbanisme et d'architecture) that introduced him to many projects (Cité de l'architecture & du patrimoine).

The Criée Aux Poissons was a quayside building of 40 symmetrical hypar umbrellas 7.2 x 8m in plan. The umbrellas were level and mutually braced appearing in plan to be in bonded rows (Figure 3-20). In the midst of the arrangement an auction auditorium clerestory glazed and roofed with four saddle hypars (Figure 3-18, 3-19, 3-20 & 3-24). The shell types can be seen to be in the style of Felix Candela's pre-existing shells, not producing novel structures. However the juxtaposition of the two shell types is striking and Candela's umbrellas were never built in such a planned and prominent site. Here the apparent lightness of the building and the transparency are appropriate.

The columns to the umbrellas were sculpted with chamfered faces (Figure 3-21) and the shell soffits of adjacent tympans board-marked in differing directions.

[35] b. Belgrade 1926, d. La Plagne-Bellecôte (Savoy) 2002. Trained at Belgrade Technical University, graduating in manufacturing engineering and from the faculty of architecture
[36] b. 1930, d. Paris 2004

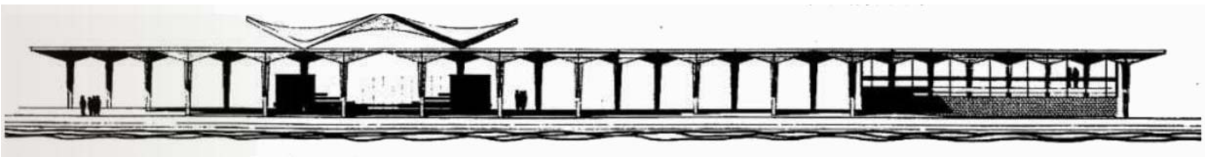


Figure 3-18 Elevation Criée Aux Poissons, Sète from East, a project drawing (Melia, 2009)

Figure 3-19 Criée Aux Poissons, Sète from East (1960s) (Melia, 2009)

Figure 3-20 Aerial view of Criée Aux Poissons, Sète (North at top) (2008). www.maps.google.com

Figure 3-21 Interior of Criée Aux Poissons, Sète from North (1966) (Melia, 2009)

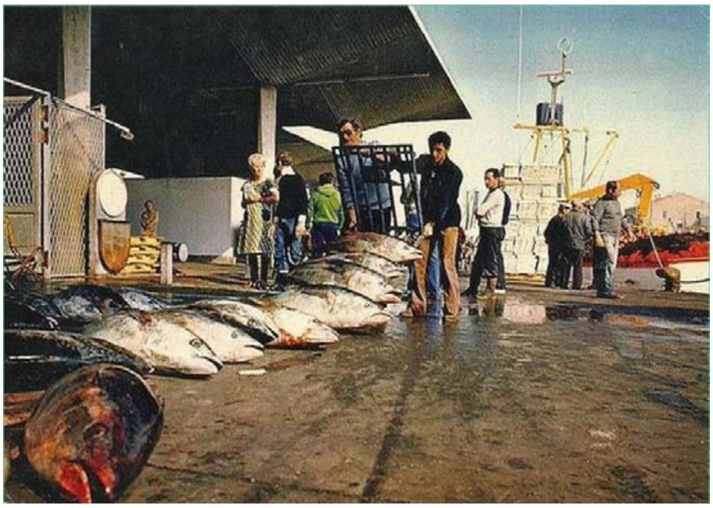


Figure 3-22 Undated postcard of Criée Aux Poissons, Sète showing rhythm of board-marked shell soffits and fluorescent tube lighting at shell boundaries. thttp://compain2.free.fr/Cartes_postales/Metiers.htm

Figure 3-23 Criée Aux Poissons, Sète showing differing direction of board-marked shell soffits and chamfered columns (2011) http://www.thauenimages.fr/SETE/SETE_PORT_06.html

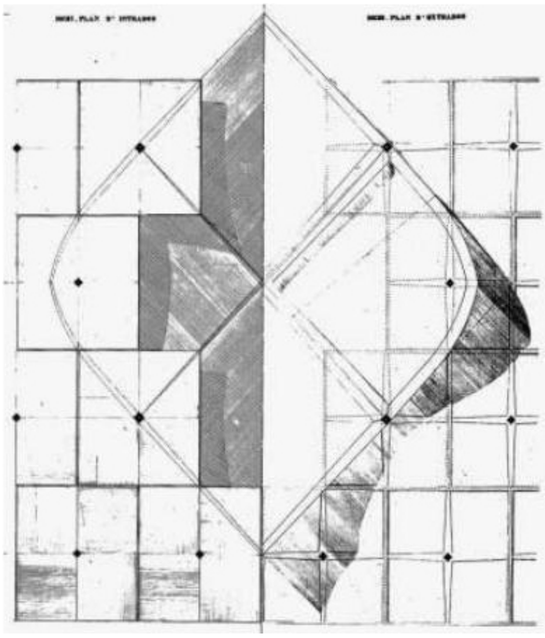


Figure 3-24 Plan showing roof shell arrangements, interior and exterior, Criée Aux Poissons, Sète, a project drawing (Melia, 2009)

Summary

The developments of Aimond and Lafaille were fundemantal to the development of the engineered hypar and its possibilities for exploitation in a variey of shell forms and building types. Perret was the pioneer of reinforced concrete elements who gave later engineers and architects the confidence to develop sculptural concrete structures and refine thin shell concrete. At the same time Gabo, in Paris, was exploiting the hypar in art. These men's influence travelled the world and, as we shall see, be realised projects of many kinds. However the work can domestically in the work of Sarger, Le Couteur and colleagues; Royan Market, Caen-La Guérinière château d'eau-marché, Cathédrale du Sacré-Cœur in Algiers and Criée Aux Poissons, at Sète, the latter being an almost exact contemporary of Queensgate Market.

3.9. Czech thread

Konrad Hruban[37] chartered as a civil engineer in 1922 and moved to Brno, where by 1924 he was a director of a construction company with expertise in concrete engineering and participated in virtually every major Czech shell structure, either as a designer or consultant. Simultaneously to the French engineers he was experimenting with hypar shells(Joedicke, 1962).

He was responsible for the building of a factory roofed with rows of hypar shells with north light in Prague 1943-5 (Figure 3-25). An account of his hyperbolic paraboloid work was published in Britain in 1949 (Hruban, 1949).

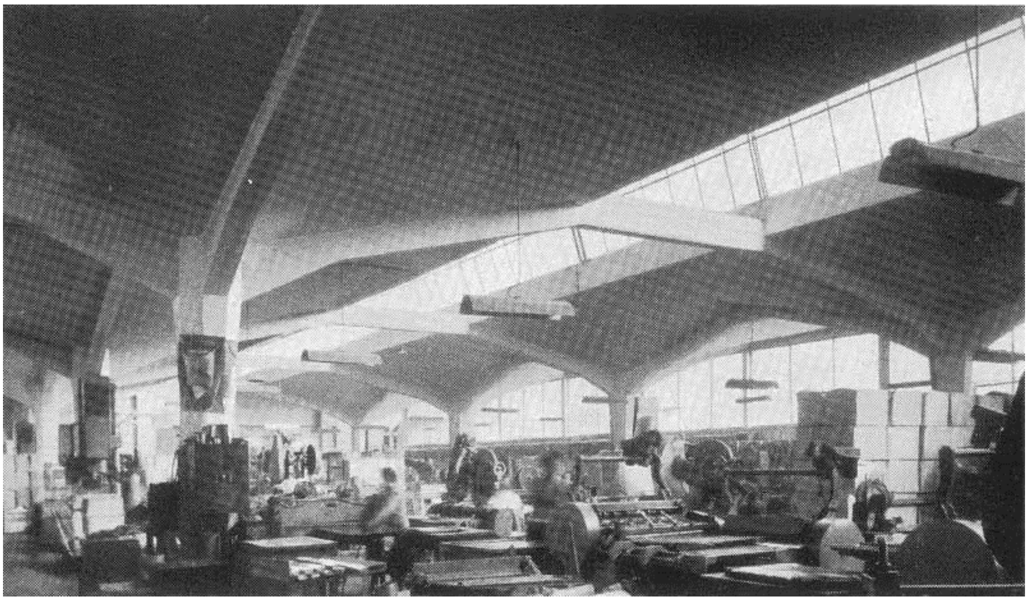


Figure 3-25 Factory in Nove Mesto, Prague (1943-5) (Joedicke, 1962)

In the five years after the second world war 400,000 sq' of factory space in Czechoslovakia was roofed with long narrow precast concrete hypars (Hume, 1961).

Hruban's work was publicised in Britain and was recognised in engineering circles in 1949 by enginers like Blumfield, Hajnal-Kónyi and Seel . However this was before post-war building controls in Britain were lifted.

[37] b. Dubany 1893, d. Prague 1977. Graduated in civil engineering from Prague Technical University in 1921.

3.10. Irish thread

James Waller[38] after attending school in Hobart, served in pupilage, 1902-4, in Tasmania. He then studied engineering at Queen's College, Galway. Graduating in 1909, he continued to study at University College, Cork. On the outbreak of WWI, he joined the Royal Engineers. He went on to build many buildings on his patented 'Ctesiphon' system. Inspired by the ancient arch of Ctesiphon in Iraq, which he had seen in the early 1920s, he used the purely compressive structural shape of the inverted catenary arch to minimise the amount of reinforcement needed in constructing the shell of a building (Rowan).For the Ctesiphon system;

"false-work arches were erected at about 3-inch [sic, probably feet] centres, over which a layer of jute fabric was spread. Cement plaster was then applied to the fabric both inside and out to form a corrugated surface. After the outside had been lightly reinforced, additional plaster was applied externally to create a shell about 2½ inches thick" (Rowan).

Waller designed huts, stores and hangars with the Ctesiphon system in 18 countries (Waller & Aston, 1953).

In 1950 he used the Ctesiphon system for Christ the King Church, Lawrence Weston, Bristol (ArchiDave, 2010) which had three concrete shells with hypar corrugations in the form of a catenary arches (Figure 3-26). The architect was **Tom Hedly Bruce Burrough**[39] of Burrough and Hannam (Anon, 1951) and the engineers, the Bristol office of Clarke and Nicholls. The nature of the corrugations was at the time unrecognised by the engineers. It seems, unwittingly concrete hypars were being executed (Derek Bond, personal communication 14 November 2011). This particular architect /engineer joint working was to bear more hypar fruit later.

[38] b. Tasmania 1884, d. Devon 1968 Obit. ICE Proceedings vol 41 no3 pp 433-4
[39] b. Newport 1910, d. Bristol 2000. Generally known as Tom or THB Burrough

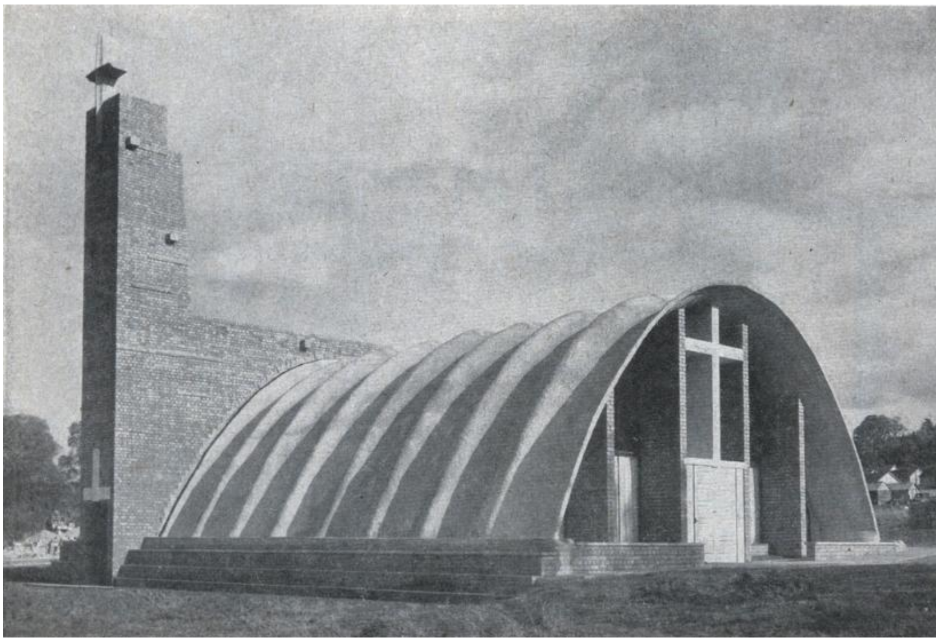


Figure 3-26. Church at Lawrence Weston, Bristol (Anon, 1951)

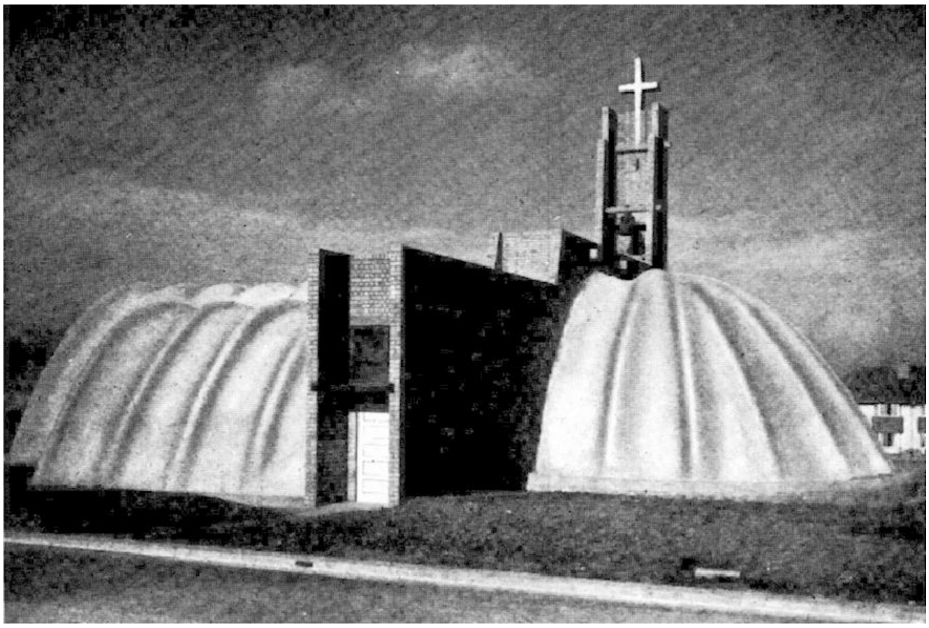


Figure 3-27 Church at Lawrence Weston, Bristol (Waller & Aston, 1953)

Summary

Waller's work was to be influential because it caught the attention and imagination of Burrough the British hypar pioneer who in turn had influence through Oliver Marcel who was the engineer for Britain's largest hypar umbrella project.

3.11. Mexican thread

Félix Candela arrived in Mexico, from Europe on a refugee ship, on 13 June 1939. His need for work in Mexico led him into the construction business. He continued his study of shells, collecting and borrowing all the material on thin shells available. Through studying the writings and work of many engineers Candela trained himself, revisiting Aimond's papers. Maillart was particularly influential.

”Maillart's papers opened his eyes to a new way of approaching structures. Maillart encouraged simplified calculations rather than rigorous analysis, a strategy that Candela found 'delightfully sympathetic and encouraging'. Candela's confidence grew”(Garlock & Billington, 2008).

Candela's work was both conventional and experimental with the use of hypar surfaces. His first work using hypar shells was the Cosmic Rays Laboratory in 1951 at UNAM in Mexico City. Around 1952 Candela built his first experimental hypar shells in an umbrella form. Hruban had previously built the form - derived from Aimond's sketch of 1936. Hruban's umbrellas were much more like Aimond's than Candela's. The massive edge beams, proud of the soffits of Aimond and Hruban disguise the shell form.

“Candela's bear a more graceful form, one that was proportioned not only by a builder and engineer but also by an artist”(Garlock & Billington, 2008)

A dramatic use of hypars by Candela was the 1954-5 Igelsia de la Virgen Milagrosa, Navarte, Mexico City (Figure 3-28).

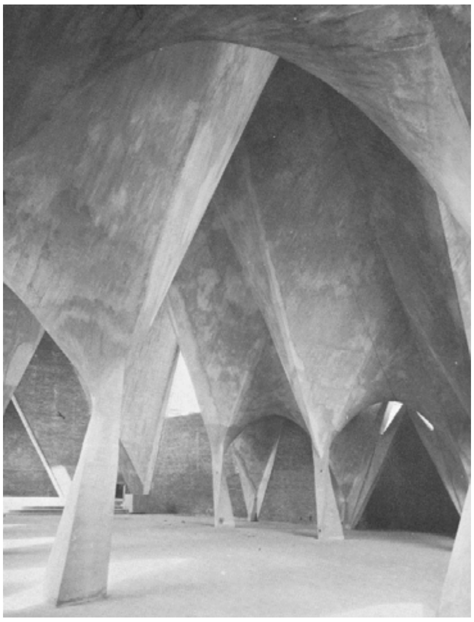


Figure 3-28 Igelsia de la Virgen Milagrosa. Interior (Faber, 1963)

In 1954 Candela started to construct hypar umbrellas as roof units. The first project was a warehouse, Rio's, initiating "the umbrella shell as a Candela trademark for low-cost industrial construction"(Faber, 1963) p.89. For 36 umbrellas there were four sets of formwork with four quadrants on a scaffold, one quadrant of formwork for each tympan. When the shell's poured concrete hardened the formwork was lowered and then moved on to form another umbrella.

Candela thought this type of roof not only offered the advantage, over other shell forms, of using straight boards for forming, but was also cheaper than all others. In his Mexican economic conditions the cost of hypar umbrellas was said to be about half that of typical industrial metal and corrugated sheets.

To allow natural lighting Candela usually tilted rows of umbrellas to create a saw tooth profile, made rows of umbrellas at different heights.

Faber stated that in Mexico City alone Candela has roofed 3 million square feet with umbrellas, square or rectangular, rhomboidal or polygonal – they were in churches, warehouses, factories, a slaughterhouse, hotels and restaurants, residences, a bank and a casino(Faber, 1963).

Candela built several markets with umbrella roofs in 1955-6. The best known and recorded is Coyoacán Market (Figures 3-29 to 3-31).

"It earned immediate public approval. The concrete roofs, thin as sails, were considered akin to the lively tents or tiangus, of the old street market"(Faber, 1963)p. 116.

Figure 3-29 Coyoacán Market immediately after construction. Electrical conduits and down lighters are on the columns (Garlock & Billington, 2008)

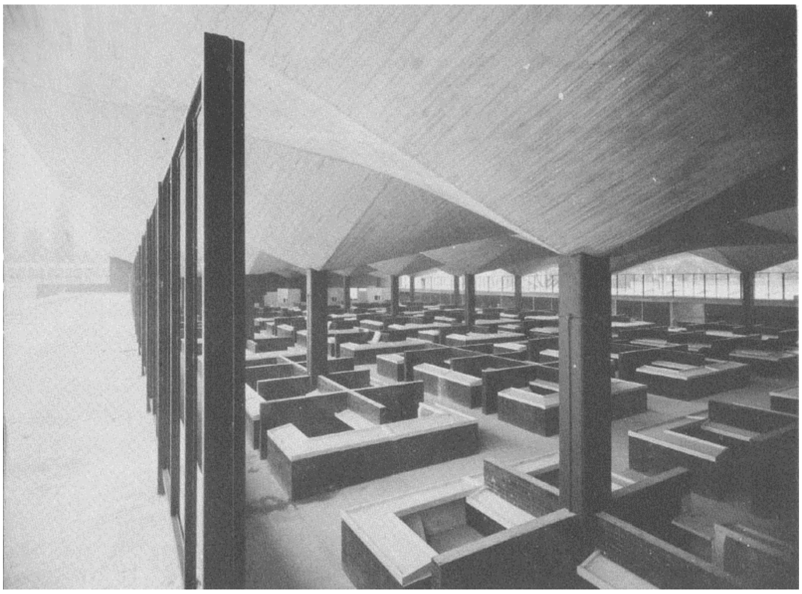


Figure 3-30 Coyoacán Market immediately after construction.
Stalls surround the colums. The glazing line which does not reach the shell is under the roof shells, not at the perimeter (Faber, 1963)

Figure 3-31 Coyoacán Market c 2007 (Garlock & Billington, 2008)

The international dissemination of Candela's work was rapid. From 1953 Candela published papers regularly and scores of articles appeared in the world's architectural and engineering journals (Faber, 1963).

In May 1959 at the invitation of the British Council and the Joint Committee on Structural Concrete (which represented the Cement and Concrete Association, the Prestressed Concrete Development Group and the Reinforced Concrete Association) Felix Candela visited Britain to lecture.

Candela’s lecture was *Ten years of building thin shell structures*. He delivered it first at the Friend’s Meeting House in London on 5 May(Joint Committee on Structural Concrete, 1959). The 1,300 people in the audience were the lucky ones;1,500 more were unable to obtain tickets (Abner, 1959). A review of the lecture in the Architects’ Journal observed;

“Candela’s achievement is unique, and spoke for itself sufficiently to bring two long rounds of applause from the audience. Even if the anticlastic shell is a simple basic idea and not his own idea in the first place, nevertheless he has explored and exploited its possibilities as a plastic tool in a way which has a parallel only in Naum Gabo’s work on similar forms in sculpture”. (N.M., 1959)

Candela also delivered his illustrated talk in four other major lecture theatres ; The Reardon Smith Theatre, Cardiff 6 May; Great Hall, University of Leeds, 7 May; Heriott-Watt College, Edinburgh, 8 May and Sir William Whitla Hall, Queen’s University, Belfast 11 May (Anon, 1959c, 1959f, 1959g, 1959h). It is clear that thousands of people attended the lectures and that they were said to be influential to many young architects. A letter to Candela from Sir Maynard Jenour, Director of Aberthaw and Bristol Channel Portland Cement Co Ltd the day after his Cardiff lecture described how the principal of the Cardiff School of Architecture and his staff had reported that young students were extremely excited by what they had seen and heard and he felt they would benefit greatly from Candela’s example(Jeavons, 1959).

Another letter received by Candela was from the architect Burrough who had also been at the Cardiff lecture. Burrough wrote observing that Candela’s enjoyable lecture had started with a picture of a “Ctesiphon” shell and enclosed a transparency of the Lawrence Weston Church that he and Waller had built ten years previously. Burrough thought it would interest Candela as an early architectural shell. Burrough also expressed the hope that he would be at the garden party that was being held in Candela’s honour by architects at The Cement and Concrete Association’s Slough research centre on 13 May(T. Burrough, 1959). In a later section we shall see more of Burrough’s works.

Candela’s intinary included a meeting with students at the Architectural Association and cocktails at the London office of **Oliver Mischa Marcel**[40] of the engineers,

[40] b. as Meir Marcel Osherovitz c.1912, d. London 1966

Clarke Nicholls and Marcel. He also travelled with contact details for architects **Gordon Graham**[41] and **Eugene Rosenberg**[42] who had visited him in Mexico and a letter from Texan architect **O'Neil Ford**[43] who hoped he will get to England when Candela is there and urging him to phone his friend **Alan Harris**[44] of Harris and Sutherland(Cubiertas ALA, 1959; Ford, 1959).

His 14 day visit, that included receptions with senior architects and engineers and formal dinners, was covered in a variety of national newspapers and magazines and 14 technical magazines. He also recorded an interview with **James Maude Richards**[45], editor of the Architectural Review, for the BBC's Third Programme. This was broadcasted as a 15 minute interview *Pioneer in shell concrete* on 19 May 1959(Anon, 1959m; BBC, 1959).

Summary

In Mexico Candela had studied European architects and engineers work, drawn it together and developed a synthesis of the work of diverse artists. Candela then developed it further in the Mexican socio-economic environment where low labour and material costs and freedom from building codes gave him the freedom to exploit thin shells and in particular the hypar.

Candela's work was widely published and was influential. Although Candela's visit to Britain in 1959 received much popular attention; packed lecture theatres, newspaper, radio and television coverage and trade journals it was the influence of his vist that is of significance. In later sections we shall look at the development of concrete hyperbolic paraboloid shells in the UK.

3.12. American thread

Tedesko's arrival from Germany in 1932 was raised in the German thread. Following his work in the US the technology was widely adopted; many stadia, auditoria, exhibition halls, churches and storage facilities were roofed with shells.

[41] d. 1997
[42] b. Moravia 1907, d. London 1990
[43] b.Pink Hill, Texas 1905, d. San Antonio, Texas 1982
[44] b. Plymouth 1916, d. 2000. Knighted in1980
[45] b. Epsom, d. London 1992.

Although the hypar was much exploited in the United States it was mainly used in the saddle form as an attention grabbing device in roasdside commercial architecture. An example was the early steel hypar used to roof a Cincinatti roadside restaurant, Frisch's Mainliner, in 1964, with extended generators to give an exaggerated form (see Figure 3-32), as it was in the UK on the A1 at Markham Moor (see section 3.13). The architects were Woodie Garber & Associates.

Figure 3-32 http://www.cincinnativiews.net/images-2/Frischs-fd.jpg

Mushroom hypars were built at the Johnson & Hardin printing plant (Figure 3-33 & 4-2), Indian Hill School and for domestic projects (Figure 4-3), all in Cincinnati by Woodie Garber & Associates with the architect, **Konrad Wachsman**[46]. (Sulerbarger, 2007). Wachsman was the son of German Jewish parents (Küpper, 2004), who left Germany in 1932 (Gössel, 2007).

Figure 3-33 Johnson & Hardin printing plant, Cincinnati (United States Steel)

The use of hypar mushroom does not seem to have been widely reported in the United States. The Cincinnati projects and the concrete ones in New York and at the Apache Plaza, Minnesota (discussed in Chapters 4 & 10) were notable. This does

[46] b. Frankfurt 1901, d. Los Angeles 1980

not mean that there were not such projects. Figures 3-34 to 3-36 show three building types of differing status.

Figure 3-34, 1961 Adel City Hall, Georgia designed by Blake Ellis (agilitynut.com)

Figure 3-35 Commercial Federal Bank, Omaha, Nebraska (www. agilitynut.com)

Figure 3-36 1964 Service station toilets, Springfield, Ilinois (www. agilitynut.com)

An interesting variation was a restaurant pavilion at Callaway Gardens, Georgia reported in 1959 (Concrete Construction Staff, 1959) (see Figure 3-37). It is clear that the roof form and the columns were key elements in the building's environment (see photo in Appendix D). The photograph features demountable and reusable shuttering that could be easly moved on wheels to new positions; also an important cost-saving measure in the making of umbrella hypars.

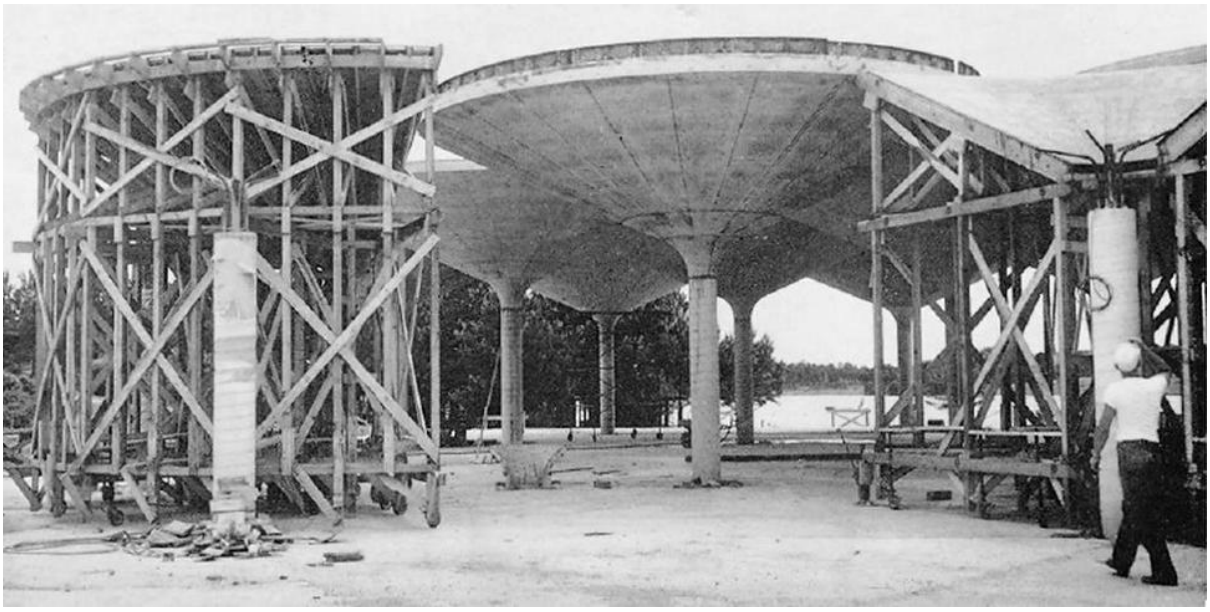


Figure 3-37 Pavilion at Callaway Gardens, Georgia composed of 30-foot diameter cones mounted on slender columns(Concrete Construction Staff, 1959).

A fine project was the 1959 Hunter College library reading room in the Bronx, New York (Figure 3-38 and Figure 4-13). The architect was **Marcel Breuer**[47]. Breuer, of Jewish descent left Germany to work with **Walter Gropius**[48] in London in 1935 and

[47] b. Pécs 1902, d. New York 1981. He studied and taught at the Bauhaus

[48] B. Berlin 1883, d. Boston 1969. Founder of the Bauhaus School, left Germany in 1934.

later moved to America. The library building was roofed with six square concrete hypar umbrellas covers an area of 120’ x180’.

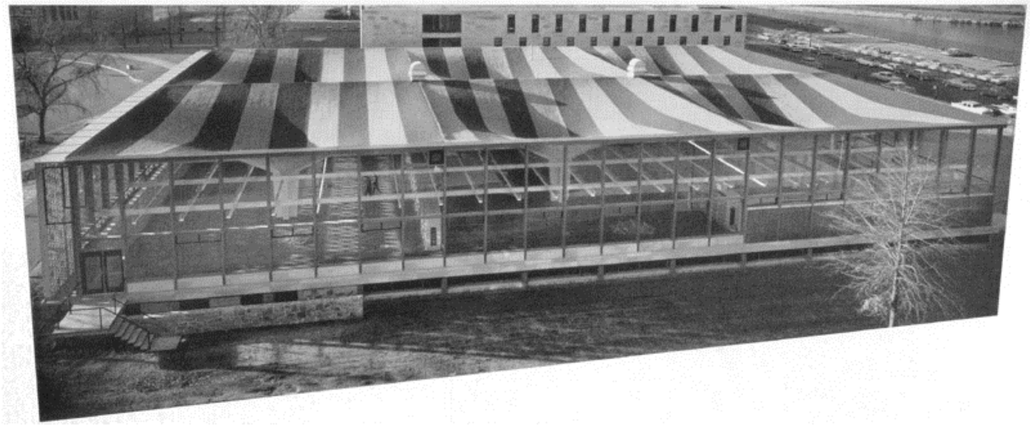


Figure 3-38 Hunter College Library, New York (C. Jones, 1962)

Summary

It seems that the hypar was introduced to the US by refugees; a Spaniard in Mexico[49] and Jewish German émigré. The development of the mushroom hypar in the USA seems to have been comparatively slight. The form was used for a variety of building types but of most significance was the Apache Plaza shopping centre. Although the hypar was much exploited by many designers in the United States it was often used as what might be described as roadside architecture; promotional identity or signage. The influence of American retail design will be discussed later.

3.13. British thread

The British experience is multi threaded including; art, pre-war concrete shell engineering and the post-war adoption of the first timber hypars.

3.17.1. Early sculptural work

In about 1935 the artist Gabo moved from Paris to England, first Hampstead and from 1939, Cornwall. From 1936 Gabo worked on representations of space by means of curves which required cords, threads and bars for transparent linear constructions. He want to get away from rectangularity and experimented with he called the ‘spherical theme’(Hammacher, 1968) (Figure 3-41).

[49] Although Candela’s Mexican work and writing was a major influence on many American designers Candela did not emigrate to the USA until 1971 as he was not qualified to practise there.

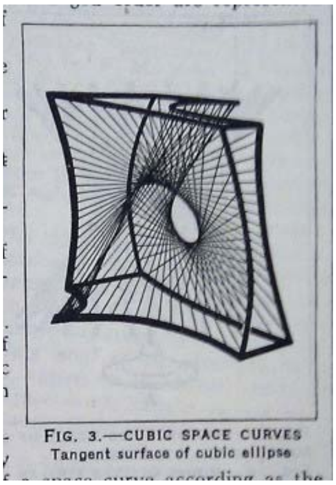


Figure 3-39 (left) Illustration from Encyclopaedia Britannica 1929 (Octavo Books, 2011)
Figure 3-40 (right) *Construction in Space (Crystal)* 1937-9, Naum Gabo
http://www.wikipaintings.org/en/naum-gabo/construction-in-space-crystal-1939

A mathematical model representing an 'oscillating developable of a cubic ellipse', had been shown in May 1936 at the Exposition Surréaliste d'Objets in Paris. Gabo was struck by the lyrical, sometimes fanciful nature of these geometrical models. *Construction in Space (Crystal)* (Figure 3-40) relates to one of the models (Figure 3-39). He later said that he aimed in this work - one of a series on the theme – to;

'take this complicated formula and change its realisation to prove that what was basically a fantasy (the intuition of the mathematician) could be seen through the intuition of an artist' (Tate, 2004).

Gabo started to use Perspex, a new material, and used it in some of his best-known works (Figures 3-42 & 3-43). He used clear tubing or sheets as warped, parabolic planes shot through with planes of nylon threads and taut, delicate webbing of strings criss-crossing (Novelguide.com, 1998).

Figure 3-41 Model for Spheric Theme circa 1937, Naum Gabo
http://www.tate.org.uk/servlet/ViewWork?cgroupid=999999961&workid=4842&searchid=11415&tabview=image

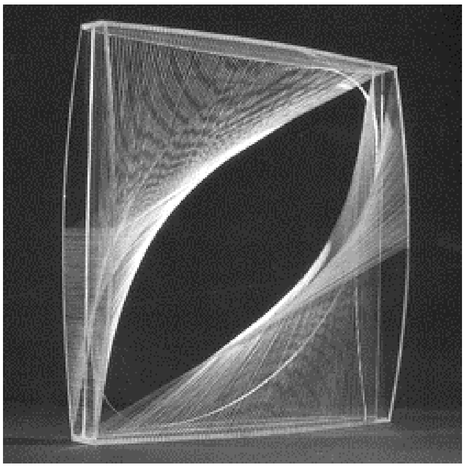


Figure 3-42 Linear Construction in Space No.1
(conceived 1942, this version probably executed 1960s) Naum Gabo
http://www.tate.org.uk/research/tateresearch/tatepapers/07autumn/lodder.htm

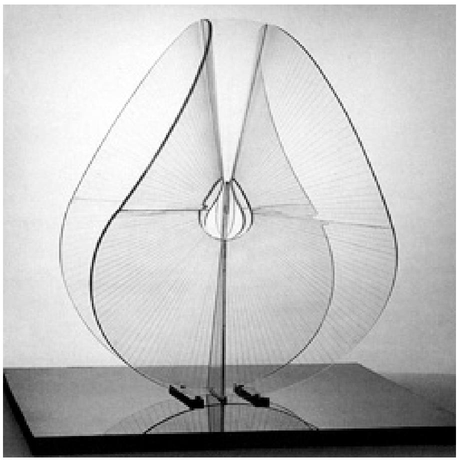


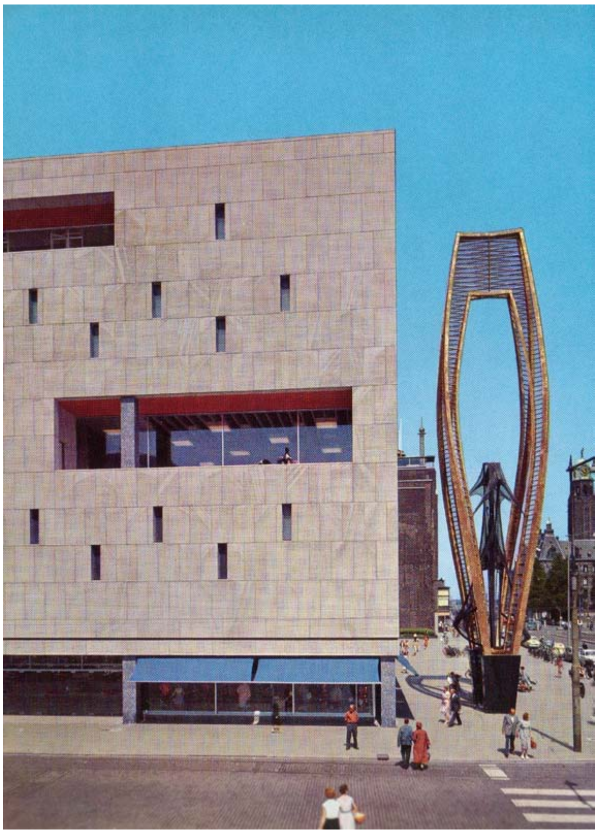
Figure 3-43 Spheric Theme: Translucent Variation (c.1937, this version executed 1951 as a replacement of original of 1938-9), Naum Gabo
http://www.tate.org.uk/research/tateresearch/tatepapers/07autumn/lodder.htm

“It is extremely interesting to consider Gabo’s contacts after his arrival in England as an emigrant, in 1935, and to investigate the relationship between him and Henry Moore, Ben Nicholson and **Herbert Read**[50], the leading quartet in England.” p. 72 (Hammacher, 1968).

Gabo moved to the USA in 1946 but was in Britain in the mid 50s. The design and building of the 1957 De Bijenkorf department store in the rebuilt Rotterdam led to a commission from the architect Breuer for Gabo, with whom he had been in Britain before the war. The result was the world’s largest constructivist sculpture; a 26m, 43 tonne untitled work at a scale that Gabo felt was appropriately architectonic (Figures 3-44 & 3-45). Gabo told Herbert Read in 1956;

[50] b.1893, d,1968

“The organic structure in the world of plants provided for me the solution to the new conception which I needed. In particular, I felt it was there I had to look for a solution for my structural problem and once this principle became evident to me, the image of the whole sculpture evolved out of it naturally. I conceived it as a tree, the trunk, the roots and the branches...”(Adrichem J, Bouwhuis J, & Dölle M, 2002)



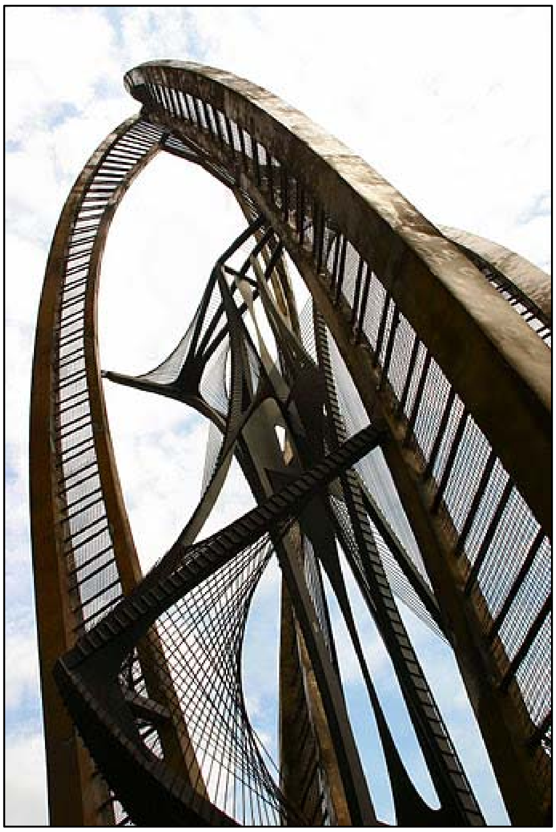


Figure 3-44 (left) Bijenkjorf store with Gabo’s untitled sculpture, Rotterdam (C. Jones, 1962)
Figure 3-45 (right) Gabo’s untitled sculpture, Rotterdam 2005 http://picasaweb.google.com/110143385797906795182/Rotterdam#5023507197788298754

The artists Hepworth, Moore, Gabo and **Man Ray**[51] all made documented trips to see the Wiener and Treutlein models (Octavo Books, 2011) (see Figure 3-1).

Moore introduced the use of strings in his work in 1937-8, this proved to be no more than an interlude but for Hepworth (Figures 3-46 & 3-47);

“who introduced strings into her work in 1938-9 – they were to become a lasting feature. She had studied mathematical models in Paris and London in her youth but let the idea lie dormant in her mind until she could use it emotionally, not mathematically.” p. 76 (Hammacher, 1968)

[51] b. Emmanuel Radnitzky, South Philadelphia 1890, d. Paris 1976.

Figure 3-46 Stringed Figure (Curlew), Version II 1956, edition 1959, Barbara Hepworth
http://www.tate.org.uk/servlet/ViewWork?workid=6065&tabview=text

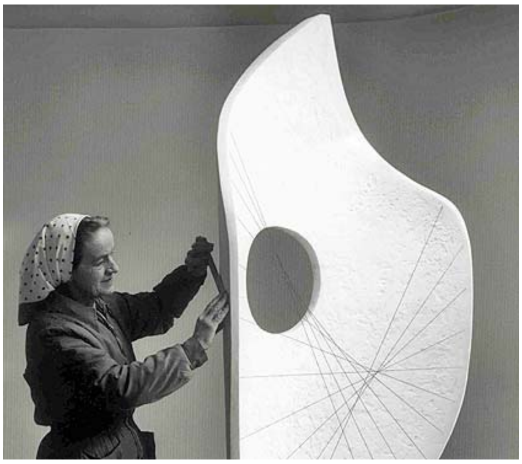


Figure 3-47 Barbara Hepworth with the plaster for Curved Form (Bryher II) (November 1961)
http://www.culture24.org.uk/art/sculpture%20%26%20installation/art343838

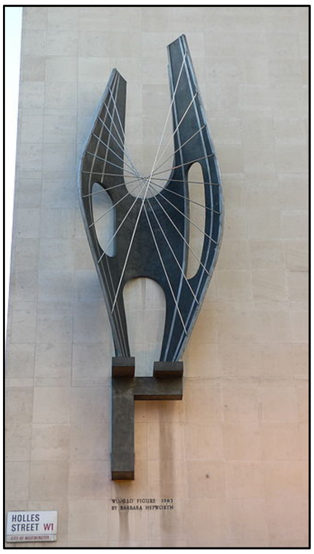


Figure 3-48 Winged Figure 1963, Barbara Hepworth.
http://en.wikipedia.org/wiki/File:Barbara_Hepworth_Winged_Figure_1963.jpg

In May 1961, following Gabo's sculptural triumph in Rotterdam, Hepworth was invited by the John Lewis Partnership to design a sculpture for their headquarters and flagship store in London's Oxford Street. They asked her that the work 'have some content that expresses the idea of common ownership and common interests in a partnership of thousands of workers'. The commissioned and agreed work was Winged Figure (1961–2) (Figure 3-48). The work was installed in April 1963. *The Guardian* approved of it and suggested it was best seen from Oxford Circus (Anon, 1963e) making it one of Britain's most prominent sculptures (see also Appendix D) .

3.17.2. First British concrete shells

Doncaster, 1935

Just as Gabo moved to England the first concrete shells in Britain were being constructed. These used the German Zeiss-Dywidag method (section 3.4) under license to Architectural Services Ltd as the 'Chisarc system' to roof a hangar at Doncaster Municipal Aerodrome in 1935 (Figure 3-49). Two barrel vaults gave a clear span of 90' x 60' (I. Anderson, 2009).

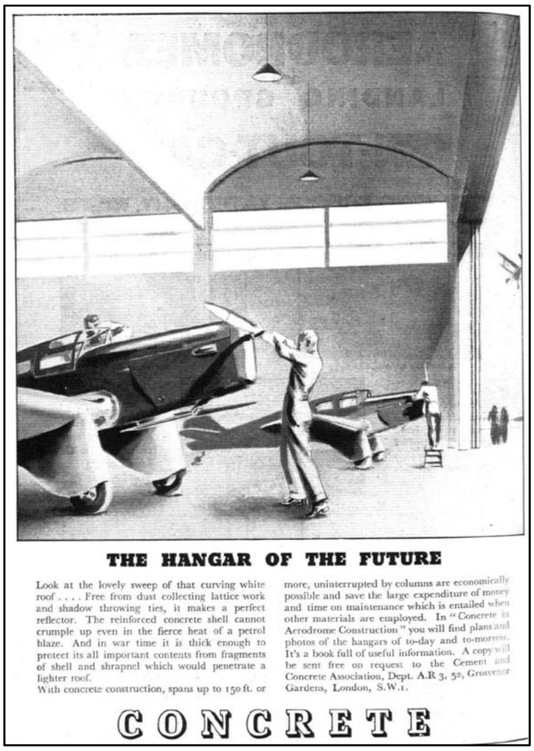


Figure 3-49 Advertisement with illustration of Doncaster Aerodrome hangar (Cement and Concrete Association, 1936)

"The design has been widely adopted in Europe and South America but it has been left to Doncaster to lead the way in this country"(Anon, 1935), ‘The principal features of the structure was said to be the large unobstructed floor area, the freedom from risk of fire and the low cost of maintenance’(Anon, 1936b).

There is evidence that **Cyril Vernon Blumfield**[52] an assistant engineer to Sir Douglas Fox and partners in 1928 (Blumfield) and architect **Ernest Seel**[53] were involved with Architectural Services;

“Seel observed that he had built two or three of the earliest barrel vault roofs in Great Britain with the able assistance of the Author [Blumfield].” (Seel, 1948)

“In this country the work had been developed by C B Blumfield (sic) among others and one of the first constructions was that of the Airfield Buildings at Doncaster. It has also been developed by such firms as Concreshell, Chisark (sic) and Shell D and Mr. de Steiger, and more recently by Barrel Vault Designs Limited in conjunction with Twisted(sic) Reinforcements Ltd”(Snow, 1947) p267

These shell developments made no impression in the contemporary architectural press, however there was newspaper coverage of Architectural Services work (Anon, 1936a). Blumfield’s later work, circa 1960, is discussed below and in Chapter 8. As late as 1952, at the Cement and Concrete Association’s Symposium on Concrete Shell Roof Construction the cylindrical form dominated the proceedings. No mention was made of hypars (Booth, 1998).

Summary

The introduction of German concrete shell technology to Britain led to pioneering engineers Blumfield and Seel continuing with shell work throughout their careers. They will feature later in hypar development.

3.17.3. The growth of hypars in Britain

The significance of British timber hypars

The first British hypars were in timber, a material that was readily available post-war. However the engineering expertise came from the reinforced concrete industry!

Hugh Tottenham[54] was a student of civil engineering at Jesus College, Cambridge. He has been said to be a man of “concrete” and a design engineer at Twisteel

[52] b. Wandsworth 1903, d. Majorca 1980. BSc Eng 1924 (Kings College). Researched stress at angles in reinforced concrete at Battersea Polytechnic, 1926. Blumfield took part in the discussion when Waller presented a paper on the Ctesiphon system to ICE in 1953. In 1960 he was the President of the Reinforced Concrete Association (Times, 9 Jun p16).

[53] b. Leeds 1908, d. Pinner 1971

(Where Hajnal-Kónyi was retained as a consultant) by 1952. Tottenham joined the Timber Development Association (TDA) as Senior Scientific Officer in February 1956 when the emphasis was on cylindrical roofs. By July 1956 a timber hypar roof was on display.

Tottenham's first hypar roof project was the 1957 Royal Wilton Carpet factory (see Figure 4-6). This was the first hypar shell roof in Britain.

Britain pioneered the use of timber for hypar construction and Tottenham was to become a prolific builder of timber hypar roofed projects. The fashion for the roofs developed fast. By 1959 six timber hypar roof projects had been completed. 97 further timber hypar roof projects would be completed by 1966 and 33 more during the decline until 1975 when the last was built(Booth, 1998).

In 1959 Tottenham left the TDA to become a research fellow in the Civil Engineering Department at Southampton University(Booth, 1998). At Southampton he conducted tests on models of the 'shells' of Sydney Opera House, for Ove Arup, in 1961 (P. Jones, 2006) and several years later on the 'mushrooms' of Queensgate Market (H. Tottenham, personal communication, 2 November 2004).

Amongst the engineers who designed wooden hypar shell roofs were the 1930s pioneer of concrete shells in Britain; Cyril V Blumfield. Blumfield was, amongst other projects, the engineer for two roofs at Liverpool University in 1960-1 (which will be discussed later). Another set of timber hypar shells were the prominent roofs for the 1962 Bernard House at Piccadilly Plaza, Manchester where the engineers were Leonard & Grant, later Leonard & Partners (Booth, 1998). Leonard & Partners were to be the consulting engineers for Queensgate Market.

Candela's celebrated lecture tour of Britain was in May 1959 (detailed in section 3.11). He lectured to thousands of people, at organised events met architects, architectural students, engineers and concrete trade representatives and recorded a 15 minute BBC radio interview however the list of identified people that he lectured to and met is limited. British concrete hypars started to be built that year.

---

[54] b.1926

The first concrete hypars were modest. Hajnal-Kónyi worked with the Lincoln architect **Sam Scorer**[55] on one of the earliest British concrete hypar shells. Their first was for a water tank tower of the Charnos lingerie factory in Ilkeston, Derbyshire by 1959. It was only an experimental shell, experience of which was to be used on subsequent proposals (Szynalska, 2010).

Another team was also at work on British hypars. On 29 July 1959 the Mound Stand of the Gloucestershire County Cricket Club ground at Bristol opened (Anon, 1959e) (Figures 3-50 & 3-51). It is roofed with an asymmetric arc of eight asymmetric hypar concrete shells, each on a single column in a mushroom formation. The shells, approximately 30' square (T. H. B. Burrough, 1970) in plan, brace one another in a row forming a continuous canopy to the public terrace. The arc is achieved by the shells being orientated at angle with concrete fillets in the intervals (Figure 3-52).

The shells are tilted down to the back of the stand. The column is off-centre with the short side toward the back of the raked stand. Assuming the shells are of the same thickness either side they would be out of balance. Stability is achieved with slim columns tying down the shells' backs at the eave, outside and beyond the back of the stand at each valley and ridge (Figure 3-53).

Figure 3-50 The Mound Stand, Gloucestershire County Cricket Ground, Bristol (Author, 2012)

[55] b. Hugh Segar Scorer in Lincoln 1923, d. Lincoln 2003

Figure 3-51 The Mound Stand, Gloucestershire County Cricket Ground, Bristol (Author, 2012)

Figure 3-52 The Mound Stand, Gloucestershire County Cricket Ground, Bristol. Bird’s eye view from South (Bingmaps)

Figure 3-53 The Mound Stand, Gloucestershire County Cricket Ground, Bristol (Author, 2012)

The shells were cast onto plywood board shuttering. No attempt at disguising the joints seems to have been made (see Figure 3-54) (Bond, personal communication 14 November 2011).

Figure 3-54 Soffit board marks and column head, Mound Stand, Gloucestershire County Cricket Ground, Bristol (Author, 2012)

The project was said to be the "First in the country to be built of reinforced concrete hypar construction"(Anon, 1959e). The architect was Burrough the club's architect (Anon, 2010b). The engineer was **Derek Bond**[56] of Clarke Nicholls & Marcel who was in the Bristol office with **Fred Clarke**. Burrough and Bond had already worked on Christ the King church at Lawrence Weston, Bristol (Figure 3-26).

Clarke was a great encourager to Bond and others. The practice subscribed to the American Concrete Institute. Candela's papers in the institute's journal were of great interest to Bond.

Candela's hypar shells seemed incredible to Bond, but to test them out with some basic calculations and with Clarke's support Bond had previously designed and built a 16' square reinforced concrete hypar mushroom in the yard of Bristol building contractor, Bond and team were delighted by its performance. At the time there was no project in mind – this was just a test (personal communication Derek Bond,12 November 2011).

Bond wrote to and exchanged letters with Candela on concrete mixes.

[56] (b. Bradford 1931)

Burrough was in many ways a traditional architect but he was also a great enthusiast for the new, especially concrete. “We were on sympathetic ground with Tom” (personal communication Derek Bond,12 November 2011).

The eight Bristol hypar umbrellas can now be seen as pioneering. Apart from the novelty of the concept in Britain they were eccentric and without down column drainage. They were to be, as we shall see, progenitors of Queensgate Market’s hypars.

The next step in the lineage was again with Clarke, Nicholls & Marcel. In 1960 the practice was the structural engineers for a series of hypar umbrella projects at Yeovil Technical College. The architect was the Somerset County Architect. The first hypar work on the project was a test for the contractor's design and construction of the formwork. It was planned to be subsequently used as agricultural equipment storage with one tilted square hypar mushroom with an asymmetrically placed column. The night after striking the formwork it failed at the column head and collapsed. The calculations would have been based on Bond’s Mound Stand work, the fault was found to be the failure of the contractor in getting the reinforcement needed into place. It was not rebuilt. Then came a series of hypar umbrellas to be used as open sided cycle sheds; these were disapproved of by the college governors; they were demolished and replaced by conventional structures. The sports hall construction continued successfully; six tilted 40ft square hypars in two rows of three with asymmetrically placed columns, glazing between rows. Plywood shuttering (Yeovil Technical College Minutes 1961-1970, personal communication Evan S David, 17 November 2011 and Derek Bond, 13 &18 November 2011) (Figures 3-55 to 3-57).

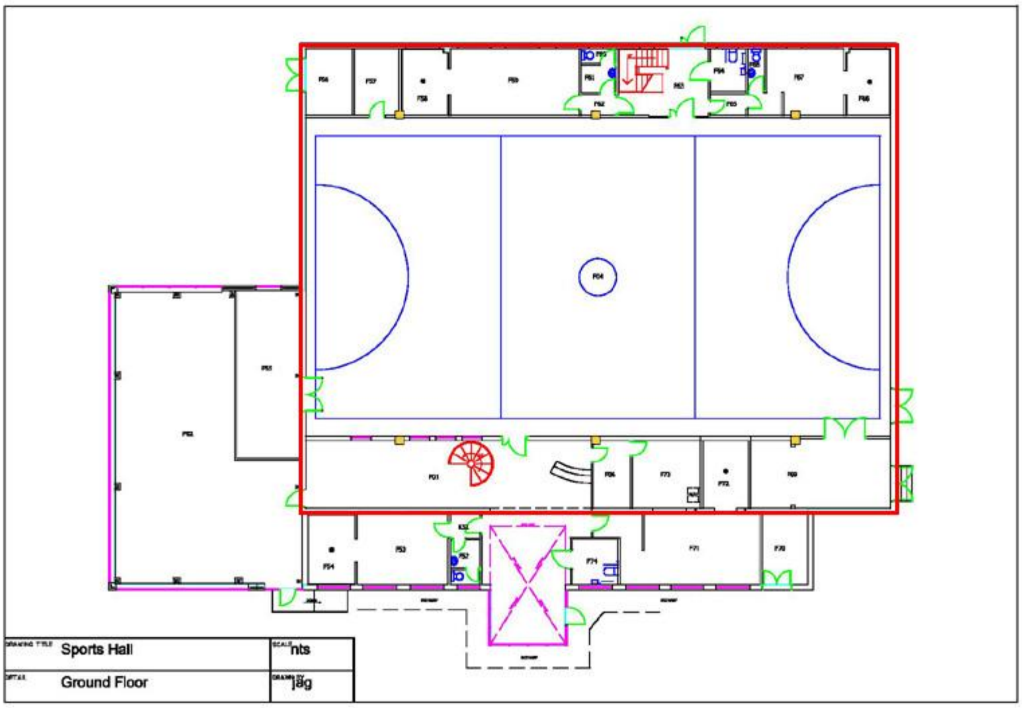


Figure 3-55 Ground Floor Plan of Yeovil College sports hall showing the six columns (in orange) to shell roof (perimeter in red). (Yeovil College)

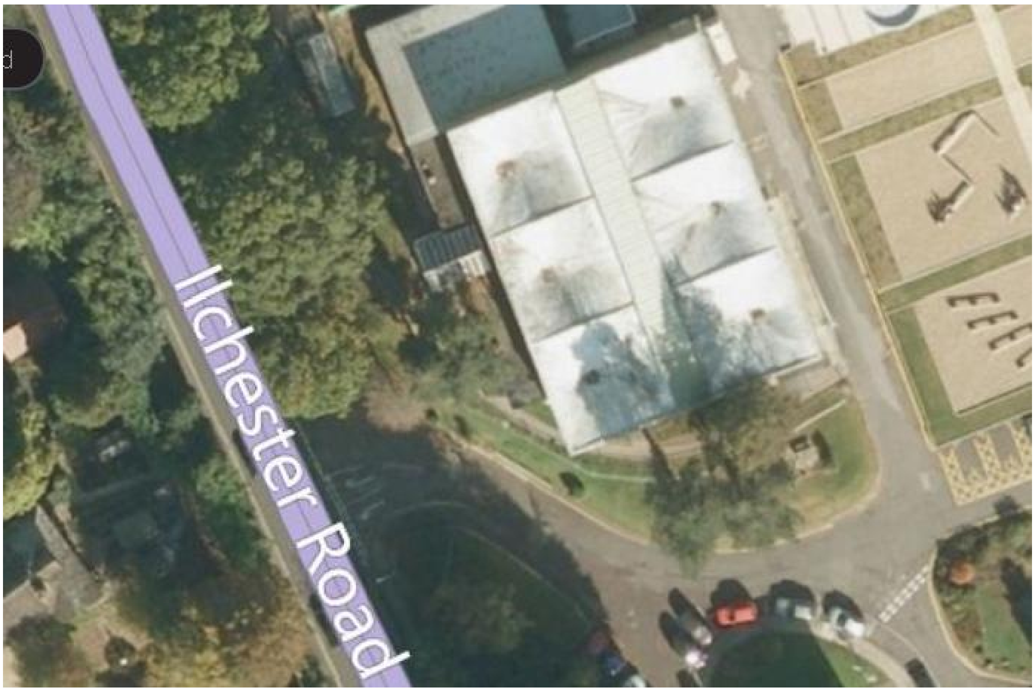


Figure 3-56 Aerial view of Yeovil College sports hall.
http://www.bing.com/maps

Figure 3-57 Yeovil College sports hall. January 2009
http://sesomersetssco.co.uk/?p=2350

The Yeovil work was more extensive and ambitious than the pioneering Mound Stand. The work was little understood by the client and its controversial design led to some of the shells being demolished soon after construction. It seems that project was unreported in the technical press but Marcel of Clarke, Nicholls & Marcel was to go on to a major hypar project in Stevenage; the John Lewis Warehouse.

Meanwhile having experimented at Ilkeston in 1959-60 Hajnal-Kónyi and Sam Scorer developed a saddle shell as a canopy service station at Markham Moor on the A1 (Figure 3-58). Scorer said that the petrol station canopy was intended as a piece of sculpture which incidentally provided a certain amount of cover from rain(Scorer, 1961).

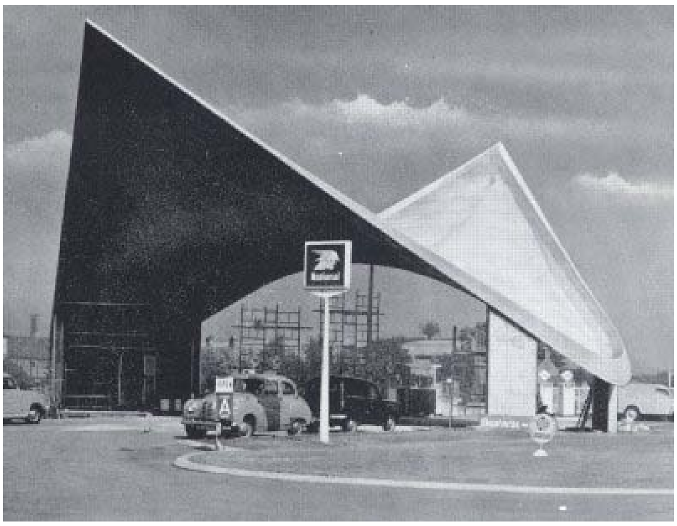


Figure 3-58 National filling station, Markham Moor, c 1960
http://mdg.vsb.cz/jdolezal/DgFAST/Realizace/HyperbolickyParaboloid/SedlovaPlocha.html

Scorer and his work has been otherwise interpreted

"a local architect who was one of Britain's few representatives of Googie, the Southern Californian style of irrationalist, high style mid-century Modernism... originally the roof contained nothing at all, being merely a gateway for cars on the way to a garage, a ceremonial, non- functional architecture"(Hatherley, 2010)

Apart from providing the engineering expertise for the realisation of Scorer's hypar work Hajnal-Kónyi was to play a direct role in the developing of engineering expertise for Queensgate market. By 1950 the 20 year old **Jim Spillett** [57] who had worked in a drawing office wrote to Hajnal-Kónyi, as he was a London based engineer, looking for a job. He got it, joined Hajnal & Myers and was there for four years. During this time he attended the Brixton School of Building (Personal communication 16 January 2011). Spillett was to become the senior partner of Leonard and Partners who were the consulting engineers for Queensgate market (see chapter 10). This gives a direct lineage of engineering expertise from Dischinger of Dyckerhoff & Widmann to the execution of the Huddersfield project.

3.17.4. Silberkuhl

The German Silberkuhl system (introduced in section 3.4) was licensed to Modern Engineering (Bristol Ltd) which exploited the system from 1957 until 1978. Two designs that were used to roof Blackburn and Burnley markets are outlined here and discussed in sections 6.15 and 6.23.

A short span roof shell was the Type 3 Silberkuhl HP shells. These were prestressed precast hypar shells. Typically they were up to 60' long and would be supported in saddles of insitu concrete portal frames to form a roof. The shells were 7'7" wide[58]. 28 x 44'shells and 14 x 40' shells were craned onto frames to roof Blackburn market hall as a continuous arc in 1963 (Figure 3-59 and Figure 6-34).

[57] Basil James Spillett b.1930

[58] The shells were 7'7" wide the short radius (internal) was 5' 5 11/16". The large radius (internal) was 392' 3 ½". The length varied according to need. The thickness was 2" - 2 ½" according to need. The depth of the u section was between 1' 6" and 1' 7 ¼". The quantity of reinforcement was subject to requirements (Martin Ashmead, personal communication 23 January 2011).

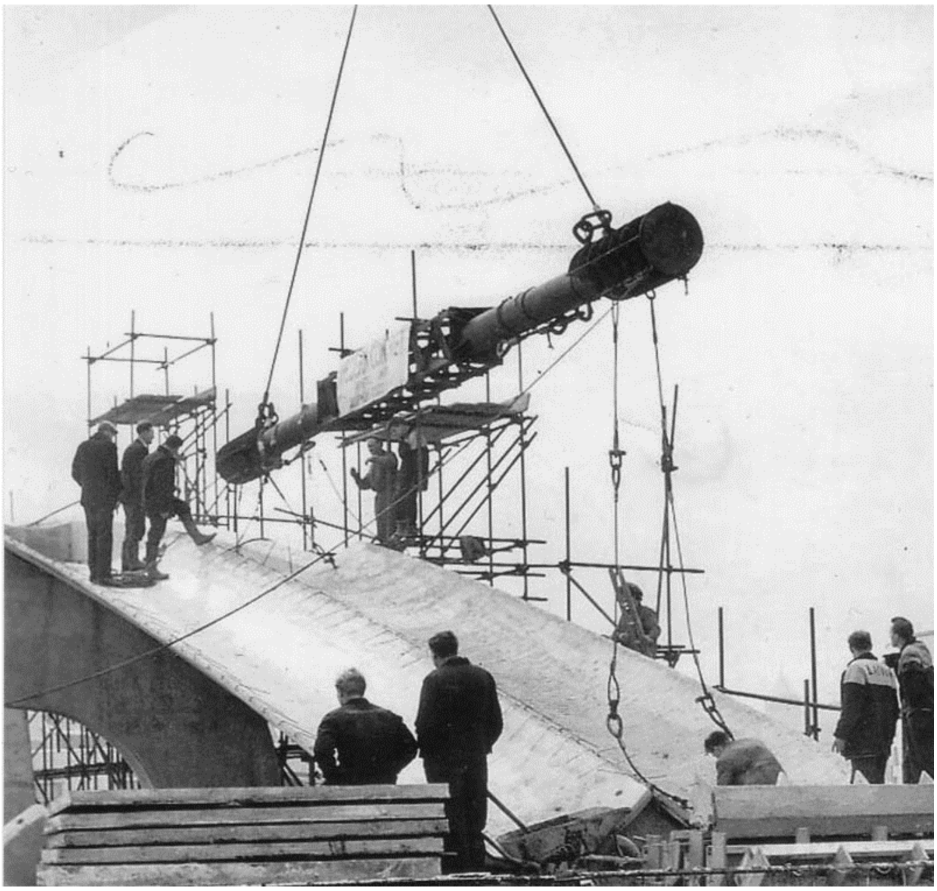


Figure 3-59 Type 3 Silberkuhl HP shells being craned onto portal frames for Blackburn Market, 1963 (Newsquest Blackburn)

The long span Klonne/Silberkuhl (KS) Shell known in the UK as ATA Silberkuhl was first used in Britain at Purfleet in February 1957 (Anon, 1957b). The system was used to form nine roof shells spanning 40m at Burnley market hall in 1969.

Silberkuhl shells were well known to the architects of Queensgate Market; the J Seymour Harris Partnership took a party from Huddersfield's Market and Fairs Committee to visit Blackburn Market in December 1965(Huddersfield Borough Council, 1965) and it was the consultant architect to Burnley Corporation for its 1969 market hall (Burnley, 1969).

3.17.5. British hypars from 1959

In 1959 Concrete Quarterly featured articles on the work of Candela, including hypar shell roofed warehouses; Nervi, including the Palazzo dello Sport and Sarger, including Caen-La Guérinière château d'eau-marché (see page 158). All three were engineers, it argued, so was it a coincidence that all three were as much architects as engineers? It cited the oration when Le Corbusier was presented with an honorary degree at Cambridge; “He observes the principles of engineering while applying to them the eye of a painter or sculptor”. The issue’s editorial was critical of British progress. Was there a reason for the comparatively pedestrian nature of much British work? Was it a matter of training? A better knowledge of structural engineering, it said, would produce better architects and architects able to get the utmost co-operation from their engineer colleagues. Would better training produce a more imaginative, versatile engineer? Could a grounding in architecture give our engineers some insight and interest beyond making things stand up? Could engineers develop a “painter’s or sculptor’s” eye? The editor did not seek a rash of hypars across Britain but asked where was our original thinking in the field of construction, and craftsmanship to backing it up?

“ A hundred years ago Brunel was putting England in the forefront of the world’s engineering. When are we again going to lead and not to follow? (B. Campbell, 1959)

We now review the development of the concrete hypar and related structures in Britain up to 1968. All these cited are projects that the designers and engineers of Queensgate Market would have have seen reports of, or visited, or known about because of their proximity.

Lincoln, 1961

Scorer and Hajnal-Kónyi continued in their hypar work. One project that attracted attention was the Lincolnshire Motor Company Showrooms (1959-61) in Lincoln (Anon, 1960a).

When the new garage for Lincolnshire Motor Company Showrooms was being built it caused a sensation. It was reported that the construction was of reinforced concrete, which was chosen for its economy, durability and fireproof qualities. The roof covered a large uninterrupted floor space 29m by 32.5m and consisted of four 65mm thick hypar shells arranged so that their highest points are at the centre and the four corners of the garage. The shells were separated by a roof-light running along the entire depth of the building. It was described in *Architectural Review* (1960:349-350) and discussed at conferences. Concrete Quarterly commented;

‘The event is welcome not because we necessarily want a spate of hypars throughout the land but because it strengthens the growing trend over here towards experiment and the more imaginative use of structural concrete. We have watched with enthusiasm what Candela has done with this form of structure in Mexico; it is encouraging to discover that architects and engineers in Britain are gradually dispelling the fogs of our own innate conservatism towards design, which still linger in patches here and there.’(Anon, 1960a)

Wolverhampton, 1961

Another 1961 project was four 40’ square concrete hypar umbrellas forming a canopy at Five Ways Garage in Wolverhampton (Anon, 1961c). The umbrellas were interconnected along the shell edges giving the structure a greater stability in resisting asymmetric loads. This allowed the columns to have a more slender section than if they had been freestanding structures (Bennett, 1961) (Figure 3-60).

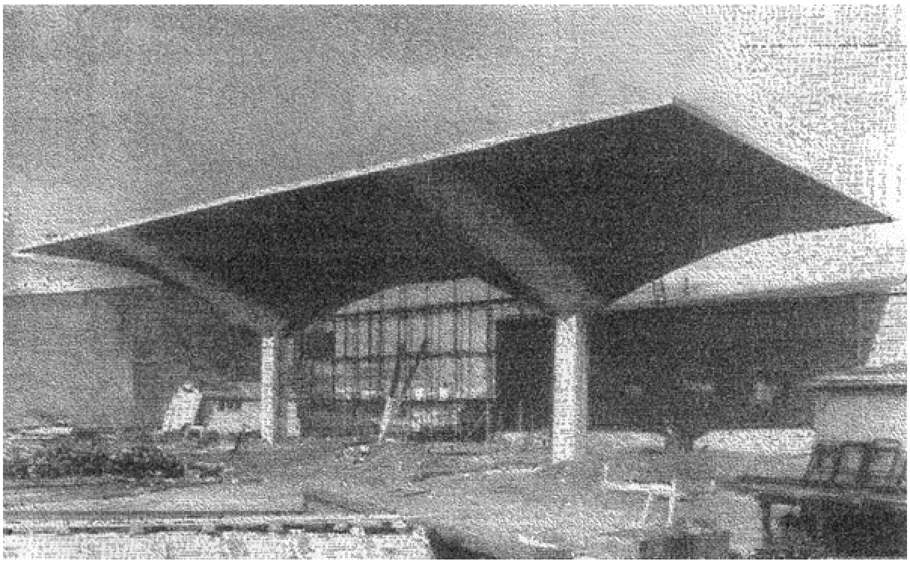


Figure 3-60 Five Ways Garage, Wolverhampton under construction (Bennett, 1961)

Two uses of the shuttering were made as the umbrellas were cast in pairs. “The shuttering was composed of random lengths of tongue and groove butt jointed and laid diagonally” (Bennett, 1961). Birmingham based Seymour Harris architects would have been aware of this project.

Accrington, 1962

The following year Accrington covered market with diamond and triangular cylindrical (in preference to hypar) roof shells opened (see section 6.11).

Stevenage, 1963

From March 1962 The John Lewis Partnership’s new warehouse was built at Stevenage, Hertfordshire. The building was completed in May 1963. It was designed by the architects Yorke, Rosenberg and Mardall with engineer Marcel of Clarke Nicholls and Marcel in collaboration with Candela.

Marcel graduated from Caen University in 1933 and came to Britain in 1936 and worked in the offices of J L Kier & Co, the reinforced concrete specialists working with Ove Arup, and then leaving to join Ove Arup in the new Arup & Arup Ltd, civil engineers and contractors before establishing his own London practice in 1946 (Anon, 1950, 1966b). On becoming a British citizen in 1948 he stated he was from Palestine (Anon, 1948). In 1950 Clarke and Nicholls formed a partnership with Marcel; Clarke Nicholls and Marcel.

Candela's degree of involvement is not clear '...here Rosenberg invited the Spanish architect and engineer to collaborate on the structural design. They had met in Mexico..." (Harwood, 1999). Brian Henderson (with YRM from 1950 and later company chairman) said that Rosenberg was impressed by Candela's structures and as Rosenberg and Yorke were friends with Marcel he feels that there was a will to involve Candela (Brian Henderson, personal communication 7 September 2011).

Marcel had also met Candela in London with a view to consultancy 1959 (Derek Bond, personal communication 13 November 2011), Marcel's CNM practice had the experience of the 1959 Mound Stand in Bristol and the sports hall at Yeovil. The Yeovil CNM project manager described Marcel and Candela as 'friends' (Evan S. David, personal communication 17 November 2011).

The Stevenage warehouse was roofed with 75 symmetrical 60'x 31' concrete hypar umbrella shells and 15 30'x 31'half umbrella shells in joined together in rows. The rows were tilted to provide a 5' interval for north light (see Figures Figure 3-61 and Figure 3-62). Precast concrete mullions link the high and low edges of adjacent shells with metal glazing bars between. Most of the shells were supported on 13' square concrete columns with a 4" diameter rainwater fallpipe down the centre of each column. Timber forms were used for casting the shells. Each set made up of 4" (0.1m) planed boards screwed to 2" plywood which was screwed to supporting timbers, was used fifteen times. The boards were places in the longitudinal direction of the shells with exception of a strip running from the column at right angles to the valley.(Anon, 1964c). The shells' upper surfaces were insulated with a layer of cork and covered with two layers of roofing felt.

One of the partnership's requirements was that the warehouse should "have good uniform natural lighting, be well insulated and fireproof, be constructed in the shortest possible time and in the most economical manner".(Anon, 1964c)

The Builder reported;

"The unusual roof form of this warehouse has resulted in a building of wide clear spaces, very light and airy, and visually extremely pleasant. Although the building incorporates a wide range of automatic services they are far from obtrusive, and the lines of structure remain clean and uncluttered. Sprinklers and lighting strips fit neatly to the roof itself." (Anon, 1964c)

Contemporary photographs shows fluorescent strip lights suspended below the lowest edge of the shell rows with the sprinkler pipe above with three branches, per half shell, running perpendicularly down across the shell, dog legging under the valley and up the 2/3 of the other side (see Figure 3-61, 3-62 & B-19).

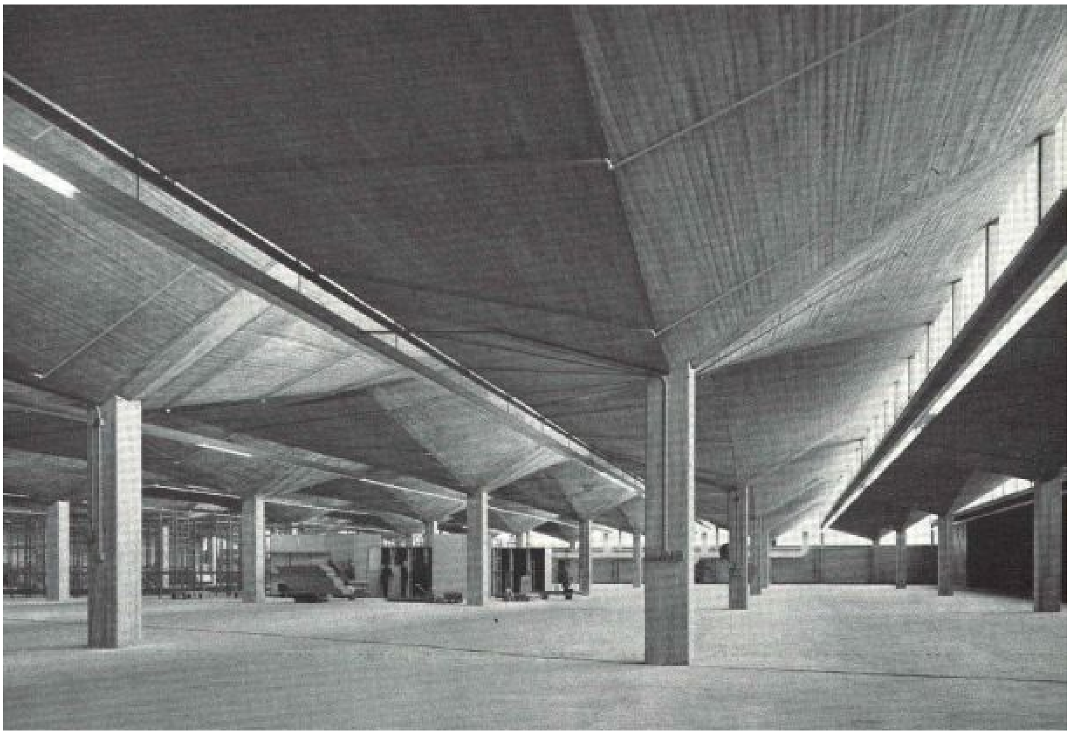


Figure 3-61 John Lewis Warehouse c 1963 (John Lewis Partnership)

In May 1963 the John Lewis Partnership magazine reported;

'It has quite a real beauty of its own. That famous new roof, which from the outside has been likened to an inside-out umbrella, from the inside has the lift and flow of waves or of birds flying. The concrete section of the roof curve and sweep against the regular rows of clear windows that give the whole design such lightness." "It's like cloisters", somebody said'.(Anon, 1963h)

In May 1963 John Lewis's, Chelsea depot magazine commented;

"It will be a vast place and a really awe inspiring with its vaulted roof which has something about it reminiscent of a cathedral"(Poole, 1988)

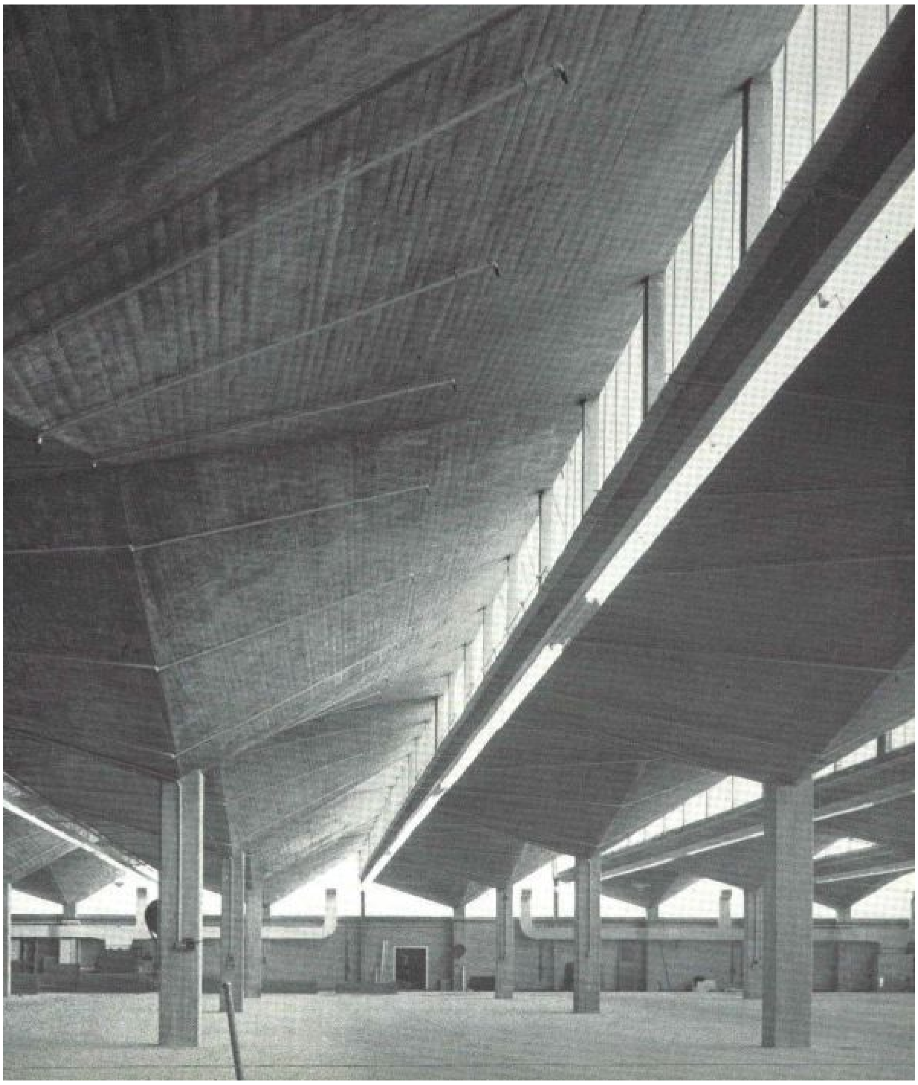


Figure 3-62 John Lewis Warehouse c1963 (John Lewis Partnership)

Serpentine Restaurant, London, 1964

This was a lakeside restaurant constructed of hexagonal concrete mushrooms (Figure 3-63) perhaps after the style of a 1959 lakeside restuarant in Georgia (see Figure 3-37 and Figure D-35). The architect was Patrick Gwynne[59]; the engineers, Jennings Potter & Bingha and the contractors Sir Robert McAlpine & Sons Ltd (Anon, 1964b). Gwynne had come second in the restaurant design competition for the 1951 Festival of Britain. That led to him designing the Crescent Restaurant at Battersea Fun Fair. This led him to meet the caterer and hotelier, Charles Forte[60] of the Forte Group who had a contract to provide catering facilities at the festival. It was for Forte he designed the Serpentine Restaurant(Forte, 1986; Harwood, 2003).

[59] Alban Patrick Gwynne b. Portchester 24 March 1913, d. Esher 3 May 2003
[60] b. Mortale, Italy 26 November 1908, d. London 28 February 2007

Forte was enthusiastic or at least adventurous in building hotels and service stations in modern styles[61]. Forte's putative role in Queensgate will be raised in Chapter 12.

Figure 3-63 Serpentine Restaurant, London,1964 (Anon, 1964b)

York, 1967

A new foyer, restaurant and bars were added to the C19 Theatre Royal, York. These were housed in a glass-walled pavilion roofed by a cluster of hexagonal concrete 'mushrooms' sprouting from slender tapered columns (see Figure 3-64). The architect was Patrick Gwynne (who had got the commission as a result of his Serpentine Restaurant(Harwood, 2003)) and the engineer, Ralph Alan Sefton Jenkins. This new version of gothic arches and vaults in concrete, was said to be "impeccably specified and constructed" leaving the perimeter free to be a "transparent envelope" (Nuttgens, 1970).

[61] The 1974 Burtonwood Services on the M62 motorway is another example.

Figure 3-64 Theatre Royal, York of 1868-8 & 1967(Photo, Keith Gibson(Nuttgens, 1970)

Harborne 1968

In April 1968 the National self-service filing station, High Street, Harborne, Birmingham opened. The canopy over the station was three identical reinforced concrete regular hexagonal hypar mushrooms each supported by a central circular column and each with edge beams (Figures 3-65 & 3-66). The structures were arranged in a group but stood apart and “obtained support against wind forces by constraints provided by small props between the separated edges. The 2’ 9‘‘ diameter(Hickman, 1970) columns “were mutually at 55’ (16.8m) centres” (Anchor, 2001). The design architect, Conrad S Rowberry[62] was reported to have said "It has

[62] (b 1928)

taken four years to evolve the design of the garage."(Anon, 1968b) The engineer was Robert D. Anchor a director of GKN Reinforcements suggested the canopies were designed by 1965 (Anchor, 2001).

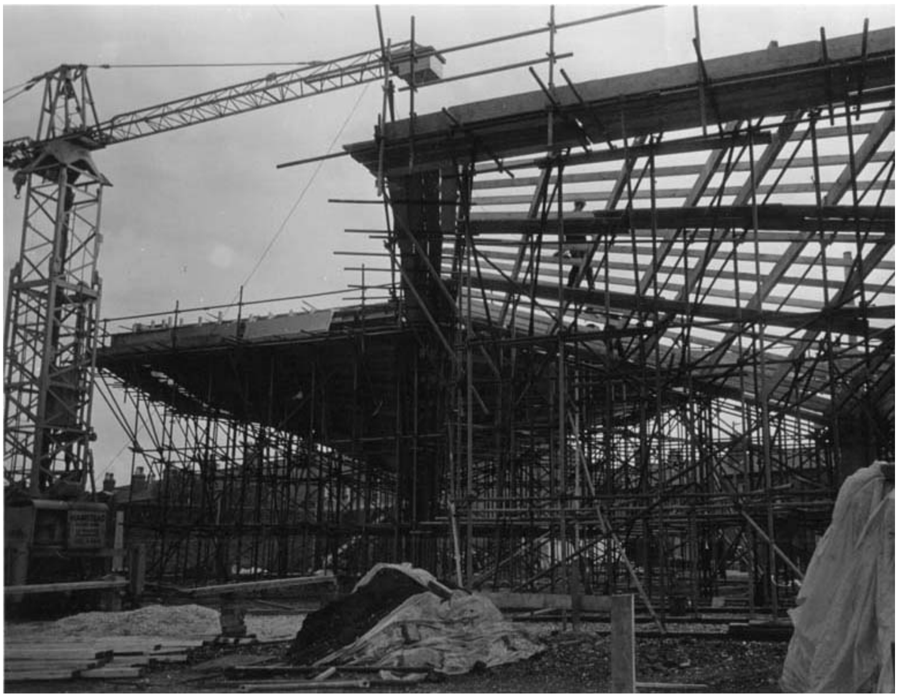


Figure 3-65 National filling station, Harborne under constrution (courtesy Colin S Rowberry)

Figure 3-66 National filling station, Harborne under construction (courtesy Colin S Rowberry)

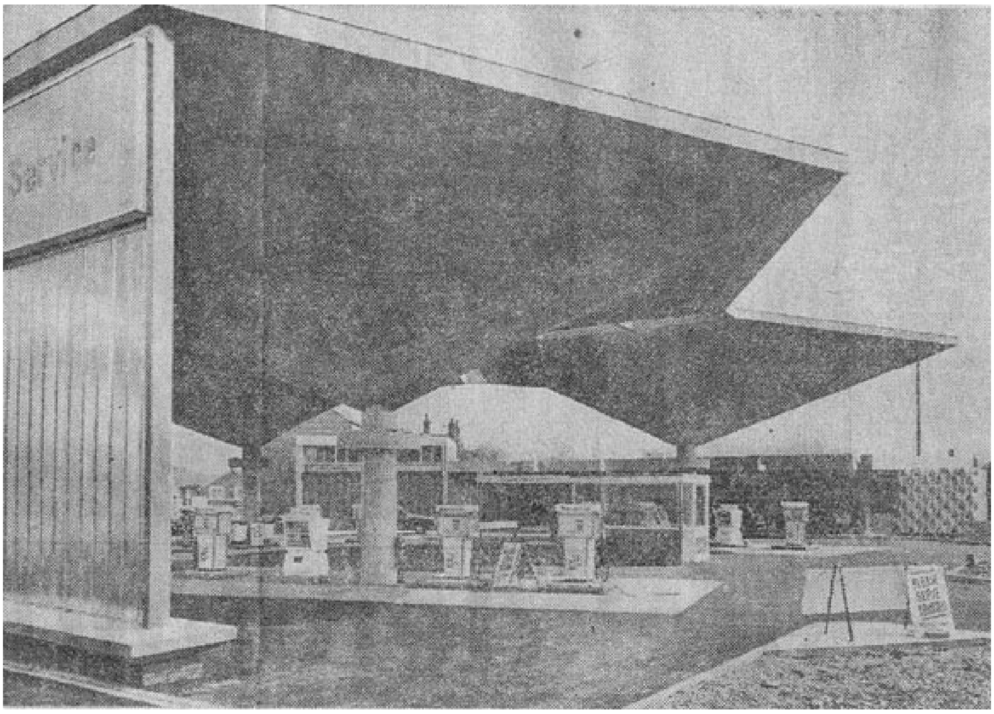


Figure 3-67 National filling station, Harborne, April 1968 (Anon, 1968b)

A concrete collar around each column just below the springing point was a lightbox that uplit the shell soffits with either fluorescent (Rowberry, C.S., personal communication, 8 August 2011) or arc lamps, “to illuminate the entire area”. (Hickman, 1970)(Figure 3-67).

The offices of the J. Seymour Harris Partnership, the architects for the Murrayfield development and market hall in Huddersfield, were 1.7 miles from the filling station. The concrete for first hypar roof shell for Huddersfield market hall was poured six months after the Harborne station opened.

Summary of British mushroom hypar projects

This in part answers Campbell’s (The Concrete Quarterly’s editor) closing question;

“A hundred years ago Brunel was putting England in the forefront of the world’s engineering. When are we again going to lead and not to follow? (B. Campbell, 1959)

The start may have been tentative but the projects became ambitious and in Huddersfield unique. To illustrate here is a full listing of British hypar mushroom structure projects.

- Test symmetrical square at John Perkins & Son Ltd, St Marks Road, Bristol mid 1950s. Engineer Derek Bond of Clarke, Nicholls & Marcel.
- Mound Stand, Gloucestershire County Cricket ground, Bristol (1959) 8 tilted square asymmetric mushrooms, braced and tied. Architect, Tom Burrough of Burrough & Hannam. Project engineer Derek Bond of Clarke, Nicholls & Marcel.
- Texas Instrument Ltd factory, Bedford (1960) 29 square symmetrical, freestanding and glazed. Architects, O'Neil Ford & Richard Colley of Texas. Consulting engineers, Oscar Faber & partners; General contractors. Tarmac Civil Engineering Ltd. The same architects had built the 1957 Texas Instruments factory in Dallas with Candela as consulting engineer.
- Yeovil Technical College (1960) covered workshop space. One tilted square with asymmetric placed column. Architect, Bernard Adams, Somerset County Architect. Engineers; Clarke, Nicholls & Marcel. Collapsed hours after striking.
- Yeovil Technical College (1960) A series of tilted squares with asymmetric placed columns, offering shelter to 432 cycles. Architect, Bernard Adams, Somerset County Architect. Engineers; Clarke, Nicholls & Marcel. Demolished after client's disapproval.
- Yeovil Technical College (circa 1960) Sports hall, 6 tilted squares in two rows of three with asymmetrically placed columns, glazing between rows. Architect, Bernard Adams, Somerset County Architect. Engineers; Clarke, Nicholls & Marcel.
- Five Ways Garage, Wolverhampton (by 1961) 4 square symmetrical, braced.
- John Lewis Partnership warehouse, Stevenage (1963) 75 tilted rectangular symmetrical, braced and glazed. Architects Yorke, Rosenberg and Mardall with engineer Oliver Marcel of Clarke, Nicholls & Marcel in collaboration with Felix Candela.
- National Mercury filling station, Harborne (1968) 3 regular symmetric hexagonal, braced. Architect Conrad S Rowberry, engineer Robert D. Anchor of GKN Reinforcements.
- Market hall, Huddersfield (1970) 21 rectangular asymmetric, freestanding and glazed. Architect J Seymour Harris partnership, Engineers, Leonard & Partners.

3.14. Belgian thread.

The Brussels Expo of 1958 had over 41 million visitors. The expo was noted for its architecture.

"The public saw the fair as a stunning success, both for its optimistic view of technology and for the sheer exuberance of much of the fair's modern architecture. At a time when the public was tiring of modernism (particularly the corporate idiom of rectilinear glass-and-steel architecture), the celebration of structure and dynamic architectural forms seen at the Brussels World Exhibition reinvigorated interest in the possibilities of modern architecture. Although experiments into the expressive and sculptural possibilities of concrete in architecture had been under way for nearly a decade (particularly in the work of Matthew Nowicki, Felix Candela, and Pier Luigi Nervi), the fair called attention to and promoted some of the more innovative possibilities of modern architecture, setting the stage for the overwhelming public acceptance of works from Jørn Utzon's Sydney Opera House (1973) to Eero Saarinen's TWA Terminal (1962) at John F.Kennedy Airport in New York."(Anon, 2011b)

Two works associated with the expo, that used concrete hypars, were engineered by **Hoyte C Duyster**[63]; the Philips Pavilion and a Volkswagen showroom.

The aim of the architecture for the showroom was maximum transparency. The building, for which architect **Claude Laurens**[64] worked closely with Duyster, was roofed with two reinforced concrete hypar mushroom shells. Each was 31.5m by 23m. The supporting 0.6m x 0.6m column was eccentrically placed. Additional columns had to be provided at the back and sides to minimise bending moment.

"The elevation for most part glazed, were detached from the shells, strengthening the impression that the roof was free floating"(Lagae, 2002)

The Philips Pavilion, commissioned by the electronics company, Philips was designed for the Brussels Expo of 1958 by the office of Le Corbusier.

Le Corbusier accepted the commission by saying "I will not make a facade for Philips but an electronic poem"(Treib, 1996)p 9.

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[63] b. 1907, d. 1987.

[64] b. Paris 1908, d. 2003. The son of sculptor Henri Laurens, he grew up around such artists as Picasso, Chagall, Braque and Matisse, who were regular visitorsMboka, M. (2011, 15 August). Leopoldville 1950s - tropical modernism sets the tone. Retrieved 3 September, 2011, from http://kosubaawate.blogspot.com/2011_08_01_archive.html.

The executed pavilion was a cluster of nine hypars, composed asymmetrically to create dynamically-angled contours and constructed out of pre-stressed concrete components (Figure 3-68).

“From the beginning of the project Le Corbusier was determined that mathematics, being a central part of human creation, would play a fundamental role in the building’s design” (Treib, 1996)p 19.

Because Corbusier was busy with the planning of Chandigarh, much of the project management was assigned to **Iannis Xenakis**[65], who was also an experimental composer.

According to Xenakis, the idea of using curved surfaces composed of straight lines was inspired by his composition Metastasis, premiered in 1955 (Treib, 1996).

“Xenakis, an accomplished architect, saw the chief difference between music and architecture as that while space is viewable from all directions, music can only be experienced from one. The preliminary sketch for Metastasis was in graphic notation looking more like a blueprint than a musical score, showing graphs of mass motion and glissandi like structural beams of the piece, with pitch on one axis and time on the other. In fact, this design ended up being the basis for the Philips Pavilion, which had no flat surfaces but rather the hypars of his musical masses and swells.” (Wikipedia, 2011c)

Treib demonstrates the ‘striking’ correspondence of the relation between the content of a catalogue of models of mathematical solids, illustrated with drawings that determined the forms, in Le Corbusier’s library and the warped surfaces of the Philips pavilion (Treib, 1996).

Treib says that the, building which existed for only 180 days;

“...was intended to be a phenomenon that no member of the audience had ever experienced before. The audience was titillated, tantalized, impressed, and ultimately mystified by the building they had entered and what they had seen within it, and not the details of its architectural construction...” (Treib, 1996)p 243.

[65] b. Brăila, Romania 1922, d. Paris 2001.

Figure 3-68 Philips Pavilion, Brussels, 1958
http://www.archdaily.com/157658/ad-classics-expo-58-philips-pavilion-le-corbusier-and-iannis-xenakis/expo-1958-paviljoen-van-philips-2/

Although the expo was very popular and well recorded it has proved impossible to identify which architects and engineers within the scope of this work did or did not visit.

3.15. Israeli thread

The development of the hypar in Israel was late in the chronology of the shell type but it produced original work.

Eliahu Traum[66], had left Austria for Palestine in 1939 a few months before the outbreak of the war (the majority of his family were Holocaust victims). He trained as an engineer at the Technicon and was to become interested in shells as a doctoral student at MIT in 1954. Candela's work in Mexico was much publicised and Traum was intrigued by it. In his design practice he tried to implement such shells. First he designed symmetrical hypars for the roof of several synagogues in Israel, and then precast ones. He realised that the structural design of such shells for asymmetrical

[66] b. Vienna 1924. Education in engineering at the Technion, Israel Institute of Technology and received his BSc. and Diploma as Structural Engineer in 1949 and his MSc. in 1951. In 1957 he received his DSc. in Structural Design from Massachusetts Institute of Technology (MIT).

shapes or loading was not yet clearly established. This led him to write a paper on the structural design of such shells for asymmetrical shapes or loading (Eliahu Traum, personal communication, 24 August 2006). Traum's paper, *Bending and torsional stresses in assymetrical hypars* (Traum, 1964) will be discussed in chapter 11.

Traum's most prominent application of such shells was for the Israel Museum in Jerusalem with architect **Al Mansfeld**[67]. They devised umbrella units, 11.2m square, which could be constructed independently or in combination with additional units (Figure 3-69 to 3-71).

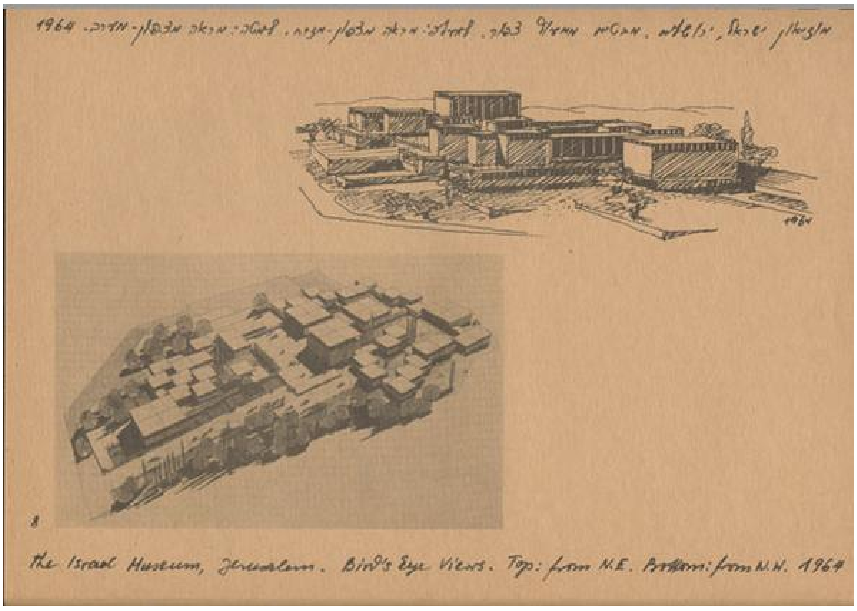


Figure 3-69 Israel Museum, Jerusalem. Bird`s Eye Views. Top: from N.E. Bottom: from N.W. (1964)(Israel Museum)

The roof of each umbrella is on a single central column, enabling a clerestory to separate the seemingly levitated roof slab from the free-standing walls of each modular enclosure (seealso Figure 4-23 and Figure 4-24).

The first section of the museum was completed around 1965 and consists of a number of hypar mushroom units, each resting on a central column that contains all services such as air conditioning, lighting and roof drainage. Through this system a

67 b. St Petersburg, Russia 1912, d. Carmel, Israel 2004. He started to study archtecture at the Technische Hochschule, Berlin in 1931. With the Nazis in power, he moved in 1933 to Paris, where he completed his studies as student of Auguste Perret. In 1935 he migrated to Palestine and taught at the Techicon from 1949 to 1956.

large exhibition area was formed. (Eliahu Traum personal communication, 8 August 2006)

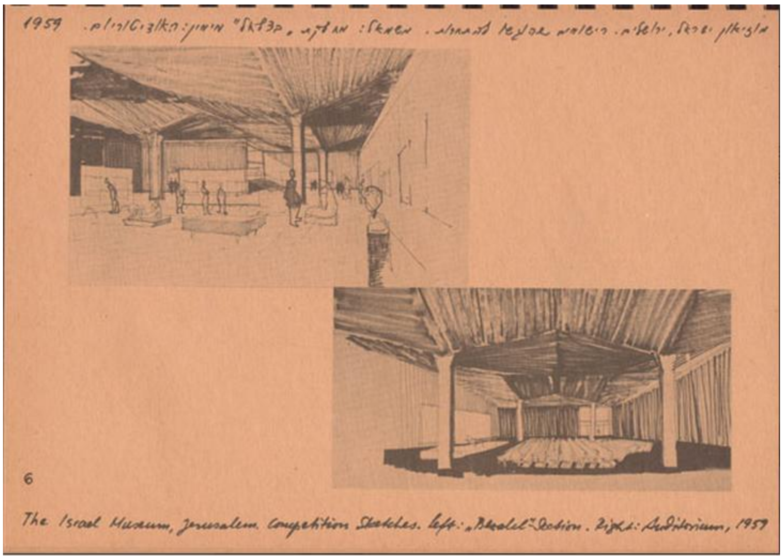


Figure 3-70 Competition sketches for the Israel Museum. Left Bezalel Section, Right Auditorium (1959)(Israel Museum)

Figure 3-71 Bronfman Archaeology Wing, Israel Museum (2010) http://www.artknowledgenews.com/2010-08-06-20-37-19-the-israel-museum-has-reopened-and-celebrates-its-45th-anniversary.html

Traum’s work and paper were to be fundamental to the engineers of Queensgate Market establishing the structural integrity of the proposed roof shells. However the synthesis of the Israel Museum shells and glazing are echoed in Queensgate Market; shown in Chapter 4.

Chapter 4 Shell Glazing

‘A facade looks like an abstract picture where forms and materials are gathered in a precise organization’ Olivier Cornu (Achitag, 2011)

Having explored the development of the hypar in architecture it is important to consider the completion of the envelope to form shelter, control ventilation and natural lighting. Perhaps, to many designers, such glazing and ventilation is an inconvenience interrupting the poetry of the form. Because of the shell’s use and local climatic conditions some projects that would have to be closed in temperate climes do not require glazing; the author has visited a Mexico City church and a market in Casablanca where dramatic shells are unsullied by glazing bars. In other environments how have designers managed this and what leads to aesthetic success?

Architectural styles are associated with particular fenestration patterns; in a Gothic building the types of glazing bars can be anticipated. Thin shell structures are not an architectural style but there are commonalities as a form. By the very nature of the shell, their glazing has no structural purpose; here glazing is limited by other factors such as, pane size and the properties of glazing bars.

Boyd writing in 1958 observed that the nature of concrete shells was a challenge to the rectilinearity of modern architecture and its services; lifts, lavatories, air-conditioning equipment and glazing (Boyd, 1958). No study of the shell glazing has been found, it is perhaps overlooked, so empirical observation is required.

To a degree the general glazing of Queensgate Market is familiar to other mushroom shell projects. In contrast the Queensgate elevation’s glazing is very distinctive. No other project with this pattern of glazing bars has been identified. This chapter reviews the glazing of shell roofs to seek what solutions and influences were available to the designers.

Since the 1920s designers of shells of many types have taken such a challenge in the glazing below shell roofs in variety of ways. This chapter takes an approximately chronological overview of the glazing of shell structures and then looks at and compares Israel Museum (see also 3.15) with Queensgate Market. An introduction to the development of patent glazing completes the chapter.

4.1. Glazed shells

An overview of the glazing of shell structures.

Reims Market has a distinctive transom and mullion pattern in concrete that avoids a chequerboard pattern yet is graphically sympathetic, strong and independent of the shell profile (Figure 4-1).

Figure 4-1 Boulingrin market hall, Reims (1929) (photo; David Griffiths, 2012)

The Johnson & Hardin printing plant (date unknown) in Cincinnati shows no real sympathy with the roofline being simply a horizontal division at door height with minimal transoms, leaving the glazing above to run up to the profile of the shell (Figure 4-2) and the private home playroom(name and date unknown) in the same city similarly makes no attempt at a more sophisticated solution, with arguably, with its irregularity, an even less satsfactory geometric subdivision of mullions (Figure 4-3). This perhaps because their ardent modernist architect, Woodie Garber[68] is said to have been insistent on designing on a one metre grid because he considered it the “most inteligent dimension for human planning”(Sulerbarger, 2007).

[68] b. Cincinati 1913, d. Cincinati 1994

Figure 4-2 Johnson & Hardin printing plant, Cincinnati (United States Steel)

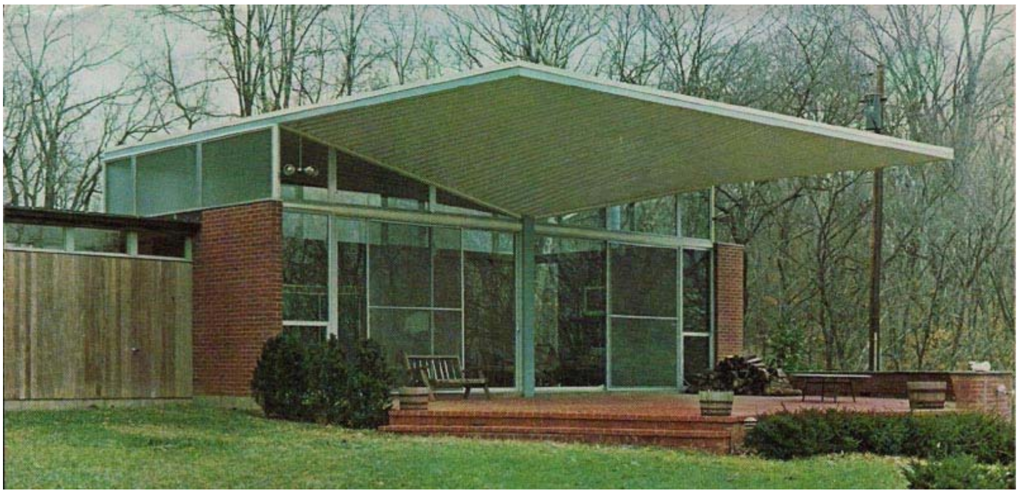


Figure 4-3 Private home playroom and terrace, Cincinnati (United States Steel),

Royan Market has a symmetrical geometrical transom arrangement that is not continued across the whole span of the elevation (Figure 4-4).

Figure 4-4 Royan Market 1956
http://www.architag.fr/article-figures-urbaines-83437098.html

Another approach found is the arrangement of either mullions or transoms being aligned or orientated in relation to the shell profile. Lambert Aiport has two rows of transoms in arcs of differing radii that mitigate the transition of form from the lower rail to the upper (Figure 4-5).

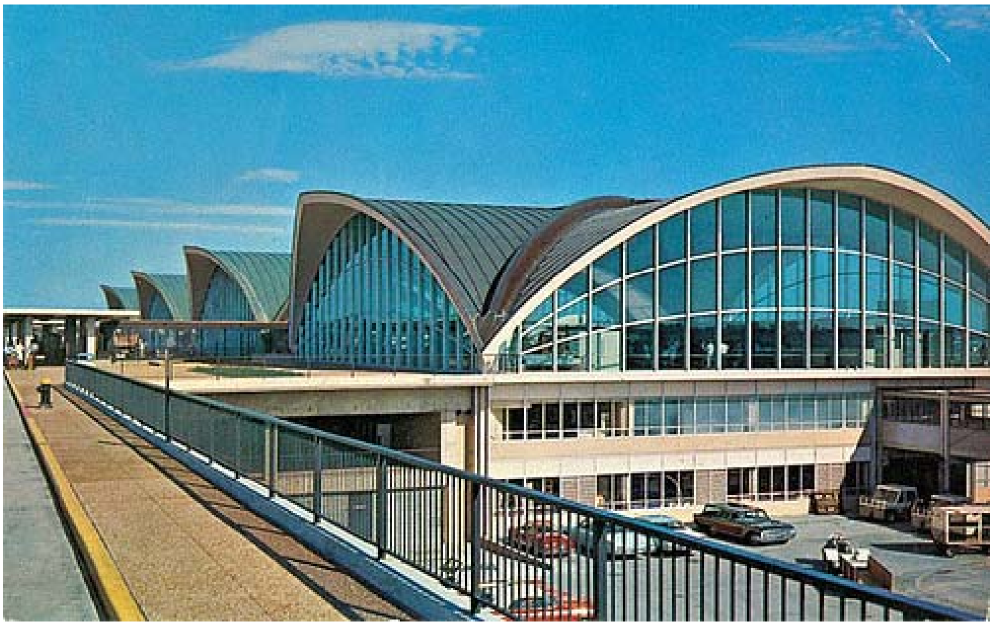


Figure 4-5 Lambert Airport, St Louis, 1956 (Postcard circa 1968)
http://www.modern-stl.com/links/illustrated-glossary/

The 1957 Royal Wilton Carpet factory near Salisbury was notable because it was Britain's first hypar roof. It was made of timber. The architect, Robert Townsend [69] designed the glazing bars; mullion and transoms to follow the eccentric geometry of the fenestration. This can be seen indistinctly in Figure 4-6.

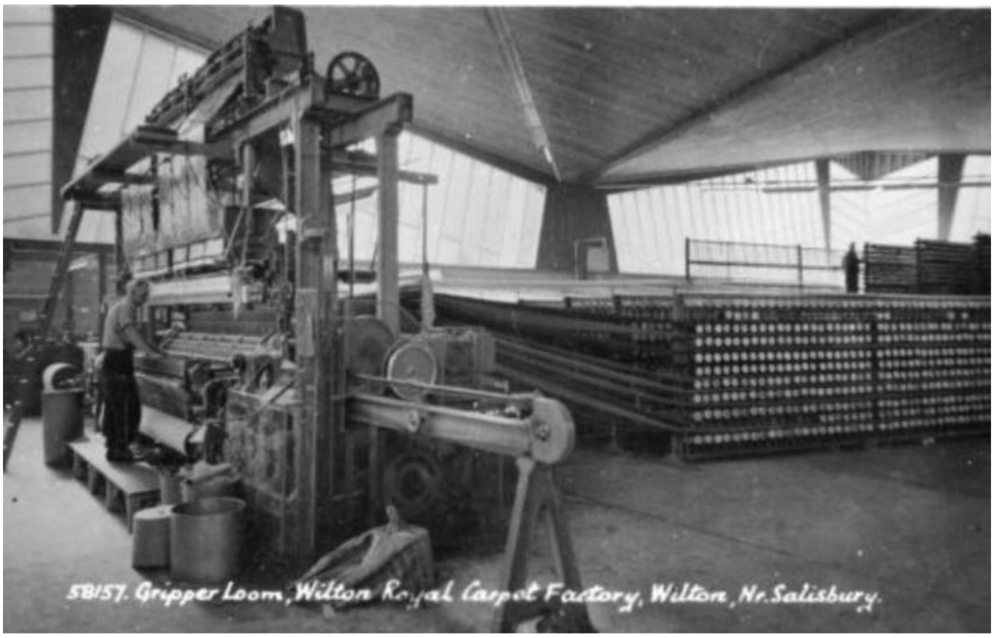


Figure 4-6 Royal Wilton Carpet factory weaving shed (1957) (Sweetman postcard)

Smithfield Poultry Market, like Lambert airport, had two rows of transoms under a shell arc. Here the two arcs were of the same radii and each had alternate transoms staggered to produce a strong graphic device sympathetic to the arc (see Figure 4-7).

Figure 4-7 Smithfield Poultry Market interior, 1963 (Author, 2010)

[69] b.1910, d.1987.

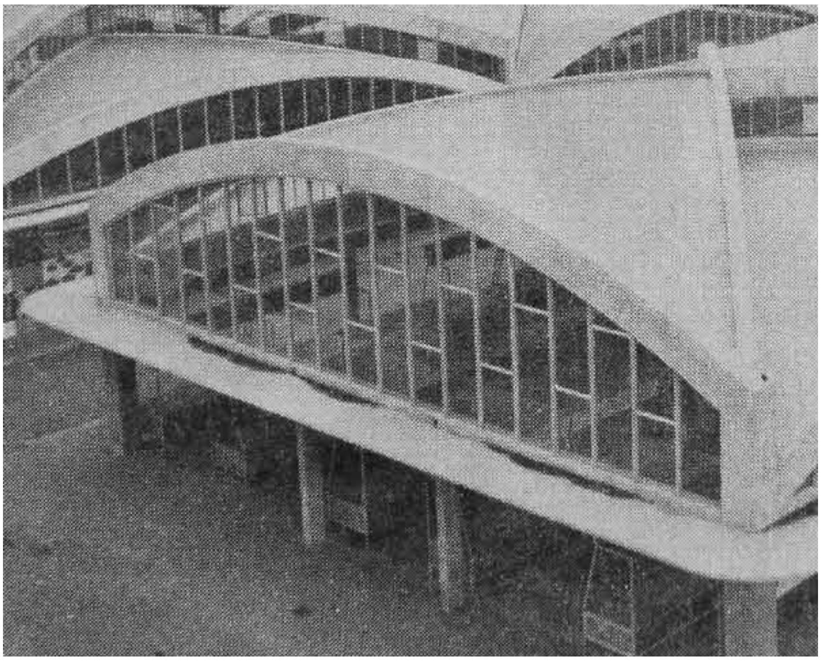


Figure 4-8 Accrington market 1962 (Anon, 1963g)

Accrington's 1962 market had, like Smithfield, staggered transoms but here there was no apparent relationship to the shell arc (see Figure 4-8). The positioning of the transoms and opening windows of the 1965 market in Blackburn acknowledged the rising roof height but did not acknowledge the unusual and dramatic curvature of the roofline (Figure 4-9 and Figure 4-10). The Blackburn project was in contrast to the exactly contemporary arrangement at a Raynes Park garden centre designed by Noel Wurr[70] (Figure 4-11 and Figure 4-12).

Figure 4-9 Blackburn Market, 1965 (County Borough of Blackburn)

[70] b.1926

Figure 4-10 Blackburn Market, (Author, 2010)

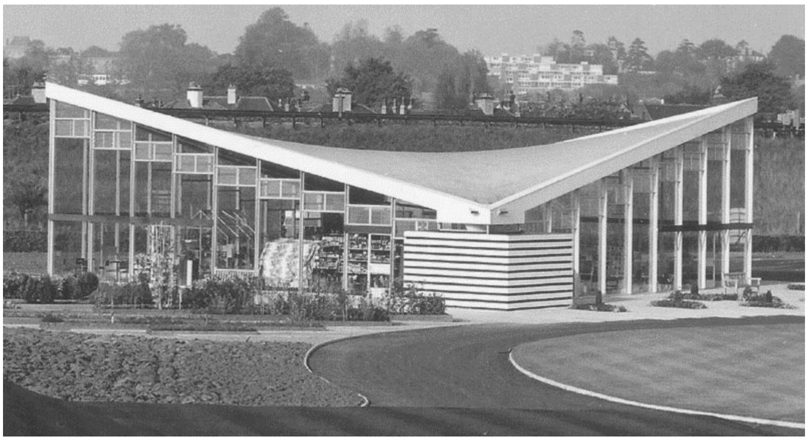


Figure 4-11 Garden Centre, Raynes Park, 1965 (courtesy Noel Wurr MBE)

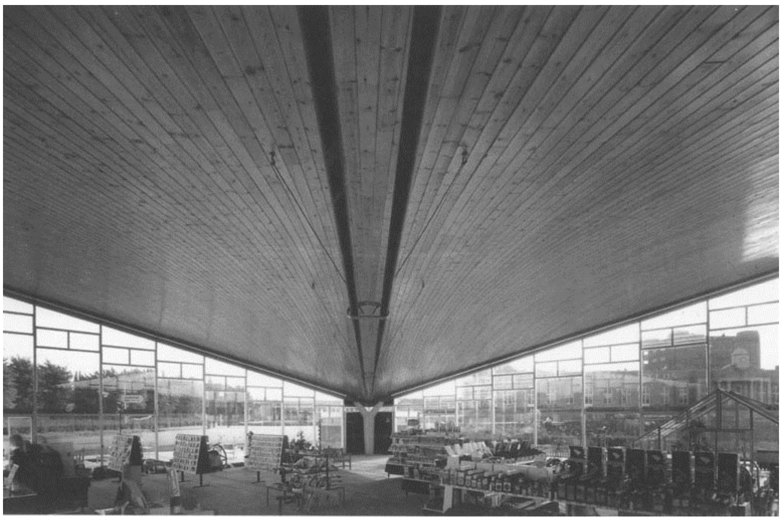


Figure 4-12 Garden Centre, Raynes Park, 1965 (courtesy Noel Wurr MBE)

Marcel Bruer's 1959 hypar mushroom roofed Hunter College Library had perimeter curtain glazing (Figure 4-13). Here the glazing bars are kept to a minimum and low; not interrupting the shells' silhouette.

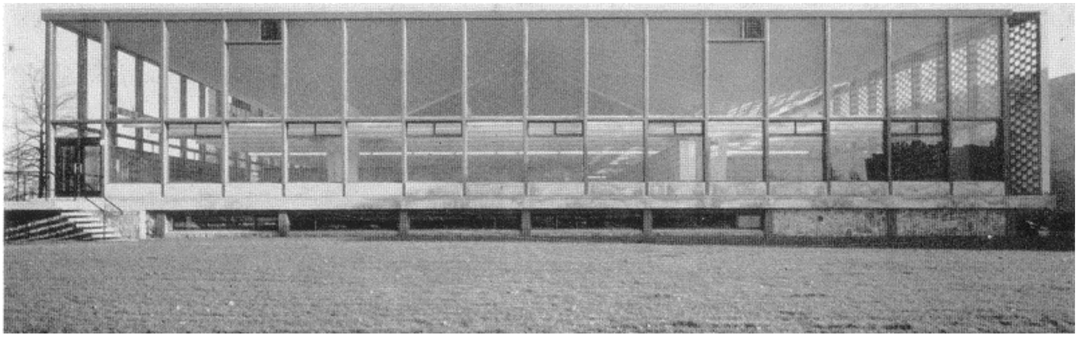


Figure 4-13 Hunter College Library, New York (C. Jones, 1962)

Figure 4-14 Apache Plaza (1962) (Mike Evangelist, 1960s)
http://smg.photobucket.com/albums/v399/apacheplaza/Apache%201960s/?action=view&current=Windowdetail.jpg

The large clerestory of the Apache Plaza was glazed with dramatic Mondrian inspired blocks of colour (Figure 4-14, Figure 4-15 & Figure 10-3). This is the only example found of any colour being used in secular shell glazing other than Queensgate Market.

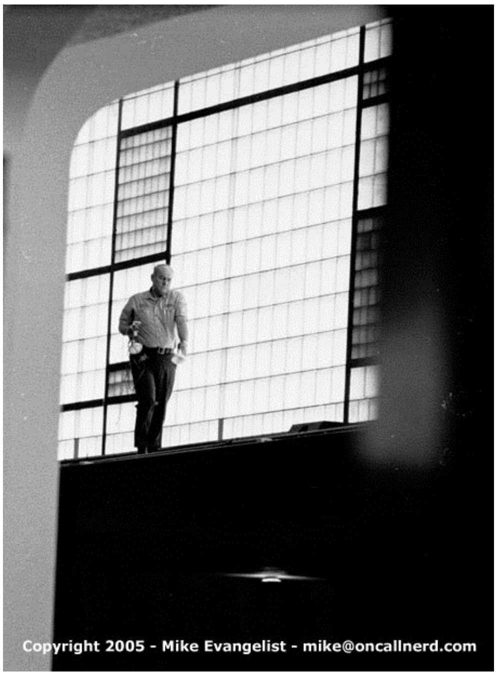


Figure 4-15 Apache Plaza (1962 (Mike Evangelist 1960s)
http://smg.photobucket.com/albums/v399/apacheplaza/Apache%201960s/?action=view&current=d0728929.jpg

An unusual pattern was created at a Katowice project (Figure 4-16). Here the transoms, lighter than the mullions that give a vertical emphasis, are in straight lines on parallel generators shallower than the roof line. The building's corner is turned with chamfered glazing.

Figure 4-16 Unidentified building in Katowice, Poland
http://www.skyscrapercity.com/showthread.php?t=926842&page=3

The last project that predates Queensgate Market is Hatfield swimming pool, completed in 1966 (Figure 4-17). Its much-mullioned glazing had a single transom that like the Johnson & Hardin printing plant failed to be sympathetic to the facade.

Figure 4-17 Hatfield swimming pool at night
Welwyn Hatfield District Council Official Guide (1974)
http://cashewnut.me.uk/WGCbooks/web-WGC-books-1974-2.php

Huddersfield's market hall shows a design response to the mid-shell geometry that has not been found in any other shell project (Figure 1-13 & 4-18 to 4-20). The roof terrace elevation has strong mullions with secondary transoms that are arranged in pairs framing tinted panes. These emphasised units are arranged, evenly spaced, in relation to the shells above. This is an elaborate arrangement that yields simplicity and harmony.

Figure 4-18 Queensgate Market Huddersfield (1970) (Author, November 2012)

Figure 4-19 Queensgate Market Huddersfield (1970) (Author, September 2004)

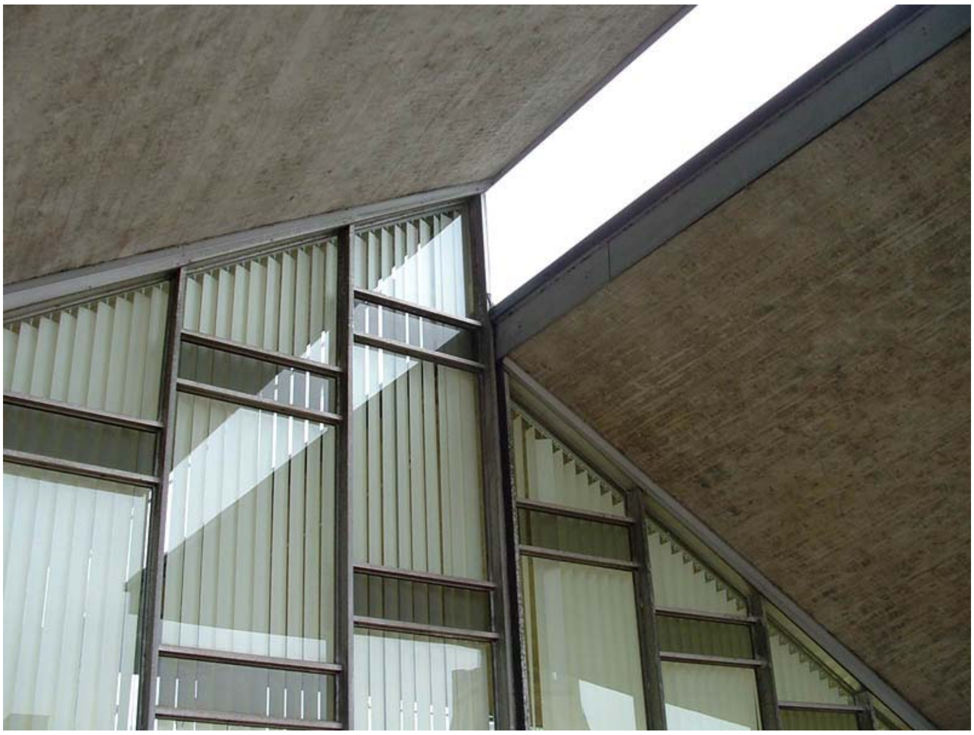


Figure 4-20 Queensgate Market Huddersfield (1970) (Author September 2004)

Katowice PKP station of 1972 mid-shell's glazing (post-dating Queensgate) was simple with glazing bars in sympathy to the shells but it is not share the poetry of the shell form (see Figure 4-21 and Figure 4-22).

Figure 4-21 Katowice PKP Station, (1972) in 2010
http://notatnikmieszczucha.blogspot.com/2010_04_01_archive.html

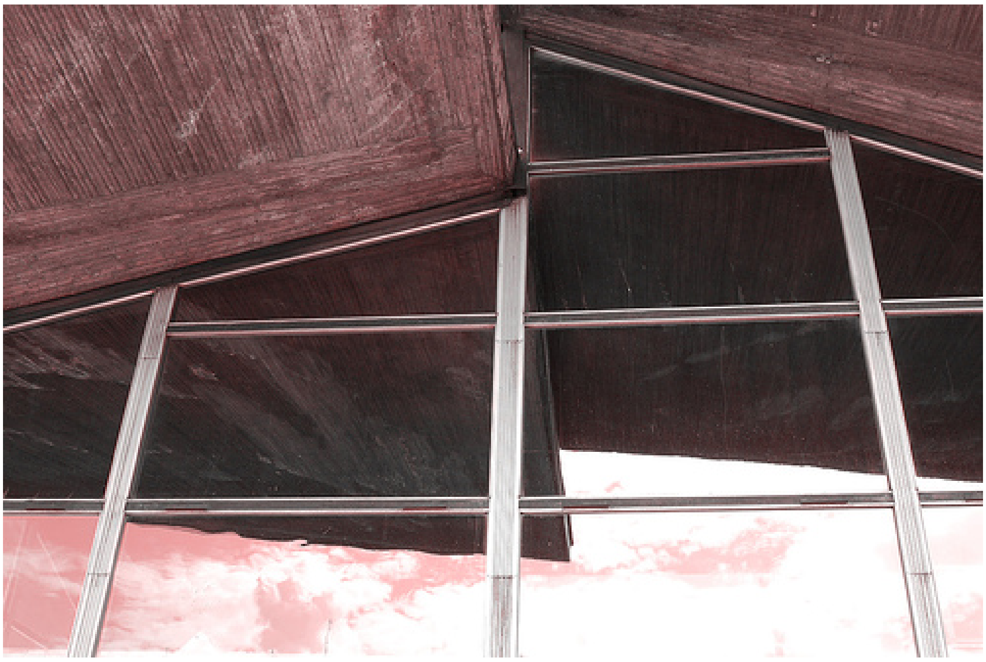


Figure 4-22 Detail of Katowice PKP Station (1972), in 2007
http://www.flickr.com/photos/ahorcado/1395695417/

Israel Museum & Queensgate Market

The arrangement of Queensgate Market's 21 rectangular roof shells that in plan are interlocked or contiguous are, in elevation 4' 6" apart in height from neighbouring shells. This gives a vista of stacked glazed boxes. The Israel museum which has square hypar umbrellas (see 3.15) with perimeter clerestory glazing also presents the viewer with a vista of stacked glazed boxes (Figure 4-23 and Figure 4-24).

Figure 4-23 The Israel Museum, Jerusalem, 2010
http://israeltours.wordpress.com/2010/07/21/new-israel-museum/

Figure 4-24 The Israel Museum, Jerusalem
http://www.english.imjnet.org.il/htmls/page_1465.aspx?c0=14896&bsp=14393

At Queensgate Market the umbrella shells with perimeter glazing present an orderly series of glass boxes stepped up away from the viewer from nearby streets and buildings (Figure 4-25 to Figure 4-27).

Figure 4-25 Queensgate Market from Princess Street showing clerestory glazing elevations (Author 2004)

Figure 4-26 Queensgate Market from town hall showing clerestory glazing elevations (Author 2004)

Figure 4-27 Queensgate Market from car park showing clerestory glazing elevations (Author 2004)

4.2. Development of aluminium patent glazing

Prior to Queensgate there is no evidence that the glazing of earlier shell structure buildings had been designed to accommodate movement of the shells. The Queensgate shells being free standing structures and asymmetric were expected to move under wind and snow loading in three planes; to and fro, up and down and left and right.

The Huddersfield company, Heywood Helliwell Ltd were contracted to find a solution to allow glazing between the shells to perform in all wind and snow load conditions. Heywood Helliwell specified patent aluminum framed glazing suspended and fixed only from the upper hypar and devised concertina membranes of EDPM, a synthetic rubber, that allowed the glazing to perform between adjacent umbrellas that can move independently 2" in any direction; left and right, forwards and backwards, up and down (discussed at 11.10). DuPont started EDPM production in the 1960s. It is commonly used as a roofing material and for automotive seals.

Patent glazing is widely used in overhead glazing found extensively in railway stations, shopping malls, atria, schools, canopies, conservatory roofs and northlight glazing. It is a self-draining system of dry glazing that does not rely necessarily for its watertightness upon external glazing seals. It consists essentially of a series of longitudinal supporting members (glazing bars), and an infilling of glass. Patent glazing originates from late 19 century developments. Patent glazing is a generic term derived from early patents taken out to protect concepts of glazing bars having a drainage facility with dry glazing techniques. These early methods advanced the former putty glazed wood or iron bar methods, which required regular maintenance. One of the significant patents was granted to the architect Thomas William Helliwell[71] of Brighouse in 1877 who established Helliwell's Patent Glazing Company to make and market it. It was to be the successor Huddersfield company, Heywood Helliwell Ltd who was contracted to glaze Queensgate Market in 1969.

At the beginning of the 20th Century the recent innovation of lead covered patent glazing bars was a success, due mainly to the success of re-glazing the central

[71] c1841-1892. Helliwell was almost certainly one of the 30 entrants for the 1877 Huddersfield Market Hall design competition. He went on to be the winner of the 1880 competition for the central market hall in St Helier, Jersey. His central market is still in use but his installed patent glazing has been replaced.

transept of the Crystal Palace with the new patent glazing bars (Figure 4-28). Long clear spans of glazing bars were achievable.

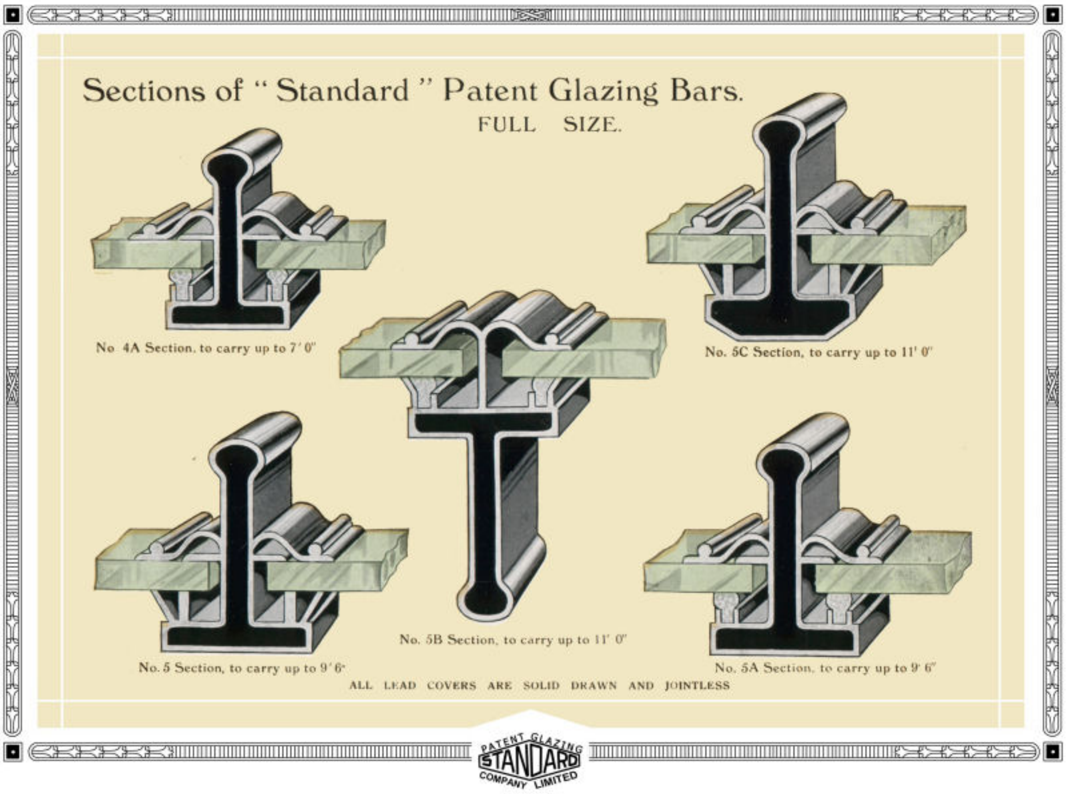


Figure 4-28. Page from 1928 catalogue of the Standard Patent Glazing Co.
http://www.patent-glazing.com

For many years, lead covered patent glazing bar had proved to be successful in roof glazing systems; no other materials could offer such low maintenance and longevity at an affordable price.

During WWII, the aluminium industry grew rapidly to provide the light metal needed for aircraft. When the war ended, there was a large aluminium industry. In the 1950s there was demand for building projects. The new technology from this industry enabled an alternative material to be offered for glazing bars; the aluminium glazing bar.

The arrival of the aluminium glazing bar in the 1950's was gradually adopted by all the major patent glazing companies. With similar low maintenance, greatly reduced section weights and significantly lower manufacturing costs than its predecessor, aluminium patent glazing bar increased its share of the market. By the late 1960s the lead covered glazing bar had been superseded by aluminium.

At first aluminium sections were installed in their raw ‘mill finish’ state. Due to atmospheric conditions, the original bright metallic appearance of aluminium becomes dull as the surface oxidizes and develops a roughened texture. To produce colour and also protect the metal from the oxidization process, ‘finishing’ was introduced in the 1960’s (Standard Patent Glazing Co). Queensgate market was glazed with mill finish aluminium patent glazing bar.

4.3. Summary

Queensgate Market’s glazing remains both an enigma and pioneering. No previous hypar building seems to have had such attention given to the relationship of the glazing pattern to the shell form. The hypar shells of the Israel Museum, of great significance through Traum’s published work also form a relationship with Queensgate through its roofscape. The performance of dynamic glazing to allow shell movement was novel; here aluminium patent glazing was to work with a flexible membrane setting a precedent. This will be developed in Section 11.10.

Chapter 5 Market hall architecture up to 1939

"Not just shopping places but social amenities with civic pretensions" Robin Bellamy 2011

This chapter traces the history of the market hall from its beginnings in Britain where the solely commercial function of the outdoor market was to be controlled, regularised and become a statement of civic order and pride. Six examples of market halls up to 1880 are featured to illustrate the degree of significance that could be granted to a market hall by its promoters and the associated risks. How post WWII market halls developed with contemporary technologies and societal pressures will be seen in chapter 6. The art of markets will be discussed in chapter 7.

5.1. Early British markets

Although markets have been held and managed since ancient times, the British public market hall does not have a long history.

From the Middle Ages in England the monarch had the power to grant charters, to churches, nobility and towns, with the right to hold markets and fairs. A charter holder had a monopoly on markets within 6 2/3 miles and the right to collect tolls from traders, taxes on sales and enforce standards of weights and measures.

Two building types often dominated the medieval market place, the toll booth where standard weights were kept and the market cross where the market was administered and business could be transacted. There was a characteristic tension between the centralisation and spreading of market trading. Commercial and demographic pressures would see the spread of trading but law, regulation and enforcement would keep activity at the market place. Shelters around market crosses were common but as late as 1831 only a fraction of towns had a market house. Early examples of organised covered space are known of and some survive; Wymondham, (c1550) and Shrewsbury (1596)(Schmiechen & Carls, 1999).

It would not seem fanciful to propose that the architecture of market halls could be read as symbols or metaphors of; patronage, commercial importance, civic pride, power and social order. A clear example of patronage and the expression of the social order, the hegemony, was expressed in Leominster. The town's town hall had two floors. The upper was used for public meetings, transacting magisterial and other business, and the lower ones as poultry and butter market.

“It is a building of singular construction...by the celebrated architect, John Abel. It is composed of timber and plaster, and ornamented with curious grotesque carvings, and stands on twelve pillars. The brackets of the arches above the pillars, and the upper part of the building, display a profusion of carving. Numerous compartments are formed by the disposal of the beams at the sides and ends of the structure, which exhibit various shields of the arms of those who contributed to defray the expense of raising it on which are inscribed the following sentences...”(Lascelles, 1851)

On the east side was to be found ‘As columns do support the fabric of a building, so noble gentry do sub-prop the honour of a State’.

Enclosed market complexes, agora-like were usually surrounded by colonnades or porticos. These could encompass a variety of market structures. John Nash designed two such markets; Abergaveny (1796) and Chichester (1808)(Morrison, 2003). Penzance Market of 1837 illustrates the growing civic nature of market buildings (seesection 5.2). These and later reforms of markets in the late 18th and early 19th centuries were part of a revolution in both architectural form and the arrangement of public space.

The market hall was planned as a feature of everyday urban life which went beyond commerce into the realm of human behaviour and social values. If trade was to be conducted in a respectable, orderly fashion, then people needed to be educated in the appropriate virtues; it was believed that the proper spatial arrangement and visual language of the market environment would serve as instructors in such moral lessons.

For Victorians, beauty, truth, and civic virtue were one. Architecture, which had always conveyed visual messages about the use of space, was now put to work identifying shopping as separate from street activity. As a result, the street became a more private environment, and the public activity of marketing became more focused.

“For centuries the traditional open-air marketplace, with its occasional market house and its customary plethora of dirty wooden stalls, had stood only as the locus for commerce; it had not aspired to a higher purpose.” (Schmiechen & Carls, 1999)

In a market hall, the movements and behaviour of traders and shoppers could be closely controlled, and extraneous activities excluded. Unlike the shambles and market houses of the past, a market hall could accommodate every type of trader. These halls are different from the conventional trading street or square; they create permeability during trading, and vast impermeable blocks otherwise, and order through the standardisation of units, control of rents and hygiene. The development of the British market hall was swift, Schmiechen & Carls claim that the idea of buying most of their food in a market hall was a foreign idea to most urban dwellers in Britain in the 1830s; fifty years later this became commonplace. To illustrate their development selected indicative markets are discussed here.

5.2. St John's Market 1822.

St John's Market Liverpool opened in 1822 and was the first covered general food market in Great Britain. It was described as a "stupendous building". It was 83 yds by 45 yds; "a very large and severely functional building by John Foster Jun."(Sharples, 2004) (see Figure 5-1). The market gained a greater architectural presence and active retail frontage with an 1883 addition (see Figure 5-2). Active frontages to market halls have not been universally adopted in designs into the late 20th Century.

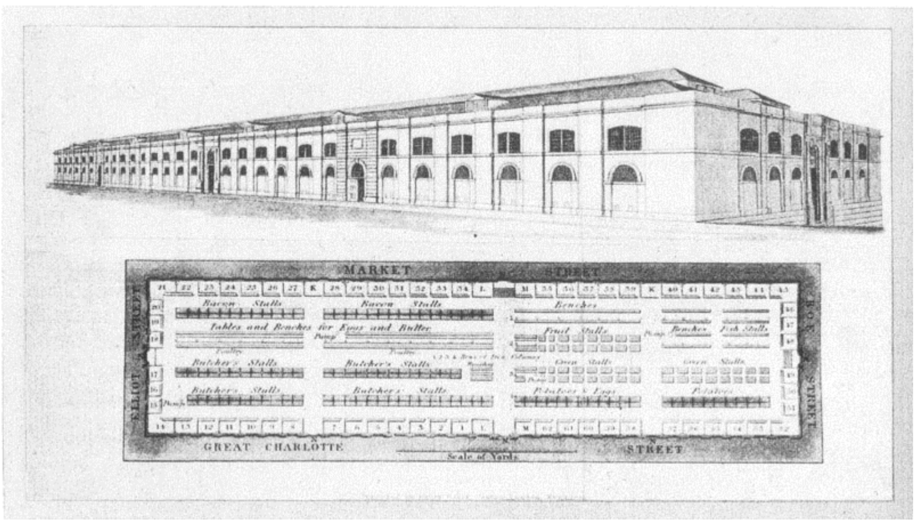


Figure 5-1 View and layout plan of St John's market, Liverpool, 1822 (Environmental Health & Protection Committee, 1970)

Figure 5-2 St John's market, Liverpool, 1883 extension. Late 1950s (http://bernardstilwell.wordpress.com/category/theory/consistency-in-design/)

5.3. Penzance market 1837

"By 1837... Penzance's new, tall imposing granite Ionic market house was presenting marketing as something both separate from the street and noble in its connection to civic responsibility. The new market building was designed to direct users' attention away from the vulgarity of the streets and often depressingly ugly uniformity of the town." p48 (Schmiechen & Carls, 1999) (Figure 5-3)

Figure 5-3 View of Guildhall and Market House, Penzance. 1838. http://www.penleehouse.org.uk/collections/item/PEZPH:1999.227.html

5.4. Hereford Butter market 1860

Schmiechen & Carls wrote that the aim of the architect of Hereford's Butter Market was typical: striving not to make the new market fit into the existing townscape but to make it stand out, to show that here in mundane Hereford was a place for lofty activities(Figure 5-4). Until then Hereford's marketing and other street activities had mingled in the open-air C16th market in the town square. With its 80' clock tower, the new market hall acted as an advertisement for the activities of the market;

"as noble and well-ordered, worthy of an environment that is separate from those of the street. The public market had joined the church and town hall as an idealized institution." p48 (Schmiechen & Carls, 1999)

More than any of the new building types of the nineteenth century the market hall was the manifestation of the aesthetic theory of functionalism that linked social ideals to architecture. Taking a didactic view of public space the Victorians declared that aesthetic form must follow social function. This theory rested on the notion that architecture- through the better design should be a primary agent of social reform and moral improvement. The organisation of space, the use of ornamentation, and the erection of special structures for specific functions would lessen the threat of social upheaval, reduce the antagonism between classes, and improve the physical well-being of all. (Schmiechen & Carls, 1999)

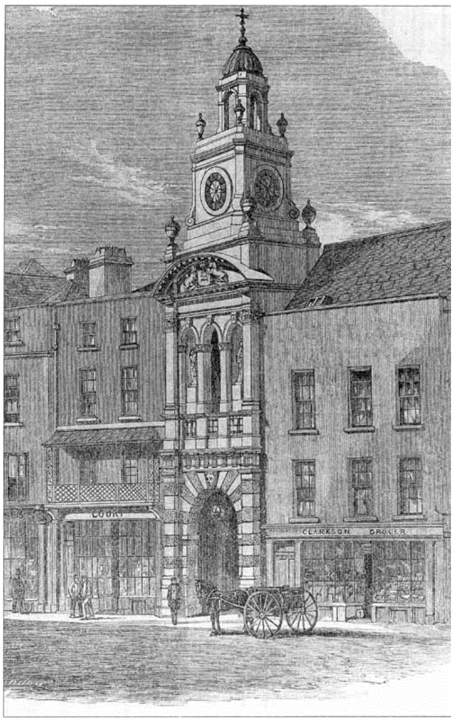


Figure 5-4, Butter Market, Hereford, 1860 (Schmiechen & Carls, 1999)

In 1878 the Building News advised;

“Accordingly, the dominant architectural rule in designing the facade of a market building was that the building should carry out this ideal. In spite of the frenetic atmosphere inside most market halls-quite similar to that of, the open-air markets-the visual message of the exterior was decidedly different. “We do not mean to say we can get the picturesque effects of the old markets of Shrewsbury, Salisbury, Peterborough, Leominster, Hereford, and other old towns but we can do something to make them somewhat different from huge railway sheds and Crystal Palaces.” “p48 (Schmiechen & Carls, 1999).

Unfortunately, unlike railway stations where money was often no problem, market hall designers were limited by economic factors and a fixed and often restrained site. A site that was too small, such as Hanley, or a hall “badly built”, such as Newark (1883), could lead to abandonment. On the other hand, a market hall had to pay for itself, so an oversized or overdecorated building would drive up rental costs, which would in turn defeat the purpose of the public market.(Schmiechen & Carls, 1999).

5.5. Columbia Market 1869.

The pre-eminent example of an inappropriate market was London’s Columbia Market (1869) in Bethnal Green. It was entirely misconceived; built over four years at the expense of Baroness Angela Burdett-Coutts to the designs of Henry Astley Darbishire[72] for the sale of produce to the working classes and others in the neighbourhood (see Figure 5-5).

At its opening *The Times* carried a 3,000 word article on the market;

“the like of which for lavish decoration and almost extravagant adornment of interior does not exist in the world. The Halles of Paris and the central market of Brussels are as nothing when compared with the beauty of this almost cathedral pile” (Anon, 1869b)

[72] b.1825, d. 1899

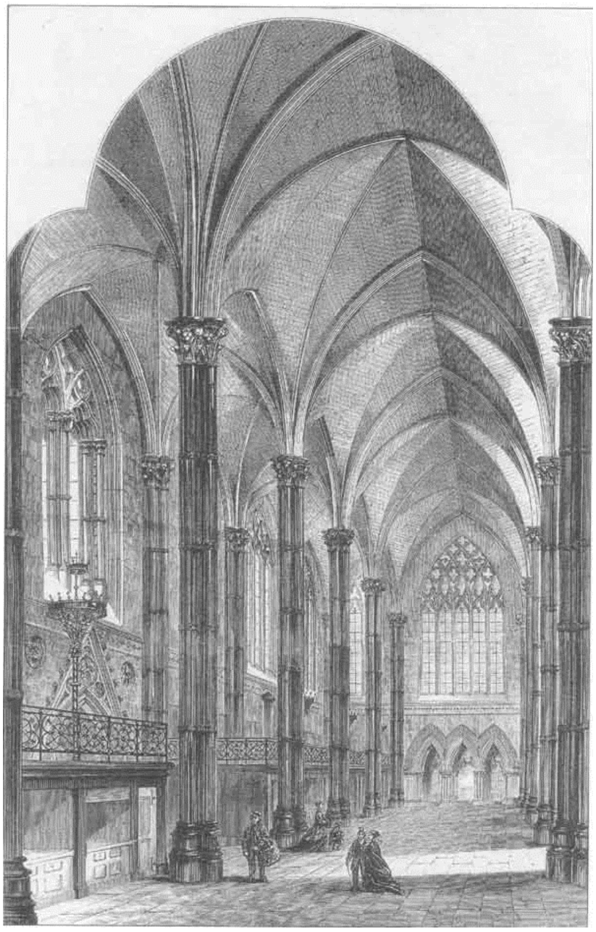


Figure 5-5 Columbia Market, 1869 (Schmiechen & Carls, 1999)

In December 1869 *The Times* commenting on the desertion of traders from the market observed;

"It had been urged by certain critics that the structural beauty of the market has been a great hindrance to its success. The hall is like the nave of a Gothic cathedral, and it is said that the dwellers in Shoreditch think it far too fine "for the likes of them". It may be conceded that they have hitherto had no reason for associating **architectural ornament with cheap greens** [author's emphasis], and that clustered columns of polished granite are not likely to suggest to them the prompt supply of their various needs. We have seen one tenant look at these columns rather piteously, expressing the while his wish for something that he "could hit a nail into." To his mind the granite was in the wrong place and not beautiful for the simple reason that its hardness was inconvenient." (Anon, 1869a)

Though conceived in a philanthropic spirit it turned out to be one of the great "follies" of Victorian architecture; a complete failure as the stall keepers refused to attend the market, even at nominal rent (Anon, 1875).

We shall see how the apparent dichotomy of the aspirations of market managers and designers, and the needs of market tenants at Columbia Market has been apparent in subsequent market halls. Was architectural ornament with cheap greens to stay?

5.6. Accrington market 1869

In October 1869, only a few months after the opening of Columbia Market a new market hall opened in Accrington. This edited description is revealing.

"The edifice, which is built of stone, can scarcely be spoken off in too flattering terms. The front part presents a beautiful and massive appearance, and for months past has elicited expressions of admiration from crowds of persons...
…The cost of erecting such a building has of course been great, and by many people it is feared that a long time will elapse before the number of stalls requisite to fill the interior will be let. We confess there is great reason for this apprehension, but when we remember how rapidly the town has grown during the past twenty years, and the likelihood that the increase will be great in the future, owing to the railway facilities Accrington possesses, we have hopes that the building will not be found too large for the wants of the people. The erection of so commodious a Market Hall cannot fail to attract large numbers of people from the neighbouring townships; and if it is productive of no other benefit than that of knitting them closer together, the building will have accomplished a great purpose....
…The main front to Blackburn–road is entirely of ashlar stone, and is divided into three parts, the centre part being well brought forward by coupled pilasters, relieved from the flanks by half-angle pilasters and returned caps and cornices. Over these coupled pilasters are double inverted shafts with moulded bases and carved heads supporting the cornice of gable(s). Over each pilaster are carved vases of fruit, at the foot of main sculptured groups, indicating the commerce, industry and agricultural pursuits of the inhabitants of the district...
…The main central entrance is a noble piece of work, with deeply-moulded base, granite shafts, carved caps and bands, deeply moulded and carved arch, with projecting key-stone, on which is carved a fine head of short-horn bull. Over this entrance and above the cornice is the market clock, with moulded ring, richly carved and supported on either side by beautifully-modelled flowers and fruit. This carved work is well covered by the main gable cornice, at the same height as the clock. Granite panels are inserted, with a good and rich effect, between the coupled pilasters, forming the centre part of this front. On either side of this main division is a triplet of arches springing from pilasters of a minor character, with moulded caps and bases, and keystones carved to represent game, produce etc..."(Anon, 1869c)

The civic importance of the market is clear. The newspaper account sees it as a commercial and and social good; knitting people together. Its manifestation is said to be noble (Figure 5-6 and Figure 5-7).

Figure 5-6 Accrington Market Hall, 1869. Central bays of facade, 2011 (Author)

Figure 5-7 Accrington Market hall 1869 interior, 2010
http://www.accringtonweb.com/gallery/showphoto.php/photo/10745/cat/all/ppuser/2085

5.7. Huddersfield market 1880

Huddersfield was not early in building a market hall, but then the town had little control of its affairs as it was largely controlled by one major land owner, the Ramsden family. Indeed the town’s market rights were held from 1599 by the Ramsden family, who dominated the town's 18th and 19th century development.

Plans for covering of the town’s Market Place were prepared by local architect William Wallen in 1851. The idea seems to have originated with the Hon. Isabella Ramsden who felt that the ladies of the area, who brought their dairy and other produce for sale in the town, deserved some covered accommodation but it was not proceeded with(Ramsden, 1851).

Incorporation as a Borough was secured in 1868 and the new corporation was one of great civic ambition, including the creation of a modern covered market hall however the Ramsden family still had the market rights.

In 1869, on behalf of the Ramsden family, another local architect, William H Crossland established the probable costs of a market hall, on land surrounded by Kirkgate, Cross Church Street, King Street and Old Kirkgate[73]; again it was not proceeded with(Law).

After an unsuccessful attempt at compulsory purchase in 1871, the corporation acquired the market rights by agreement in 1876. The site was to be bounded by King Street, Victoria Lane, Victoria Street and The Shambles (approximating to the area of phase III in Figure 11-1). After running a competition the Markets & Fairs Committee turned to the Huddersfield architect Edward Hughes[74]. His Gothic design was approved on 1 March 1878. The Market Hall opened to the public on 31 March1880 (Griffiths, 2003) (Figures 5-8 to 5-12). It was on a confined site and its design was promptly compromised by the corporation insisting on a wholesale market on the lower floor with ramped cart access. A later fire and subsequent conversion to entirely retail never allowed adequate preparation areas and servicing. The inadequacies of the market were shown up at the 1962 public enquiry and are alluded to in section 10.4.

[73] In delicious irony much of this site was developed as Huddersfield’s biggest shopping mall, Kingsgate, 140 years later and a plan to expand onto the remainder was announced in 2012.
[74] b. Chester 1838, d. Huddersfield 1886

Figure 5-8 Huddersfield Market Hall, (The Builder 28 December 1878)

Figure 5-9 Huddersfield Market Hall, King Street April 1970 (Sotnik)

Figure 5-10 & Figure 5-11Huddersfield Market Hall.
Shambles (l), Victoria Lane (r), April 1970 (Sotnik)

Figure 5-12 Huddersfield Market Hall, 1960s (Sotnik)

5.8. Decline

Market arcades developed as market halls were built on low rent back- land sites off commercial streets (Albany Arcade connecting Halifax's 1896 Borough Market to Market Street acts as a 21st century shopping mall)

By the 1890s the public market was facing significant competition from the new fashioned department store, chain stores and the co-operative movement. A solution was for markets to reinvent themselves by adopting shops and shop windows into their exterior facades, as happened to the existing St John's Liverpool in 1883 (Figure 5-2). Halifax's 1896 market was built with shops to the exterior; it included three public houses and one side with fishmongers' shops with the remaining exterior shops all being butchers' shops. These were only modifications to the building type. Such strategies did not stop the precipitous decline in market hall development (see Table 1).

The priority for local government moved from improving food supply to sanitary reform, gas supplies and slum clearance. A general perception by 1918 was that public markets had seen their day, however market halls continued, becoming the 'supermarket' of the working classes.

The construction of market halls after WWI was limited almost entirely to rebuilding after fire damage, altering and renovation projects. Table 1 illustrates the cycle of British market construction with a peak in late C19 and a pre WW1 trough.

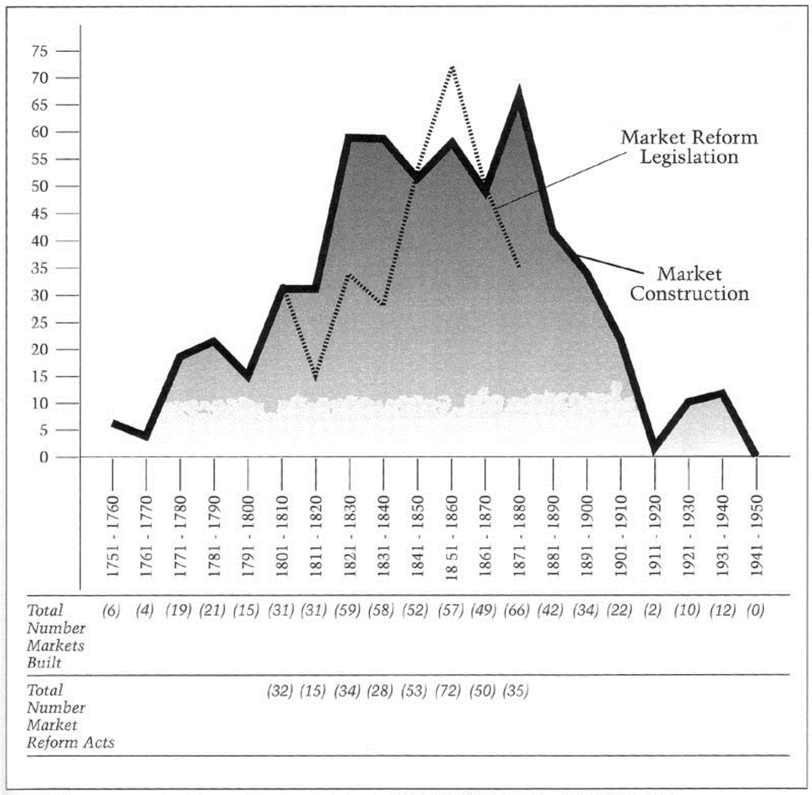


Table 1 Market construction1751-1950 and Parliamentary market reform acts 1801-78. From p147 (Schmiechen & Carls, 1999)

5.9. Summary

The British market hall allowed corporations greater control of markets, the behaviour of traders and shoppers could be closely controlled, and extraneous activities excluded. Hygiene, weights & measures and effluent could all be managed.

During the mid-nineteenth century the market cross presence in market places was being commonly replaced in its function as an emblematic beacon by a variety of porticos, clock towers and spires. Schmiechen & Carls suggest they give visual authority. Below and behind these landmarks were a standard market hall with a three bay lay out; low side aisles with a central bay that ensured natural light through clerestory windows. The creation of many variant forms followed technology, local materials, style, site and land levels(Prokosch, 2004). Huddersfield's 1880 market appears to have been of the standard model.

The first tower incorporated into the market facade was at Blackburn in 1848. As a market was the destination of a large proportion of the population, local and of the region, a tower functioned as an important marker and also often carried a clock to ensure trading hours were observed and a water tank to supply the market.

The civic pride articulated in the architectural decoration of the halls like Accrington (classical) and Huddersfield (gothic) is characteristic of late C19 British market halls. There are many more. In Chapter 7 we will see how this decoration developed from market cross designs with examples of the art of Birmingham, Gloucester, Bradford and Manchester markets.

The C20 lack of innovation of market design was to continue to the 1950s relieved by the reconstruction of bombed cities. The markets of Accrington, Halifax, Huddersfield, were undamaged. Liverpool St John’s was damaged but remained. The British cities that lost markets halls were the first to have new ones from the late 1950s; they were to prove to be different yet have echoes of the past.

Chapter 6 Market hall architecture 1955-1970

“Markets are tough building types for minimalists to do because what works is the atmosphere of clutter, not one of austerity” Kester Rattenbury (Rattenbury, 2008)

World War II saw the loss of many British market buildings through bombing. Food rationing also meant that consumers had to register with a single retailer, so discouraging the price comparison shopping of markets. Markets were slow to recover and they had changed; technology and society had changed. The three aisle market became redundant, first abroad and then in Britain new structures appeared. This chapter will list 23 of such markets that were developed and opened before Queensgate Market and look at many of these, illustrating the diversity of concepts and possibilites. The range of designs included projects that can be seen to have an aspect that was an immediate precedent to Queensgate. Some will be seen to be have an influence on Queensgate while others such as Aylesbury, Hyde and Nelson were potential models but offered nothing to Huddersfields’ designers.

Precedents are not always obvious; the provision of either natural clerestory or overhead lighting divdes market halls into two groups; natural lighting or not. This was fundemental to Queensgate where it was uniquely achieved. It is not possible to generalise about other post-war British market halls as all these halls also had one-off (for British markets) natural light solutions; Coventry, Wolverhampton, Swansea, Accrington, Sheffield, Wakefield, Blackburn, Shrewsbury, Gloucester, Bradford John Street, Burnley and Hartlepool. Each will be described in this chapter.

It is important first to look at the changing nature of post-war British town centre development and associated legislation in order to explain the context within which these radically new market hall designs were conceived and executed.

6.1. Town planning

Major changes in town planning meant that radical changes to town centres became the norm. Four such policies are outlined here.

The creation of pedestrian precincts was promoted by the British traffic expert Sir Herbert Alker Tripp[75] in his 1938 and 1942 works on traffic problems(Tripp, 1938, 1942).

[75] b.1883, d.1954

The plans of Sir Patrick Abercrombie[76] of the 1940s which provided novel designs for the redevelopment of blitzed cities like London, Hull and Plymouth and relatively undamaged cities like Warwick and subsequent provincial initiatives. The Abercrombie plans[77] can be outlined as the proposed redevelopment of almost all of a town's Victorian building stock and the separation of local and arterial traffic through construction of an inner ring road and possibly an outer ring road.

The *Town and Country Planning Act 1947*[78] established that planning permission was required for land development; ownership alone no longer conferred a right to develop the land. Planning authorities were required to prepare comprehensive development plans and were given wide-ranging powers in addition to approval of planning proposals; they could carry out redevelopment of land themselves, or use compulsory purchase orders to buy land in Comprehensive Redevelopment Areas and lease it to private developers.

Professor Sir Colin Buchanan[79] and team produced *The Buchanan Report* of 1963(Buchanan, 1963). This gave planners a set of policy blueprints to deal with the effects of traffic on the urban environment, including traffic containment and segregation, which could be balanced against urban redevelopment, new corridor and distribution roads and pedestrian precincts. It is understandable that the planning and development of market halls was different to earlier markets. Another factor was the growth of the property developer (discussed in Chapter 10).

[76] b.1879, d.1957
[77] Including: J. H. Forshaw and P. Abercrombie, *County of London Plan*, Macmillan & Co. 1943; J. Paton Watson and P. Abercrombie, *A Plan for Plymouth*, Underhill (Plymouth) Ltd., 1943; E. Lutyens & P. Abercrombie, *A Plan for the City & County of Kingston upon Hull*, Brown (London & Hull), 1945; P. Abercrombie, J. Owens & H. A. Mealand, *A Plan for Bath*, I. Pitman (London) 1945; P. Abercrombie & R. H. Matthew, *Clyde Valley Regional Plan*, HMSO, Edinburgh, 1946; P. Abercrombie and R. Nickson, *Warwick: Its preservation and redevelopment*, Architectural Press, 1949.
[78] *Town and Country Planning Act 1947* (10 & 11 Geo. VI c. 51)
[79]b.1907, d.2001

6.2. Sidi Bel Abbes

The earliest post-war European market halls were the 1955 vegetable and fish wholesale markets of Sidi Bel Abbes in Algeria. While recognising that Algeria is not part of Europe, it was then a department in the Fourth French Republic and was a French garrison town.

The two neighbouring markets were developed on a city centre site that redeveloped the town street plan for transport on boulevards.

Figure 6-1 Postcard of Sidi Bel Abbes vegetable market (postally used 1962)
Corner of fish market can be seen on left margin.
http://www.mekerra.fr/images/cartes%20postales/amand-guy-cpa/marche-en-gros.jpg

The vegetable market had a 60m diameter, with a dome built with pre-cast concrete members and voussoirs. The surrounding two floor building was roofed with shallow concrete shells that were arranged radially covering 40 storehouses. The administrative offices supported with stilt-like angled columns.

The Fish Market (Figure 6-2) was a rectangular 250sq m structure with a concrete shell that shows a wave pattern borne by slim V columns.

Figure 6-2 Postcard of Sidi Bel Abbes Fish market at completion 1955
http://www.mekerra.fr/images/cartes%20postales/cartes%20francis%20rodriguez/poissonnerie/nouv-poiss-01.jpg

The market was recognised, in a patronising tone, in the British architectural press;

“The vegetable market, Sidi Bel Abbes is a far cry from Fordrough, Birmingham. It is more surprising therefore to find, instead of the traditional construction usually associated with more primitive forms of labour, a building that is quite remarkable for the advance techniques far above the general level in Great Britain”(Anon, 1959l) (Tracey-White J, 1997).

The design was indeed unmatched by British work for several years. The elegance of the thin shell form is exploited here to provide clear span, shade and ventilation. See also Appendix A

6.3. Royan

The first post-war European market hall was opened in 1956 at Royan, France. It was a freestanding circular market with a roof of 13 radiating reinforced concrete shells cantilevering from 13 peripheral points to form a dome like structure with a massively scalloped circumference (Figure 6-3).

Figure 6-3 Royan Market, postcard
http://archipostcard.blogspot.com/2011/04/royan-promenade-autour-du-marche.html

The interior was open, stalls were only at counter height (see Figure A-5). Lighting was restrained, natural lighting by central and radiating roof lights, artificial lighting was by a central thin halo of lights suspended, mid space. The structural engineer was René Sarger (Anon, 1959j; Janberg; Joedicke, 1962) who went on to work on the 1956-8 Caen-La Guérinière market hall and water tower (see 6.6). See also Appendix A .

6.4. Coventry

The first new British market hall to be built after the war was in Coventry in 1957, as part of the planned city. An early design was to have been rectangular with a parabolic roof, but this was changed to a circular design

"A circular plan was adopted as the best means of achieving access to shopper at several points around the perimeter, and concentrated layout out of stalls within, so that shoppers are encouraged to circulate rather than go directly to their objectives"(Anon, 1959b).

The concern about encouraging the dispersion of shoppers across the market is apparent in many subsequent market projects.

The market had a flat roof with car parking that linked to a series of neighbouring roof tops (Anon, 1959a). Servicing was via basements, with ramped vehicle access

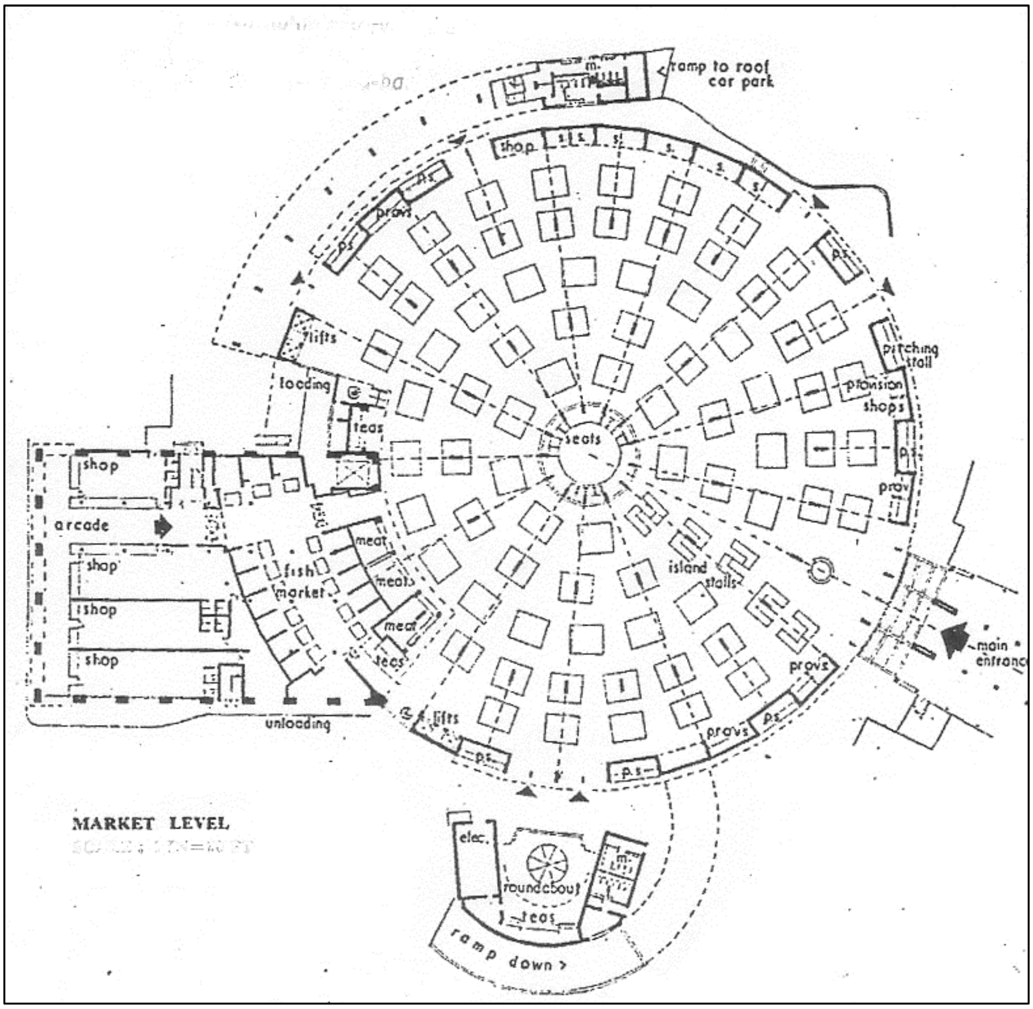


Figure 6-4 Coventry market plan, market level.(Anon, 1959b)

To the west, the circularity of the market was interrupted by a former engineering works converted into a fish market. The lift shaft of this building was extended upwards to form a clock tower replacing the former market's tower (Figure 6-5) (Anon, 1959b).

Figure 6-5 Coventry market (Anon, 1959b)

The hall contained island stalls arranged in groups in concentric rings with forty shops set into the perimeter wall, sixteen of them facing inwards. The teakwood units had brass and galvanized steel fittings with a common style of signboards suspended from roof beams (Figure 6-6). The stalls were designed as market tables keeping the overall height down to allow views through the market (Anon, 1959b). The columns were mid-stall group and therefore not blocking customers' views of stalls.

Figure 6-6. View of Coventry market interior looking towards centre. Stalls, sign boards, stall lighting, ceiling lighting and three columns (two inner ring) shown. http://www.coventrytelegraph.net/multimedia/nostalgia/images/2008/06/04/a-look-back-at-50-years-of-coventry-retail-market-92746-21022293/

Despite a roof top car park there was some top lighting with a central circular roof lantern with inset glass lenses with clerestory patent glazing at the perimeter. Artificial lighting was by ceiling mounted fluorescent strip lighting and angled lamps cantilevering from bottom of stall sign boards (Figure 6-6)).

The market's designers included public art in the building. A painted mural depicting farming and industrial scenes was commissioned through the twin city of Dresden (discussed in 7.5).

See a fuller description in Appendix A, p 345.

6.5. *Plymouth*

Plymouth Pannier Market of 1959 has a large central hall. Surrounding this, shops some with frontages to streets, others facing into the market and some running right through. The shops and first-floor balcony have small cantilevered shell roofs forming a wave pattern (Figure 6-7) (English Heritage, 2003).

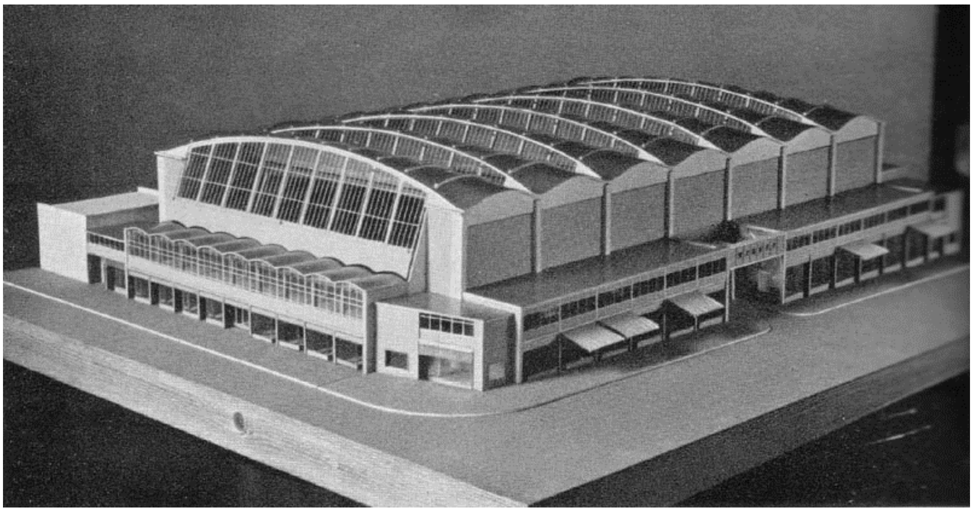


Figure 6-7 Model of Pannier Market, Plymouth(Chronowicz, 1968)

Figure 6-8 Plymouth market interior(Chronowicz, 1968)

The tall stalls, incorporating fascias, were built of prefabricated concrete and timber arranged in blocks of six (Shepherd, 1961).

Conoid shells incorporating north-facing rooflights provided even natural light across the interior (English Heritage, 2003). Armatures mounted on stalls above the market floor and standard poles carried conical lanterns of unknown type (Figure 6-8) (Chronowicz, 1968).

The market featured two murals (discussed in 7.7).

The feature of staircases leading up to six snack bars (Shepherd, 1961) on the gallery under the “wavy roofs”(English Heritage, 2003) was of interest to NABMA members.

“Certainly one feature that caused much speculation is the placing of the Refreshment buffets as a higher level than the remainder of the stalls, it appeared that some of the tenants were not in full agreement with this policy, they would have preferred to be on the same ground level with the other stalls.” (NABMA, 1961)

“One of the best features is the grouping of refreshment stalls away from the market floor and the more adequate provision for cleaning food and vegetables. The fact that the hall is without any pillars or obstructions has a very great advantage on the old one”(Shepherd, 1961)

See a fuller description in Appendix A, p 350.

6.6. Caen-La Guérinière

Caen was laid waste during the Normandy campaign of 1944 and subsequently rebuilt. The new town suburb of Caen-La Guérinière needed council offices and market and a water tower. All these were designed to be in one building, the château d'eau-marché of 1956-9.

Figure 6-9 Caen-La Guérinière château d'eau-marché, postcard franked 1959 (Photedit) (author's collection)

It was planned to be a 16,000sqft elliptical market hall with a 100' water tower in the form of an inverted cone at the centre that acts as the central column of the market roof with beams radiating out (Figure 6-9). The concrete beams bear radiating concrete shells. Provision for natural light was made by radiating rows of lenses in the roof shells (Figure 6-10). The market hall was never used as a market.

This bold design design is uncompromising in its use of board-marked concrete.

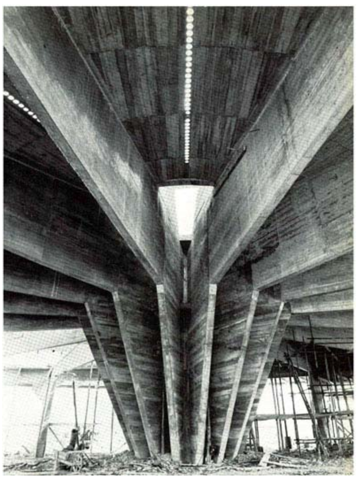


Figure 6-10 The board-marked base of the Caen-La Guérinière water tower and the putatvie market roof (Anon, 1959j)

See a fuller description in Appendix A, p349.

6.7. Wolverhampton

Wolverhampton Market of 1960 included a large hall for general goods, a separate meat and fish hall, civic restaurant, balcony coffee-tea bar, a snack bar, five lock up shops on the street and eight perimeter shops with street frontage. Servicing was by ramp down to basement.

The general market is roofed with reinforced concrete barrel vault shells with clear spans (Figure 6-11).

Figure 6-11 Recent aerial view of Wolverhampton Market showing roof shell arrangement and new entrance lantern http://www.expressandstar.com/news/2010/09/02/wolverhamptons-ailing-markets-are-to-stay-put/

The timber stalls were in rows following the line of the shells on low upstands. Substantial framed signboards were angled downwards (Figure 6-12). The counters were designed to be easily dismantled for cleaning.

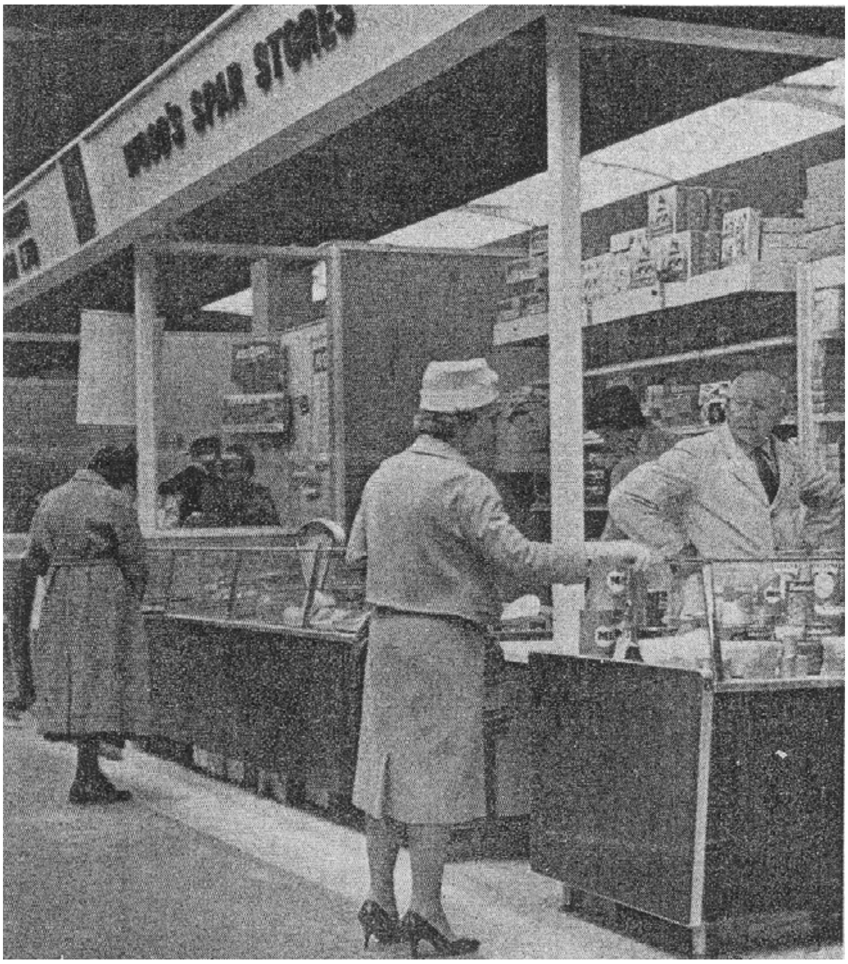


Figure 6-12 Wolverhampton Market stalls and roof shell lighting (Anon, 1960d)

The barrel vault roof had continuous roof lights at the crown, the meat and fish market with north light concrete shells. Lighting said to be “generally” fluorescent.

The market included a licensed civic restaurant with facilities for evening functions; a balcony coffee-tea bar and a snack bar. The restaurant opened onto a terrace and a sunken garden for light refreshments in summer (Anon, 1960d).

See a fuller description in Appendix A, p356.

6.8. Swansea

Swansea Market of 1961 was quite different; 160’ deep with a clear span of 192’ under a curved steel arched roof, the central part of which had an aluminium double skin with insulation (Figure 6-13).

Figure 6-13 Swansea Market, 1970. Showing service side
http://www.swanseaheritage.net/swanseathroughtheyears/gat.asp?A_ID=272

See a fuller description in Appendix A, p360.

6.9. Shipley

Shipley Market Hall of 1962 was on the lowest floor of an island site shopping centre scheme, by a private developer on a council owned site. Taking advantage of the fall in level away from the town square the market is just below street level at the far side of the block where a colonnade had shop units on either side of the market entrance (Figure 6-14 & Figure 6-15)

Beneath the tower was a staircase down to the market, with a rising escalator. Servicing at market hall level with vehicle access ramp and loading bay.

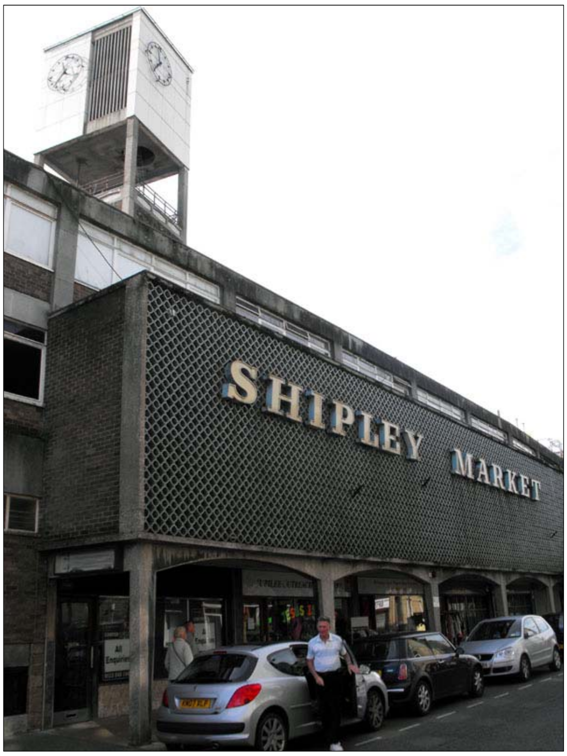


Figure 6-14 & Figure 6-15 (l) Shipley market colonnade, ceramic screen, and (r) freestanding clock-tower. September 2011 (Author)

The stalls were of a uniform design. Formica-like micro abstract patterned risers with stainless steel trims. Stall dividers up to eye level of pegboard in a bent-wood frame. The stalls had no superstructure. Pendant stall signs in Formica-like wood-grain, with applied letters. Giving “the appearance of a large store rather than of a market hall”(Anon, 1961d) (Figure 6-16).

Figure 6-16 Shipley Market Hall interior 1961
(Shipley Library collection)

The hall's ceiling was low without natural light, the columns and beams massive. Many pendant fluorescent tubes provided high light levels (Figure 6-16).

The six-storey freestanding clock tower has a portal to the market hall. The expressed structural frame is relief patterned. Each storey's infill is different to the next like stacked boxes. There are balconies asymmetrically arranged. The top story is a campanile again asymmetric. A sculpted figure with hammer forms a bell clapper.

The architects were Gerald M Baxter, staff architect for Arndale Property Trust in conjunction with Shingler Risdon Associates one of many markets and shopping centres carried out by the pair and the firm.

See a fuller description in Appendix A, p363.

6.10. Hamburg

In 1962 two European concrete shell-roofed markets opened. One was Hamburg wholesale fruit and vegetable market (Großmarkt Hamburg). The roof was 221m x 180m; three vaulted parabolic shells with two suspended parabolic shells between them (Figure 6-17).

Figure 6-17 Hamburg wholesale fruit and vegetable market (Anon, 1963f)

“This curvature of the roof in all directions in each section undoubtedly produces a pleasant architectural effect. There is a shifting interplay of light and shadow and the building despite its size, never appears monotonous or clumsy. The other side of the picture and its ingenious engineering solution was the great difficulty presented by the analysis and construction of this unusual shell roof”(Anon, 1962k)

See a fuller description in Appendix A, p368.

6.11. Accrington

The second 1962 market was Accrington Covered Market which came close to being even more “unusual”.

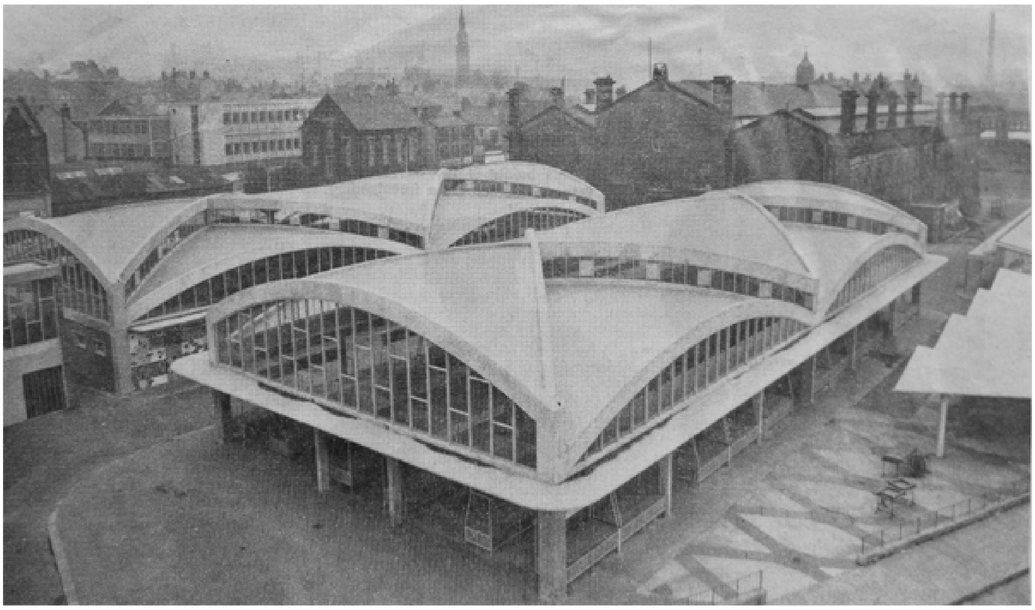


Figure 6-18 Accrington Covered Market 1962.
Folded plate roof over pitchers’ gaffs to right (Anon, 1963g)

Two rectangular umbrella structures, each with an arrangement of seven triangular and diamond shaped reinforced 3” concrete shells at two heights allowing clerestory lighting to single storey market pavilions, with basements (Figure 6-18). Two columns to the centre of each pavilion were required to support the corners of four shells (Anon, 1963d).

J E Gibson discussed the design of shells roofs and his 1958 model testing of Accrington Market (Gibson, 1961) (Figure 6-19).

‘..the original conception of which had been a series of hyperbolic paraboloids. On linking these up to form the completed structure, it was found that because of the geometry of the paraboloid, the final structure assumed a sagging appearance that was not aesthetically pleasing. It was decided by the architect and the consultant to eliminate this appearance of sagging by making the surfaces cylindrical, whilst still retaining the outer boundaries which were diamond and triangular-shaped in plan.”pp. 222-223(Gibson, 1961).

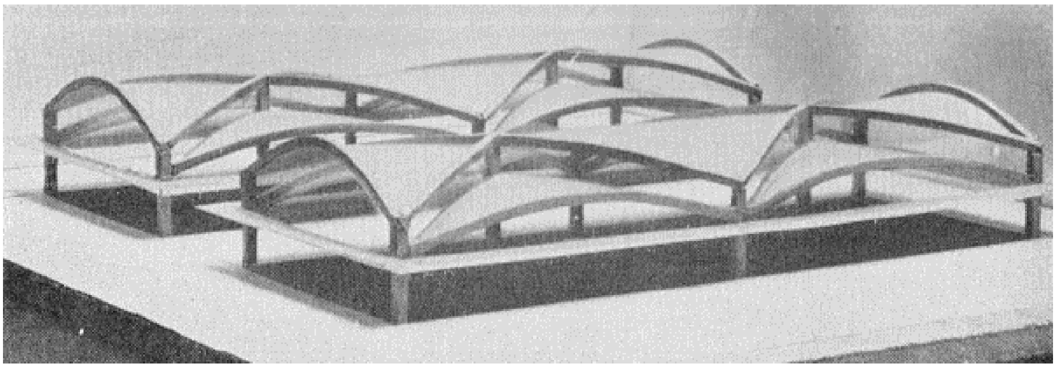


Figure 6-19 Model of Accrington Market Hall (Gibson, 1961)

Figure 6-20 Accrington Covered Market interior (Accrington Borough Council, 1962)

The shells had all the vertical intervals between them and the interval below every shell at the market's perimeter glazed;

"which make an exciting and intriguing geometrical pattern. The success of the scheme is that the Market is covered with a substantial roof and yet the concave expanses overhead are filled with natural light..."(Joynson, 1962a).

"In the dark hours the fluorescent tubular lighting and the light coloured stalls will present a most brilliant spectacle which will be greatly appreciated" (Anon, 1962g). It is apparent that traders' stalls also had lighting (Anon, 1962e). The stalls had an illuminated sign box with the name of the stall holder picked out (Figure 6-20) (Joynson, 1962a).

Keeping in with the exuberance of the neighbouring1869 market (discussed in chapter 4) three ceramic murals were commissioned by the council(Accrington Borough Council, 1960, 1961) (discussed in chapter 7).

The stalls, designed and made-in house by the council engineer's department (Anon, 1962g), were of galvanised steel with plastic fronts (Joynson, 1962a). The plastic described was a patterned Formica (Accrington Borough Council, 1962; Bushboard, 1962). This is the earliest market hall found to have declared the use of Formica or a similar product (Figure 6-20).

Little later architectural comment has been found. Pevsner, after describing the old market wrote; "New market, not at all a monument, but successful with its interlocking vaults"p46 (N Pevsner, 1969) and from 1976; "The outside market that was built behind the market hall in 1962 must count as a success ; its shallow concrete domes lightly and elegantly enclose the colours, sounds and smells of the assorted stalls"(Anon, 1976a).

Figure 6-21 Accrington Covered Market c 1965(Barrett & Duckworth, 2004)

Figure 6-22 Accrington Covered Market 1962 showing roof signage and kiosk (Accrington Borough Council, 1962)

For more contemporary comment and fuller description see Appendix A, p376.

6.12. Sheffield

Sheffield Castle Market opened in phases from 1959 to 1965.

The main phase IV market is on two main floors and is divided into five cells; those at the ends contain freestanding staircases with flights wrapping round central concrete piers and wide half landing balconies offering views down into the market hall. The three central cells have voids at the upper level which allow daylight to the lower level.

There is no sense of a market's trading hall in these Castle Market extensions (Figure 6-23 to and Figure 6-25). Fudge refers to indoor streets (Fudge, 1968).

Figure 6-23 Map for public use in Castle Market, Sheffield, February 2011 (Author)

The arrangement of voids and interconnecting cross halls produces staggered pedestrian routes which were designed to promote circulation with the aim of preventing areas of poor trade. The steeply sloping site allows level access to both main market floors.

The land levels fall away to the river behind the market. The lower levels of the markets have service passages connecting it to the upper and lower loading bays. Flanking this passage were individual stock rooms, stairs and hoists.

Figure 6-24 and Figure 6-25 Castle Market, Sheffield, interior (Fudge, 1968)

As each floor has headroom of about 4.9m; allowing the provision of a mezzanine level to the wooden framed stalls, for display in some cases, stock rooms for others. The stall risers display a variety of Formica type patterns, some identical to Blackburn Market.

The market had no contemporary art that can be identified as such but graphic ‘castle’ design was expressed in a variety of media (discussed in chapter 7).

See a fuller description in Appendix A, p 376.

6.13. Birmingham

Birmingham's Bull Ring Centre officially opened in May 1964, as the first indoor city-centre shopping centre in the UK (Anon, 2011a). It also had an open-air market and a market hall under the shopping centre (Figure 6-26 and Figure 6-27)[80].

Figure 6-26 Bull Ring Centre, Birmingham. 1966 postcard.
Author's arrow indicates market hall entrance
http://www.100thbirthday.co.uk/images/StoreGallery/pages/0103Birmingham-1966.htm

Figure 6-27 Bull Ring Centre, Birmingham. 1966 postcard
http://www.100thbirthday.co.uk/images/StoreGallery/pages/0103Birmingham-1966.htm

[80] The relief bull shown in Figure 6-26 was by Trewin Copplestone who had earlier designed elements of Birmingham's Five Ways Shopping Centre and Auchinleck House for Murrayfield and Seymour Harris & Partners. See Section 10.3.

The outdoor market area had opened in November 1962 with 150 stalls within the new Bull Ring, which was still under construction. The new market hall incorporated into the Bull Ring shopping centre opened in November 1963 (NABMA, 1964).

The indoor market had a column and beam construction with a waffle ceiling under the shopping centre (Figure 6-28).

Figure 6-28 Birmingham Bull Ring market, 1964.
http://www.britishpathe.com/record.php?id=43295

The columns appear to have coincided with stall frontages. The stalls appear to be metal framed. They had decorated stall risers that look like the Formica surfaces found in Sheffield and Blackburn markets. There were continuous standard white fascia boards with stall names in applied lettering. (British Pathé, 1964).

Figure 6-29 Birmingham Bull Ring market, 1964.
http://www.britishpathe.com/record.php?id=43295

The market was without natural light and without significant space lighting. Behind the stalls' fascia boards was fluorescent lighting that gave some light to the low ceiling (British Pathé, 1964) (Figure 6-29).

The outdoor market was divided by the elevated bus station access (Figure 6-27). One side had permanent dual pitched market stall roofs (Figure 6-27). On the other side the sunken outdoor market had 13 permanent inverted hexagonal umbrellas with clusters of four stalls below. All these were fibre-glass roofed, reported to be designed by the city architect Alwyn Gwilym Sheppard-Fidler[81] (Anon, 1962b). Each umbrella's structure is obscure but the canopy was of six shallow ridged components (Figures 6-30 & 6-31) (Anon, 1962c). Most of the roof components were in four ice cream colours, with two colours to each umbrella. The canopies appeared to have drained to the centre. Years later a Sunday Times article on Leicester's market referred to "the plastic whimsy of Birmingham's Bull Ring"(Anon, 1971d)

Figure 6-30 Birmingham Bull Ring outdoor market's hexagonal umbrella stalls (Fudge, 1968)

Figure 6-31 Birmingham Bull Ring outdoor market's hexagonal umbrella stalls http://i.pbase.com/g6/86/127086/2/71075924.2PRwfYpN.jpg

See also Appendix A

[81] b. Holywell, Flintshire 8 May 1909, d. Epsom, Surrey 4 January 1990. Obituary at RIBAJ v97 No 6 1990 June p91

6.14. Wakefield

Wakefield Market Hall of 1964 was built as a three aisle block in the street plan. It had a gallery around the market with small trading units and a restaurant with views over the street and the market. It had a frame of pre-cast concrete. Each column supported a double cantilevering beam, the outer arm carried an edge beam and the inner supported posts that carried a roof beam. The posts and end of the roof beams were tied longitudinally by beams to form the heads and sills of glazed clerestories giving light across the hall (Figures 6-32 & 6-33).

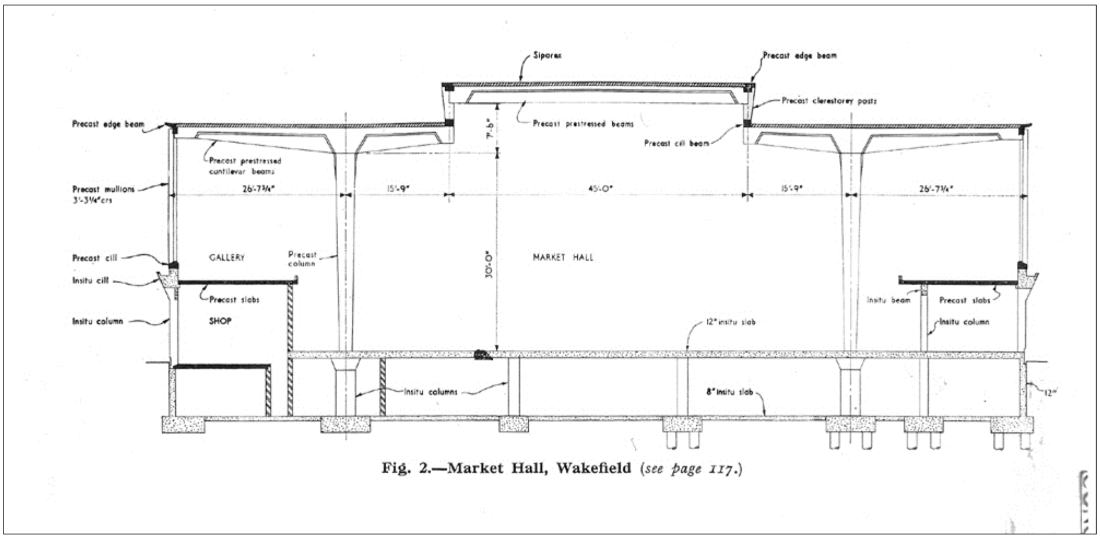


Figure 6-32 Wakefield Market Hall cross section(Anon, 1965a)

Figure 6-33 Wakefield Market Hall, 2008
http://photos.jml.net/

See a fuller description in Appendix A, p 389.

6.15. Blackburn

Blackburn Covered Market of 1964 had a centre roof covering an area of 160’ by 106’ without intermediate supports. The structure was of three reinforced concrete portal frames at 40’ centres, post-tensioned. The bays are spanned by pre-stressed precast hyperbolic paraboloid System Silberkuhl concrete shells produced by Modern Concrete Ltd (see section 3.17.4) forming a parabolic curved roof rising to 53’ above the market floor, each of the 56 shells measuring either 40 or 44’ giving 14 shells per bay (Anon, 1964a; Marsden, 2011) (Figures 6-34 to 6-37).

Figure 6-34 Blackburn Market 1964. West aspect.
Photo of photograph on display in market office April 2009 (Author)

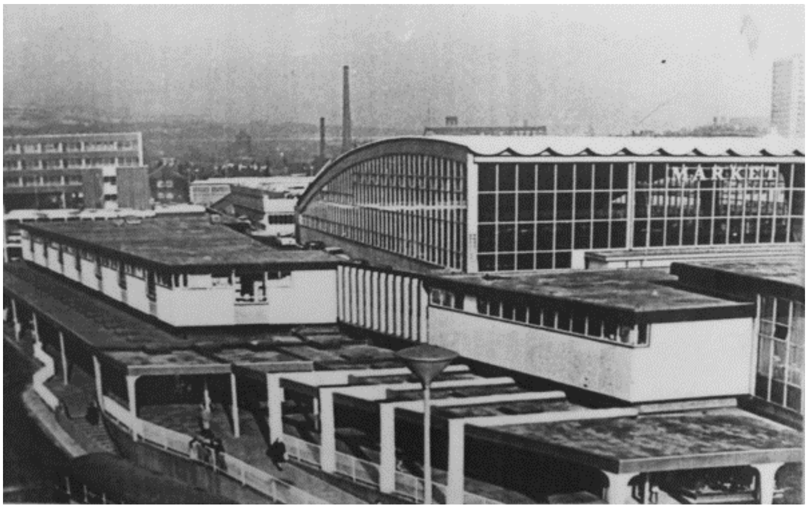


Figure 6-35 Blackburn Market 1964. South West aspect.
Photo of photograph on display in market office April 2009 (Author)

Figure 6-36 Blackburn Market Hall 2011 after closure (Author)

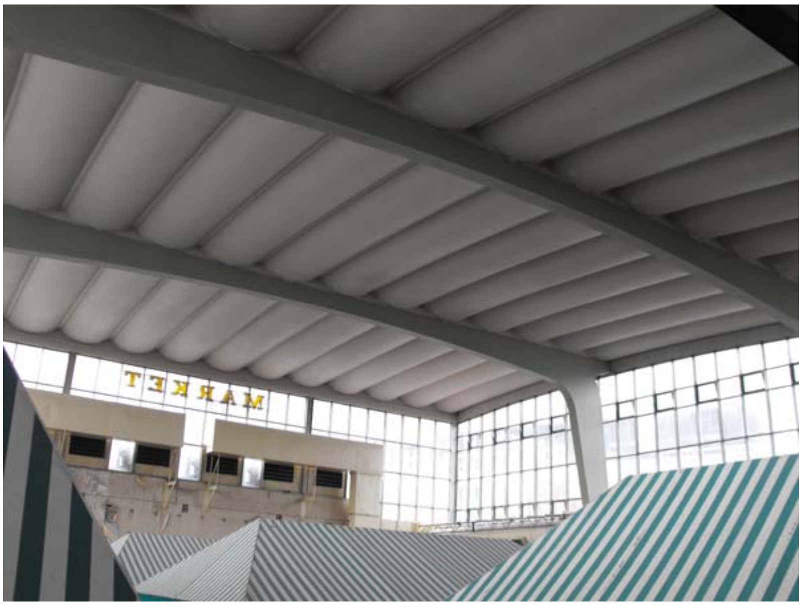


Figure 6-37 Blackburn Market Hall 2011 after closure (Author)

“With a large asymmetrically curved concrete roof and a somewhat frilly front” p64 (N. Pevsner, 1969)

Beneath the shell roof the large clerestory was ‘fully glazed affording a light and airy atmosphere pleasing to shopper and trader alike’ (County Borough of Blackburn, 1964). Supplementary lighting was provided by reflected light from the shell soffits, illuminated by tungsten-iodide flood lights positioned on the side walls. Lighting of the stalls was achieved by colour corrected fluorescent lights behind the fascias of the stall structure with facilities for spot lights as required (County Borough of Blackburn, 1964). “The market chiefs went to great pains to select lighting as near to sunlight as possible” (Anon, 1964d)

A contemporary account (Anon, 1964d) and photographs show that many walls were tiled with micro mosaic tiling. Some surfaces appeared to observers to be tiled (market staff personal communication) but were Formica; a range of designs being evident after closure in July 2011.

The electrically heated floor “is a light coloured terrazzo tile with the floors of the individual stalls, the mini shops and the cafe balcony area in hard wearing thermoplastic tiles. The main entrances to the hall are covered with a special Italian ribbed rubber flooring” (Anon, 1964a). This suggests that it was Pirelli rubber which was advertised as being used in the 1964 Birmingham Bull Ring Centre (Pirelli, 1965)

It all made quite an impression on the local newspaper that ran a 68 page special supplement on the market’s opening, the editorial read;

“Space age styling and spacious facilities. Like an aircraft hangar, which it faintly resembles, the daily market has an abundance of air space to floor space, the blending of off white concrete and glass give the Salford junction a new focal point’ As for a launching platform for the larger new central Blackburn of the nineteen-seventies, symbolically it certainly looks the part”(Anon, 1964d).

See a fuller description in Appendix A, p 393.

6.16. Shrewsbury

Shrewsbury Market of 1965 is on an island site. The steel truss roofed market hall is over commercial units on the ground floor. An outsized brick faced and copper detailed clock tower (Figure 6-38) was included replacing a Gothic one (Figure 6-39). The architect proposed a penthouse restaurant with gardens and pergola walkways about the roof lights over the market(Anon, 1960c). It is not clear if this was realised.

Figure 6-38 Shrewsbury Market Hall
http://www.panoramio.com/photo/49008450

Figure 6-39 The New Corn Exchange and Market, Shrewsbury. Illustrated London News 1869. Engraving. Shrewsbury Museums Service SHYMS FA 1995 015

The architects stated that as the building, which replaced an "ugly monumental structure built in 1869" was in close proximity to 17th century black and white houses with oversailing first floors the reinforced concrete building's design was to echo the same feeling (Anon, 1960c). See a fuller description in Appendix A, p 401.

All the subsequent market halls that opened in Britain up to Keighley Market in 1971(with the exception of Leigh Market in 1968 (see Appendix A, p 407)) were integrated into large shopping centre developments. The position of the market within each development, the architectural values, the design qualities, access arrangements and degree of integration differs greatly.

6.17. Hyde

See Hyde Market in Appendix A, p 403.

6.18. Aylesbury

See Aylesbury Market in Appendix A, p 404.

6.19. Nelson

In 1968 Nelson Market Hall opened on a lower ground floor under the Arndale Centre, an enclosed shopping mall. The fall in level allowed the market hall to be on the downhill side along with servicing access.

Figure 6-40 annotated illustration of the Nelson Arndale Centre, 1968 (Arndale, 1968)

Public access is from a non-retail frontage with a few steps or ramp down from the street and by escalator down from the mall (Figure 6-41).

Figure 6-41 Nelson Market Hall, escalators to and from the Arndale Centre above. Abstract relief pattern tiles top right (1967- probably 1968). Source Nelson Library

The hall has massive rectangular concrete columns, at 36' centres, supporting the centre above. Columns in the aisles were clad with Formica like framed panels to the height of the stall fascias (Figures 6-42 & 6-43). A wall was clad with abstract relief tiles (Figure 6-41 and Figure 7-21) (discussed in chapter 7).

Figure 6-42 Nelson Market Hall interior from stairs to Cooperative store (1967- probably 1968). (Nelson Library)

Figure 6-43 Nelson Market Hall interior from entrance ramp (1967- probably 1968). (Nelson Library)

The Architects were Shingler Risdon with Arndale consultant architect Percy Gray. Nelson Corporation Architects designed the stalls and market interior(Anon, 1968e; Drake, 1978; W. R. Stott Ltd, 1968). See a fuller description of Nelson Market in Appendix A, p 409.

6.20. Gloucester

Gloucester’s1865 Eastgate Market Hall was taken down in the late 1960s during the redevelopment by Land Improvements Ltd of the area as a shopping centre (Pullan, 1968).

A new Eastgate Market was provided as part of the development. The portico of the 1856 market was re-erected along Eastgate Street as the main entrance to the new shopping centre (Figure 6-44).

Figure 6-44 Eastgate market portico to front of shopping centre, 2009
http://www.flickr.com/photos/bazzadarambler/3274830108/

The 1968 market, behind the Eastgate shopping centre, projected out between a bowling green and a scheduled ancient monument (the ruinous C17 Greyfriars), reaching an inactive minor lane (Figure 6-45).

Figure 6-45 Birds Eye view of Eastgate Market (between the roof top car park, a bowling green and the roofless Greyfriars), Gloucester, 2010
http://www.bing.com/maps/?FORM=MMREDIR

The market is quite different in execution to the rest of the centre which has little natural light and rooftop car parking (Figure 6-45).

The market has glazing down both sides;
"Sculptural exterior. At the sides angled steel mullioned windows alternate with ribbed granite aggregate panels, their butterfly-splayed tops flanking Corbusian concrete rainwater chutes. Entrance front to Greyfriars with projecting concrete canopies. Mostly white-tiled within." p465(Verey & Brooks, 2002) (Figure 6-46).

Figure 6-46 Eastgate Market, Gloucester. East elevation, 2008
Photo; Jean Thornhill http://www.flickr.com/photos/42210194@N05/3895887976/

The melamine stall risers and dividing partitions were manufactured and supplied by Insulation Equipment Ltd of Oswestry as they were for Queensgate Market in 1970 (Figure 6-47).

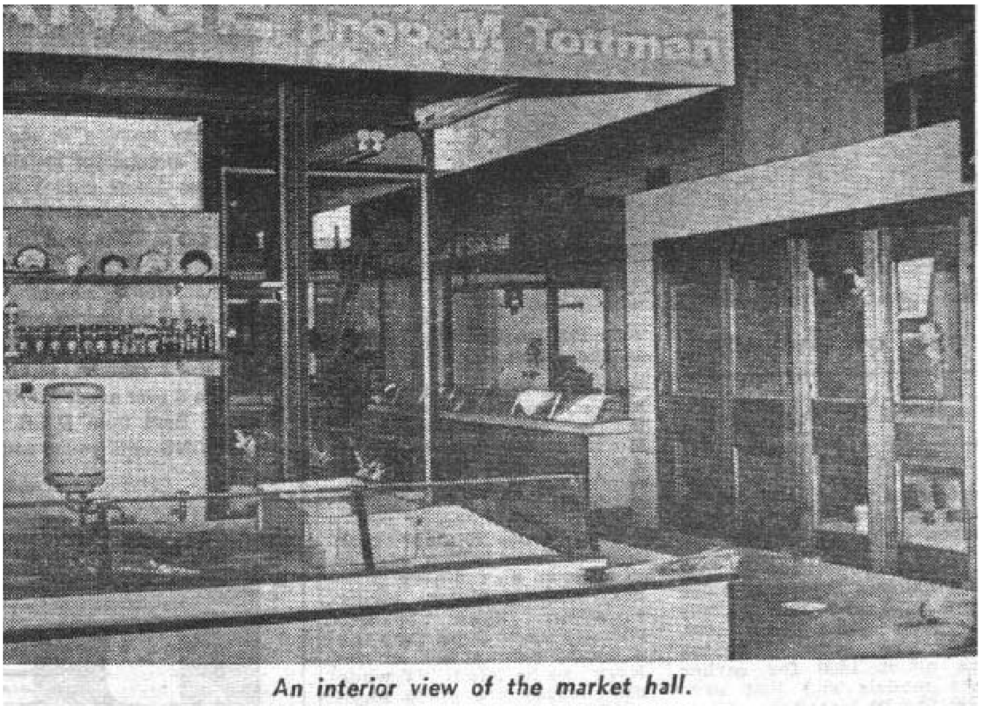


Figure 6-47 Gloucester Market (Pullan, 1968)

There was a piece of commissioned art and a small reset Roman mosaic, with triple spiral pattern in red, black and white (discussed in chapter 7).

The architects were Shingler & Risdon Associates.

See a fuller description in Appendix A, p 414.

6.21. Worcester

Blackfriars Market in Worcester was part of Centrovincial Estates Ltd's Blackfriars 1969 Shopping Centre. The hall was on the first floor of the retail development. Access was by stairs, ramp, travellator (see Figure A-97) and an extended open walkway from a multi-storey car park over a neighbouring retail block (Figure 6-48 and Figure 6-49).

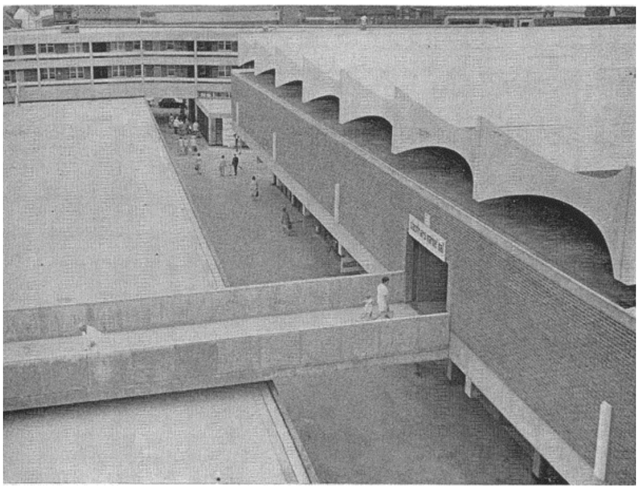


Figure 6-48 and Figure 6-49 Blackfriars Market and walkway(Anon, 1970b)

Interestingly the suggestion that "The market hall was substituted for the bowling alley originally planned"(Anon, 1969d) would have led to the compromised market with public access being difficult and the elaborate arrangemets made.

The roof was of long span steel trusses and apparently without natural light, which a bowling alley would not have required. The 70 stalls were arranged with all fronts at 45 degree angles so each neighbouring unit was facing in another direction, no other market has been found with this arrangement (Figure 6-50). In a 1970 photograph above the standardised dark stall fascias there are very deep panels of abstracted cloudscapes (Figure 7-24) (Anon, 1970b).

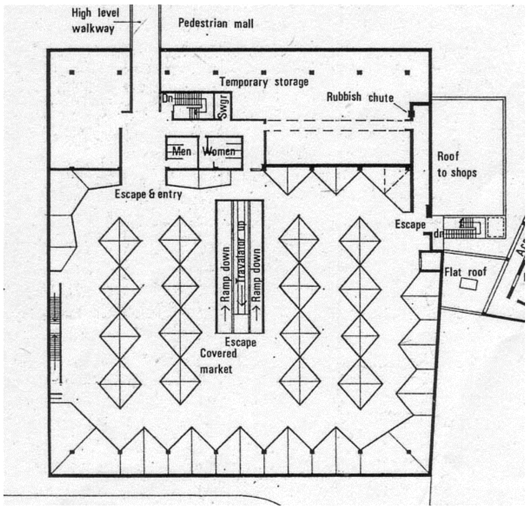


Figure 6-50 Blackfriars Market Hall plan(Anon, 1970b)

See a fuller description in Appendix A, p 419.

6.22. Bradford John Street

John Street Market, Bradford of 1969 was redeveloped from an open market.

"…the open market atmosphere has been largely preserved by flooding the place with daylight through a fibreglass roof, which is one of the building's most remarkable features. (FH, 1969)

It was built on the same site, behind a new supermarket on Westgate (a Morrison's store), a row of shops and next to a multi-storey car park (shaded area at the top of Figure 6-51). This is the earliest example found of a British market hall and adjoining supermarket being planned and developed together.

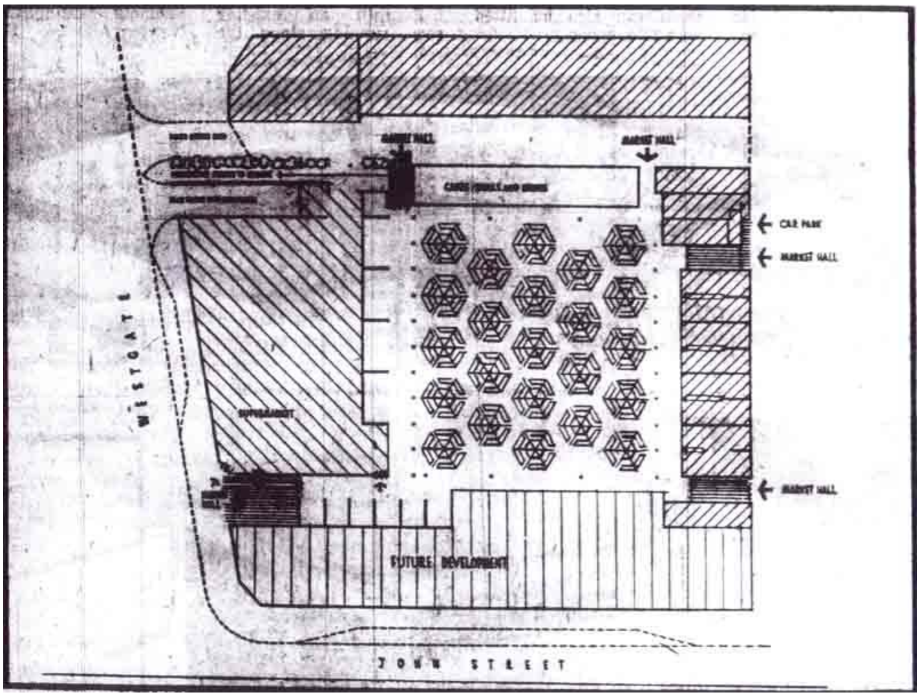


Figure 6-51 Plan of John Street Market showing market at centre with supermarket to left and car park to top (FH, 1969)

In 1968 it was reported;
"The market stalls are being set out in diamond shapes of six units. The building will have an overall roof but will create the impression of the units being "small islands."(Anon, 1968d)

At opening the stalls were, in plan, in 23 hexagonal blocks (Figure 6-52). The fibreglass roof reflected the pattern of the stalls. Steel portal frames in the centre of block had six interconnected columns giving support to the roof. The design left some untidy structural issues as around the perimeter there were free standing columns (seen as dots in Figure 6-52) (Anon, 1969a; FH, 1969).

The market must have been gaudy. “It’s a gay, colourful market”; the hexagon pattern was echoed in the arrangement of multi-coloured floor slabs. The stalls were white, but colour was introduced in various ways, particularly by the use of bright laminates for the stall risers “They glow in red, blue, gold or green with different colours on separate units” (FH, 1969) (see Figure 6-52).

A view of one section of the new Bradford John Street Market.

Figure 6-52 John Street Market, Bradford at opening (World’s Fair, 22 August 1969)

Figure 6-53 View of the roof of John Street Market from above. The hexagonal timber roof decks of the stall blocks contrast with pale fibreglass roof panels reflecting the stall/aisle layout. Beyond are decks of the car park (Anon, 1969a)

The market's plan is reminiscent of the 1962 Birmingham, outdoor market. Here the cover is complete. An explanation for the layout was given;

"One of the finest features of the market is to be found in the arrangement of the stall units, for they are not in straight rows with aisles in between the rows. Instead they are in what seems like a more random formation enabling customers to circulate better and to see more. Of course it is not random-it is carefully calculated…"(FH, 1969).

The change from the reported 1968 diamond plan appears to have inspired by the scientific rationalism of architects and urban designers such as Charles Lamb, Noulan Cauchon[82] and Barry Parker who advocated the economic advantages and efficient land use generated by hexagonal plans.

"If we increase the number of houses for which given lengths of roads and services suffice, the costs of maintaining, lighting, supervising, scavenging and draining, our roads will be less and we shorten the rounds of the rent collector, the policeman, the dustman, the postman, the milkman, the banker, the water cart, the doctor and the road surveyor, and the distances we have to go to centres of amusement and recreation, to shop, to the station and to visit our friends", p185 (Parker, 1928).

There was much interest in the market. Visits were made by Derby (twice), Newton Abbott, Nottingham and Sheffield councils (Anon, 1969b). Derby was to follow the pattern in its 1975 market.

The market was nicknamed 'the beehive' before opening; the notion of economy of space with the market managers planning to aid the diffusion of shoppers certainly lead to lost and bewildered shoppers unable to navigate. This outcome was apparently not experienced in Birmingham's outdoor Bull Ring market, perhaps because the surrounding buildings helped navigation.

See a fuller description in Appendix A.

[82] b.Canada 1872, d. 1935

6.23. Burnley

Burnley Market Hall (1969) and open market was within a £5m Hammerson Group development (Figure 6-54). The hall was roofed with nine long-span (130’) Silberkuhl KS pre-cast shells giving north light to and allowing a clear span market hall (Halstead, 1969b) (Figure 6-55) above a ground floor block of commercial retail units. It featured commissioned mosaics (discussed in section 7.14).

Figure 6-54 Market Square, Burnley. The market is to the left with a glazed elevation. Undated postcard (M. Parr, 1999)

Figure 6-55 Burnley Market Hall interior, 2008
http://www.flickr.com/photos/rossendalewadey/2574980063/

The Architects for Hammerson were Bernard Engle & Partners. The consultant architects to the corporation was the J Seymour Harris Partnership (Burnley, 1969).

See a fuller description in Appendix A, p 423.

6.24. Hartlepool

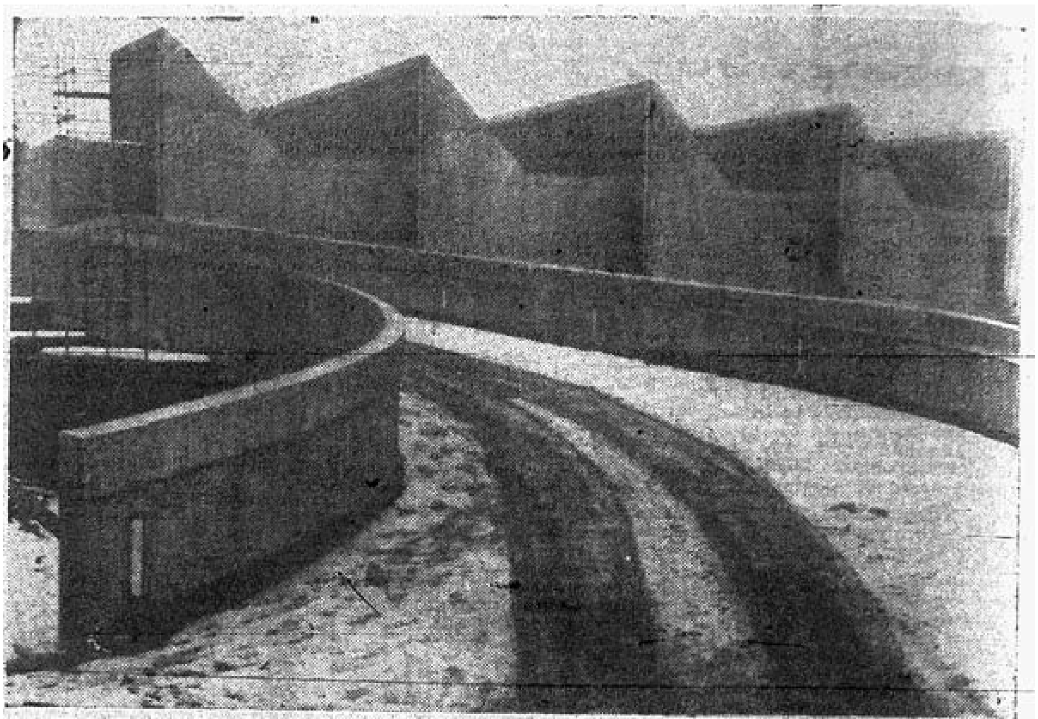
Hartlepool's 1970 market was part of the council owned Middleton Grange shopping centre that had opened the previous year. It is above retail perimeter retail units and integrated with the shopping centre by retail arcades.

The hall is clear-spanned with five north lights formed by cranked insitu reinforced concrete beams (Figure 6-57). All exposed concrete has a board marked finish. The elevations are dramatically vertically board-marked (Figure 6-56).

Figure 6-56 Hartlepool Market(Anon, 1973a)

Figure 6-57 Hartlepool Market interior, 1970 (Anon, 1970d)

The whole appears sculptural as the north light gables are extensions of articulated north light first floor bays. These cantilever forming a narrow arcade with the bay elevations being extended, reducing to a point at ground level, otherwise described as “...futuristic design incorporating large areas of windows and jagged sides which jut out from the building and taper to triangular pillars to provide covered walkways down the sides of the building”(Anon, 1970d). This arrangement was described as “sail-shaped roof-light fins intended to echo the traditional gable and dormers of the existing old buildings and to reflect the town’s function as a port” (Anon, 1973a) (Figure 6-58).



The ultra-modern lines of Hartlepool's covered market in the new shopping centre stand out sharply against the snow-filled skies in this picture taken from the bottom of one of the Stockton Street service ramps.

Figure 6-58 Hartlepool Market, 1970 (Anon, 1970i)

See a fuller description in Appendix A, p 429.

6.25. Summary

This development of new market halls continued with Huddersfield’s market hall that opened on 2 April 1970 (see chapters 11 & 12).

Features of market hall design								
market hall and year	Tower	Concrete shell	Commissioned art	sculptural architectonic quality	Cafe on mezzanine	Formica type surfaces	Terrazzo	Fluorescent lighting
Sidi Bel Abbes1955		yes		yes		?		?
Royan, France 1956		yes		yes		no		no
Coventry 1957	yes		yes			no	yes	ceiling
Plymouth 1960		yes	yes	yes		no		no
Wolverhampton 1960		yes			yes	?		
Swansea 1961				yes		yes		
Shipley 1961	yes					yes	yes	ceiling
Hamburg 1962		yes		yes		?		
Accrington 1962		yes	yes	yes		yes		ceiling
Birmingham 1962	yes					yes	yes	stall
Smithfield 1963		yes		yes		yes		
Wakefield 1964			yes			?	yes	
Blackburn 1964		yes		yes	yes	yes	yes	stall
Sheffield Castle 1959 & 1965	yes		yes		yes	yes		
Shrewsbury 1965	yes					?		?
Aylesbury 1967	yes				yes	yes		stall
Hyde 1967						?		yes
Nelson 1968	yes					yes	yes	ceiling
Gloucester 1968			yes	yes		yes	?	stall
John Street Bradford 1969				yes		yes	?	yes
Blackfriars Worcester 1969				yes		yes	?	stall
Burnley 1969		yes	yes	yes		yes	?	yes
Hartlepool 1970				yes		yes	?	stall
Huddersfield 1970		yes	yes	yes	yes	yes	yes	stall
Liverpool 1970	yes			yes	?	?	?	yes
Llanelli 1970						?	?	ceiling

Table 2 Summarising chronology of market hall developments 1955-1970

In order to see if there was any pattern to the development of features in the discussed post-war markets Table 2 was compiled. The results are clear in some respects; the use of laminate surfaces and fluorescent lighting is adopted during the eriod. The use of new to market materials such as Formica is apparent from 1961 for

Swansea and was announced for Accrington in 1962. Pirelli rubber was used from 1964 in Blackburn market, otherwise there is little firm identification of materials and later refurbishment has led to the replacement of surfacing materials making assessment problematic.

Major features are easier to recognise, for example Queensgate's elevated restaurant and roof terrace were prefigured in post-war markets as diverse as Aylesbury, Blackburn, Plymouth, Sheffield Castle, Shrewsbury, Wakefield and Wolverhampton.

In the table market towers and concrete shells are mutually exclusive.

It is clear that post-war markets were built in a new world and a new way; the architecture from the start was, simplistically stated, following the 1951 Festival of Britain zeitgeist. There was a spirit of new architecture for modern times. Coventry was built at the cusp of new materials being introduced (it used long-standing materials such brass, steel with teak for stalls) and was initially, to have a parabolic roof while contemporaries fully embraced shell technologies; Sid Ben Abbes (1955) where the fish market looks so C21-like, Royan (1956) Caen-La Guérinière (1958), Plymouth (1959) and Wolverhampton (1960). Even then conservatism was apparent; Accrington's market (1962) designers had rejected the use of hypars by 1958 however the realised roof shells were an important aspect in the appreciation of the market – it was felt that they were 'light and elegantly enclose'.

The clear or wide span of market roofs was almost universal for market halls that were not under car parks or shopping centres. Narrow spans, being associated with load bearing structures, had compromised natural lighting and ceilings without ornamentation or sculptural aspiration; Coventry, Shipley, Birmingham, Aylesbury, Hyde and Nelson.

Wide spans being either unexciting or unexpressive engineered solutions such as Wolverhampton, Shrewsbury, Worcester and Hartlepool or a highlight of the a market's design, allowing natural lighting, a 'dynamic', space age' or 'pleasant' expression; Sidi Bel Abbes, Royan, Plymouth, Swansea, Hamburg, Accrington, Smithfield, Wakefield, Blackburn, Burnley, Liverpool and Rotherham (the latter two being described in Appendix A).

Birmingham's outdoor and Bradford's John Street markets are exceptions to this pattern (As in later years Keighley, Leicester and Bletchley markets were). In Birmingham, as an outdoor market stall, canopies of course had to be over the stalls but the inverted hexagonal umbrellas were extraordinary, even if there were to be described as 'plastic whimsy'. They extended the image of a stall canvas cover from which rain water drips from the eaves to a self-draining architectural form that had presence from above and below. Their design was said to be of the city architect, Sheppard-Fidler but as he had 82 qualified architects in his department of 264 staff the attribution may be nominal(Gold, 2007). In section 11.3 we shall see how the Queensgate architect would have been aware of the work.

The 1969 Bradford John Street was a covered market where the roof pattern and structure reflected the stall plan; this correlation, albeit in a different format, was earlier planned for at Huddersfield and had been, at the client's insistence dropped (see section 11.2).

One market, Sheffield, had mezzanines to stalls for traders' use; later Burnley Market was to have the same provision. There may have been other such markets but available records do not suggest this. In Sheffield was to no disadvantage, in Burnley it negated the advantages of the gull wing roof and clerestorey lighting. It would have been possible to repeat this on many stalls at Huddersfield, no matter how unsatisfactory, to the height of the central market office.

The use of colour in the market at Braford was unusual (later Keighley may have also used a strong colour palate). Otherwise market halls of the time provided a stall framework with little distraction from the graphics and colours of traders'signs and goods.

The secondary location of market halls was achieved through siting on lower and upper floors in Shipley, Birmingham, Shrewsbury, Hyde, Aylesbury, Nelson and Worcester; admitted and ameliorated by elaborate access arrangements including ramps, lifts and escalators. The market halls of Burnley and Hartlepool were on upper floors but they had signed and articulated external presence. The secondary location of market halls will be raised again in section 10.1.

This secondary siting of markets was not through inexperience or naivety. It is not that there was a restricted number of practices that had experience of market halls. There were only two architectural practices responsible for more than one British market hall between 1955 and 1971. A glance at the projects of these two practices indicates that their markets were part of larger schemes. In the following listings additional related projects are included to demonstrate how these major practices focused on larger retail developments of which some included markets:

Bernard Engle & Partners; Friars Square Aylesbury, Stockport's Merseyway Centre (no market), Barrow In Furness, New Street (west side), Huddersfield and Burnley shopping centre.

Shingler Risdon Associates (often in conjunction with GM Baxter, staff architect of the Arndale Property Trust); Shipley Market (Leach & Pevsner, 2009), Walkden Market Hall (1965), Eastgate Market Hall and Eastgate Shopping Centre, Gloucester (1968), the Arndale Centre and Market, Nelson (1968) and several other shopping centres including; Arndale at Jarrow(1961), Drumchapel, (1963), Lychgate centre at Worcester (1967) and Lichfield (Anon, 2006; Greenslade, 1990; N. Pevsner, 1968; N Pevsner & Williamson, 2002).

On the other hand those market halls which were one off executions have stronger architectural presences. If the status of markets in megastructures are compromised this is evidence that there is a pattern.

In section 10.3 we shall see how J Seymour Harris & Partners and its successors had also designed several shopping centres. In addition to being consultant architects to Burnley Council for a market hall (1969) and, of course, Queensgate Market

Finally the lack of contemporary independent and objective architectural criticism of markets from this period is apparent. There are exceptions but generally little comment that is not by, or uses text supplied by, an interested party such as the council, developer or architect (such material appears in the advertising features that often accompanied the opening of a market) has been found. The author's reliance on partisan views is unavoidable and conscious.

Chapter 7 Market art

"Art is not necessary to make a good building. This is not a time like the Gothic period. But I welcome art as an addition to the architecture, the same way I welcome people, flowers, books – signs of living and usage for which the space is the container" Marcel Breuer (C. Jones, 1962)

This short historical survey is intended to illustrate the range of what appears to be common themes of art, where it is present, in market halls. Civic pride and order, the marketing function, heritage and local industries & agriculture seem to be the four themes widely found both alone and their syntheses; there are exceptions.

The development of the market cross as more than just as a plain marker seems to start in Britain as early as the 7th century evolving from early medieval free-standing stone high crosses. Often elaborately carved, these structures include carved stone spires, obelisks and crosses. The earliest surviving British covered markets are market crosses that offer some shelter.

A fine example is at Malmesbury where the ornate c.1490 market cross was said to be built as "a place for poore market folkes to stande dry when the rayne cummith" (as much quoted by historians such as Schmiechen & Carls, 1990, many guide books and others although no source has been identified) (Figure 7-1).

The gothic architecture is ornate but there is little art beyond the architectural style of secular order and stature.

Figure 7-1 Malmesbury market cross, Adrian Pingstone (2005)
http://en.wikipedia.org/wiki/File:Malmesbury.market.cross.arp.jpg

Another even more ornate and surviving market cross was built in Chichester c 1501 (Figure 7-2); built, according to the inscription upon it, by Edward Story, the bishop of Chichester.

Figure 7-2 Chichester market cross, Chris Mckenna, 2002
http://en.wikipedia.org/wiki/File:Chichester_market_cross_2002-07-15.jpg

The Chichester cross has empty niches upon it. If the identity of any of the intended figures were known the cross’s significance may be plainer.

The development of market halls did allow for figures. The 16th century Loggia del Mercato Nuovo in Florence built by Giovanni Battista del Tasso in 1547-1551 had 18th century alterations that included corner niches into which statues of famous Florentines were intended to be placed. Only three were made during the 18th century: Michele di Lando, Giovanni Villani, and Bernardo Cennini (Levey, 1996) (Figure 7-3).

Figure 7-3 Mercato Nuovo, Florence c 1890-1910 (Tangires, 2008)

The following pages show a chronological selection of indicative British market hall sculpture and murals in a variety of media. Art from Stevenage c.1959 and Wallsend c.1966 is included, not from the markets but from central shopping areas indicating the transference of market hall art to the shopping mall.

7.1. Birmingham, 1851

A market hall had been at the Bull Ring since 1835. An elaborate 6.4m tall bronze fountain was erected in the hall in 1851, commissioned by the Commissioners of the Street Acts, it cost £900. The basin of the fountain was made of Yorkshire sandstone and was 4.5m in diameter. This supported a square limestone pedestal, on each side of which was hung cast bronze arrangements of wares which were sold at the market – fish, game, vegetables and flower and fruit. This, the base for a bronze statue, which consisted of four figures of children, each representing one of Birmingham’s major industries; gun-making, glass blowing bronzing and engineering, which surrounded the column of the 4.6m diameter fountain bowl shaped as a Greek tazza around the edge of which were eight lion heads from which water poured into the basin 3m below. The apex of the fountain was a decorated urn which spouted water into the tazza (Noszlopy, 1998) (Figure 7-4).

Figure 7-4 Old Market Hall and Fountain, Birmingham, 1880
(w/c on paper), Langley, Walter (1852-1922)
© Birmingham Museums and Art Gallery / The Bridgeman Art Library

7.2. Gloucester, 1856

Gloucester's Eastgate Market of 1856 (architects; Medland & Maberly) had an entrance built in stone "with three round-headed arches with giant attached Corinthian columns, modillion cornice and pediment with a clock in the tympanum, surmounted by a bell tower. This has been described as "Excellent carving of market produce and symbolic figures" p239-40 (Verey, 1976) (Figure 7-5).

Figure 7-5 Gloucester market portico of 1856 (detail) (2009)
http://www.flickr.com/photos/bazzadarambler/3274012181/

7.3. Accrington, 1869

Accrington's market was opened to great enthusiasm.

The classical stone façade included carved groups of figures with vases of fruit and other produce at their feet indicating the commerce, industry and agriculture of the area.

The main entrance's key stone was the head of short-horn bull. Over this and above the cornice is the market clock, with moulded ring, richly carved and supported on either side by *putti* with beautifully-modelled flowers and fruit. Other keystones represent game and produce etc (Anon, 1869c). See Figure 5-6 and section 5.7 for a contemporary account.

Figure 7-6 Accrington Market hall 1869 central bays, 2011 (Author)

7.4. Manchester 1873

Manchester wholesale fish market of 1873 bore 6 tympanums with stone reliefs by Joseph Bonehill. The four scenes are of fisherfolk at work (Figure 7-7).

Figure 7-7 Manchester Wholesale Fish Market; a tableau of fishermen unloading their catch; on the left two kneeling female figures sorting a basket of fish
http://pmsa.cch.kcl.ac.uk/images/nrpMR/MRMCR481.jpg

7.5. Coventry, 1957

In Coventry's 1957 market hall is a 100' x 5' mural by Jurgen Seidel, part of a reciprocal programme of works uniting the two blitzed cities (Figure 7-8). Following an invitation by Coventry, Dresden's city authority ran a competition for art for the rebuilt Coventry. Seidal's mural was donated by the City of Dresden in 1961 and depicts the industries and crafts of Coventry (Coventry City Council, 1998; English Heritage, 2010b; Gould & Gould, 2009; Ring, 2011).

Figure 7-8 Photo montage of Coventry market mural (Author, 2005)

The market's 2009 listing report includes;

"Above the current market office is an impressive painted mural...commissioned especially for the market in the 1950s in a Socialist Realist manner, depicting farming and industrial scenes.” The murals are said to be a principal reason for the listing decision “It contains significant art work that contributes to its architectural and historic importance”(English Heritage, 2009).

Coventry twinned with Dresden, as a gesture of peace and reconciliation following World War II “so the commission through the city’s Burgomeister is appropriate” (Harwood, 2008a).

7.6. Stevenage, 1959

In 1946 Stevenage was the first designated New Town; house building started in 1949. Its new town centre of 1957-9 included the first pedestrian-only shopping area in England.

There was no market hall but the Town Square, “small with a good sense of enclosure” (Pearson, 2005) has an openwork concrete clock and bell tower with below a ceramic tile ‘contour map of the area on which information logos are dotted about’ Pearson considered this a focal point and a strong and unusual centrepiece (Pearson, 2005).

The geographer and artist, Ewart Johns saw the square as sculptural;

“Standing in Town Square, Stevenage, is like being inside a piece of sculpture which has been designed primarily for enjoyment from within. The place invites exploration, and justifies the Development Corporation’s assertion that ‘Stevenage endeavours to create an intimate urban atmosphere reminiscent of some older cathedral cities but without their disadvantages...’. This is by no means an extravagant claim (and is certainly less so than that of many of our ancient cities, when advertising themselves as “historic” while busy destroying their heritage behind the mask of “urban development.” P170 (John, 1965)

The 1959 Letchworth, Hitchen and District Society’s new store off Central Square was built with a 27’ by 20’ ceramic mural (Figure 7-9).

“This striking design by Mr. G Bajo of the C.W.S. Architects’ Department forms part of the frontage... It has aroused considerable interest in architectural circles, both in this country and abroad. Praised by the Daily Telegraph and the Sunday Times it has also been singled out for special mention in France’s Revue Moderne.

The Mural symbolises the spirit and activities of the Co-operative movement as a whole and in relation to Stevenage.

Contemporary buildings and structures in the upper part of the picture are typical of the “spring –like” architectural atmosphere of the new town, which is only half-way to full development, but already a self-contained economic unit with growing industry and comers in rural setting.

Four cornerstones of a balanced economy – Industry, Commerce, Transport, and Agriculture - are represented in the mural by symbolic figures.

A spinning-wheel and finished products represent Textile and Consumer Goods, while the steelworker of Heavy Industry is beside the teaching figure which stands for Science and Technology.

The lower part of the picture shows Agriculture-the primary but indispensable branch of production-as a background to the fundamental social unit, the Family."(Co-operative Wholesale Society, 1959)

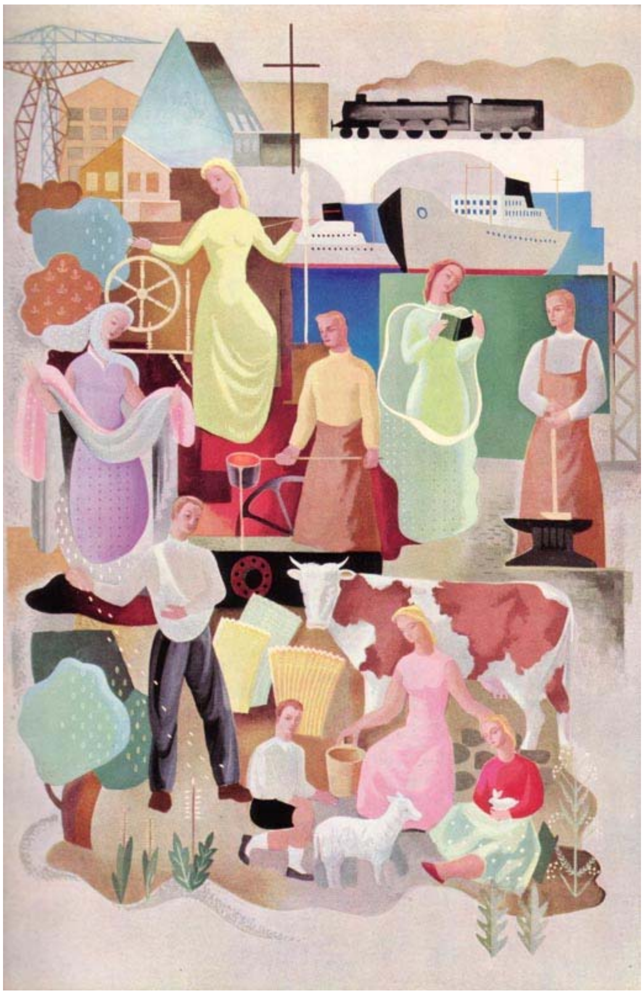


Figure 7-9 G Bajo's design for the 1959 Letchworth, Hitchen and District Society's Stevenage store (Co-operative Wholesale Society, 1959)

7.7. Plymouth Pannier Market, 1960

The market featured two murals. The south entrance to Plymouth's Pannier Market has plaster murals by David Weeks. They show market activities, while the north entrance has outline figures of shoppers incised into the walls.(Pearson, 2007)

The New George Street entrance to Plymouth's Pannier Market has a 20' x15' mural by the local 31 year old sculptor, David Weeks; "executed in an experimental process through four layers of coloured plaster of black, yellow, red and blue with a white top-coat". When the plaster had dried Weeks chiselled the plaster away to varying depths to carve out the design (Figure 7-10). It was to "show the various retail trades and their work in the new market"(Anon, 1959i), The Cornwall Street entrance has outline figures of shoppers incised into the walls(Anon, 1959i; Pearson, 2007) (Figure 7-12).

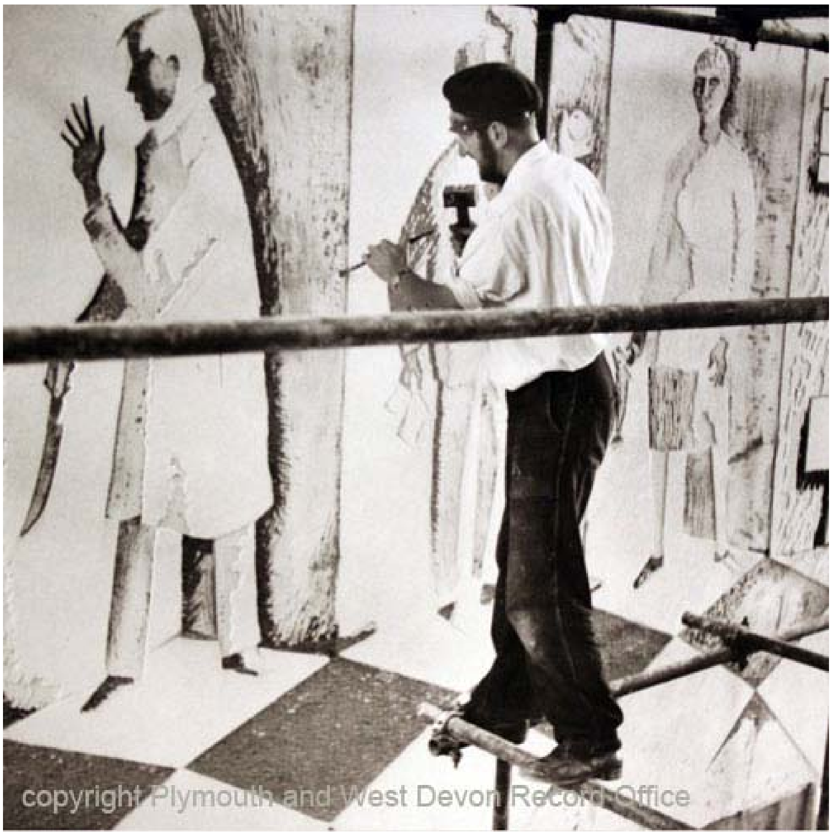


Figure 7-10 Sculptor David Weeks working in Plymouth Pannier Market, 1959
Plymouth and West Devon Record Office part of the City Architect's Collection
http://www.20thcenturycity.org.uk/ImageDetail.aspx?g=5&r=36&e=136

Figure 7-11 Plymouth Pannier Market George Street entrance mural, July 2011
http://www.flickr.com/photos/stevecadman/5940174259/

Figure 7-12 Plymouth Pannier Market Cornwall Street entrance mural, July 2011
http://www.flickr.com/photos/stevecadman/5940729216/in/photostream/

7.8. Accrington, 1962

The market featured three ceramic murals commissioned by the council (Accrington Borough Council, 1960, 1961) installed on external walls of the new fish and main markets. The fish market mural was a mosaic depicting a circular theme of fishing and fish marketing' (Figure 7-13). Another was a tile mural 'depicting fruit, flowers and vegetables, in abstract form'(Accrington Borough Council, 1962) (Figure 7-14). The market was signed with large individual block serif capital letters along the Broadway elevation (Barrett & Duckworth, 2004) (Figure 7-15).

Figure 7-13 Fish market pictorial mosaic (courtesy June Huntingdon)

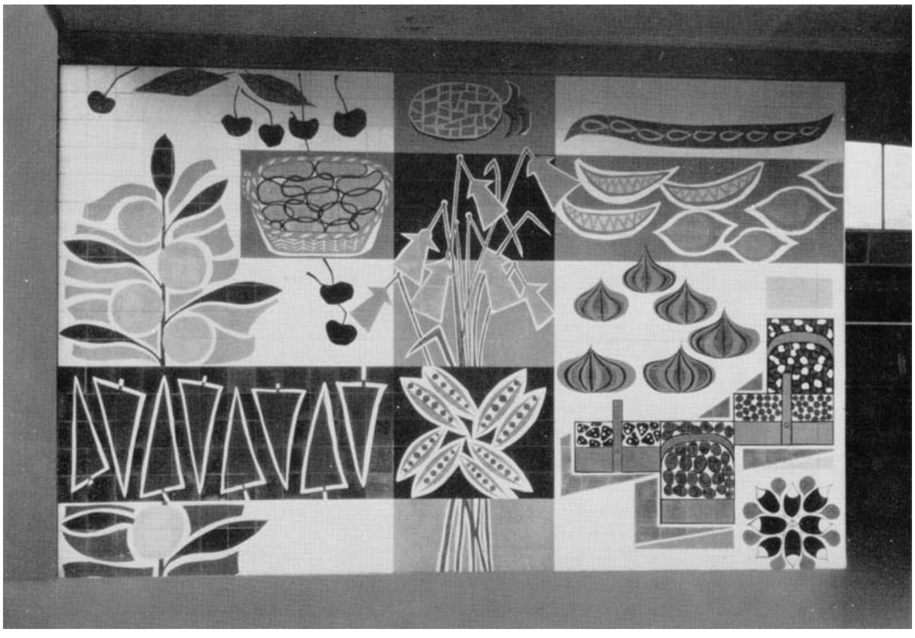


Figure 7-14 Accrington Covered market tiled mural
(Accrington Borough Council, 1962)

Figure 7-15 Accrington Covered Market c 1965 (Barrett & Duckworth, 2004)

7.9. Sheffield, 1964

Castle market was built over the ruins of a castle. A turreted castle form was expressed in a variety of sizes and media; relief pattern tiling (Figure 7-19), mosaic (Figure 7-16), direction board (Figure 7-17), signage (Figure 7-18) and as a massive roof-top sculpted lift house and tank tower that gives a dramatic skyline silhouette (Figure 7-20).

Figure 7-16 Sheffield Castle market external mosaic, 2011 (Author)

Figure 7-17 Sheffield Castle Market direction board, 2011 (Author)

Figure 7-18 Sheffield Castle Market relief signage
http://www.sheffieldtelegraph.co.uk/news/local/case_for_saving_castle_market_is_demolished_1_2880228

Figure 7-19 Sheffield Castle Market external patterned relief tiling detail 2011 (Author)

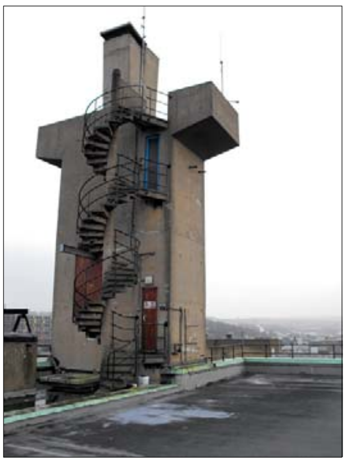


Figure 7-20 Castle Market roof top lift and tank tower 2011 (Author)

7.10. Wallsend, 1966

The Forum Centre is a shopping centre developed by the Murrayfield Estate Company. The architect was J Seymour Harris and Partners (see also 10.3)

The retail development did not include a market but it did feature abstract murals, inspired by the town's Roman history, made from novel and locally produced proprietary artificial onyx, Exsilite (Wood, 1972) (Figure 10-17).

There was also a bronze statue, *Market Woman* by Austrian émigré sculptor Hans Schwarz[83] (Fenwick, 2003). The sculpture is of a female Roman figure bearing a basket containing chickens on her head(Usherwood, Beach, & Morris, 2000).

Little discussion has been found of shopping centre art. Exceptionally, for *Market Woman* the sculptor replied to criticism of the work and explained he was looking for realism. "He wanted the woman to appear as a tough hardworking peasant, not a graceful girl. The roughness shows that the work was done by hand, and also was meant to give the impression of age. The 'patchy' nature of the colour was deliberate to create immediately an effect that would otherwise have come, only after weathering."

Schwartz objected to a romantic interpretation of sculpture, seeing as inappropriate; "a Hadrian of grandeur, who in point of fact based his rule of subjugation of subject races"(Anon, 1967b)

[83] b. Vienna 1922, d. 2003, Expelled by the Nazis in 1939 (his father died in Auschwitz). After being interned in Britain as an enemy alien he attended Birmingham School of Art 1941-3 and worked as a commercial ilustrator until 1964 when he became a full time artist. His portrait of Nikolaus Pevsner is in the National Portrait Gallery.

7.11. Nelson, 1968

The market has abstract patterned relief tiling above perimeter stalls, overpainted; significance unknown.

Figure 7-21 Nelson Market Hall, interior tiling. 2011 (Author)

Otherwise art features were in the mall and a rooftop 83’ painted steel pylon bearing an abstracted Arndale motif (Figure 7-22). It was designed by Christopher Haley a graphic design student of Batley College of Art (Drake, 1978).

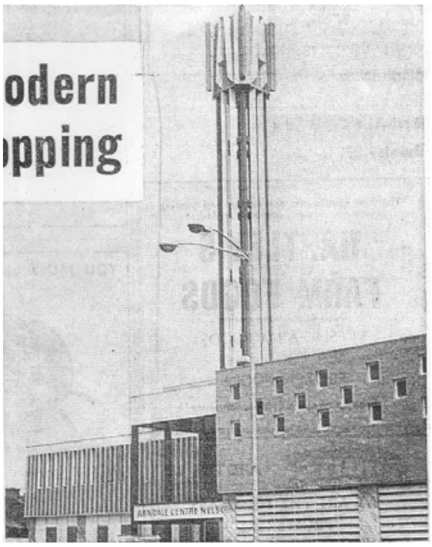


Figure 7-22 Nelson Arndale mast, 1968 (Arndale, 1968)

7.12. Gloucester 1968

Eastgate market has two modest art pieces. At the North end, adjoining the Eastgate Shopping Centre, a small reset Roman mosaic, with triple spiral pattern in red, black and white.(Verey & Brooks, 2002) At the south end a tree-shaped ceramic mural above the Greyfriars entrance to the market hall (Pearson, 2005) (Figure 7-23).

Figure 7-23 Eastgate Market, Gloucester, North elevation to Greyfriars lane 2007
http://www.flickr.com/photos/melmoththewanderer/1544539269/in/photostream/

The significance of the tree mural has not been identified and the citizens of Gloucester seem to be without interest in it.

7.13. Worcester 1969

In a 1970 photograph of Worcester’s 1969 Eastgate market (Figure 7-24), can be seen, above the stall fascias very deep panels of abstracted cloudscapes. As the market hall was windowless it seems to the author to be an apology.

Figure 7-24 Blackfriars Market interior (Anon, 1970b)

7.14. *Burnley 1969*

In 1969 Burnley market had two fine mosaic panels installed in a stairwell;

"two murals which will testify that Burnley has some appreciation of the arts. One is a mosaic, whose appeal will depend on individual taste; it depicts a scene in the market area of old Burnley. Older residents will realise that this owes something to "artistic licence" in its composition which compresses former wider-spread geographic features into a smaller compass, in order to catch the spirit of the past" (Halstead, 1969a).

"Consists of two large colourful murals located in the stairwell. They are signed by the artist and depict a rural scene with sheep and cows, and a scene with traders. The signature is reported to be Kramer Hart" (Anon, 2011c)

Kramer Hart remains obscure. In 2011 Burnley Council officers were even unsure when they were installed. The two panels (Figure 7-25 and Figure 7-26) are the work of a fine artist.

Figure 7-25 and Figure 7-26 Burnley Market Hall stairwell murals; rural (l) and market (r) scenes (Burnley Council, courtesy Lynn Pearson)

7.15. Summary

It is apparently difficult to see market hall art as a fine art even when it is. It is not only the building managers' willful blindness and the public's indifference to it once realised. Throughout this study people have been incredulous when interest is shown in the art of contemporary markets, let alone the art of demolished markets. The commissioning of art by a public body for a market hall must contain or at least colour the creative process. For several hundred years tableaux of local agriculture and industries, trades and produce have been the norm, the quality seems high in that skilled people have chiseled, cast and painted.

No brief or commissioning document for market hall art has been found. Perhaps it would be along the lines of the 1839 instruction to an architect; to produce a market for Bury with "such an external and internal architectural appearance as may serve to at once indicate the uses to which the buildings are to be devoted, and of a sufficiently imposing an important character"(Act, 1839)

The art's civic celebratory function can be ostentatious; Accrington in 1869 or as decorative fun as in Accrington again in 1962. New market halls are still having art works commissioned, so there must be a significance to the commissioners even if it's significance is soon lost. In some markets the position is rather different. At Gloucester and Worcester the art is clearly apologetic for the shortcomings of the buildings' designs. There is also the apparent decoration by pattern; Nelson (1968) and Barrow (1971) (Figure A-141) where there is no fine art quality to the abstraction.

Uniquely Sheffield Castle Market affected a branding exercise with its art; a castle motif appearing in relief tiles, mosaic, on signage of all kinds and even as a silhouette of the roof top lift tower.

Coventry's painted mural is one of the most ambitious works yet it is clear that it was not part of the market's original design. The afterthought was though in the spirit of market hall panoramas. It is poignant that the 1961 painted mural, depicting farming and industrial scenes was produced by an artist from Coventry's twin town, Dresden. The twinning was through a spirit of peace and reconciliation; exemplars after the two cities had suffered fire storms and major loss of life after intense wartime air raids.

The art associated with the Murrayfield development in Huddersfield and Queensgate market is discussed in chapters 7 and 9. Subsequent examples of market hall art; Keighley (1971), Barrow (1971), Bradford (1973), Altenrhein (2001), Santa Caterina (2005) and Carmarthen (2009) are highlighted in Appendix A.

Chapter 8 Post-war Public murals

'Admire me!' must, surely, never be said by a mural decoration. The essence of appropriateness is that it never forces itself on our attention. It must never be self-sufficient. It must always be part of a larger thing that would look naked if isolated from its context: and also something whose context would look equally naked without it. This I am convinced is the truth about mural decoration" (Newton, [1959])

This chapter introduces the postwar spirit that led to public art and in particular murals being used for new developments in Britain. Chapter 9 will develop chapters 7 and 8 by exploring the history of the exemplar of public art in a post-war market hall; Queensgate.

To introduce the zeitgeist it is useful to look at Frank Gibberd's view of the holistic spirit for Harlow New Town, a town that was to become synonymous with public art[84].

"Our detail design in the Town Centre and, for that matter, design in Stevenage and other new town centres, was undoubtedly influenced by the 1951 Festival of Britain. It gave the public a vision of a new kind of environment in which all kinds of objects, like kiosks, seats, sculpture and flower boxes, were brought together with pavings and landscape to form intricate and exciting scenes. It acted as a stimulus for new designs and it made them more readily acceptable to the public"(Gibberd, Harvey, & White, 1980)

In 1950 painter and sculptor, Hans Feibusch[85] surveyed the recent history of murals.

"A revival of Mural Painting is under way; it started on the Continent between the wars and has spread to most countries on this and the other side of the Atlantic." (Feibusch, 1950)

In 1943 Eric Newton had suggested that this inter- war revival was limited;
"the fascist States, especially Italy have seen a revival of officially provided wall painting, and so have the United States, in connection with their democratic Federal Art Projects. However so much of that government-fostered work has appeared in buildings which the-man-in-the-street is only too glad never to enter, or leave quickly if he has to enter them: municipal offices, law courts, ministries and so on.(Newton, 1943)

WWII Britain did see many murals being painted; the wartime ones appeared in over 150 British Restaurants by 1943, mainly by young artists and art students(Newton, 1943).

[84] In 2009 Harlow Council voted to approve a proposal made by Harlow Art Trust to rebrand Harlow as 'Harlow Sculpture Town'
[85] b Frankfurt 1898, d. London 1998

“This movement in itself is not surprising, since the habit of decorating wall with partings is a very old one; rather we should be shocked that a break could ever have occurred in one of the greatest arts, and one of the most constant and profound ways of human self-expression”(Feibusch, 1950)

Feibusch observed that private patronage of muralists had declined and that in their stead corporate bodies, the government, councils and corporations in growing consciousness of their cultural obligations were beginning to commission works of art.

“They are discovering how useful the artist can be to them as a propagandist or in the embellishment of their buildings, or as in a church, as creator of a certain mood.” (Feibusch, 1950)

“There must be means of creating buildings which represent us in a wider sense in the great achievements, trials and hopes through which we pass and which shape our true form. These means can be found in the use of mural painting and sculpture in close combination with architecture” (Feibusch, 1950)

Feibusch is clear about the role of the new muralists.

“A mural is part of an architectural setting for which it is especially designed, a great number of conditions and limitations are imposed upon it, so that it does not enjoy complete autonomy; yet by turning these limitations to profit it can become the most complete and profound as a work of art.” (Feibusch, 1950)

The following year the Festival of Britain started ‘bringing art to the people’ and murals were a significant element in the decoration of Festival sites throughout the country. The South Bank Exhibition alone included around 100 murals (Pearson, 2010).

The post-war building boom created increased opportunities for muralists. For one thing, modern architecture - with its tower blocks and broad expanses of blank surfaces - simply provided more space for murals, but it wasn’t just the South Bank architects who were keen on colour.

Labour politician, Anthony Crosland, wanted Britain to become ‘a more colourful and civilised country to live in’. To achieve this we needed, amongst other things, more open-air cafés, later closing hours for public houses, more pleasure gardens on the Fesival of Britain Battersea Park model, more murals and pictures in public places.... and statues in the centre of new housing estates (Crosland, 1956).

Apart from the Festival murals, Pearson states that over 1,000 (more than 600 large scale) murals in a huge range of materials, were installed in Britain between 1940 and the early 1980s (Pearson, 2007).

Post-war, in and on “new schools, churches, then later on offices, colleges, shops, stations and even underpasses...They were commissioned from artists who generally designed and carried them out with little input from the public, but with much attention to the nature of the site”(Pearson, 2008)p

In 1963 a ‘ well known’ anonymous designer of murals, was quoted as saying “It is about time that we stopped doing murals”p15 (Perkin, 1963) meaning that it was time that the mural became an integral part of the building and cease to be something applied. Perkin, an architect, applauded the employing of designers to be in close touch with the building design from the start.

Based on Pearson’s research, approximately 30 ceramic murals are thought to have been erected in England in the 1950s and 63 in the 1960s(English Heritage, 2011) but more are being identified even after loss. The 1960s ceramic murals formerly of Accrington market and St George’s Centre, Preston, with more in other media, have been identified and recorded by the author through this study.

The high cost of ceramic murals may account for relatively few works in the media being commissioned. Relief murals were developed as new media and techniques were adopted and the mural was taken seriously as a means of expressing a building’s zeitgeist. Examples of the standards set are the murals of Dorothy Annan and Alan Boyson. Single works by the two illustrate.

The1962 Cromwell Secondary School for Girls in Salford (Sculptor Alan Boyson[86]) had a mixed media *Tree of Knowledge*, a 7m x 7m relief panel (Marsden, 2010). It eloquently expressed the ordered pedagogic nature and aspirations of the school (Figure 8-1).

[86] b. Stalybridge 1930

Figure 8-1 Tree of Knowlege, Alan Boyson 1962, Salford (Eddie Smith, 2009)

Dorothy Annan[87] produced nine ceramic panels on the Fleet telephone exchange of 1961. They are semi-abstract, textured, scored and hand-painted (Figure 8-2).

In the Architect & Building News, at the time of the building's opening, it stated that 'an attempt was made to add interest at street level to Farringdon Street with a number of faience murals and display cases to exhibit Post Office activities'. Indeed panels depict particular items of technological equipment (including television and radio aerials, a cable, a telegraph pole, and a pair of buoys). Others panels are more impressionistic representations of communication technology. One is inspired by the patterns produced in cathode ray oscillographs. They were intended to be viewed as a whole, a technological tableaux articulating the nature of London's largest telephone exchange.

[87] b. Pará, Brazil 1900, d. Snettisham, Norfolk1983)

Figure 8-2 Fleet Telephone Exchange panels, Dorothy Annan, 1961 (Michael Bojkowski, 2011)

Not surprisingly, since the work could be executed by the main contractor, concrete became widely used for the relief and decoration of buildings. The material was cheap and formwork could be produced with salvaged and low cost materials. A high degree of artistry and more complicated forms could be executed with expanded polystyrene (Shell). With suitable colouring agents in the mortar it could then resemble dearer and harder to execute ceramic. An example is the 1963 Rotunda Relief of Lloyds Bank, Birmingham by John Poole[88] (Figure 8-3).

Figure 8-3 detail of The Rotunda Relief (1963) at Lloyds Bank, Birmingham by John Poole (Shell)

[88] b. Birmingham 1926, d. Bishampton, Worcestershire 2009. There is strong circumstantial evidence that in 1939 he worked as an assistant for James Woodford on the stone figures insitu at Huddersfied Library; it would be a coincidence that his later Birmingham work may have influenced Steller & Roberts. He specialised in sculpture at Birmingham School of Art from 1940-43.Buckman, D. (2009). A. John Poole: Sculptor, letter-cutter and restorer whose love of architecture informed his monumental works.   Retrieved 19 January, 2012, from http://www.independent.co.uk/news/obituaries/a-john-poole-sculptor-lettercutter-and-restorer-whose-love-of-architecture-informed-his-monumental-works-1821285.html

A project that is of particular relevance to this study was completed in Liverpool in 1961. This was at the time that Gwyn Roberts, who was later to be the project architect for Queensgate Market was an architecture student at Liverpool College of Building; this will be revisited in section 11.3.

The group of 1961 buildings in Liverpool, the Mathematics and Oceanography Building and computer room at the university (architects: Bryan and Norman Westwood and partners) had a remarkable juxtaposition of hyperbolic paraboloid shells and an assembly of murals.

The two buildings featured timber hyperbolic paraboloid roof shells. The two storey computer room roof was of four copper-clad square saddle hypar shells. The six storey Mathematics and Oceanography building's penthouse plant room had roof shells that cantilevered out over space all of which "are interesting forms that are decorative and satisfying in themselves and do not need further treatment" (Westwood, 1961).

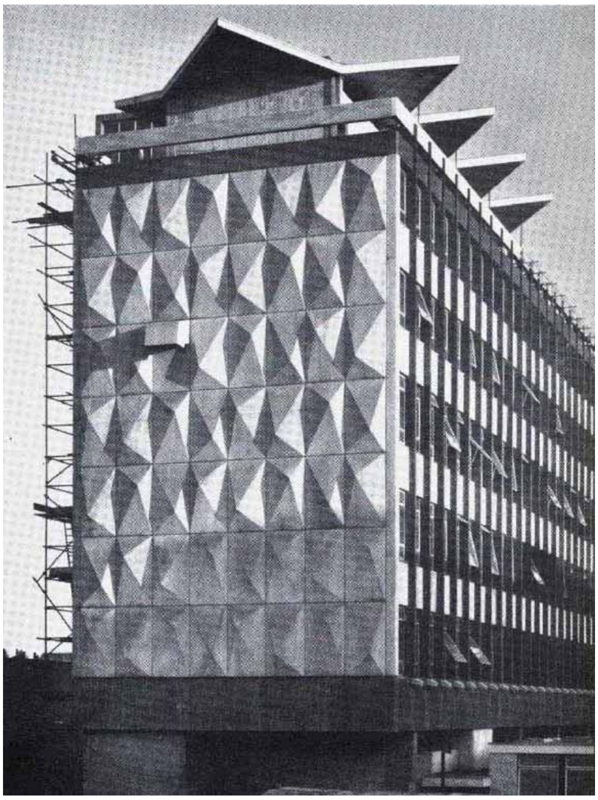


Figure 8-4 University of Liverpool's Institute of Mathematics showing the cantilevering roof shell hypars and precast tetrahedron panels on the North wall. (Westwood, 1961)

The four 19’ square shells and the twelve 18’ by 12’ hypars were designed and engineered by the veteran pioneer of British concrete shells of the 1930s, Blumfield of C. V. Blumfield and Partners (Booth, 1998). Below, the gable was decorated with relief panels of tetrahedrons, 7’ by 4’ by 3ins thick, in reconstituted Bath stone (Figure 8-4).

The building had an entrance screen and gate of cast iron painted black by John McCarthy. The design of the open work gate and screen is derived exclusively from mathematical symbols (Figure 8-5).

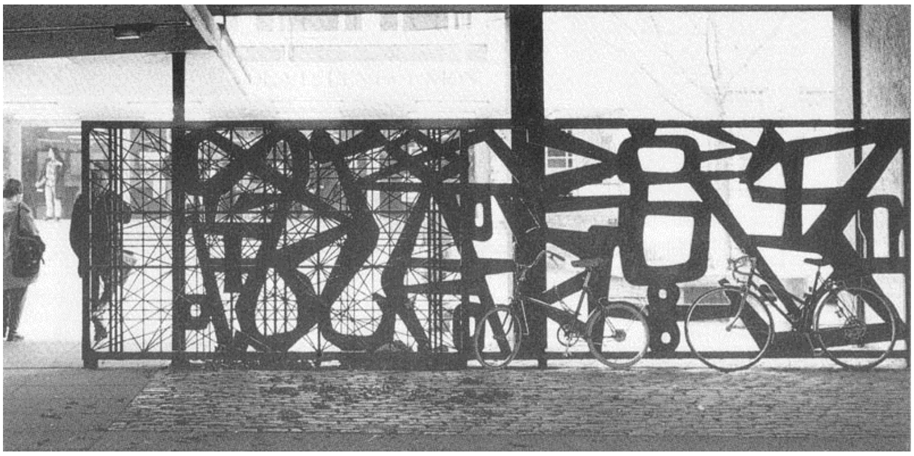


Figure 8-5 Mathematics and Oceanography Building, Liverpool University; screen and gate (Cavanagh T, 1997)

The entrance hall had a 4m tall relief of black concrete of oceanographic motifs by Eric Peskett [89] which architect said was “giving a contrast of plain shiny surfaces and rugged sculpted ones”(Cavanagh T, 1997). It is not illustrated here as it has too little contrast for worthwhile reproduction.

The entrance hall also had five reliefs of various dimensions in terrossa ferrata by John McCarthy illustrating the growth of mathematical ideas(Cavanagh T, 1997; Pollard, Pevsner, & Sharples, 2006; Westwood, 1961)(Figure 8-6 and Figure 8-7).

[89] b. Guildford 1914, d. 1997

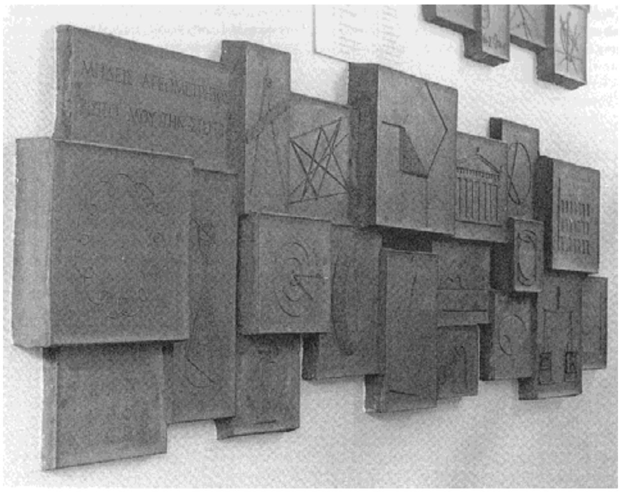


Figure 8-6 Mathematics and Oceanography Building, Liverpool University. The influence of Greece and Rome panel of The growth of mathematical ideas (Cavanagh T, 1997)

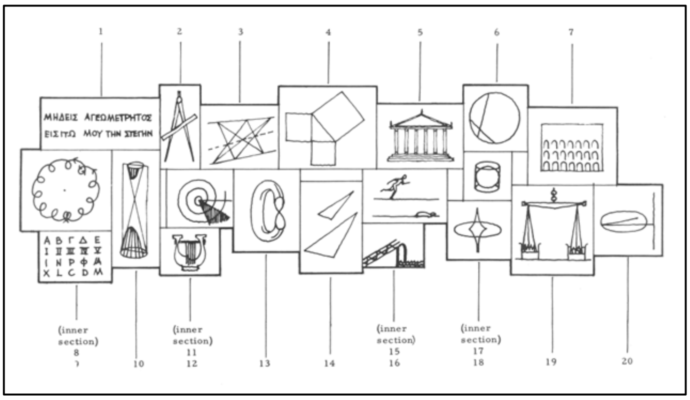


Figure 8-7 key to notes for The influence of Greece and Rome panel of The growth of mathematical ideas from the Liverpool University Mathematics and Oceanography building's 1961 commemorative brochure. Transcribed at http://pcwww.liv.ac.uk/~lrempe/Murals/

The Liverpool building was the subject of a three page article in a *1961 Concrete* Quarterly (Westwood, 1961) so not only was Roberts an architecture student in the city, it was recorded in a significant journal in his purview.

8.1. Huddersfield's public art

There was some twentieth century public art associated with new developments in Huddersfield; the 1937-40 public library and art gallery had sculpture, reliefs and mural paintings that articulated the significance of the building. Through the commissioning by The Ministry of Education Architects Department, Greenhead High School for Girls had two 1961 works by the refugee sculptor, Peter Peri that featured welcoming and musical performance. The 1961 fire station had elaborate relief civic bearings in local stone and the 1965 Civic Centre had novel Exsilite clad piloti in a Mondrian style, gold coloured mosaic and decorated armorial bearings engraved in Portland stone.

Developers were to bring much more to the town. Hammerson's 1968 New Street development bore a large tile mosaic and the Murrayfield development in Huddersfield had two public murals on the first phase. Queensgate Market was to be in phase II which started at the completion of phase I.

Huddersfield Alderman Clifford Stephenson [90] chaired the Huddersfield Estate & Property Management Committee from 1956 and sub-committees during 1959-74 that negotiated and managed the Murrayfield proposal agreement and subsequent development. He was a passionate moderniser with little time for conservation of townscape (WYAS). For a businessman, he had unusually strong enthusiasm for the sculptural articulation of buildings. In 1956 he built a television set service centre for his retail business (C. M. Jones, 1956). Above the main entrance was a bas-relief in cast concrete that conveyed the power of broadcasting (Hammond, 1996) that he commissioned, this was designed and executed by a Huddersfield art school graduate and technician. He was also on the committees that were responsible for the fire station and civic centre developments.

Stephenson's insistence on his own taste being followed led to phase I of the Murrayfield scheme carrying an Italian ceramic mosaic mural to a design by local artist Harold Blackburn[91] (Figure 8-8). This had been objected to by both developer and architect in a series of letters. The Murrayfield director R. W. Allen wrote to

[90] b. Huddersfield 1903, d Huddersfield 1992
[91] b. 1899, d.1990

Stephenson in July 1966, '…our architects have expressed the opinion, very definitely that this mural is unsuitable for purpose. However you have made it clear to us that this is the type of mural that the corporation wish to see…' Later Frank Price wrote '...in Huddersfield we bowed to the wishes of the council by erecting a mural representing various aspects of the wooltrade.'p 279 (Price, 2002). It is 65' long and 8' high.

Figure 8-8 Mural on Ramsden Street, Huddersfield "The development of the woollen industry from a cottage craft practised as an ancillary to farming, up to the beginning of the industrial revolution" http://www.flickr.com/photos/mickaul/6116467056/in/set-72157627491703877/

The other side of the building, on the same development, carries a mosaic mural that was inspired by the local townscape; Facets of the local scene (Figure 8-9).

Figure 8-9 Mural on Princess Street, Huddersfield "Facets of the local scene" designed by Mural Consultants Ltd (1967), (Author 2010)

The commissioning of Queensgate's sculptural work followed the installation of these two murals. This is discussed in Chapter 9.

The British post-war revival of the mural as a public art medium was in full flow in the 1960s. Fine artists such as Annan, Boyson and Poole rode on the wave of such demand. Both the future market architect, Roberts and future market sculptor, Steller would have been aware of Poole's rotunda frieze as both were students at Birmingham art school at the time (see Chapter 9). Roberts would already have been aware of the Liverpool Mathematics Building architectural sculpture.

Independently of Roberts murals were being commissioned by developers in Huddersfield, this was not uncommon at the time. Even more pertinently Clifford Stephenson was an enthusiast for artistic articulation of buildings. In Chapter 10 we shall see how Murrayfield and Seymour Harris had a policy of using murals to enliven shopping centres. The combining of the interests and experiences of the developer, the architect, the client and the two students was to have a significant outcome.

Chapter 9 Square One Design Workshop

“Fritz Steller has always favoured clay and in particular stoneware clay as his principal materials for his own sculpture and his commissioned work. Stoneware clay is one of the few natural materials left which provide for him the qualities he requires for his work. It has beautiful subtle colours and greater durability than any other material known to man. Most of all it can be fashioned into exciting and subtle shapes by the skillful craftsman. It is nothing astonishing that a sculptor will wish to make pots which in this context are an extension of his work”(Square One, c1973)

Having reviewed public art associated with British market halls this chapter will concentrate on the narrow field of the development of Queensgate Market’s public art showing how training, circumstance and opportunity led to dramatic results.

In the post war years arts education in the UK grew. The ceramics industry needed industrial designers, publishers needed graphic designers, education needed arts teachers etc. Amongst the country’s colleges, artists, sculptors, studios, arts centres and workshops we are concerned with the few individuals who were connected with one workshop; Square One Design. At the heart of Square One was Fritz Steller.

Fritz Steller[92] was the son of a Dresden map publisher. The family migrated from East to West Germany in the early 1950s. The young Steller wanted to study art, but his father wanted him to go into printing, and in 1958 persuaded him to study graphics at a college in Amsterdam. Within months he left the course and travelled to England in hope of rekindling a student conference romance, and having failed, enrolled at Birmingham College of Art in 1959. There he studied for a national design diploma, taking general art, intermediate art for a second year, and three years of sculpture; after a further year he obtained an advanced teaching diploma (UCE).

Steller’s training is of significance. John Bridgeman[93], head of sculpture at Birmingham College of Art from 1956 to 81, was one of the earliest British sculptors to embrace fibreglass, plastics, concrete and ciment fondu. He was a master of ‘lost wax’ modelling and bronze casting, and a pioneer in the integrated sculptural articulation of buildings.

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[92] b. Dresden 1941

[93] b. Felixstowe 1916, d. Warwick 2004

“As a conscientious objector, his art was profoundly affected by wartime experiences in London where, often in dangerous conditions, he helped dig bodies out of bombed and mined buildings, and took rescued civilians to hospital”.(Michael, 2005)

In 1951 he contributed large panels of marine life to the Dome of Discovery in the South Bank Exhibition of the Festival of Britain.

During the early 1950s his work was sought after by a number of large companies who wanted to integrate sculpture into their new post-war buildings. These included Pilkington Glass, St Helens (a life-size figure of a glass-worker), Saville Tractors in Slough (a group of tractor workers) and Petrofina Oil at Waterloo, London (a life-size *Icarus*).

Murrayfield commissioned Bridgeman to produce the statue of the mythological local giant Rombold for the company’s Airedale centre in Keighley (Figure 10-21). The £15,000 bronze statue was unveiled in May 1968, weeks after the start of construction of Huddersfield’s market. (Keighley News, May 4,1968) (T&A May 9th 1968) (T&A October 16 1986)

Bridgeman made an enormous impression on Steller (Steller personal communication), whose work and attitudes to public art and architectural sculpture should be seen in light of his studies under the idiosyncratic and democratically minded Bridgeman (Michael, 2005). Under Bridgeman’s tutelage, Steller became proficient in drawing and working with clay, concrete, steel, bronze, plaster, stone, fibreglass, plastics, concrete and ciment fondu.

Bridgeman created a series of large-scale works around Birmingham during its post-war reconstruction which helped the city redefine itself. For the city architect, Sheppard-Fidler (who features in section 6.13) he created large play sculptures seen as integral to new housing developments in the city.

Steller’s motivation is expressed well by another of his significant mentors, stone sculptor William Dalley[94] a teacher of sculpture at Birmingham during 1954-77 (personal communication Hazel Tatlow 30 November 2006) Dalley wrote ‘My work is motivated by visual thinking about events and problems with which I am concerned at any moment. These are influenced by political events, personal happenings, tensions, observations ad infinitum.’

[94] b.1916, d.1977

Steller was introduced to the diversities of classical, African and pre Columbian art. Significantly Steller learnt of the Pyramid of the Plumed Serpent of Xochicalco, Morelos, Mexico of which images had been published in Europe even before photography and the pyramid's restoration, such as the 1836 *Voyage pittoresque et archéologique dans la partie la plus intéressante du Mexique* by the German engineer, architect and draughtsman, Carl Nebel and often since (Figure 9-1 and Figure 9-4).

Figure 9-1 Ruinas de la piramide de Xochicalco from Voyage pittoresque et archéologique dans la partie la plus intéressante du Mexique, Carl Nebel 1836
http://www.flickr.com/photos/odisea2008/4584248050/lightbox/

While at Birmingham Steller met and married textile arts student Sonya Ferris[95]. He also befriended fellow student Gwynfor 'Gwyn' Edwards Roberts[96] who was

[95] b. Birminhgam 1944
[96] b. Bangor 1936, d. Birmigham 2004

completing his architectural training at Birmingham 1963-5 (UCE). Roberts was to become the project architect for Queensgate Market (see section 11.3).

In 1965, having gained his teaching certificate, Steller taught art at a Kidderminster school until the Huddersfield commission in 1969. In October 1966 the Stellers set up home in Snitterfield, near Stratford-upon-Avon. With the house was an old wheelwright's smithy and workshop. Here, with fellow young craftspeople, they established the Square One Design Workshop in spring 1967. The team intended to produce paintings, sculpture, pottery, furniture, woodcarving, weaving and embroidery (Duckworth, 1967).

Amongst others attracted to Square One were Merion John Warren[97] and Frank Maurier[98] . The two men had met as students at Loughborough College of Art & Design in 1964. They studied ceramics under visiting lecturer David Leach[99] and head of ceramics, Arthur Griffiths[100]. Maurier and Warren were awarded DipAD in 1967. The two decided to go into partnership and when looking for workshop space found a base and space at Square One Design Workshops working as Maurier Warren Ceramic Designs (Figure 9-2).

"Where we were on a mission to transform the face of pottery design! We were really just interested in starting our own pottery, but we increasingly sub-contracted to Square One, and largely were influenced by Fritz Steller throughout". (John Warren 8 June 2011)

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97 b. 1945
98 b. 1945
99 b. 1911, d. 2005 Anon. (2005, February 25). David Leach. *Times*. Retrieved from http://www.timesonline.co.uk/tol/comment/obituaries/article518442.ece
100 b.1928 Christie's. Arthur Griffiths. Retrieved 29 August 2011, from http://www.christies.com/LotFinder/lot_details.aspx?intObjectID=784153

Figure 9-2 John Warren and Frank Maurier of Maurier Warren Ceramic Designs with a 1967 kiln load (Anon, 1967c)

“The attraction was both the philosophy of Fritz & Sonia, but also the fact that we could start immediately we had cleared out the old forge hearth and benches to make ourselves some space, because there was already Fritz's kiln in being, even though it was remarkable inefficient & we soon had to enlarge & improve it.” (John Warren 7 June 2011)

Martin and Maurier built a new kiln and kept modifying it (Warren 8 June 2011).

Huddersfield Market project architect Gwyn Roberts was a friend of Steller. Roberts was no stranger to Square One and Steller’s ambitions. The two men socialised and drank together, Roberts attended the Stellers’ wedding and their wives knew one another.

Steller recalls being invited to make a sculptural proposal (Fritz Steller personal communication, 2004) for the Queensgate elevation of the market hall. There is no evidence of a competition for a proposal or multiple invitations for proposals for Queensgate Market art.

Having submitted maquettes (Figure 9-5), Steller was awarded a £9,000 contract by the J Seymour Harris Partnership to produce the panels in February 1969.

Each 18’ by 18’ panel is haut relief with expressions of the mushroom-like shells of the Queensgate market roof turned 90 degrees (described more fully in Chapter 12).

The work then and often since has been likened to pre-Columbian art. With Steller’s reading and training it is not surprising and he acknowledges a debt. It is not inconceivable that Roberts was also aware of the Xochicalco reliefs. A 1957 issue of Concrete Quarterly largely devoted to Mexico has a photograph of Xochicalco (Figure 9-3) (Anon, 1957a).

Figure 9-3 “A corner of the temple pyramid of Xochicalco, the “Place of Flowers”, Cuernavaca
–rubble and adobe face with cut stone, intricately and beautifully carved”
Concrete Quarterly No 33, 1957 (Anon, 1957a)

Figure 9-4 Detail of pyramid at Xochicalco (Author 2008)

Figure 9-5 1969 Four small maquettes for *Articulation in movement* by Steller (Author 2008)

Production began at Square One in Snitterfield in March 1969 but Steller had no means of producing the work without the support of Maurier and Warren and others.

“It is apparent that it was definitely Fritz who had the guiding vision. What hacked us off in the end that although we had had a more than equal share in the conception and realization of Fritz's architectural work, and many of his sculptural pieces too, (I don't think he would have been able to do it all without our technical expertise and attention to detail), in the end all the publicity and attention was on Fritz, "The Man & His Vision". We were very young and naive I suppose, and believed in the big cooperative vision of a group of equals striving together for equal rewards. We were most decidedly "used", big time; I suppose we were the convenient tool he used to achieve his work. It was a fantastic experience until I burnt out and left, and managed to get my own life and direction back.” (John Warren personal communication 4 June 2011)

The project required much experimentation, fifty tons of Stourbridge fireclay (Figure 9-8 and Figure 9-9) and a new large new kiln “Big Bertha” that was built by Maurier and Warren (Figure 9-14).

Wood remembered ‘He was so interested in what he could achieve by using the process that he had put together. It was a fairly unique thing that he had put together. The kiln was amazing’.(K Wood 26 August 2004) (see Figures 9-15 to 9-16).

The production of work at the Square One workshop, a studio used to weaving, throwing pots and domestic saleable work, was a daunting task. Facilities were basic; workshop space was not large enough for a single panel. Planning permission for the kiln was required; it was built and fired but consent was never granted. The production process of heavy manual work was outlined by the author in 2007 (Marsden, 2007) but the team-work and logistics required have become clearer (see Figures 9-6 to 9.19). The lack of space and facilities and the improvisation required has become apparent. In Figure 9-8 the tipping of clay into the Square One yard shows the kiln in the background with drying tiles from the project, on racks. Figure 9-9 shows the small yard from a different angle.

The weight and size of the tile blocks made handling difficult and the main contractor's requirements were not anticipated. For a panel;

"The bottom row of pieces rests on a steel L section bolted to the building. Subsequent rows were bedded in cement and tied back using galvanised bars, again bolted to the building. This was a last minute change which blew Fritz's quotation to pieces, and added to the time it took to fix because the pieces were not uniform in depth. We thought it was overkill to tie in every unit like this but the Architect & Engineers insisted. The anchors in the backing brickwork had to be sited in a place where the unit was deep enough to be able to get in behind and fix it. This really frayed tempers & slowed things up, which didn't go down well with the main contractor.(Frank Maurier personal communication 11 June 2011)

Figures 9-6 to 9-19 also show the scale of the task of manhandling 50 tonnes clay through being worked sculpted, processed and fired. Each of the 144 pieces for each of all nine panels having been produced then had to be transported to Huddersfield, raised onto a scaffold and laboriously bolted-on yet be delicately handled.

Making the Huddersfield panels

We had worked out that to fit the 18ft spaces they were designed for, the panels needed to be 20 ft in the clay stage. Unfortunately the biggest workshop was only 16 or so feet across so we had to devise a method to make them so that there could be true continuity from top to bottom. The shrinkage though, wasn't as big as we had calculated, and they ended up a bit oversize. I've always checked each clay I have used since, and it was one of the first technical tasks I set the vocational students!

Please now refer to the rather crude & complicated diagram.

We made one big platform, rather like a normal sprung floor, 20 ft x 10 ft with the beams resting on rod steel rollers, running across the workshop, and 4 off 5 ft square platforms to lay along the 20ft edge to make a continuous 15 ft x 20 ft platform.

20-inch square chipboard boards were laid on that, and galvanised wire strung along the joints between them. These were so that each of the 144 pieces of the panel could be lifted in a fairly wet state after cutting, to be carried away easily to have the holes in the walls cut, and the paper removed, so that the air could circulate for drying more efficiently.

Starting at the edge of the 5 ft platforms, I think from the bottom of the panel, (but it could have been the top), clay walls were constructed over the wires, the hollows filled with newspaper to the required height, and tops put on the cells or chambers, across to 2/3rds of the way across the 20x10 platform.

The wires were pulled up through the walls along a big beam, very bendy & a bit dodgy!!

The pieces were taken away, being numbered sequentially as they left, leaving the last two rows, cut, but still in place.

The 5 ft square platforms were lifted and put to one side. An ex REME block & tackle with continuous running chain operating a lifting hook was fixed outside the building, and the whole platform shifted across the workshop floor, still with two rows of panel pieces on it to provide continuity.

The 5 ft square platforms were re-laid on the other side of the workshop, boards and wires re-established, and the panel finished, complete with flashing details.

Wires were pulled up as before, pieces carried out, platforms re-positioned, and the next one started!

At least, that's how I remember it being done.

Alan Martin actually did most of the building work I think, but we all had a hand in it from time to time.

Figure 9-6 Making the Huddersfield Panels, John Warren (2011). See also figure 224

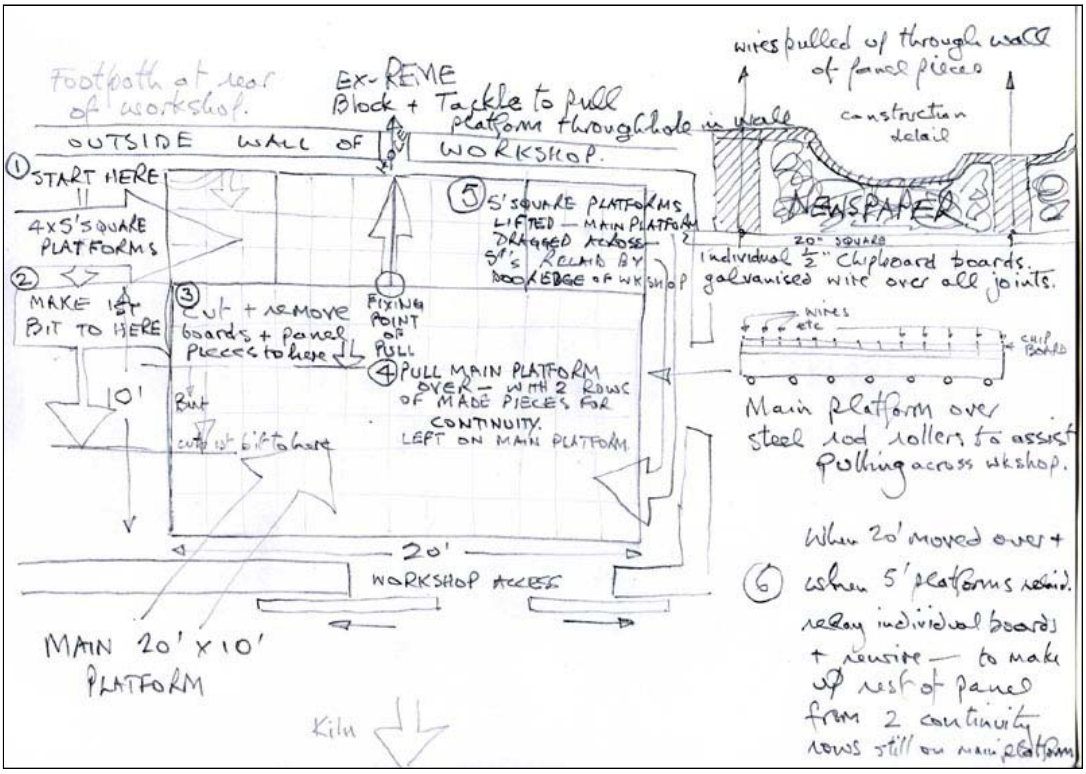

Figure 9-7 Making the Huddersfield Panels, John Warren (2011)

Figure 9-8 Delivering fireclay for *Articulation in movement* at Square One. Note the tiles drying on racking under plastic in middle distance. (Courtesy Fritz Steller)

Figure 9-9 Preparing fireclay for pugmilling for *Articulation in movement* at Square One (Courtesy Fritz Steller)

Figure 9-10 Alan Martin building an *Articulation in movement* panel after the 10' board has been moved across the floor (John Warren)

Figure 9-11 Alan Martin pulling cutting wire through an *Articulation in movement* panel, Frank Maurier looking on. Note large maquettes and copies of the architect's Market hall elevation drawings on the walls (John Warren)

Figure 9-12 Cutting out surplus clay from a leather–dry *Articulation in movement* tile (Courtesy Fritz Steller)

Figure 9-13 Dried *Articulation in movement* tiles before firing (courtesy Seymour Harris Partnership)


Figure 9-14 (left) Frank Maurier working on the big kiln chimney at Square One
Figure 9-15 (right) An early firing of the kiln (all John Warren)


Figure 9-16 (left) Frank Maurier and Ray Davies unpacking tiles from the kiln for Castle Vale, 1970
Figure 9-17 (right) Coded Articulation in movement tiles being loaded for transport to Huddersfield (all John Warren)

Figure 9-18 On the Huddersfield scaffold two men are manhandling a tile into position in a panel. Note packing blocks between wall and tiles (Huddersfield Film Makers Club)

Figure 9-19 Fitting steel rods to secure a tile, from within the tile, in Huddersfield (Huddersfield Film Makers Club)

Figure 9-20 *Articulation in movement* installed, 1970 (Huddersfield Examiner)

Steller was also commissioned to produce a relief for the market's interior north wall at clerestory level. It is *Commerce* (Figure 9-21). About 100' long it is a black painted gas-welded metal relief of semi abstracted scenes (described more fully in Chapter 12), these themes were all seen being portrayed in various styles in the markets discussed in Chapter 7.

Figure 9-21 photo montage of *Commerce* (Author 2004).

The Constructivist nature of the work has not been seen in other market art (Figure 9-22).

Figure 9-22 Detail of Commerce, Fritz Steller (1970) (Author 2010)

The realisation of *Articulation in movement* was achieved through skilled artisan cottage scale activities being brought to work on an industrial scale. The workers were potters and sculptors. None were experienced in working to the scale required; the poetic scene of Figure 9-2 was to become that of Figure 9-11 where the task was larger than Square One's capabilities . There was much manual labour, including building a kiln. Management skills and strategies were lacking so the process was fraught with stress and problems. The delivery and fixing of the work in Huddersfield was not done to the timetable and standards required by the main contractor were exasperating. It was also done in such contrast to the building where the engineering had enabled the vision; here the vagaries of clay and firing were just coped with. It may have been a great achievement but it was clearly not a repeatable or commercial exercise.

Although it seems unlikely, out of the egos, resentment and disorder of this single tiny rural workshop the output was to lead to the industrialisation and a new flowering of ceramic murals and other works. This was not as envisaged by Steller but nevertheless a result of the Square One team's trials and tribulations; explored in Appendix D.

Chapter 10 Post-war town centres and The Murrayfield Real Estate Company

"It is our belief that there is much need for actual shopping centers-market places that are also centers of community and cultural activity. We are convinced that the real shopping center will be the most profitable type of chain store location yet developed, for the simple reason that it will include features to induce people to drive considerable distances to enjoy its advantages." Victor Gruen, 1948 p1(Hardwick, 2004)

10.1. Post-war commercial development

The bombing of the cities of Europe led to a wave of redevelopment from 1945.

The classic early example of planned European shopping was Lijnbaan at Rotterdam, said to be the celebrated pioneer pedestrian centre (Beddington, 1982) and "described and praised so often that it needs no more than a passing reference here"p195 (Tetlow & Goss, 1968) (Figure 10-1 and Figure 10-2).

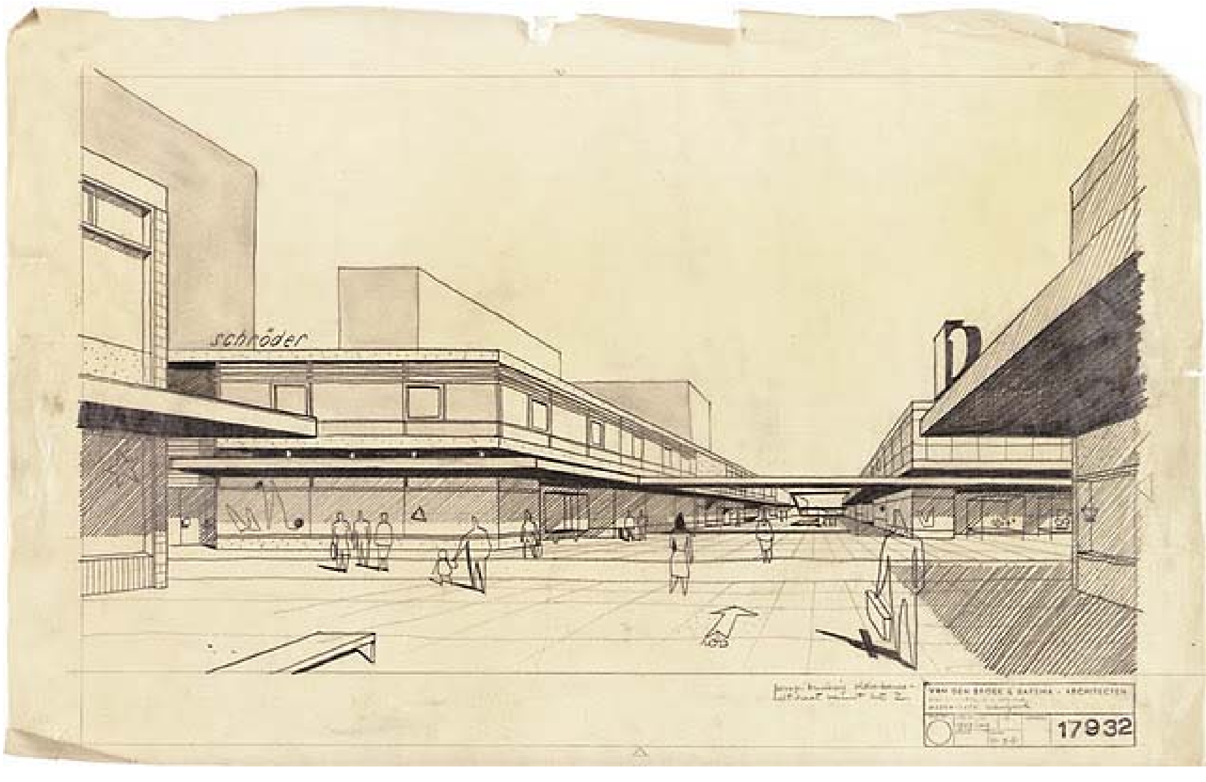

Figure 10-1 Shopping centre designed by Van den Brock & Bakema (Lijnbaan, Rotterdam, 1953). Drawing from The Netherlands Architecture Institute. http://maciejratajski.blogspot.com/2010_07_01_archive.html

Figure 10-2 Lijnbaan shopping centre, Rotterdam. 1960s postcard
http://www.flickr.com/photos/36691513@N06/3518307794/

Beddington states that some early British attempts were less successful "Plymouth, Portsmouth, Bristol were rebuilt with shops on both sides of wide traffic thoroughfares with no appreciation of the significance of sites other than that of relating existing sites to existing owners"p4 (Beddington, 1982)

An increase in traffic and its problems in the 1950s and 1960s led to calls for pedestrianised shopping, leading to international moves towards the planned shopping centre. The shopping centre is a managed complex of trading units served by controlled pedestrian circulation routes and fed by a transport system. It is a mega-structure, not a single building. It can be open to the air or enclosed with a variety of leisure services and amenities possible. Stevenage was the first British New Town to incorporate fully pedestrianised shopping. The first phase was formally opened in 1959 (Mckean, 1982). Stevenage was the subject of much attention.

"The Stevenage town centre is the result of a revolution in our thinking about society's responsibility for the controlled development of urban life: at the height of success, the movement for town planning along community lines succeeded, at Stevenage, in recognising one more vital need of all civilised communities- beautiful surroundings. The townscape of the central area of Stevenage represents a new Renaissance in urban design: going back to fundamentals of aesthetics through Mondrian, its architects recaptures a purity of line and mass that is truly Classical, and this has proved entirely compatible with, and indeed necessary to, the realisation of the aims of sociological thinking of an equally fundamental kind. There is a dangerous tendency for aesthetics to be given an apologetic last place in the list of advantages and achievements of a well organised and efficient piece of town planning. But –as has often been shown-from early Greek art to the engineering works of the last century, efficiency and beauty are not only compatible, they can be inseparable."

"Standing in Town Square, Stevenage, is like being inside a piece of sculpture which has been designed primarily for enjoyment from within. The place invites exploration, and justifies the Development Corporation's assertion that 'Stevenage endeavours to create an intimate urban atmosphere reminiscent of some older cathedral cities but without their disadvantages...'. This is by no means an extravagant claim (and is certainly less so than that of many of our ancient cities, when advertising themselves as "historic" while busy destroying their heritage behind the mask of "urban development."

The present fashion –evident in Stevenage –for involving the best groups and individual specimens of trees that have been found on the original site, as a focus for a precinct, or as a foreground or backdrop for important buildings is derived from the Garden City Movement. In other words, the tree groups, retained in their natural or semi-natural arrangements are Romantic elements in a Classical setting of buildings. This method of composition can be most effective and is certainly a thoroughly British compromise; it should not however be allowed to dominate all notions of how to embellish town architecture. There is a point where a tree, retained at all costs, its base encased in cobble-sets or precinct paving is an anachronism, while there is danger that sculpture –an art which has been given only scanty opportunities in our new townscapes –will be forgotten. pp 169-70 (John, 1965)

The new town was built without a market hall, an indication of how the market was not regarded as relevant place; the new shopping centre was to replace the function. We saw in section 7.6 how the centre with no market was to have market hall art!

Harlow New Town eventually did have an outdoor market as proposed by the Harlow Development Corporation Architect-planner, Frederick Gibberd but only after a board visit to another market he had designed; Lansbury Market, Poplar. Later Gibberd recalled that when the market proposal was taken to the board;

"there were members who thought the qualities that appealed to me would produce an element of brash vulgarity inappropriate to the focus of the new town"(Gibberd, et al., 1980)

Meanwhile in America where there was no lack of land for out of town shopping centres, transport was very auto-centred and where the weather is more extreme, the experience was rather different but with similar issues. The market hall was being replaced by the 'rationalisation' of retailing.

"By the 1960s, the once-thriving tradition of indoor market halls in the U.S. became nearly obsolete. Most markets closed, were torn down, or converted into other uses."(Kahle)

Southdale in Minnesota, was in 1956, the world's first enclosed shopping centre. It was designed by Victor Gruen[101] who wanted an atmosphere of leisure, excitement, and intimacy to be created. To achieve this he placed works of art, decorative lighting, fountains and tropical plants throughout the mall.

“Victor Gruen designed a fully enclosed, introverted, multitiered, double-anchor-tenant shopping complex with a garden court under a skylight—and today virtually every regional shopping center in America is a fully enclosed, introverted, multitiered, double-anchor-tenant complex with a garden court under a skylight. Victor Gruen didn’t design a building; he designed an archetype... Victor Gruen may well have been the most influential architect of the twentieth century. He invented the mall.”(Gladwell, 2004)

The 1961 Apache Plaza was the second such centre in the state of Minnesota, after Southdale. It had over 70 stores in an air conditioned building. The architect, Willard Thorsen[102] designed a central court that was 350’ long and three stories high. The court's roof was ten inverted rectangular hyperbolic paraboloid mushroom roof shells (see Figure 10-3). The shells measured 65’ by 71’ all at the same height sprang from single columns (J Anderson). The shells were arranged as a block 2 x 5 standing two storeys higher than the surrounding shops. The perimeter interval was glazed (see Figure 4-14 and Figure 4-15).

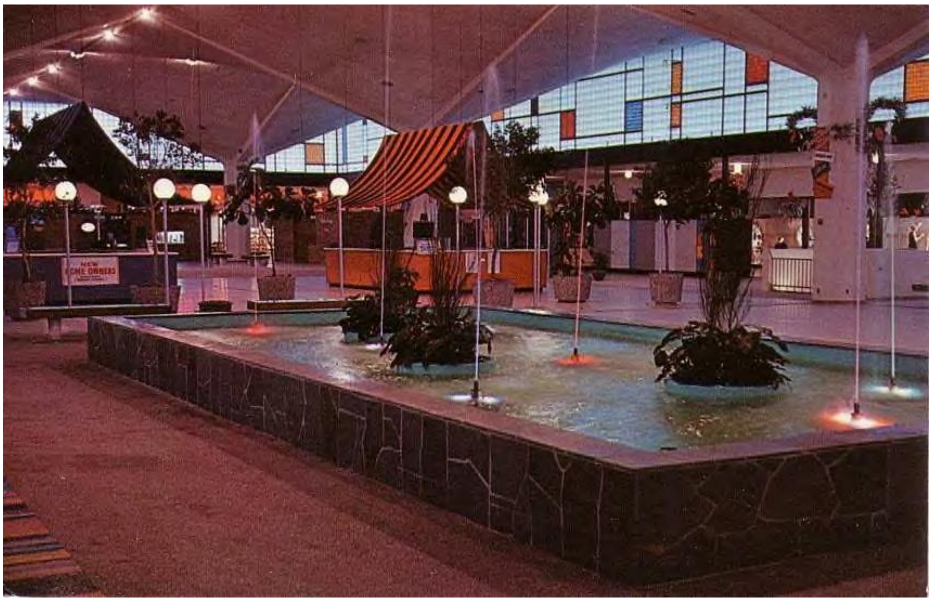

Figure 10-3 Apache Plaza postcard (1962)
http://apacheplaza.com/apachehistory4.html

[101] b Vienna 1903, d. Vienna 1980
[102] b. Mason City, Iowa 1924, d. 1998 AIA. (2010). Willard Lien Thorsen (1924-1998) ahd1044934. Retrieved 20 August 2011, from http://communities.aia.org/sites/hdoaa/wiki/Wiki%20Pages/ahd1044934.aspx

“Obviously America was a quite a leader in those days. In fact I can remember the chief designer for John Madin which was another big Birmingham practice at the time, Fred Mark. Every couple of years he would do a tour of what was new and best in the states and come back. It was amazing, the influence it had.”(Ken Wood, personal communication 26 August 2004).

The transatlantic influence and European experience penetrated into the UK. One of the earliest retail spaces to be “inspired by American shopping centres”(Swift, 2000) was the modest 1963 precinct at Kingswinford near Dudley, this used a thin concrete shell (Figure 10-4 and Figure 10-5). In this area of relative low land values and with the values of family based business the development was not cramped on its site. It was a crescent of retail units with servicing and parking to the rear on a corner site. To the front beyond raised flower beds, seating and planters, an electricity showroom in a rotunda. The rotunda, roofed with a 2 1/2’‘ thick concrete shell dome was a landmark. The dome is supported by expressed and extended fin-like columms. (Swift S, 2000)(Charles Kenchington, personal communication 19 December 2011).

Figure 10-4 Aerial view of Kingswinford precinct, Dudley circa 1963 (courtesy Charles Kenchington)

Figure 10-5 Kingswinford precinct, Dudley circa 1963 (courtesy Charles Kenchington)

The first substantial planned covered shopping centres were the Elephant and Castle in London and the Bull Ring, Birmingham. Although they were covered multi - leveled malls on the lines of Gruen style malls, by reason of their confined sites, they were more intricate than their American counterparts. Having to confine all activities in smaller areas than conventional in the US it helped create megastructures in which a wide range of functions were brought together in the same container (Gold, 2007). The design of these and other centres were further compromised by the absolute desire to maximize available floor area. In Chapter 6 we saw what priority market undertakings were given in the allocation of prime space in 1960s megastructures.

In the 1963 sales brochure for the Elephant and Castle centre (opened 1965), the developers, the Willets Groups claimed it to be London’s largest and most ambitious shopping venture.

“In design, planning and vision it represents an entirely new approach to retailing, setting standards for the sixties that will revolutionise shopping concepts throughout Britain.”(Wikipedia, 2011a)

“...The Bull Ring although adequately successful, seemed to be an economy version of the American Centre”. Neither the Bull Ring nor the Elephant & Castle had much resemblance to their transatlantic cousins, lacking what were considered in the UK as trimmings, but in their shopping centre concept were the essential ingredients.

“These latter were sophisticated and high quality design, high quality low maintenance finishes with attractive and comfortable surroundings and convenient access for shoppers and servicing.” (Beddington, 1982)

Contemporary opinions differed.

“The Bull Ring development is not only a triumph of engineering; it also has buildings which, both individually and in their grouping, are of outstanding merit. Fine bold lines, uncompromising sweeps of facade, beautifully balanced verticals and horizontals-these are all in the best tradition of modern design, and they have a unity of composition and an originality of style that make them a highly sensitive work of art. ”p177 (John, 1965)

Many other shopping centres followed with a mixture of indoor and outdoor arrangements, some with the incorporation of retail markets. By 1982 there were said to be about 250 shopping centres in the UK including, Huddersfield’s Princess Alexandra Walk (phases 2, 3 & 4 of the Huddersfield Murrayfield development). (Beddington, 1982),

The inclusion of markets in shopping centres can come by a number of ways. Boroughs when granted a charter to hold a market have a monopoly franchise in a defined area. The borough becomes the market authority. The classic definition of a market, consistently approved and approved at the highest level, was that given in the case of Downshire v O'Brien ((1887) 19 LRIr 380, 390):

"A market is properly speaking the franchise right of having a concourse of buyers and sellers to dispose of commodities in respect of which the franchise was given."

This franchise right is guarded by market authorities who then run or contract out market undertakings.

When a developer assembles the land for a shopping development the proposed site may include a market. The borough can release or sell the site to the developer but impose a condition on the developer that accommodation for a market is provided.

This need not be a disadvantage to the developer and the development, it can be an asset but there is a difference between the two trading types that can be of significance for the building type.

UK shopping centres with the integration or at least the inclusion of markets included Arndale, Shipley; Bull Ring, Birmingham; Friars Square, Aylesbury; Blackfriars, Worcester; St John's, Liverpool; Arndale, Nelson; Arndale, Manchester; Victoria Centre, Nottingham and Eagle Centre, Derby.

10.2. The Murrayfield Real Estate Company

The Murrayfield Real Estate Company was one property developer, amongst others, that arrived late. The inter-war period had seen the rise of the big commercial estate agent. The market in property between the wars blossomed chiefly in shops around the expansion of shop chain companies. In 1920 there were estimated to be 24,000 multiples and by 1939 this had swollen to 44,000. They expanded by buying existing shops or by leasing shops from developers in traditional high streets, or on parades in the suburbs. Investors became increasingly willing to buy shops as investments, tempted by the security of the rent paid by Woolworths and other shop companies growing at the time. It is a basic charm of investment in commercial property that companies are obliged to pay rent out of revenue before tax or dividends share capital.

Although London experienced a post-war property boom, 1955 to 60 was relatively quiet for the shop developers in provincial high streets. The main reason was that the raw material, land, was hard to come by in any quantity. Developers tended to be interested only in the main shopping streets, where they could let shops to the multiple companies or shopkeepers who were strong enough financially to afford the high rents of the central area. In the early fifties Ravenseft was the only big shop developer operating all over the country. The increasing freedoms for councils to use their powers to redevelop town centres attracted the interest of other developers. By 1960 there were six important companies: Ravenseft, Arndale, Hammersons, Laing, Murrayfield and Town & City. Arndale, Hammersons and Murrayfield were all to have 1960s developments on New Street, Huddersfield.

Who was behind Murrayfield? An interesting group; Walter Flack was the son of a tailor. His parents had wanted him to become a solicitor, but he failed to matriculate and drifted into estate agency. During the war he rose to sergeant in the Eighth Army in North Africa and afterwards returned to his pre-war employers. In 1949 he formed his own estate agency with two partners.

In 1958, with the post-war property boom far advanced, Walter Flack started his own development company, Murrayfield; soon he was working on development plans for dozens of town centres

Flack was less of a one-man band than many developers. He enlisted his old boss from his days in the desert, Field-Marshal Sir Claude Auchinleck as non-executive chairman of Murrayfield. Flack's right-hand man was Alan Wright; the estate agency became Walter Flack, Wright & Partners. Both Flack and Wright were talented at putting people at their ease, a vital accomplishment in endless negotiations with local officials (Marriott, 1967).

From 1958 or 9 the third leading player in the Murrayfield cast was the Birmingham alderman, Frank Price[103]. Price had been a councillor since 1949 and had been on the powerful public works committee from the start. He became Chairman of the committee in 1954 and served in that role for nine years. Amongst the developments he oversaw were the Birmingham ring road system and the National Exhibition Centre, the Central Library and the Bull Ring Centre of which he was very proud (Price, 2002).

By 1958 Price was leader of the Birmingham Labour Party. He met Flack through the Birmingham architect, J. Seymour Harris, whom Murrayfield used for many projects. Flack and Price liked one another at once. They mutually admired each other's outspoken approach. Price recalled that Flack always spoke in straight lines. 'In negotiations always give it 'em straight' he used to say, 'the only trouble is that they often won't believe the truth.'"(Marriott, 1967)

The two men soon saw how useful they could be to one another. As Price had been chairman of the Public Works Committee through post- war rebuilding he had sat in on many deals with developers and had come to know the essentials of the property business. As shop developers had to rely more on their relationships with local authorities the experience of a forceful local politician who had fought his way to the top of Birmingham was invaluable to Flack. As Price himself explained, 'You can sell a project because you understand the system from the inside.' (Marriott, 1967)

[103] b. Birmingham 1922 Price, F. Sir Frank Price, DL Retrieved 7 September 2011, from http://www.debretts.com/people/biographies/browse/p/2786/Frank+Leslie.aspx

Price set up what he called The Urban Renewal Section in Murrayfield's Birmingham office; "and with two senior and one junior qualified chartered surveyors we had landed a number of profitable developments.

"Among them were three major town centre redevelopment projects which we carried out in cooperation with the local authorities. The reputation of Murrayfield as a competent and fair dealing company was spreading.

"Our first large scheme was in the city of Dundee" p268 (Price, 2002)

"I was always involved when we were dealing with local authorities and became quite friendly with those with whom we worked" p272 (Price, 2002)

"Murrayfield's advance was rapid. Within a few years we were working on a number of large development schemes on both sides of the border". pp272-3 (Price, 2002)

In 1966, in its Huddersfield Phase I letting prospectus, Murrayfield published a list of projects in hand; six in Scotland, 32 in England and Wales and one in Paris, France.

10.3. Murrayfield and Seymour Harris

The Birmingham and London based architectural practice of J Seymour Harris & Partners was often engaged by Murrayfield for shopping centre schemes but they also worked on retail development for other private developers including Arndale (G. Ely, 1973; Estates Correspondent, 1966), Hammersons (Property Market, 1959), Reglan (G. Ely, 1969) and councils; Rushmoor (G Ely, 1975).

In June 1961 the architect J Seymour Harris delivered a paper on the 'The design of shopping centres' to the Town Planning Institute Journal annual conference(J. S. Harris, 1961). Harris said he had recently visited Canada and the United States and had investigated the development of shopping centres. He said the fundamental requirements of a shopping centre are;

- Elimination of all vehicular traffic from all pedestrian zones
- Continuity of shopping frontage
- Protection of the customer from inclement weather
- Provision of adequate car parking facilities
- Segregation of service vehicles
- Use of levels
- Use of upper floors
- Maximum freedom for shop fitters compatible with good design
- Incorporation of amenities for the general public
    a. Colourful and self-cleansing facing materials

b. Artificial lighting
c. Seats
d. Play centres for children
e. Incidental sculpture
f. Flower boxes
g. Conveniences

It is apparent that this list has a touch of Gruen's mall features about it.

Murrayfield's projects with the J Seymour Harris Partnership included; Basildon shopping centre, Five Ways at Edgbaston, but not for Murrayfield's Swan Centre at Yardley, that was Jim Roberts (Ken Wood 26 August 2004).

"Murrayfield's idea was, to a certain degree where they could see an emerging firm of architects who required a certain degree of patronage, and who could prove their capabilities then they were used on commissions but they always kept an option to choose to bring someone else in" (John Bloomer, 26 August 2004).

Because of the absence of records, radical changes to and complete demolition of shopping centres since their construction, it has proved difficult to assess the centres as they were when new. Here contemporary references and vintage photos of five shopping centre projects by the Seymour Harris practice illustrate features of them; Five Ways Shopping Centre and Auchinleck House, Birmingham; St Georges Centre, Preston; Forum Centre, Wallsend; Keighley shopping centre and Castle Vale shopping centre. None of the centres, as built, are recognisable today.

Five Ways Shopping Centre and Auchinleck House, Birmingham 1962

This slab and plinth style shopping centre and 14 storey office block with an open central piazza was on a triangular site at a major road junction. The centre was serviced with a roof-top service road. White Carrara marble was used to face some surfaces. J. Seymour Harris and Partners commissioned the artist Trewin Copplestone[104] to design artworks for the buildings. For Auchinleck House he designed and oversaw the installation of two untitled mosaic panels at the tapering end of the office block making a striking feature over the main entrance of the complex, their height emphasised the architectural form (Figure 10-6). Lines of coloured mosaic were punctuated by coloured glass boxes of differing heights and shapes arranged geometrically, taking colour contrasts as their theme. The panel facing Broad Street was composed of mainly red, yellow and orange colours, while

[104] b. 1921 Dartmouth, Devon,

the opposite panel on Islington Row was of cooler colours such as blue and green. It was transformed by electric lights in glass boxes, the works functioned day and night. Copplestone also designed the *Abstract with Sun* mosaic in the shopping centre piazza, above the shop fronts (PMSA). A 1999 news report stated that "the zigzag shopping centre canopy" was also designed by Copplestone (Hassall, 1999). It is not clear which canopies are included in this attribution (see Figures 10-6, 10-9 and 10-10). The Auchinleck House penthouse canopy is also striking by day (Figure 10-11) and when lit at night (Figure 10-12).

Figure 10-6 Broad Street elevation of Auchinleck House, with Five Ways Centre below (photo Bill Dargue)
http://oldbirminghampictures.lefora.com/composition/attachment/c3bf23bef9e8a0a87981ed67ec4138ac/339976/b15-AuchinleckHouse1967.jpg

Figure 10-7 Five Ways Shopping Centre after closure (2009) Trewin Copplestone's *Abstract with Sun* is above the shop canopy. Note also the bronze statue of Field Marshall Auchinleck (Auchinleck was the Chairman of Murrayfield Estates)

Figure 10-8 Bronze statue of Field Marshall Sir Claude Auchinleck at Five Ways Shopping Centre (City Gent, 2008) http://www.skyscrapercity.com/showthread.php?t=496909&page=7. Note also the mosaic clad piloti and white Carrara marble cladding.

Figure 10-9 Five Ways Shopping Centre (Elliott R Brown 2009)
http://www.skyscrapercity.com/showthread.php?p=73485993

Figure 10-10 Five Ways Shopping Centre (City Gent, 2008)
http://www.skyscrapercity.com/showthread.php?t=496909&page=7

Figure 10-11 Auchinleck House's penthouse canopy (Elliott R Brown, 2009)
http://www.flickr.com/photos/ell-r-brown/3669954838/in/pool-wikipics%7Cell-r-brown

Figure 10-12 Auchinleck House's penthouse canopy (Elliott R Brown, 2009)
http://www.flickr.com/photos/39415781@N06/3889043821

The Seymour Harris practice's offices were in Greenfield Avenue about 300 yds from Auchinleck House.

St Georges Centre, Preston c 1965

A Buchannan type centre with pedestrianised area between existing streets.120 shops, multi storey car park, colourful abstract ceramic murals and seating.

Figure 10-13 St Georges Centre, Preston. Aerial Image c.1965
http://www.flickr.com/photos/rpsmithbarney/5907102336/

Figure 10-14 St. George's Shopping Centre, Preston c1969, with white Carrara marble and mosaic cladding
http://www.flickr.com/photos/rpsmithbarney/5188241241/sizes/m/in/photostream/

Figure 10-15, Denis postcard, St. George's Shopping Centre, Preston
http://www.flickr.com/photos/rpsmithbarney/4879523547/sizes/z/in/photostream/

Figure 10-16 St. George's Shopping Centre, Preston c.1972
http://www.flickr.com/photos/rpsmithbarney/5383529366/sizes/z/in/photostream/

“A major feature of the centre is the wealth of murals on its walls as part of a policy by Murrayfield to make shop surroundings as pleasant as possible”(Stayte, 1966)

Forum Centre, Wallsend, 1966

The centre had 49 shops with continuous canopies faced in white Carrara marble, supermarket and cooperative department store, rooftop top parking for 250 cars and servicing and seating.

The windowless first floor was clad with Exsilite a novel fused coloured silica product made in Wallsend by Thermal Syndicate Ltd showed abstracted Roman masonry in blue green and brown (Figure 10-17).

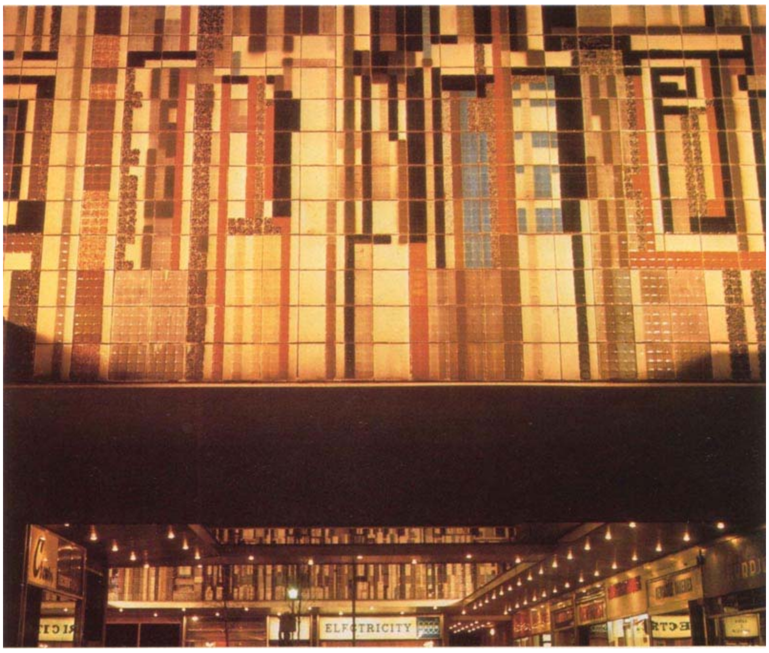

Figure 10-17 Murals above shops of Forum Centre, Wallsend (Thermal Syndicate Ltd, 1970)

Keighley 1968

The Airedale Centre feels in spirit to be similar to the Wallsend centre with pedestrianisation, continuous shop canopies, roof top servicing, murals and a commissioned statue with local relevance. The centre also had raised flower beds and seating.

Figure 10-18 Shopping Centre, Keighley c 1970
http://s657.photobucket.com/albums/uu297/KeighleyHistory/?action=view&current=DSCF0463.jpg

Figure 10-19 Shopping Centre, Keighley c 1970
http://s657.photobucket.com/albums/uu297/KeighleyHistory/?action=view&current=DSCF0464.jpg

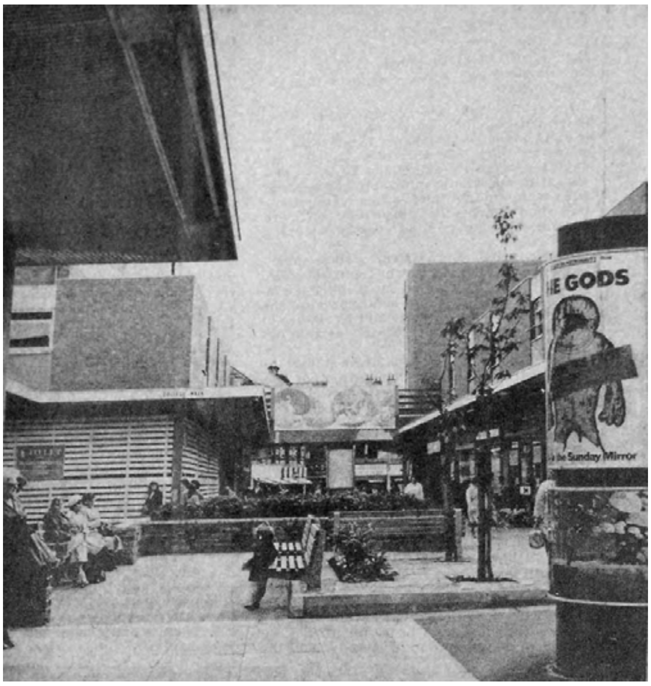

Figure 10-20 Shopping Centre, Keighley (Anon, 1971l)

Figure 10-21 Statue of Rombold in Keighley Shopping Centre circa 1970
http://s657.photobucket.com/albums/uu297/KeighleyHistory/?action=view&current=DSCF0485.jpg

Castle Vale Shopping Centre 1971

The available photos of Castle Vale again show a design like that of Keighley with pedestrianisation, continuous canopies, roof top servicing, murals and raised flower beds.

Figure 10-22 Castle Vale Shopping precinct 1970 (Frank Maurier)

Figure 10-23 Castle Vale Shopping precinct c1970 (Frank Maurier)

From the evidence of the five shopping centre projects it seems that the practice developed centres along the lines expressed by J Seymour Harris in 1961; pedestrianisation, continuous shopping frontages, canopy protection, public art, mosaic clad piloti, white Carrara marble facings, plantings and benches. We will have the opportunity to look at the Huddersfield work later.

10.4. Huddersfield's introduction to Murrayfield

Murrayfield seems to have been pushing at an open door when it made an approach to the corporation.

Clifford Stephenson recorded that the original scheme was the area between Ramsden and Princess Street only and that it was the corporation's estate manager William R Birks that first suggested a bigger development(Stephenson, 1972).

A letter of 20 May 1960 to Huddersfield Corporation from the Murrayfield Real Estate Company "offering the benefit of their experience, expert knowledge and asking for the opportunity to meet members of the council and officials to discuss in general terms the possibility of the redevelopment of the town centre" (Highways and Town Planning Committee minutes, 23 June 1960) led to the Chairman and Deputy Chairman of the Estate and Property Management committee Alderman Stephenson was chairman) being mandated to meet Murrayfield representatives. (Estate & Property Committee minutes, 18 July 1960).

On 24 January 1961 the General Purposes (Civic Buildings) Sub-Committee, which Ald Stephenson was chairman of, resolved to seek the council take action under the planning acts to seek the re-zoning of the area bounded by Buxton Road, Princess, Alfred, Queen, Ramsden and King Streets and the inner ring road, excluding the town hall and library to be an Area of Comprehensive Development (see Figure 11-11). This would then lead to property not owned by the council subject to compulsory purchase.

Cllr Stephenson told the council meeting on 1 February 1961

"This simple resolution…is one of the most important ever considered in this chamber, possibly the most pregnant with benefit to the town and its ratepayers since the purchase of the Ramsden Estates [in 1920].

Carried to fulfillment its result will be the rebuilding of to the most modern and advanced plan and standards of a section of the central area of Huddersfield, which is outworn, outmoded and substantially under developed.

"Huddersfield is a town which owes its growth to the Industrial Revolution. Most of the buildings now standing are a hundred years or more old, and have reached the end of their efficient life.

“The lay-out was unplanned in the modern sense of the word. Access and facilities provided were those suited to a horse-and- cart transport system and a foot-slogging populace.

“The scheme envisaged in this resolution is a complete rebuilding of the town sector...”

“In general principles...the scheme is based on the most modern of and progressive ideas of town planning, embodying the central theme of shopping precinct

“In such a design pedestrians circulate comfortably and safely free from interference by wheeled traffic, which is entirely segregated.

“Off street servicing to all the shops eliminates traffic congestion and helps to remove bottle necks to traffic streams on other roads.”

“This is a plan for the beginning of a new Huddersfield in keeping with the spirit and needs of the times”(Anon, 1961b)

In a letter in printed in the local newspaper the following day, Clifford Stephenson wrote;

“Readers will probably appreciate amplification of the word “benefit”.

“The most important benefit and the essential reason for the proposal is that it will modernise a substantial part of the town and provide up-to-date buildings and layout which will give more attractive, more convenient and safer shopping for our citizens.

“These are the prime considerations; but to them are added the bonus benefits to the Corporation Estate Department and an increased rateable value from the better and fuller utilisation of our land.

“In brief it means a major improvement to the town at less than no cost to ordinary ratepayers.”(Stephenson, 1961)

The following week another newspaper article appeared indicating that Murrayfield was gaining a foothold in Huddersfield;

“After months of negotiation it is announced that the Theatre Royal, Huddersfield is to be sold in March, subject to planning permission to a London property company”(Anon, 1961f)

Murrayfield was in town.

In less than a year the company had the council’s support and it is apparent that Ald Stephenson, as subcommittee chair, took full responsibility for the decision that was to lead the demolition of the 1880 market hall. In 2012 his former doctor recalled that it was one of the decisions of which he was most proud as he regarded working conditions in the old market hall as intolerable (Kilcommons, 2012).

Summary

Huddersfield was not a blitzed town. Its post-war redevelopment fits a pattern; it was redeveloped in the 1960s because it was a prosperous town that had the scope for redevelopment of land marginal to retail streets. The neighbouring towns; Halifax, Dewsbury, Barnsley, Oldham and Rochdale not being as successful at the time did not see contemporaneous change.

Murrayfield was opportunistic, skilled and experienced. It had ‘Mr Birmingham’, Frank Price, who was able to make cases for redevelopment that were attractive to civic corporations and investors.

The J Seymour Harris Partnership had developed the design of shopping and office developments that were in scale to townscapes and had adopted American influenced qualities of servicing, pedestrianisation and finishes.

Huddersfield Corporation had the sensibilities of Alderman Clifford Stephenson and William Birks who were keen for change to benefit the town.

Chapter 11 Huddersfield market design

"It will be a great ornament to the town and productive of great benefit"
Huddersfield Daily Examiner 6 April 1970, quoting Alderman Joseph Woodhead during the construction of the town's 1880 market hall.

Not surprisingly, no comprehensive design brief or design philosophy for Queensgate Market has been identified. To understand the design stage, preconstruction record or design philosophy for Queensgate Market this chapter explores the information available.

The market hall was part of phase two of a four phase development programme by Murrayfield. It was the only part where the client was Huddersfield Corporation. To understand the part we shall look at the whole. A chronology is used to show the how the market design was undetermined and changing up to 1967.

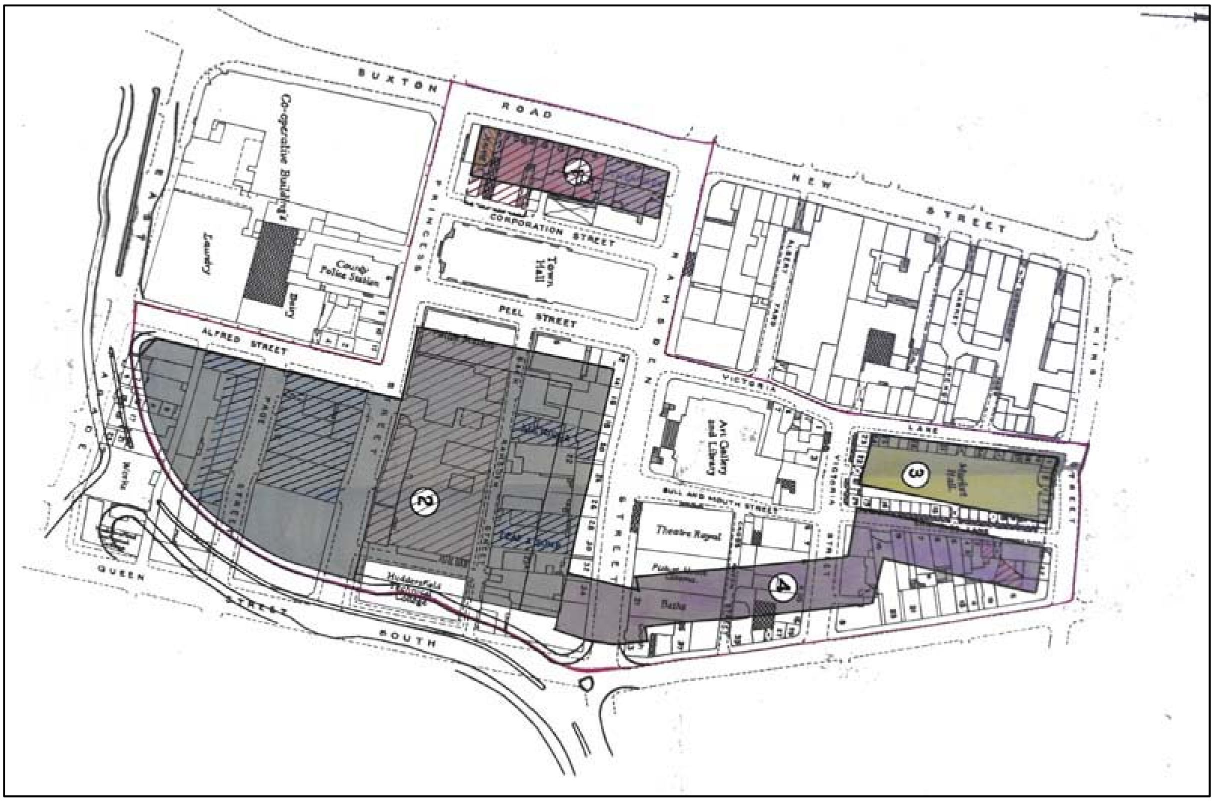

Figure 11-1. Huddersfield Corporation Estate Office Map with four projected phases of the Murrayfield development (undated)

11.1. Chronology of Phase II of Murrayfield development 1960-1967

1960

The earliest design proposals seen for the Murrayfield Huddersfield development by J Seymour Harris and Partners are from December 1960 where all the phases of the proposed development are included.

The report includes a section entitled *Principles and aims of planning* which included a nine point list;

“1 The provision of shopping precincts and piazzas in which shoppers may not only be free from the fear of the motor vehicles, but also may be able to shop undercover and to wonder with the maximum of freedom within the shopping area.

2. With comprehensive redevelopment, it is possible to utilise to the maximum the opportunities afforded by falls and levels of the existing site, and also to create central areas in which maximum consideration may be given to the architectural and aesthetic treatment of the buildings, provision of main vistas and focal points if interest, and the introduction of landscaping to provide some greenery within the central area to enhance and balance the whole scheme.

3. The provision of off-street servicing (to all shop units) for unloading and unloading of goods.

4. The segregation of the motor vehicles from the pedestrian shopper and servicing vehicles, by the provision of roof car parks.

5. The creation of a shopping centre and commercial centre which would enhance the prestige and prosperity of the community.

6. The provision of continuity of trading which is only achieved in a comprehensive redevelopment scheme, which provides the means of least hardship to trader or other occupiers who would otherwise be dispossessed, together with the added provision of maximum alternative accommodation which can be designed for each trader to enable the most economic use of space.

7. The improvement from a traffic point of view of access and egress to the new ring road from this central area.

8. The provision and establishment of floor levels in such a manner that the maximum freedom is given to Architects acting on behalf of incoming tenants, and the maximum utilisation of frontage and floor areas compatible with aesthetic considerations.

9. The use of self-cleansing materials, such as marble, and the masking of unsightly and untidy tankrooms, lift mechanism rooms, etc.”

This list can be compared with J Seymour Harris's paper on the *The design of shopping centre* for the Town Planning Institute Journal's annual conference(J. S. Harris, 1961) (see Chapter 9).

The 1960 Seymour Harris report also had four photographs of a model of the proposed comprehensive redevelopment area (Figure 11-2 to Figure 11-5). The master plan can be seen in the realised work but the elements were all to be recomposed. The planning principles cited in the report can be seen realised in the model.

The market hall and shops block can be seen as a flat-roofed structure with 24 skylights and decorated elevations to east and west. The fall of Ramsden Street down the slope of the hillside is maintained with level access to Queensgate beneath an over-sailing restaurant block.

Figure 11-2 Detail of Plate 1 "View of model of proposed redevelopment. St Paul's Church in foreground" from J Seymour Harris report of December 1960 (J Seymour Harris & Partners, 1960)

Figure 11-3 Detail of Plate 2 “View of model from NE. Junction of Queen Street, King Street and Cross Church Street in centre foreground” from J Seymour Harris report of December 1960 (J Seymour Harris & Partners, 1960)

Figure 11-4 Detail of Plate 3 “plan view of the model” from J Seymour Harris report of December 1960 (J Seymour Harris & Partners, 1960)

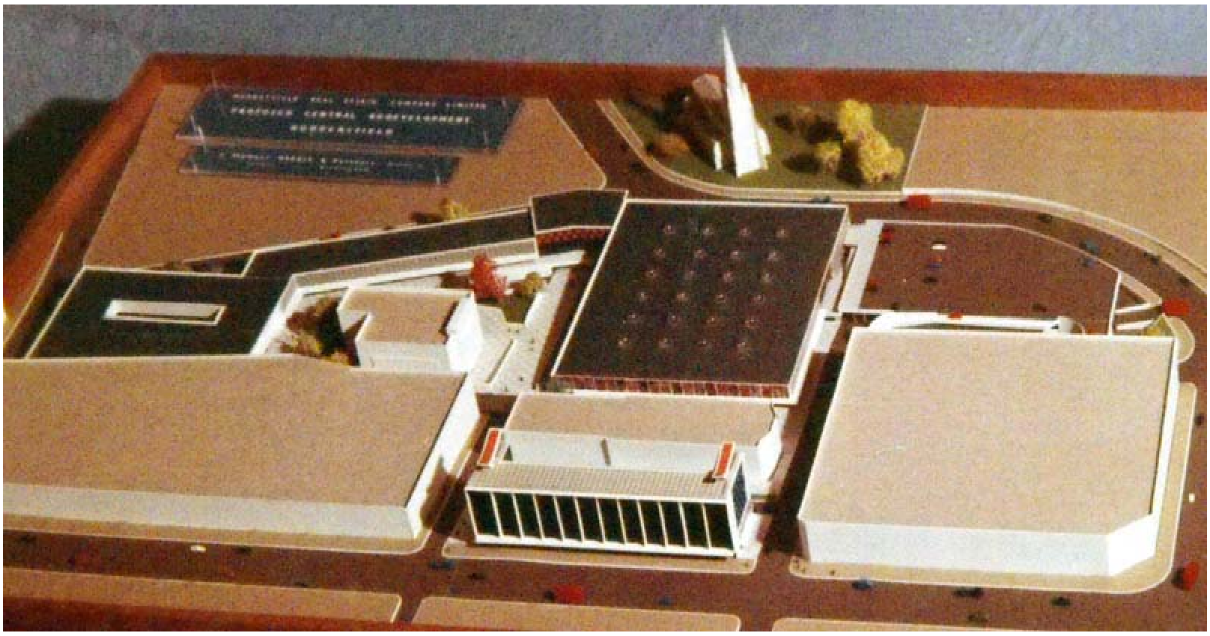

Figure 11-5 Detail of Plate 4 “View of model the west. A proposed office block with shops facing onto Buxton Road in the foreground” from J Seymour Harris report of December 1960 (J Seymour Harris & Partners, 1960)

1962

A photograph of a J Seymour Harris & Partners ‘Central Development Model’ taken on 25 June 1962 by the Huddersfield Daily Examiner shows some differentiation of the phase II block (Figure 11-6 and Figure 11-7).

Figure 11-6 'Central Development Model' (Huddersfield Daily Examiner 1962)

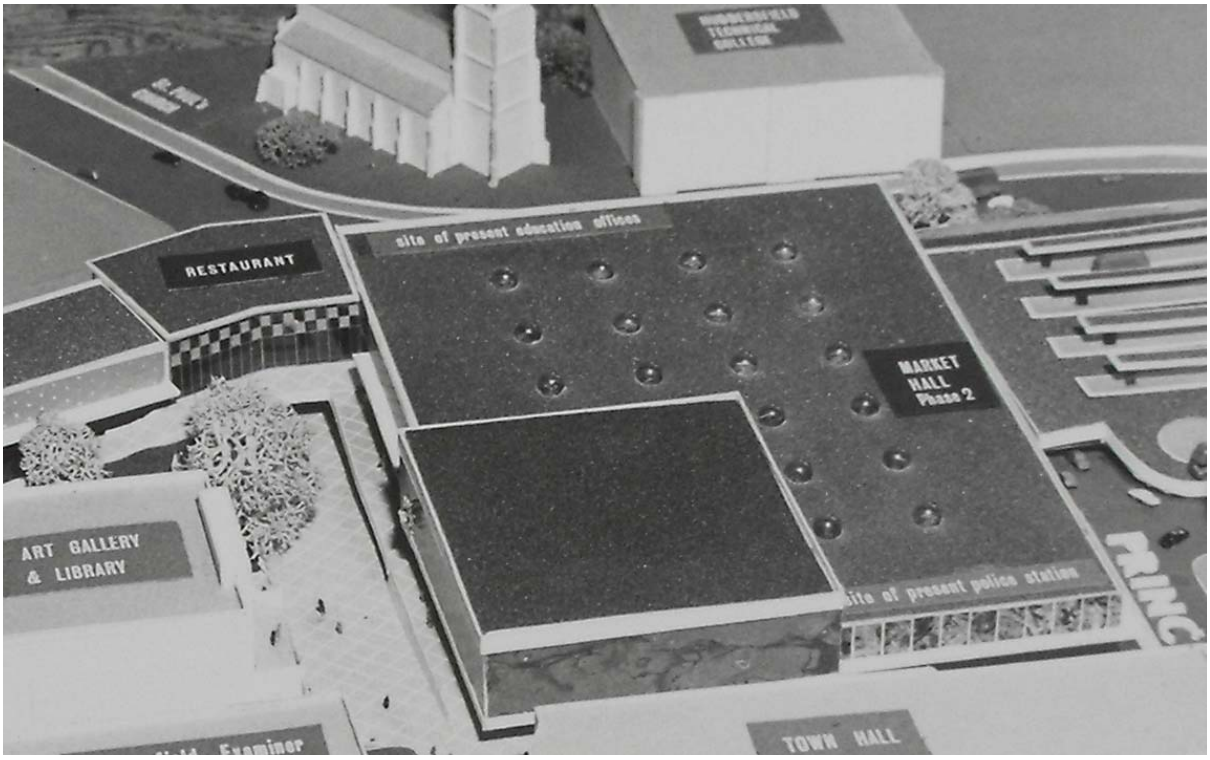

Figure 11-7 Detail of Central Development Model' (Huddersfield Daily Examiner 1962)

1963

The phase II area was bounded by Peel Street, Princess Street, Queensgate and across Ramsden Street to include the area that is now the Piazza.

As for phase I, the architects were the J Seymour Harris Partnership.

"Murrayfield's idea was, to a certain degree where they could see an emerging firm of architects who required a certain degree of patronage, and who could prove their capabilities then they were used on commissions but they always kept an option to choose to bring someone else in …. According whether if at the end of the day had produced the right profit that they were looking for, and had been done relatively smoothly because they were foremost in recognising that for comprehensive development anywhere you had to have not only the local authority on side bit you had to have the population onside and therefore that were fairly alert to the fact that in the Huddersfield development with a new ring road going on that something a little special was require for the market albeit that the market was just a part of the puzzle, it was a very important piece and equally it was recognised that the library was a very important piece with a central role and therefore it tended to emerge in the master plan that around the piazza in closest proximity to the library was if you like, a softer les dynamic impact and indeed that wrapped all round… " (Bloomer, J. Personal communication, 26 August 2004).

The Markets and Fairs Committee made inspections of: Wolverhampton Market, 16 July 1963 (Huddersfield Borough Council, 1963a); Coventry Market, 3 October 1963 (Huddersfield Borough Council, 1963b);

1965

The outline planning application (TP15142) 16 February 1965 Commercial development incorporating shops, market hall, public house and dance hall.

shops	43,900 sq ft
market hall	54,850 sq ft
market shops	25,450 sq ft
public house	3,700 sq ft
dance hall	20,500 sq ft

The early designs and model show the market hall as an undifferentiated block.

The Huddersfield Markets and Fairs Committee made inspections of: Blackburn Market, in December 1965 (Huddersfield Borough Council, 1965), Sheffield Castle Market, date unknown, (Anon, 1966a) and Burnley, date unknown, (Anon, 1970h).

1966

First hypar reference found was in the Huddersfield Examiner in January 1966 (Anon, 1966d). An1966 artist's impression of the scheme shows the five hypar mushrooms above Queensgate as realised and also shows the concept of relief panels (Figure 11-8).

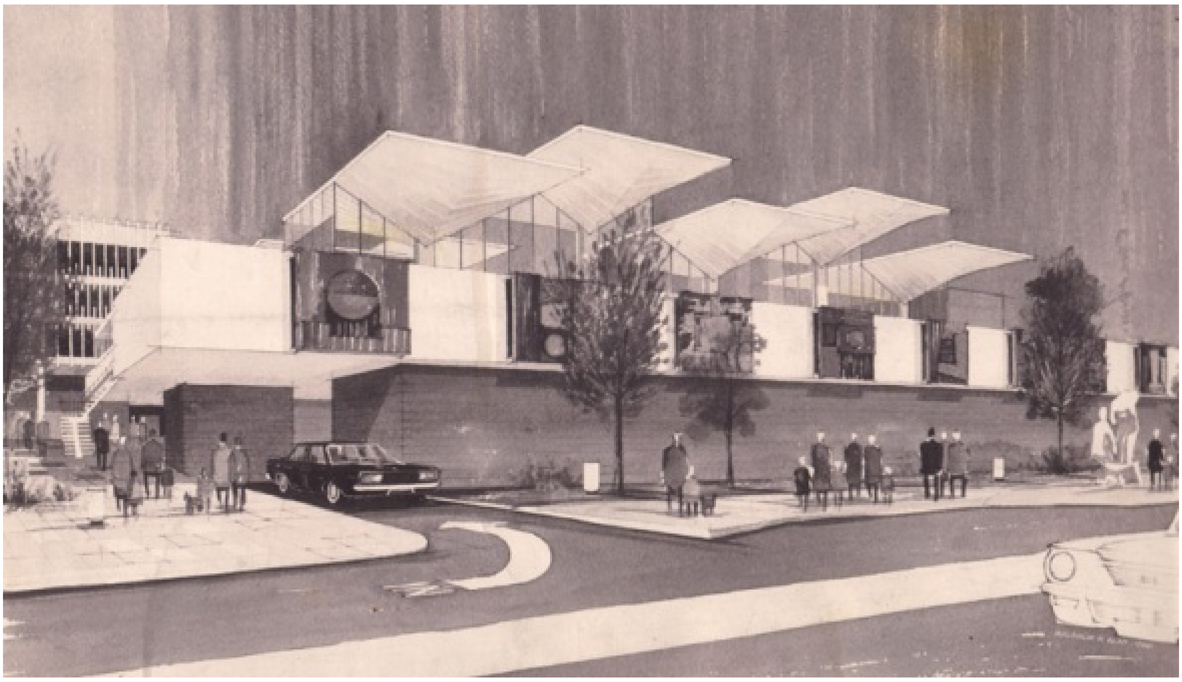

Figure 11-8 Artist’s impression of Queensgate Market. Signed and dated below the car on right (Malcolm K Read, 1966), from bromide print in author’s collection

January 1967

The outline planning application (TP16842 28) for phase II was for commercial development incorporating shops and retail market hall.

commercial shops	5,167 sq ft
market hall	44,946 sq ft
market shops and arcade	19,408 sq ft
total	118,521 sq ft

11.2. Development of the hyperbolic paraboloid mushrooms

Alderman Jack Sykes was reported in January 1966 suggesting that the market traders ‘know what they would like to see in their new Market Hall, They don’t want it to be a featureless “pill-box” type building’(Anon, 1966a)

Alderman Stephenson, wrote in April 1970 “Quite early the committee decided that much of the attractive appearance of a Market Hall depends on the roof design, and the architect Mr Kenneth Wood was instructed to give emphasis in his planning to this feature"(Stephenson, 1970)

In December 1968, nine months into the market's construction a press release issued by the Seymour Harris partnership said of the market

"The dominant feature of this development is the market roof... Its conception was designed to express the trading divisions of the market hall, and ingender (sic) an organic atmosphere, thus attempting to achieve the traditional market environment using modern techniques...the rough board shuttering is intended to give a textured finish to the soffit and accentuate the directional movement along the length of the market hall".(Seymour Harris Partnership, 1968)

An echo of this is in the market's opening commemorative brochure; "The Architect's conception was for the roof to express the trading divisions of the Market Hall using modern techniques"(County Borough of Huddersfield, 1970).

11.3. The significance of Gwyn Roberts

One of the Seymour Harris team for the second phase was the newly qualified architect, Gwynfor Edwards Roberts.[105]

Roberts, on leaving Llanrwst Grammar School, worked for the Llandudno architectural practice of Byron & Bancroft before his national service from February 1957 to February 1959 (Army, 1959). His army service took him to Germany, Hong Kong and South Africa. (W. Roberts, 1996) Then an architecture sandwich course at Liverpool College of Building 1960-3 and Birmingham School of Architecture for his finals, 1962-5; ARIBA in 1967(G. E. Roberts, 1967). His RIBA dissertation was *Services to industrialised building* (Edwards-Roberts, 1965). While he was a Birmingham student he met and befriended sculpting student, Fritz Steller.

He worked at The J Seymour Harris Partnership in Edgbaston while he was a Birmingham student and joined the practice on completion of his studies.

Roberts became the project architect for Huddersfield phase II. Roberts's previous experience of hyperbolic paraboloid roof shells is unknown. Opportunities for his introduction to them are apparent. The contemporary trade literature included many examples.

Other possibilities are:

[105] b.Conway 1936, d Birmingham 2004

1 Candela was on a lecture tour of five British cities (London, Cardiff, Leeds, Edinburgh and Belfast) in May 1959; three months after Roberts's discharge from national service (see section 3.11). Roberts must have been aware of the visit but no record of whether he attended a lecture or not has been found.

2. Roberts was studying architecture in Liverpool when the 1959-61 Mathematics and Oceanography Building and computer room were completed at the university. This had a remarkable juxtaposition of hyperbolic paraboloid shells and an assembly of murals (Discussed in Chapter 7).

3. The Seymour Harris team had local hyperbolic paraboloid shell umbrellas to experience and examine; the filling station at Five Ways, Wolverhampton less than three miles from Ken Wood's home. Discussed in section 3.17.5.

In 1966 potential shell design precedents were legion. The shell roofs of the market halls in Royan (1956) Caen-La Guérinière (1958), Plymouth (1960), Accrington (1962) Hamburg (1962), Smithfield (1963), Blackburn (1964) and Burnley (1969) were well reported and all either less than ten years old or in development. Seymour Harris & Partners were designing Five Ways Shopping Centre and Auchinleck House with folded plate cantilevering canopies at the time the Huddersfield project was initiated in 1960. Later the practice (as the Seymour Harris Partnership) was consultant architect for the new Burnley Market Hall so the practice had experience of the Silberkuhl roof shell systems.

British post-war markets had tended to have clear span halls and those that did not can be seen as the basement or secondary retail space to prime retail where the columns on the trading floor are supporting more than just a roof; Shipley and Birmingham. The exception is Coventry with roof top car parking. It was a departure for the trading floor to be interrupted

It is clear Roberts initiated the idea of hyperbolic paraboloid shell roofing

"In those early days when we started to talk about it and in some depth and that is when we bought Gwyn into it he then started to think about what possibly we could do and I remember him coming to me on day with one or two sketches and after discussing it asking whether we go ahead with it I said yes and we push as hard as we can and I think it will be accepted, as long as they can see that we are confident that we can do it this way". (Wood, K. Personal communication, 26 August 2004).

“He had a brilliant mind. We used to tease him about it but he had a head bigger than most people. He had got a large head and it was pretty full of brains.” (Wood, K. Personal communication, 26 August 2004).

Roberts’s captain’s testimonial on army discharge included;

“An extremely hard working and capable NCO. He is of above average intelligence and has good leadership qualities which when further developed will make him a useful leader.”(Army, 1959)

John Bloomer recalls that Roberts read lots of magazines and books and that Italian concrete was of great interest to him. (Bloomer, J. Personal communication, 26 August 2004).

“The hyperbolic paraboloid shells were then being considered but what we had then got was a fabric with the layout, to the best of my knowledge, was more or less square you had then an arcade of market hall shops. There was then an upper gallery with a café and entertainment space and a further row of market shops that I think was double fronted on the far side. And then the arcade from the commercial side came in. So what you had then was a definition where we knew the structure had to be a free structure. So how it emerged really was a series of isolated columns, in rows seemed to give us this chance with a series of roofs at different levels. (Bloomer, J. Personal communication, Womborne, 26 August 2004).

Vaughan agreed with the author’s proposition that Roberts wanted to have an interesting roof structure which would return to the traditional concept of the market place with rough wooden stalls shaded but not enclosed by a canopy. (Vaughan, A. Personal communication, Edinburgh. 15 May 2007).

There was a modern example of this in the centre of Birmingham, a few hundred yards from Roberts’s architecture college and less than two miles from the Seymour Harris office; the Bull Ring market, a traditional outdoor market. The market had been redeveloped with new permanent stalls that were novel; hexagonal canopied inverted umbrellas that sheltered clusters of stalls. Discussed in section 6.13

The Seymour Harris team was, of course, aware of the pioneering work of Nervi, the 1961 Chiesa dell'Autostrada of Giovanni Michelucci[106] and other Italian concrete structures,

“Where the inspiration for the shells came from was ironically through the early Italian stuff that was being done at the time. I made reference to the Italian Job, the Palazzo del Sporto for instance”. (Bloomer, J. Personal communication, Womborne, 26 August 2004).

[106] b. Pistoia 1891, d. Fiesole 1990

The Palazzo del Sporto of 1958-60, the Palazzetto dello Sport of 1957, both in Rome and the Palazzo del Lavoro of 1960-61 in Turin were all engineered by Nervi, all well known and by 1967 anthologised in a English language book on modern Italian architecture (Galardi, 1967). The book also includes the single shell roof vault of the1951 Pescia Flower market and the 1958-60 pavilion of the Turin Motor Show.

"Ken was very active in the Concrete Society in those days, and one of the things that emerged from the Concrete Society magazines of the day was photographs of very elegantly formed coupled series of roof shells because board marked concrete was quite, and I hesitate to say, an avant-garde material at the time but it was well recognised as a way forward and can I remember Gwyn sort of looking at these and going away and sketching, cos he was the design inspiration behind it all really. Gwyn, and coming up with the idea if we could actually use this form and we could apply it to the roof spaces, but instead of having everything coupled together we could be individual so they grew like mushrooms then we had a way forward." (Bloomer, J. Personal communication, Womborne, 26 August 2004).

An early conception was of one hypar umbrella spanning the whole market hall. As this was to prove to be 85m x 38m it would have been the world's largest. He asked his quantity surveyor colleague Alan Vaughan to cost the shell. Vaughan dismissed the proposal as far too costly. Roberts then projected two hypar umbrellas to span the hall. Vaughan again judged the notion too dear. Then three shells, then four. This impasse led to Roberts asking Wood to take Vaughan off the project because he was being "difficult". Wood refused and the two men continued to work together successfully (Vaughan, A. Personal communication, Edinburgh. 15 May 2007; Wood, K. Personal communication, Womborne 10 February 2008).

11.4. Concrete hyperbolic paraboloid shells

No listing of British concrete hyperbolic paraboloid shell projects has been found. Identified projects are listed and discussed in Appendix B.

Roberts and Vaughan together visited the John Lewis Partnership warehouse in Stevenage. They saw the use of unplaned board-marking in the grey concrete of the shell soffits and how even screw heads left a clear impression. They also saw how the bottom of the shell at the column head often left an untidy finish with leakage from the shuttering and cavities on the soffit where it would have been impossible to vibrate the mix enough to allow total compaction. The sprinkler system, downlighters and other services were suspended from the soffits. In the warehouse this was practical and not of any disadvantage but aesthetically it was not satisfactory for the sculptural roof of the projected market hall. (Vaughan, A. Personal communication, Edinburgh. 15 May 2007.).

Roberts sought to use asymmetric hypars for the market hall roof. It is not clear to Vaughan that there was a design imperative for this. (Vaughan, A. Personal communication, Huddersfield, August 2007.)

Bloomer thinks there was a need for the asymmetry;

"If you imagine that we have got the plan form. We obviously had to lay down the basic way the market was going to work and that in itself dictated the column spacing so that we had a situation that each of the shells couldn't sit squarely on each of the columns. " (Bloomer, J. Personal communication, Womborne, 26 August 2004).

Ken Wood knew that the asymmetry was a problem; the very nature of the unbraced individual structures;

"Token had a very good director and engineer and I can't even remember his name. He was a fairly big man. When you got him down out of the Token grasp and talked to him about it he said that is where your problem is going to be the keeping them individual., if you tied them together, no problem. We said that would lose the whole feeling for the market hall but luckily in the team was Jim Spillett of Leonard and Partners... and Joe Nichols, he was a brilliant engineer and also prepared to be adventurous and so it emerged. He sat down and looked at these things and first of all because of the way the space was they were unequal, so it was a cantilever. Right that was the first problem to solve. "No problem" he said "We make it twice as heavy at the back as we do the front. That'll hold it OK.

"He put some calculations on it and said well if they are all cast in the same axis and provided that the columns are within a certain height you can use the same columns...and he said they won't tip backwards and forwards But he said they will twist and they will nod and I think these things were 28'by 16' or bigger than that I think, fairly huge" (Wood, K. Personal communication, Womborne, 26 August 2004).

"We did some experiments. We made some paper models just to see the way things work and we were confident that the structure would do what we wanted it to do." (Bloomer, J. Personal communication, Womborne, 26 August 2004).

Nicholls says that Candela's work was not important to the design. Candela's published work had not addressed the issue of asymmetry; the necessary methodology for the shell calculations (Nicholls, J. personal communication 14 May 2005). Nicholls found, in the Institute of Structural Engineers Library, Eliahu Traum's

1964 paper on asymmetric hyperbolic paraboloids (Traum, 1964). The Traum paper was of such significance to the Leonard's team Ken Davies, Nicholls's junior, was to keep both Nicholls's photocopy of Traum's paper and the drawing sheet on which Nicholls had resolved the equation for the Huddersfield shell design.

A series of approximations had to be made for the Leonard designed shell structures. Spilett, with such novel structures, required reassurance that the anticipated range of differential movements between the shells would be limited.

Spillett commissioned Hugh Tottenham at the Department of Civil Engineering of Southampton University to conduct statical load testing on 1/24 scale resin models. The strain recorders' readings were provided on five-hole punched data tape and processed using the G36FG36[107] computer program (Tottenham, undated).

11.5. Detailing

The only significant source for the issues raised around the detailing of the market hall shells is the former Seymour Harris architect John Bloomer who worked on the project. He graphically recalled the matter.

"How the hell do you combine in-situ white concrete with pumped poured onto the head of an in-situ already cast natural column without having a complete and utter mess around the top?

"This is where we sat down with McAlpines and the engineers and we really kicked it around. I think I came up with the idea for the concrete caps "howz about we make some precast caps?" Which as it turned out were four piece things which could be cast on the floor, cured and locked around the top as permanent shuttering with shadow lines, the lot. Then we could pour the concrete in and it could cascade in to get the continuity on to the reinforcement and you wouldn't worry that you had got shuttering that you couldn't get out of the way.

"What would that do then would allow the shutters to be relaxed and brought away by 25 or 50 mm from the main face after the initial 72 hours and to remain for 7 or 14 days which was good. McAlpines came up with the suggestion that with regard to the board marking. We looked very carefully at the wood that we used, and we tried a number and if my memory is correct it was Canadian White Spruce that was selected. It was only three inches wide, the planks. They were screwed, brass screwed into place on the base shutter and the screw heads were left slightly high so that you got an indent. The other thing was that between every board there was a foam strip of the type that you use for draft excluders. There was hundreds of miles of this stuff. The result was that we had some crack, master carpenters involved. We cast some samples, we found that it would work. We did a few dummy runs on the shutter assembly and found that would work and the result was that they poured 21

[107] To date the author has been unable to further identify the program

of those shells off three shutter forms. So that was seven shells per shutter and the beauty of it was that the guys were so fastidious in the preparation with the mould oil or whatever that the seventh one was as good as the first one. So you didn't lose progressively because they made sure the pretreatment that the fines of the concrete was not going to infuse the shutters" (Bloomer, J. Personal communication, Womborne, 26 August 2004).

11.6. Art

The design of the market hall's Queensgate elevation, being a council project, did not have the mitigation of Murrayfield's directors.

The phase II elevation was not apparent in December 1968 when a Huddersfield Daily Examiner article (Anon, 1968c), that referenced the content of the recent Seymour Harris press release (J. Seymour Harris, 1968) used a 1966 artist's impression by Malcolm K Read of the new market hall from Queensgate that portrayed abstract forms quite unlike those later realised (Read, 1966).

Fritz Steller's friendship with Roberts was Steller's only connection with the Huddersfield project. Roberts turned to his friend Fritz Steller, who was just starting up his Square One workshop, inviting him to propose a dramatic articulation of the building Queensgate elevation.

Ken Wood felt that 'Fritz was so desperate to do it, he wasn't on his knees for the commission but he knew it would be a one-off opportunity' (Wood, K. Personal communication, Womborne, 26 August 2004).

Bloomer said:

'Fritz saw the nature of the building and really came up with some basic, illustrative ideas. The aim was to get the energy of what was going on inside the building onto the outside. We didn't want to actually express historic connotations but we wanted action… It was an architect-inspired suggestion to really give it some wallop; to make it distinctive and Mr Stephenson recognised that having seen some of these, like everyone does having seen them, stepped back and say 'Whey hey!' realising they were going to be unique when he saw them in comparison with other ideas that were then on offer, the two dimensional mosaics' (Bloomer, J. Personal communication, Womborne, 26 August 2004).

Having submitted maquettes, Steller was awarded a £9,000 contract by Seymour Harris in February 1969 to produce the panels (Anon, 1969f)

The design and production of the ceramics is discussed in Chapter 9 and the work is described in Chapter 12.

11.7. Lighting

The lighting of the market hall shared the same problem as other architectural shell interiors. Market halls without purloins, tie bars and trusses have exhibited a wide variety of artificial lighting techniques to keep the ceiling space clear of clutter.

An indication of the importance of the shell soffits being kept clutter-free was given by John Bloomer as he recalled Roberts's horror and fury at the mechanical engineer's intention to run fire prevention sprinklers across the roof shell soffits. (Bloomer, J. Personal communication, Huddersfield, 4 September 2004).

The original hypar mushroom covered market of 1955-6, Coyoacán Market used angled down lighters that were fixed to the columns. The cable conduits up and around with junction boxes can be seen in photos before opening (Figure 3-29 & 3.30).

Plymouth Market had quadrapod frames over walkways, rising from the stalls with pendant lights. Royan has crane-like cantilevering frames with downlighters. Hamburg had penant boxes of lamps in two rows under each shell. Accrington had rows of fluorescent tubes along shell beam edges. Blackburn had lighting provided by reflected light from the shell soffits, illuminated by tungsten–iodide flood lights positioned on the side walls. Smithfield poultry market has no space lighting; lighting is confined to the stands in the trading space below the shell roof.

Non-market hypar roofed public spaces have had the same variation. The central court of Apache Plaza had discrete down lighters at the joints between adjacent shells; there was also underwater uplighters in the fountain pools.

Katowice Station had four white flying saucer- like lamps on black brackets from below each column head, providing up and down lighting (see Appendix D).

The designers of Hatfield swimming pool (see Appendix B) and Harborne service station both lit the soffits as means of reflected space lighting from boxes at the column heads.

The Huddersfield solution was discrete, sophisticated and inefficient. The modern and novel light sources, unavailable to earlier market hall projects were hidden in light boxes that seemed to be part of the trader's stalls. But the 4 x 400W uplighters were the same for all 16 columns with no reflectors irrespective of the distances to the shell. Early photographs show intense white lighting to the column just above the light boxes (see Figure 1-6).

11.8. Stalls

The 1963 Birmingham indoor market stalls and the Burnley stalls of 1969 (where the consultant architects were Seymour Harris) with their continuous fascias and applied lettering appear similar to the realised Huddersfield ones.

Blackburn Market's stalls are raised on terrazzo upstands cantilevering proud of the market floor. The Queensgate arrangement was similar but with radius corners rising from the floor.

Sprinklers were fitted to the stall frames; they were unobtrusive behind stall fascias. The alternative had been to run the pipework across the shell soffits.

The planned diffusion of shoppers as anticipated in Coventry was eventually accomplished by breaking the stall plan away from the roof shell pattern intended by the architect. The realised market layout can be seen in Figure 12-1.

11.9. Flooring

The market was generally floored with terrazzo tiling with radius corners to stalls up-stands. Such tiles certainly been used at Blackburn market. Earlier market use has not been found,

A market arcade photograph of June 1970 shows dark ribbed floor tiles in Flemish bond(Huddersfield Examiner, 1970).

"At the vintage I am almost sure we use Pirelli ribbed rubber flooring in the arcade with the market shops. Cos it was tough." (Bloomer, J. Personal communication, Womborne, 26 August 2004).

Pirelli ribbed rubber flooring was first used at Rome Termini in 1949. It appears to have been used at Blackburn Market in 1964. By 1965 it was being manufactured in Britain and was used at the Birmingham Bull Ring shopping centre both unbonded and bonded(Fudge, 1968). It was advertised as a hard wearing, non-slip, sound-deadening surface(Pirelli, 1965).

11.10. Glazing

As covered in Chapter 4, no evidence of glazing of shells designed to allow movement prior to the Huddersfield project has been found. The Queensgate shells, being free standing structures and asymmetric, were expected to move under wind and snow load in three planes; forward and back, up and down and left and right.

The Huddersfield company, Heywood Helliwell Ltd were contracted to find a solution to allow glazing between the shells to perform in wind and snow load conditions.

Heywood Helliwell's Chief Designer, Les Ratcliff was reported by a local newspaper in January 1969;

"We have never tackled a job quite like this before, for the building is absolutely original in design.

"I am glad to say, however that I think we have now mastered all the difficulties. The building has proved quite a challenge to us, but we are now hoping that everything will go smoothly" (Anon, 1969c).

Ratcliff was experienced, his 2004 autobiographical notes, prepared for a seminar on Huddersfield market's design included;

"His work included being the initial project designer for the cladding of the GPO Tower in London. Les was involved with the development of aluminium and plastics from the start of the use of these materials."

For glazing to the perimeter of the shells Heywood Helliwell specified patent aluminium framed glazing suspended and fixed only from the upper hypar (see Figure 11-12 to Figure 11-14) and devised the use of concertina membranes of ethylene-propylene-diene monomer (EPDM), a synthetic rubber, that allowed the glazing to perform between adjacent umbrellas that can move independently 2" in any direction; left and right, forwards and backwards, up and down (see Figure 11-10 and Figure 11-11).

In 2004 former Heywood Helliwell Product Designer, Malcolm Dobson who worked with Ratcliff on the Huddersfield project, described the EPDM concertina membrane as a product more familiar to bridge engineers as an expansion joint material that was supplied by DuPont in 1968/9. Dobson had kept a sample from the project (see Figure 11-9).

Figure 11-9 A manufacturer's 105 x 80mm sample of the EDPM concertina membrane with a Heywood Helliwell alumininium profile from the 1968 design process of Queensgate Market's glazing (Author, 2012)

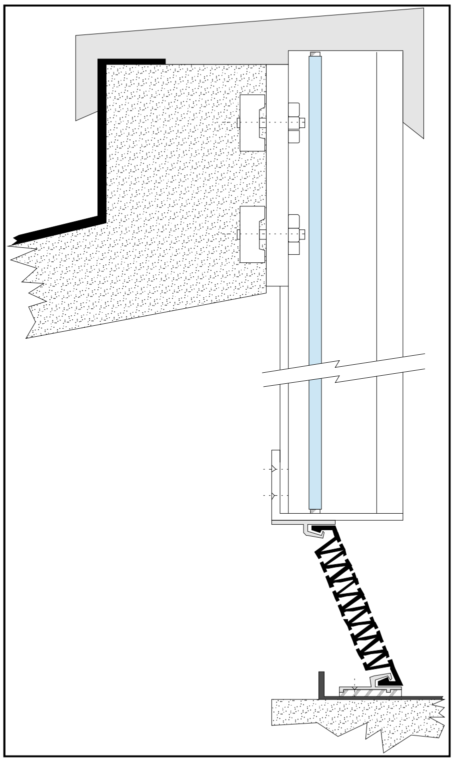

Figure 11-10 Diagram of vertical cross section showing the use of the EPDM membrane at the bottom of the suspended glazing when attached to the top of a neighbouring shell (Dobson, 2004)

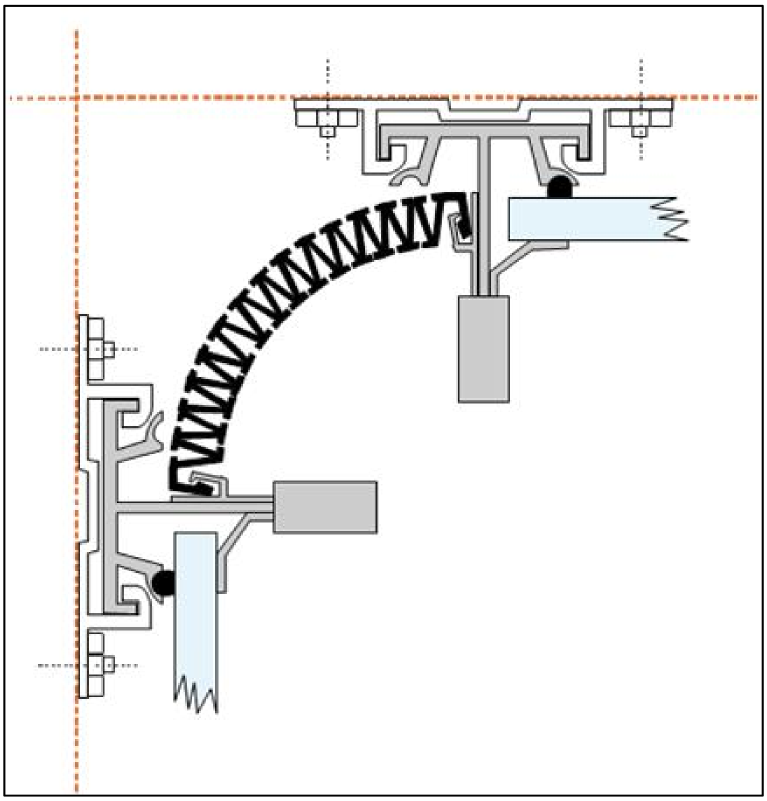

Figure 11-11 Diagram of horizontal cross-section showing the use of the EPDM membrane at side of suspended glazing when attached to suspended glazing of another shell (Dobson, 2004)

Figure 11-12 Queensgate Market. Patent glazing mullions bolted to shell perimeter (Colin Prior, 1969)

Figure 11-13 Queensgate Market. Bottom of patent glazing mullions bolted to bottom rail profile, clear and proud of U section on sill (Colin Prior, 1969)

Figure 11-14 Queensgate Market. Detail of bottom of patent glazing mullions bolted to bottom rail profile, clear and proud of U section on sill (Colin Prior, 1969)

Figure 11-15 Queensgate Market. Glazing in place (Colin Prior, 1969)

Figure 11-16 Queensgate Market. Complications of glazing showing how the change of shell is acompannied by mulions that need a membrance between (Colin Prior, 1969)

11.11. Design philosophy

In the absence of a design stage or preconstruction record of the design philosophy for Queensgate Market there are retrospective observations that may illustrate the position.

Ken Wood was the Seymour Harris partner responsible for the Huddersfield project at the design and construction stages.

"Ken had tremendous skill in convincing the client that we knew exactly what we would do and the faith that he had in his team of young guns as we were then. We were very young and wet behind the ears, that we could deliver what we promised to deliver. The person who pushed it hard from Huddersfield's point of view was Clifford Stephenson. He really believed in it. Douglas Graham was more on the politics and finance side and Hartley was for the market traders. I think the combination was excellent." (John Bloomer 26 August 2004)

“Everyone wanted something a little bit special. The market traders wanted a market hall but they didn’t know what they wanted. We recognised if you like, everyone in the team recognised that we needed to produce a pre-eminent part of the overall development through the market.

“The other objective I think was one was that it had to have an envelope that encouraged the tradition variety bustling sort of market hall and that the key for us at least was the variety of styling and the use of the maximum amount of daylight, so that if you like in the same way that traditional markets had tented stalls, but everything else was open. If we could produce echoes of that then that is really where it started from. (John Bloomer 26 August 2004)

Not everyone was impressed. In 1971 the NABMA president, Cllr G R Moyes, said in his presidential address;

“The decision of this Association to hold the Executive Committee meeting in the constituencies of Member Authorities where new markets were either in the process of being built or had recently been opened was indeed a decision that has made this year very interesting and added a valuable source of information for delegates. In conjunction with the Executive Council meetings I was able to visit the new markets at Huddersfield and Leicester.

We have to decide in the future whether the sculpture on the walls, the flowing ceilings and other paraphanalia [sic] really have an important part in the life of the market. It is not easy, I know, because models and sketch plans can be very misleading and what looks exciting as a model looks very different when completed. I am not suggesting that we should not have good buildings or layouts, what I am suggesting is that we should get what we want as Market Administrators and not costly monuments – after all it is we who have to answer to the tenants [sic] criticisms of the rents that must be charged, not the people whose names grace the plaques on the wall.”(Moyes, 1971)

Moyes’s speech led to Hartley, the Huddersfield Alderman, persuading Ken Wood to make a speech called ‘Monuments or Functional Buildings’ in reply at the NAMBA conference in 1972(Wood, 1972). A facsimile of the speech from conference programme is in Appendix D.

Wood tackled various aspects of market design. He referred to the modern practice of separation; less confusion of customers and services, vehicle movements on another floor, goods lifts and the discharge of rubbish.

Wood touched on building regulations, Public Health Act, The Food Hygiene (Market Stalls & Delivery Vehicles) Regulations 1966, the Shops, Offices & Railway Premises Act 1963 and planning acts and how these influence the dorm of the design and the their siting, appearance and relation to adjoining buildings.

Wood emphasised the contemporary inattention to the skyline of buildings that he said used to be important; “a notable feature of townscape”

Wood was assertive about art and buildings.

“I favour trying to display where applicable, art, either murals or sculpture as part of buildings where it is continually on display and can be seen and commented on favourably or unfavourably by members of the public”.

He emphasised that it could be a salvaged piece or a local commission (as he had done at Wallsend, Figure 10-17) which provided a free exhibition of local industry.He addressed Moyes’s taunt about flowing ceilings;

“Referring to the statement made last year about flowing ceilings, this is not too easily answered and to produce an analysis of a normal flat roof type of structure and the roof form at Huddersfield would mean that two entirely separate designs would have to be drawn and costed in detail. Market halls are not just a series of boxes with the possibility of having one of a series of standard roof types running through the scale of dirt cheap to damned expensive. If this was so other factors would need to be altered, such as foundations, columns and glazing to name a few.” (Wood, 1972)

Wood said he aimed to design interesting and functional buildings within fairly rigid bounds and limits. This needed the full co-operation of the clients; public or private and a full professional design team.

In conclusion Wood reflected on markets being the most human of all institutions, an area of self-expression and that if market buildings were to be erected that were not worthy of the standing of a town centre, that are not planned properly they could contribute to the degeneration of town centre shopping.

It was not about pieces of sculpture on the walls or monuments; it was that markets should be of a high standard to provide every facility for the shopper as it was being done in shopping centres. Market developments had to keep in step with this progression.

Summary

Queensgate Market’s position, even its existence was because Murrayfield could see that the site of the 1880 market was a prime retail site and because of the nature of the market it was unserviceable. Hygiene, deliveries and refuse and pedestrian access were all compromised by shared street level access from narrow roads to three sides. By giving the new market a secondary site the market hall site could be redeveloped with basement servicing. The phasing of the development meant that the market could be built with a new car park.

The work of the Seymour Harris team was certainly either setting new standards or was state of the art in several ways; glazing, lighting, shell technology, surfaces, servicing.

J Seymour Harris's nine point list, the development of the shell concept through Robert's short career and reading, Wood's concrete experience and Steller's long art training all contributed to the genesis of Queensgate's qualities. In the next chapter we shall see how Wood's 1972 lecture was a reflection of what was realised at Huddersfield.

Chapter 12 Huddersfield Market diagnostic evaluation

“...it was immediately apparent to me that here was something special”.
Neil Jackson (Jackson, 2004)

A diagnostic evaluation of Queensgate market (see Figure 1-1 to 1-13). Diagnostic evaluations of other market halls since 1945 in this format are given in Appendix A.

Huddersfield New Market Hall, opened 6 April 1970

Cost

£736,000 (HDE 1 Oct 1969)

Site

The market hall part of Phase II and the other Murrayfield development phases in Huddersfield were built on steeply sloping sites. The design of Phase II is lowest at top of the slope so the view of the 1875-81 showpiece town hall is uninterrupted and wraps round the 1939 library, never challenging its monumental classicism. The design is highest at the bottom of the slope with a dramatic elevation to the ring road. The servicing of the market and the rest of the shopping centre is entirely by service road access from the ring road with goods’ lifts and stairs.

Layout

The pedestrianised Piazza has all shop entrances at one level. The market is at the same level as are all its shops and stalls.

Public access is on three sides by five entrances. One, on Peel Street, on the high side has a flight of stairs down to the market. The car park entrance has steps up to the market. On the north side, from the Piazza the two entrances to the market are through a market arcade and an arcade of privately owned units. Some of the units onto the Piazza also had a market hall frontage.

Mezzanines

On the Queensgate side of the hall are stairs up to a heavily glazed mezzanine that was intended for use as a 260 seat restaurant. Several market traders told the author that the Forte Group had an option or agreement with the council to lease the restaurant and that this fell through when Forte found that the market had been designed so that there was no public access to the mezzanine out of market hours. Could this really have been a fashionable success like Forte’s Gwynne designed Serpentine Restaurant in Hyde Park?

In September 1970 a newspaper article stated that the corporation had been advertising for 13 months for a tenant without success. The markets committee was reported to have looked at similar schemes at Blackburn and Burnley markets; Blackburn appeared to do well, and the committee had felt there would be plenty of interest in the same at Huddersfield. Rowntrees and Forte’s were among the few firms that inspected the restaurant site but then lost interest. The two sets of terrazzo stairs could be used to reach this floor and that access, it was suggested may have been the problem(Anon, 1970h).

From the restaurant there are views across the market hall and from the adjoining roof terrace, a panoramic view across the east of the town.

The terrace has a canopy of the shells that extended from the columns. There are cast-concrete uplighter cases on the terrace holding floodlights. These lit the shell soffits over the terrace.

In the market there is also a central two-storey panoptical structure; glazed market offices below are waste disposal chutes, stairs, lifts and janitorial supplies.

Stairs and lifts from the market floor give access to the mezzanine floor below, which was designed with preparation areas and traders' rest rooms and storage cages. On the lower levels are further storage areas and loading bays.

Structure

The market is built as a reinforced concrete frame. Infilling is by concrete slab, brickwork and stone

The roof structure is made up of 21 freestanding 3'6" x 2'3"columns at 11', 15’6”, 20’ and 24'6" tall above the market floor. Each supports, 5' off-centre, an asymmetrical shell, of four rectangular insitu cast board marked hyperbolic paraboloid shells. The four hypars form an inverted umbrella.

Thus the mushroom shells cantilever 23’ to one side of the column, and 33’ to the other. The shells are 56' x 31' and 10' deep. The umbrellas are not connected to each other structurally for bracing; they each stand and function independently.

The shells are in four rows of four and one of five facing Queensgate. From north to south the rows alternate in height, and from west to east they step upwards, and then down. This means there are gaps of 4'6" between neighbouring roof sections.

The shells are achieved with hot rolled steel reinforcing and high quality insitu concrete with a 3/8" aggregate and sand of pure very hard Bee Lay limestone from the Ballidon quarry, Derbyshire. There are conflicting sources on the shell covering. The upper surface was either lined with ½" expanded polyurethane board, covered with roof felt that fairs rainwater funnel-like into a PVC pipe down the centre of the pillar (Prior, 1969) or, as in a letter from Seymour Harris & Partners with the quantity surveyor’s cost breakdowns for the roof shells, the insulation is 1” of compressed cork and cast iron pipes (Tranter, 1969).

Each shell weighs about 80 tons. In order to distribute their weight evenly at the column head they are 3" thick on the longer side and 7" inches thick on the shorter side, The soffit of each shows the impression of rustic board marking of the parallel planks of the unplaned Canadian White Spruce shuttering that runs along the length of the shell.

At the column head, accentuating and defining the junction between the shell and column a set of four white column capitals can be seen, with shadow line joints. “This simplified the shuttering at this junction, the void formed by these units being filed with the shell concrete when the shell was cast.”(Prior, 1969)

Stalls

On opening the hall had 187 rectangular market stalls and 27 shop units, available singly or in multiple units.

Excepting the perimeter, the stall layout does not allow any clear sight lines across the market (Figure 12-1)

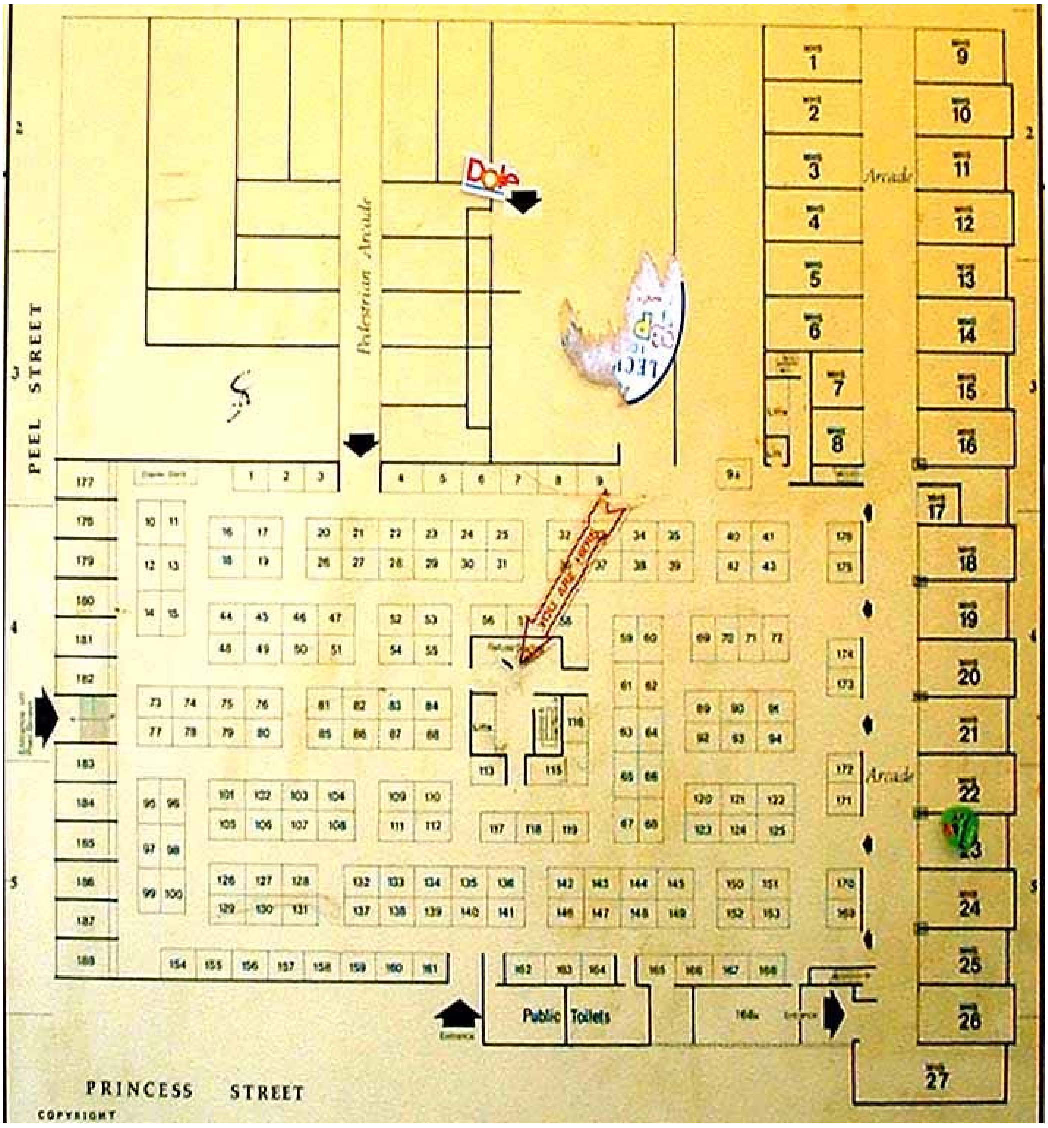

Figure 12-1. Huddersfield Murrayfield Phase II floor plan (1970)
showing market hall stalls, shops and private retail block (Author 2004)

The shops and stall units are of standardised steel framed construction with sprinklers integral to the frame. All the stalls are on coved skirted terrazzo plinths from the terrazzo tiled floor.

The melamine stall risers and dividing partitions were manufactured and supplied by Insulation Equipment Ltd. Stalls were supplied with regular white fascias on which tenant's signs were fitted in a regular default style unless the tenant provided otherwise.

Glazing

The market has 10,000 square feet of glazing.

The intervals between the roof sections are single glazed. Patent aluminium framed glazing is suspended, fixed only from the upper hypar. Concertina membranes of EDPM, a synthetic rubber are fixed to the bottom rail and to the lower shell and between glazing frames at corners. This allows the glazing to perform between adjacent umbrellas where each shell can move independently 2" in any direction; left and right, forwards and backwards, up and down.

Similarly the intervals between the roof shells to market edge and the wall below is glazed to allow for movement.

There are louvered windows on some glazing to the outside walls with remote manual winches.

The mezzanine restaurant alone has exterior glazed aluminium curtain walling that transects the shells at the column position rather than the shell edge.

Artificial lighting

The space lighting was from boxed uplighters about 8' high on each of the hall's columns – discrete continuations of stalls' fascia boards. The lamps within were GEC 400 watt mercury indium bromide metal halide quartz incandescents (GEC 400w MBI/U BLUE). The date code on them indicates the date of production as being February 1970.

They were developed only for coloured floodlighting effects. GEC produced this blue lamp as a copy of a similar invention from GE of America, who developed the technology behind them in 1965 (James D. Hooker. Personal Communication 2 June 2011).

There was no intrusion by any mechanical service above the stalls. Although long disconnected the lamps and fittings are still in place. No reflectors or fixtures for reflectors were found in the light boxes when the lamps were inspected in January 2011. There was found to be one lamp on each side of every column; totalling 25,600 watts of uplighting.

All the stalls had banks of fluorescent tubes in the roof frame of the stall, behind the stall fascias. The stalls were open with no roofs or canopy. This meant that stalls' fluorescent lighting lit the roof shell and light reflected from the roof shells lit the stalls (This is shown in Figure 1-6).

Flooring

The market arcade floor was fitted with Pirelli ribbed black rubber. The main market floor is pale terrazzo tiles with electric underfloor heating.

Exterior

The market hall’s entrances were not greatly differentiated in the retail elevations to the piazza or Peel Street.

The architects' original design included concrete finishes to all elevations. The client demanded stone cladding, considering it to be sympathetic to the town's stone work. 14,000 square feet of stonework and buff textured bonded brickwork that was laid with great expertise by masons laid-off from the construction of Liverpool's Anglican Cathedral. The quality of the masonry is never compromised in any remote or hidden part of the exterior.

There is more patent glazing over natural stone walling and expressed framework to the façades on Peel and Princess Streets, where there are direct entrances into the market hall, including a bridge from the adjacent car park. On this last entrance is the commemorative slate plaque unveiled at the official opening of the market.

Art

The roof shells of the market hall have been described in many terms; as sculptural, flowing, poetic, evocative, modernist interpretation of Gothic, cathedral-like, dull concrete, dismal, grey slabs and boring shuttered concrete.

The Queensgate façade of the market hall displays five roof shells to the mezzanine restaurant with patent curtain wall glazing with glazing bars synchronised with the roof lines.

Beneath the restaurant, against the outside wall are 19 shop units that vary in depth alternately. So that from the outside the first floor is indented delineating each trading space which is emphasised by ceramic panels by the Square One Design Workshop. The nine relief panels (18' x 18') are proud between Elland Edge ashlar and over stone sneck cladding. The panels continue across the façade, nine panels with 10 ashlar intervals.

To the right hand end is the later, much bigger and double-sided tenth panel through which passes through the staircase that rises from Queensgate to the Piazza.

The work was said to be the largest ceramic sculpture in the world, being made from 50 tons of Stourbridge fire clay fired in a reduction kiln at Snitterfield at stoneware temperature (1250 to 1300 degrees Celsius), making them acid rain and chemical resistant. The rust-brown colouring of the panels came from iron and manganese oxides applied to the work before firing.

The work is entitled *Articulation in movement*. Each panel has a representation of the market's mushroom-like boardmarked shells that are turned 90 degrees with the bas relief stalks, asymmetric and striated cap soffits of each resembling a trumpet's bell being harmoniously aligned with adjoining ones. This gives feeling of movement right along the building. Around the stem of each are haut-relief organic representations that reflect the nature of the goods available within the building.

The market's interior north wall at clerestory level is decorated with a metal relief *Commerce.* This is made of black painted metal relief of semi abstract figures, again by Fritz Steller. At the left of the piece scenes of sowing, husbandry and harvesting can be seen. On the right are representations of local industries. In the middle is trade, the essence of the market with agricultural produce and manufactured goods.

In a corner of the market is a stone relief of the town's armorial bearings that were salvaged from the police station that had been on the market site.

Novelty

The roof shells were novel, it is clear that there had been no other structure of assymetric freestanding hypar umbrellas. The glazing achieved clerestory lighting across the roof.

The extensive use of public art was unprecedented in any other identified market hall. The two commissioned works articulated 1, the structure, layout and function of the building and 2, agriculture, industry and exchange. The sculptural roof was intended to be a feature that reflected trading divisions in the market.

The trees along Queensgate are from the original architect specified scheme.

The elevated and glazed central market office is a major feature of the interior, no other market examined was found to have a panoptical market office.

Aspirations

The market hall's development featured in seven contemporary national publications; Concrete (Anon, 1969g), Architectural Review (Anon, 1970a), Concrete Quarterly (Anon, 1971e), The Guardian (Ardill, 1971), The Architect (Anon, 1972f), Building (Anon, 1972a), and Glass Age(Anon, 1972d). In 1975 a BBC programme led to an article in The Listener (Nairn, 1975)

Editorial comment was slight;

"The roof is the most interesting aspect of the reinforced concrete structure, designed to give the maximum amount of natural daylight and definition to the groups of stalls. It also adds height and dignity to the hall and the board marked shell soffits providing a perfect neutral canopy for the complex colour and detail below...Altogether this is a shopping centre with more life and architectural distinction than most" (Anon, 1971e)

"And rounding the bend, the staggering cliff of the new market hall with its outsize relief panels of rich earth-coloured stone and its mushroom roofs." (Ardill, 1971)

"The one place where modern architecture has really thought about the inner Huddersfield is in the new market hall. The designer here had a really difficult problem. It was a sloping site in which he had to fit this market hall. Although the outside was a bit glam, he really went to work on the inside. The firm was J Seymour Harris who do a lot of town centre schemes up and down the country, and whoever was the designer in that firm really did Huddersfield proud here. To cope with the slope and to fit everything in he used concrete mushroom columns at intervals - mushroom because they splay out at the top and this could have been a structural gimmick; but here that are used to define spaces, to relate them, to bring the light in from the top so that you are at one with the building itself. That combined with the fact that the stalls are not regimented has made it a marvellously human place, the opposite of most indoor shopping centres. It is in-fact, and this is pretty rare in Britain-a real modern market(Nairn, 1975).

Visits to other markets

Wolverhampton market July 1963, Coventry market October 1963, Blackburn Market December 1965 and Castle Market, date unknown (Anon, 1966a) were visited by Huddersfield market traders, councillors and representatives of the Murrayfield Real Estate Co.

Architects

J Seymour Harris Partnership; structural engineers, Leonard & Partners; quantity surveyors P A Fisher & Partners; general contractor from March 1968 Token Construction Co Ltd & from late 1968, Sir Robert McAlpine and Sons Ltd.

Chapter 13 Discussion

13.1. Shell engineering

The genesis of the thin concrete shell in Germany, associated with Franz Dischinger was clearly an innovation with lasting global significance. Engineers that did much to develop reinforced concrete and shells beyond the barrel vault in Britain trained in mainland Europe; Kamal Hajnal-Kónyi, Oscar Marcel and others. Those responsible for introducing shells to the Americas were also European trained; Tedesko and Wachsman. Additionally the Spanish architecture student Felix Candela, was fascinated by the thin shells; especially the work of Dischinger, Maillart, Aimond and Lafaille. His later autodidactic work in Mexico led him to read widely, hypar experimentation and dramatic hypar architecture.

In the early 20th Century the hypar was also first being consciously realised in architecture by Gaudi, in art by Constructivists and in engineering by Aimond, Lafaille and Hruban.

The development of the hypar is complicated and was either progressed despite or through mid-twentieth century migration caused by persecution and war. The migration of men through conflict and intolerance who were associated with the precursors and design of Queensgate market's hypars is notable; including; Eliahu Traum, Kamal Hajnal-Kónyi and Felix Candela. Wilhelm Silberkuhl, whose work was used to roof contemporary British markets but not Queensgate had a path that is not as clear (see Appendix F).

Knowledge and influence also came from Europe even if the practitioners work came only through publication or lecturing in Britain; Baroni, Hruban, Maillart, Nervi, Sarger and Torroja.

British concrete shell construction started with German designed barrel vaults in 1935. In the 1960s the same British engineers, Blumfield and Seel were working on timber hypars.

In Britain engineers such as Arup, Hajnal-Kónyi and Marcel with European pre-war training had developed great reinforced concrete expertise that was transferable to new structures and was passed to younger men; Anchor, Bond, Spillett and

Tottenham all of whom became British hypar pioneers. Despite more than the 40 years between the construction of the two buildings, there is a close professional connection between Frankfurt and Queensgate markets. Hajnal-Kónyi supervised tests of roof shell models for Frankfurt, worked for Twisteel (later GKN), which was responsible for the engineering of many British concrete hypar projects and he worked with Sam Scorer on four hypar projects. 40 years after his Frankfurt work his former pupil, Spillett, commissioned tests of roof shell models for Queensgate (Tottenham, undated).

Meanwhile in Mexico, Candela was using European reinforced concrete and engineering technology to develop exciting new structures that were cheap. Engineers like Traum and his partner, Zalewski, were inspired to progress the understanding of the engineering of Candela's work and carried out dramatic hypar work in Europe and Israel.

Although Candela's hypar umbrellas seem to cover every sort of building type in Mexico it was not just in Mexico that use of concrete hypar mushrooms were widely used. These, all with their precedents including Candela's work in Mexico could be seen;

Shelter – Mound Stand, Bristol and Five Ways garage, Wolverhampton
Display – Brussels Volkswagen showroom and Israel Museum.
Storage – Stevenage warehouse
Googie emblem style – National Mercury filling station at Harborne
Concourse – Apache Plaza and Katowice PKP station.
Market – Sète and Casablanca

A clear early example of the direct Candela influence is the Mound Stand. Burrough quested for thinness in his Mound Stand shells but being disappointed by the thickness of the edge beam, the work was not predominately sculptural but inexpensive and functional. Hajnal-Kónyi and Scorer's work unequivocally bridged the gap between engineering and sculptural form. The editor of Concrete Quarterly had asked in 1959 'Is there a reason for the comparatively pedestrian nature of much British work?' (B. Campbell, 1959). As she posed the question novel projects in Britain were being realised.

13.2. The hypar as a sculptural form

In 1958 the architect and critic Robin Boyd[108] published an essay, *Engineering of Excitement* in which he saw the hyperbolic paraboloid as the structural form to most symbolise the new excitement of architectural engineering.

"The plain but wholesome dough of modern architecture is being flavoured with more and more currants: buildings with warps, waves, folds, droops and other unexpected shapes sharply outlined against the modular grid background. They are the shapes seen on graphs, on stress diagrams over an engineer's shoulder, and each gives a visual indication of a special structural principle...

"Despite their apparent diversity these buildings have in common that every one of them can be, and frequently is, called exciting... the new shape architecture is not simply providing solutions to structural-functional problems and it is certainly not done frivolously. It may mark the beginning of warmer collaboration between architecture and engineering" (Boyd, 1958)

Boyd suggested three factors that contribute to the apparent movement.

Firstly, until the 1950s the exploratory impatience of technologists was frustrated in post-war times.

Secondly, architects with a 'science fetish' wanting to be "little Leonardos" were in love with the idea that their discipline could merge the incompatible natures of art and science. This was emphasised by masters of one trade wanting to show their proficiency in another. To illustrate Boyd cites Le Corbusier as painter and Wright as engineer. The architect "in this nuclear age is embarrassed still to be considered an artist. He would rather invent a structure than seek spatial inspiration".

Thirdly, a reaction or swing against the notion of universality in modern architecture, instead 'a hankering after the particular, the individual poetic expression'. In the international style each building's design was expected to adapt to suit the need of regional variation, a theory capable of universal application. Here the universal was forsaken because such exciting shapes were conspicuously once-only creations; "They are in short poetic buildings"(Boyd, 1958).

Candela's feted British lecture tour May 1959 led to an architect acknowledging the related sculpture of Naum Gabo. Gabo's work was being developed by others in

[108] (b. Melbourne1919, d. Melbourne 1971)

Britain. Barbara Hepworth's commission from John Lewis only just predated the partnership's Stevenage warehouse which was also appreciated on plastic and spatial terms.

Since the work of the constructivists the hypar has been expressed in many plastic forms and also, by Xenakis, musical. It is apparent that the1950s and 1960s was a time of the hyperbolic paraboloid being used by artists in a range of media. The influence of mathematical modeling was clear in well-reported and known contemporary architectural sculpture. Three examples illustrate this; Gabo's Rotterdam work, the Philips pavilion in Brussels and on London's Oxford Street, Hepworth's winged figure.

The hypar shell was seen by architects as a means of producing more than sculptural interest, unifying and creating rhythms within buildings such as a Two Saints, Southwark were being designed with a futurist zeitgeist. Significance was being attached to the architecture of hypars. In a West Ham school a hypar was used "to express the communal and reactional (sic) part of the project," the assembly hall. In a Hendon church the "undulating surfaces of the shells added great interest to the interior which was quite devoid of any decoration treatment". An Ipswich school entirely roofed concrete hypars formed "a rhythm unifying the whole" (Hume, 1961).

The John Lewis Partnership magazines were lyrical on its Stevenage warehouse "It has quite a real beauty of its own. That famous new roof, which from the outside has been likened to an inside-out umbrella, from the inside has the lift and flow of waves or of birds flying. The concrete section of the roof curve and sweep against the regular rows of clear windows that give the whole design such lightness." "It's like cloisters", somebody said (Anon, 1963h) and "It will be a vast place and a really awe inspiring with its vaulted roof which has something about it reminiscent of a cathedral"(Poole, 1988).

Queensgate Market hall roof has been seen as sculpture and as a modern interpretation of Gothic. We have, from the architect, the report that the architect sought to engender 'an organic atmosphere' of the 'traditional market environment' that accentuates movement along the market hall (Seymour Harris Partnership, 1968). The boardmarking of the market's shells certainly accentuates them.

Boardmarked concrete was not novel but boardmarked hypars were something of a Candela speciality; it was not artifice, it was how his shuttering was constructed, reflecting the straight lines found on the hypar tympan. At the Mound Stand plywood was used giving the soffit a clean finish. At Stevenage and Huddersfield the boardmaking was artifice, it ignored the hypars' generators and was laid longitudinally akin to the planks of a ship's hull. The shuttering was plywood with the unplaned boards laid within to give texure and pattern to the shell soffits. At Stevenage the board-marking ran in the direction of the row of shells except that at the border of each tympan the pattern was interrupted by a wide border running perpendicularly.

At Huddersfield the pattern is uninterrupted and without ridges from gaps between boards.The elaborate counter-intuitive joinery needed to achieve this is thought to be unrepeated as the spruce planks had to accommodate twists in the shuttering yet present a tidy fit. To ensure the best finish, not coarse as at Markham Moor (Figure D-32) and Stevenage, foam strips were squeezed between planks by skilled joiners that earned the architects' appreciation. As a final touch roundheaded screws were used so that they would appear as countersunk in the shell soffit. Such a finish was elaborate and purely to enhance use of timber patterning to giving senses of market shelter and of movement through form. No precedent has been identified.

The 1963 comment on Hamburg Market, in which the dramatic roofs could be clearly seen from the open topped stalls, seems most appropriate when considering Queensgate Market;

"This curvature of the roof in all directions in each section undoubtedly produces a pleasant architectural effect. There is a shifting interplay of light and shadow and the building despite its size, never appears monotonous or clumsy. The other side of the picture and its ingenious engineering solution was the great difficulty presented by the analysis and construction of this unusual shell roof"(Anon, 1962k)

13.3. Felix Candela

Candela was and can still be seen as both an artist and engineer. His publishing on his mushroom hypar work was a spur to many:

- to study by academics such as Traum
- intriguing to practising engineers such as Bond, Marcel, Faber, Sarger and Kostanjevac

- inspirational to architects such as; Thorsen (Apache Plaza), Scorer (Lincolnshire & area), Le Couteur (Sète) and Roberts (Huddersfield)
- influential to architects such as; Gwynne (The Serpentine and York's Theatre Royal) and Rowberry (Harborne)

The practice of British concrete hypar construction, precast and insitu (circa 1957 to 1969) is more extensive than has been previously reported. It is closely allied to the development of British timber hypars that were built 1957-1975. The engineers had transferable skills. A summary of British hypar concrete mushroom shell structures is given in Appendix B.

Despite the assertion that Roberts was alone in Britain in realising 'Candela's umbrella concrete shells as a market roof the influence of Candela's hypar umbrellas was contemporaneously influential on the designers of other markets. For Keighley (1971) and Bletchley (1974) the roof shells were plastic but nevertheless influence was there. As confirmation of the influence, Pierre Botschi architect of the Bletchley market also designed a Candelaesque sports pavilion in 1972 (see Appendix D).

13.4. Concrete shells in markets

By the 1960s there was a history of concrete shells for markets, the earliest major clear span structures were for market halls in Germany (Frankfurt 1927 and Leipzig 1929), Switzerland (Basle 1929), Hungary (Budapest 1931), Spain (Algeciras 1934), France (Rheims (1929).

Post-war market hall projects; Royan (1956), Caen-La Guérinière (1958) Plymouth (1959) Wolverhampton (1960), Hamburg and Accrington (1962), Smithfield (1963) and Blackburn (1964) all demonstrated the affordable wide span of concrete shells yet producing an architecture expressing civic confidence.

The earliest hypar umbrella roofed buildings identified date from 1943-5 in Czechoslovakia and precast hypar shells were use there in the post-war years. However the practice failed to be replicated until Candela's 1954 Rio warehouse in Mexico City. The first use of a market hall being roofed with hyperbolic shells was in 1954, not with a clear span roof but with mushroom structures that meant there were columns across the market. Candela found that the cost of roofing a warehouse with hypar umbrellas in the economic and social circumstance of Mexico in the 1950s was so low that it was successfully employed in many other projects in preference to other techniques. Labour, cement and aggregate costs were low so simply reusing shuttering for a hypar mushroom shell many times was a contract winner. The aesthetic of the hypar umbrella was seen in Mexican towns as an echo of the traditional market stall canopy.

Hypar shells were considered in 1958 for a market hall roof in Accrington but not proceeded with, apparently for aesthetic reasons, and cylindrical shells were adopted. Unfortunately no further record or discussion about the potential use has been found. No markets that used concrete hypar roofs other than as mushrooms have been found. The only market with such a hypar roof is Coalville and that is in steel on a steel frame. For Candela an early use of hypar mushrooms was to roof markets and the practice spread across Mexico through other architects, engineers and contractors.

The only shopping centre outside Mexico found to have been found to used hypar umbrellas is Apache Plaza for the concourse. It could be argued that Katowice station was also a shopping centre, but its raison d'être was as a station concourse (see Appendix D).

The only markets outside Mexico that have been found to have used hypar umbrellas are Queensgate and the 1975 Rue d'Agadir, Casablanca (Appendix D).

13.5. Glazing and roof shells

Accrington market, Hamburg market, Apache Plaza, Hatfield swimming pool and the Israel Museum hall were all built with clerestory lighting that was important to the function of the building. For Apache Plaza and Hatfield swimming pool the central space was a meeting, social and recreational space. For the others the daylight goods display was significant. Huddersfield market's lighting had to achieve success in both functions.

In Chapter 4 the glazing of shells was seen to be challenging. The use of glazing bars has been significant in the harmonisation of the elevations of buildings to varying degrees of aesthetic success.

13.6. The post-war market hall

The development of the British market hall has been an evolutionary process, perhaps the Darwinian process of the survival of the fittest can be observed. Some markets such as Columbia were destined never to be a success. Others were unable to cope with environmental changes; in transport, retail practice and hygiene regulations. A few post-war markets were of a design that had a weakness in their designs that lead to fire risk, damp, dangerous, uncomfortable or just miserable environments and failure; Eagle Centre in Derby, John Street in Bradford, Keighley, Aylesbury and Leicester.

Another factor is consumer behaviour, foot fall for markets at the low rent end of developments have been problematic, multi-level markets really struggle to keep economic activity on all floors, Sheffield Sheaf; Nottingham Victoria; Hyde; Newcastle Greenmarket; Liverpool St John's and Lancaster have demonstrated this.

Queensgate's elevated restaurant and roof terrace were prefigured in post-war markets as diverse as Aylesbury, Blackburn, Plymouth, Sheffield Castle, Shrewsbury, Wakefield and Wolverhampton. Huddersfield Corporation parties had visited Blackburn, Wolverhampton and Sheffield.

The erection of market halls with towers, itself an evolution of the market cross has been common place. Some towns' market halls when demolished lost their towers and had new ones built with new halls eg; Coventry and Shrewsbury. Carmarthen had a market tower reused twice. Huddersfield's 1880 market hall's tower was demolished without any apparent consideration of retention or replacement. The same was true for amongst others, Blackburn and Burnley. The common factor was that market halls with thin shell roofs were not built with towers. The exception is the extraordinary Caen-La Guérinière water tower and market structure – but as it never opened as a market the negative correlation of shell and tower is maintained.

Was the roof shell seen as a beacon or market symbol that replaced the tower as a landmark function? Was the civic sensibility of the market maintained with overarching shells? Do the curves of the shell give feminine symbolism to the architecture replacing the phallic tower?

Queensgate market was fitted out à la mode. Coventry market's materials; teak, brass and galvanised steel must have seemed antiquated just ten years after opening. Plymouth, Wolverhampton Sheffield and Shipley would have looked dated. The later Gloucester, Blackburn, Burnley and Nelson all showed modern, better lit stalls as seen at Huddersfield.

Queensgate market was built with all the modern materials and techniques that a 1970 building could boast; terrazzo tiling, Pirelli ribbed rubber tiling, contemporary patterned Formica type laminates, fluorescent tubes, mercury halide uplighting, Perspex lettering, aluminium patent glazing, EDPM gaskets, basement servicing and a multi-storey car park.

It is not those elements that make the market – it is a question of architecture that made the market different - but does the architecture bring success?

A simple analysis of British market halls (excluding Huddersfield) is made here. In the years 1961-1972, 14 market halls opened in the towns of Aylesbury, Birmingham, Bradford (2), Hyde, Halifax, Liverpool, Llanelli, Luton, Merthyr Tydfil, Nelson, Nottingham, Shipley and Worcester. All these markets were secondary to shopping centres and generally considered to be without any architectural merit or interest. One burnt down and was replaced. Four have been demolished without replacement; nine of them are still, to a degree, working markets.

In the same years 15 market halls opened in the towns of Accrington, Barrow in Furness, Blackburn, Burnley, Bury, Gloucester, Hartlepool, Keighley, Leigh, Northwich, Rotherham, Scunthorpe, Swansea, Wakefield and Walkden. All the markets had a style that is recognisable as being a market building, an architectural expression. Two were demolished without replacement, three replaced and one burnt down. Nine of them are still, to a degree, working markets.

This simple, two group, analysis suggests that a market hall that expresses itself through its architecture is not significant to the success or longevity of a market.

13.7. Public art

Alderman Stephenson's enthusiasm for the new and for public art; the recent pattern of market hall art (Coventry, Plymouth and Burnley); the post-war neo-enthusiasm for public art, the Seymour Harris shopping centre philosophy and an architectural clarity of aim by Ken Wood and team (the practice having having already commissioned shopping centre art by Birmingham Art School connected and war hating artists Bridgeman and Schwartz supported by Murrayfield's corporate fun money policy that had provided the Huddersfield Phase I mosaics) were all drivers for the commissioning of major works for Queensgate.

Huddersfield Library and Art Gallery had been impressively sculpturally articulated for 30 years. Nothing of Phase II was to distract or show disrespect to James Woodford's[109] large stylised figures.

Instead on the service side of the market there was more than token art, as at Gloucester's weak gesture. The architects had spoken of giving it some punch, a wow factor and that is what Steller delivered. The work was extraordinary and on an unprecedented scale, *Articulation in movement* remains monumental. Its influences were eclectic; Mayan, constructivist and Bridgeman's public art philosophy. Its articulation of the building's zeitgeist apparently unique with its structure function and plan boldly trumpeted. Yet the work came from a micro-scale pottery, handcrafted by studio potters far removed from architectural expression.

Articulation in movement was largely a failure. It was commercially unrepeatable and structurally bizarre. The meaning, the significance of *Articulation in movement* was for decades misunderstood; never described or explained. Even its nature has been obscure; in the 1970 commerative booklet referred to as stonework and later paid consultants have described it as both concrete and stone. Its success has been in what followed. Appendix D shows the influences of Queensgate market on other projects. Some projects show a will to decorate the market, or just relieve elevations, with artwork perhaps as an afterthought; in effect imitating Queensgate but without real purpose or expression.

Its offspring, Transform was to be used at over 139 sites in Great Britain. This outcome from Queensgate market project was not recognised at all until 2007 when three sites were identified. Now, through this study, many more sites have been found – including Kirkgate market, Bradford.

[109] b. Nottingham 25 September 1893, d. London 8 November 1976

Inside Queensgate Market Steller's mural of local commerce; agriculture, manufacturing and exchange is related to the tradition of market art found. Other market murals, Accrington, Plymouth, Coventry and Burnley all exhibit a panorama or a spectrum of economic activity rather than being a token decorative display such as, Gloucester (1968) or apparently decoration by pattern; Nelson (1968) and Barrow (1971).

It is poignant that the Coventry's 1961 painted mural, depicting farming and industrial scenes, in Coventry Market was produced by an artist from Coventry's twin town, Dresden. The twinning was through a spirit of peace and reconciliation; exemplars after the two cities had suffered fire storms and major loss of life after intense wartime air raids. Steller was born in Dresden in 1940; his Huddersfield metal mural is of the same subject. He was an art student in Birmingham at the time of the installation of the Coventry mural and the market was visited by the Huddersfield Corporation team in 1963.

In his 1972 speech to NABMA Wood suggested that there may be sculpture worthwhile preserving from an old market in a new one. At Gloucester the former market portico had been rebuilt to be the entry to the new shopping centre. The development phases at Huddersfield meant that even if had been desirable the new market was completed before the former market closed so this would have been problematic. Stone relief armorial bearings of Huddersfield, from a police station formerly on the site were painted and put on display in a corner of the new market where they remain an anachronism.

13.8. Post-war shopping centres

Two observations on post-war developments show that the Huddersfield Murrayfield development and market were not from the moulds described.

"The greatest single architectural fault of the modern shopping environment is surely the neglect of the upper segment of view. The dull horizontal parapet is one ingredient of this neglect, In open shopping centres, the low canopy of the so-called 'arcade' which shuts this view off completely, is another. When the ceiling of an arcade is relatively high, two storied perhaps it is always flat and dull and often dirty too, revealing a huge blind spot in the designer's repertoire." (Wright, 1973)

"Great Britain invested heavily in many of its communities after World War II, modernizing them by building new roads, housing, and commercial spaces. In a nod to their forward-thinking design, these projects were anti-Victorian in scale and appearance. Instead, architects tended toward emotionally restrained forms accompanied by complicated spatial arrangements and wide, open gathering areas.

“Although these post-war projects were ambitious, they were ultimately ineffective and developers lost interest in upgrading them. As a result, many of these projects failed.” (Byrne, 2012).

Murrayfield was bold, even buccaneering in their town centre redevelopment schemes. Many of its projects have since faded. In Huddersfield they met an unusual ally; Clifford Stephenson, a man of business, culture and civic values interested in the town’s progress and townscape who thought big and with some sensitivity (despite his contribution Stephenson had no civic role at the official opening of Queensgate Market; it was to be the day of his peers on the markets committee).

There was also the experience of the Seymour Harris partnership; their Murrayfield projects at Wallsend, Preston, Five Ways and Keighley were all successful. Ken Wood was the Seymour Harris partner responsible for the Huddersfield project at the design and construction stages.

The maxims of Seymour Harris on retail design could be seen expressed at Huddersfield; continuous retail frontages, use of upper storeys, hidden plant, separated servicing, raised flower beds, benches and cleanable services- white Carrara marble was used on phase I.

13.9. Proximity

The proximity of people and buildings relevant to Queensgate in the West Midlands is significant.

Roberts’s training at Birmingham Art School and his employment with the J Seymour Harris Partnership led to Roberts befriending Steller and introducing him to Ken Wood.

Steller established Square One at Snitterfield, north of Stratford-upon-Avon

Ken Wood ‘s home was near the Five Ways Garage in Wolverhampton.

The J Seymour Harris Partnership offices were near and Robert’s college close to the new Birmingham Bull Ring market with its hexagonal plastic canopies over groups of stalls, when Frank Price (who ran Murrayfield’s Birmingham office) as Lord

Mayor of Birmingham accompanied the Duke of Edinburgh unveiling a commemorative plaque at the Bull Ring Centre in 1964 (Buckingham Palace, 1964).

The Mercury Service Station in Harborne, the country's second self-service filling station was opened in April 1968. This had three hexagonal hypar mushrooms as canopies.

At Kingswinford, near Wolverhampton and Dudley, the shell roofed precinct rotunda of 1963 was an early post-war retail space that had a strong streetscape presence.

13.10. Gwyn Roberts

Roberts's architectural experience was comparatively slight, He had worked in North Wales before national service, trained in Liverpool and Birmingham and been with the J Seymour Harris Partnership for no longer than his time in Birmingham.

The Huddersfield scheme was his first major project. The project's surviving drawings and model photographs that predate Roberts's work show a flat roof with occasional skylights.Roberts would have had before him all the beam, truss and shell options that had been used. Recently reported examples were; Accrington Market (1962), Wakefield Market (1964), Blackburn Market (1964), Shrewsbury Market (1965) and Berrows printing works in Worcester (1965).

As outlined by Bloomer and Wood, Roberts took the Candela mushroom concept and realised what was later described in the December 1968 press release by The Seymour Harris Partnership. (see section 11.2). The press release author's identity is not overt but its reference; KW/GER/CMS 64;82 suggests Ken Wood and Gwyn Edwards Roberts were party to it.

The rejection of the Blackburn and Burnley market roof types is profound. Seymour Harris Partnership architects had visited Blackburn with Huddersfield Corporation and market representatives and the Seymour Harris partnership was the council's consultant architect at Burnley market.

Chapter 14 Conclusion

“If you would understand anything, observe its beginning and its development”
Aristotle

This study aims to explore the development of Queensgate Market;

- the trajectories of art, engineering and architectural practice
- the transfers of awareness, knowledge, empowerment and actualisation
- the mechanisms and vectors at play in such transfers; education and autodidactic learning and dissemination through publication and migration.
- the connections based on proximity, employment, meeting and travel.

In short how did Queensgate Market come about?

The study

At first sight one might think this is a study of art or architectural criticism but that was not the intention, it attempts to be more a study of the evolution, genetics and embryology of a proletarian humanist-based realisation. In this metaphor can we see Queensgate Market as the progeny of cross-fertilisation, a hybrid where some elements were deliberately crossed while other were fertilised through the vagaries of wind-blown pollination?

This study has covered many material variables; concrete shells, market structures, public art, glazing, lighting, shopping centres, surfacing materials and abstract elements such as legislation and planning

If the market’s family tree of buildings can be identified will we be able to have a vision of it as Thomas Cole’s architect in *The Architect’s Dream*? There are obstacles; this study has limitation of scope and scale. It is also a subject on which apparently little or no previous study has been done. Even the notion of examining and studying the antecedents of post- war buildings is an area on which no significant work has been found for projects other than the exceptional or the controversial, such as system building. Histories of buildings have been found to be restricted to narrow areas; a comparison would be of cathedrals; both of Liverpool’s and Coventry’s; here accounts of their development were published during their execution, at completion and later. This modest study of a modest building was not anticipated to be such a journey of discovery of late twentieth century markets. If markets are to be studied at all the need for the collection of material is apparent.

Queensgate

Queensgate Market was a single project; contemporaneously other projects were being developed that had common but not mutual influences and being of the time share some circumstances; Sète fish market and Katowice station are two examples although many other circumstances, sites and function of these were idiosyncratic. The development of the Huddersfield umbrellas was through the global work of the identified engineers and through small matters like the experience of the execution of work at Stevenage, with its board-marking, untidy column heads and clutter of mechanical fittings. Almost contemporaneously at Sète and then Katowice more elegant chamfered columns with clean crisp column heads were being developed – a refinement not seen at Huddersfield. This illustrates how the awareness of and confidence in the technologies and skills were uneven, The Huddersfield team was gung ho for the asymmetry and fastidious in the board marking detail but lacked confidence in shuttering engineering.

42 years after the building of Queensgate market few records have been found in corporate hands. The recognition by people involved in the project in the late 1960s that something special was being built lead to them taking photographs, keeping notes, letters and documents that have allowed the author more access to the 1960s than was expected. What was it about the market hall that led to this foresight?

Queensgate market could easily have been totally subjugated by a shopping centre. Instead, although it was part of a shopping centre, an architectural crescendo of markets reached a climax in the project. The market did not have a tower or feature entrance, its approaches were modest with restrained signage but the market has an architectural impact above its station.

Dischinger's pioneering work has a clear human chain to Queensgate through Kálmán Hajnal-Kónyi and Jim Spillett. Other engineers had key and tangential roles. Clearly the market is the epitome of influence of contemporary people not involved in the project and who have never seen the building; Felix Candela, J Seymour Harris, Barbara Hepworth, Kálmán Hajnal-Kónyi, Eliahu Traum, Giovanni Michelucci, Pier

Luigi Nervi, John Bridgeman, Colin Rowberry, Marcel Breuer, Robert Anchor and Naum Gabo. The lack of involvement in subsequent projects that an architect, engineer or artist inspires is of course commonplace; those that develop technologies can expect the spread of the techniques and materials.

Other engineers; Hugh Tottenham; Cyril Blumfield and Ernest Seel; James Waller with Derek Bond of Clarke Nichols & Marcel had established a foundation of British expertise of thin shell engineering and pioneering hypars from 1934. Their roles in building and supplying confidence should be emphasised; Marcel of was the engineer for Stevenage and Tottenham, timber hypar pioneer, supervised the testing of the Huddersfield shell models. Blumfield's (that included the Liverpool mathermatic building) and Seel's long careers included Britain's first reinforced concrete shell.

For Queensgate Market the position is unusual, a diverse set of technologies, skills and circumstances with a group of team leaders who only worked together on Queensgate Market, part of phase II of the Huddersfield Murrayfield scheme; Frank Price, Fritz Steller, Jim Spillett, Clifford Stephenson and Ken Wood produced a unique building through a convergence of vectors or multi-linear paths with global influences of art, architecture and engineering. These linear paths; hypar shells, public art, ceramic sculpture, dynamic glazing technology, market design and retail design did converge at Huddersfield and this nexus of threads was unique.

Queensgate was the last British insitu concrete hypar shell structure. The practice of concrete hypars just stopped in Britain. Queensgate was the last British concrete shell roofed market. Coalville Market of 1975 had a rare steel hypar roof. Keighley, Leicester and Bletchley had covered markets with plastic shells that were 7Candela influenced. The production of Silberkuhl shells continued for another eight years and was widely used for warehouse roofing until construction work slumped in the late 1970s. Queensgate remains the only structure of free-standing of asymmetric hypar umbrellas in the world.

Hand-made ceramic sculpture of this scale has not been attempted again, instead the process was industrialised. *Articulation in movement* proved to be a one-off. Through the trials of its production a new product was developed, patented, invested in and taken to market. It remained in production until the late 1970s. It also drove the people involved to more work – either to get away from it or through emboldening them.

Glazing continued to develop after Queensgate, it was only a step in an exciting and continuing journey. New materials make Queensgate's glazing rather dated but its place in history of glazing should be secure.

Market halls continue to be built in other ways with other materials. Queensgate had a long trail of retail market antecedents; prefigured examples of elements were available to the architects; the construction of stalls, the adoption of new materials, the intention to diffuse shoppers by layout, an elevated restaurant, the planned separation of servicing from marketing and clerestorey lighting.

Not that everyone was impressed by Queensgate Market; the NABMA President in his1971 presidential address, in reference to Huddersfield, said they did not want "costly monuments".

In 1969, two years earlier and before the completion of Huddersfield market, Pevsner described Accrington's 1962 market as, "not at all a monument, but successful with its interlocking vaults"p46 (N. Pevsner, 1969).

Pevsner's view on Huddersfield's market? Well, Pevsner didn't visit Huddersfield after 1964 but his co-author, Ian Nairn did in 1975 and was impressed.

Queensgate was not the last British architectural market hall; a design not secondary to a retail megastructure. Rotherham's, adventurously built on a sloping site, opened 11 months later; Keighley 14 months and Bury 18 months later, Scunthorpe's opened in November 1972; the unusual Darwen market of 1975, then nothing of note until Rotherham's tensile canopy of 1988.

It is ironic and poetic that conflict, persecution and migration of people in the mid Twentieth Century stirred up art, architecture and engineering so that through dislocation and circumstances discoveries were made, strangers met and inspired one another in such a profound way. Yes Queensgate was both the progeny of a considered and planned design process through transfer of knowledge by 'apprenticeship', training, publishing, travel, experience and skills of many. There was also a time of opportunity. The well-travelled and sophisticated small town businessman and councillor, Stephenson sought change in Huddersfield. Flack and his team saw opportunity in the post-war rebuilding and planning of British towns and cities. There was also migration, the unplanned pollination on the winds of war: Steller was a west midlands artist because of the cold war and a failed romance. Mansfield and Traum were in Israel because of Nazi crimes. Hajnal-Kónyi, Breuer, Gabo and others were in the UK either temporarily before moving on or permanently, again because of Nazi persecution; Candela was in Mexico as a displaced person after civil war. Bridgeman's art was affected by his blitz experiences. The experience of Traum being a young refugee leaving Austria for Palestine, a doctoral student in the US becoming interested in Candela's work in Mexico and then a consulting engineer in Israel who publishes a post-experience technical paper in an Australian journal which is used by Nichols in London, shows how the planned transfer and the vagaries of life-changing collateral impacts of war merge.

Finally there is Gwyn Roberts. He only built one market and one hypar project. He even left his employer before the project was completed and he went on to be a very successful commercial architect and property developer in an eponymous practice with associates. Nothing else in his portfolio can be related to Queensgate yet it was his first major project and his masterpiece. The pattern of his studentship, friends, reading and work with colleagues and Ken Wood that has been examined, is what we have to account for the mix that produced the design and qualities of the Queensgate; functional, aesthetic, sculptural, both assertive and respectful. Architectural decoration with cheap greens can be more tangible than a dream.

Is there a market hall renaissance? The 21st century has brought remarkable market halls (see appendix A) in Altenrhein, Aarau, Barcelona, Wakefield, Carmarthen, and Rotterdam's is expected in 2014.

To dream

As was posed earlier can we achieve a perspective of the development of this building?

Consider if Cole's sleeping architect was to dream now what would his landscape vision include if Queensgate Market was before him?

Could we expect in the landscape's foreground just below us Casablanca, Keighley, Bletchley, Coalville and Rotherham markets, to the right ceramic clad megalithic structures of all kinds and qualities; including; Bradford's Kirkgate Market, Swindon Station, Teeside University and the Dawson House rotunda in Billingham. Over to the left; Barrow, Liverpool St John's, Lupton and Scunthorpe markets?

In the centre, Queensgate Market in clear relief; just behind we can see the petrol stations of Harborne, Wolverhampton and Markham Moor, to the right Liverpool's Mathematics building and The Israel Museum, over to the left ranges of Silberkuhl roofs?

In dark shadow, below our line of sight and unvisited; Apache Plaza and the markets of Aylesbury, Chester, Hyde, Nelson and Worcester?

Behind them Birmingham's Bull Ring markets, the soft rounded rooflines of the market halls of Accrington, Blackburn, Wolverhampton, Side Bell Abbes, punctuated by the towers of Caen-La Guérinière and Coventry markets. Down the waters' edge, The John Lewis Warehouse, the Serpentine restaurant, York's Theatre Royal and the Mound Stand. Nearby constructivists are overseeing the hoisting of their works into position?

The sculptural shells of Candela spread out across a dry plain, the far side fringed by Doncaster's airport hangar, with Algeciras, Budapest, Rheims, Basle, Leipzig and Frankfurt markets. Just beyond the Zeiss planetarium and Sagrada Familia?

Then the gothic towers of Victorian market halls of Huddersfield and Blackburn beyond them classical Gloucester, Penzance and Accrington markets and then a forest of market crosses in cemetery like order with the occasional vernacular market houses chapel-like?

Finally on the low horizon Roman and Greek fora and agora can just be made out; above, on high ground, hazy behind wispy cloud, the Mayan pyramids of Mexico?

It is only a dream.

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Dedicated to Ken Marsden (1923-2012) & Ken Wood (1928-2008)
who would have been amused and Mandy Sykes who was not.

Thanks to Rebecca Fox for assistance with French and German translations.

AN EXPLORATION OF THE DEVELOPMENT OF HUDDERSFIELD'S 1970 MARKET HALL: ARCHITECTURAL DECORATION WITH CHEAP GREENS; AN ARCHITECT'S DREAM?

CHRISTOPHER ROLFE MARSDEN

A thesis submitted to the University of Huddersfield
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Appendices **page**

Appendix A Market Halls since 1945, diagnostic evaluations

Annotated chronology of British and selected European market halls 1955-2012

(alphabetical index below)

Alphabetical Index	**page**

*Notes not included because of limited information found.

Vegetable and fish wholesale markets Sidi Bel Abbes, Algeria, 1955

Neighbouring buildings that were developed on a city centre site that redeveloped the town street plan for transport on boulevards.

Structure

0.65 ha Vegetable Market was a 60 m diameter structure with a hemispherical dome of 41m diameter dome. The dome was built with precast concrete members and voussirs. The surrounding two floor building was roofed with shallow concrete shells that were arranged radially covering 40 storehouses. The administrative offices supported with stilt-like angled columns.

Figure A-1 Postcard of Sidi Bel Abbes vegetable market (post marked 1962)
Corner of fish market can be seen on left margin.
http://www.mekerra.fr/images/cartes%20postales/amand-guy-cpa/marche-en-gros.jpg

Figure A-2 Postcard of Sidi Bel Abbes vegetable market

Fish market

Rectangular 250sq m structure with a concrete shell that shows a wave pattern borne by thin v columns

Figure A-3 Postcard of Sidi Bel Abbes Fish market at completion 1955
http://www.mekerra.fr/images/cartes%20postales/cartes%20francis%20rodriguez/poissonnerie/nouv-poiss-01.jpg

Novelty

“The vegetable market, Sidi bel Abbes is a far cry from Fordrough, Birmingham. It is more surprising therefore to find, instead of the traditional construction usually associated with more primitive forms of labour, a building that is quite remarkable for the advance techniques far above the general level in Great Britain”(Anon, 1959l),   (Tracey-White J, 1997).

Architects

Architect; Marcel J Mauri. Structural Engineers; Pelnard Considere and Caquot.

Royan Market Hall, 1956

Structure

Built in 1955-6, a freestanding circular market with a roof of 13 radiating reinforced concrete shells cantilevering from 13 peripheral points to form a dome like structure with a massively scalloped circumference. It has a diameter of 52.4m and maximum height of 10.5m the maximum height at the perimeter is 6m.

Figure A-4 Royan Market, postcard
http://archipostcard.blogspot.com/2011/04/royan-promenade-autour-du-marche.html

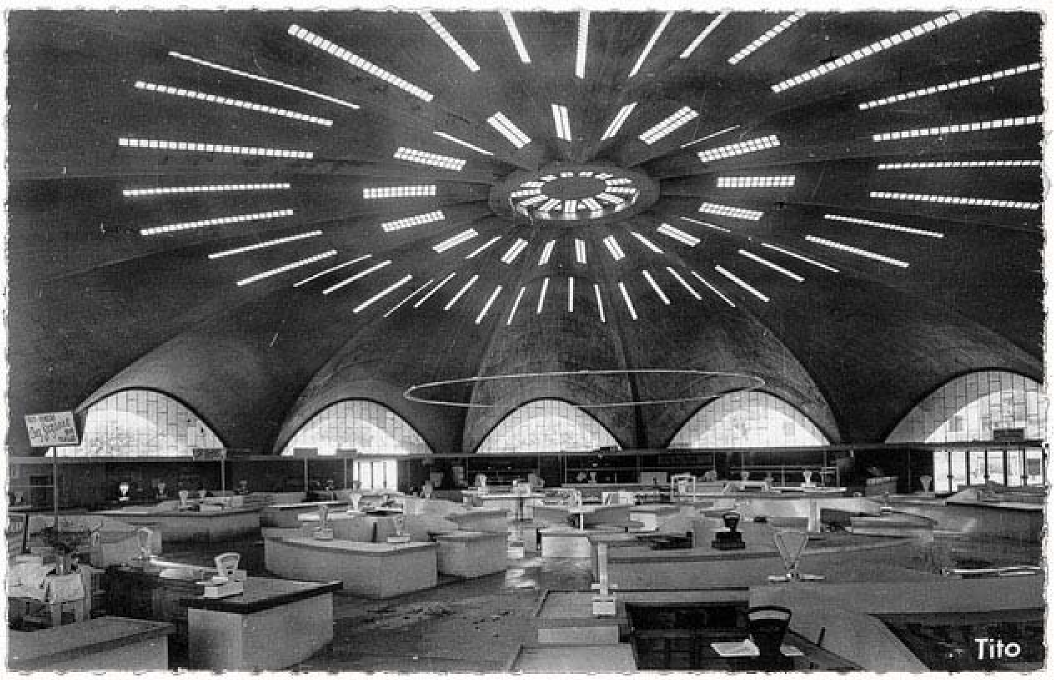


Figure A-5 Royan Market, postcard
http://synccity.blogspot.com/2011/01/militant-modernism.html

Stalls

The stalls were at counter height.

Lighting

Natural lighting is by central and radiating rooflights. The artificial lighting was by a central thin halo of lights suspended, mid space.

Architects

André Morisseau & Louis Simon. Engineer; René Sarger (Anon, 1959j; Janberg; Joedicke, 1962)

Coventry market hall (Tenders were sought in December 1956, started trading 1957, officially opened 1958)

Cost

£320,000 plus £65,000 conversion of former building.

Design

A first scheme was to have been rectangular with a parabolic roof, but this was changed to a circular design

"A circular plan was adopted as the best means of achieving access to shoppers at several points around the perimeter, and concentrated layout out of stalls within, so that shoppers are encouraged to circulate rather than go directly to their objectives"(Anon, 1959b)

The flat roof permitted car parking, in a complex scheme that linked a series of neighbouring roof tops (Anon, 1959a). The basement, with ramped vehicle access, under the western half of the building is a delivery and storage area.

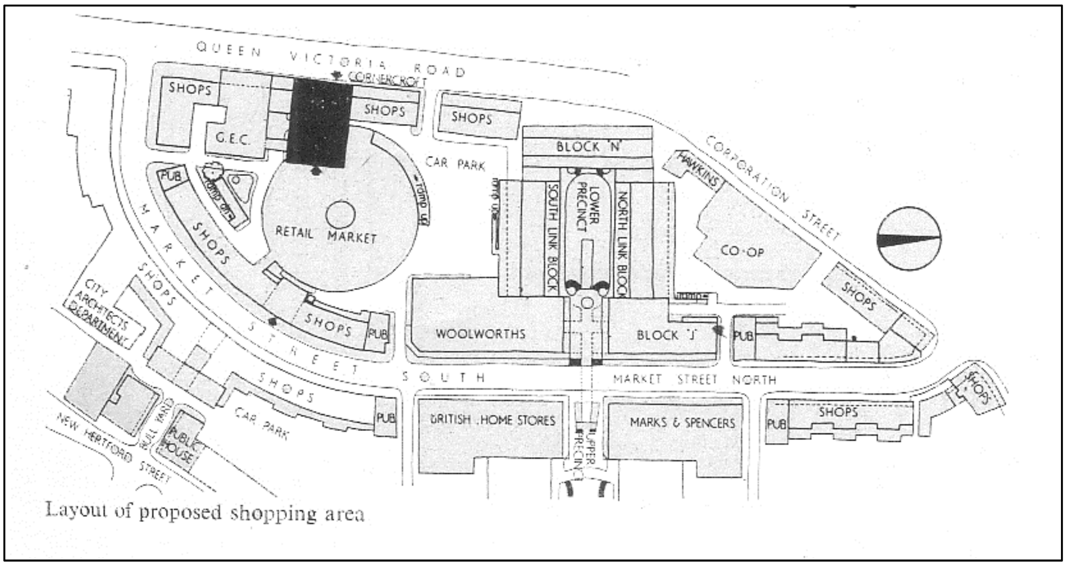


Figure A-6 Proposed layout of shopping area with market hall (Anon, 1955)

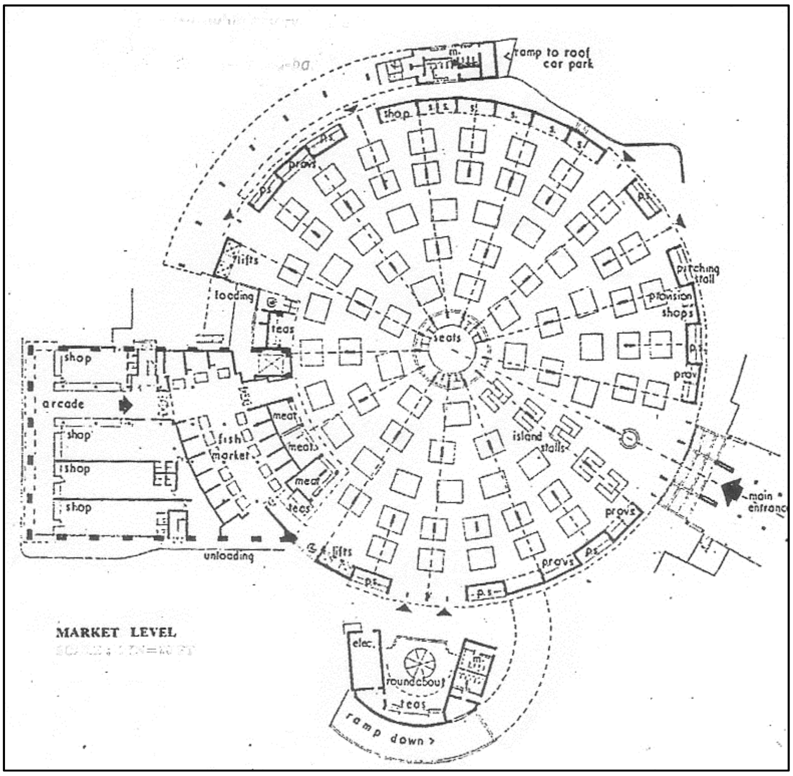


Figure A-7 Coventry market plan, market level.(Anon, 1959b)

To the west, the circularity of the market was interrupted by a former engineering works converted into a fish market. The upper floors became flatted factory units (Gould & Gould, 2009). The lift shaft of this building was extended upwards to form a clock tower replacing the old market's one (Anon, 1959b).

Figure A-8 Coventry market (Anon, 1959b)

Structure

The market hall in plan, 276' (84m) in diameter and 15' (4.5m) high, on a single floor. The structure is a series of 13 concrete radial frames joined by exposed concentric ring beams, all fair faced with brick infilling and an asphalted concrete roof, laid out as car parking. The hall had two concentric rings of V columns.

Stalls

The hall contained 160 island stalls arranged in groups of two or four units in concentric rings, with forty 'shop stalls' set into the perimeter wall, sixteen of them facing inwards. The teakwood units had brass and galvanized steel fittings with a common style of pendant sign boards suspended from roof beams. The stalls were designed as "market tables" allowing the display of goods but keeping the overall height down to allow views through the market (Anon, 1959b). The columns were mid stall group.

Figure A-9 View of market Coventry market interior looking towards centre. Stalls, sign boards, stall lighting, ceiling lighting and three columns (two inner ring) shown. http://www.coventrytelegraph.net/multimedia/nostalgia/images/2008/06/04/a-look-back-at-50-years-of-coventry-retail-market-92746-21022293/

Lighting

Central circular roof light with inset glass lenses above the central area. Clerestory metal framed patent glazing at the perimeter. Artificial lighting was ceiling mount strip lighting with angled lamps cantilevering from bottom of stall sign boards.

Ventilation

“Forced extraction to fish market and food shops”(Anon, 1959b)

Art

The cast-iron columns of the fish market was decorated with miniature ships’ figurehead sculptures of mermaids, sailors and Neptune, all by sculpted by James C Brown, responsible for much of the artwork in the new buildings(Gould & Gould, 2009).

A mural was commissioned through the twin city of Dresden’s mayor.

A feature of the Rex Market, a former Coventry market, had been a children’s merry-go-round, and a new roundabout was designed by David Mason, which was moved around the site as the market and adjoining shops opened. It is now in the centre of the market, originally planned with seating as an area for shoppers to relax in, but remains an integral part of the market design. The terrazzo floor with a central mosaic, was a gift to the City by the Coventry Branch of the Association of Building technicians and designed by David Embling on the theme of happiness, with a central sun motive.

Novelty

It was claimed to be the first English post-war, large-scale covered retail market.

Aspirations

To the east the market was behind a range of shops on Market Street, at either end public houses were developed, intended to extend the ‘life’ of the precinct beyond shop hours.(Gould & Gould, 2009)

Visits to other markets and by others

Coventry market was inspected by the Huddersfield Markets and Fairs committee with representatives of the Murrayfield Real Estate Co. Ltd. and Huddersfield Market Hall traders on 3 October 1963 (Huddersfield Borough Council, 1963b)

Architects

Built to the designs of principal assistant architect Douglas Beaton, assistant architect Ralph Iredale and assistant Ian Crawford under the direction of the City of Coventry Architect and Planning Officer Arthur G Ling, the Deputy City Architect and Planning Officer, David Percival.

Caen-La Guérinière château d'eau-marché 1956-8

Design

Caen was laid waste during the Normandy campaign of 1944 and subsequently rebuilt. The new town of Caen-La Guérinière needed council offices and market and a water tower. All these were designed to be in one building.

Figure A-10 Caen-La Guérinière château d'eau-marché,
postcard franked 1959 (Photedit) (author’s collection)

Structure

The structure built was a 16,000sq ft elliptical market hall with a 100ft water tower in the form of an inverted cone at the centre that acts as the central column of the market roof with beams radiating out. The beams bear radiating concrete shells. Entirely built in reinforced concrete.

Lighting
Provision was made by radiating rows of lenses in the roof shells

Figure A-11 The board-marked base of the Caen-La Guérinière water tower and the market roof (Anon, 1959j)

It was supposed to accommodate an indoor market and a community centre, but it did not come about.(Dupart, 2007)

Architect
Gulliame Gillet. Engineer; Rene Sarger.(Anon, 1959j)

Plymouth Pannier Market, 7 September 1959

Cost

Building £281,000, site £175,000(Shepherd, 1961)

Design

Large central hall 57ft high of 148ft clear span and 224ft length. Surrounding this, shops with storage space over, some with frontages to streets, others faced into the market and some running right through. Logical plan with broad central entrance on long facade to Market Avenue, with smaller entrances in the side elevations from streets. The shop elevations had simple shop fronts under small fascias with blinds.

The shops and first-floor balcony have small cantilevered shell roofs forming a wave pattern. (English Heritage, 2003)

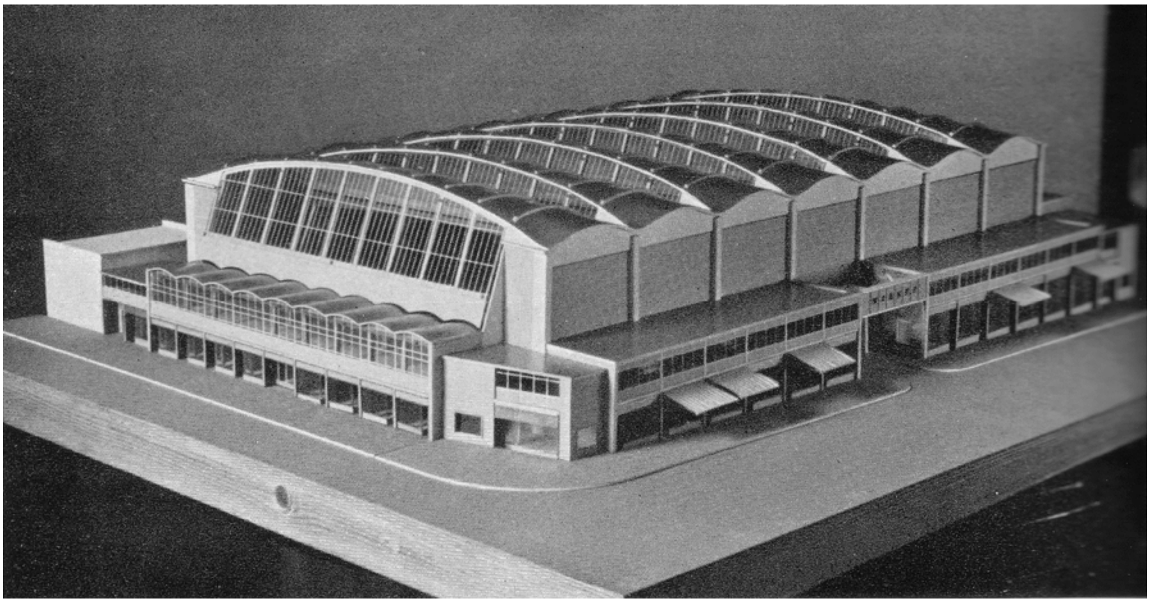


Figure A-12 Model of Pannier Market, Plymouth(Chronowicz, 1968)

Structure

Post-tensioned reinforced shell concrete roof on pre-tensioned reinforced concrete trusses at 32ft centres, incorporating north lights. The reinforced concrete expressed externally, with infill panels of precast concrete slabs, cast with local aggregate, and glass.

Figure A-13 Plymouth market interior(Chronowicz, 1968)

Stalls

144 permanent stalls built of prefabricated concrete and timber, 8 ft by 9 ft and arranged in blocks of six (Shepherd, 1961).

Lighting

Conoid shells made it possible to incorporate north-facing rooflights, providing a cool even natural light across the interior.(English Heritage, 2003)

Quadrapod armatures mounted on stalls above the market floor and standard poles carried decorative conical lanterns of unknown type (Chronowicz, 1968)

Ventilation

Window in the north light windows could be opened and closed by remote button operation by market staff(Shepherd, 1961).

Art

The New George Street entrance to Plymouth's Pannier Market has a 20 ft x15ft mural by the local 31 year old sculptor, David Weeks. "executed in an experimental process through four layers of coloured plaster of back, yellow, red and blue with a white top-coat". When the plaster had dried Weeks chiselled the plaster away to varying depths to carve out the design. It was to "show the various retail trades and their work in the new market"(Anon, 1959i), The Cornwall Street entrance has outline figures of shoppers incised into the walls(Anon, 1959i; Pearson, 2007).

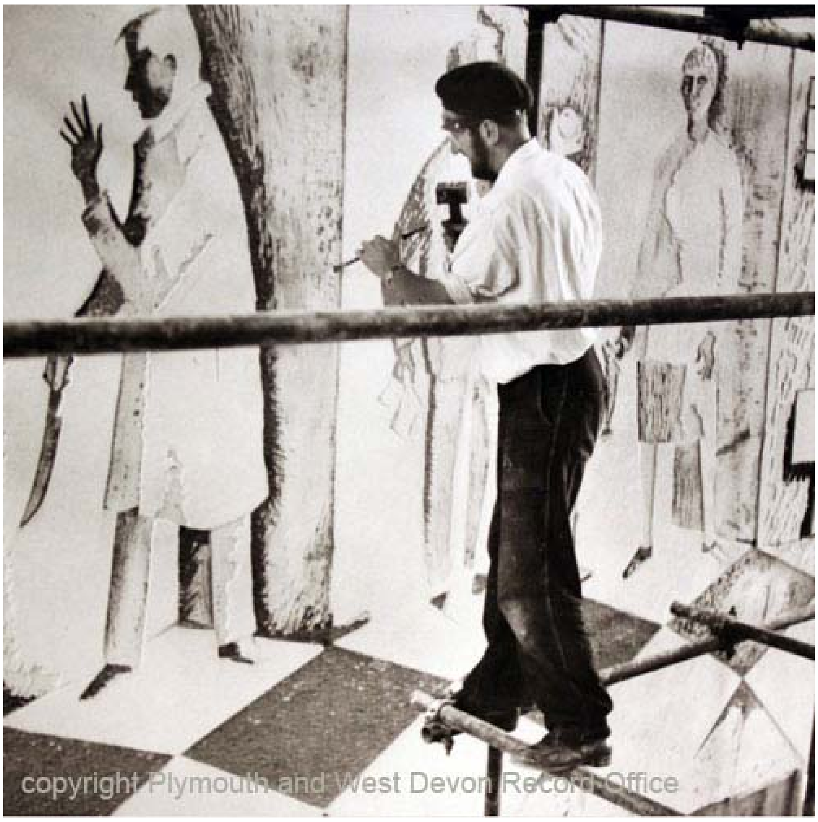


Figure A-14 Sculptor David Weeks working in Plymouth Pannier Market, 1959
Plymouth and West Devon Record Office part of the City Architect's Collection
http://www.20thcenturycity.org.uk/ImageDetail.aspx?g=5&r=36&e=136

Figure A-15 Plymouth Pannier Market George Street entrance mural, July 2011
http://www.flickr.com/photos/stevecadman/5940174259/

Figure A-16 Plymouth Pannier Market Cornwall Street entrance mural, July 2011
http://www.flickr.com/photos/stevecadman/5940729216/in/photostream/

Novelty

“The new building is of an unusual design and it took a lot longer than an ordinary traditional build would have done”(Shepherd, 1961)

The portal frames were constructed first, with the shells built on shuttering afterwards - a far more flexible and economic system than trying to pour the two elements together. The portal frames took up the weight of the shells, gradually, with negligible transference of resulting stresses into the shell membrane. The design of the roof is thus reduced to its simple elements, and in addition a greater speed of construction was possible with less shell shuttering and scaffolding included. “This was the real innovation of the Pannier Market, that marks it out as a development from other north light shell concrete buildings, together with the system of pre- and post-tensioning that could then be adopted. It is an early example of a post-war market built using a shell concrete system. Shell concrete was pioneered in Germany before the war, but was only widely adopted in Britain afterwards, when shortages of steel and timber, and rising costs, made it an ideal solution for bridging large spans without columns. Here the use of conoid shells made it possible to incorporate north-facing rooflights, providing a cool even natural light across the interior that adds to its powerful simplicity”. (English Heritage, 2003).

The feature of two cantilevered dogleg staircases of concrete with broad timber balustrade leading up to six snack bars (Shepherd, 1961) on the gallery under the “wavy roofs”(English Heritage, 2003) was of interest to delegates of the 1961 NABMA Plymouth conference that visited the market. “Certainly one feature that caused much speculation is the placing of the Refreshment buffets as a higher level than the remainder of the stalls, it appeared that some of the tenants were not in full agreement with this policy, they would have preferred to be on the same ground level with the other stalls.” (NABMA, 1961)

“One of the best features is the grouping of refreshment stalls away from the market floor and the more adequate provision for cleaning food and vegetables. The fact that the hall is without any pillars or obstructions has a very great advantage on the old one”(Shepherd, 1961)

Aspirations

It was also important sociologically, for the original market bombed in 1941 had determined to keep going through a series of temporary iron structures through the war, so that its permanent rebuilding was symbolic of Plymouth's survival and regeneration. Its completion as one of the last buildings of the new shopping area was also symbolic of the spiritual completion of central Plymouth. (English Heritage, 2003)

Visits to other markets and by others

NABMA conference delegates on 5 September 1961(NABMA, 1961)

Architects

Walls and Pearn for Plymouth City Council; designed by Paul Pearn with Ken Bingham, job architect. Albin Chronowicz, British Reinforced Concrete Engineering Co. Ltd, engineer.

Wolverhampton Market, 22 June 1960

Cost

Tender price £462,000

Design

On an island site a covered retail market that included a large hall for general goods, a separate meat and fish hall, civic restaurant, balcony coffee-tea bar, a snack bar, five lock up shops on the street and eight perimeter shops with street frontage. Above the shops, lettable offices.

Servicing by ramp down to basement

Structure

Structural frame throughout in reinforced concrete, with brick infills. The general market roofed with reinforced concrete barrel vault shells with clear spans.

Figure A-17 Recent aerial view of Wolverhampton Market showing roof shell arrangement and new entrance lantern http://www.expressandstar.com/news/2010/09/02/wolverhamptons-ailing-markets-are-to-stay-put/

Stalls

86 general stalls in rows on low upstands, in timber. Substantial framed signboards, angled downwards. The counters designed to be easily dismantled for cleaning. Constructed by A Edmonds & Co Ltd.

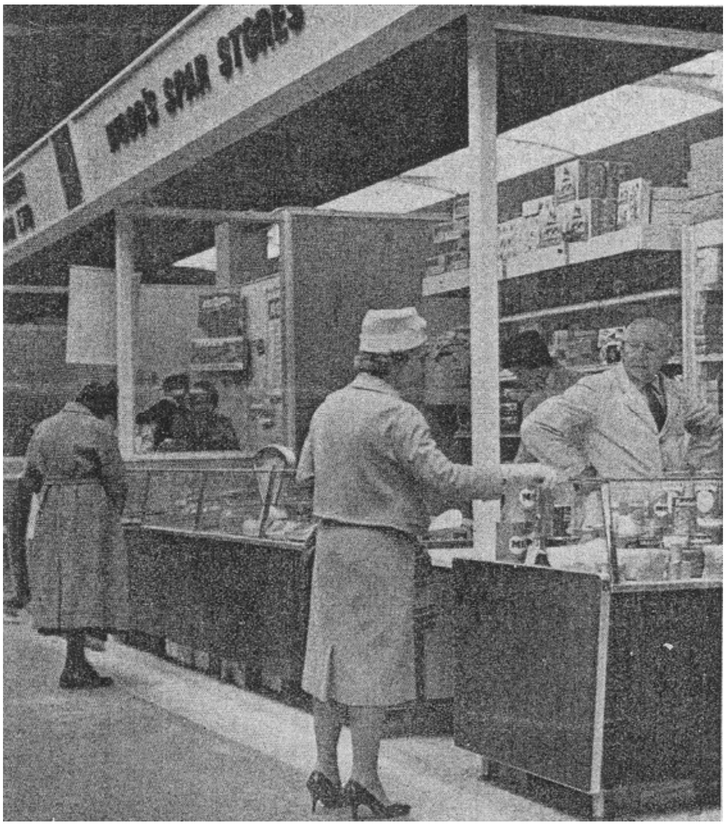


Figure A-18 Wolverhampton Market stalls and roof shell lighting(Anon, 1960d)

Lighting

The barrel vault roofs have continuous roof lights at the crown, the meat and fish market with north light concrete shells. Lighting generally fluorescent.

Ventilation

Continuous opening ventilator with electrical operation from the market office. No heating to the market halls or shops

Surfaces

All walls to food stalls with a “glazed cement finish”; Emalux, Floors, coloured granolithic and terrazzo. Relief pattern Marley tiling to the market’s entrance. External piloti clad in multi-coloured mosaic. The exterior clad mainly with exposed aggregate concrete panels, also Portland stone with some marble.

Novelty

A spacious licensed civic restaurant seating 180 people with facilities for evening functions; a balcony coffee-tea bar, a snack bar. The restaurant opened onto a terrace and a sunken garden for light refreshments in summer. (Anon, 1960d)

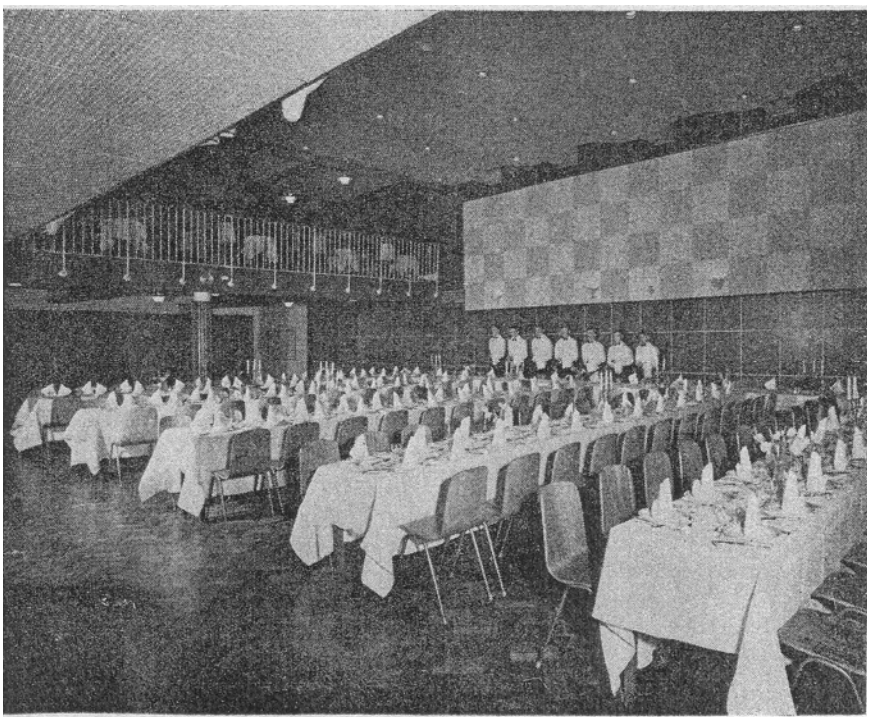


Figure A-19 Wolverhampton market civic restaurant (Anon, 1960d)

Visits to other markets and by others

Wolverhampton market was inspected by the Huddersfield Markets and Fairs committee with representatives of the Murrayfield Real Estate Co. Ltd and Huddersfield Market Hall traders on 16 July 1963 (Huddersfield Borough Council, 1963a)

Signage

Market signage in Stymie Bold to all major elevations including Stymie Bold Italic proud of the cantilevering porch

Figure A-20 Wolverhampton Market entrance signage
http://www.flickr.com/photos/98688203@N00/3338453339/

Architects

Borough engineer, H. Schofield; deputy borough engineer A.G. E. Chapman, chief assistant architect; J. A. Richards, assistant architect in charge, K. W. Johnson, assistant architect. Reinforced concrete design by GKN Reinforcements Ltd(Anon, 1960d)

Swansea Market, 18 May 1961

Cost

Tender cost£216, 165

Design & Structure

Swansea market was destroyed by bombs in 1941. The new market on the same site was built with perimeter shops and a hotel.

The 160 ft deep market has a clear span of 192 ft under a curved steel arched roof, the central part of which has an aluminium double skin with insulation; an uninterrupted floor area of 30,750 sq ft.

Entrances from three shopping streets have prominence with projecting canopies with illuminated lettering visible from all directions.

Servicing is from the fourth side with recessed covered loading bays, storage and preparation areas and a refuse bay.

Figure A-21 Swansea Market, 1970. Showing service side
http://www.swanseaheritage.net/swanseathroughtheyears/gat.asp?A_ID=272

Stalls

A metal frame-work carried the plastic fascia with the tenants sign and supported light fittings and blinds when the stall was closed. Generally the stall risers were tiled with plastic faced partitions between stalls, “with a wide variety of colours used in tiles, fascia panels and blinds to give an interesting and harmonious appearance”p66 (T. L. Lewis, 1966)

Figure A-22 Swansea Market interior, 2011
http://www.fotolibra.com/gallery/747081/swansea-indoor-market/

Lighting and Ventilation

A high level of natural lighting is given by glazed lower stretches of the roof and the gable ends. Gear operated opening lights and permanent ventilation in both gables provide cross ventilation. Artificial lighting was "provided by a series of special fittings placed below the arched roof which are suspended from the main arches. These have lamps at the top and bottom, to give some illumination to the main roof and an even, but not high level of illumination at floor level as each of the stalls has its own display lighting."p65(T. Lewis, 1966)

Surfaces

Floor finishes were a combination of granolithic paving and ceramic tiles. The limited wall areas were covered in ceramic or mosaic tiling.

Signage

Entrances' projecting canopies with illuminated lettering visible from all directions.

Architects

Architect, Sir Percy Thomas & Son. Stall layout was by the borough estate agent W Cyril Rogers. The main contractor was Robert M Douglas (Contractors) Ltd.(T. Lewis, 1966)

Totnes Market 1961

Civic hall on columns with market under. 2,412 sq.ft.

“Bland, with shallow pitched roof, but less painful than most urban buildings of this time. Slate-hung first floor on columns, approached by a spiral ramp”p874 (Cherry & Pevsner, 1989)

Figure A-23 Totnes Civic Hall. Northern side with market below and outdoors, http://www.zenoshrdlu.com/kapstuff/totmarket.jpg

Figure A-24 Totnes Civic Hall. Southern side with market below and outdoors, 2006 http://www.flickr.com/photos/dave_mitchell/317748591/

Architect G.A. Jellicoe & Partners

Shipley Market Hall 1 December 1961

Design

The market hall is on the lowest floor of a privately developed shopping centre, on an island site on the north side of the town’s market square. Taking advantage of the fall in level away from the square the market is just below street level at the north side of the block on Westgate where a colonnade has shop units on either side of the market entrance. A tall ‘boxy clock tower’ on the market place south side(Leach & Pevsner, 2009). Beneath the tower is a staircase down to the market, with a rising escalator. Servicing is at market hall level with vehicle access ramp and loading bay.

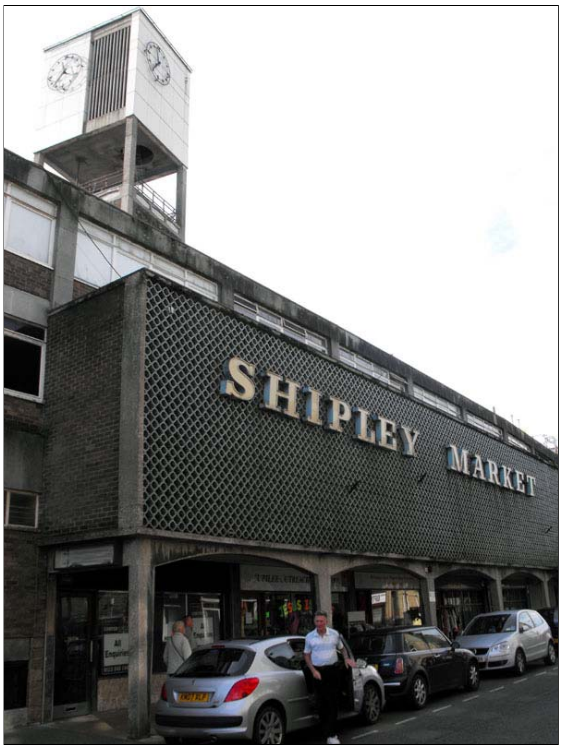


Figure A-25 Shipley market colonnade, ceramic screen, and clock-tower

Figure A-26 Shipley market freestanding clock-tower, September 2011 (Author)

Structure

The expressed concrete framed three story flat roofed building, Clock tower also an expressed concrete frame.

Stalls

The 40 stalls were of a uniform design. Formica-like micro abstract pattern risers with stainless steel trims. Stall dividers up to eye level of pegboard in a bent-wood frame. The stalls had no superstructure. Pendant stall signs fascias in Formica-like wood-grain, with applied letters. Giving “the appearance of a large store rather than of a market hall”(Anon, 1961d)

Figure A-27 Shipley Market Hall interior circa 1961 (Shipley Library collection)

Figure A-28 Shipley Market Hall interior circa 1961 (Shipley Library collection)

Lighting & Ventilation

The hall's ceiling is low without natural light. The columns and beams are massive. Many pendant fluorescent tubes provide high light levels. Electrically heated.

Surfaces

Patterned terrazzo tile floor.

Art

The six-storey freestanding clock tower has a portal to the market hall. The expressed structural frame is relief patterned. Each storey infill is different to the next like stacked boxes. There are balconies asymmetrically arranged. The top story is a campanile again asymmetric. A sculpted figure with hammer is a clapper.

Figure A-29 Shipley Market Clock Tower, 2009
http://www.flickr.com/photos/10089490@N06/3228603133/in/photostream/

Figure A-30 Shipley Market Clock Tower with figure with hammer as clapper, September 2011 (Author)

Novelty

The above the colonnade is a massive pierced screen of pale blue Belgian ceramic glazed quarter-pipes, the length of the building and two stories high. It screens the service area to the shops above.

Signage

The ceramic screen carries large applied *SHIPLEY MARKET* letters in Stymie Bold Italic. Above the two entrances are red market signs.

Architects

Shingler Risdon Associates in conjunction with Gerald M Baxter, staff architect of Arndale Property Trust (Anon, 1962h)[110].

Hamburg wholesale fruit and vegetable market (Großmarkt Hamburg) 1962

Completed in June 1962, the market roof is a continuous 221m x 180m; three vaulted parabolic shell s with two suspended parabolic shells between them. The roof is supported by 12 chains of arches, three parabolic frames and two cross-members at 20m intervals (Anon, 1962k). The market's roof and windows were the subject of the cover photo accompanying a four page illustrated Concrete Quarterly article (Anon, 1963f).

[110] Unseen references to the development are *Surveyor and Municipal and County Engineer* 1961 30 December p1538 and *Master Builder* 1962 April p81

Figure A-31 Hamburg wholesale fruit and vegetable market (Anon, 1963f)

Figure A-32 Hamburg wholesale fruit and vegetable market (Anon, 1963f)

“This curvature of the roof in all directions in each section undoubtedly produces a pleasant architectural effect. There is a shifting interplay of light and shadow and the building despite its size, never appear monotonous or clumsy. The other side of the picture and its ingenious engineering solution was the great difficulty presented by the analysis and construction of this unusual shell roof”(Anon, 1962k)

Accrington Covered Market, 27 October 1962

Cost

Contract cost £173,677

Design

The new Accrington market hall was conceived of as two rectangular umbrella structures, each with an arrangement of seven reinforced concrete shells at two heights allowing clerestory lighting.

Built to the rear of the 1869 market hall, Accrington's 1962 covered market, the major part of which was two pavilions (divided by a service road closed to traffic during trading hours). Each pavilion was in plan 139' long and 60' wide. An adjoining block of five fish market stalls under a mono pitch roof started trading the previous year. Another flat roofed block had 22 lock up shops, a cafe and public lavatories. There a was a freestanding 95ft x 25ft reinforced concrete folded triangular plate roof for seven pitchers to trade "to add interest and draw shoppers into that side of the market"p13(Accrington Borough Council, 1962). There was also a sweets and tobacco kiosk.

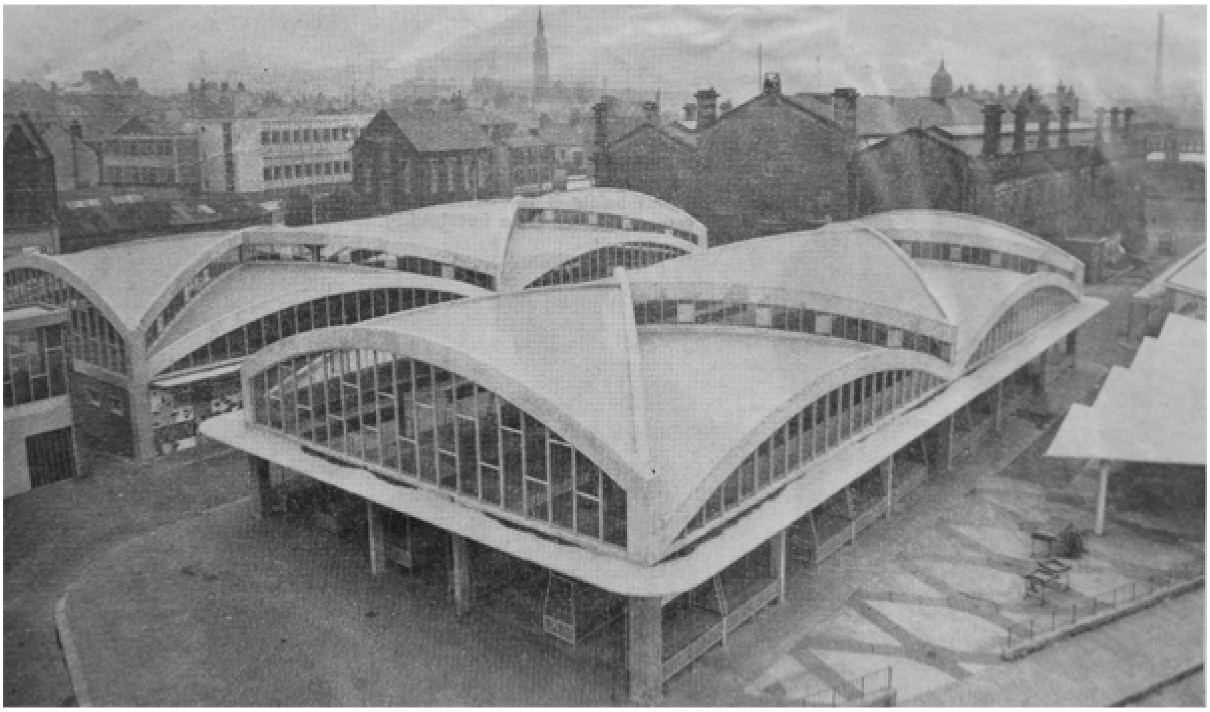


Figure A-33 Accrington Covered Market 1962. Folded plate roof over pitchers' gaffs to right (Anon, 1963g)

Structure

The single storey market pavilions, with basements, were roofed by a series of 3"triangular and diamond shaped concrete shells, with 59'6" radii, carried on arched 24" by 12" cross section, reinforced concrete ribs of 60' spans at two levels. The ribs were in turn carried at their roots by a 15 ½" x 18" prestressed tie beam along the perimeter of each hall supported on 6 main and 12 subsidiary columns. Two columns to the centre of each pavilion were required to support the corners of four shells. Each of the perimeter main columns contained a copper rainwater fall pipe to drain the shells (Anon, 1963d).

In the contemporary council documents and accompanying publicity and the nature of the shells was the ill-defined or at least confused. The council's announcement of the market's roof design in September 1958 was reported by the Accrington Observer (Anon, 1958) as being "spherical triangles" The booklet published to commemorate the opening of the market clearly stated that the shells are spherical (Accrington Borough Council, 1962) and most contemporary reports stated that the shells were spherical;(Anon, 1962d) (Anon, 1962i) (Anon, 1962j) (Anon, 1963a), and a later report (Prestressed Concrete Development Group, 1966?-a) does not specify the nature of the shells. However two reports;(Anon, 1963d) and (Anon, 1963g) state the shells were cylindrical.

There is an authoritative source. J E Gibson M.Sc.(Maths), Ph.D., D.Sc., A.M.I.C.E., A.M.I.Struct.E., M.I.A.S.S. discussed the design of shells roofs and his 1958 model testing of Accrington Market (Gibson, 1961).

'..the original conception of which had been a series of hyperbolic paraboloids. On linking these up to form the completed structure, it was found that because of the geometry of the paraboloid, the final structure assumed a sagging appearance that was not aesthetically pleasing. It was decided by the architect and the consultant to eliminate this appearance of sagging by making the surfaces cylindrical, whilst still retaining the outer boundaries which were diamond and triangular-shaped in plan."pp. 222-223(Gibson, 1961).

"The structure as finally conceived by the architect consisted of a series of shells at different levels, all cylindrical surfaces either of a diamond or triangular shape" p. vi(Gibson, 1968). The continuing text on "Market Hall at Accrington" p 283-295 discusses only cylindrical shells,

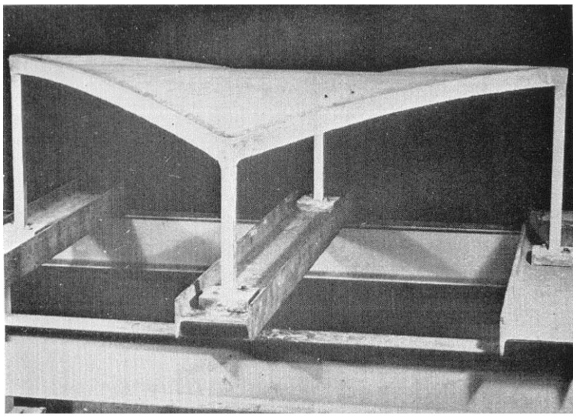


Figure A-34 1:16 Diamond cylindrical shell loading test model (Gibson, 1961)

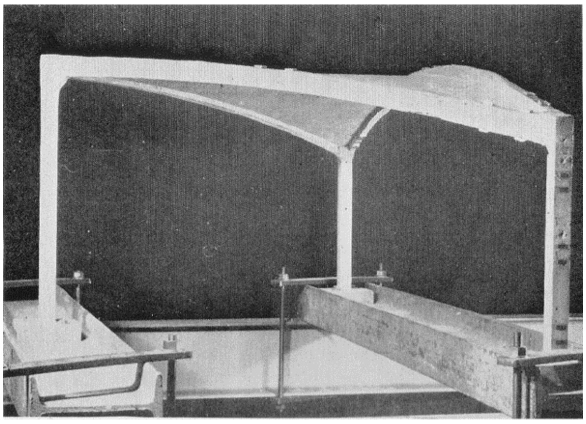


Figure A-35 1:16 Trinagular shell loading test model (Gibson, 1961)

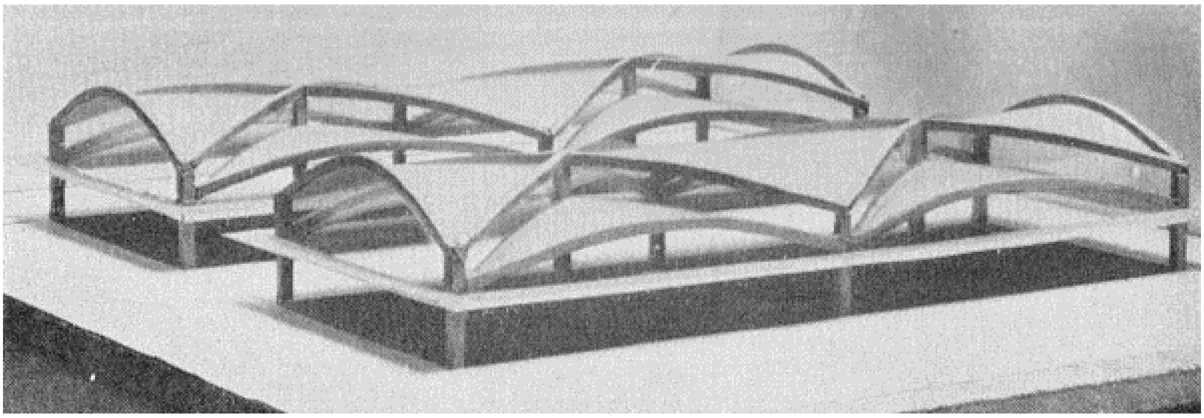


Figure A-36 Model of Accrington Market Hall (Gibson, 1961)

“The resulting roof structure, though consisting of a series of cylindrical surfaces, could not be analysed by standard cylindrical shell analysis as each individual surface was no longer bounded by parallel generators, so a complicate design problem was presented p. 223(Gibson, 1961).

He concludes the discussion by stating “This chapter would be incomplete without mentioning the work of Professor Nervi who has used reinforced cement mortar to build actual structures.” p. 233 (Gibson, 1961)

Gibson discusses the Accrington project as an example of “...model analysis which offers a means of solution in those cases where mathematical analysis is either too complex or non-existent.” p. vii (Gibson, 1961).

Stalls

110 stalls designed and made in house by the council engineer’s department (Anon, 1962g) they were made of galvanised steel with plastic fronts (Joynson, 1962a). The plastic described was a patterned Formica (Accrington Borough Council, 1962) supplied by The Bushboard Co Ltd (Bushboard, 1962).

Figure A-37 Accrington Covered Market interior (Accrington Borough Council, 1962)

Lighting

The shells at two levels in triangular and diamond-shaped slabs had all the vertical intervals between them and the space below every shell at the market's perimeter glazed "which make an exciting and intriguing geometrical pattern. The success of the scheme is that the Market is covered with a substantial roof and yet the concave expanses overhead are filled with natural light...'(Joynson, 1962a).

"In the dark hours the fluorescent tubular lighting and the light coloured stalls will present a most brilliant spectacle which will be greatly appreciated" (Anon, 1962g). It is apparent that traders' stalls also had lighting (Anon, 1962e). Stalls had an illuminated sign box with the name of the stall holder picked out (Joynson, 1962a).

Ventilation

Photographs show ten-pane louvre windows at regular intervals across each arc of glazing (Gibson, 1968) and (Accrington Borough Council, 1962).

Surfaces

Hall floors were coloured mastic asphalt. Some columns had multicoloured mosaic tiling (Accrington Borough Council, 1962).

Art

Three ceramic murals were commissioned by the council(Accrington Borough Council, 1960, 1961) installed on external walls of the new fish and main markets. One fish market mural was a mosaic depicting a circular theme of fishing and fish marketing' the other was a bold pattern. The main covered market mural a tile mural ‘depicting fruit, flowers and vegetables, in abstract form’(Accrington Borough Council, 1962).

Figure A-38 Fish market pictorial mosaic (courtesy June Huntingdon)

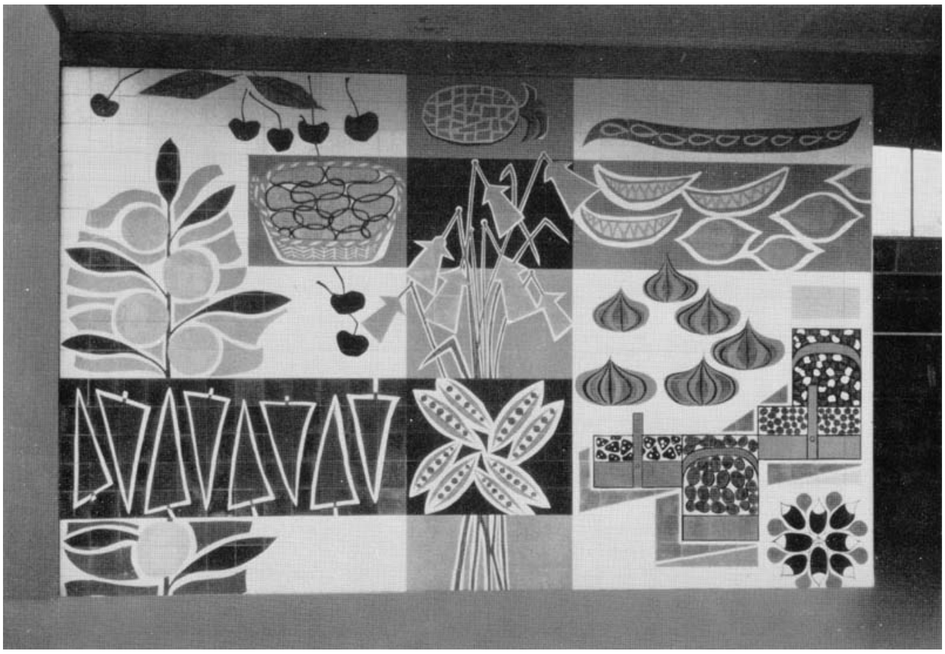


Figure A-39 Accrington Covered market tiled mural (Accrington Borough Council, 1962)

Novelty & Aspirations

‘With the shell suspended on thin columns there should be conveyed with it all an overriding sense of light, airiness, grace and buoyancy which should give both Accrington people and visiting shoppers a vivid impression of a lively and enterprising town...

Alderman Brotherton said “On the contemporary architectural features we must remember that we have to build for posterity not just for ourselves. We want the market to stand for the next 50 years and it must embody all the new features now” (Anon, 1958)

“Accrington’s new Market may not be as impressive as Coventry Cathedral, but it will be more exciting than the Coventry Market – which offers a better standard of comparison.
The Market at Coventry is one of the newest in the country and was one of those which Accrington Corporation representatives went to see when the town’s new Market scheme was launched” (Joynson, 1962a)

“It can certainly be claimed that this structure is the finest in the North West. It is in advance of that of Coventry, which was one of the markets the committee went to see when they were embarking on the scheme. Even Smithfield has only just adopted the idea of the concrete umbrella for the new poultry market being built there.” (Joynson, 1962b)

At the market’s opening ceremony the mayor invited Alderman Brotherton to move a vote of thanks. In his speech the alderman, smiling “suggested that the Chamber of Trade or Rotary Club might be interested in commissioning Henry Moore to do a modern sculpture in keeping with the modern design of the market”. (Anon, 1962g)

In two of the contemporary reports on the 1962 Accrington market the hyperbolic paraboloid shell design history is recognised; “The original intention for the roof was a series of hyperbolic paraboloid roof sections, but experiments proved that in this case the structure assumed a sagging appearance. It was found to be more aesthetically satisfying to base the design on cylindrical sections” (Anon, 1963g) and agreement with a second article that also suggests the shells were cylindrical and spherical (Anon, 1962i). No image or reference to an image of the rejected hyperbolic paraboloid shell design has been found.

In October 1962 Accrington Council was planning “a £3,200 garden setting” as the “decorative finish to the new markets scheme”, with trees, ornamental flower beds, ornamental paving and seats to two sides of the market hall(Anon, 1962a).

Little later architectural comment has been found. Pevsner, after describing the old market; “New market, not at all a monument, but successful with its interlocking vaults”p46 (N Pevsner, 1969) and from 1976; “The outside market that was built behind the market hall in 1962 must count as a success ; its shallow concrete domes lightly and elegantly enclose the colours, sounds and smells of the assorted stalls”(Anon, 1976a).

Visits to other markets and by others

In June 1955 Accrington Corporation’s Market Superintendant “suggested that, before any action was taken with regard to the re-siting and re-organisation of the Outside Market, it might be advisable to visit the markets of other authorities with a view to observing any desirable features which could be incorporated therein. It was resolved that a Sub-committee and appropriate officials be authorised to visit the markets at Derby, Nottingham and Rochdale”. (Accrington Borough Council, 1955a) Nottingham’s market hall was built in 1928, Derby’s 1866 market hall had been extensively renovated in 1938, and Rochdale’s built in 1939 (Schmiechen & Carls). A report on the visits to the markets at Derby and Nottingham was later approved.(Accrington Borough Council, 1955b)

“The Market at Coventry is one of the newest in the country and was one of those which Accrington Corporation representatives went to see when the town’s new Market scheme was launched” (Joynson, 1962a)

Signage

The market was signed by architectural individual block serif capital letters along the Broadway elevation (Barrett & Duckworth, 2004) and proud of the roofline of the lock up shops. (Accrington Borough Council, 1962)

Figure A-40 Accrington Covered Market c 1965(Barrett & Duckworth, 2004)

Figure A-41 Accrington Covered Market 1962 showing roof signage and kiosk (Accrington Borough Council, 1962)

Architects

The project was planned, designed and constructed by a team led by the Borough Engineer and Surveyor, Bernard Hartley BSc(Eng)Lond, AMICE, AMIMunE in collaboration Dr Denis Matthews MA, D.Eng, MSc(Eng), MICE, MIStructE, MAmSocE, consulting structural engineer engaged on the reinforced concrete and structural design. The Architectural Design Principal was Bernard Mulhall ARIBA(Accrington Borough Council, 1962).

Sheffield Castle Market opening in phases, 27 July 1959 to 1965.

Design

Castle Hill Market was built in 1928-30 to the rear of a new Co-operative Society building. In 1940 the Co-operative Society building was destroyed during the Sheffield blitz. The market was unscathed and continued trading. In 1956 Sheffield Corporation purchased the Coop's bombed site on Exchange Street with the intention of extending the Castle Hill Market. A marketing brochure produced by the Corporation in c1957-8 stated that the new market occupied one of the best positions in the city and that its development was the first important step in the reconstruction of this part of the city centre. (Sheffield, n.d.)

For the new market building, known as Castle Market, the architect advocated a multi-storey design over part of the site to provide the elevation such an important position warranted and to make maximum use of the valuable, and restricted, site with the inclusion of five lettable office floors. In addition, as many street frontage shops as possible were incorporated into the design, with two tiers of shops on the Exchange Street elevation, the first-floor shops accessed by an external upper pedestrian level.

The main phase IV market is on two main floors and is divided into five cells; those at the ends contain freestanding staircases with flights wrapping round central concrete piers and wide half landing balconies offering views down into the market hall. The three central cells have voids at the upper level which allow daylight to the lower level.
There is no sense of a market hall in Castle Market. Fudge refers to indoor streets.

Figure A-42 Map for public use in Castle Market, Sheffield, February 2011 (Author)

The arrangement of voids and interconnecting cross halls produces staggered pedestrian routes which were designed to promote circulation with the aim of preventing areas of poor trade.

Figure A-43 Castle market, Sheffield, interior (Fudge, 1968)

Figure A-44 Castle market, Sheffield, interior (Fudge, 1968)

The steeply sloping site is utilised to allow ground-floor access to both main levels. There are two internal open stairs and a double staircase in the centre leading either up or down into the inter-war meat and fish market. There are two passenger lifts; “As a result buyers use the whole building easily, and no level suffers economically at the expense of another”(Anon, 1961a)

The land levels fall away to the river behind the market. The lower levels of the markets have service passages connecting it to the upper and lower loading bays. Flanking this passage were individual stock rooms, stairs and hoists.

Figure A-45 Service and pedestrian ramps to upper service bay (2008)
http://www.flickr.com/photos/harryhalibut/2947459589/in/set-72157622832484797

At the rear the service yard is reached by a 1960s curved concrete vehicle ramp. The ramp is supported on single massive concrete piers and brackets. Curving more steeply to its inside is the cantievered pedestrian ramp, which rises to a doorway in the north-east corner of the inter-war market. The north elevation has a raised concrete loading dock and projecting steel-framed canopy. There is a similar loading dock and canopy at a lower level to the east elevation.

Building work began in February 1958. Phase IV opened for business on 27 July 1959. The offices were completed in March 1961 and Gallery shops in April 1962. Phase V was built between 1963 and 1965.(English Heritage, 2010a)

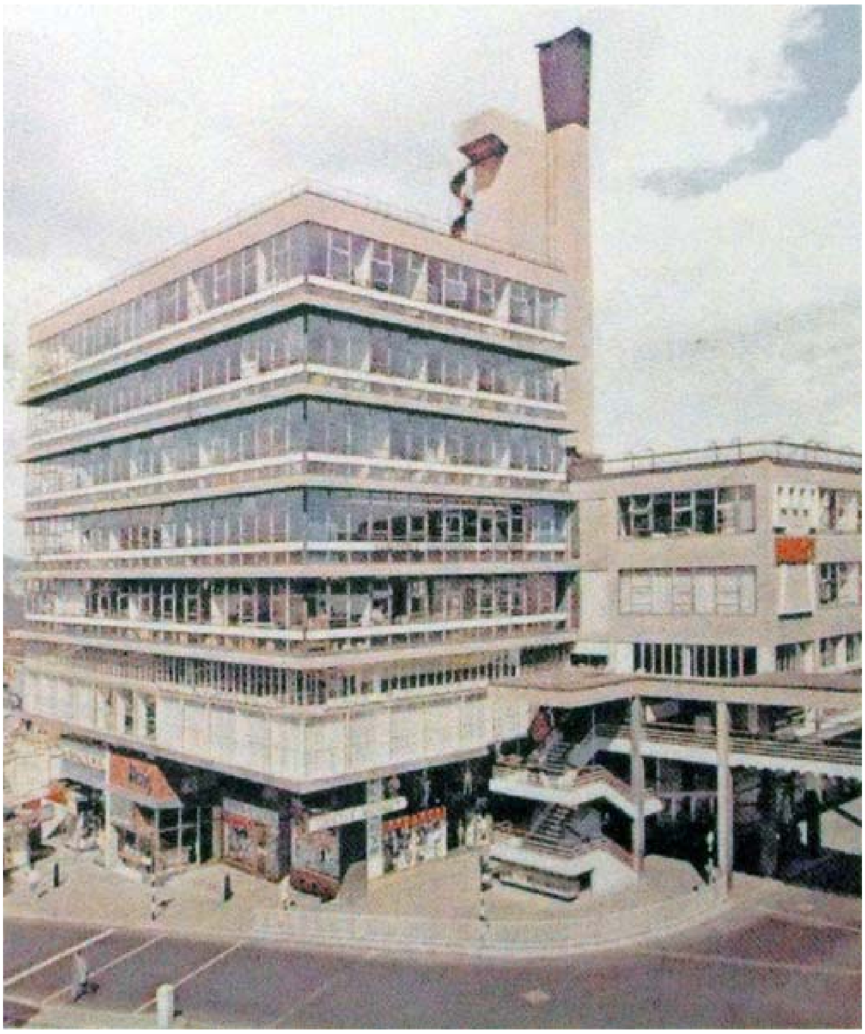


Figure A-46 Castle Market, Sheffield (Sheffield Council)

Structure

A frame of in-situ reinforced concrete with reinforced concrete floor slabs, mainly with a ribbed profile. The exterior walls are finished in precast 2in thick grey terrazzo slabs, fair-faced concrete and infill panels of Uxbridge flint bricks.

Stalls

Over 200 stalls in a range of stall types. As each floor has headroom of about 4.9 metres, to allow the provision of a mezzanine level to the wooden framed stalls. Apparently for display in some cases, stock for others.

The stall risers display a variety of Formica type patterns, some identical to Blackburn Market.

Lighting & ventilation

Four cells are lit by a series of north-light sawtooth roofs raised over glazed clerestories with pivoting upper lights to enable ventilation. Flat roofs have small areas inset with grids of square or circular glass lens roof lights.

Surfaces

The market hall floor and stairs are paved with ‘Cerebati’ceramic tiles, and the interior walls are either fair-faced concrete, brick, or finished with ceramic and glass mosaic tiles and bold patterned coloured glazed Pilkington tiles.(Anon, 1959k)

Art

The markets castle logo was expressed in a variety of media. Relief pattern tiling, mosaic, direction board, signage and a sculpted lift house and tank tower.

Figure A-47 mosaic, 2011 (Author)

Figure A-48 Direction board, 2011 (Author)

Figure A-49 Relief signage
http://www.sheffieldtelegraph.co.uk/news/local/case_for_saving_castle_market_is_demolished_1_2880228

Figure A-50 Patterned relief tiling detail 2011 (Author)

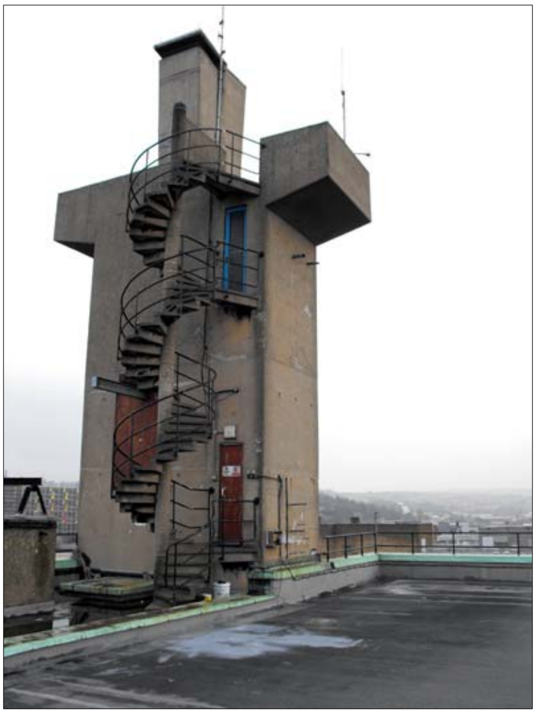


Figure A-51 Castle Market roof top lift and tank tower 2011 (Author)

Novelty and aspirations

In 1956, the Markets Committee and the architects Thomas & Peter H Braddock, for a Hammerson's scheme (1959-62) on the other side of Exchange Street, agreed that their two buildings should bear a definite physical relationship in order that this major development might form an effective piece of civic design. Additionally there was an intention for the public and private schemes to be interdependent to an extent, creating a large modern shopping centre to the benefit of each. The solution was to narrow Exchange Street and include upper pedestrian galleries to both Castle Market and the private development linked by two high-level bridges over the street.

This high-level walkway was eventually extended with further footbridges along Waingate to Haymarket. The Architects' Department saw Castle Market as one element of a much grander vision of regeneration of post-war Sheffield. The gallery level walkways were intended to form part of a safe circulation system for pedestrians linking buildings and connecting with other key locations such as Corporation's Park Hill housing scheme separating pedestrians from the burgeoning road system. It was thought at this time that the intended northern extension of the M1 would run through the city. Architectural and planning critic Ian Nairn wrote enthusiastically about this possibility of roofing right over the industrialised Sheaf Valley forming one pedestrian level with motor traffic underneath(Nairn, 1967).

An isometric plan shows the walkways(Information Library) while a larger area is depicted in a plan of Sheaf Valley redevelopment dated July 1962, showing the walkways reaching out from the commercial centre and spanning roads to link housing, recreational and educational buildings in one integrated approach. However, the scheme was not realised.

Visits to other markets and by others

Castle Market was inspected by the Huddersfield Markets and Fairs committee, date unknown, (Anon, 1966a)

Signage

Stall signs were in a unified style for most stalls, some individual kiosks had brighter signs. Directional signage was apparent in all areas.(Fudge, 1968)

On the exterior there was high level projecting sign spelling MARKET in red set in a relief white castle turret.(Fudge, 1968)

Architects

Sheffield Corporation city architects' department under the leadership of J L Womersley, the City Architect, with the Deputy City Architect, Andrew Derbyshire as project architect. Derbyshire was employed at Sheffield between 1955 and 1961, when he left to join the private practice RMJM. He worked closely with Mr Rixon, the Deputy Market Superintendent, to reproduce 'the bustling character of the old market and the individuals who traded there'. For phase V Andrew Derbyshire had left the architects' department by this date, and it is likely that the architect was W L Clunie, the new Deputy City Architect.

Consulting structural engineers, Ove Arup & Partners; general contractors William Moss & Sons Ltd of Loughborough.(English Heritage, 2010a)

Birmingham Market, 14 November 1963(NABMA, 1964)

Design

The 1835 market hall, with room for 600 stalls and an ornamental fountain, was designed by Charles Edge. In 1940 it was gutted after being hit by an incendiary bomb. It was still in use although roofless until the redevelopment of Birmingham in the early 1960's(Chinn).

Birmingham's Bull Ring Centre officially opened in May 1964, however it was opened in phases earlier. It was a multi-level covered shopping area providing over 350,000 sq. ft. of retail trading space, a 9-storey office block and multi-storey car park for 500 vehicles. The first indoor city-centre shopping centre in the UK (Anon, 2011a). It also had traditional open-air market stalls, a market hall under the indoor shopping centre. Anderson states that the market was on two levels(J. Anderson, 1988) another report says on three (Schmiechen & Carls, 1999).

Figure A-52 Bull Ring Centre, Birmingham. Undated postcard (M. Parr, 1999)

The outdoor market area had opened in June 1962 with 150 stalls within the new Bull Ring, which was still under construction. The new market hall incorporated into the Bull Ring shopping centre opened in November 1963 (NABMA, 1964).

Structure

The indoor market had a column and beam construction with a waffle ceiling under the shoping centre.

Figure A-53 Birmingham Bull Ring market, 1964. http://www.britishpathe.com/record.php?id=43295

Stalls

The square columns appear to have coincided with stall frontages. The stalls appear to be metal framed. They had decorated stall risers that look like the Formica surfaces found in Sheffield and Blackburn markets. There were continuous standard white fasica boards with the stall name in applied lettering. Behind the fascia boards was fluorescent tube lighting that gave some up lighting to the low ceiling (British Pathé, 1964). Anderson states that the market was on two levels(J. Anderson, 1988).

Figure A-54 Birmingham Bull Ring market, 1964. http://www.britishpathe.com/record.php?id=43295

Lighting

Without natural light and without significant space lighting. Behind the stalls' fascia boards was fluorescent tube lighting that gave some up lighting to the low ceiling (British Pathé, 1964)

Ventilation

The Bull Ring Centre was heated and air conditioned. It is not clear if the market was.

Novelty

The sunken outdoor market had at least 14 permanent inverted hexagonal umbrellas with clusters of stalls below. Each umbrella's structure is obscure but the canopy was comprised of six shallow ridged components, seemingly in moulded plastic. Most of the roof components were in four ice cream colours, with two colours to each umbrella. The canopies appeared to have drained to the centre. Fudge felt that the use of pastel colours, not bolder colours, was an opportunity missed (Fudge, 1968). Years later a Sunday Times article on Leicester's market referred to "the plastic whimsy of Birmingham's Bull Ring"(Anon, 1971d)

Figure A-55 Birmingham Bull Ring outdoor market's hexagonal umbrella stalls (Fudge, 1968)

Figure A-56 Birmingham Bull Ring outdoor market's hexagonal umbrella stalls
http://i.pbase.com/g6/86/127086/2/71075924.2PRwfYpN.jpg

Signage

The Bull Ring Centre was noted for its signs that covered many elevations. The market entrances were discrete.

Figure A-57 Birmingham Bull Ring market entrances
http://www.birminghamforum.co.uk/index.php?topic=4688.11

Architects

Sydney Greenwood and T. J. Hirst (Foster, 2005).

Wakefield Market Hall, 13 April1964

Cost £296,000 (NABMA, 1964)

Design

The hall was built as a block in the street plan next to an operating open market. It was rectangular 130 ft x 192 ft, with a gallery around the market with small trading units and a restaurant with views over the street outside and over the market.

Servicing was by ramped underground access to basement with traders' stores.

Structure

The structural frame was of pre-cast concrete column and beams. It consisted of pairs of 30ft columns 76ft' apart at 20ft intervals. Each column supported a double cantilevering beam, the outer 27ft arm carried an edge beam, the 16ft inner arm supported posts that carried a roof beam spanning 45 ft. The posts and end of the roof beams were tied longitudinally by beams to form the heads and sills of glazed clerestories.

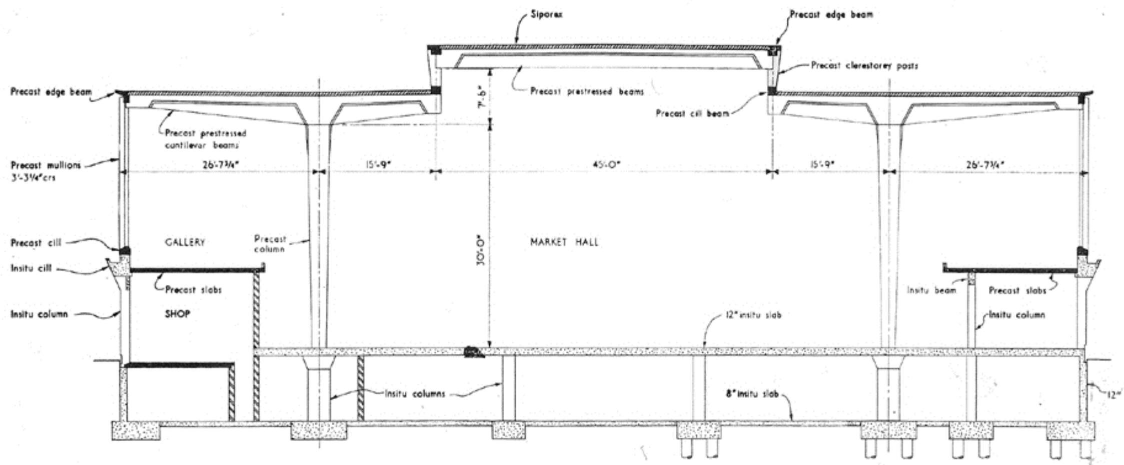


Fig. 2.—Market Hall, Wakefield (*see page 117.*)

Figure A-58 Wakefield Market Hall cross section(Anon, 1965a)

Figure A-59 Wakefield Market Hall, 2008 http://photos.jml.net/

Stalls

59 stalls on the market floor with a snack bar and hairdresser; 27 stalls on the balcony.

Lighting

There was mullioned clerestory lighting to each side of the hall above perimeter shops. Artificial lighting was by high level pendant lights suspended from the roof soffit.

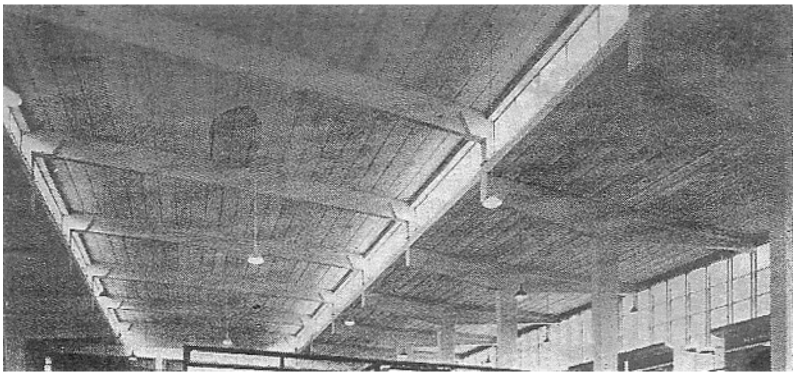


Figure A-60 Wakefield Market Hall lighting (Anon, 1965a)

Surfaces

All exposed internal concrete was painted. External concrete of the clerestory was rubbed to expose grey Cornish granite aggregate, below the exposed frame members were clad with faience and mosaic. Flooring was terrazzo.

Art

See signage

Novelty

"Wakefield's old market hall was a prefabricated shed originally designed as a swimming pool. It's unclear why, in 1963, the town council purchased a pool for the task... a viewing balcony ringed the central hall, presumably for spectators to see the action in the water"(Richardson, 2008). No further reference to the swimming pool design has been found.

Signage

The market's signs were MARKET made of individual cast concrete letters on relief decorated mounts set into the clerestory windows each letter replacing an entire pane. With a touch of pop art, red neon tubes surrounded the entire letter forms. The word MARKET was expressed both vertically and horizontally on the elevations.

Figure A-61 Wakefield Market Hall 2008
http://photos.jml.net/

Figure A-62 Wakefield Market Hall during demolition, 2008
http://photos.jml.net/

The architect Michael Egan(b. St Médard-en-Jalles 1907, d.London 2003) was best known as an architect of flamboyant cinemas(Eyles, 2003). It is hard to feel not to feel that there is a touch of cinema design here.

Architects

Engineer & surveyor, J N Sedgwick; architect. Michael Egan and Partners; consulting engineers, Harry Brompton & Partners. (Anon, 1965a; NABMA, 1964; Walker, 2000).

Northwich, 1964

Single storey clear span with north lights, surface servicing.

Shop units to the exterior, on a side street, under a continuous canopy with the market entrance marked with by raised portal. The maket had a stumpy tower to the main street which otherwise had an inactive frontage (see Figure A-63)

Figure A-63 Northwich Market exterior (Elsan, Mann & Cooper (Kingham Knight, 1966))

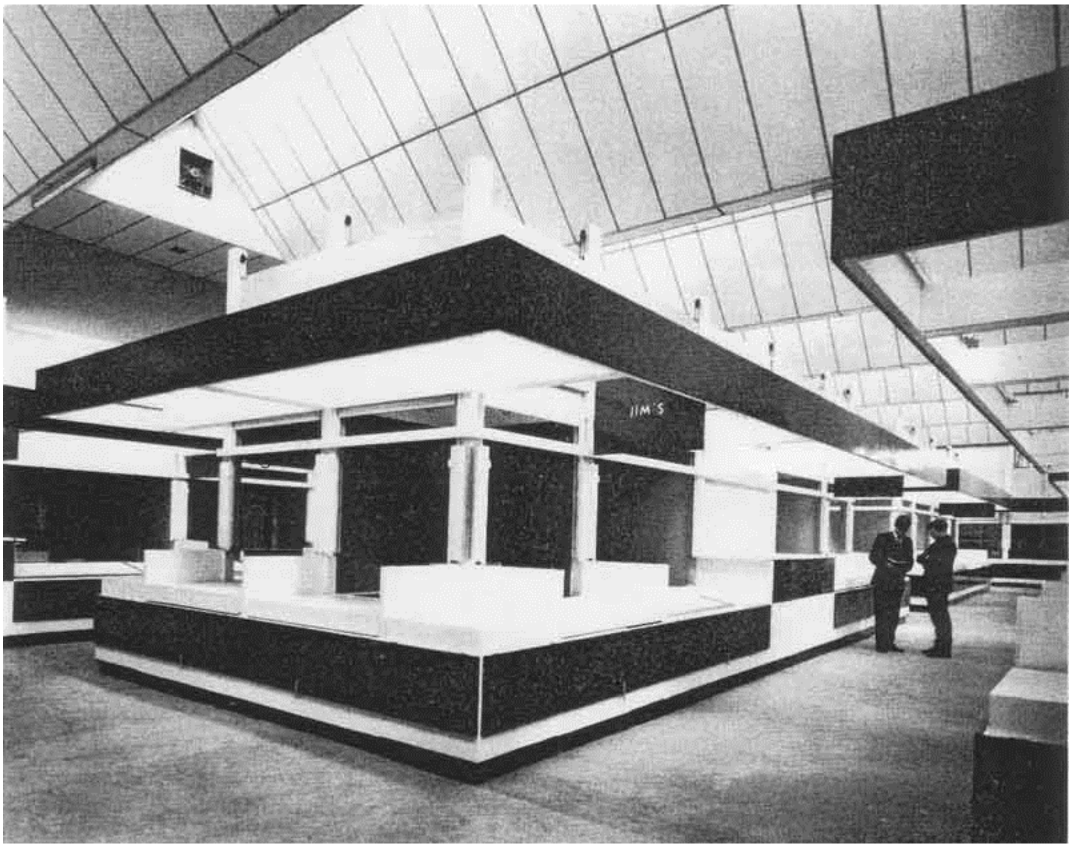


Figure A-64 Northwich Market interior (Elsan, Mann & Cooper in (Kingham Knight, 1966))

Stalls in blocks with continuous fascias (see Figure A-64).

Architects
Kingham, Knight Associates

Blackburn Covered Market, 11 November 1964

Built on the initiative of the Improvement Commissioners, Blackburn's market hall of 1848 was the town's first public building of importance and was noted for its beauty. It was designed by Terrence Flanagan, Engineer for the Bolton, Blackburn, Clitheroe and West Yorkshire Railway. The building was in the early Italian style, with a frontage of 3 gables and a campanile 72' high at the west end. The upper section of the tower contained an illuminated clock. The interior was 186' long by 109' wide, described as "completely unique in its appearance" and in the "early Italian palazzo style"(County Borough of Blackburn, 1964; Schmiechen & Carls, 1999). Since WWII the market had outgrown the building and was considered too small for the needs of the town. It was demolished in December 1964 (S. Smith) to allow central area development.

Cost
The cost was reported as being £600,000 for the markets project. The culverting and sub-way work was carried out at a cost of £220,000.

Design

In May 1961 a Central Development Area partnership plan between Blackburn Corporation and Laing Development Co Ltd, sweeping away 25 acres of the town centre was announced. It included the building of a new shopping centre with office accommodation and recreational amenities in which vehicles and pedestrians were to be completely segregated. Shops would have underground service roads with car parking at roof top level for over 1,00 cars. (County Borough of Blackburn, 1964).

The new County Borough of Blackburn Wholesale and Retail Markets were a complex covering an area of about six acres including a daily market hall of 29,700 ft^2, a two- and three-day market hall of 69,000 ft^2, a daily fish market hall of 4,500ft^2, 36 perimeter shops, 14 ‘mini’ shops, five cafes, a restaurant, with a roof top service road and parking for 330 vehicles. There were separate buildings for wholesale market traders and market garden traders. Amenity planting of

The River Blakewater runs through the site and it was necessary to culvert a 400yd length of it in order to prepare the site. Pedestrian underpasses were also developed.

Figure A-65 Blackburn Market 1964. North West aspect. In foreground the wholesale market, then the three day market under car park and the market hall beyond. Photo of photograph on display in market office April 2009 (Author)

Figure A-66 Blackburn Market 1964. West aspect.
Photo of photograph on display in market office April 2009(Author)

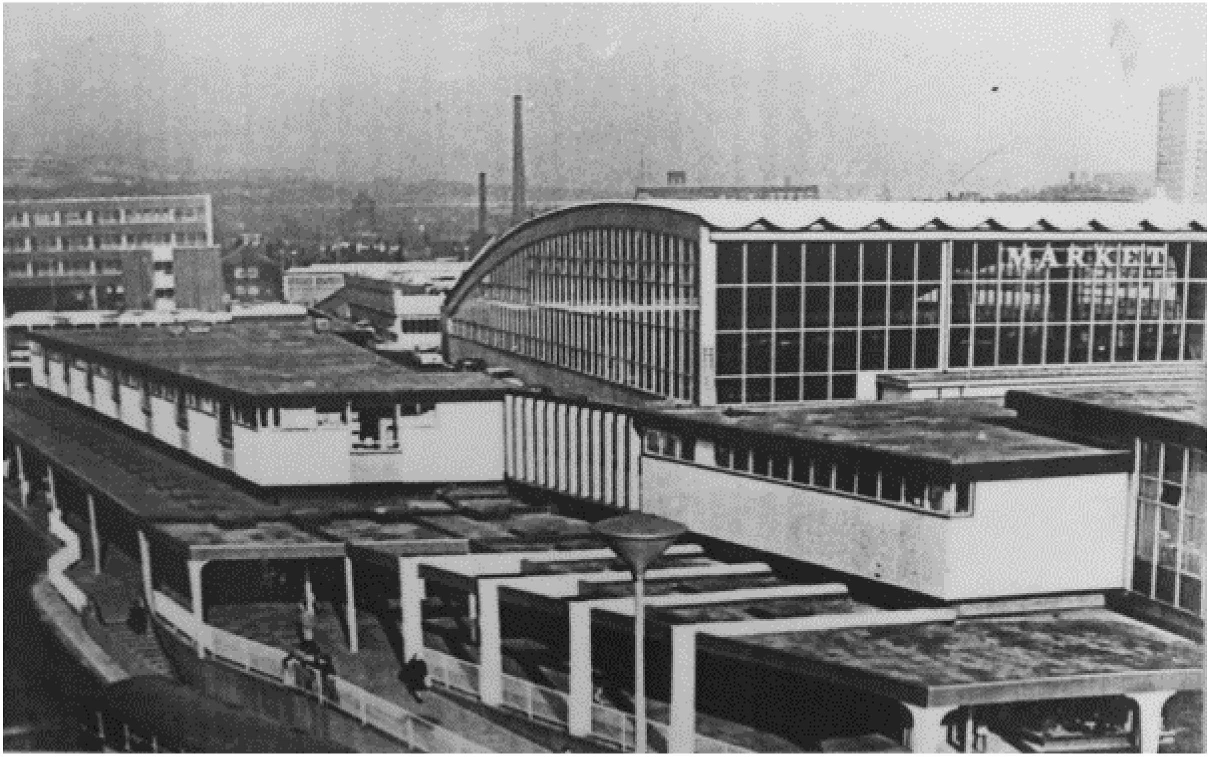


Figure A-67 Blackburn Market 1964. South West aspect.
Photo of photograph on display in market office April 2009 (Author)

Figure A-68 “The Market, Blackburn” Colourmaster International postcard no date
http://www.cardcow.com/280423/market-blackburn-lancashire/ accessed 11 October 2011

Structure

The daily market, covered an area of 29,700ft^2. The centre roof covers an area of 160’ by 106’ without intermediate supports. The structure is of three reinforced concrete portal frames at 40’ centres, post tensioned. The bays are spanned by pre-stressed precast hyperbolic paraboloid System Silberkuhl concrete shells produced by Modern Concrete Ltd in Bristol forming a parabolic curved roof rising to 53’ above the market floor, each of the 56 shells measuring either 40’ or 44’ x 7’ 7” giving 14 shells per bay (Anon, 1964a; Marsden, 2011).

Figure A-69 Blackburn Market Hall 2011 after closure (Author)

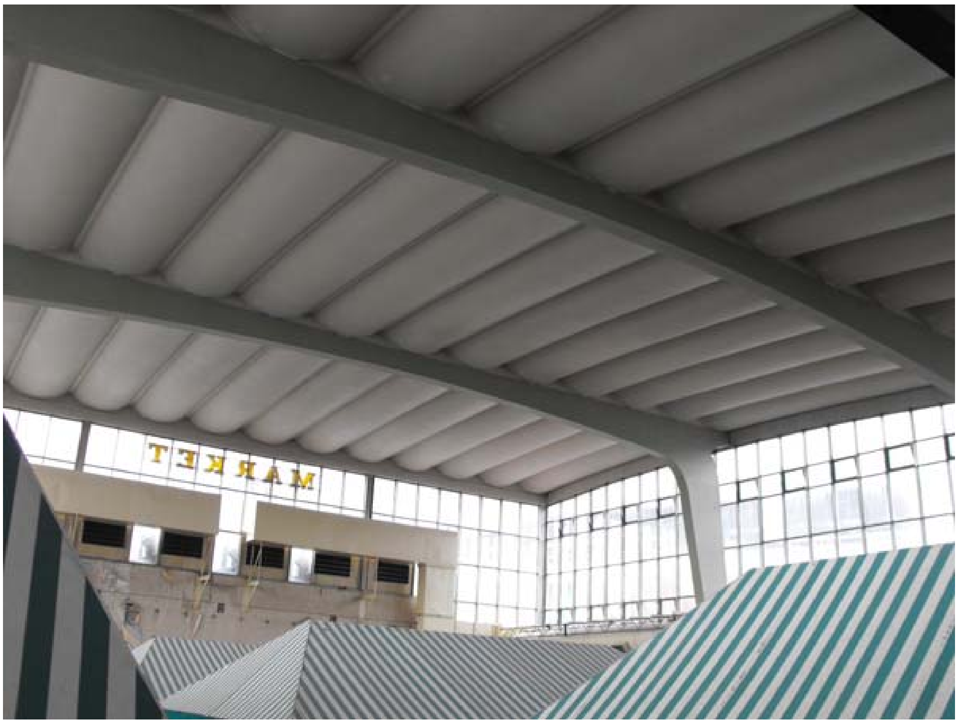


Figure A-70 Blackburn Market Hall 2011 after closure (Author)

“With a large asymmetrically curved concrete roof and a somewhat frilly front” p64 (N. Pevsner, 1969)

Stalls

On terrazzo upstands that are perpendicular to the floor, allowing access to services beneath the suspended floor.

Lighting

Beneath the shell roof the large clerestory was ‘fully glazed affording a light and airy atmosphere pleasing to shopper and trader alike’ (County Borough of Blackburn, 1964).

Supplementary lighting was provided by reflected light from the shell soffits, illuminated by tungsten – iodine flood lights positioned on the side walls. Lighting of the stalls was achieved by colour corrected fluorescent lights behind the fascias of the stall structure with facilities for spot lights as required (County Borough of Blackburn, 1964). “The market chiefs went to great pains to select lighting as near to sunlight as possible” (Anon, 1964d)

Ventilation

The problem of inadequate ventilation arrangements was passed to a consultant for advice and a scheme was to be proposed for improvement late in 1967(J.A. Smith, 1967).

Surfaces

A contemporary account (Anon, 1964d) and photographs show that many walls were tiled with micro mosaic tiling. Some surfaces appeared to observers to be tiled (market staff personal communication) but were Formica- a range of designs being evident after closure in July 2011.

The floor was electrically heated “is a light coloured terrazzo tile with the floors of the individual stalls, the mini shops and the cafe balcony area in hard wearing thermoplastic tiles. The main entrances to the hall are covered with a special Italian ribbed rubber flooring” Circumstantially this is the Pirelli product used at the Bull Ring, Birmingham (Anon, 1964a).

Novelty

A local newspaper editorial read “Space age styling and spacious facilities. Like an aircraft hangar, which it faintly resembles, the daily market has an abundance of air space to floor space, the blending of off white concrete and glass give the Salford junction a new focal point’ As for a launching platform for the larger new central Blackburn of the nineteen-seventies, symbolically it certainly looks the part”(Anon, 1964d).

Aspirations

Future development envisaged an extension of the Central Development Area to take in 150 acres to the site of the new market, separated from the shopping areas by Ainsworth Street, that was to form part of the circulatory road system for the central shopping area (County Borough of Blackburn, 1964).

Visits to other markets and by others

A 1959 council report stated “Central Development, with its bearing on the Wholesale and Retail Central Markets, has been and continues a current matter of great importance. As a result visits of inspection have been made to the new Coventry Retail and Wholesale markets and Bradford Retail market in the year (F.W. Morris, 1959).

The Markets Committee inspected Wolverhampton Market (which opened in June) in August 1960 (Morris FW, Annual report of the Markets & Abattoirs General Manager for the year ending 31st March 1961) and the new markets at Accrington, Birmingham and Swansea were inspected in the year ending March 1963 “when much useful information was required” (F.W. Morris, 1963)

Twelve official deputations and twenty unofficial visits were made to the new market soon after opening (J.A. Smith, 1966) including Huddersfield Markets and Fairs committee with representatives of J. Seymour Harris and Murrayfield Real Estate Co. Ltd. on 8 December 1965(Huddersfield Borough Council, 1965)

Signage

The Southern Clerestory elevation caries large yellow Stymie Bold letters

Architects

Planning Design and Construction was the responsibility of the Borough Engineer and Surveyor Mr Frank V Powell AMICE, John Laing Construction Limited provided the consultant structural engineering service for the project.

Walkden Market Hall 1965

Worsley UDC built the Market Hall and the Pembroke Hall which opened in October 1965(Walkden Local History).

"Appallingly bleak and overscaled, in exposed concrete"p669(Hartwell, Hyde, & Pevsner, 2004)

Architects; Shingler Risdon (see also Shipley Market Hall).

Shrewsbury Market, 1965

Developer; City & Town Buildings Ltd (Anon, 1960c)

Design

On an island site the market hall is over commercial units on the ground floor. 21,357 sq ft .

An outsized brick faced and copper detailed clock tower was included replacing the earlier gothic one.

The architect proposed a penthouse restaurant with gardens and pergola walkways about the roof lights over the market(Anon, 1960c). It is not clear if this was realised.

Figure A-71 Shrewsbury Market Hall
http://www.panoramio.com/photo/49008450

Structure

The market hall is of exposed steel work supported by the first floor reinforced concrete slab. The reinforced concrete perimeter window mullions at 4 ft centres have black granite aggregate and are stiffened by in situ spandrel panels finished with white Carrara marble pebbles.

The roof is metal decking with of 3ins cork insulation.

The clock tower has a reinforced concrete frame that was intended by the architect to be a skeleton. The client wanted a brick faced tower.(Anon, 1960c)

Stalls

Permanent stalls around the perimeter of the market floor and gallery level with a pannier market on uninterrupted space (Schmiechen & Carls, 1999).

Figure A-72 Shrewsbury Market interior (April 2011)
http://www.flickr.com/photos/revdancatt/5625021337/

Aspirations

Figure A-73 The New Corn Exchange and Market, Shrewsbury. Illustrated London News 1869. Engraving. Shrewsbury Museums Service SHYMS FA 1995 015

The architects stated that as the building, which replaced an “ugly monumental structure built in 1869” was in close proximity to 17th century black and white houses with oversailing first floors the reinforced concrete building’s design was to echo the same feeling (Anon, 1960c). Architectural critic Ian Nairn wrote “New buildings in Shrewsbury are as bad as they can get. Not only commercial stuff, but David Aberdeen’s Market Hall all let down one of the best country towns in Britain”(Nairn, 1965).

Architects

David du R. Aberdeen & Partners

Hyde Market Hall. 20 January 1967

Cost

£100,000

Design

Part of Clarendon Square Shopping Centre, a Metropolitan Railway Estates Company development. A 10,750 sq. ft. market hall off a covered mall. On three floors with public stairs and pram ramps between floors in the centre of each floor with wide aisles and a row of stalls to each side. Underfloor heating . Service bays and lifts staff and stock rooms.

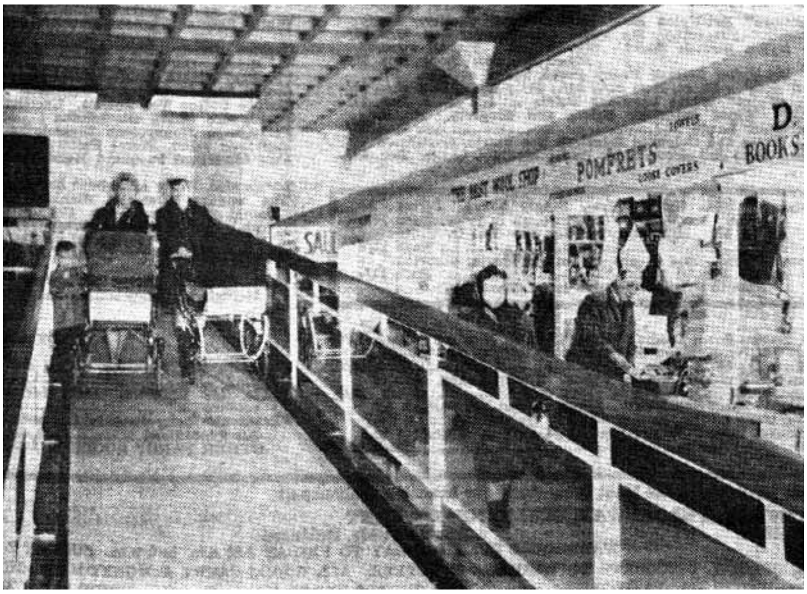


Figure A-74 Hyde market pram ramp between upper and ground floors. (Grimshaw, 1967)

Stalls

75 stalls

Lighting

Mainly fluorescent.

Architects

Leach Rhodes & Walker (Anon, 1967a, 1967d; Grimshaw, 1967; Schmiechen & Carls, 1999)

Lower Friar's Square, Aylesbury, 1967 (market closed by 1990)

Design

The Hammerson Group's Friar's Square shopping centre was opened in 1967. Traffic circulated around and below the centre which also had a bus station.

The shopping centre with a large asymmetric quadrangle of inward facing retail units had in the middle, a sunken court, with a 120 stall open market and underneath, a covered market with stairs down at either end of the court.

Structure

The covered market had square columns across the market supporting the windowless roof.

Stalls

The 58 stalls had standard risers and fascias

Surfaces

precast coffered concrete units

Figure A-75 Lower Friar's Square market (Anon, 1971j)

Lighting

Good artificial lighting above.

Surfaces

Flooring appears to have been Semtex like. (Anon, 1971j).

Art

Novelty
Above the open market was an elevated cafeteria that that was said to provide a grandstand view (Anon, 1971j). Two abstractly pierced concrete pylons were above echoing a design to the exterior of the centre.

Figure A-76 Friars Square with elevated cafeteria. In foreground signage of access to Lower Friars Square(Anon, 1971j)

Figure A-77 Friars Square external mural during construction. Cafe pylons at top, 1967/8 (Ron Adams http://www.flickr.com/photos/dlanorsmada/4168739038/)

The retail market has fared less well... having moved to the unrelievedly harsh grey concrete of the modern Friar’s square complex, which rises like a fortress.”(J. Anderson, 1988)

Architects

Bernard Engle & Partners (also architects of Stockport's Merseyway Centre, Barrow In Furness Market Hall, Huddersfield's Hammerson development, New Street and Burnley shopping centre)

Leigh Market Hall, 3 April 1968

Cost

£155,000 (Anon, 1968a)

Design

Said to have had basement servicing

Figure A-78 Postcard of Leigh Market Hall. Note wall of market shops on left. www.leighlife.com

Figure A-79 Leigh Market Hall 1989 www.leighlife.com

Figure A-80 Leigh Market Hall 1989 www.leighlife.com

Figure A-81 Leigh Market shops 1989. Note market hall behind shops www.leighlife.com

Nelson Market Hall, 5 June 1968

Cost

£170,000

Design

13,284 sq ft market on lower ground floor under the new Arndale Centre, an enclosed shopping mall. The fall in levels allowed the market hall to be on the downhill side along with the servicing of the both the centre and the market.

Figure A-82 annotated illustration of the Nelson Arndale Centre, 1968 (Arndale, 1968)

Public access is from a non retail frontage with a few steps or ramp down from the street and by escalator down from the mall.

Figure A-83 Nelson Market Hall, escaltors to and from the Arndale Centre above. Abstract relief pattern tiles top right (1967- probably 1968). Source Nelson Library

Structure

Market hall has massive rectangular concrete columns, at 36 ft centres, supporting the centre above. Columns in the aisles were clad with Formica like framed panels to the height of the stall fascias.

Figure A-84 Nelson Market Hall interior from stairs to Cooperative store (1967- probably 1968). Source Nelson Library

Figure A-85 Nelson Market Hall interior from entrance ramp (1967- probably 1968). source Nelson Library

Stalls

64 Standard timber stalls on terrazzo radiused upstands. Very deep framed fasicas with applied Stymie Bold Italic lettering. Stall risers also framed Formica like panels. All stalls had service points for electricity, water, drainage and telephone with ducts under terrazzo floor. Stalls in blocks of 4,6, 8 on irregular plan

Lighting

No natural lighting. Artificial lighting from fluorescent lamps proud of the ceiling.

Ventilation

Air conditioned.

Surfaces

Flooring, terrazzo tiling. The little wall that was exposed was clad with relief ceramic pattern tiling, interior and to market portal.

Figure A-86 Nelson Market Hall relief pattern tiling, 2011 (Author)

Art

In 2011 one wall, above perimeter stalls, overpainted large abstract relief pattern tiles; significance unknown.

Figure A-87 Nelson Market Hall, interior tiling. 2011 (Author)

Otherwise art features were in the mall and a rooftop 83 ft painted steel pylon bearing an abstracted Arndale motif. It was designed by Christopher Haley a graphic design student of Batley College of Art (Drake, 1978).

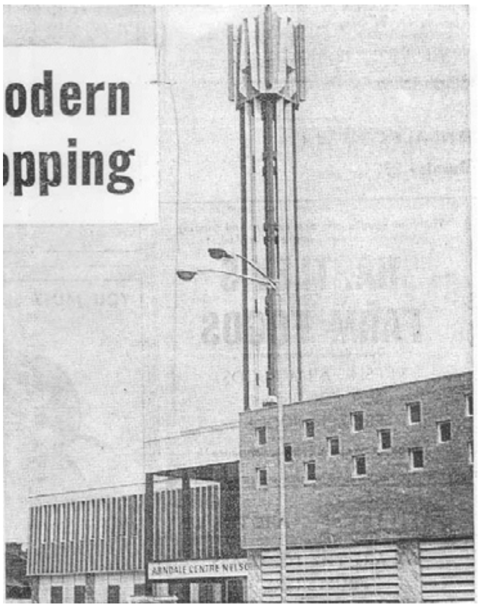


Figure A-88 Nelson Arndale mast, 1968 (Arndale, 1968)

Novelty

Figure A-89 Nelson market Hall street entrance with display windows and relief pattern tiling to right, 1967- probably 1968). Source Nelson Library

Aspirations

The 1968 mall had plenty of boosting copy; "The Arndale Centre with its 21st century layout and design, results in the most satisfactory pattern yet achieved in a British centre."(Arndale, 1968) "The Arndale Shopping Precinct of 1966-8 on the other hand offers nothing of civic value" p181 (Drake, 1978; N. Pevsner, 1969)

Visits to other markets and by others

Signage

Entrance had Stymie Bold above doors

Architects

Shingler Risdon with Arndale consultant architect Percy Gray. Nelson Corporation Architects designed the stalls and market interior(Anon, 1968e; Drake, 1978; W. R. Stott Ltd, 1968).

Gloucester, 31 October 1968

Cost

Design

The 1865 Eastgate market hall was taken down in the late 1960s during the redevelopment By Land Improvements Ltd of the area as a shopping centre(Pullan, 1968).

Figure A-90 Interior of 1856 Eastgate Market
http://www.visit-gloucestershire.co.uk/boards/topic/754-eastgate-market-to-close/

A new market hall, was provided as part of the development. The portico of the 1856 market was re-erected further down Eastgate Street than its original site as the main entrance to the new shopping centre.

Figure A-91 Eastgate Market before 1968
http://oldgloucester.visit-gloucestershire.co.uk/195010.html

Figure A-92 Eastgate market portico to front of shopping centre,2009
http://www.flickr.com/photos/bazzadarambler/3274830108/

The new market is behind the Eastgate shopping centre projecting, out between a bowling green and the a scheduled ancient monument and the ruinous C17 Greyfriars, to reach the inactive Greyfriars lane.

Figure A-93 Birds Eye view of Eastgate Market, Gloucester, 2010
http://www.bing.com/maps/?FORM=MMREDIR

The market is quite different in execution to the rest of the centre which has little natural light and rooftop car parking; the articulation of the centre is through the repositioned 1865 market portico crowded by the bulk of the building.

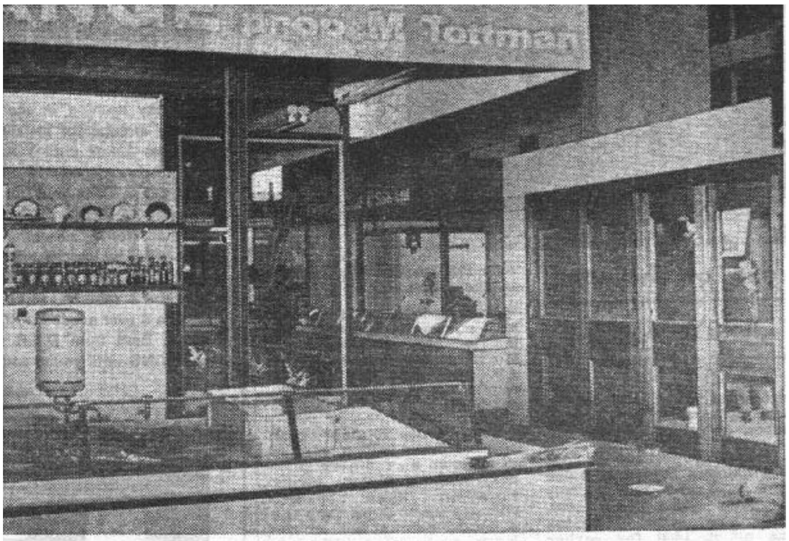
The market has glazing down both sides ; “Sculptural exterior. At the sides angled steel mullioned windows alternate with ribbed granite aggregate panels, their butterfly-splayed tops flanking Corbusian concrete rainwater chutes. Entrance front to Greyfriars with projecting concrete canopies. Mostly white-tiled within.” p465(Verey & Brooks, 2002)

Figure A-94 Eastgate Market, Gloucester. East elevation, 2008
Photo; Jean Thornhill http://www.flickr.com/photos/42210194@N05/3895887976/

Structure

Stalls

Stalls on two floors. On plinths with superstructure being set back from the stall front. The melamine stall risers and dividing partitions were manufactured and supplied by Insulation Equipment Ltd of Oswestry. A list of fascia colours for stalls dated 1968 is in Gloucestershire Archives (GBR/L/2/9/3/3).



An interior view of the market hall.

Figure A-95 Gloucester Market (Pullan, 1968)

Lighting

Natural lighting from east and west elevations. Fluorescent tubes behind stall fascias.

Ventilation

High level managed ventilation and heating. Sprinklers across the ceiling

Surfaces

Mostly white-tiled within(Verey & Brooks, 2002).

Art

At the North end, adjoining the Eastgate Shopping Centre, a small reset Roman mosaic, with triple spiral pattern in red, black and white.(Verey & Brooks, 2002) At the south end a tree-shaped ceramic mural above the Greyfriars entrance to the market hall(Pearson, 2005)

Figure A-96 Eastgate Market, Gloucester, North elevation to Greyfriars lane 2007
http://www.flickr.com/photos/melmoththewanderer/1544539269/in/photostream/

Architects

Shingler & Risdon Associates.

Blackfriars Market, Worcester, June 1969

Cost

Whole scheme £800,000

Design

Part of the Centrovincial Estates Ltd’s Blackfriars Shopping Centre.The 20,000 sq ft hall was on the first floor of the retail development. Access was by stairs, ramp, travellators at 12 degrees and an extended open walkway from a multi-storey car park over a neighbouring retail block.

“The market hall was substituted for the bowling alley originally planned”(Anon, 1969d)

Structure

Reinforced concrete frame with brick infill. The roof was of long span steel trusses with woodwool slab decking and bituminous felt.

Stalls

70 Stalls arranged with all fronts at 45 degree angles so each neighbouring unit was facing in another direction. In a 1970 photograph above the standardised dark stall fascias there are very deep panels of abstracted cloudscapes(Anon, 1970b)

Figure A-97 Blackfriars Market interior (Anon, 1970b)

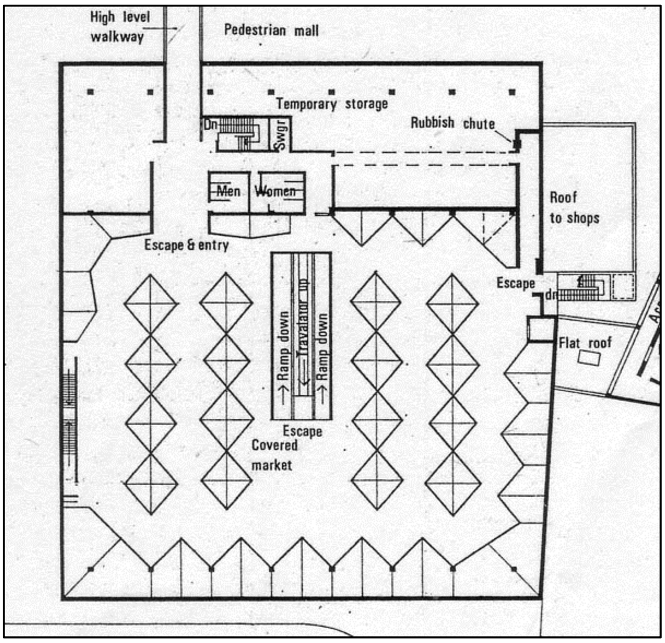


Figure A-98 Blackfriars Market Hall plan(Anon, 1970b)

Lighting

Apparently without natural light, which a bowling alley would not have required.

Ventilation

Surfaces

Exposed concrete was either fair faced or bush hammered**.**

Art

Novelty

The market had level direct, and very exposed high level walkway from the multi-storey car park.

Figure A-99 Blackfriars Market and walkway (Anon, 1970b)

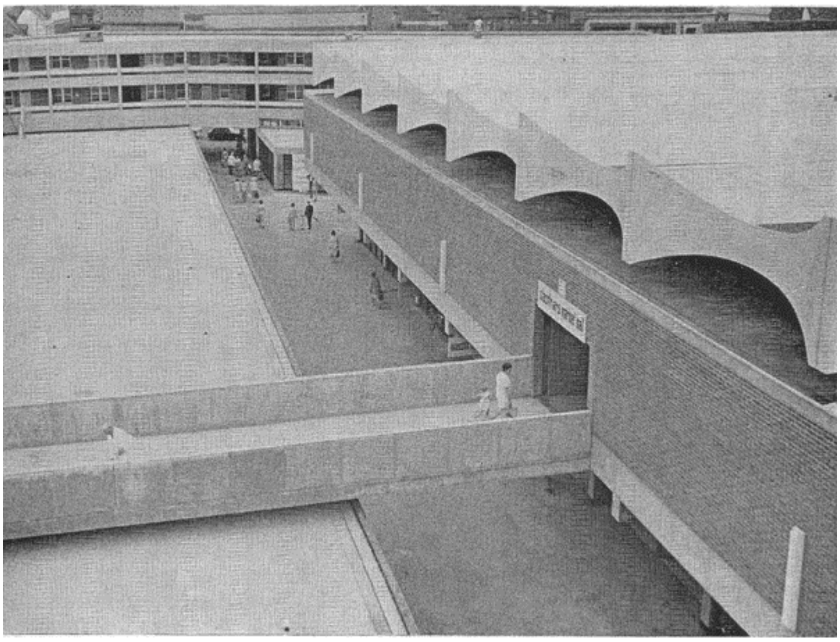


Figure A-100 Blackfriars Market and walkway(Anon, 1970b)

Aspirations

The roof line on two elevations had a wavy fibreglass cornice giving a serrated roof line that was said to have “the effect of reducing the bulk of the building so that it fits in well with the general scale of buildings such as the Georgian houses” (Anon, 1970)

Signage

A condensed san serif font in lower case above walkway entrance

Architects

A. Maurice Tribich & Associates.

Bradford John Street Market, August 1969

Cost £180,000, redeveloped from an open market

The main source on the market deaighn is from a newspaper' s market opening advertising feature:

"It's a gay, colourful market and unlike the old market, it is covered, but the open market atmosphere has been largely preserved by flooding the place with daylight through a fiberglass roof, which is one of the building's most remarkable features.

Two inches thick it is composed of panels so devised that they echo the honeycomb effect of the 23 hexagon shaped stall units whose six sides can be used as separate stalls if desired.

Each of the fibreglass roof panels is made up of a series of circles which have both strengthening and decorative effects.

Steel portal frames provide support for the roof panels and also above each stall unit is a timber roof deck.

The hexagon pattern is re-echoed in the arrangement of multi-coloured floor slabs.

The stalls themselves are white, but colour has been introduced in various ways, particularly by the use of bright laminates for the counter frontages. They glow in red, blue, gold or green with different colours on separate units…

One of the finest features of the market is to be found in the arrangement of the stall units, for they are not in straight rows with aisles in between the rows. Instead they are in what seems like a more random formation enabling customers to circulate better and to see more. Of course it is not random-it is carefully calculated…(FH, 1969)

In the centre of each of the 23 hexagonal stall groups is a group of six small columns which are interconnected so providing support for the roof.(Anon, 1969a)

A view of one section of the new Bradford John Street Market.

Figure A-101 John Street Market, Bradford (Anon, 1969b)

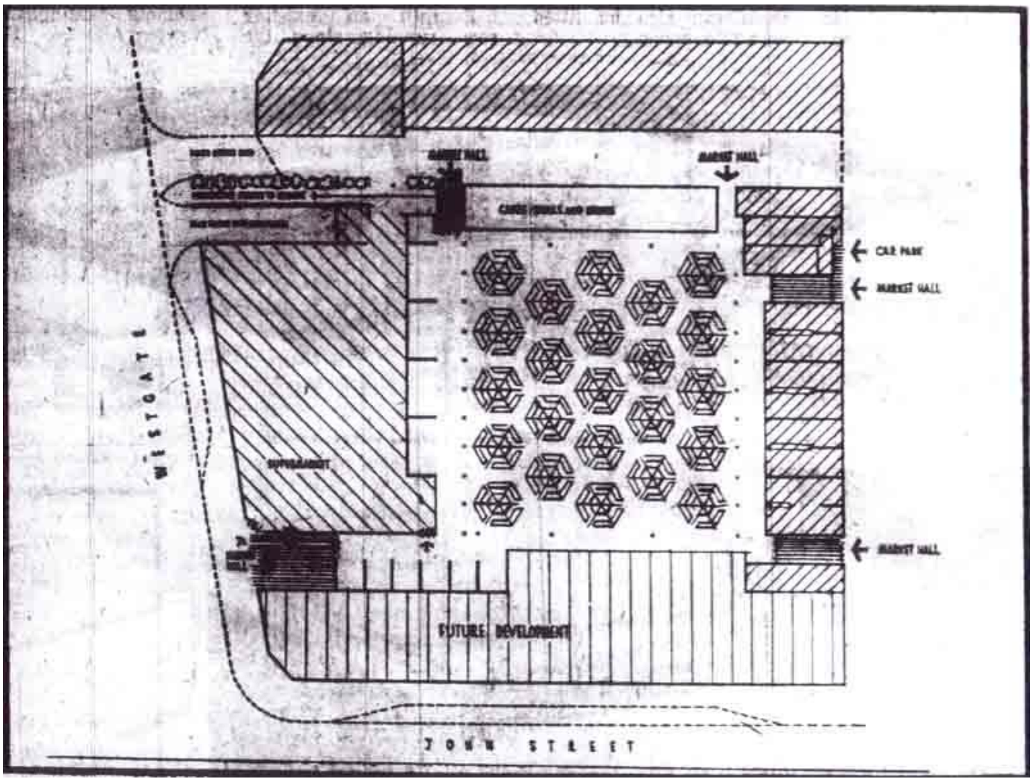


Figure A-102 Plan of John Street Market showing site with supermarket to left and car park to top (FH, 1969)

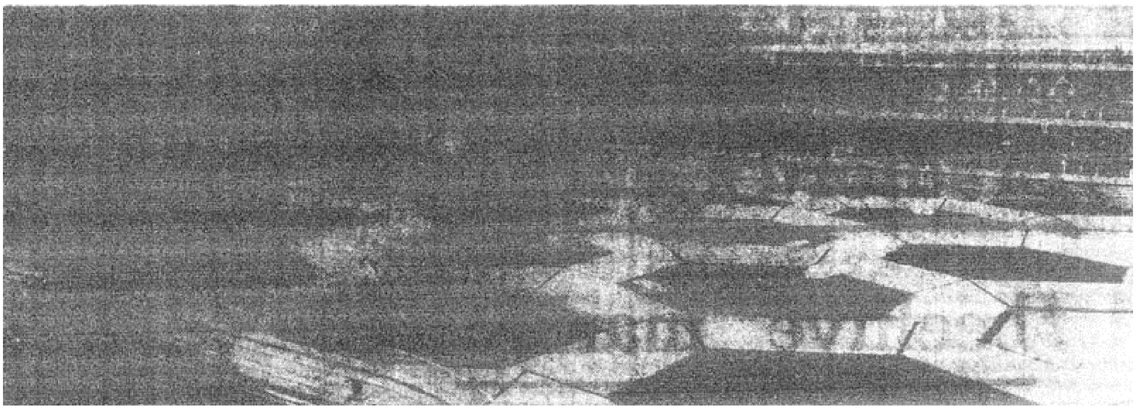


Figure A-103 View of the roof of John Street Market from above. The hexagonal timber roof decks of the stall blocks contrast with pale fibreglass roof panels reflecting the stall/aisle layout. Beyond are decks of the car park (Anon, 1969a)

Lighting and ventilation

The natural lighting through the fibreglass roof was a significant feature.

Above the stalls was fluorescent tubes and pendant lamps with “attractive modern style cylindrical shades” (FH, 1969). No reference to heating has been found.

Stalls:

On upstands (Figure A-104) Timber stalls by Constructional Units Ltd, Cricklewood London

Surfaces

Include: laminate to stall risers, ribbed vinyl to columns, mosaic wall tiling, floor paving.

Signage

A dark block capitals on pale signs above the five entrances

Architects:

Designed by Mr W Clifford Brown, the City Architect, and his staff.
Main Contractors, Gilbert-Ash Northern Ltd, Bradford
Fibreglass roof panels by Bondlite Ltd, Liversedge
Stressed skin roof panels by Kingston Craftsmen Ltd, Hull
(Advertisments associated with FH, 1969)

FH, 1969).

Novelty

The hexagonal stalls with integrated fibreglass roof caused much interest in the market. Visits were made by Derby (twice), Newton Abbott, Nottingham and Sheffield councils (Anon, 1969b). Derby was to follow the pattern in its 1975 market.

Burnley, 17 November 1969

Cost

£600,000

Design

Market hall and adjacent open market, planned in 1965, is within a £5m Hammerson Group development where the council retained the freehold and market rights. The markets are at first floor level allowing commercial and retail frontages to three sides of the development at street level. Three staircases, a ramp, an escalator a bridge and a travelator all provided pedestrian access to the market level. Servicing access by a common access road, shared with the retail units.
A mezzanine floors provided dry storage space level. There were also preparation rooms, twin rubbish chutes to refuse skips and a staff rest room/ canteen.

Figure A-105 Market Square, Burnley. Undated postcard (M. Parr, 1999)

Structure

The market is roofed with nine long span (130') Silberkuhl KS pre-cast shells giving north light to and allowing a clear floor space for the market hall with unobstructed vision by the public(Halstead, 1969b).

Figure A-106 Burnley Market Hall interior, 2008
http://www.flickr.com/photos/rossendalewadey/2574980063/

Stalls

Rectangular steel framed stalls to a common design with white sign board fascias(Burnley, 1969; W. R. Stott Ltd, 1969).

Lighting

Reported as “attractive” Appear to be fluorescent tubes below the roof’s tie rods.

Ventilation

Heating by hot air ducts over the perimeter stalls with electricity supply to stalls to enable tenant’s own supplementary heating

Art

“New also are two murals which will testify that Burnley has some appreciation of the arts. One is a mosaic, whose appeal will depend on individual taste; it depicts a scene in the market area of old Burnley. Older residents will realise that this owes something to “artistic licence” in its composition which compresses former wider-spread geographic features into a smaller compass, in order to catch the spirit of the past” (Halstead, 1969a)“Consists of two large colourful murals located in the stairwell They are signed by the artist and depict a rural scene with sheep and cows, and a scene with traders. The signature is reported to be Kramer Hart(Anon, 2011c)

Figure A-107 Burnley Market Hall stairwell mural, rural scene
(Burnley Council, courtesy Lynn Pearson)

Figure A-108 Burnley Market Hall stairwell mural, market scene
(Burnley Council, courtesy Lynn Pearson)

Novelty

Long span Silberkuhl Shells

Signage

Exterior Signage in large projecting single block capital letters

Architects

Architects to the developers, Bernard Engle & Partners

Consultant architects to the Corporation, J Seymour Harris & Partners(Burnley, 1969)

Hartlepool Market, 31 March 1970

Design

The market is part of the council owned Middleton Grange shopping centre that had opened the previous year. It is above retail perimeter retail units and integrated with the shopping centre by retail arcades.

Three stories, car parking at lowest level with market hall above and servicing and storage units at an upper level.

Structure

The 76ft x 110ft market hall is clear-spanned with five north lights formed by cranked insitu reinforced concrete beams. All exposed concrete has a board marked finish. The elevations are dramatically vertically board-marked.

Figure A-109 Hartlepool Market(Anon, 1973a)

Stalls

The stalls are on low risers. The metal-frames were behind the counter with cantilevered lighting and standard white sign fascias. Formica-like risers(Drew, 2009; Hartlepool Borough Council, 2009).

Figure A-110 Hartlepool Market interior, 1970 (Anon, 1970d)

Lighting

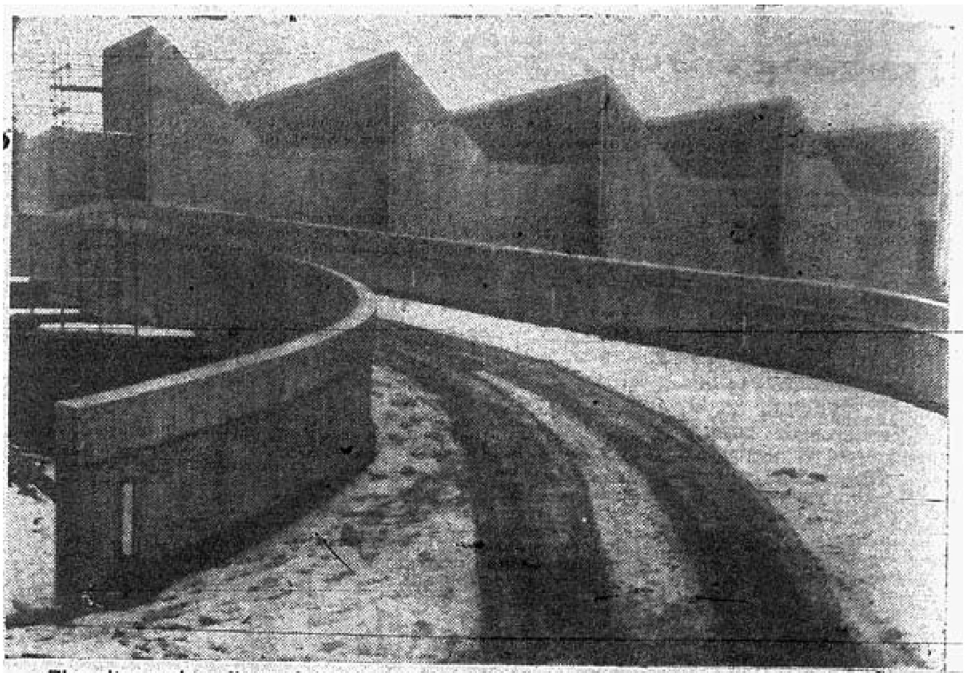
North light roof. Fluorescent tubes behind stall fascias

Ventilation

The hall opened with hot air heating and air conditioning(Anon, 1970d). Sprinklers were on the market's ceiling.

Aspirations

The whole appears sculptural as the north light gables are extensions of articulated north light first floor bays cantilevering out forming a narrow arcade with the bay elevations being extended, reducing to a point at ground level, otherwise described as "...futuristic design incorporating large areas of windows and jagged sides which jut out from the building and taper to triangular pillars to provide covered walkways down the sides of the building"(Anon, 1970d). This arrangement was described as "sail-shaped roof-light fins intended to echo the traditional gable and dormers of the existing old buildings and to reflect the town's function as a port" (Anon, 1973a)



The ultra-modern lines of Hartlepool's covered market in the new shopping centre stand out sharply against the snow-filled skies in this picture taken from the bottom of one of the Stockton Street service ramps.

Figure A-111 Hartlepool Market, 1970 (Anon, 1970i)

Signage

The market signage was MARKET in illuminated bold san serif applied letters.

Architects

Architects, Clifford Culpin & Partners; Structural engineers A E Beer & Partners.

Clifford Culpin & partners designed the Swan Walk shopping centre in Horsham opened 1977 (no market)(Beddington, 1982)

Queensgate Market, Huddersfield opened for trading 2 April and officially opened 6 April 1970

St John's, Liverpool, opened for trading 6th April 1970, officially opened 9th April 1970

The St John's was built on the site of the 1822 St John's market (demolished 1964).

Design

Plans for the precinct were announced in 1962. The St John's precinct was to be the flagship of a large, ambitious scheme to re-design and rebuild Liverpool city centre. The scheme involved tackling extensive damage from enemy bombing raids during World War II, knocking down city centre slums, and initiatives designed to encourage economic growth and investment given the decline in port activity and high levels of local unemployment.

The new St John's precinct, developed by Ravenseft Properties Ltd replaced the old St John's market and pubs and clubs nearby were demolished to make way for it. According to the Liverpool Daily

Post the precinct was envisaged as "a unified civic, social and shopping centre" and "a new miniature town in the centre of the city". It covers 2.5 hectares, combining a market, shops on two levels a hotel and a multi-storey car park.

By 1967 the council had described the proposal defensively at length including it access by the public;

"The new St. John Retail Market will occupy the corner of the Precint on the Elliot Street/Houghton Street junction. Shopper will be able to enter the Precintc at street level from Lime Street and by way of the arcades they will arrive at the main hall of the market; public access to the market will be obtained from Elliot Street/Houghton Streetby both escalators and stairs(Bradbury, 1967)

The accompanying illustration showed the market's roof form that was realised in 1970 (Figure A-112), this is the earliest reference to this design found.

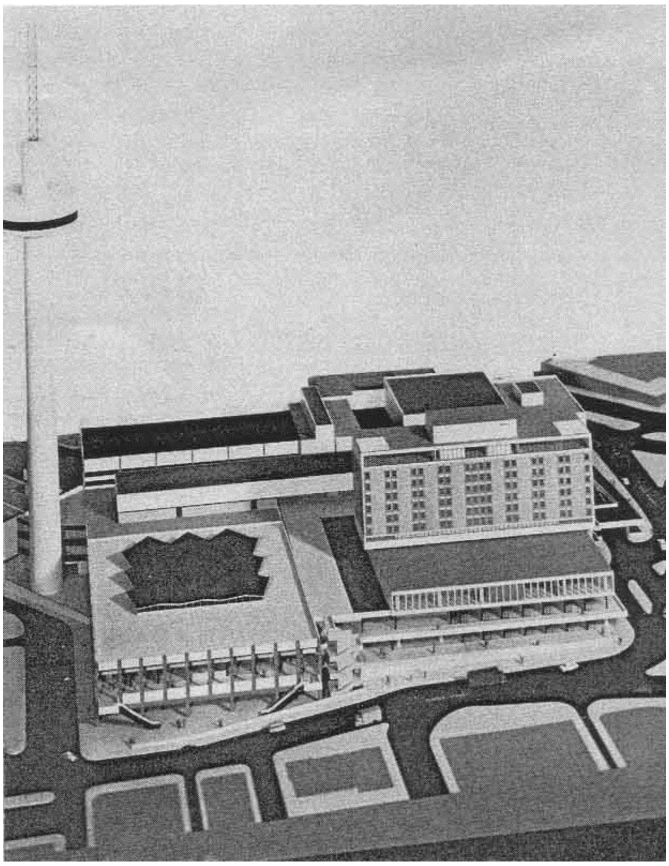


Figure A-112 "Model of St. John's Precint showing the new Retail Market between the vertical feature on the left and the hotel on the right" (Bradbury, 1967)

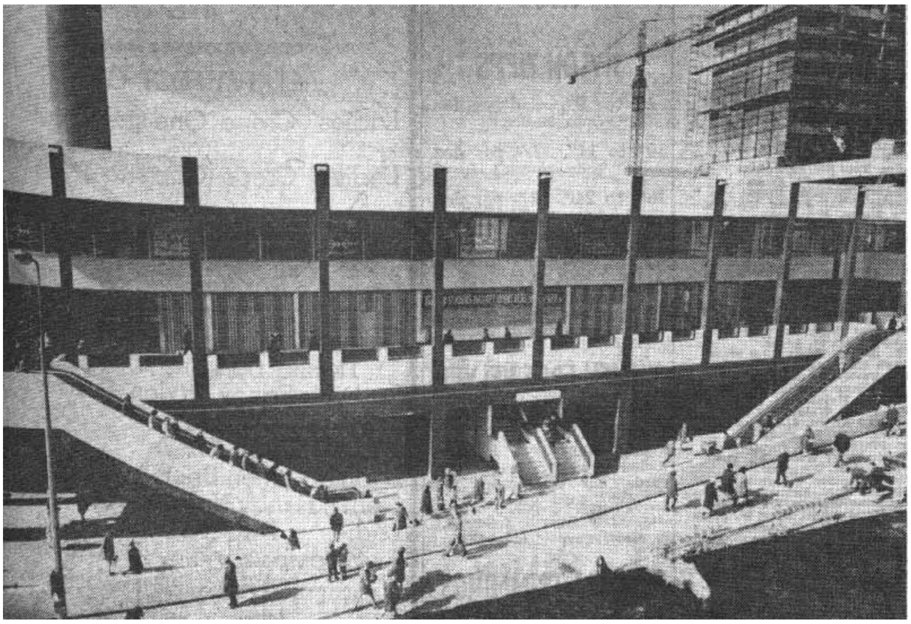


Figure A-113 St John's Centre Market exterior with retail units below, Liverpool (Anon, 1970g)

There were subways, indoor and open air escalators, stairways and ramps for access into the centre and the market.

"In the overall design of the Precinct the greatest importance has been placed on ensuring east and direct access to it not only from the present surrounding streets but in future, from the main pedestrian routes which will be a feature of the redeveloped central are of the city".(Environmental Health & Protection Committee, 1970)

The market was to have its own loading bay and storage area in the basement (Bradbury, 1967).

Figure A-114 St John's Precinct, Liverpool, 1970s. Shows escalators and stairs up to the market and the market atrium's saw tooth roof-line (Dennis postcard)

The market hall was overall 180 x 250 ft with central two storey atrium 75 ft square with a 38' deep balcony on all sides. Trading on two floors.

Figure A-115 St. John's Market, December 2009
http://commons.wikimedia.org/wiki/File:St_John%27s_Market,_Liverpool_%283%29.jpg

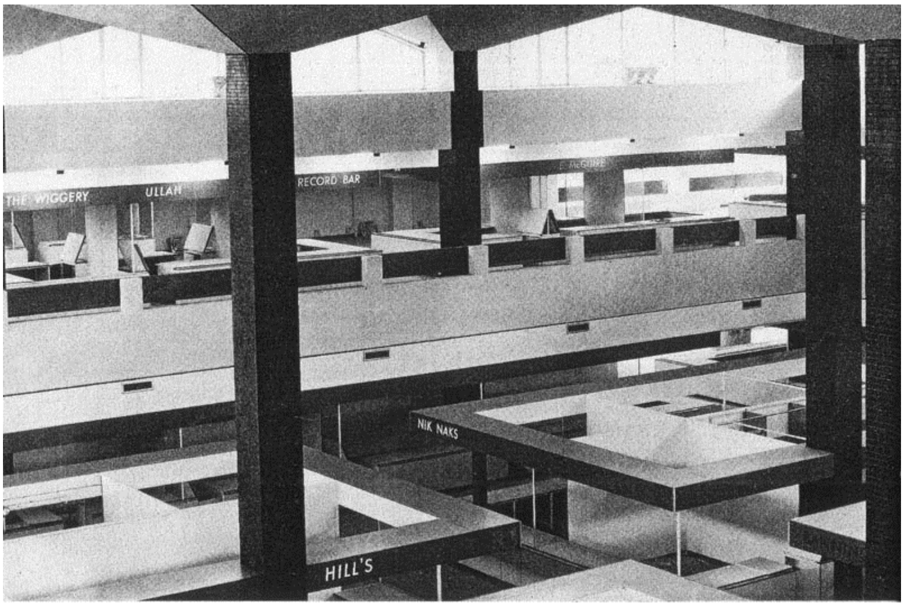


Figure A-116 St John's Market, Liverpool
"View from the balcony of the main market hall and balcony trading area"
(Environmental Health & Protection Committee, 1970)

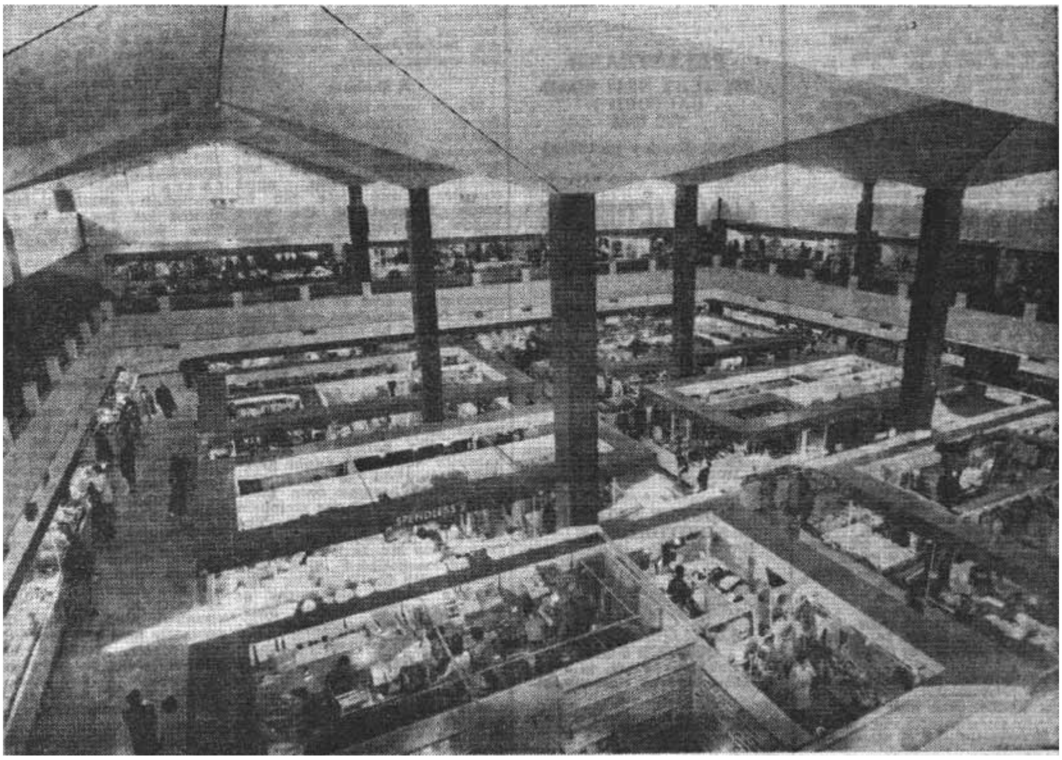


Figure A-117 Main hall of St John's market, Liverpool (Fourdrinier, 1970)

Structure

A reinforced concrete framed building with column at regular centres. Generally flat-roofed. The exception being the 12 columns that rose around the perimeter of the balcony and the 4 in the open market hall. These 16 were either tile or brick clad and rose another storey to support inverted pyramidal roofs that spanned the market. Eight are half pyramids, eight full pyramids.

“The attractive market roof which surmounts the Market, supported by glazed walls, is constructed as a series of contrasting planes which by daylight and by floodlight create the impression of a floating canopy”(Environmental Health & Protection Committee, 1970)

Figure A-118 View from the roof of Liverpool Anglican Cathedral of St John’s market roof, 2008.
http://www.flickr.com/photos/wirralbells/2844380638/sizes/o/in/photostream/

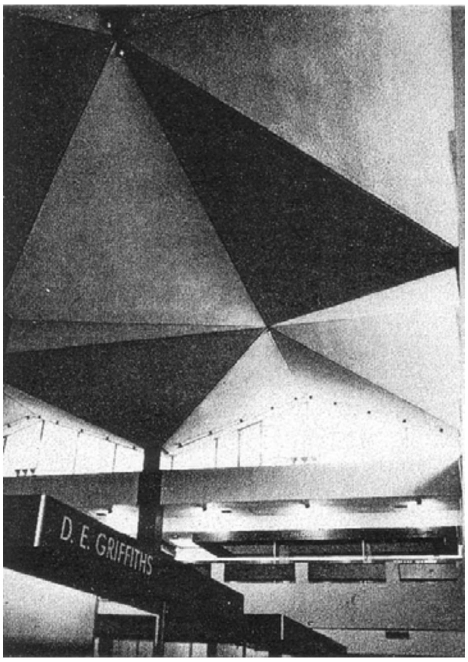


Figure A-119 St John’s Market, Liverpool
“The contrasting planes give a canopy effect to the roof of the market”
(Environmental Health & Protection Committee, 1970)

Stalls

159 stalls on the lower floor and 63 on the upper. All on plinths 31/2ins deep. Except for fish stalls partitions and counters were of formica-faced (sic) block board. 4ins stainless steel bag shelves to the stalls. The stalls had inverted box fascias. Stall signage was in a standard lettering style in a range of colours. Columns on the trading floor are within the stall frontage.

Lighting

Clerestory glazing to the perimeter of the pyramidal mushroom roof. Clusters of three uplighting floods could be seen along the sill of the clerestory under each soffit apex.

The avenues were lit with colour corrected fluorescent tubes “which combined with spill light from the stalls give a bright and pleasant effect”

Ventilation

Filtered re-circulated warm air at 65 degrees Fahrenheit and cooling to 4 degrees below outside temperature.

Aspirations

“The precinct is a bleak and brutal affair, monolithic, inward looking, and awkwardly related to the different levels of adjoining streets”p189(Sharples, 2004)

Signage

The dominating feature of the St John’s Centre, also dominating much of the city centre, is the137 metre beacon of 1969, originally known as St. John's Beacon. It was actually a chimney for the centre’s boilers. Apparently modelled on Rotterdam’s Euromast. It had a revolving restaurant near the top (Sharples, 2004).

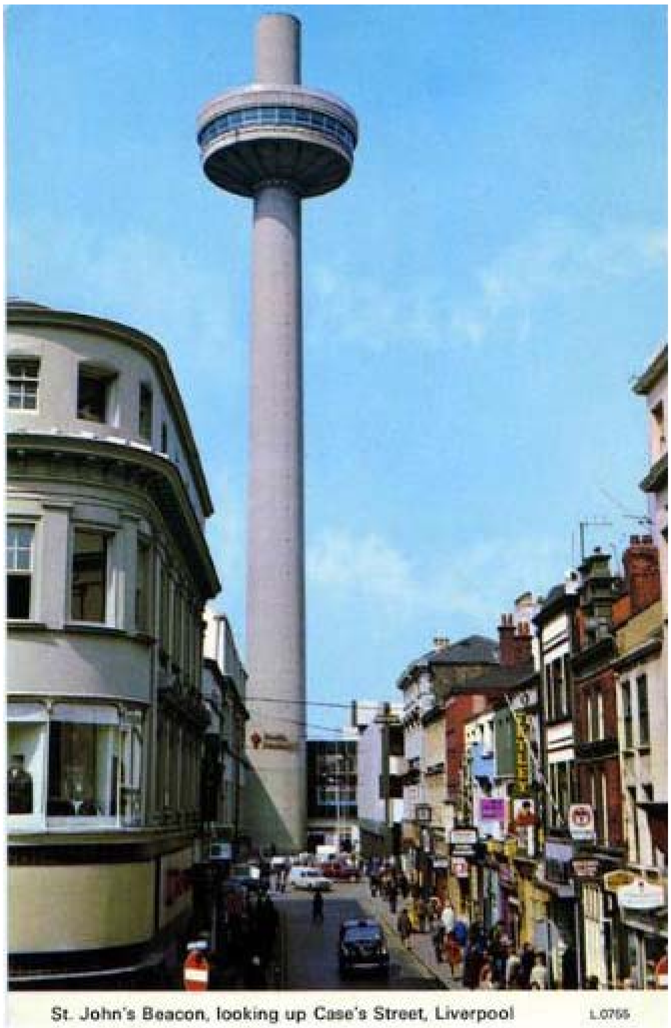


Figure A-120 St John's Beacon, Liverpool, 1970s (Dennis postcard)

Architects

Ronald Bradbury[111], city architect in co-opertion withJames A Roberts (b. c1922).

Llanelli Market, 1 May 1970 with precinct completed 1975

Cost

Complicated attribution of costs. Multi-storey car park £207,000 with market below £102,000. Subsequent development phases to each entrance, 1971 £101,000; 1972 £67,000; 1973 £128,000 and 1974 £116,000 totaling £721,000(Llanelli Borough Council, 1975).

Design

The 1866 market, a basic three aisle shed was accessed and serviced by congested narrow lanes of the main shopping areas.

[111] B. 1908, d 1971

The new market hall 19,330 sq ft under a multistorey car park is on the site of the old market hall, the market is at ground level with no street frontage. Access to the market is again through a shopping arcades to all four sides and a cafe with an open terrace.(Anon, 1970c). The stall configuration with the markets 28” square columns was a concern in the months up to opening. These were said to being detrimental to trade by obstructing the frontages of stalls and customers’ views. The alternative was said to be to have them in the aisles then obstructing pedestrian flow(Anon, 1970e, 1970f). Servicing to the market by is by service road to under car park ramp and to the surrounding shops by the former market’s perimeter lanes.

Structure

Lift slab multi-storey car park.

Stalls

44 standard stalls, 40 fruit vegetable and dairy produce stalls and a wet fish market. Standardised stalls have lighting and roller blinds behind fascias.

Figure A-121 Llanelli market, 1970. (Llanelli Borough Council, 1970)

Figure A-122 Fruit, vegetable and diary produce section of Llanelli market, 1970. (Llanelli Borough Council, 1970)

Lighting

Suspended fluorescent tube lamps

Surfaces

Brick and concrete

Art

Ornate column from former market reused as lamp standard in precinct.

Novelty

The new market was a redevelopment of the area that introduced car parking and kept the street pattern. The sequential development, by the council without a private developer, took seven years of construction.

Access from one street is through an arcade and then by subway under a service road.

Aspirations

“The market development had been achieved in just over seven years from the clearance of the old Pavilion site. A commercial developer, had he been able to acquire this desirable prime site, would do doubt have redeveloped in far less time, but his task would have been easy; wholesale demolition at one time of all the property involved and, perhaps, if sufficient clients had been available, reconstruction under a single integrated contract with all the advantages that this can connote in time. But there would have been no regard for tradition, no consideration give to the livelihoods of the market tenants and the needs of the market users between demolition and reconstruction...the overall result... has fitted out Llanelli for Twenty-first Century living out of a Nineteenth Century environment, with the minimum of physical change."(Prescott, 1975)

Architects

Borough Architect, R B Mowbray, project architect Iwan Davies(Llanelli Borough Council, 1970, 1975)

Rotherham Market 27 March 1971

Design

The market was built in association with an adjacent open market at a higher level, an adjoining C & A store and perimeter shops.

The market hall has two levels evolved from the steeply sloping site allowing both levels to have direct access to the street. In the hall a ramp and stairs and a lift connected the two levels. Two service areas with preparation room, goods lifts and lock-up storage units.

Structure

The 40m square market hall's walls are of conventional reinforced concrete construction but roofed with a fully glazed fan-shaped roof radiating outward and upwards (with a 8.8m rise) from the main entrance.(Anon, 1971k) Constructed of tubular steel trusses the roof needed two stanchions mid-hall. (Bell, 1971)

Figure A-123 Rotherham market exterior (http://betweenchannels.blogspot.com/search?updated-max=2011-06-15T05%3A09%3A00-07%3A00&max-results=7)

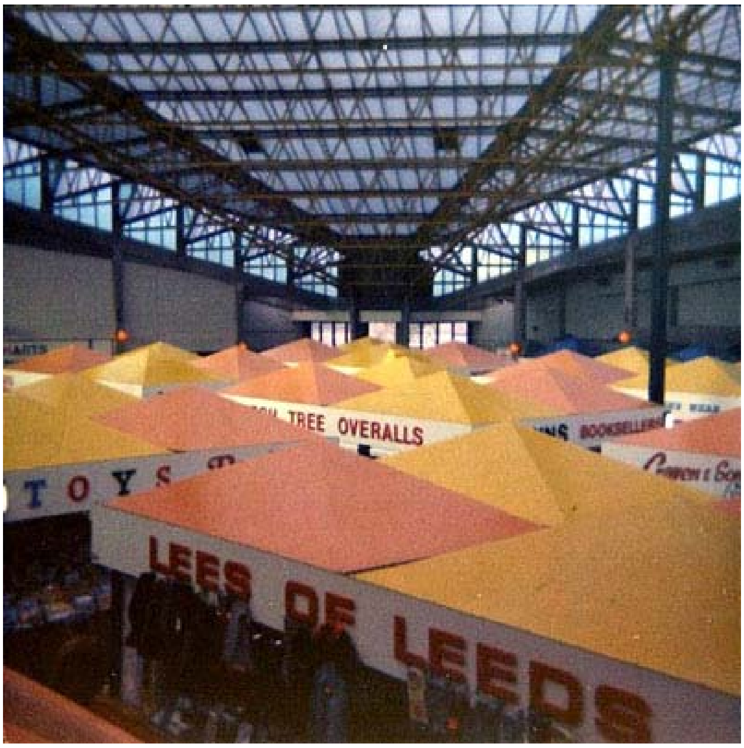


Figure A-124 Rotherham market interior (http://betweenchannels.blogspot.com/search?updated-max=2011-06-15T05%3A09%3A00-07%3A00&max-results=7)

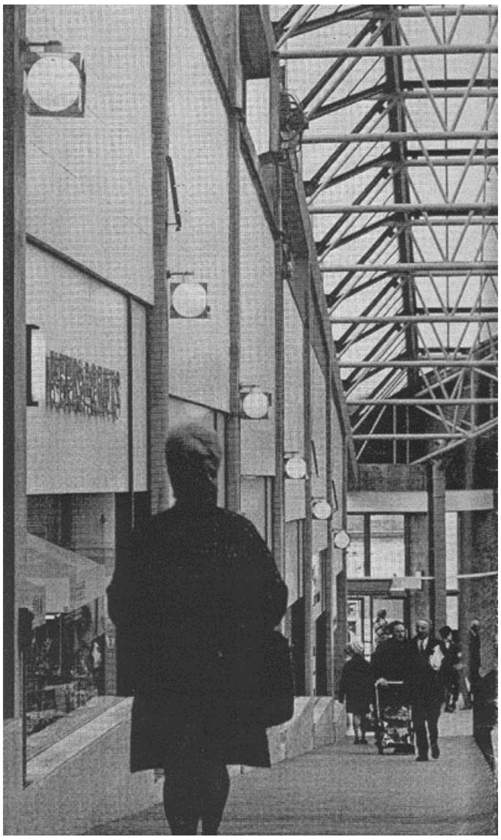


Figure A-125 Rotherham market interior, view looking down ramp with decorative lighting.(Anon, 1971k)

Stalls

87 stalls and 25 shop units. Stalls had mild steel frames with bright pink and orange pyramidal grp canopies(Anon, 1972c)

Figure A-126 Rotherham market interior (http://betweenchannels.blogspot.com/search?updated-max=2011-06-15T05%3A09%3A00-07%3A00&max-results=7)

Lighting

Glazed with plyglass translucent sheets with white fibreglass infill. The side wall glazing had 6mm Calorex heat absorbing glass in anodised aluminium patent glazing. Decorative orange lamps in cube lanterns on pilasters of side walls.

Ventilation

Filtered warm air ducted throughout the market and in summer the system can be used for cooling (Anon, 1971k). Fans and opening lights fitted in patent glazing.

Art

Columnar water feature on piazza ouside C& A store near market entrance.

Figure A-127 Rotherham sculptural feature with market hall entrance to right.(Anon, 1972c)

Aspirations

“The architect placed great emphasis on the appearance of the steel work as they intended it to be the principal feature of the whole building”(Bell, 1971). “C&A’s is a fashionable box with high quality shop fitting whereas the individual success of the market relies on a more basic architectonic quality”.(Anon, 1972c)

Architects

Architects and Structural Engineers, Gillinson Barnett & Partners (for C&A, Leach Rhodes and Walker)(Anon, 1972c)

Westgate Market, Halifax, 30 April 1971

Replaced the 1890s Lower Market hall that was demolished for commercial and office development in 1968.

The new market was on the ground floor with level access on Wesgate as part of the new development. Lower floor. Space for a cafe on lower floor, also rear loading bay, trader staff restrooms and storage facilities.

Structure

Little street frontage with a deep retail area of a steel framed stone faced town centre block. Low ceiling.

Stalls

32 standardised stalls with white fascias and signage. Stalls by F W Whatmough & sons Ltd of Halifax.(Anon, 1971h)

Figure A-128 West Market, Halifax, June 1971 (Anon, 1971b)

Lighting

No natural light excepting shop front, fluorescent lights set into ceiling.

Ventilation

Heat curtain at doors on both floors. Stale air being extracted from the centre of the market

Surfaces

Terrazo tile flooring with coved skirting. Suspended aluminium tile ceiling with services above.

Aspirations

“Westgate market is second to none. We investigated the latest designs and technical details in other places, rejected some ideas and improved upon some others, bearing in mind other authorities mistakes” Neville McMahon, Assistant Borough Architect.

“It is more than a physical replacement. It is a new concept and a new shopping precinct which scraps the image of the old market with its cold appearance and lack of comfort for traders and shoppers alike” Raymond O’Brien, Market’s General Manager (Anon, 1971a)

Visits to other markets and by others

Exploratory visits to other markets in Yorkshire and Lancashire

Signage

Shop fascia to Westgate

Architects

Building’s architects; Shingler Risdon Associates. Market design team led by Borough Architect, B A Waddington with Neville McMmahon and job architect John Greenwood (Anon, 1971a).

Keighley Market, 16 June 1971

Cost

£134,000 market

Design

A proposal for a new market hall was made by T D Williams, borough architect, in 1961 and supported by the markets committee. In 1962 a Murrayfield Estates Co proposal for a new market hall led to a new design being agreed (Anon, 1961e, 1962f). These did not proceed. However the neighbouring Murrayfield shopping centre did.

In September 1969 the borough architect announced a new market design. It led to the page 1 newspaper headline “Light and colour in new market plans – inverted umbrella form of plastic canopies”(Anon, 1969e). This design was built. The market is a detached hall without exterior retail frontage with large armorial bearings, presenting a formal civic image.

Figure A-129 Keighley Market 18 June 1971 (photo J. S. Cardwell)

Figure A-130 Wheels & Fire sculpture outside Keighley Market
(http://www.thetelegraphandargus.co.uk/news/4169181.Council___s____shame____as_statue_is_moved/)

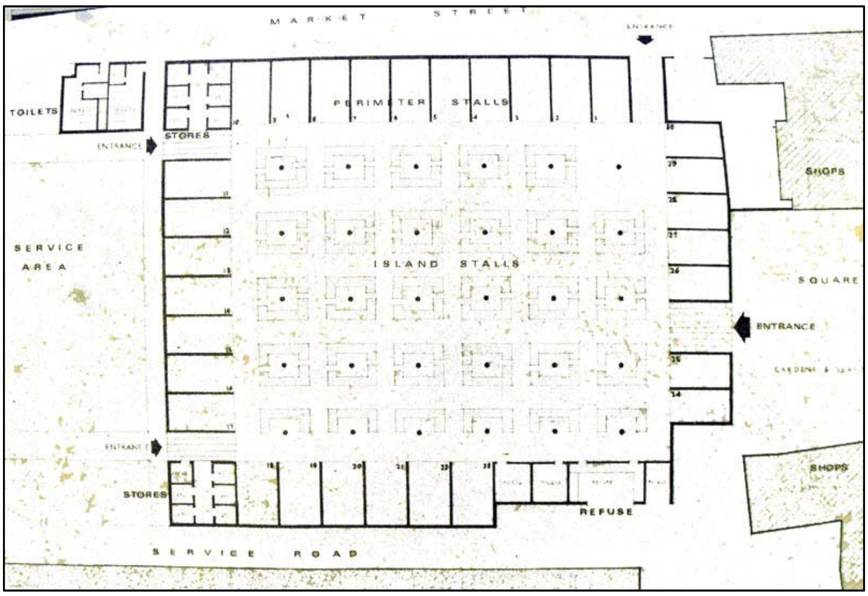


Figure A-131 Projected Keighley Market plan (Anon, 1969e)

Structure

With 30 perimeter stalls under a flat roof the main market hall had an exotic roof. “The roof is of glass fibre reinforced plastic canopies held on a centre support and linked together to form a continuous canopy.

Each canopy is in the form of an inverted umbrella and has translucent panels to allow daylight to enter the market area.

Other sections of the canopy have incorporated permanent colours to add visual interest and lend a cheerful appearance to the interior.” (Anon, 1971f)

The 24 symmetrical mushrooms, square in plan (and six half umbrellas) sprang from the top of circular concrete columns positioned at the centre of clusters of island stalls. A January 1971 construction photograph shows the single-skinned plastic mushrooms being assembled with angled quadrants. The colours of the canopies are unknown.

Figure A-132 Keighley Market construction, January 971 (photo Keighley News)

Stalls

The 52 island stalls had a novel design, at each inner corner of the counter a metal pole rose to carry a frame from which the stall fascia cantilevered over the counter as far as the stall riser below. This was independent of the central mushroom column.

Figure A-133 Keighley Market interior, June 1971 (photo Keighley News)

Figure A-134 Keighley Market interior, June 1971 (photo Keighley News)

Lighting

From the back of stalls' fascias, dark cylindrical down-lighters can be seen to be on cantilevering brackets in 1971 photographs.

Ventilation

The market was unheated. The single skin roof led to condensation problems; " indoor 'rain' cascaded down onto stalls every winter" (Thompson, 1985).

Art

In January 1971 the winner of a Keighley Corporation Works Committee completion to design a model for a feature for the entrance to the new market hall was announced. The winning entry was by local sixth form pupil Angela Pettit. The winning design was said to be of fire and wheels, representing energy and mechanical power, twin themes typifying the spirit of Keighley. The judges included Geoffrey Daniel, a partner of the J Seymour Harris Partnership, architects to the developer of the Keighley shopping centre, Murrayfield (Anon, 1971c).

The sculpture was realised by Keighley Technical College staff and students(Anon, 1975d).

The full size work was unveiled in July 1975. At the unveiling the work was “the symbolic sculpture of cast iron wheels and flames symbolises the prosperity and progress of Keighley. At the time Miss Pettit had a BA Hons in graphics from Leeds Polytechnic (later the artist’s name was Mrs Angela Mitchell) (Anon, 1975b, 1975e; White, 2009).

Signage

Dark applied block lettering to wall by entrances

Architects

Basil Andrew Waddington (d.1977), Keighley Borough Architect (1964-1970), Main contractors; J Totty & Sons Ltd.(Anon, 1971g). Stalls manufactured and installed by Robinson (Silsden) Ltd (Robinson, 1971).

Barrow in Furness Market 7 July 1971

Cost

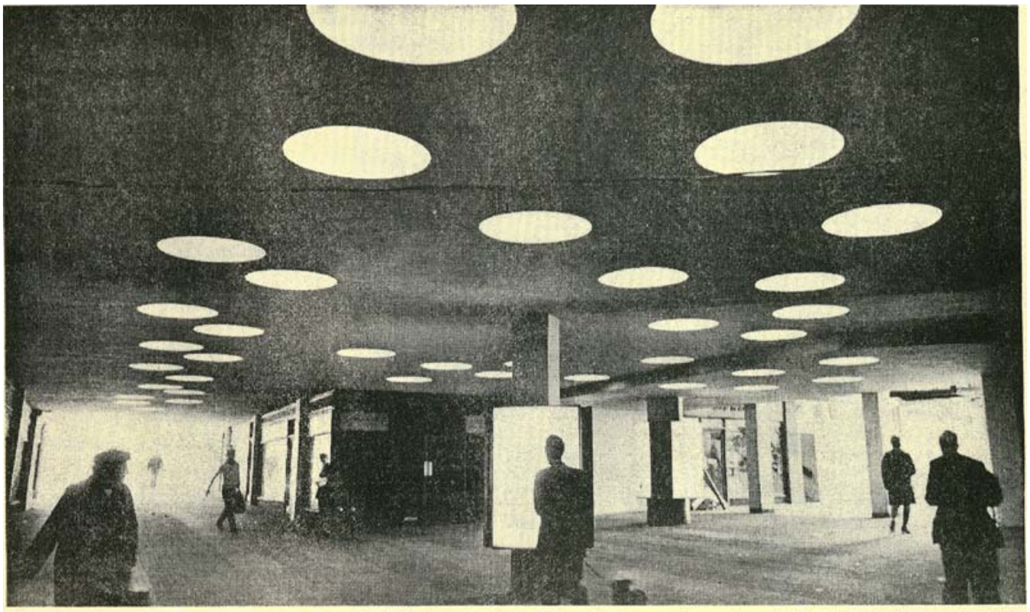
£500,000

Design

At a town centre junction on an acute corner a privately developed shopping arcade with offices above gave covered access to the market hall behind. Exterior cladding of randomly ribbed concrete panels and columns clad in mosaic. Entrance canopies finished with ribbed teak. Because of a fall in levels from the front the further entrances to the market hall were stepped and ramped. Servicing was from ground floor rear access. Stock rooms and staff facilities on the first floor. Roof top car park with four stair cases and a lift. 8,000 sq feet of offices

Barrow's imposing town centre complex takes shape. To the corner site of Furness House is now added the new Market Hall with its Duke Street frontage on the extreme left and arcade access beneath the coat of arms and on either wing.

Figure A-135 Furness House, Barrow, 1971 (Anon, 1971i)



An impression of the arcade area adjoining the market hall. On the left is the Dalton Road arm of the arcade and on the right is that leading from the Furness House approach.

Figure A-136 Shopping Arcade to Market and Furness House, 1971 (Anon, 1971i)

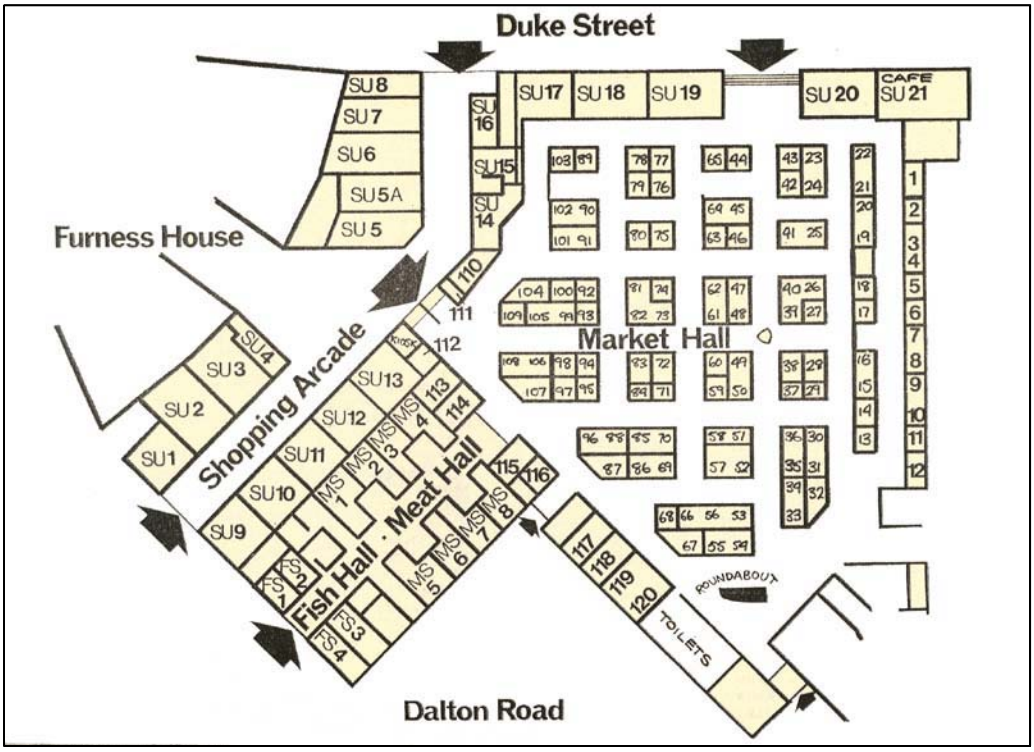


Figure A-137 Barrow Market Hall plan 1971 (Anon, 1971i)

Figure A-138 Barrow Market Hall from Duke Street, 1971 (Anon, 1971i)

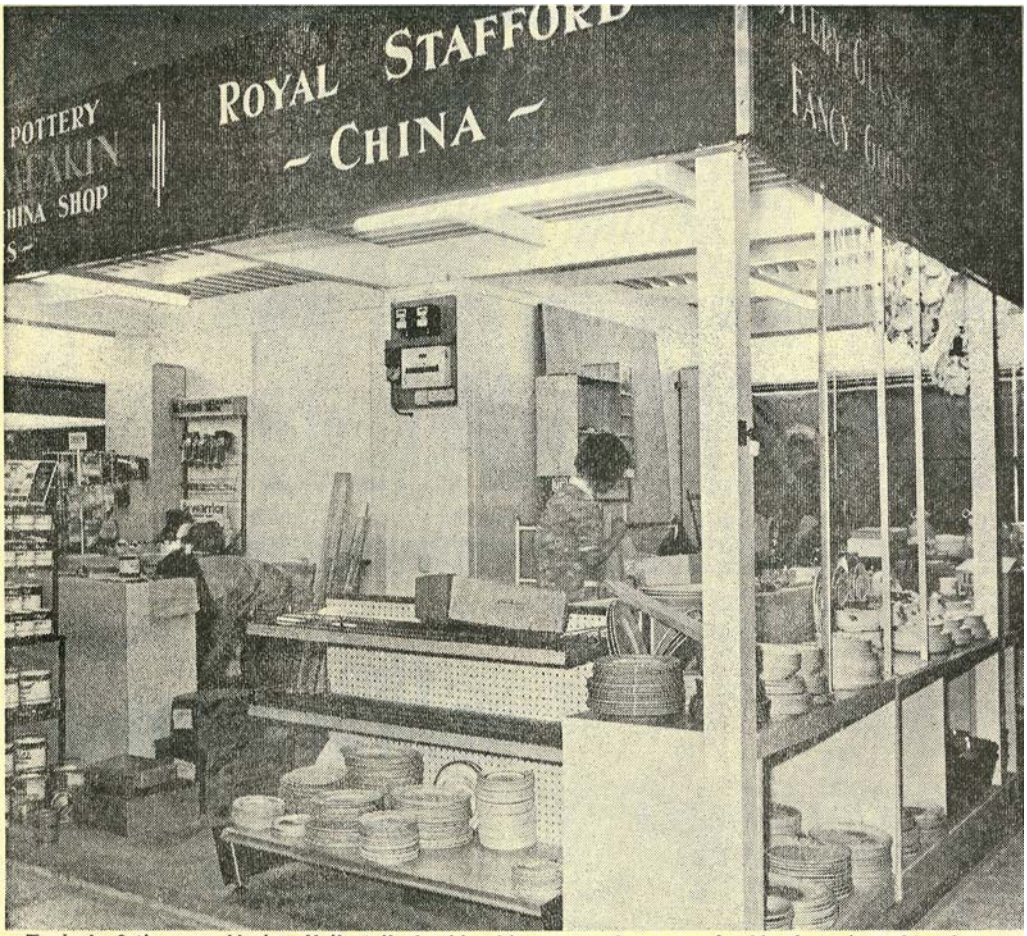
Structure

A steel framed building. Columns can be seen at stall fronts across the market.

Figure A-139 Barrow Market Hall with column breaking stall front, November 2010 (http://www.southlakes.addr.com/photo2010/barrowindoormarket3.jpg)

Stalls

120 stalls, with custom-made fascias, hot & cold water, drainage & electricity. Timber stalls painted orange, olive and white. (Anon, 1971i).



Typical of the new Market Hall stalls is this china store that, even by Monday when this picture was taken, was all but ready for last Wednesday's opening.

Figure A-140 Barrow Market Hall 1971 (Anon, 1971i)

Lighting

No natural lighting (Tyson, 1971). Fluorescent tubes in stalls.

Surfaces

Interior flooring, black and white terrazzo.

Art

"Because the perimeter storage above the main hall is of double height a modernistic, sculptured profile treatment has been used on a portion of the wall at high level above the entrances from Duke Street. Soft lighting is used to enhance the sculptured effect but not detract from the stalls."(Anon, 1971i) An advertisement by a local painting contractor cites "multi-coloured textured finishes" by a local painting contractor(R. Parr, 1971) does not really convey nature of the abstract design.

Figure A-141 Barrow Market interior with relief mural, March 2006
(http://www.southlakes.addr.com/photo3/market22006.jpg)

Novelty

Children's roundabout in market hall – roundabout also features in Coventry Market

Signage

To the teak portal canopies applied Helvetia white letters.

Architects

Bernard Engle & Partners. Stalls designed by Barrow Corporation's chief architect, Ian McIntosh and built by the authority's direct works department.

Bury Market October 1971

The Bury Market Act 1839(Act, 1839) led to an architect being instructed "to produce such an external and internal architectural appearance as may serve to at once indicate the uses to which the buildings are to be devoted, and of a sufficiently imposing an important character"

The 1839 market was replaced by a 1901 market hall that included an octagonal domed entrance for the sale of fruit, flowers, sweets and toys" The market was destroyed by fire in 1968.(Schmiechen & Carls, 1999)

Cost

£90,000(Bury Metro, nd)

Design

"As with all market halls it was necessary to limit the number of internal supports in order to provide for the maximum flexibility of use" (Anon, 1974a).

Structure

The 61 m x 46 m hall is roofed by a cast insitu 3.5m x 6.7m hollow spine beam on three columns with two 23m spans supporting two sets of 23m cantilevering precast, pre-stressed 18 ton beams that are anchored over it by 28mm post-tensioned strands. This forms a double cantilevering span of 46m with roofing panels resting on the beams. This gives a gull wing appearance.

The central spine column can be jacked to allow for movement associated with underlying geological fault. The hollow spine carries service including hot air heating.

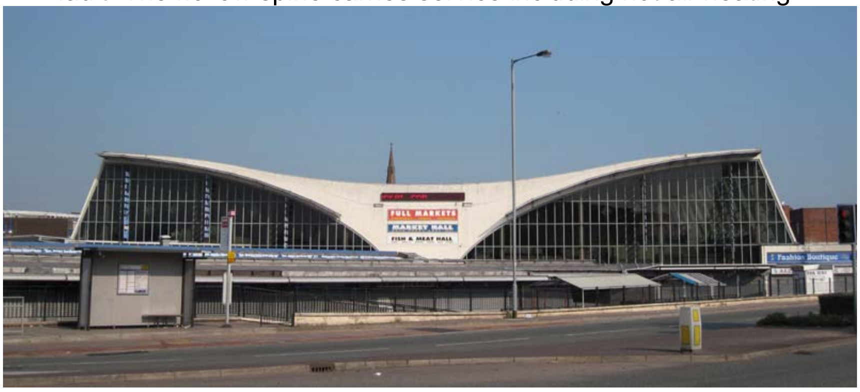


Figure A-142 Bury market from Spring Street, May 2010 (http://www.panoramio.com/photo/35984127)

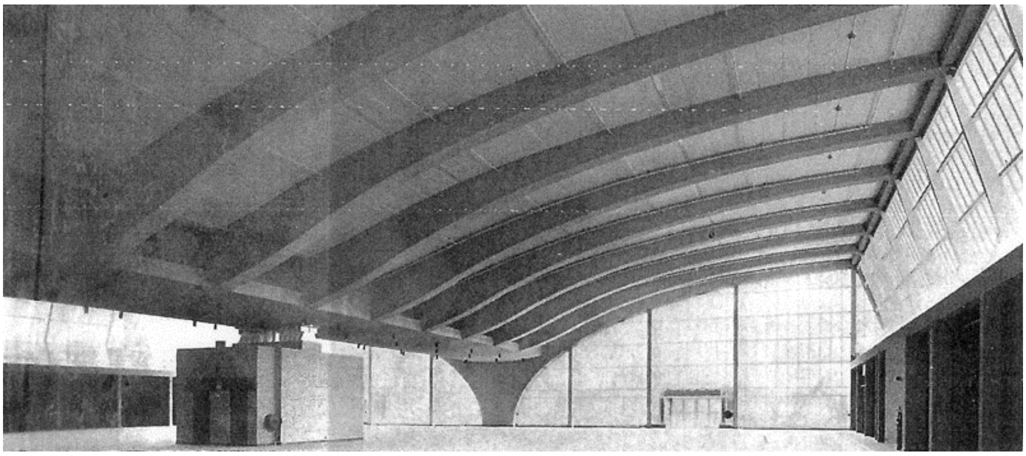


Figure A-143 Bury market hall, (1971?) (Anon, 1974a)

Lighting

Glazing is fitted to the soffits at the perimeter of the roof down to shop units or the market floor.

Architects

The new market hall was designed by Harry S Fairhurst & Son; the consulting enginners were Taylor Whalley and Spyra. The main contractors were Shepherd Construction Co Ltd (Concrete April 1974 p42).

Leicester Market 1971-1978.

Design

From the 1930s the market place had a filled with a north-lit roof in glass, corrugated iron and asbestos which in 1968 the city's planning officer described as an act of "cultural barbarism unequalled throughout Europe"(Smigielski, 1972b) and "ugly like over a goods station" and the modernising scheme was to provide the market with an "attractive and colourful roof" and create new civic square to the front of the historic corn exchange.(Smigielski, 1968)

Figure A-144 Leicester market hall roof and Corn Exchange 1971 (Bellamy)

Structure

Project architect Bellamy says constraints such as the market having to function during construction, no working or materials storage areas and restricted service road access led to a prefabricated solution.

Pre-cast concrete umbrellas were considered by the engineers but their bulk and problems of transportation made them impractical in Bellamy's view. A prefabricated design in steel was developed but a change to a glass reinforced polyester (GRP) roof was chosen as the most suitable because of appearance, production speed and ease of erection. By 1971 the market was rebuilt with 178mm square tubular steel umbrellas at 6.7m centres supporting a 3.35m grid of RHS steel beams on the end of tapered arms. 300 flat topped pyramidal roof units 3.35m square were born by the grid. The roof units were a double skin of glass fibre reinforced polyester filled with polyurethane foam. Each weighed 250lbs. They were brick red on the outside and dark grey on the soffit. The flat tops were translucent. Some pyramids were inverted and hung down over the market aisles (Anon, 1972e; Farebrother, 1971).

Figure A-145 Leicester market roof 1972 (Toomey)

Figure A-146 Leicester Market, 1972 (Toomey)

Drainage of the roof was through fall pipes within the RHS steel column. The steel columns also had the provision for traders' display racks, overhead slots for name boards and electricity supply.

Figure A-147 Leicester Market interior showing stall arrangement and roof support, 1971 (Bellamy)

Stalls

Grouped in squares around the steel umbrella columns. Smigielski had sought hexagonal groups but the architects opposed this. Bellamy says that most sales are at the corner of a stall so that having the column at the centre makes sense (personal communication RC Bellamy, 12 September 2011).

The Architect's Journal commented
"It has long been suggested that the comforts of the supermarket have put an end to the open market in street or square. But in fact this is not so – at least not yet as witness the rebuilding of the celebrated Leicester Market. Architects would wish this issue to be settled on social not merely architectural grounds. But they must be excused if they hope, secretly, that the open market will survive. The nicely articulated roofscape, the direct relationship between structure and each separate enterprise, the purposeful animation – all these produce a shopping environment which for all its draughts, certainly looks much better than any supermarket." (Anon, 1972a)

Lighting

Natural light through translucent flat tops of roof shells. Artificial lighting to the stall was given by small reflector lamps cantilevering from the grid.

Figure A-148 Leicester market interior showing artificial lighting, 1971 (Bellamy)

Art

A bronze statue of John Manners, 5th Duke of Rutland had stood in various places in the city. From 1855 he was close to the Corn Exchange but early c20 it was moved elsewhere. Now the statue was moved back to the market and revealed in a small piazza formed by drawing the market back. The statue and the corn exchange were opened to view.

Figure A-149 Statue of John Manners, 5th Duke of Rutland on Leicester market piazza, 1972 (Toomey)

Novelty

In 1972 Smigielski thought the market place was the most outstanding feature of the city in the previous10 years because it was a new type of environment, unique, a place that everybody thinks has something continental about while it is entirely English.(Smigielski, 1972a).

Bellamy had developed grids as a student project for a Nottingham market and for the Leicester project spent considerable time designing grids in various modules and stall configurations. Bellamy comments on the change of material from timber-ply stressed panels to GRP for the canopy. It "failed to weather & I regretted using an untested material"(Bellamy, personal communication 19 September 2011).

Unusually there was architectural criticism of the market;

"The old stalls had an amazing souk like effect, with hundreds of naked light bulbs at eye-level. The new have lost some of the intimacy but provide an extra grandness. The best thing about them is that the structure is tough and solid, without imposing itself on the goods..."(Anon, 1971d)

"Despite the obvious good intentions which lay behind the design of this open market, something is not quite right. Notwithstanding the practical and visual improvements over its predecessor, there is a general impression that, in an attempt to recapture some of the qualities of the old canvas-roofed street market, the designers have produced a half-bred imitation in plastics and steel.

"The irregular roofline of a traditional market is here replaced by something which is too mechanical and, in spite of the shape of the individual pyramids, monotonous. This shortcoming could well have been overcome if a couple of sections had been raised above the overall roofline...

"...These criticisms of what was undoubtedly a brave attempt to provide (for a change) what a large section of the people really want in their town may seem unduly harsh in the circumstances. The Leicester authorities certainly deserve praise, if not for producing an entirely successful version of this age-old institution, at least for endeavouring to do so, and thus perhaps persuading other authorities to do likewise." (Chisholm, 1971?)

Visits to other markets

The project architect recalled visiting many markets including Sheffield and Nottingham (personal communication RC Bellamy, 12 September 2011).

Luton Market 27 January 1972

Design

Part of a 1970s Arndale Centre development, with a multi-storey car park above. Trading area on one level with escalator, lift and stair access. 39,000 sq feet 145 stall market hall with air conditioning. Refuse shoots to basement.

Serviced by ramp access to basement. Basement includes meat and vegetable preparation rooms, bin sluices and a refuse area. Mezzanine with dry goods storage, traders' toilets and locker and rest rooms.

Included in the building, a new public house next the market's main entrance.

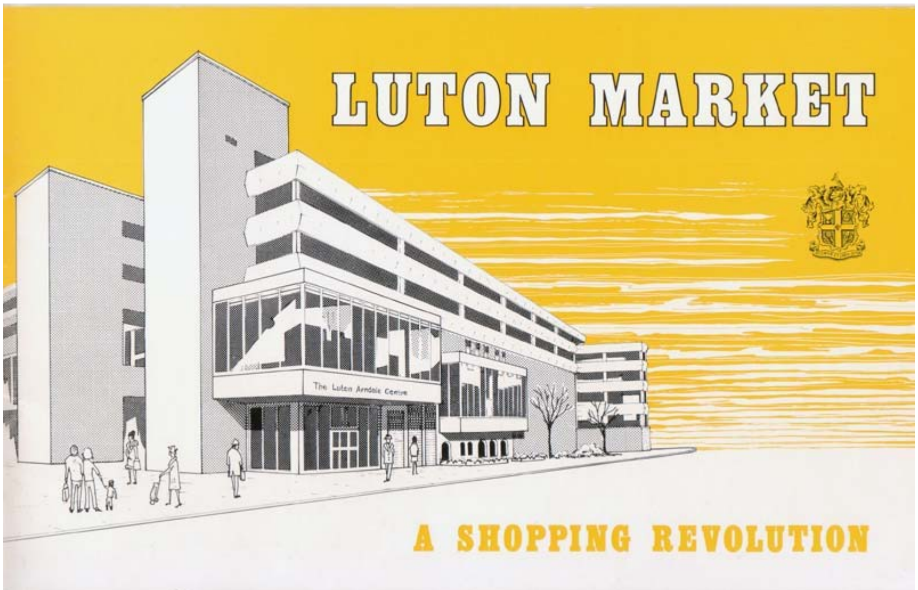


Figure A-150 Luton Market brochure cover, 1972(Luton Corporation, 1972)

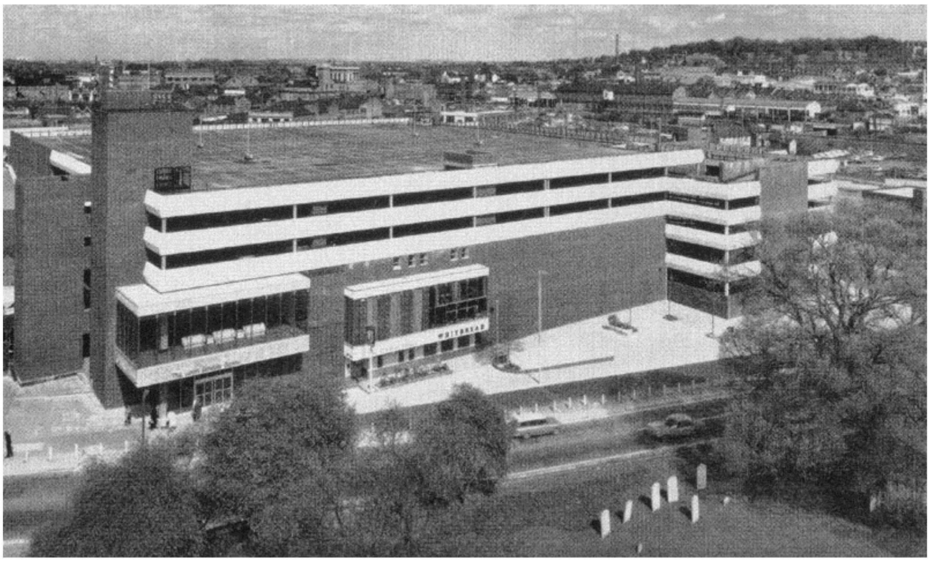


Figure A-151 Luton Market exterior, 1972(Luton Corporation, 1972)

Stalls

On plinths, standard design, metal framed with Formica–covered counters and partitions, equipped with telephone power points, water and drainage. Standard sign boards, white fascias and contemporary fonts.

Figure A-152 Luton market interior 1972 (Luton Corporation, 1972)

Lighting

No natural light. Banks of fluorescent tubes behind stall signs which also lit the ceiling.

Aspirations and novelty

Public house.

Central heating, air conditioning and ventilation for whole market. Air changes 2-4 times per hour. The meat and fish trading area had a separate air conditioning and ventilation system allowing rates of air change 10-20 times by season.

“A market to be envied.”
“With a market for the seventies Luton has bought luxury to the traditionally spartan occupation of market trading.”
“Everywhere you walk, you will find that the temperature, lighting and lay-out blend to perfection”(Luton Corporation, 1972)

Visits to other markets

unknown

Victoria Centre, Nottingham, 1972

Cost

£700,000

Design

A 120,000 sq ft corporation market in £10m, 516,000 sq ft city shopping centre developed by the Capital and Counties Property Company in the cutting of a redundant railway station site. The station's red brick clock tower of 1900 was retained and stands in contrast to the "unobtrusive"(Weston, 1973) reeded *insitu* concrete faced shopping centre. The rows of ducts at roof level one of the few noticeable architectural features. The megastructure included three levels of car parking, five blocks of flats 36,000 sq. ft. of offices and a bus station was five times the size of Birmingham's Bull Ring (Anon, 1973b; Capital Shopping Centres, 2009; Harwood, 2008b; Weston, 1973)

Figure A-153 Victoria Centre and clock tower, 2009
(http://www.flickr.com/photos/decipher_shot/3497748833/)

It was a condition of the planning approval that the centre should incorporate the 800 year old market (Weston, 1973). “The Victoria Centre was the most up-to-date shopping centre in the country, boasting the biggest market complex in Britain. The opening... of the Victoria Centre Market marked a revolution in market trading. It offered 138 stalls on the lower floor and 156 stalls on the upper floor, plus a separate section of 20 stalls for meat and fish.”(Nottingham Post, 2011)

The market is located half way along the mall and had trading areas on two levels.

Stalls

In 2011 the market, now only on the upper floor, has suspended ceilings. Stalls on plinths, metal framed with fascias almost reaching the ceiling.

Figure A-154 From the main entrance of Nottingham Market,2005
http://lizian.blog.co.uk/2005/09/15/lizian_111_victoria_market_how_to_find_u~183854/

Lighting

No natural lighting. The mall was reported to be generally lit with colour corrected mercury vapour lamps to varying intensity with a general intensity of 15 lumens(Anon, 1973b). In 2005 No specific details for the market however in 2005 there was recessed fluorescent lighting in the market's ceiling.

Ventilation

Had air conditioning, temperature maintained at 65 degrees F(Weston, 1973).

Surfaces

In the shopping centre; ' "We have deliberately played down the design of the centre in a negative way to reinforce the impact of the shop units", explained Mr Michael Haskoll, who was in charge of design on behalf of the architects.

The result is a low key-key monochromatic colour scheme, fairly subdued lighting and the absence of any violent architectural shapes. Floors are finished with terrazzo, columns and beams with mosaic and lift shaft walls in sculptured marble. The ceiling is finished with pendant rectangular panels which hide lighting, ducts and other service elements (Weston, 1973). The market's columns display cheaper finishes.

Art

The shopping centre opened with children's tubular play sculpture in the form of a grasshopper, " a remarkable water curtain – a constant stream of even trickles trained ingeniously down strands of clear plastic into a pool” and an “eccentric” revolving water clock or “Aqua Horological Tintinntabulator”designed by Rowland Emmett (Weston, 1973). None of these features were or are near the market.

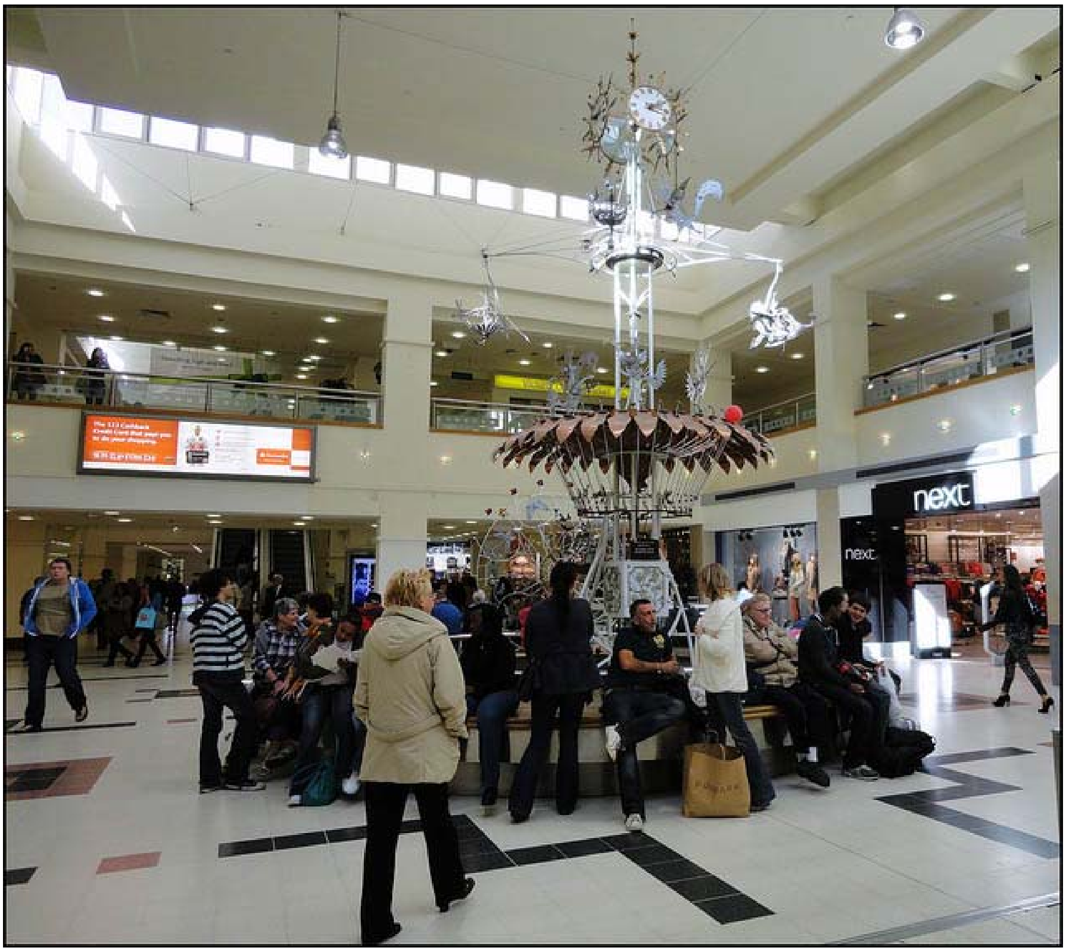


Figure A-155 Rowland Emmett Water Clock, Victoria Centre, October 2011 (http://www.flickr.com/photos/bazzadarambler/6221973763/)

Aspirations

At the times of the official opening of the Victoria Centre Sir Richard Thompson Bt MP chairman of the developing company Capital & Counties Property Company Limited was quoted in a Times newspaper Capital & Counties advertisement “it is perfectly possible to find attractive architectural solutions which are commercially viable as well- if the planners have vision and the developers are not too greedy”

“The problem is that the Victoria centre has severed the NE quadrant of the city from the hub”(Harwood, 2008b)

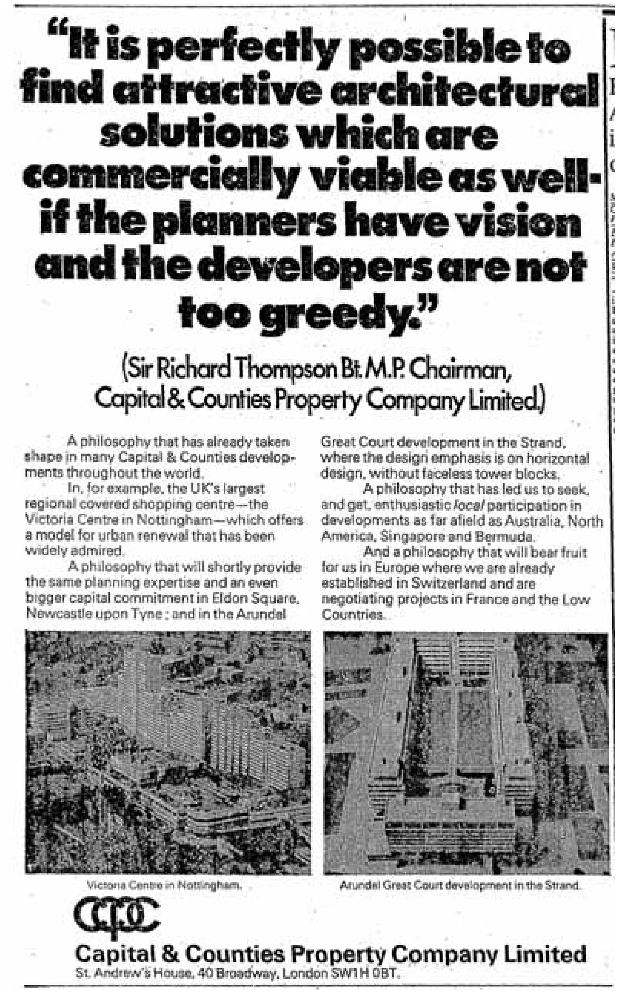


Figure A-156 advertisement, Times 28 February 1973

Architect

Peter Winchester of Arthur Swift & Partners

Scunthorpe Food Hall Market 3 November 1972

Cost

£300,000

Design

Part of the town centre's comprehensive redevelopment by Scunthorpe Borough Council in association with Ravenseft Properties Ltd.

It was felt that "owing to the key role the building would have to play in the redeveloped town centre, it must equally reflect its association with its surroundings as its internal function. This association would have to be expressed in terms of quality and appearance, as well as general planning.

“In particular it was considered that the new town centre would well be deficient in terms of skyline and roofscape generally. This would be emphasised by the fact that many people would view the scheme from high level on account of the multi-storey flats and car parks, The market scheme should attempt to alleviate this deficiency to some extent”(Anon, 1972g)

The hall is single storey 110ft x 120ft on plan surrounded by perimeter structures housing services, storage and preparation and a cafe.

Structure

A reinforced concrete frame, with brick infill, supporting four 50 ft x 60 ft timber pyramids with a pitch of at least 37.5 degrees. Surmounted by apex lanterns. The roof was concrete tiled. The whole has a perimeter tie bar. There is a massive central column at the meeting point of the four pyramids.

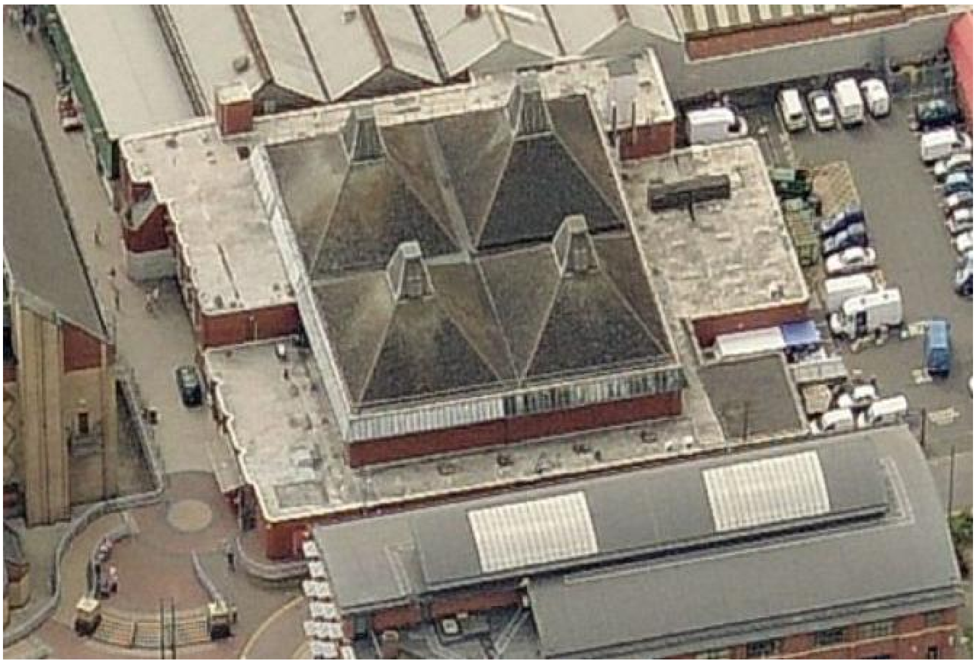


Figure A-157 Scunthorpe food hall market from the East, Bird’s eye view
http://www.bing.com/maps

Figure A-158 Scunthorpe market food hall interior
http://www.flickr.com/photos/dhwright/4576085290/in/photostream/

Figure A-159 Scunthorpe market food hall interior with central column
http://www.flickr.com/photos/dhwright/4576085290/in/photostream/

Stalls

42 stalls in various sizes, being exaggeratedly tall with framed fascias at the top of mansard style striped canopies with scalloped hems as if actually acting as a water shedding canopy (Anon, 1972b).

Lighting and Ventilation

The four apex lanterns with patent glazing had louvres giving permanent ventilation. Also continuous clerestory glazing at the foot of of the pyramids at the market’s perimeter.

Surfaces

The roof soffit is of stained tongue and groove boarding with exposed timber frame

Novelty and Aspirations

As well as satisfying most of the “aesthetic and townscape considerations the pyramid form seemed ideally fitted to providing natural ventilation though apex openings by producing a venturi (sic) effect similar to malt houses of the past. Since food markets have considerable smell problems, this seems a solution meriting attention... Although the building is not yet completed, it is possible already to appreciate the dramatic effect of the roof both internally and externally...”(Anon, 1972g)

Architects

Borough architect, Brian Brook in succession to Charles J. Weeks; job architect M J Brown. Main contractor William Wright & Son (Lincoln) Ltd.

Kirkgate Market, Bradford, 22 November 1973

Cost £4m

Part of the Kirkgate Centre developed by Arndale “brutalty out of scale on dingily Brutalist pre-cast concrete”(Leach & Pevsner, 2009) . It replaced the function of the nearby 1872 Kirkgate Market

Figure A-160 Kirkgate Market, Bradford 1973 (Anon, 1974c)

Design

Windowless market hall with coffered ceiling. Access from outside is by ramps

Figure A-161 Lower ramp to Kirkgate Market, Bradford (2009)
http://www.flickr.com/photos/jamesw-bell/4174110622/

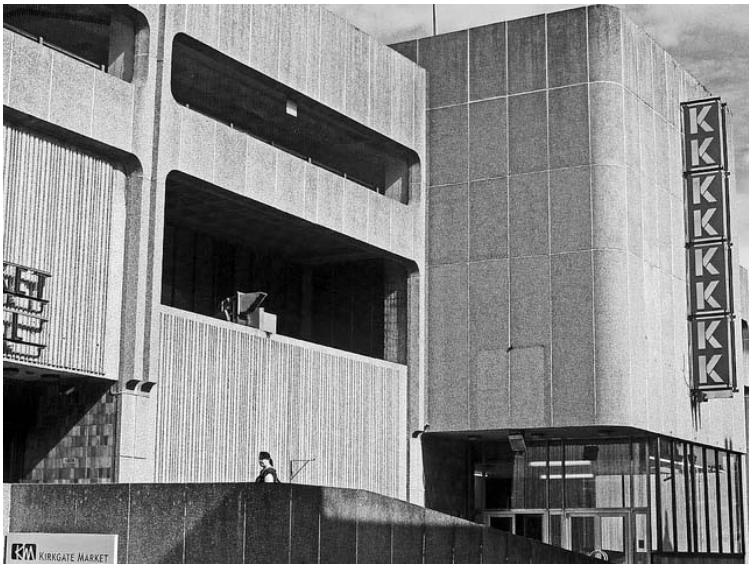


Figure A-162 Upper ramp to Kirkgate Market, Bradford (2011)

Surfaces

Terrazzo tile flooring . Many walls tiled with patterned brown and yellow tiles.

Art

Reliefs at an entrances to the market and a remounted shaft and base of an ancient Bradford market cross was displayed on the entrance ramp.

The reliefs were described in the late 1970s

“They offer what seems to be a combination of abstract, symbolic and representational designs hinting at human and inhuman animal; faces of sun-gods, moon-goddesses, angels, pixies, imps and ogres; doors doorways and pillars – or shops, shop fronts and stalls and variations upon cuneiform and hieroglyphic themes.

One mural portrays topwise a bird –like creature of no doubt mythological background and the other a magically expanded or exploded barleycorn, somehow related bottomwise to a cactus like root.

All in all the murals wear an air of being unloved, unwanted and quite unappreciated”(Bowskill, late 1970s).

The hall has one 6.5m square and four 2.5m square tiled wall panels. No contemporary record of the tiles has been found, however the tiles date from its construction; a site quantity surveyor for Higgs and Hill, the main contractors for the project, remembers the murals well, but not the designers or fixers (Barry M Jeffreys personal communication 2 April 2012).

The murals are apparently abstract compositions of extruded relief tiles with large (see Figure A-163).

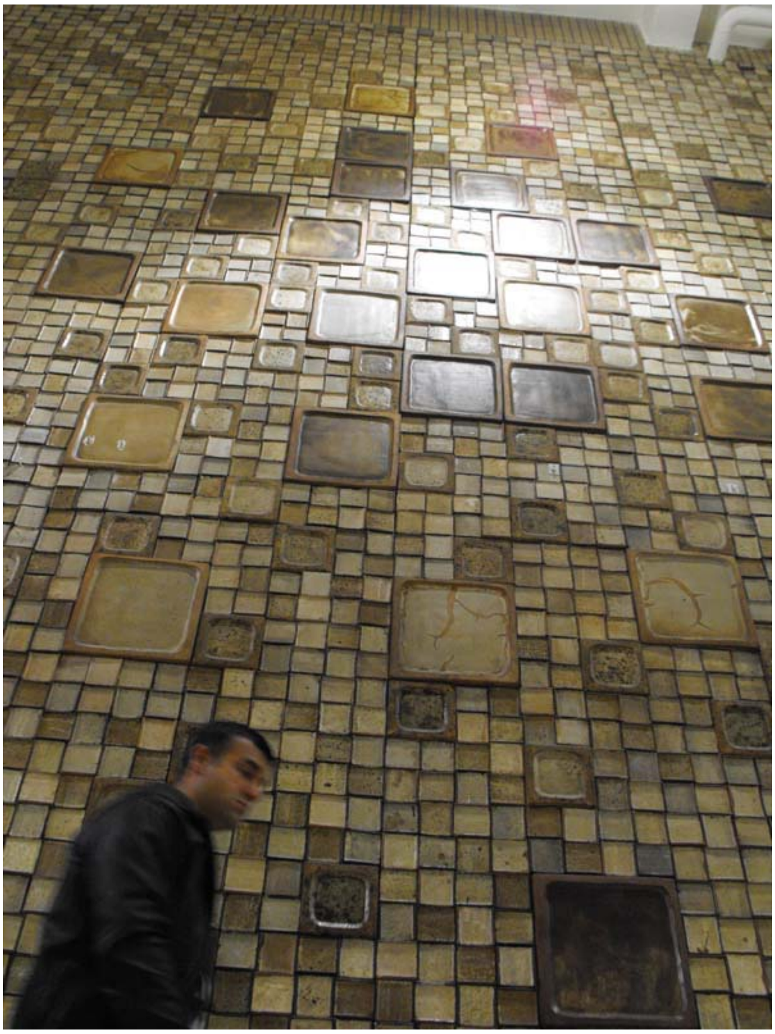


Figure A-163 Tile panel in Kirkgate Market, Bradford (Author 2012)

Figure A-164 Detail of tile panel in Kirkgate Market, Bradford (Author 2012)

The smaller tiles on the panel (see Figure A-164) are like tiles in the Transform catalogue (see Figure D-11); both are extruded. The larger tiles show the use of metal oxides on the surface as used in *Articulation in movement*. Square One team member and later Transform production manager, Frank Maurier suggests that the smaller tiles were 1973 Transform tiles produced at Dosthill and the larger tiles were sub contracted and produced at Snitterfield (personal communication 7 April 2012).

Figure A-165 Relief in Kirkgate Market, Bradford (2009)
http://www.flickr.com/photos/technogran/4158301891/

Figure A-166 shaft of an old Bradford market cross in Kirkgate market entrance (Anon, 1974c)

Architects

John Brunton & Partners (Leach & Pevsner, 2009)

Rue D’Agadir Market, Casablanca, 1975

Marché d’alimentation

A covered market covering an area of about 40x 30m. The roof is of shallow freestanding square hyperbolic paraboloid concrete umbrellas, each with a central circular column. The columns with slightly splayed heads are at six heights with the shells at eight sizes in plan from 4m to 11.4m (Cohen & Eleb, 2002; Ragon & Tastemain, 1999).

Figure A-167 Rue D’Agadir Market, Rue O Slaoui facade.
(http://www.flickr.com/photos/jad_bouchouka/4607474138/)

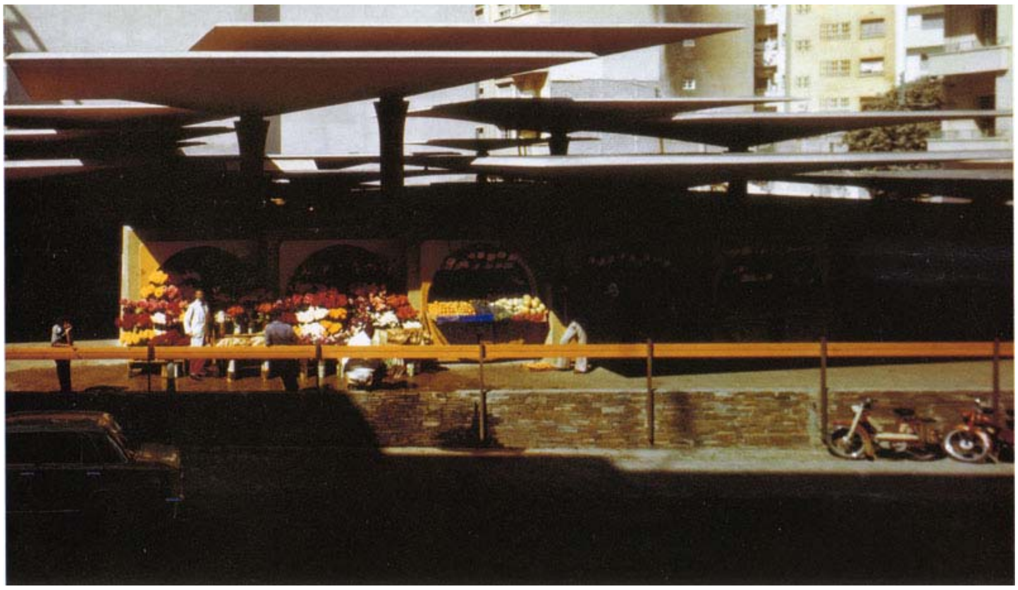


Figure A-168 Rue D’Agadir Market from Rue D’Agadir (Ragon & Tastemain, 1999)

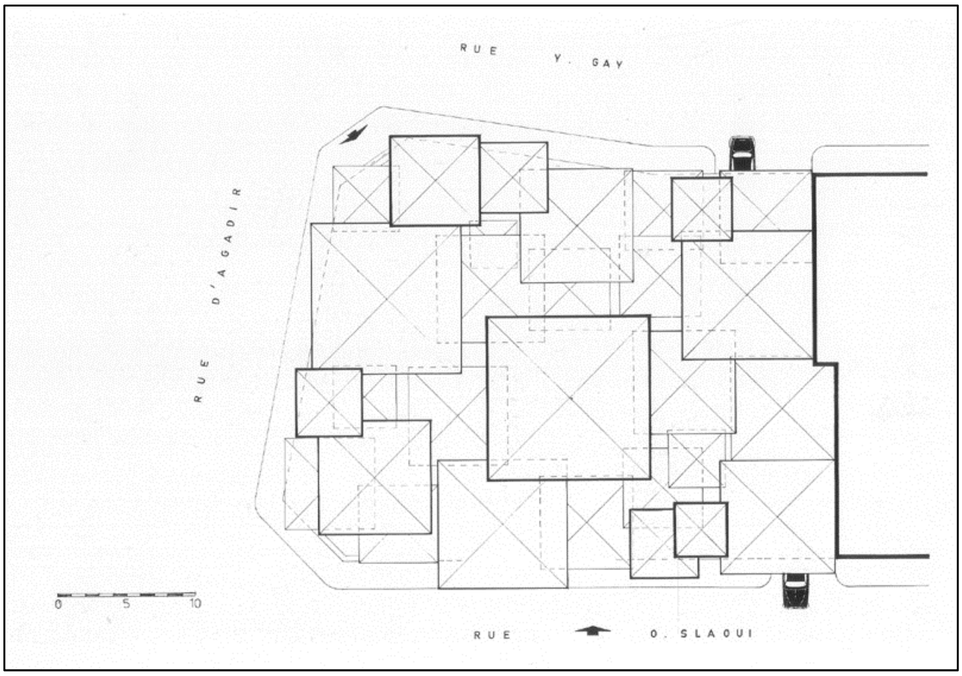


Figure A-169 Plan of roof shells of Rue D'Agadir Market (Ragon & Tastemain, 1999)

The shells overlap one another so there is shading, rainscreening, clerestory lighting without glazing. All surfaces are board-marked. A shadow gap is apparent at the springing point.

Stalls

The stalls are cast concrete boxes with a circular aperture taking up almost a whole side as the stall front. Stalls to the perimeter face outwards to the street,

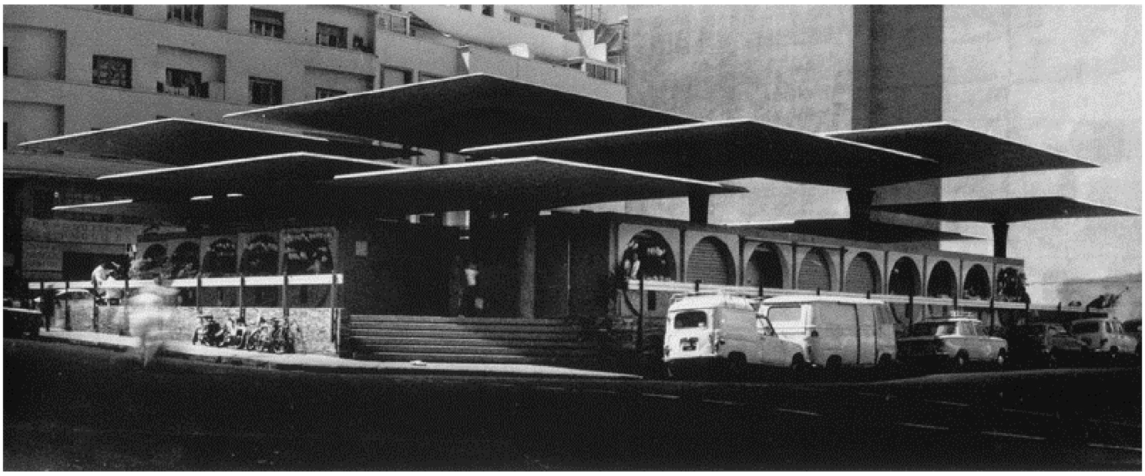


Figure A-170 Rue D'Agadir Market from corner of Rue D'Agadir and Rue O Slaoui (Ragon & Tastemain, 1999)

The market is serviced by ramped access to a basement.

Figure A-171 Interior views of Rue D'Agadir Market (Ragon & Tastemain, 1999)

Art

A block wall protecting the drop to the basement ramp is pierced with square andslot apertures giving bright highlights to the shady interior. The security grilles used give angular patterns.

No artificial lighting, ventilation, fire protection or signage.

Architect

Jean-Francois Zevaco (1916-1998).

Eagle Centre market, Derby, 20 November 1975

Design

Client Derby Council and CIN Properties, a £7m shopping centre with theatre, market and public house.

Single storey trading area.

Raised flower beds at main entrance

Structure

The roof made up of a 58 glazed hexagonal umbrella – shaped units covering 9000m2. Each unit was 5.4m wide and composed of a hexagonal space frame of structural hollow steel sections.

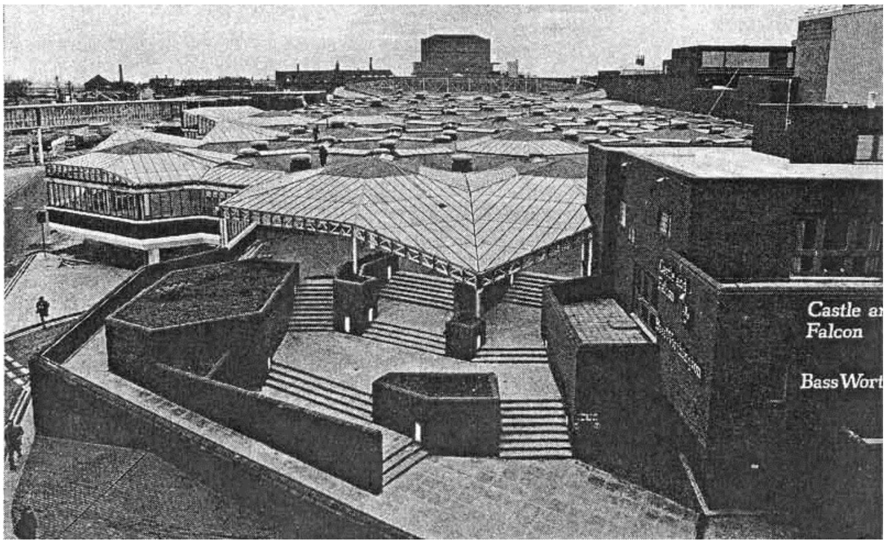


Figure A-172 Entrance and glazed roof of Eagle Centre Market and Public house, 1975 (Rimmer, 1975)

Figure A-173 Eagle Centre Market http://www.picturethepast.org.uk

Figure A-174 Eagle Centre Market, 1970s
(Derby City Council DRBY003399 http://www.picturethepast.org.uk)

Figure A-175 Eagle Centre Market with roundabout, 1970s
Derby City Council DRBY003407 http://www.picturethepast.org.uk

Figure A-176 Eagle Centre Market, 1970s
(Derby City Council DRBY003406 http://www.picturethepast.org.uk)

Stalls
Circa 276-320 stalls. Arranged In hexagons. Wooden structures, many finishes and graphic styles(M. Smith)

"In a feature on the new facilities, the Derby Evening Telegraph wrote: 'Newcomers to the covered market at the Eagle Centre may be forgiven if they are reminded of a maze. Such is the labyrinth of stalls – 276 of them – that it is easy to become temporarily lost.'

'But, the paper assured readers, there would be no difficulty in traversing the market once direction signs, some illuminated, were installed.

'In fact, the confusion continued and matters went from bad to worse. Only traders appeared to know where anything was situated and they claimed they were constantly being asked for directions to specific stalls.

The main problem seemed to be that stalls were in hexagonal groups of six. The question everyone, other than those who had planned and built the place, asked was "why?".' (Anon, 2007a)

Lighting

Extensive roof glazing, steel framed with Georgian wired glass. Fluorescent tubes with reflectors above to soffit of structural frames. Various fluorescent tube arrangements above stalls (M. Smith).

Art

None in the market, In the shopping centre a large abstract clock and wooden water feature

Figure A-177 Abstract water feature in Eagle centre, Derby, 1970s
(Derby City Council DRBY003394 http://www.picturethepast.org.uk)

Figure A-178 Abstract water feature in Eagle Centre, Derby
(Derby City Council DRBY003403 http://www.picturethepast.org.uk)

Novelty & Aspirations

The theatre was reached through the market.

“Architecturally the centre is interesting although the malls lack the height say the Wester Hailes centre at Northampton they have the compensation of large areas of glazing...umbrella shaped units...the result is that the market place has some relationship with the outside world and with more traditional markets” (Rimmer, 1975)

Inadequate interior signage, no public conveniences, no sprinkler system.

“It was a very radical design in its day, with the honeycombed styled stalls, but it didn't quite succeed practically and was scorned on as it resembled a gigantic maze!”(M. Smith)

Visits to other markets and by others

Bradford, John Street Market (Boenke, B. Personal communication 27 July 2011)

Architects

Elsom, Pack & Roberts, job architect Bob Boenke. Structural engineers, Clarke, Nicholls and Marcel.

Coalville Market 22 October 1975

Cost

£300,000

Design

Two pavilions, each 6,400 sq ft with 3,300sq ft link with cafe and public toilets (Anon, 1975c). “The basic requirements were to provide an attractive functional roof which would be suitable for a market atmosphere, with plenty of light and air movement. Clear spans of approx 24 m were required, with a minimum number of stations around the perimeter, and clear lines internally.” Bird nests and roosting were to be discouraged. There are also perimeter lock-up shops (Stimson, 1977)

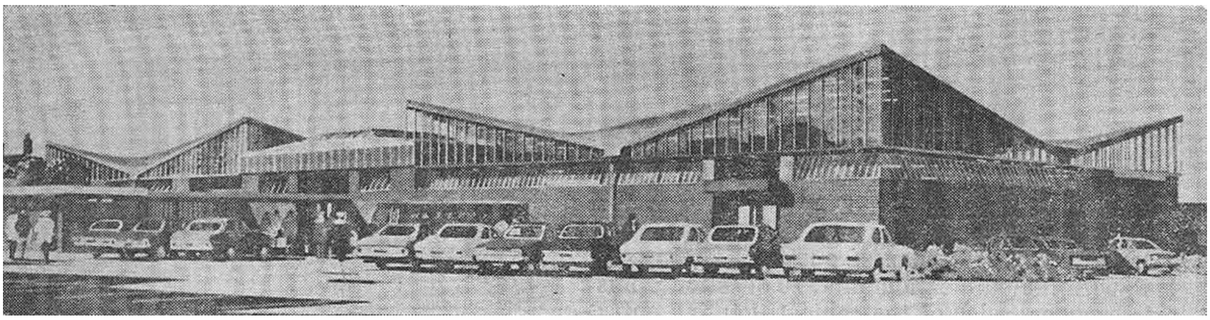


Figure A-179 Artist’s impression of Coalville Market (Anon, 1974b)

Figure A-180 Coalville Market, aerial view (Stimson, 1977)

Structure

A consideration was the legacy of coal mining and clay pits in the immediate area and the possibility of further mining below the site. It was decided to divide the structure into several separate structures with totally independent foundations.

“It was considered that a series of hyperbolic paraboloid shapes over the main hall would meet the requirements of giving natural light, airiness and pleasing appearance” Each of two major roofs was to be made up of four symmetrical hyperbolic paraboloids giving an overall plan of 24m x24m with a rise of 3m with the eaves at a height of 4.90m.

“Consideration was given to the use of steel, reinforced concrete and timber for the structural materials to the hyperbolic paraboloid. Since the cost of skilled labour have[sic] increased dramatically over the past few years it was considered that a prefabricated and site assembled framework would be more[sic] economical.

“A steel frame using rectangular hollow sections (RHS) met the requirement.”

To minimise the number of stanchions two main portal frames are joined at right angles – the apex of each joining at the centre. The outer corners are stabilised with light RHS stanchions forming Vierendeel trusses. Thrust is taken down the rafter slopes of the portals and girders.(Anon, 1976b) The roofing grid is made of 100mm x 50mm RHS members, supporting shallow profile galvanised steel decking that has the flexibility to cover the hyperbolic paraboloid shape the decking is overlaid with insulating board, three layers of roofing felt and chippings. (Stimson, 1977)

Figure A-181 Coalville Market as roof was completed, 1975 (Stimson, 1977)

Stalls

The 108 stalls had a patent aluminium section framework with Formica covered panels, fascias and counter tops. Cost of stalls, £30,000 (Anon, 1975c).

Figure A-182 Coalville market January 2010
http://isabellapepper.wordpress.com/2010/01/27/coalville-market/

Figure A-183 Coalville Market, December 2010
http://www.flickr.com/photos/nmcgowan/5317311677/

Lighting

The side triangular Vierendeel trusses are clad with patent glazing to the eaves

“Strip lighting was connected to the underside of the hyperbolic paraboid grid which accentuated the shape internally at dusk.”

Ventilation

Natural

Novelty

Steel hyperbolic paraboloid roof

Architects

S.W. Greenbury of Newman Levinson & Partners; Consulting Engineers Peter H Hill & Partners

Darwen Three Day Market, 20 June 1975

Design & Structure

A single storey hall, hexagonal in plan with radius corners. Two reinforced concrete pedestrian bridges from high ground and the a roof top car park allowed access across the flat roof and between and around raised pyramidial skylights (see Figure A-184 and Figure A-185). Pillars can be seen at the perimeter, columns are in the hall of which the spans are unknown. The hall had elevations of exposed regular bush-hammered ribbed concrete and a parapet of exposed irregularly ribbed concrete that cantilevered out beyond the building's foot print

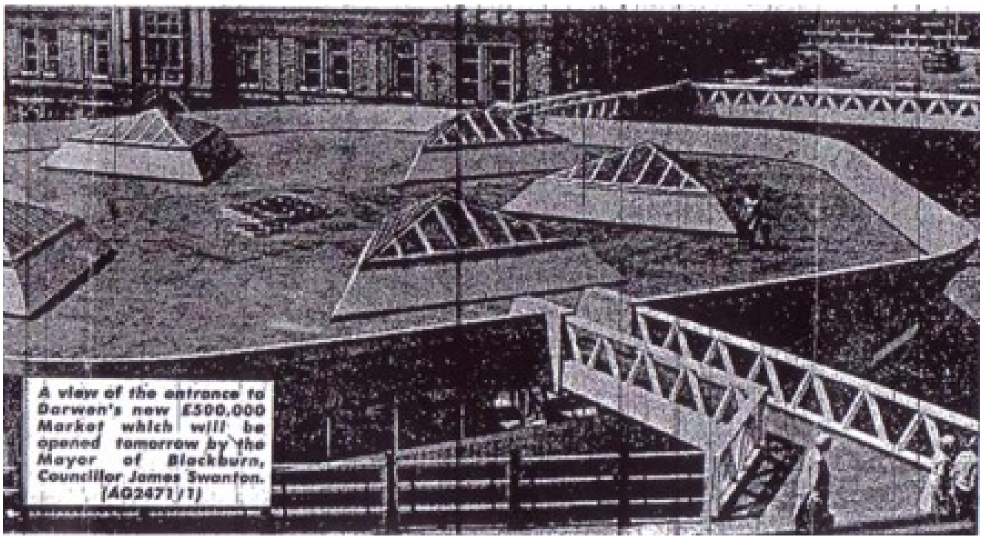


Figure A-184 Darwen Market before opening, with footbridges onto roof (Anon, 1975a)

Figure A-185. 1975 Darwen Market Hall. The footbridge appear wrapped in mesh (undated)
http://www.cottontown.org/page.cfm?pageid=1790

.

The hall’s concrete coffered ceiling was broken by six large, almost dramatic in the low ceiling, triangular chamfered light wells with roof lights above each of the six stall blocks. Also with clerestory lighting at the whole perimeter. Artificial lighting was by ceiling mounted exposed fluorescent tubes.

The 66 stalls were freestanding and timber framed with service conduits routed across the ceiling (Figure A-188). The stalls were in concentric single rows with radial aisles allowing sight lines to the centre. The layout had the radial symmetry of the 1950s markets in Sidi Bel Abbes and Coventry (Figure A-186). Entrances were at several of the corners.

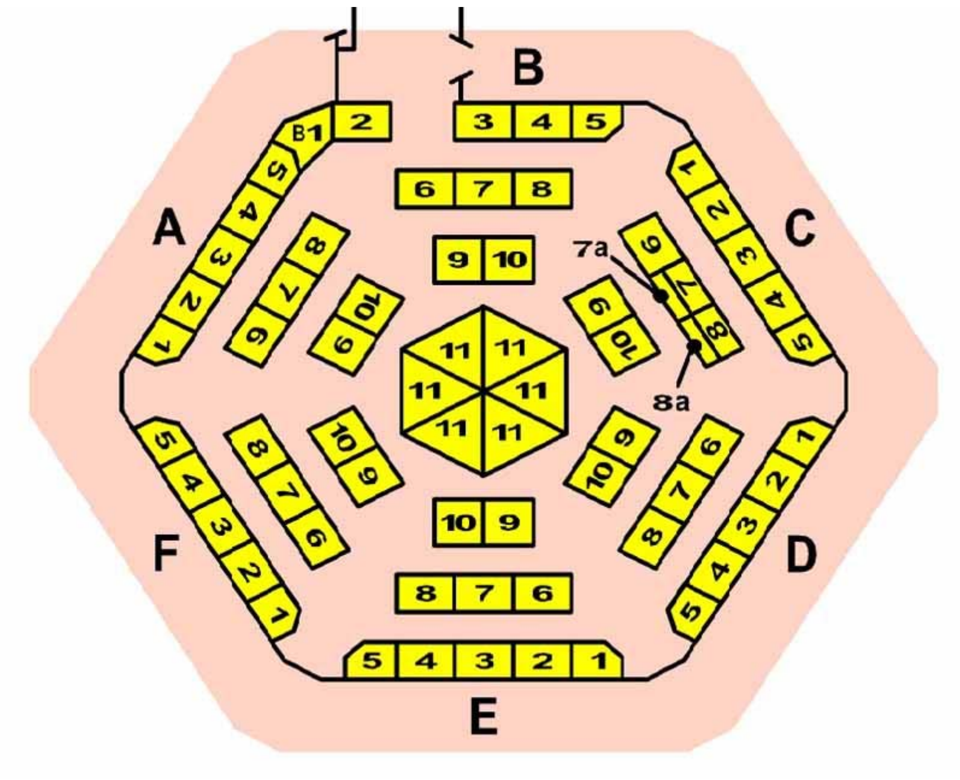


Figure A-186 Darwen market hall stall plan (2005)
http://www.darwenmarket.com/map.html

Figure A-187 1975 Darwen market hall (Ken & Janie Rowell 2008)
http://www.panoramio.com/photo/7855219

Architect
Walter Stirrup, Blackburn, the Lancashire County Council plan is no 6/3/LA101 and the Building Regulations Plan 68/44 (Personal communication, Letitia Caparelli, Darwen Libray, 29 November 2012).

Bletchley Market, 1976

Design & Structure

The canopy of the street market was made up of 27 interlinked 4m x 6.5m hexagonal white mushrooms. Each formed from six GRP segments. Rainwater was ducted down the stems of the mushrooms.

Figure A-188 Bletchley Market
http://www.flickr.com/photos/iqbalaalam/2345334582/

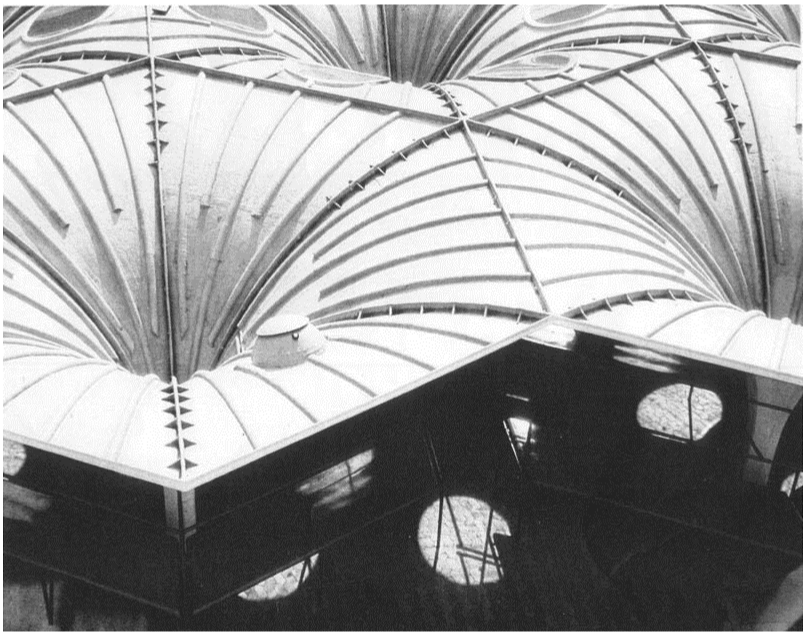


Figure A-189 Bletchley Market canopies from above (Anon, 1977)

Stalls

Kee Klamp tubes and fittings with GRP tops.(Anon, 1977)

Figure A-190 Bletchley Market
http://www.flickr.com/photos/iqbalaalam/2345336562/

Lighting

Circular roof lights were in all panels of the seven central mushrooms. Lighting and power to stalls were integral to the canopy

Architects

Milton Keynes Development Corporation, (1974. Derek Walker and Pierre Botschi).

Arndale Centre market, Manchester, 1978

A 15 acre development by Town & City properties with Manchester Corporation; land north and south of two main shopping streets bridged and enclosed by two shopping malls with a link to two elements the corporation insisted on, a bus station and a market. There was no natural light in the centre.

“This is perhaps the flagship of the Arndale centre developments and typical of the Arndale style-workmanlike, but unromantic internally, aggresive externally... The tenant mix is controlled, an element of segregation introduced – from luxury trading grade down to the market”p103(Beddington, 1982).

The two level 200 stall market hall was isolated from the rest of the complex on its own on the north side and to the east of the bus station.

Architects; Sir Hugh Wilson & Lewis Womersley

Carmarthen Market 1981

Design

Carmarthen Market of 1846 was designed by F.E.H. Fowler of London. Fowler's design was selected by competition, but the winning plans were revised to reduce cost. The whole complex cost £5,600. The market included a two-storey square tower of brown rubble stone, Italianate style, with arched openings, and a square timber clock turret.

A large part of the market was damaged by fire in 1929 and rebuilt. The clock tower was retained.

In 1981 a new market replaced the rebuilt 1930s market hall which was inadequate in is food hygiene standards. It’s site now related to the neighbouring Tesco store; an outdoor market was on the piazza between. The designers were impressed by Fenuil Market in Boston (USA)“where the spaces, colours, textures and trader’s sign boards all contributed to a successful and commercial result”. The clock tower was again retained.

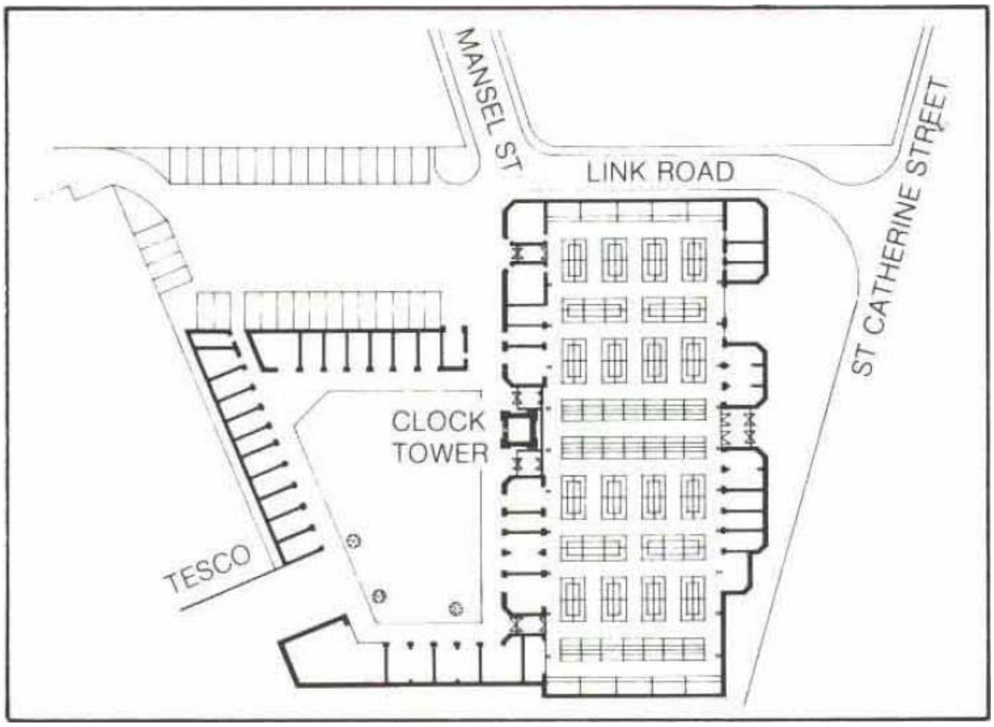


Figure A-191 Carmarthen market plan (Anon, 1981)

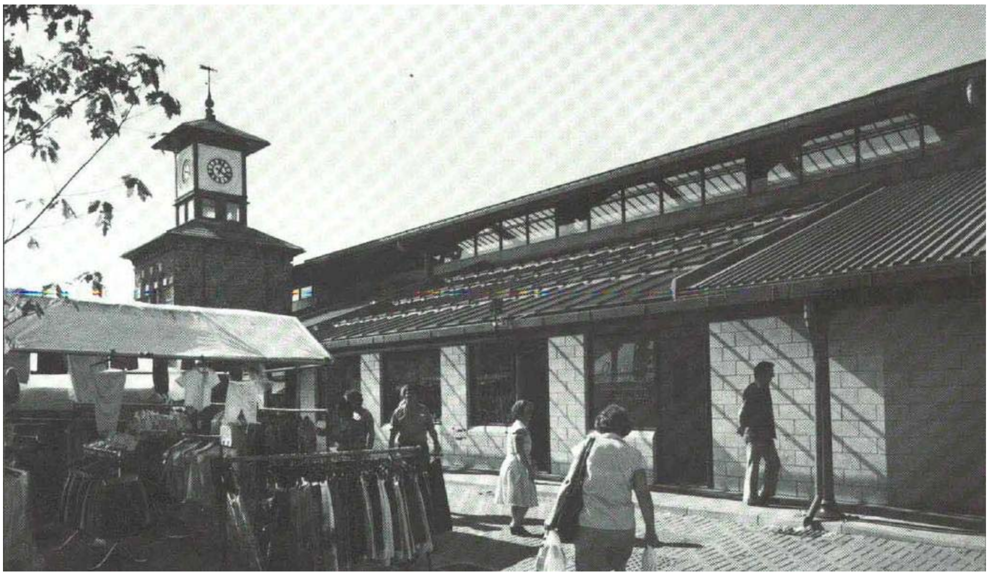


Figure A-192 Carmarthen market exterior(Anon, 1981)

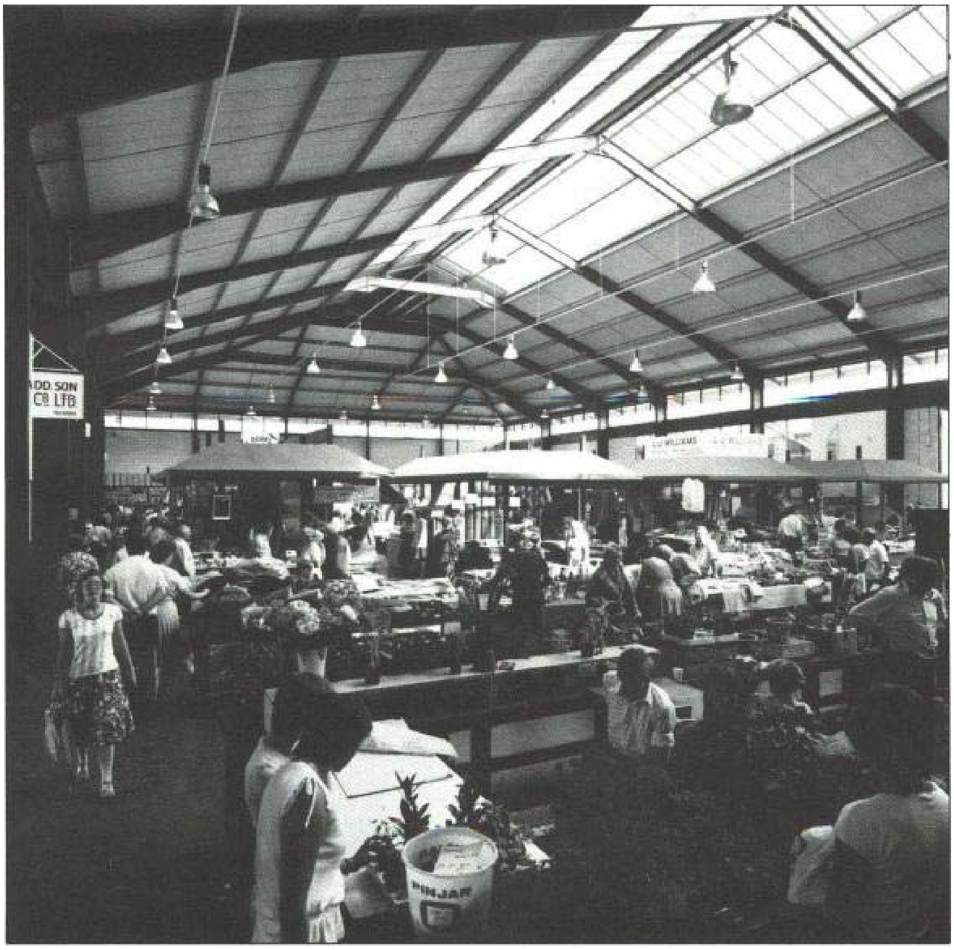


Figure A-193 Carmarthen market interior (Anon, 1981)

Structure

Concrete block walls. Truss free steel frame clear span roof

Stalls

Perimeter stalls, free standing kiosks under canvas canopies table and carts

Lighting

Solar tinted glass panels in roof. Suspended downlighters

Architects

Percy Thomas Partnership

Rotherham open market, 1988

Market canopy.

“Rotherham wanted to raise the profile of its market which was proving less attractive for local traders and customers than rival shopping venues which include the out of town Meadowhall centre. The market stalls occupied an open court within a development suffering from a dowdy 1970s image.”

“The tented roof makes a focal point for the area as well as supplying weather protection for traders and shoppers.”

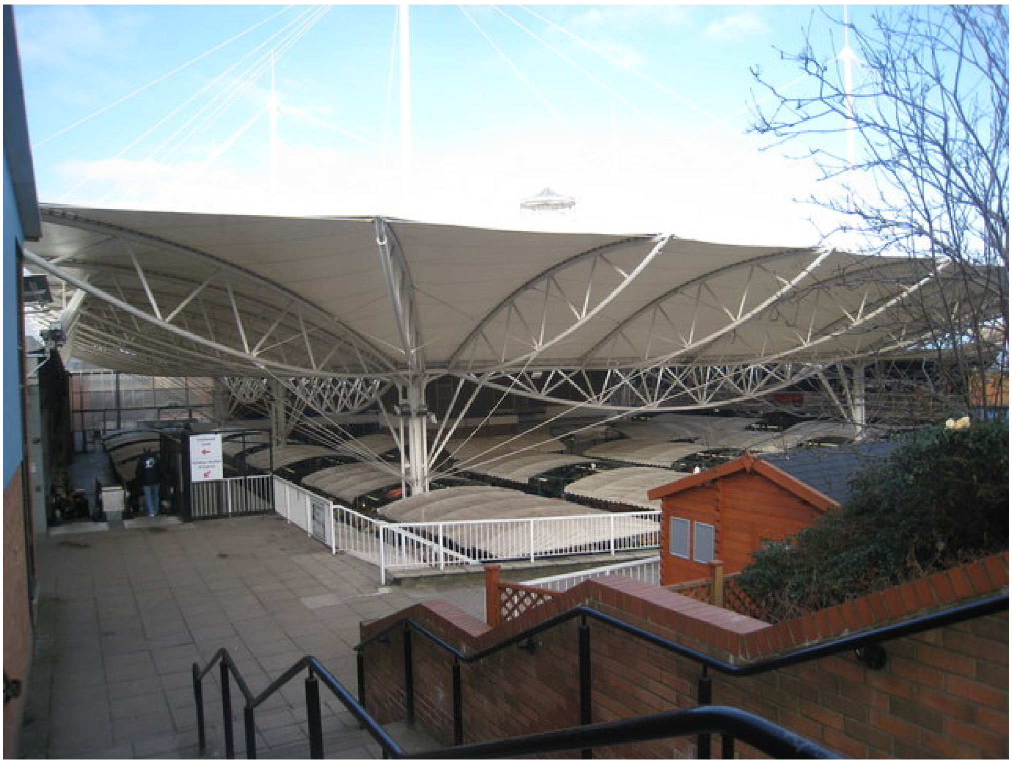


Figure A-194 Rotherham market, January 2011
http://www.geograph.org.uk/photo/2250348

Figure A-195 Rotherham Market from above. 1971 market hall roof glazing to left
http://www.architen.com/projects/rotherham-market

Covering over 3,500sqm, a tensile PTFE canopy cantilevers over the market. With the existing structure still in place, The roof is supported on six free standing masts, entirely independent of the existing market.

“This contrast between old and new, classic and modern is what makes the structure so intrinsically striking and has led for it to be labeled(sic) a space age flying roof!”(Architen Landrell, 1998)

Altenrhein Market Hall, 2001

Architect
Friedensreich Hundertwasser

Figure A-196 Altenrhein Market Hall
http://www.panoramio.com/photo/5178307

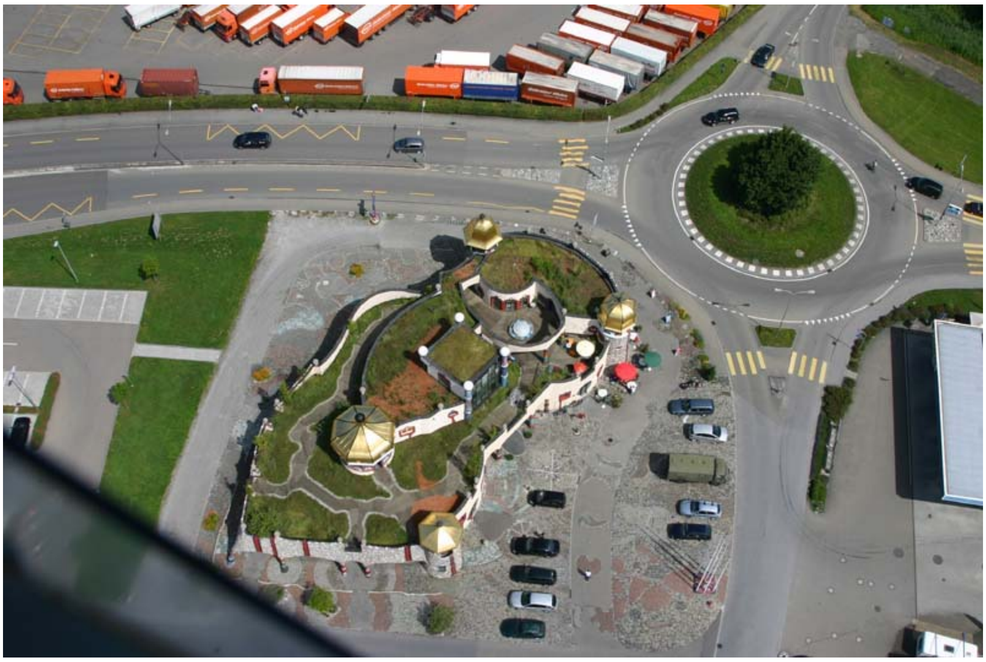


Figure A-197 Altenrhein Market Hall aerial view
http://www.panoramio.com/photo/32711901

Figure A-198 Altenrhein Market Hall interior
http://kultpavillonblog.blogspot.com/2011/04/bruno-schlatter-nein-noch-nicht-wien.html

Aarau Market Hall 2004

Design

Sited in a square, formed by the demolition of commercial buildings in a dense part of Aarau, the 20 x 30m market building follows the adjacent building fronts, bending gradually on one long side and more on the other. Its location accommodates movement around the hall on both sides. When open on the short sides, the building allows free movement through itself as well as around.

"The simple exterior of rectangular wood posts in a regular rhythm is split into a low and high section, the former opaque (or open when the doors are rolled to allow access) and the latter open. A flat roof, also wood, caps the building with a minimal profile. The greatest quality of the exterior comes as one moves past the building; what was opaque at an extreme angle becomes open more head-on. The tight spacing of supports creates an ever-changing face for the utilitarian structure that falls somewhere between market stand and warehouse." (Hill, 2004)

Inside a single column breaks the interior. "Here the outside wall's separation of high and low makes the most sense, as the surrounding facades are framed between the low wall and roof, like looking through a window with large blinds." (Hill, 2004)

Structure

Laminated wood portal frames in local Douglas Fir at 0.5m centres support the building along two walls. Inside the hall, the portal frames are supported by four large roof beams joined at the centre of the building and supported by a large wooden column of four laminated 240 x 240 mm posts.

Lighting

Lights and sprinklers are between roof members**.**

Ventilation

No heating or insulation.

Surfaces

Concrete and Douglas Fir treated with a copper-pigmented glaze that lends the structure a light bronze tone.

Aspirations

"The architects have utilised the narrow gaps left by the portal frames to form a screen, allowing the building to appear solid and transparent from various vantage points. This flow between the interior and exterior remains an important feature of the design. Visitors are encouraged to enter and exit the building freely... The simplistic approach taken by the architects suits the building's function well, while the use of wood, contrasting with its surroundings, emphasises the building's place in the street." (Hill, 2004)

Architects

Miller & Maranta (Anon, 2003; Hill, 2004)

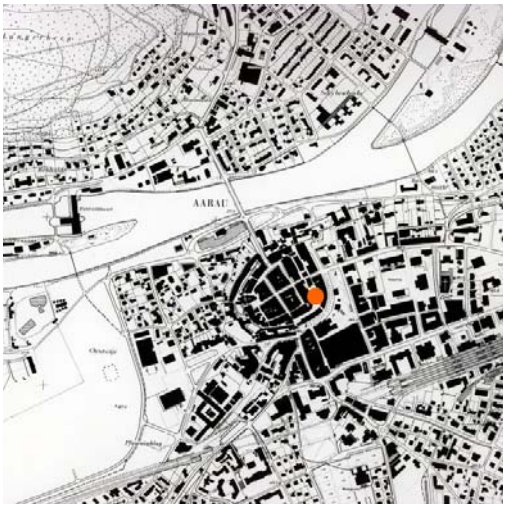


Figure A-199 Location of Market Hall in Aarau
http://www.archidose.org/Dec04/121304a.html

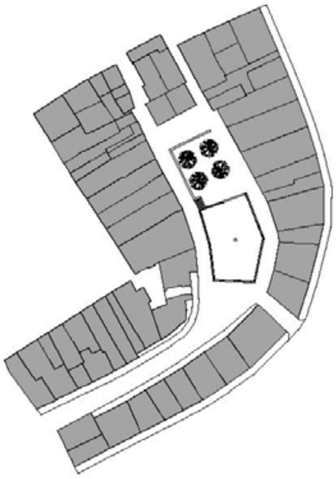


Figure A-200 Site plan of Aauru Market Hall
http://www.archidose.org/Dec04/121304a.html

Figure A-201 Aauru Market Hall from S.
http://www.archidose.org/Dec04/121304a.html

Figure A-202 Aauru Market Hall, W elevation from S
http://www.archidose.org/Dec04/121304a.html

Figure A-203 Aauru Market Hall, E elevation from N.
http://www.archidose.org/Dec04/121304a.html

Figure A-204 Aauru Market Hall, Interior,
http://www.archidose.org/Dec04/121304a.html

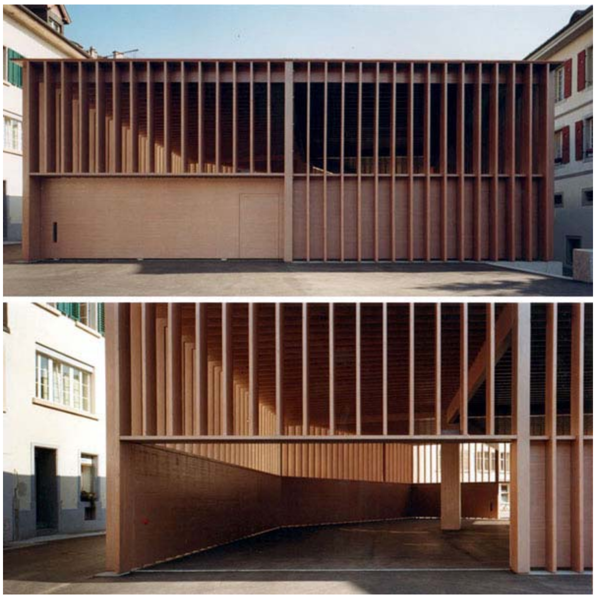


Figure A-205 Aauru Market Hall,
http://www.archidose.org/Dec04/121304a.html

Santa Caterina Market, Barcelona 2005

Cost

Euros 21m

Design

A new roof covers a pre-existing neoclassical market.

“Market is covered with a great, wave-like roof adorned with a carpet of colourful ceramic tiles lift on writhing, and intertwining, steel columns.”

Figure A-206 Santa Caterina Market, Barcelona (Kaylan, 2011)

Figure A-207 Santa Caterina Market, Barcelona
(Kaylan, 2011)

Stalls

60 vendors' stalls mix with shops, cafés, a supermarket, a restaurant, and community services, with underground parking and a pneumatic garbage-collection system.

Surfaces

The white-painted masonry walls on three sides of the rectangular 1845 market structure, with many arched openings permeable to the surrounding streets were retained. The same granite pavers used on city streets in the neighbourhood were used in the market interior "so that everyone understands it's a public space," (AR February 2006)

Art

The roof made of 325,000 coloured ceramic hexagons that represent fruits and vegetables in an innovative way.

Novelty

"New technology has also entered the building in the guise of computers installed in, to date, 33 of the 100 Santa Caterina stalls. These allow stall holders to take orders by email from customers and to deliver goods to them."

The archaeological excavations of the medieval Convent of Santa Caterina found on the site were preserved and opened to display. (AR February 2006)

Aspirations

"The architects were asked to squeeze together the revived market, the plan of which was constantly changing, a museum, two blocks of 59 low-rent social housing for senior citizens, an ambitious underground car park for articulated lorries serving the market and 250 cars together with an "organic waste depository" for the Santa Caterina and La Ribera districts of the city centre."

Architects

Enric Miralles (d 2000) and Benedetta Tagliabue of EMBT

Wakefield Market, opened and partially closed 2008 reopened 2010

Cost £8m.

Design

A component of the £200 Trinity Walk development by Modus Properties and Simon Developments.

"The project is simple: basically it is a great big roof, open at one end where it acts as a canopy for the open market. Tucked under the roof a three enclosed boxes – the covered market, the food market and a storage building"(Rattenbury, 2008).

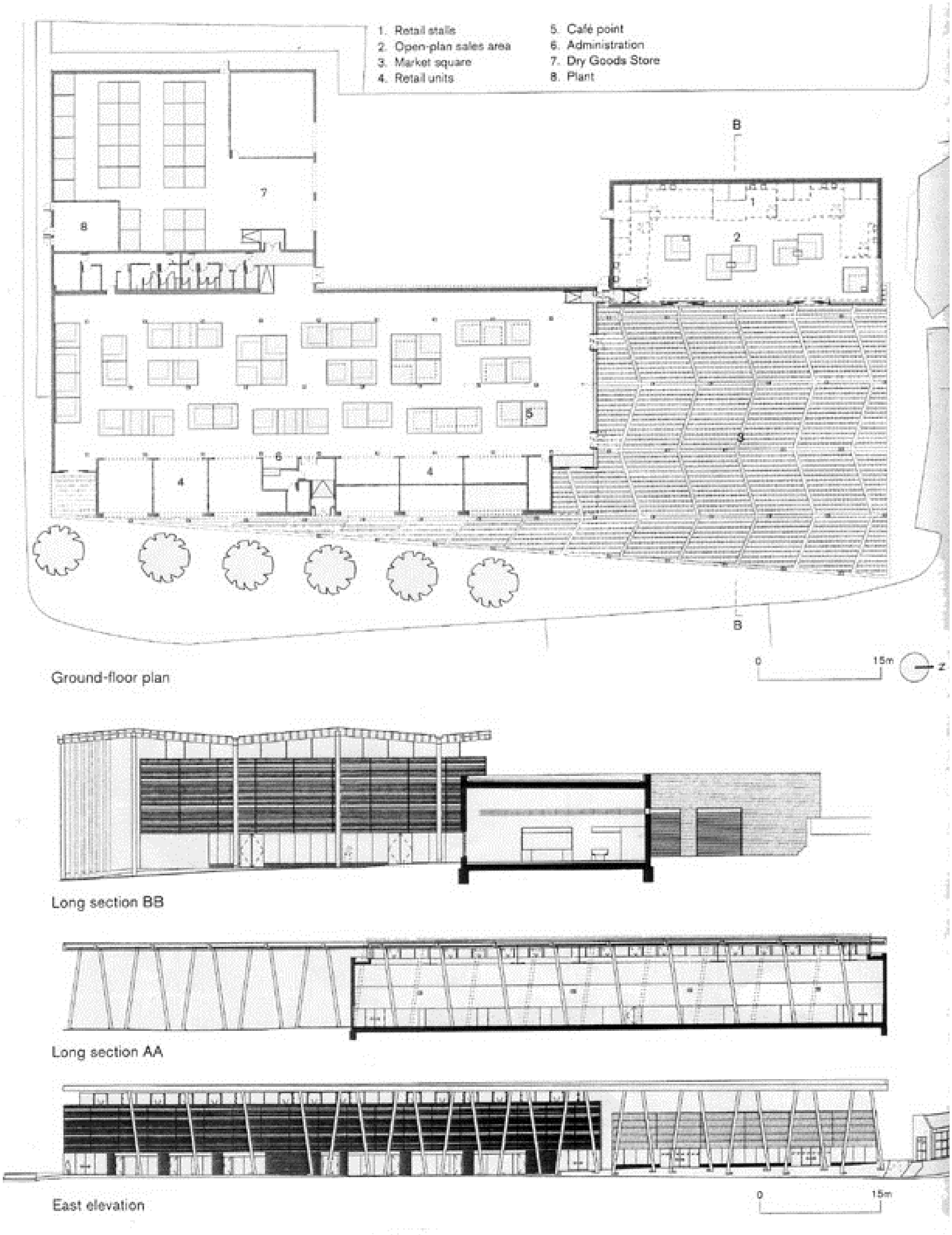


Figure A-208 Wakefield market ground floor plan, elevations and sections (Rattenbury, 2008)

Figure A-209 Wakefield Market from SE, June 2011 (Author)

Figure A-210 Wakefield Market from NE, June 2011 (Author)

Structure

The not quite square glazed oversailing roof of herring- boned glulam beams is supported on steel square section columns cranked at 8 degrees.

Stalls

Inside closed market 49 stalls by HMY Radford. The lack of coherence between the two rows of internal cranked steel columns at 7m intervals and the stalls is clear.

Figure A-211 Wakefield market stall and cranked steel column
http://www.radford.co.uk/wakefield.html

Figure A-212 Wakefield market stalls and cranked steel columns
http://www.radford.co.uk/wakefield.html

Lighting

The indoor market roof is has clerestory lighting to two elevations and some glazed roof panels. The food market has display windows under the oversailing roof. Downlighters in the indoor market.

Figure A-213 Wakefield market with standardised stalls with blank fascias allowing for traders' signage. http://www.radford.co.uk/wakefield.html

Ventilation

Ceiling mounted fans to the indoor market.

Surfaces

External surfaces include horizontally ridged rough rubber-formed-concrete panels to the food hall, horizontal stained cedar cladding totnhe indoor market and coloured stone banding on the storage building. Indoor market floor is terrazzo.

Figure A-214 Wakefield market food hall display window, ribbed concrete and signage, June 2011 (Author) as.

Figure A-215 Wakefield market service building, June 2011 (Author)

Signage

Applied silver grey block capital lettering to market walls. A building corner has it vertically arranged as on the 1964 Wakefield market hall.

Architects

Adjaye Associates

Carmarthen Market 8 April 2009 (officially opened 22 January 2010)

Cost £4m

Design

The former market hall was demolished to make way for the £74m St Catherine's Walk redevelopment that includes 30 new shops, a multi-screen cinema, restaurants and multi-storey car park.

The new market was built next to the fomer market hall. The 1846 market hall clock tower was retained for the third time. The tilting north facade gives a strong image of a geological formation.

Figure A-216 Carmarthen Market Hall 2010
http://www.rioarchitects.co.uk/Projects/RetailandLeisure/CamarthenMarket.html

Figure A-217 Carmarthen Market Hall and 1846 clock tower 2010
http://www.rioarchitects.co.uk/Projects/RetailandLeisure/CamarthenMarket.html

Structure

Welsh slate and pennant stone, locally sourced timber and a north glazed zinc clad roof.

Stalls

74 stalls supplied by Radford HMY Group. Standardised stalls with blank fascias allowing for traders' signage. Service ducting runs across the stall tops over aisles.

Figure A-218 Carmarthen market interior, 2009
http://www.radford.co.uk/carmarthenmarket.html

Lighting

Single mono pitch roof with clerestory lighting, some tilted emphasising the roof structure. Emphasised pattern forming glazing bars. Roof lights. Pendant lighting and stall lighting. Also decorative wall lighting.

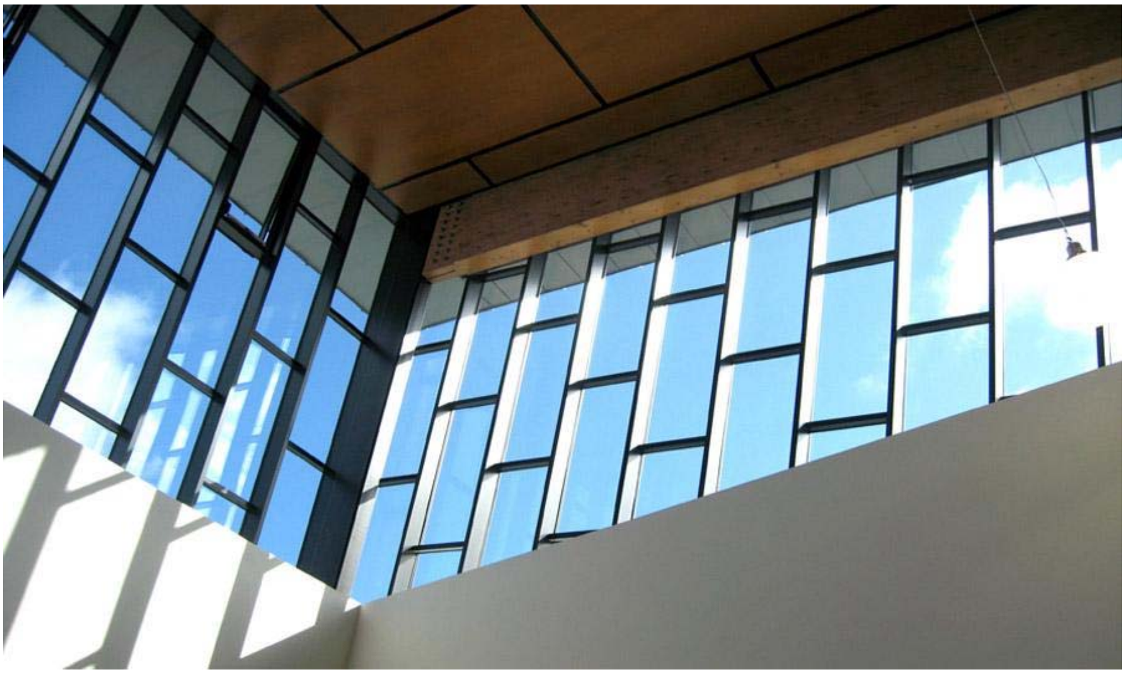


Figure A-219 Carmarthen Market Hall 2010
http://www.rioarchitects.co.uk/Projects/RetailandLeisure/CamarthenMarket.html

Figure A-220 Carmarthen Market Hall 2010
http://www.rioarchitects.co.uk/Projects/RetailandLeisure/CamarthenMarket.html

Figure A-221 Wall lights above slate wall, Carmarthen Market Hall 2010
http://www.rioarchitects.co.uk/Projects/RetailandLeisure/CamarthenMarket.html

Surfaces

Slate, timber,

Art

A transcript from the Black Book of Carmarthen in slate at the market's entrance. (Llyfr Du Caerfyrddin) and is thought to be the earliest surviving manuscript written entirely or substantially in Welsh. Written around 1250, the book's name comes from its association with the Priory of St. John the Evangelist and Teulyddog at Carmarthen.(Clark, 2009)

Figure A-222 Black Book transcript at Carmarthen market entrance

Signage

Applied relief lettering to slate wall

Architects

John Vergette and Brian Chambers of Rio Architects

Blackburn Market, 1 June2011

Cost

£8m under £66m The Mall

Design

70,000 sq ft single storey market under shopping mall, glazed curtain walling to pedestrianised streets.

Figure A-223 Blackburn market street entrance, June 2011
http://www.flickr.com/photos/blackburn-with-darwen/sets/72157626881208233/

Street level access and connected by escalators and two lifts to the department stores above,

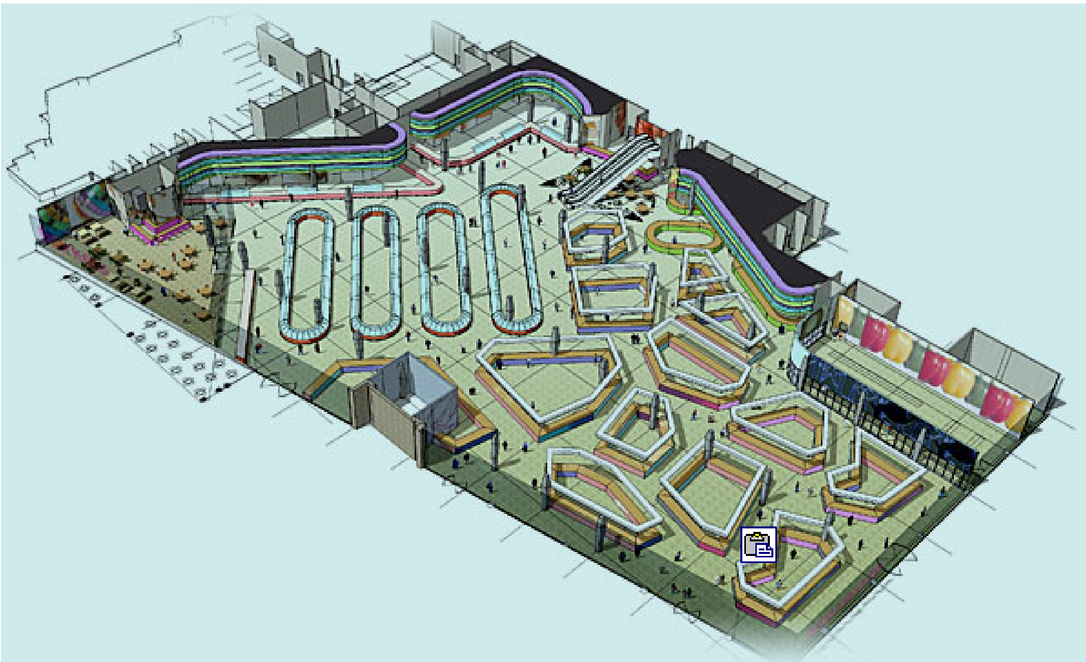


Figure A-224 Aerial perspective of Blackburn market layout showing boundary glazing and escalators to the Mall. http://www.blackburnmarket.com/images/pictures/artwork/market-aerial-perspective.jpg

Figure A-225 Blackburn market interior June 2011
http://www.flickr.com/photos/blackburn-with-darwen/sets/72157626881208233/

Stalls

127 stalls: 61 food, 50 non-food, one café, nine café/catering stalls with shared seating and six mini shops.

Lighting

Daylight to perimeter, pendant mercury downlighters

Ventilation

Ceiling mounted air conditioning. Design emphasis has been placed on heat recovery and thermal insulation to reduce costs in use(Quarterbridge, 2010).

Art

None

Novelty

An IT infrastructure that enables traders to develop their businesses with EFT, on-line sales and web marketing.

Aspirations

“The first continental style market in the country”(Blackburn with Darwen Borough Council, 2010)

Architects

Architects; Capita Symonds. Fit out by the council.

Rotterdam Market Hall, construction started June 2011; expected completion, 2014

Design

The arched building in the centre of Rotterdam, developed by Provast is a public market sheltered by an arch of 219 apartments. It will include100 market stalls, shops and restaurants, 1,200 parking spaces and an underground super market. The 100.000 m2 project is part of the current regeneration of Rotterdam's post-war centre.

Figure A-226 Projected Rotterdam Market Hall, location (MVRDV)

Figure A-227 Projected Rotterdam Market Hall, exterior (MVRDV)

Lighting

The 40m tall and wide opening of the front and back will be covered with a flexible suspended glass facade, allowing for maximum transparency and a minimum of structure.

Ventilation

The design for the Market Hall is a result of new laws from the Netherlands that require public markets to be covered, and also that certain rooms for a residential dwelling must have natural daylight. Each apartment is situated so that rooms and living spaces are situated on the exterior of the archway with views out to the city, while the kitchen, dining and storage is on the interior, with lots of insulation to block the noise from the bustling market below.

Figure A-228 Projected Rotterdam Market Hall, interior (MVRDV)

Art

"The interior of the arch will be covered in lcd technology providing the city with an ever changing interior".

Aspirations

The market hall, a sustainable combination of food, leisure, living and parking, will be realised as a new urban typology." A new icon for Rotterdam, a public building emerging from housing"

Architects

Architects: MVRDV with INBO. Structure: D3BN/ DHV

Appendix B British concrete shells since 1945

2.1 A chronological listing of identified British hypar projects

2.2 An annotated chronological catalogue of selected concrete shells

2.1 A listing of identified British hypar projects

1959

Mound Stand, Gloucestershire County Cricket Ground, Bristol

Charnos factory, Ilkeston

Parkdene Infants School, Bedford

1960

Two Saints School, Southwark

National Mercury service station, Markham Moor

Texas Instrument factory, Bedford

1961

Lincolnshire Motor Company Showrooms, Lincoln

Service station, Colchester

Clarence Pier, Southsea

Braunstone School, Leicester

Five Ways Garage, Wolverhampton

1962

Commonwealth Institute, Kensington

Workshop, Yeovil Technical College

1963

St. John the Baptist, Lincoln

Cycle sheds, Yeovil Technical College

Sports Hall, Yeovil Technical College

1965

Berrows printing works, Worcester

1966

Swimming pool, Hatfield

1968

National Mercury service station, Harborne

1970
Market hall, Huddersfield

2.2 An annotated chronological catalogue of selected concrete shells

Ikestone 1959

Hajnal-Kónyi worked with the architect Sam Scorer of the partnership of Denis Clark Hall, Sam Scorer and Roy Bright on one of the earliest and futher British concrete hyperbolic paraboloid shells. Their first was for a water tank tower of the Charnos lingerie factory on Corporation Road, Ilkeston, Derbyshire by 1959. It was only an experimental shell, experience of which was to be used on subsequent proposals (Szynalska, 2010). A 1959 article that featured the building in Architectural Review does not mention the innovation, nor does a local industrial archaeology website but it was referred to in *Concrete Quarterly* in 1960 (Anon, 1960a; "Ilkeston and district heritage; industrial archaelogy and architecture,")

Figure B-1 Charnos factory, Ilkeston with water tower, May 2003
http://www.ilkcam.com/2003/030518/Towards%20Hallam%20Fields.html

Bedford, 1959

Another contender for the earliest concrete hyperbolic paraboloids is the 1959 assembly hall of the new Parkdene Infants School, Kingsbrook, Bedford (R. M. Harris & Kennedy, 2009). The hall is square with a clear span of 46 ft. Four, square in plan shells have their thrusts taken by slightly splayed corner columns that are tied together by a beam at a lower level that supports adjacent flat roofs. There is clerestory glazing on all sides. There was a passing reference to the Bedford work in *Concrete Quarterly* (Anon, 1960a).

Architect, S Vincent Goodman FRIBA, County Architect of Bedford. GKN Reinforcements Ltd designed the reinforced concrete(Bennett, 1961).

Bristol 1959

On 29 July 1959 the Mound Stand of the Gloucestershire County Cricket Club ground at Bristol opened (Anon, 1959e).

Figure B-2 The Mound Stand, Gloucestershire County Cricket Ground, Bristol, from the north (Mo Davies 2007) http://www.flickr.com/photos/8717346@N05/692877211/

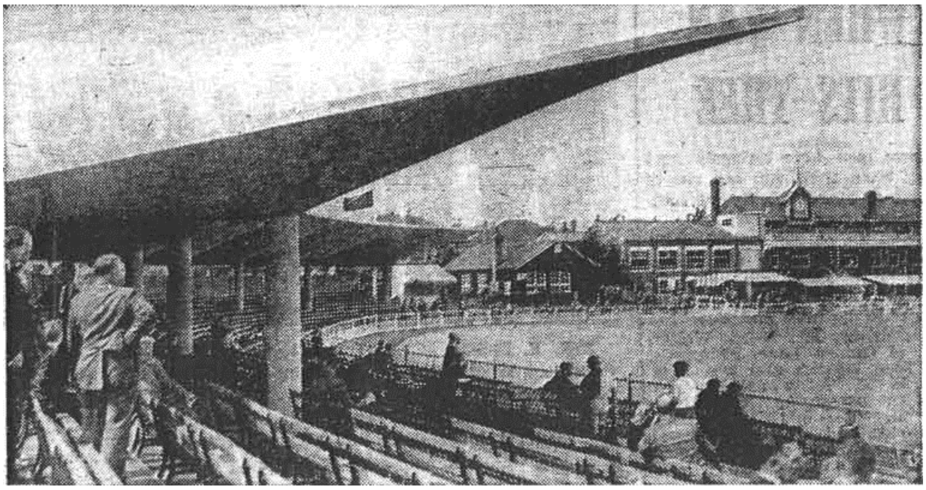


Figure B-3 The Mound Stand, Gloucestershire County Cricket Ground, Bristol from the east (Anon, 1959d)

Figure B-4 The Mound Stand, Gloucestershire County Cricket Ground, Bristol. Bird's eye view from South. Bingmaps

Figure B-5 The Mound Stand, Gloucestershire County Cricket Ground, Bristol from south-west (RPS, 2011)

It is roofed with an asymmetric arc of eight asymmetric hyperbolic paraboloid concrete shells, each on a single column in a mushroom formation. The shells, approximately 30ft square (T. H. B. Burrough, 1970) in plan, brace one another in a row forming a continuous canopy to the public terrace. The arc is achieved by the shells being orientated at angle with concrete fillets in the intervals.

The shells are tilted to the back of the stand allowing the unrestricted views expected of a spectators' stand. The column is off-centre with the short side toward the back of the raked stand. The shells therefore seem out of balance. Stability is achieved with slim columns tying down the shells' backs at the eave, outside and beyond the back of the stand at each valley and ridge.

The shells are shallow and because of the tilt, too shallow for rainwater to drain down the central column. Instead a fall pipe drains each shell by the tie columns beneath the valleys. The shells were cast onto plywood board shuttering(Bond, personal communication 14 November 2011).

The architect was T.H.B. Burrough (b.Newport1910, d. 2000), the club's architect (Anon, 2010b). The engineer was Derek Bond (b. Bradford 1931) of Clarke Nicholls & Marcel "These are thought to be the first examples of such construction in the country"(T. H. B. Burrough, 1970). "First in the country to be built of reinforced concrete hyperbolic paraboloid construction"(Anon, 1959e). Burrough and Bond had already worked on Christ the King church at Lawrence Weston, Bristol. There was a passing reference to the Bristol work in *Concrete Quarterly* (Anon, 1960a).

Derek Bond's family moved to Bristol during the war for his father's police work. At school was he good at mathematics. After school in 1947 applied to a job advert as trainee draughtsman with Square Grip Reinforcement Co Ltd in its Bristol office and got job. The work was mainly about reinforced concrete detailing.Through private study became a qualified structural engineer aged 21. Bond wanted to work on whole structures as an engineer not just detail. Joined Clarke Nicholls Marcel in Bristol with Fred Clarke.

Clarke was a great encourager to Bond and others. The practice subscribed to the American Concrete Institute.Felix Candela 's papers in the Journal of the American Concrete Institute were of great interest to Bond. (Candela's articles appeared in Vol 23 No 4 1951, Vol 24 No 7 1952, Vol 26 no 5 1955...)

Candela's hypar shells seemed incredible to Bond, but to test them out with some basic calculations and with Clarke's support Bond designed and built a 16ft square reinforced concrete hyperbolic paraboloid mushroom in the yard of Bristol building contractor, John Perkins of St Marks Road, Easton. Bond and team were delighted by its performance. At the time there was no project in mind – this was just a test (personal communication Derek Bond,12 November 2011).

Bond wrote to and exchanged letters with Candela on concrete mixes.

Tom Burrough had trained at the Royal West of England Academy School of Architecture and subsequently worked under Sir George Oatley. His wartime service in the Royal Engineers included the rebuilding of destroyed bridges all the way up Italy into Austria when the Germans were retreating, 1994-5. After demobilisation he went into practice with Francis Hannam (T. Burrough, no date). His work included the early use of pre stressed concrete.

Tom Burrough was in many ways a traditional architect but he was also a great enthusiast for the new, especially concrete. "We were on sympathetic ground with Tom" (personal communication Derek Bond,12 November 2011).

Yeovil, 1960

In 1962-3 Clarke, Nicholls & Marcel were the structural engineers for a series of hypar mushroom structures at Yeovil Technical College. Architect, Bernard Adams, Somerset County Architect.

The first hypar work on the project was a test for the contractor's design and construction of the formwork. It was planned to be subsequently used as workshop space. One tilted square hypar mushroom with an asymmetrically placed column. The night after striking the formwork it failed at the column head and collapsed. The calculations would have been based on Bond's Mound Stand work, the fault was found to be the failure of getting the reinforcement needed into place. It was not rebuilt.

Then came a series of hypar umbrellas to be use as open sided cycle sheds. These were disapproved of by the college governors; they were demolished and replaced by conventional structures.

The sports hall construction continued successfully; six tilted 40ft square hypars in two rows of three with asymmetrically placed columns, glazing between rows. Plywood shuttering ((*Yeovil Technical College Minutes 1961-1970*), personal communication Evan S David, 17 November 2011 and Derek Bond, 13 &18 November 2011).

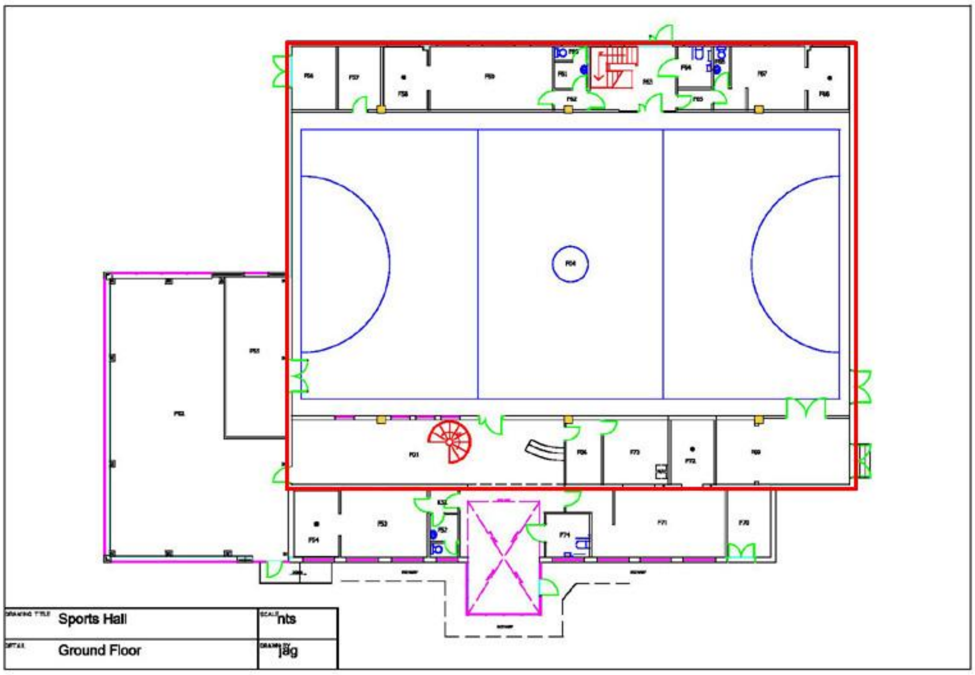


Figure B-6 Ground Floor Plan of Yeovil College sports hall showing the six columns (in orange) to shell roof (perimeter in red). (Yeovil College**)**

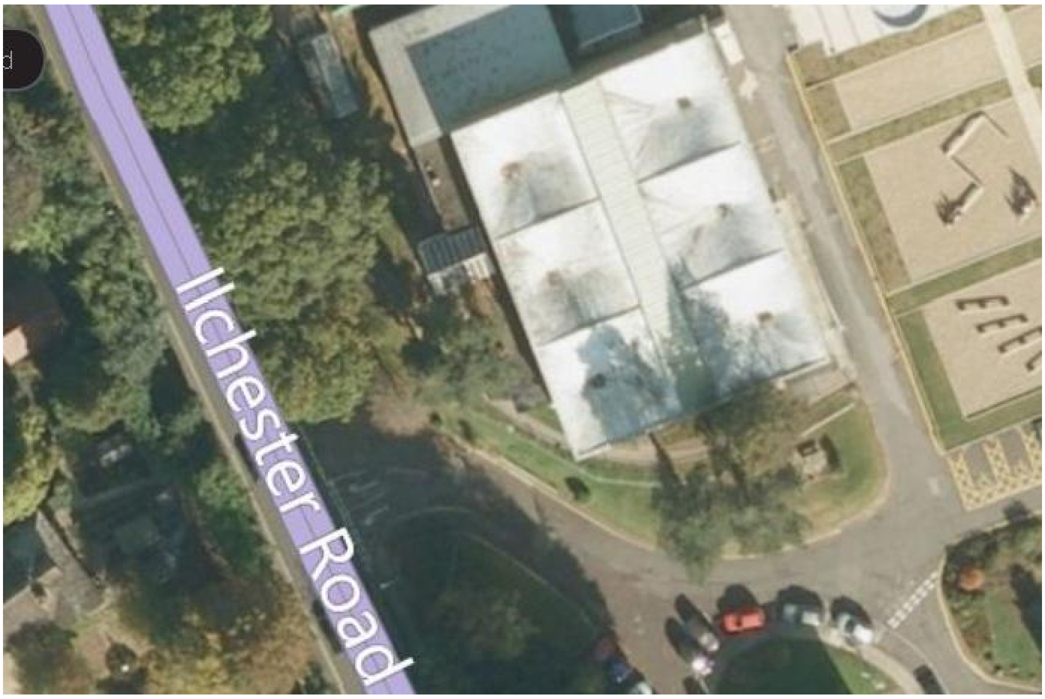


Figure B-7 Aerial view of Yeovil College sports hall.
http://www.bing.com/maps


Figure B-8 Yeovil College sports hall. January 2009
http://sesomersetssco.co.uk/?p=2350

An early concrete hyperbolic paraboloid roof was for Two Saints School, Southwark of 1960 (English Heritage, 1993) (Architects; Chamberlin, Powell & Bon. Consulting engineer, A R Flint) The pentagonal school assembly hall was roofed with five radially arranged hyperbolic paraboloid shells separated by roof lights. Instead of using temporary shuttering in the construction, wires were strung diagonally between temporary edge members. The wires supported reinforcement and wood wool slabs which formed permanent shuttering to the 2ins thick concrete shell formed by guniting from below.

Markham Moor,1960

In 1959-60 the Hajnal-Kónyi and Sam Scorer[112] developed a saddle shell was as a canopy to fuel pumps at a service station on the A1 at Markham Moor, Nottinghamshire.

It is supported on four columns at the low points and for aesthetic reasons the high point had been raised 6in above the shape given by the hyperbolic paraboloid to allow for creep. As no support of the high points was required her deflections were acceptable.

In 1961 Scorer said that the petrol station canopy was intended as a piece of sculpture which incidentally provided a certain amount of cover from rain(Scorer, 1961).

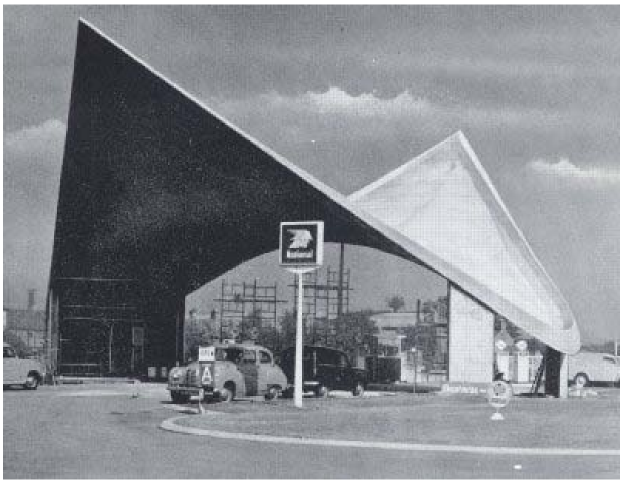


Figure B-9 National filling station, Markham Moor, c 1960
http://mdg.vsb.cz/jdolezal/DgFAST/Realizace/HyperbolickyParaboloid/SedlovaPlocha.html

Scorer and his work has been otherwise interpreted “a local architect who was one of Britains’s few representatives of Googie, the Southern Californian style of irrationalist, high style mid-century Modernism... originally the roof contained nothing at all, being merely a gateway for cars on the way to a garage, a ceremonial, non- functional architecture”(Hatherley, 2010)

[112] b. Hugh Segar Scorer in Lincoln 1923, d. Lincoln 2003

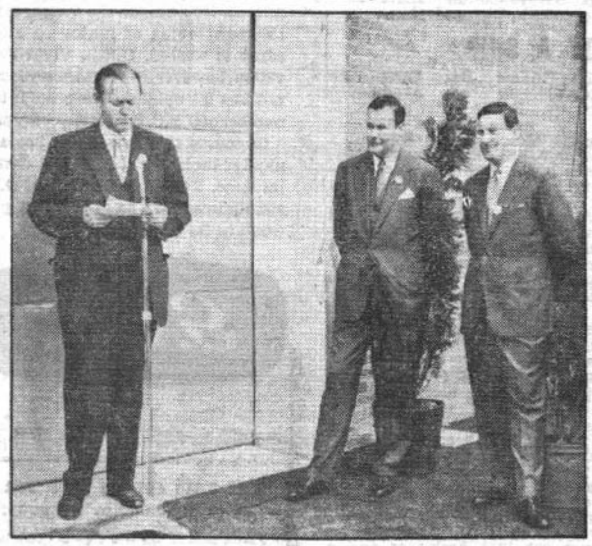
By 1950 Jim Spilett (aged 20) who had worked in a drawing office and done national service wrote to Dr Hajnal-Kónyi, as he was a London based engineer, looking for a job. He got it, joining Hajnal & Myers and was there for four years. During this time he attended the Brixton School of Building (Personal communication 16 January 2011).

Wilhelm Silberkuhl

Wilhelm Silberkuhl[113] studied architecture at the Technical University of Hanover (Silgat, 2004). Silberkuhl patented a variety of concrete shell roof designs. Two relevant designs are discussed here.

A short span roof shell was the Type 3 Silberkuhl HP shells. These were prestressed precast hyperbolic paraboloid shells. Typically they were up to 60' long and would be supported in saddles of insitu concrete portal frames to form a roof. The shells were 7'7" wide[114].

The system was licensed to Modern Engineering (Bristol Ltd) which exploited the system from 1957 until 1984. The company's joint managing directors, brothers John Oldrech Adler and the older Ivan Walter Adler[115]. The brothers settled in Bristol (D. Buckman, 2006; Mills, 1958).



PROF. W. SILBERKUHL (designer of the Silberkuhl system of roof construction) opening the new works of Modern Engineering (Bristol) Ltd. at Emery Road, Brislington Trading Estate. Co-directors of the company, Mr. I. W. and Mr. J. O. Adler, are seen right of picture.

Figure B-10 (Bristol Evening Post, 26 September 1958)

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[113] b. Castrop 1912, d. Bad Wiessee 1984. See Appendix F for biographical details.

[114] The shells were 7'7" wide the short radius (internal) was 5' 5 11/16". The large radius (internal) was 392' 3 ½". The length varied according to need. The thickness was 2" - 2 ½" according to need. The depth of the u section was between 1' 6" and 1' 7 ¼". The quantity of reinforcement was subject to requirements (Martin Ashmead, personal communication 23 January 2011).

[115] b. Czechoslovakia, 1914, d. Somerset 1989. He qualified in law in Prague and was an accomplished painter

28 44’shells and 14 40’ shells were used in three rows to roof Blackburn market hall as a continuous arc in 1963.

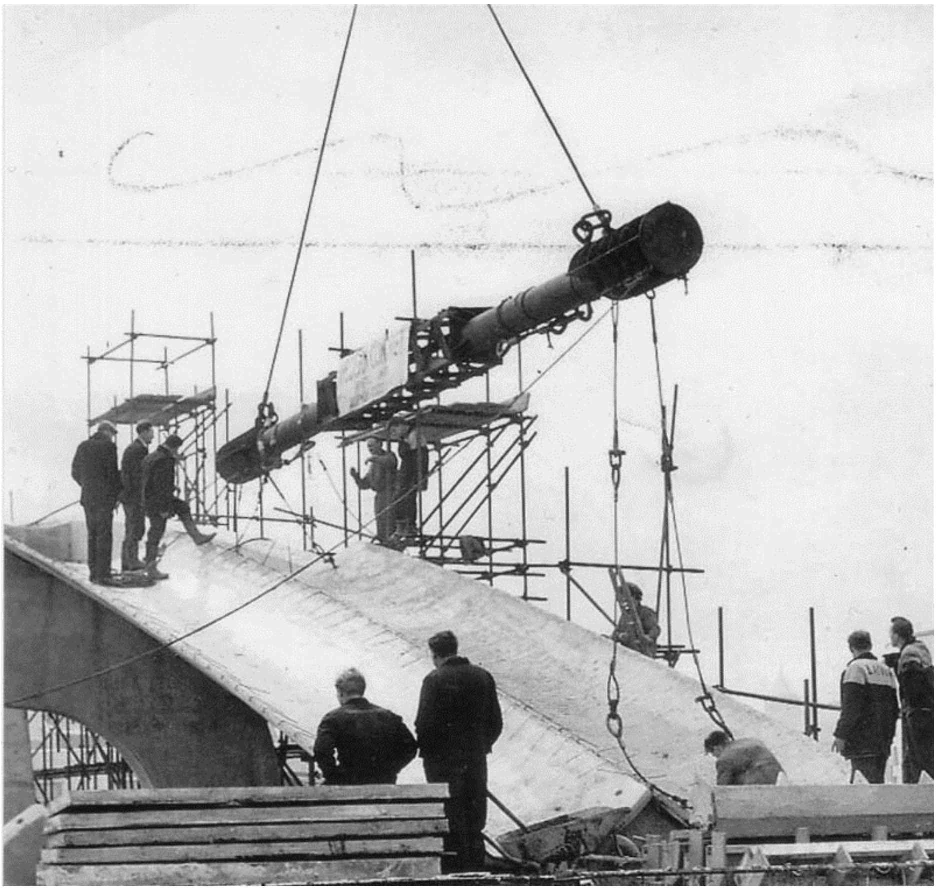

Figure B-11 Type 3 Silberkuhl HP shells being craned onto portal frames for Blackburn Market, 1963 (Newsquest Blackburn)

The long span Klonne/Silberkuhl (KS) Shell was first presented in Britain in February 1957(Godfrey, 1957). The first British KS shell (known in the UK as ATA Silberkuhl) large-span building was at Purfleet, Essex, in 1957(Anon, 1957b). The system was used to form nine roof shells spanning 40m for Burnley market hall in 1969.

The precast construction developed by Silberkuhl consisted of two elements; an arched steel lattice girder and pre-cast reinforced concrete shells units, each a section of a cone, 7.23 m long 1.86m wide and 0.11m thick.

The girder is the scaffold during erection, when finished it becomes the shell stiffening member. The precast units are rested side by side in the manner of a sloping beam from the bottom of one lattice beam to the top of the next. After jointing the units work in combination as a shell.

The shell roof profile forms a saw tooth profile with the vertical spaced between the shells glazed. An advantage over a standard north light is the curvature of the shell gutters allowing quick drainage.

Warm waste air can be extracted from the top of each shell. The system was designed for spans from 24m to 60m.

Independently Bristol was to be the home of another British hypar first in 1959 with the Mound Stand.

Lincoln 1961

Lincolnshire Motor Company Showrooms (1959-61) Lincoln(Anon, 1960a), Architect Sam Scorer, engineer Hajnal-Kónyi.

When the new garage for Lincolnshire Motor Company Showrooms was being built it caused a sensation. In 1959 this was the largest hyperbolic paraboloid to have been built in the UK, perhaps until the Commonwealth Institute was built in 1962. It was reported that the construction was of reinforced concrete, which was chosen for its economy, durability and fireproof qualities. The roof covered a large uninterrupted floor space 29m by 32.5m and consisted of four 65mm thin hypar shells arranged so that their highest points are at the centre and the four corners of the garage. The shells were separated by a roof-light running along the entire depth of the building. It was described in *Architectural Review* (1960:349-350) and discussed at conferences.

Concrete Quarterly commented ‘The event is welcome not because we necessarily want a spate of hyperbolic paraboloids throughout the land but because it strengthens the growing trend over here towards experiment and the more imaginative use of structural concrete. We have watched with enthusiasm what Candela has done with this form of structure in Mexico; it is encouraging to discover that architects and engineers in Britain are gradually dispelling the fogs of our own innate conservatism towards design, which still linger in patches here and there.’(Anon, 1960a)

Bedford 1960

In 1960 umbrella hyperbolic paraboloid roof shells were constructed at the Texas Instrument Ltd factory in Bedford. It has 29 umbrella units 48 ft square rising from 9ft at the springing to 18ft at the edges. The shells are 2 ½ ins thick – the smallest practical dimension which would contain all the necessary reinforcement. Each shell is free standing quite independent of its neighbour with 3ft 6ins gap between them which can accommodate continuous rooflights between them. 3” x12” edge beams (thickenings) are at the perimeter of each shell to take the tension forces. Down the lines of maximum slope are radial thickenings to take the compression forces. The column head thickenings are 8’ square to give continuity with the columns and assistance in taking the secondary cantilever forces.

Figure B-12 Texas Instrument Factory, Bedford under construction (Anon, 1961c)

1n 1961 John Faber of Oscar Faber & Partners said that the shutter marks had been left exposed in order to accentuate the curvature and beauty of the shell. He believed that the application of plaster, quite apart from its cost, would have detracted from the appearance of the work, Faber drew attention to the architect's device of painting the shells a pale primrose yellow, while the columns were an exceedingly deep dull blue to make them less obtrusive. This "gave a psychological uplift".(Scorer, 1961)

In addition to snow and insulation loading the design allowed for a continuous edge load of 100lb/ft run which was anticipated from fluorescent lighting, cable trays, sprinklers and tilt from out of balance, snow loading and services. This was determined from a 1/6 scale model testing at Wexham Springs by the Cement and Concrete Association.

Architects, O'Neil Ford & Richard Colley of Texas; Consulting engineers, Oscar Faber & partners; General contractors, Tarmac Civil Engineering Ltd (Anon, 1960b). The same architects had built the 1957 Texas Instruments factory in Dallas with Candela as consulting engineer. The Dallas building was built with hyperbolic shell roof and tie beams.

Colchester 1961

A small petrol station canopy in Colchester was reported in 1961. The position of the roof supports led to an irregular triangle. Three irregular hyperbolic paraboloid concrete shells being used which had common edges along the medians of the prescribed triangle. The external edge was finished in the smooth curve of a kidney shape along which the 2in shells were thickened to stiffen and provide drainage to the columns. The columns were tied. Shuttering was with straight boards. Architects, Shepperson & Dixon of Ipswich, GKN Reinforcements Ltd designed the reinforced concrete (Bennett, 1961.

Leicester 1961

In 1961 the new assembly hall of Braunstone School, Leicester was a regular hexagon with six concrete 2 ins thick hypar shells 21' wide at the exterior. It was 36 ft 3ins from the perimeter to the central apex. They were supported by pitched concrete frames and connected at centre by an hexagonal ring beam (Bennett, 1961). The perimeter was stiffened by an upstanding beam that led rainwater to the down pipes in the columns. As the shells were independent of each other, one set of formwork could have been employed but the contractor used two sets(Anon, 1961c) (Architect; TA Collins FRIBA, County Architect of Leicester. GKN Reinforcements Ltd designed the reinforced concrete)(Bennett, 1961).

Wolverhampton, 1961

In 1961 for Five Ways Garage, Wolverhampton, four 40 ft square concrete hypar umbrellas with 2 1/4 in thick shells (Anon, 1961c) forming a canopy at the filing station were reported upon. The umbrellas were interconnected along the shell edges giving the structure a greater stability in resisting asymmetric loads and wind loads. This allowed the columns to have a more slender section than if they had been freestanding structures (Bennett, 1961). No dimensions were reported.

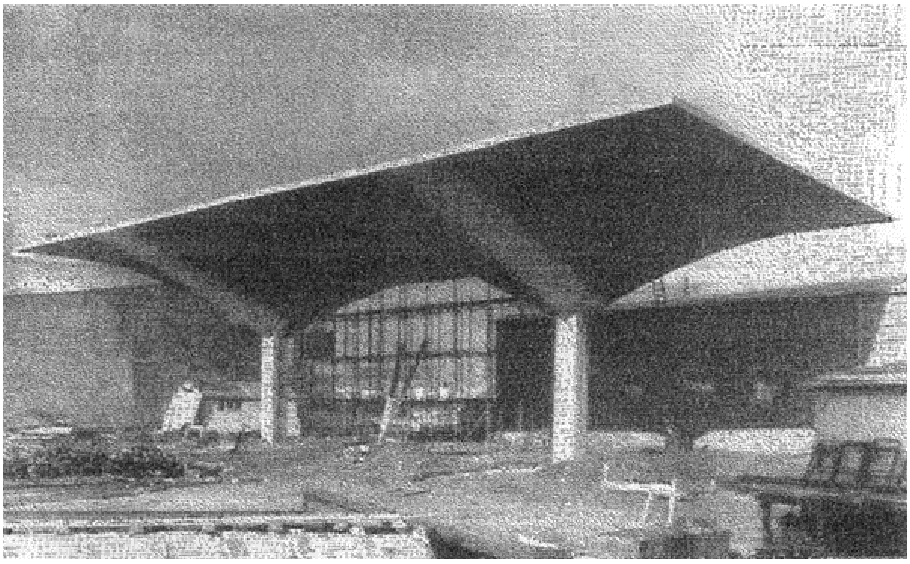

Figure B-13 Five Ways Garage, Wolverhampton under construction (Bennett, 1961)

Two uses of the shuttering were made as the umbrellas were cast in pairs. "The shuttering was composed of random lengths of tongue and groove butt jointed and laid diagonally" (Bennett, 1961) (Architects Charles E Mason & Richards A/ARIBA. GKN Reinforcements Ltd designed the reinforced concrete)

Southsea 1962

On 1 June 1941 Clarence Pier, Southsea was bombed. Exactly 21 one years later it reopened(Billy

Manning Limited, 2011). The new lift tower roof was a set of four conjoined concrete hypars set in a square that had their 4 supporting columns set in a little with the unsupported corners set out and cantilevering out at a sharp angle (Bennett, 1961). “Although the designers considered it necessary to use quite thick tie beams between the low corners, this structure does point the way towards more enterprising use of small scale hyperbolic paraboloids as an eye-catching feature of a building”(Anon, 1961c) (Architect AE Coggswell & Son FRIBA in association with R Lewis Reynish FRIBA; GKN Reinforcements Ltd designed the reinforced concrete)

Accrington 1962

Accrington covered market with diamond and triangular cylindrical roof shells (in preference to hypar shells) opened on 27 October 1962.

London 1962

Just a few days later, on 6 November, the Commonwealth Institute, in Holland Park, Kensington, London opened. It was designed by Robert Matthew, Johnson-Marshall and Partners and engineered by AJ & JD Harris, of Harris & Sutherland. Construction was started at the end of 1960.

The shape of the roof reflects the architects' desire to create a ‘tent’ in the park. The roof is a saddle shaped hyperbolic paraboloid shell surrounded by four other warped surfaces. The whole structure’s plan is 183ft sq including an overhang at the eaves of 8ft. The shell was bounded by four prestressed insitu tapering concrete beams that continue below as supporting columns. At the deep end the beams are pierced by triangular openings forming a lattice beam that allows day light and vertical glazing between the roof components.(Anon, 1963i)

The design was selected “after making several trial designs, as a satisfactory compromise between ‘engineers’ shells’ and ‘sculptural shells’. The former, being based on strict mathematical forms, are easy to design and build but were considered to be dull and conventional in appearance, whereas ‘sculptural shells’ were considered to be of attractive design but almost impossible to design by calculations”(Anon, 1963c)

Hull and East Riding Cooperative Skyline store on Jameson Street, Hull 1963

By November 1963 a 30 m x 20m flattened rectangular concrete shell dome with clerestory glazing over the top-floor Skyline Restaurant and Ballroom. (Architect: Co-operative Wholesale Society Architects). An image of the design had been published by the society in 1961(Hull and East Riding Co-operative Society, 1961) however no significant report on the roof as been found although it is larger than the Brynmawr shells and it is contemporaneous with the celebrated Smithfield Poultry Market roof and covering a social and recreational space.

Smithfield Poultry Market, May 1963

Cost

£1,800,000 (Woodward, 1963)

Design
The former Smithfield Poultry market was destroyed by fire in 1958. The client committee wanted a structure more fire proof than the previous one so reinforced concrete was chosen for the structural frame.

Figure B-14 Smithfield Poultry Market, 1963(Prestressed Concrete Development Group, 1966?-b)

Figure B-15 Smithfield Poultry Market, 2011
http://quotidian.me.uk/display_id.php?n=2071&m=05&y=2011&c=&pn=0

“For aesthetic and functional reasons it was decided not to have any supports for the roof inside the hall...Various types of frames with secondary beams were investigated but generally work was concentrated on shell structures which are able to cover large areas in a light and elegant way. Cylindrical shells as well as doubly curved shells spanning between frames were considered, but the frames or ties beams cutting into the space of the Hall proved unsatisfactory.
The dome covering the whole area of the Market Hall was finally selected as the optimum solution from functional, aesthetical and cost considerations without necessarily being the cheapest solution”. (Ahm & Perry, 1965)

Structure
Constructed on a reinforced concrete frame it is roofed with an elliptical paraboloid clear span dome 225ft x 128ft x 60ft in reinforced concrete supported by pre-stressed edge beams, which was a new approach. It was cast in situ onto precision formwork, and as the reinforcing cables were tensioned to pre-stress the edge beams, the entire shell was lifted clear of the formwork.(Dale)

The roof is covered with copper sheeting. It was designed to have a bituminised cork compound as insulation underneath but expanded PVC was used. (Ahm & Perry, 1965)

Figure B-16 Smithfield Poultry Market interior, 2010 (Author)

The roof was built with the use of a complex system of more than 1,000 pre-formed plywood shuttering sheets, each one a different shape(Anon, 1963i)

Stalls
Designed for 30 poultry wholesalers; timber framed stalls, "all with blue fascias and contemporary-style signage, forming a strong period composition".(English Heritage, 2000; Prestressed Concrete Development Group, 1966?-b)

Lighting
Roof shell pierced with 5ft diameter rooflights. Full glazing in metal frames to clerestory perimeter under the arc of the roof on each side. The arrangement of the fenestration's transoms is harmonious to the arc of the roof shells.

Figure B-17 Smithfield Poultry Market interior, 2010 (Author)

Ventilation
“a ventilation system produced by drawing in air, the increased pressure within forcing the air out through openings in the building”

Surfaces
Floor of gently sloping concrete that could be washed down with hot water (Woodward, 1963).“Tile and formica (sic) surrounds to the balcony fronts and outer walls. The entrance is tiled, with patterned end walls and timber handrail.”(English Heritage, 2000)

Figure B-18 Smithfield Poultry Market interior, 2010 (Author)

Novelty & Aspirations
“The concrete shell roof at Smithfield is a much more ambitious than Arup and Jenkins had undertaken at Brynmawr. The single shell here measures 68.6m by 38.1m, more than five times the area of the shells used there, where a group of nine bays in three-by-three formation used shells measuring 25.9m by 18.9m...The shell is just 75mm across the full area and meets the lower structure at each corner on seemingly impossibly-slender supports, hence the 'floating' impression. ..The rise of the dome is just 9.1m, representing an advance in concrete shell technology and confirming Arup's and Jenkins’ confidence in their structural analysis. Jenkins was a co-founder of Ove Arup & Partners and a specialist in the mathematics of shell structures. The calculations were put to the test before construction by the assessment of a 1/12th scale model.
This display of pre-stressed concrete mastery is typical of the 1960s, when 'everything was possible' and there was a real sense of optimism, adventure and derring-do in architecture and engineering. In concrete shell construction, the particular combination of knowhow, ambition and expertise has rarely been seen since. A comparison can be made with Owen Williams’ BOAC Maintenance Headquarters at Heathrow...The Poultry Market structure was intended to be replicated across the whole site, replacing the old complex entirely. In the event, only this one shell was constucted(sic).”
(Dale)

“It remains to be seen whether this design will provide a solution to be followed in the future. Architecturally the concrete shell roof cannot be appreciate from the level of the market floor because of the web of steel beams, columns, rails and travelling hooks which make up the tenants’ stalls ... and some other roof shape may be equally valid. The external treatment is an attempt to reproduce a ‘market look’ and is frankly phony...”(Woodward, 1963)

“The exterior is a remarkable piece of `pop architecture', that is absolutely `of its time'”. (English Heritage, 2000).

Architects
Sir Thomas Bennett and Son.
Structural engineers, Ove Arup and Partners, job engineer Jack Zunz(English Heritage, 2000), supervising engineer Povl Ahm (Dale). Main contractors; Sir Robert McAlpine & Sons Ltd

In 2000 English Heritage reported on the market roof; “Experiments in shell domes only began after the war, however, and were exemplified by the nine relatively small ones at the Brynmawr Rubber Factory, Wales. Shell concrete domes were a pleasingly aesthetic way of achieving large, uninterrupted spans using relatively little steel. They were thus eye-catching yet relatively cheap, and the technique was adopted here for speed of construction. While shells used in industrial premises are rarely set over interesting buildings, those in markets could form the basis of an attractive composition. However, the opportunity was not grasped, except here.”(English Heritage, 2000)

St. John the Baptist (1963) Lincoln

London 1963

Early in 1963 there was an illustrated report of a canopy over petrol pumps in Upper Thames Street London, The very asymmetric canopy ‘cantilevered ‘from only one column and the shape resembling that of a waterlily’ (Anon, 1963b). Its engineering design is not apparent.

Stevenage 1963

From March 1962 The John Lewis Partnership’s new warehouse was built at Stevenage, Hertfordshire. The building was completed in May 1963. It was designed by the architects Yorke, Rosenberg and Mardall with engineer Oliver Mischa Marcel (b. ‘Meir Marcel Osherovitz’ c.1912, d. London 1966) of Clarke Nicholls and Marcel in collaboration with Felix Candela.

Marcel graduated from Caen University in 1933 and came to Britain in 1936 and worked in the offices of J L Kier & Co, the reinforced concrete specialists working with Ove Arup, and then leaving to join Ove Arup in the new Arup & Arup Ltd, civil engineers and contractors before establishing his own London practice in 1946 (Anon, 1950, 1966b). On becoming a British citizen in 1948 he stated he was from Palestine (Anon, 1948). In 1950 when Clarke and Nicholls, both steel specialists, were the project engineers for Leeds College of Technology they formed a new partnership with the London based Marcel; Clarke Nicholls and Marcel.

Candela's degree of involvement is not clear ‘...here Rosenberg invited the Spanish architect and engineer to collaborate on the structural design. They had met in Mexico..." (Harwood, 1999). Brian Henderson (with YRM from 1950 and later company chairman) said that Rosenberg was impressed by Candela’s structures and as Rosenberg and Yorke were friends with Marcel he feels that there was a will to involve Candela (Brian Henderson, personal communication 7 September 2011).

Marcel had also met Candela in London with a view to consultancy 1959 (Derek Bond, personal communication 13 November 2011), Marcel’s CNM practice had the experience of the 1959 Mound Stand in Bristol and the sports hall at Yeovil. The Yeovil CNM project manager describes Marcel and Candela as ‘friends’ (Evan S. David, personal communication 17 November 2011)

The 145,000ft^2 (13,500m^2) Stevenage warehouse was roofed with 75 symmetrical 60’x 31’(18.3m x 9.4m) concrete hypar umbrella shells and 15 30’x 31’(9.15m x 9.4m) half umbrella shells in joined together in rows. The rows of 5 &1/2 shells were tilted to provide a 5’ interval for north light.

Precast concrete mullions link the high and low edges of adjacent shells with metal glazing bars between.

Most of the shells were supported on 13 ft concrete columns 06.m square with a 4” diameter rainwater fallpipe down the centre of each column. At the receiving dock the shells columns were higher to allow for high loads.

Timber forms were used for casting the shells. Each set made up of 4” (0.1m) metre planed boards scewed to 28” plywood which was screwed to supporting timbers, was used fifteen times.

The boards were places in the longitudinal direction of the shells with exception of a strip running from the column at right angles to the valley.(Anon, 1964c)

The shells’ upper surfaces were insulated with a layer of cork and covered with two layers of roofing felt.

Among partnership’s requirements were that the warehouse “have good uniform natural lighting, be well insulated and fireproof, be constructed in the shortest possible time and in the most economical manner”.(Anon, 1964c)

The Builder reported; “The unusual roof form of this warehouse has resulted in a building of wide clear spaces, very light and airy, and visually extremely pleasant. Although the building incorporates a wide range of automatic services they are far from obtrusive, and the lines of structure remain clean and uncluttered. Sprinklers and lighting strips fit neatly to the roof itself.” (Anon, 1964c)

Builder photographs shows fluorescent strip lights suspended below the lowest edge of the shell rows with the sprinkler pipe above with three branches, per half shell, running perpendicularly down across the shell, dog legging under the valley and up the 2/3 of the other side (see Figure B-19).

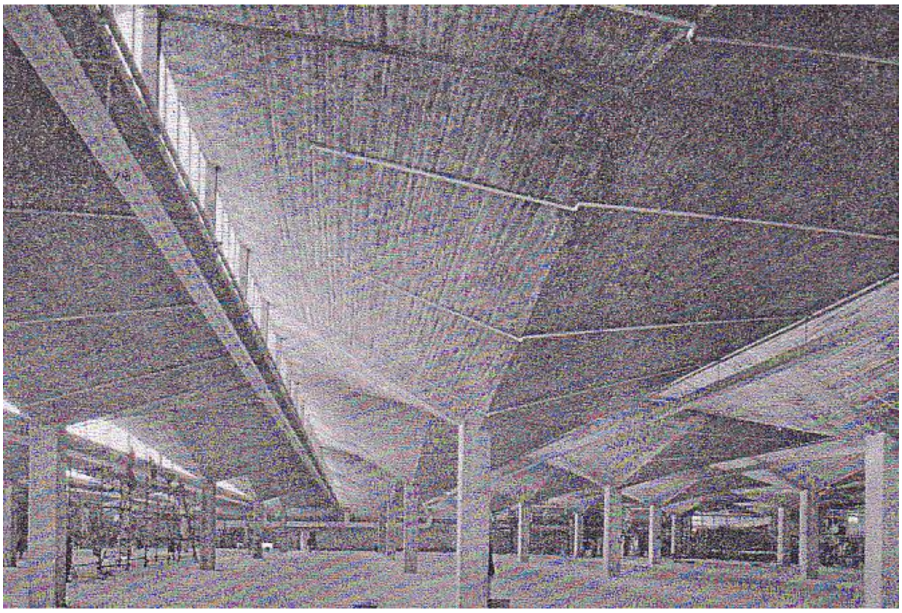

Figure B-19 John Lewis warehouse c 1963, Stevenage (courtesy John Lewis Partnership)

In May 1963 the John Lewis Partnership magazine reported “It has quite a real beauty of its own. That famous new roof, which from the outside has been likened to an inside-out umbrella, from the inside has the lift and flow of waves or of birds flying. The concrete section of the roof curve and sweep against the regular rows of clear windows that give the whole design such lightness.” “It’s like cloisters”, somebody said.(Anon, 1963h)

In May 1963 John Lewis’s, Chelsea depot magazine said ”It will be a vast place and a really awe inspiring with its vaulted roof which has something about it reminiscent of a cathedral”(Poole, 1988)

Hatfield, 1966

Hatfield Rural District Council completed a swimming pool in 1966

Figure B-20 Hatfield swimming pool at night - Welwyn Hatfield District Council Official Guide (1974) http://cashewnut.me.uk/WGCbooks/web-WGC-books-1974-2.php

The principal design feature was the hyperbolic paraboloid concrete shell roof. The four saddle shells are in two pairs (1 & 3, 90 ft x 61 ft (27.4 m x 21 m); 2 & 4, 80 ft x 69 ft (24.4 m x 21 m), in a cruciform plan. Each pair offers mutual bracing. The shells are each supported on two principal column of equal height, each 2' 6" (0.76 m) in diameter spaced at 69 ft x 61 ft (21 m x 18.6 m) which are shared with the neighbouring shell and a pair of subsidiary columns (Anchor, 2001). From their springing points the shells are tied with four multi strand cables, Freyssinet post-tensioned. (Anon, 1965b)

One pair of shells are tilted away from each other so the shells are higher to the centre. One pair (2 & 4) the shells meet and overarch the other pair. This gives triangular storey lighting at both the perimeter and across the roof in four directions. The eaves remain at the same height and this allows bracing at the perimeter.

"The design of this pool breaks away from the pattern we have grown used to in two senses; first it creates interesting surroundings – within there is an impression of height and light and second the roof shape breaks down the noise level and creates a peaceful atmosphere. The concrete shell roof is the largest of its kind in the country"(Anon, 1966c).

The Crittall glazing from the shell soffits is mid shell; no fixing details have been found.

Architects, Woodroffe Buchanan and Coulter (job architect BJ Dobbie); Reinforced concrete design, GKN Reinforcements Ltd

Worcester, 1965

In 1965 the printing works for Berrows, Hylton Road, Worcester opened.(Anon, 1996) It had unrestricted area of at least 44ft x 180 ft for presses with a total area of 100 ft x180 ft. Fire proof requirements suggested concrete should be used and the need for lots of daylight suggested shells to the architect.

It was also felt desirable to express the nature of the structure throughout rather than hide the works behind a facade of office unrelated to the work's structure. There was a desire present the roof as the dominant clean-lined feature and every effort was made to emphasise its nature.

A central row grid of nine 22 ft x 44 bays and two flanking rows of eight bays 22 ft x 30 ft was adopted. A structure of reinforced concrete frames with hypar shells between met requirements. Management offices were in the prominent ninth central bay to the front. (Gorst, 1961)

The roof was said to have a unique arrangement where the thrust from the concrete hypar shells were born by horizontal edge beams in the shell in a lattice where the resulting horizontal forces were balanced. It gave good north light, eliminated the use of ties and was said to be economical. The roof was insulted with polystyrene and felted. Architect Henry Gorst, B Arch ARIBA. GKN Reinforcements Ltd designed the reinforced concrete (Bennett, 1961).

Harborne 1968

In April 1968 the National self-service filing station, High Street, Harborne, Birmingham opened. The canopy over the station was three identical reinforced concrete regular hexagonal hyperbolic paraboloid mushrooms each supported by a central circular column and each with edge beams. The structures were arranged in a group but stood apart and “obtained support against wind forces by constraints provided by small props between the separated edges. The 2 ft 9 ins diameter(Hickman, 1970) columns “were mutually at 55ft (16.8m) centres” (Anchor, 2001). The design architect, Conrad S Rowberry (b 1928) was reported to have said "It has taken four years to evolve the design of the garage."(Anon, 1968b) The engineer was Robert D. Anchor a director of GKN Reinforcements suggested the canopies were designed by 1965(Anchor, 2001).

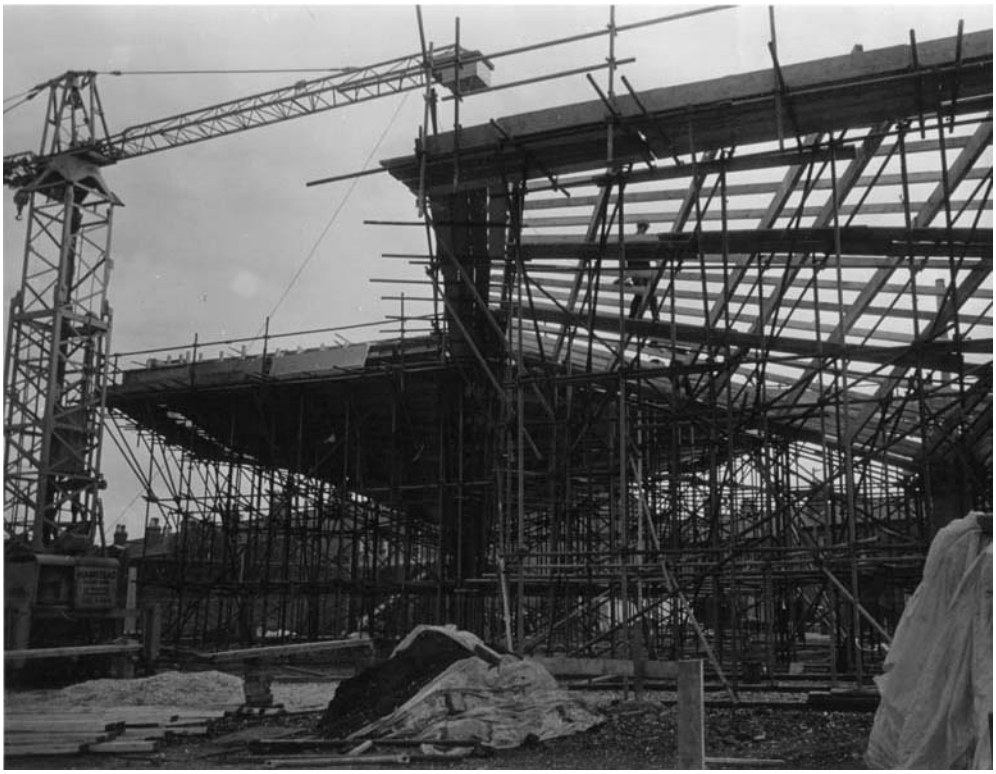

Figure B-21 National filling station, Harborne under constrution (courtesy Colin S Rowberry)

Figure B-22 National filling station, Harborne under constrution (courtesy Colin S Rowberry)

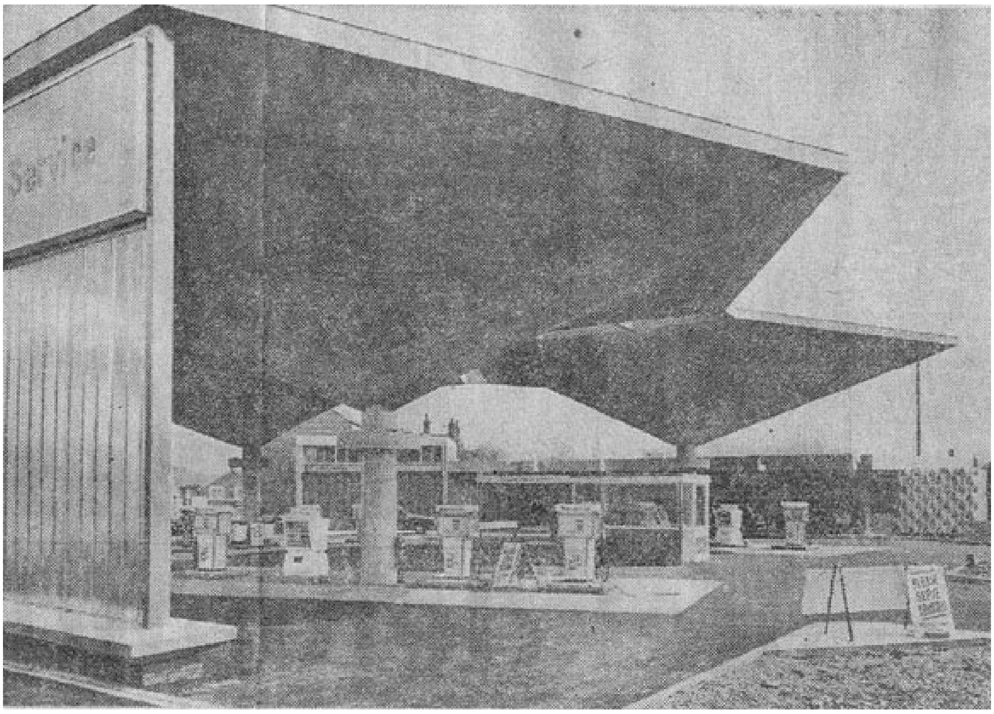

Figure B-23 National filling station, Harborne, April 1968 (Anon, 1968b)

A concrete collar around each column just below the springing point was a lightbox that uplit the shell soffits with either fluorescent (Rowberry, C.S., personal communication, 8 August 2011) or arc lamps, “to illuminate the entire area”. (Hickman, 1970)

The offices of the J. Seymour Harris Partnership, the architects for the Murrayfield development and market hall in Huddersfield, were 1.7 miles from the filling station at Greenfield Crescent, Edgbaston, Birmingham. The concrete for first hyperbolic paraboloid roof shell for Huddersfield market hall was poured on 21 November 1968.

Appendix C Market Hall Art

Longton,1862

"This Market Hall was Erected A.D. 1862" A ornate mosaic panel fills the tympanum beneath the lion-head arch, while fretted metal ornaments once decorated the towers.

Figure C-1 Longton market Strand entrance detail (2009)
http://www.thepotteries.org/photo_wk/087.htm

Bradford Kirkgate Market (1872) was noted for its spandrel sculptures. The main Kirkgate entrance had figures of Pomona and Flora, goddesses of fruit and flowers; the Darley Street entrance had figures of a sower and reaper and the Godwin Street entrance had figures of Summer 'a sprightly female watering a beautiful bed of flowers' and Winter 'a hoary-headed man clad in winter garb, engaged in warming himself at a bright log fire'(Robinson A, 1970). All were sculpted by Farmer & Brindley of Westminster.

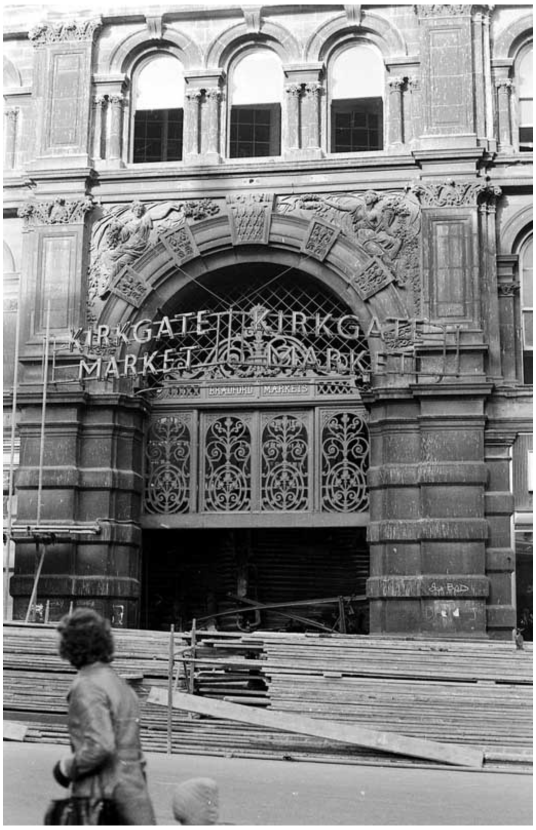

Figure C-2 Kirkgate entrance to Kirkgate Market Bradford. 1973
http://www.flickr.com/photos/johngreyturner/3843320537/

Figure C-3 Kirkgate Market, Bradford. Darley Street entrance (Robinson A, 1970)

Manchester wholesale fish market of 1873 bore 6 semicircular tympanum panels with well sculpted stone reliefs by Joseph Bonehill. The four scenes are of fisherfolk at work.

Figure C-4 Manchester Wholesale Fish Market; a tableau of fishermen unloading their catch; on the left two kneeling female figures sorting a basket of fish
http://pmsa.cch.kcl.ac.uk/images/nrpMR/MRMCR481.jpg

Burton upon Trent, 1883

in May 1880 a competition for architectural designs for a market hall was launched with one of its terms being the inclusion of an ornamental design connected with the history of the town over the west entrance. All the designs are in Darley Dale stone. The main work is a haut relief of King John, accompanied by two knights, granting Burton's Market Charter to a kneeling abbot who is accompanied by two monks and a figure bearing a bishop's crozier. The other sculptures on the building include a relief of the Burton coat of arms, a pair of seated male figures holding fruit and relief of a bull's head with a ring through its nose. (Noszlopy G & Waterhouse F, 2005)

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Figure C-5 Burton Market, West entrance

http://www.burton-on-trent.org.uk/category/surviving/market/market-general

Figure C-6 Burton market tympanum with a pair of seated male figures holding fruit
http://www.burton-on-trent.org.uk/category/surviving/market/market-general

Figure C-7 Burton market, side entrance with keystone relief of a bull's head, complete with a ring through its nose
http://www.burton-on-trent.org.uk/category/surviving/market/market-general

Stoke, 1900

Over the main entrance to the market is a relief panel referring the produce of the market, the central image is a bull's head, this is surrounded by game birds, fish, fruit and other produce. On either wing of the building is a relief panel of the same coat of arms, a quartered shield with several charges. The building frontage has several slim pilasters which act as divisions between shop fronts. These are topped with ceramic capitals depicting a Green Man-type face amongst foliage (PMSA).

Figure C-8 Stoke Market of 1900, panel above main entrance (2006)
http://www.thepotteries.org/art/108.htm

Figure C-9 Stoke Market of 1900, detail of pilaster capital (2006)
http://www.thepotteries.org/art/108a.htm

Hull, 1904

A copper weather-vane depicting a pennant-flying galleon in full sail by E Spencer on the 1904 market hall by City Architect, Joseph Hirst (Anon, 1904; Schmiechen & Carls, 1999).

Appendix D Epilogue

This appendix has two parts, one expands on development of shells and ceramic murals after Queensgate and the other on the subsequent history of projects mentioned in the text. They are introduced here and follow below.

1. Subsequently

The development of concrete shells and an aspect of ceramic murals after 1969. It also introduces the contemporary issues raised by the design of Huddersfield's 1970 market hall. The development of markets is followed in 0.

2. Postscript

An alphabetical listing by place of buildings and public art mentioned in the current text with brief notes on subsequent events.

1. Subsequently

"Everyone should try to build nice things instead of just building things"
Felix Candela,1964(Rowntree, 1964)

This part follows the development of concrete shells and an aspect of ceramic murals after 1969. It also introduce the contemporary issues raised by the design of Huddersfield's 1970 market hall the attitude of the president of the National Association of British Market Authorities (NABMA) is worth quoting. Norwich Corporation Alderman Cllr G R Moyes, the President of NABMA, in his1971 presidential address to the association's annual general meeting said;

"The decision of this Association to hold the Executive Committee meeting in the constituencies of Member Authorities where new markets were either in the process of being built or had recently been opened was indeed a decision that has made this year very interesting and added a valuable source of information for delegates.

In conjunction with the Executive Council meetings I was able to visit the new markets at Huddersfield and Leicester. I made a special visit to Derby and there I saw the present retail market, the wholesale market, the abattoir and the livestock market. It was in Derby that I was most impressed because the information and figures I was given in answer to my questions convinced me that here was an authority that had got its priorities right. In building their new livestock Market they first of all looked at the income potential and then related the capital outlay to it – the result is that they have a new modern market equally as good as the one we have in Norwich and built at slightly less cost, and you can realise what that means when you consider the relative value of money today against the value in 1960. I understand from Councillor Skinner and Mr Whittall [A. E Whittall was General Manager of Markets, Derbyi] that the same criteria will apply in the building of the new Retail Market. I congratulate them and certainly recommend a visit.

"... many authorities in the process of building or reorganising markets of all kinds are aware of the terrific increase in building costs. These have to be finance from the rents we charge or allowed to charge, or subsidised by the ratepayers and I think it is time we asked ourselves are these high costs really necessary? Quite frankly I have felt, and indeed said so, in my authority that they are not. I believe that it is time we all looked in the mirror and asked ourselves are we really doing the job we were elected or employed for? Too often we are ready to accept the fact that because we are concerned with the day-to-day administration of markets and abattoirs, that the question of layout and type of building is best left to the Engineer and Architect or to the Town Planner. This is where we make our first mistake because, let's face it, these officials are not interested in business as such, but only in producing something they believe will fit in with their idea of what it should look like. They are rarely interested in anything else.

"I think that in his field it is important that we get our economics right and in clear perspective.

"It is essential, as I mentioned earlier on, that first of all we must look at the income potential and then relate the capital outlay to it. After all, I see no point in building fabulous new markets that either have to be subsidised through the rates or to have rents charged that mean empty stalls or increased prices on the produce. In the end it is the consumer who pays, whether it be on the goods or through the rates. I believe, quite sincerely, that as Market Authorities, we have the right to expect a reasonable return for our outlay, both capital and administrative costs but I believe equally sincerely that both tenant and consumer have the right to expect us to be as reasonable as possible in our approach to that outlay. This has not always been so in the past and, indeed, when I walk round our own Livestock market which, incidentally, in 1960 cost £525,000 I am appalled at the unnecessary expenditure. I am certain now that the cost could have been much less and we would not, after 11 years of operation, still be faced with an annual loss.

"Having seen some of the new markets in recent year it seems to me that that this kind of thing still goes on. We have to decide in the future whether the sculpture on the walls, the flowing ceilings and other paraphanalia [sic] really have an important part in the life of the market. It is not easy, I know, because models and sketch plans can be very misleading and what looks exciting as a model looks very different when completed. I am not suggesting that we should not have good buildings or layouts, what I am suggesting is that we should get what we want as Market Administrators and not costly monuments – after all it is we who have to answer to the tenants [sic] criticisms of the rents that must be charged, not the people whose names grace the plaques on the wall."(Moyes, 1971)

These comments seem to have stung the Huddersfield Corporation representative. In 2004 Ken Wood recalled;

"Councillor Hartley got me involved in a lecture, I remember, after two or three years afterwards; At Great Yarmouth, to talk about markets" (personal communication. 26 August 2004).

Wood did give such a lecture, entitled 'Monuments or functional buildings' to the National Association of British Market Authorities Annual Conference at Great Yarmouth in 1972.

"...we must not lose sight of the role of the building itself must play in town centre redevelopment. Quite often insufficient attention is paid these days to the skyline of buildings which used to be a very noticeable feature of townscape...

"I wish to spend a few minutes on the display of art in or on buildings. I favour trying to display art, either murals or sculpture as part of buildings where it is continually on display and can be seen and commented on favourably by the members of the public. This way of display is in no way detrimental to displays in Art Galleries. It is only a small percentage of the total cost of the building and I refer to Liverpool[116] where the sculptor developed a method of using polystyrene mould panels set inside the normal concrete shuttering and the concrete was poured in the normal way.

[116] St John's market is in St John's precinct in the Liverpool city centre and was opened April 1970 but no use of polystyrene moulded concrete has been identified in the project. However a 1961 Liverpool project, The Mathematics and Oceanography Buildings that would have been known to Wood and team did use such polystyrene moulded concrete extensively Westwood, B. (1961). Institute of Mathematics - University of Liverpool. *Concrete Quarterly*(49), pp.33 - 35.. See chapter 6.

“On the question of decoration don’t forget the buildings you are demolishing. Often there are features which can be preserved, stored and used in new buildings. No all and everytime, but these occasions do arise. A plaque depicting some historical event. Why not as with sculpture, introduce it into the design where it can be seen, talked about and have a connection with our past, our heritage. I ask you to use art not store it away. Although the example I now give is not truly connected with markets, it shows a panel used at a shopping centre at Wallsend where a product of that town, made solely in that town, has been used to depict, in abstract form, the Roman connections of the past.

“With the co-operation of the Developer and Local Authority that local firm were provided with an exhibition of local industry, open to the public without charge. The industry gained, so did the town. Is it not worth the effort. I agree this is not an exception to markets, but there is in retail markets a great chance for these observations I have made to be put into use. Your old market if it is being renewed, may have something worthwhile preserving, but don’t forget the new art.”...

“Referring to the statement made last year about flowing ceilings, this is not too easily answered and to produce an analysis of a normal flat roof type of structure and the roof form at Huddersfield would mean that two entirely separate designs would have to be drawn and costed in detail. Market halls are not just a series of boxes with the possibility of having one of a series of standard roof types running through the scale of dirt cheap to damned expensive. If this was so other factors would need to be altered, such as foundations, columns and glazing to name a few.”

“The aim is to design interesting structures within fairly rigid bounds and limits once these limits are known, but at the same time all factors must be taken into account and in order to obtain interesting buildings that are functional the full co-operation of public or private clients is essential and a full professional design team whether inside or outside the Local Authority is also necessary...”

“Should you allow your markets to decline and allow buildings to be erected which are not worthy of the standard of our town centres, that are not planned properly you could very well be contributing to the degeneration of town centre shopping

“It is not the point of whether or not there are pieces of sculpture on the walls or whether the buildings are monuments...”(Wood, 1972).

A facsimile of the complete lecture is at the end of this appendix .

Shells

No record of any further cast insitu concrete hypar shells after Huddersfield market hall have been found in the UK.

The use of precast Silberkuhl shells continued on projects until the 1980s. Surviving projects from the 1970s include two swimming pools and a sports hall in Bristol and factory/ warehouses in Bletchley and Jarrow.

The number of subsequent concrete hypars anywhere seems to be very limited and this reflected the general fast decline in the numbers of shell structures built.

Based on the number and variety of shells built from the 1920s to the early 1960s, the period was considered by Meyer and Sheer to be the golden age of concrete shell construction. “Subsequently, concrete shells began to receive less attention. Fewer technical papers were published on their design methods and construction techniques, and the number of signature structures built declined noticeably”(Meyer & Sheer, 2005).

Even before Huddersfield market was complete a paper delivered to the International Association for Shell Structures in1969 was entitled “Do shells have a future?” The speaker was concerned about the lack of the development of new designs and the extensive reliance on computer analysis (Dotter E, 1969).

In 1966 Anton Tedesko, reviewing the American experience, blamed the decline in shell structures on economics and construction technologies, citing also the detachment of the designer from the construction process(Tedesko, 1971).

Before this concrete shells were widely used in the construction of signature architectural and civic projects such as stadia and airport terminals and for utilty projects requiring large spans and high clearances such as exhibition halls, hangers and factories.

Boothby and Rosson reviewing the history in 1998 suggested that both the architectural and engineering professions were both excited by the promise of concrete shells and had quite different viewpoints about their design and construction; attitudes that reoccur in discussions between the two disciplines about design in general(Boothby & Rosson, 1998).

Engineers sought optimised structures and articulated a design aesthetic based on the notion of rationality. In 1971, engineer Stefan Medwadowski (whose works were “characterized by the conscious effort to define space and fulfil function in an aesthetically pleasing manner” (Abel, 2000)) appealed for simplicity and constructivism as a dominant aesthetic (Medwadowski, 1971).

Architects were said to adopt structural forms that were not necessarily reflective of rational engineering design and chafed at the engineers’ insistence that that constraints of shell construction limited the form-making decisions available to architects(Boothby & Rosson, 1998).

To explore the reasons for the decline of interest in concrete shells in the USA, Meyer and Sheer interviewed a number of engineers, architects, and other building professionals to determine their opinions and if they believe the advantages of concrete shells in terms of economy, aesthetics, and utility, once so widely agreed on, still existed.

The near-unanimous response to their question ‘why have thin concrete shell lost their popularity? was; “They cost too much to build.” The cost most often mentioned was for labour to erect the shoring and formwork. Compared with material costs, labour costs were considered prohibitive “The type of formwork and shoring varies from labor-intensive to extremely labor-intensive, depending upon the shell geometry and method of construction”.(Meyer & Sheer, 2005).

Felix Candela’s influence can be seen in a variety of projects after Queensgate Market

Architect Pierre Botschi of the Milton Keynes Development Corporation was to be significant in the design of the 1974 Bletchley Market which will later be shown to be inspired by the work of Felix Candela.

Botschi's earlier project, the 1972 Wolverton Sports Club pavilion was of GRP (Dunleavy, 2011) had more than an echo of Candela's 1968 Palacio de los Deportes of the Olympics games; both with rows of arches supporting a roof of geometric shells.

Figure D-1 Wolverton Sports pavilion, 1976 (University of Huddersfield)

Figure D-2 Palacio de los Deportes, Mexico City, 1968.
(de Anda Alanis, 2008)

Concrete hypar shells were used to roof the concourse of Katowice railway station, Poland and completed in 1972, It was designed by Wacław Kłyszewski, Jerzy Mokrzyński and Eugeniusz Wierzbicki. Its construction was supervised by Wacław Zalewski, Eliahu Traum's professional partner.

The sixteen square tilted mushrooms in two rows were on board-marked sculptural concrete columns that were reported to have had 6 cm thick walls (Katowice, 2011). The columns met the board marked shells in an elegant manner (Figure D-4). This column configuration had a precedent in the Sète Criée Aux Poissons.

Figure D-3 Katowice PKP station (February 2008, Author)

Figure D-4 Katowice PKP station, column and lighting (February 2008, Author)

Paul Andreu's (1938-) RER station at Terminal 3/Roissypole, Charles-de-Gaulle Airport, Paris opened in 30 May 1976. The board marked concrete roof forms are not hypars, are symmetrical and braced (Figure D-5 and Figure D-6).

Figure D-5 RER station at Terminal 3/Roissypole, Charles-de-Gaulle Airport, Paris (2007)
Arched from column to roof structure all in board-marked concrete.
Down-lighters can also be seen between the units.
http://fr.wikipedia.org/wiki/Fichier:Roissypole_RER_B_P1200609.jpg

Figure D-6 RER station at Terminal 3/Roissypole, Charles-de-Gaulle Airport, Paris
Bracing points and glazing mullions visible (David Shore, 2005)

Ceramic murals

Fritz Steller of Square One managed to supply and fit the ceramic components of the Queensgate market reliefs with his ad hoc team, over an extended contract period with scaffold access that the site engineer and clerk of works was forced to allow.

Frank Maurier remembers the stress.

“The bottom row of pieces rests on a steel L section bolted to the building. Subsequent rows were bedded in cement and tied back using galvanised bars, again bolted to the building. This was a last minute change which blew Fritz's quotation to pieces, and added to the time it took to fix because the pieces were not uniform in depth. We thought it was overkill to tie in every unit like this but the Architect & Engineers insisted. The anchors in the backing brickwork had to be sited in a place where the unit was deep enough to be able to get in behind and fix it. This really frayed tempers & slowed things up, which didn't go down well with the main contractor.” Frank Maurier personal communication 11 june 2011

Steller realised that the experience of producing and installing *Articulation in movement* was not a process that was commercial or even a repeatable experience. Steller recognised that the costs, time and problems of affixing the Huddersfield ceramics to the masonry of the market hall had to be reduced to offer the ceramic cladding of buildings as a commercial proposition.

Steller was already working on a series of fibreglass and ceramic panels for another Seymour Harris panels project, Castle Vale shopping centre. The textured fibreglass panels were in high relief with ceramic components.

Figure D-7 Castle Vale Panel units at Square One

Figure D-8 Panel unit being craned in to position at Castle Vale

Figure D-9 A panel installed at Castle Vale

There was already no lack of cladding solutions, a ‘enormous’ range of cladding materials including ceramics as brick, tile and mosaic was on offer to the construction industry(Musgrave J, 1971). The most celebrated ceramics were Twintiles produced by Shaw-Hathernware. These 9” x 3”glazed tiles were designed with keyed backs to adhere to concrete either in situ or to pre-cast panels. From the early 1960s they were widely specified on hospitals, stations, shopping centres and universities. By the late 1960s Twintiles had become associated with on-site failures on many prestigious projects, pre-eminently Warwick University, only a few miles from Steller's workshop.(Stratton, 1997)

Steller's friend, the Huddersfield Market project architect, Gwyn Roberts in his RIBA examination work *Services to industrialised building* looked at the prefabrication of service components to the construction industry(Edwards-Roberts, 1965). By having plumbing and other services as part of pre-formed panel modules he was looking at extending the supply of precast concrete components with additional services.

A ceramic cladding product that was adhesive, grout and pointing free that could be easily handled, light, moisture resistant and that could be erected irrespective of weather conditions would, Steller thought, have a unique selling point.

With the alignment of these circumstances a product was born. Frank Maurier remembers the genesis of a product that he was to spend the next eight years working on;

"First Fritz used fibreglass to fasten sculpture together. Next John [Warren] and I made profiled tiles by extruding them from the pugmill. IDC (concrete cladding manufacturers) saw them and thought they would make a welcome change from exposed agregate. That provoked us (probably at Gwynn's suggestion) to make the tiles up into lightweight panels."(Frank Maurier, personal communication 21 June 2011).

"We [himself and John Warren] designed the tiles used by Transform & IDC. John and I made profiled tiles by extruding them from the pugmill. Fritz's contribution was the fibre glass back" (Frank Maurier, personal communication 9 & 26 June 2011).

Steller's Birmingham training in a range of media allowed him, without telling the others at Square One, to develop an off-site prefabrication solution. Steller experimented and soon developed a technique to achieve this. On the 30 June 1970 his newly founded The Transform Ceramic Company Ltd of Square One, Snitterfield made a GB patent application for the manufacture of cladding panels. The patent was published on 24 March 1972.

The patent's description of a panel's manufacture starts with tiles of any shape or relief arranged face-up in a box deeper than the tiles, with a removable base. The box is then packed full with dry pointing such as sand and a lid clamped on. With the box inverted the base is removed to expose the back of the tiles and pointing in the interstices. Fibre glass sheets are then laid over the surface and polyester resin is applied. The resin impregnates the matting and seeps onto the tile backs and into the sand. The resin percolates into the pointing to a desired depth; more resin allows greater penetration. After setting, a stiff glass reinforced polyester (grp) panel with pointed tiles is lifted away from the sand bedii.

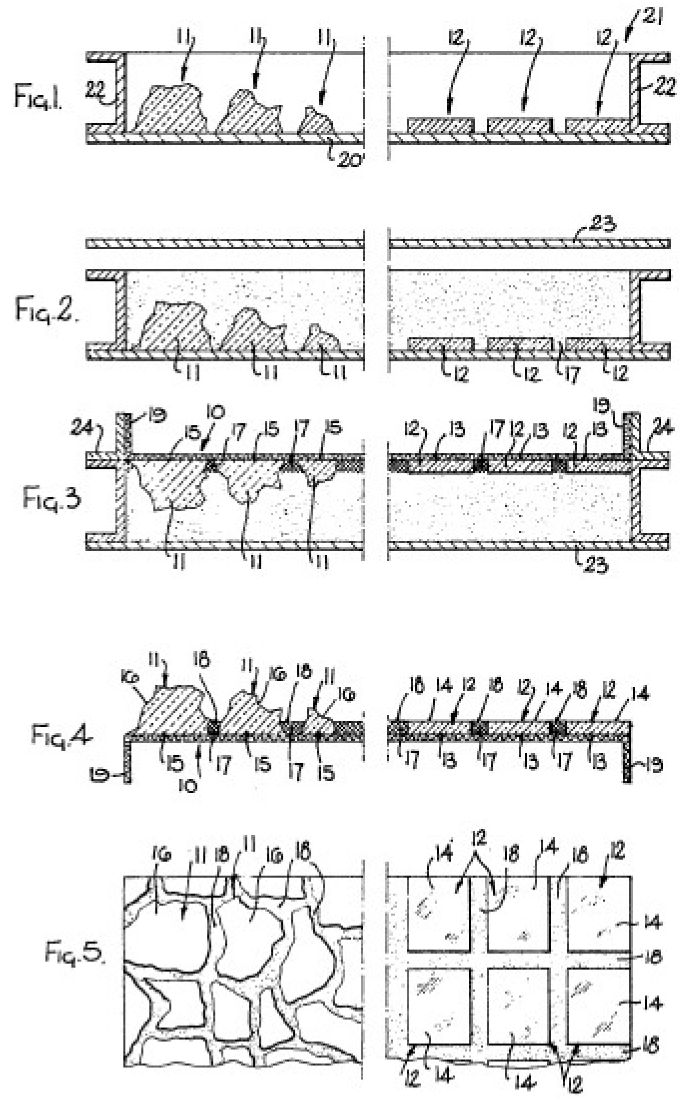

Figure D-10 Drawing from patent application GB1363843

Only days after filing the patent application an exhibition of Steller's work *Man and his environment* (15-28 July 1970) opened in the Mezzanine Gallery at the Birmingham Post and Mail Building. The exhibition leaflet read "It is interesting to see how many very traditional materials with their own particular qualities have been used in a hitherto untried context. Fritz Steller's current *project is designing* and producing a surface for pre-cast concrete buildings. The development of this idea is being carried out in conjunction with I.D.C., examples can be seen in this exhibition" (Steller, 1970).

The dynamics of Square One was changing. Frank Maurier suffered a back injury that meant he couldn't throw clay on a wheel anymore. He found a new role in the industrial production of Transform panels.

John Warren remembers leaving Square One having had enough of Steller's domineering behaviour;

“What hacked us off in the end that although we had had a more than equal share in the conception and realization of Fritz's architectural work, and many of his sculptural pieces too, (I don't think he would have been able to do it all without our technical expertise and attention to detail), in the end all the publicity and attention was on Fritz, "The Man & His Vision". We were very young and naive I suppose, and believed in the big cooperative vision of a group of equals striving together for equal rewards. We were most decidedly "used", big time, I suppose we were the convenient tool he used to achieve his work. It was a fantastic experience until I burnt out and left, and managed to get my own life and direction back.” John Warren, personal communication 4 June 2011.

With investment into the Transform product secured Warren moved to Tamworth to establish a Transform production plant in a disused pipeworks at Dosthill, from where he did some massive contracts.(Frank Warren 7 June 2011)

The Transform Ceramic Company’s 1971 promotional brochure read;

“Transform is designed for interior and exterior use in any situation where a durable wall surface is required.

“The ceramic surface of the panels has all the qualities of stoneware; a texture and warmth of colour only found in a natural material. The units may be glazed in rich browns, blues and greens or set with jewel-like discs of peacock coloured glass. Alternatively, fired unglazed the ceramic has a wealth of subtle colour variation produced by the path of the flames in the firing, ranging from pale pinks and ochres to dark orange and sepia.

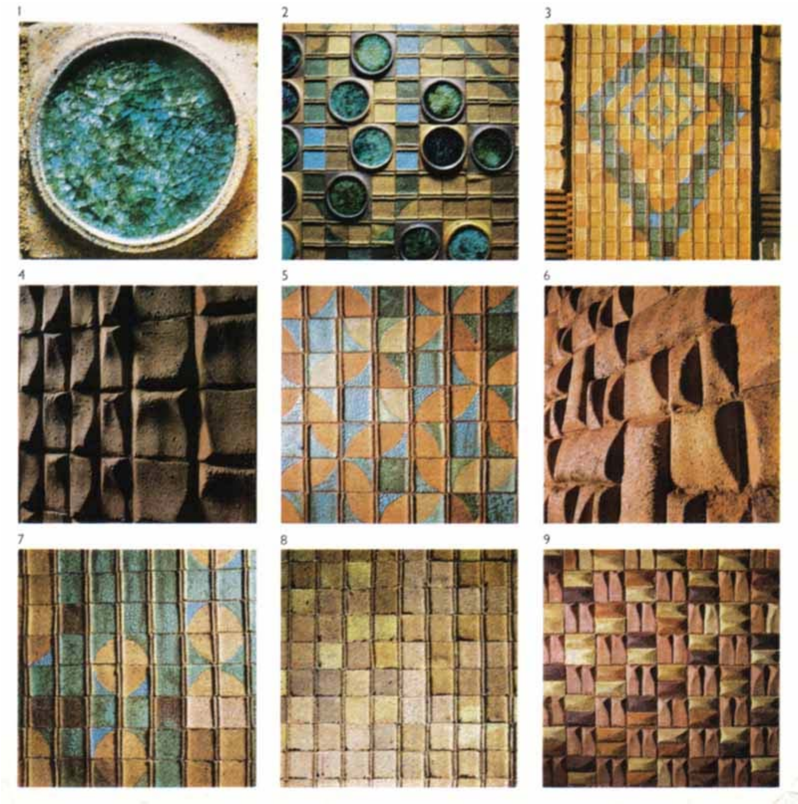

Figure D-11 Transform Catalogue detail (Transform Ceramic Company, 1971)

“The glazed flat tiles can be used to create a wide range of patterns, repetitive or individual.

“The depth of relief can vary from the surface texture of flat tiles to solid sculptural form and these may be used together giving so much flexibility in design that original schemes can be produced at no extra cost. The panels can also be pierced for use as screens, incorporate individual features, lettering or any required motif such as a trade mark.” (Transform Ceramic Company, 1971).

Production at Tamworth lasted couple of years. In 1974 Transform was bought out by G.H.Downing. Production then moved to Tunstall at Stoke. GH Downing changed the name from Transform Ceramic Cladding Company to GHD Cladding. At the time Downing was the second largest brick producer in the country, after London Brick, and were already producing brick faced concrete panels. Ibstock Brick was dabbling in lightweight panel production and Downing wanted to keep ahead of the game. Frank Warren managed the factory throughout (Frank Warren personal communication 7 June 2011). Transform production continued until about 1978. GH Downing was bought by Steetley in 1981 when it was clear that production had ceased (Denzil Spencer, personal communication, 1 August 2011).

With Frank Maurier’s records, from photographs and memories of Fritz Steller and John Warren and serendipitous discoveries by the author is evidence for and discoveries of Transform installations for a few European locations and across Britain.

The British and Irish sites were; Aberwystwyth, Belper, Billingham, Birkenhead, Bootle, Bradford, Bromley, Brownhills, Burntwood, Cardiff, Catterick, Cheadle, Chesterton, Coventry, Derby, Dinas Powis, Doncaster, Dover, Dublin, Ealing, Eccles, Edgware, Edmonton, Glasgow, Greenock, Hagley, Harborne. Hemel Hempstead, Hendon, Henley In Arden, Ilford, Kettering, Kilmarnock, Kings Lynn, Kirkby, Kirby-in Ashfield, Lancaster, Lapworth, Leeds, Leicester, Lewisham, Liverpool, Llanelli, London, Luton, Lytham St Annes, Middlesbrough, Middlewich, Mold, Motherwell, Nantwich, New Milton, Northampton, Norwich, Nottingham, Paignton, Peckham, Penkhull, Penzance, Peterborough, Pinner, Plymouth, Portsmouth, Reading, Richmond on Thames, Rochdale, Romford, Sale, Salford, Sheffield, Shirley, Sittingbourne, Skelmersdale, Slough, Solihull St Helens, St Mellons, Stanmore, Stoke, Stoughton, Streatham, Sutton in Ashfield, Swindon, Tamworth, Tooting, Tunbridge Wells, Wigan, Wilmslow, Wolverhampton, Yardley and York – 139 installations in all.

The installation of Transform panels can be compared and contrasted with the installation of *Articulation in movement*. The larger lightweight panels of Transform could be craned into position; smaller ones could be manually lifted.

Grouting with resin was needed for Transform but this was limited to the joints between panels. For some styles this meant fixing some tiles after panel installation.

Panels were fixed with screws. For the Luton Crest motel the panels formed the back of guest bedroom wardrobes.

Figure D-12 Transform panel being craned onto the Luton Crest Motel, 1972. Two men on the right, mid scaffold at first floor level are waiting to receive the panel. (courtesy John Warren)

Figure D-13 Alan Martin making good the tessellation at the joints of hexagonal tiled Transform panels, unidentified European project (courtesy Fritz Steller)

Transform installations could be very modest – for a lobby (invoiced at £50 in 1975) or extensive, invoiced at £20,000 in 1977. Contracts included tiling for; Swindon Station, banks, building societies, shop signs, offices, Southend Library, clubs, public houses, hotels, police stations in Middlewich and Nantwich, blocks of flats, Teeside Polytechnic and Llanelli Market Hall.

Some Transform installations were plain, like the auditorium of Theatre Clwyd, some polychrome patterned (Blackpool telephone exchange), some decorative (Tunbridge Wells swimming pool, some ornate (Romford offices) and others highly sculptural (Tamworth Council offices)

Figure D-14 Transform on 6.5m square panel in Kirkgate Market, Bradford (1973) (Author, 2012)

Figure D-15 Transform in Tamworth council offices (Fritz Steller)

Figure D-16 Transform in Tunbridge Wells swimming pool (1974) (Frank Maurier)

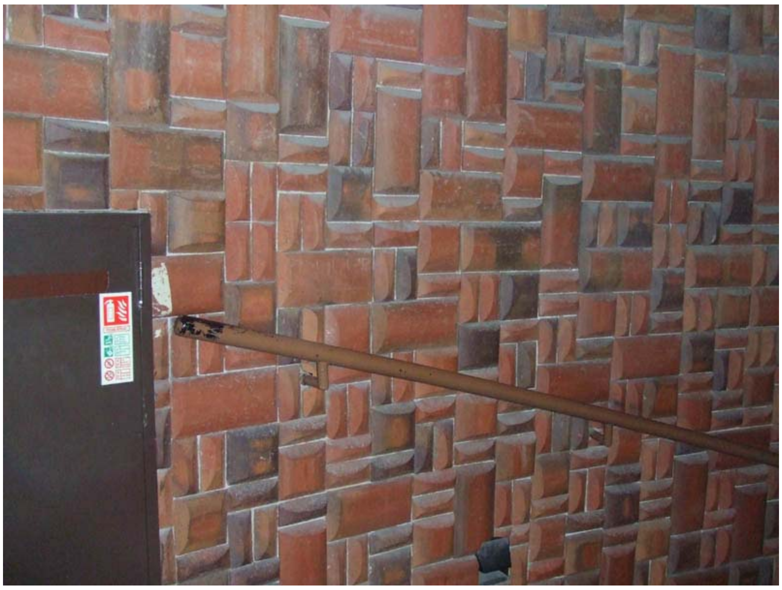

Figure D-17 Transform in Theatre Clwyd (1975) (Pat Nelder, 2011)

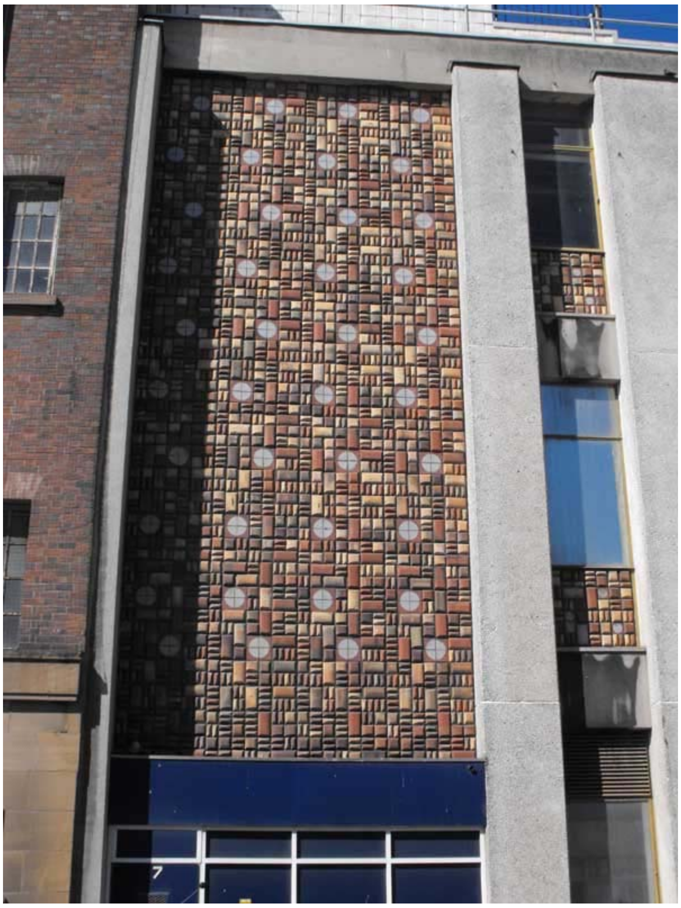

Figure D-18 Transform on Blackpool Telephone Exchange (1976) (Author, 2009)

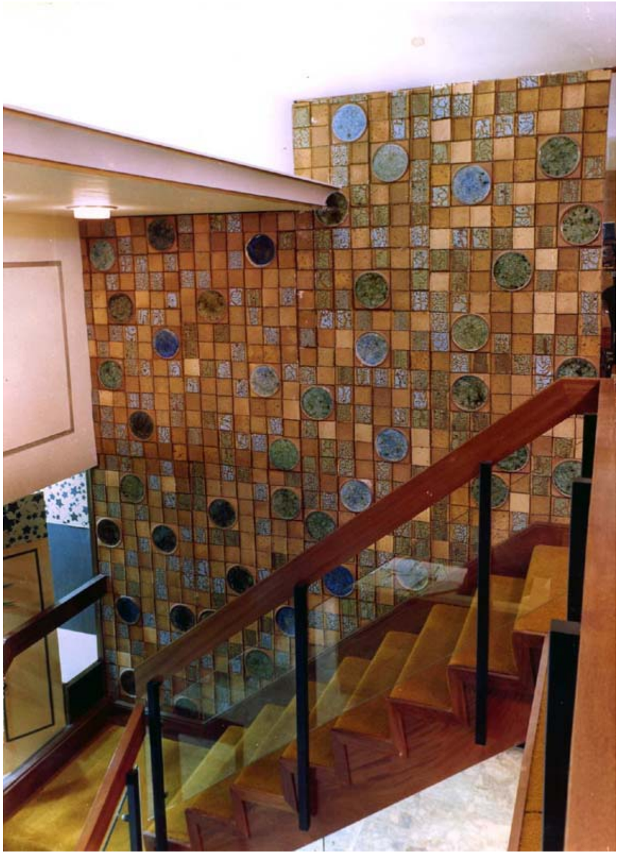

Figure D-19 Transform in Romford (John Warren**)**

By 1974 Maurier had cut all ties with Square One and was working for G H Downing in Stoke.

In the late 1970s GH Downing won the contract to produce a brick mural for the new Potteries Museum and Art Gallery in Hanley.

Maurier, designed the 33 metre long, 4 metre high mural. It was built of over 6,000 bricks. It depicts, in carved brick, the story of pottery and the stages of manufacture from the mining of clay and coal to the firing in traditional bottle ovens (Weatherhead, 1980). Maurier says that after the Huddersfield panels had given him confidence and he was not frightened of big sculpture projects.

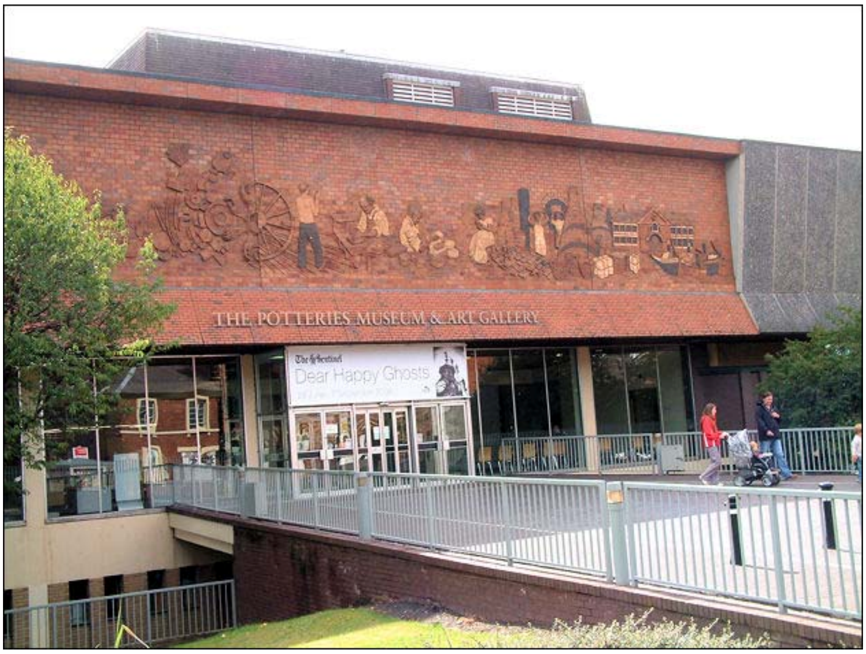

Figure D-20 relief mural of the Potteries Museum & Art Gallery
http://www.thepotteries.org/art/h9.htm

John Warren says of his time working on the Huddersfield panels “I was much less phased by events because of it, and built many kilns with the [his art school] students because of our having to at Snitterfield. Scale was never a worry for me, the students gained a lot from being able to make things big.”(John Warren, personal communication 9 June 2011).

Facsimile of *Monuments or functional buildings*, a speech deliveredby Ken Wood to the NABMA annnual conference,19 September 1972 from the programme;

Appendix 4

MONUMENTS OR FUNCTIONAL BUILDINGS

A year ago your President Alderman G. Moyes, in his address, commented on the present day new market halls and abattoirs, and I am sure those comments he made have stimulated thought and interest, for he believes that you should, as Market Administrators, be given buildings with well planned layouts and not costly monuments.

Of course buildings are easy prey for criticism by anyone who thinks he or she knows far better how the building should be designed and constructed. Often at the time many of these critics do not wish to be concerned with helping. I hasten to add also that a great deal of assistance is obtained from members of theLocal Authority whether council members or officials. It is possible to pinpoint some of these criticisms to specific gaps in the information available and given at the time designs are being prepared, but this is not the burden of this talk. Design of buildings is certainly not a clear cut issue. All members of the public have their ideas of whether they approve of a building or not, and these opinions differ greatly.

The title of the discussion "Functional or Monumental" buildings is not a fair "for" or "against" subject for discussion. As I will explain later, it is a misconceived comment that Architects or Engineers are only interested in monuments. The thought does not enter their minds, they are conscious very much of designing and constructing buildings that are worthy of our towns and cities. A number of factors have to be considered in assessing this point and therefore it is expedient to take such factors in sequence. My observations are restricted to retail stall markets where selling covers a variety of goods from food, fruit, vegetables, fish, meat, etc. to non-food items such as, hardware, clothes and textiles, ironmongery and electrical goods, stationery and so on.

By the help of colour slides I will illustrate my observations, but first it is important that we all look back

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into the past for a few minutes.

General History How did markets, as we know them, originate and how have they progressed. The start was by produce having to be bartered on the open ground where farmers and others could meet and bring their goods for exchange.

In Roman Britain during the Florian Age, Agricula and his fellow governors set out at the end of the 1st.Century to commence the planning of towns and to use money for building temples, halls of justice, public baths and markets. The overall plan included a "forum" or market square in the centre, flanked on three sides by shops and on the fourth by a basilica. Although at the end of the Roman period most of these buildings and towns fell into decay, markets continued usually outside the towns, sometimes because at the end of this period town life as it was known had altered, or because it was on a convenient road or route.

The Doomsday Book records about fifty markets which by then, were often combined with fairs providing other facilities, and sometimes these markets were held in church yards. Other places of meeting were market crosses, an example being Shrewsbury erected in 1590. Some form of cover is at this time being created and this is evident at Llanidloes built in 1609 where protection is provided. At Ledbury built in 1633 a further advancement took place, sixteen timber pillars support a building above the Town Hall.

By this time already a form of market architecture was developing just as the building of churches, bridges and houses was being evolved. At this period some traders found they needed a roof over their heads which was supported by timber and stone pillars and as shown, sometimes supporting another building. I accept this did not happen everywhere and still the markets in the open air persisted. It can be seen that the buildings shown are functional and pleasant.

In 1745 Samuel Glascodine produced an arcaded market at Bristol. At Chichester in 1807 Architect John Nash,

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erected their small market at a cost of £1,522.00. In 1875 Preston market was built costing £9,126.50 and on the other side of the Pennines in 1878 at a cost of £31,325.00 Huddersfield market was erected. In London an example is Leadenhall erected in 1881, which is a splendid structure, four arms meeting in a central octagon all roofed. Admittedly this building started off as a wholesale market but is now full of retail shops selling meat, poultry, fish and game. These form part of our townscape, part of the life and living of our towns and cities.

Retail markets with the mixture of traders and members of the public create an atmosphere of commerce, busyness maybe clatter, smells and chatter that is life. We need atmosphere and colour in our living and retail markets provide part of it. The examples you have seen, whether in London or other parts of the Country,provide this atmosphere. At the same time they have been, and in some cases, still are buildings that work and look well. Enclosed or open they were not built as monuments, but part of the townscape of the period.

During the present century several new markets have been erected and I illustrate a few of them in this Country, which some of you may not have been fortunate enough to be able to visit. I trust this way of showing you these markets will not only be of interest but also useful, as I feel sure that during past years reference has been made to them.

Over recent years far greater thought has been given to layout, in ensuring that there is separation and less confusion of the customers and the services that are necessary in bringing goods onto display, which means that vehicles are kept apart and that in multi-storey developments, lifts carry goods to the requisite floor and refuse is removed by means of discharge into mobile receptacles.

Planning Design has been influenced by Regulations that are introduced, and these rules are brought in to help to raise standards including that of cleanliness and to prevent people being trapped by fire in buildings. Important regulations are the 1972 Building Regulations which lay down compartmentation, fire rating and fire escape,

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the Public Health Act and Food Hygiene (Market Stalls & Delivery Vehicles) Regulations 1966, the Shops, Offices & Railway Premises Act 1963 and of course, the Planning Acts. All these numerous regulations and changes in town centre planning greatly influence the form of the design, not only of the layout of retail markets, but their siting, appearance and relation to adjoining buildings.

Besides these restrictions we must not lose sight of the role the building itself must play in town centre re-development. Quite often insufficient attention is paid these days to the skyline of buildings which used to be a very notable feature of townscape and added to that because buildings are much higher than they used to be with their occupants looking down onto other buildings, roofscape must not be ignored. This applies with high rise buildings such as flats, offices and car parks and it is not only the view at the ground level which should be considered, but also from the roofs of other buildings.

You may feel that I am probably overstepping the normal bounds in which the Architects and members of the fellow professions should operate, but the comment has been made that we are not interested in the business side. When working for private clients we know what has to be provided and what it must cost and also that it must cost no more. If I may criticise, I find the private client willing to put forward the calculations to bring about a financially successful project whereas the Local Authority are reluctant to do so. The private developer has to buy the land or enter into a lease with a ground rent in addition to his building cost and interest charges I appreciate that your situation in carrying out developments could be similar, but you would most likely own the land, but still be faced with building costs and interest charges. I do feel that sometimes insufficient time is allowed to analyse exactly what is required and the cost of these requirements fully appreciated. Always remember that what you require, you have got to pay for and you cannot and must not expect your professional advisers to accept and agree to costs that are not completely factual. My own experience leads me to form the opinion that far more time should be taken in consultation in arriving at a detailed schedule of requirements. I

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refrain from using the word "brief" as for some reason or other it seems to frighten people off. You must be prepared to approach this problem with a lot of thought and discipline. This has most likely been said many times before but surely if private developers can accomplish results, it is quite open for the Local Authority to do the same. In my practice the private developer is asked to produce schedules of the standards he expects and detailed guidance notes for his tenants, this is standard procedure in my office and is applied to markets or any other buildings. The slides that you now see before you show how we have approached this particular problem in order to obtain as much basic information as we can. A further matter not to be ignored is if a joint Local Authority/Private Developer project is envisaged there should be a clear understanding of what one provides, possibly with a list of exclusions. The slide shows the type of schedule I have in mind. The design stems from these procedures and analysis. Don't forget the legal aspect. The Town Clerk draws up agreements and leases and I recommend that you let your Architect have a copy, he then knows what to look for and it maybe saves some embarrassment later. These few words are pleas for co-operation.

I would like now to go on to another matter and that is - are you making the fullest use of your market sites, I feel this is not so. Let me remind you of an earlier slide you saw of the Ledbury market, even in 1633 they knew what they were doing by having a building over and this has been achieved this century at a number of places such as Sheffield, Liverpool and Wolverhampton. I accept that not all projects lend themselves to this form of complex development, but this is a point well worth consideration should you think of developing your existing, or a new site. The statement made does not necessarily mean that demolition of existing market halls should take place without first considering the feasibility of reconstructing the present market hall if this should be worthy of preservation. I had meant that this comment be only applied to covered markets but with open stall markets where they are only used once or twice a week far more use could be made of thesites. Linked with this of course is the actual siting of retail markets.

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There has been a tendency for these to be moved further out of the heart of the town into a location, still being town centre, where vehicular access is better and this has the advantage of keeping a certain amount of the vehicular traffic out of the town centre with reasonable ease or access from ring roads or bypasses, but at the same time shopping links are maintained.

Whilst on this point, over the last decade there has been the segregation of vehicles and pedestrians which has changed the pattern of shopping developments. Before the advent of the motor car the streets were a mixture of horse drawn vehicles and people, which at that time added a lot of character and atmosphere to the area. The introduction of the motor vehicle has led to frustration for the shopper where the streets have been completely blocked by vehicles, therefore the replanning with segregation in mind has now created a new atmosphere and this has led in a number of cases, to the complete integration of new shopping and retail markets.

It is necessary in the planning of pedestrian precincts that the location of the market is properly placed. At Huddersfield the market is situated between a new car park, new shopping and existing shopping so that there is a continued circulation of shoppers as well as good access to the ring road. At Bilston, a development which is being carried out with the co-operation of the Local Authority, the heavy traffic will be moved out of the town centre onto the new bypass, which is being made by forming a dual carriageway. A new bus station is being built on this bypass together with car parks. From either the car parks or bus station pedestrians can walk through to the market and into the shopping hall which itself links up with the existing shops. There is already a noticeable change in that, great interest is being shown in obtaining new shops by traders whereas there had been a decline. This is happening in many places I am very pleased to say, but it is a situation which could lead to an unsuccessful market if the location and placing of adjoining shops and car parks are not carried out properly.

Enclosed shopping centres are now occurring in this country, ie. at the recently opened development at Middleton,

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Poole which was opened some time ago and Wandsworth which we have recently completed and also the interesting development at Stechford where a retail market has been incorporated. The object of course, is to achieve successful trading and shopping. In markets it is vital that its own atmosphere be created and of course it can only be totally achieved by having all the stalls let and no empty or dead areas. The market itself has to be designed to stimulate this atmosphere and of course the location of doors, widths of corridors and placing of stalls are all most essential.

Art & Sculpture Taking up all the points raised last year I wish to spend a few minutes on the display of art in or on buildings. I favour trying to display where applicable, art, either murals or sculpture as part of buildings where it is continually on display and can be seen and commented on favourably or unfavourably by the members of the public. This way of display is in no way detrimental to displays in Art Galleries. It is only a small percentage of the total building cost. It can be an integral part of the building and I refer to Liverpool where the sculptor developed a method of using polystyrene mould panels set inside the normal concrete shuttering and the concrete was poured in in the normal way.

On this question of decoration don't forget the buildings you are demolishing. Often there are features which can be preserved, stored and used in new buildings. Not all and everytime, but these occasions do arise. A plaque depicting some historical event. Why not as with sculpture, introduce it into the design where it can be seen, talked about and have a connection with our past, our heritage. I ask you to use art not store it away. Although the example I now give is not truly connected with markets, it shows a panel used at a shopping centre at Wallsend where a product of that town, made solely in that town, has been used to depict in abstract form, the Roman connections of the past.

With the co-operation of the Developer and Local Authority that local firm were provided with an exhibition of local industry, open to the public without charge. The industry gained, so did the town. Is it not worth the effort. I agree this is not an exception to markets, but there is in retail markets a great chance for these

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observations I have made to be put into use. Your old market if it is being renewed, may have something worthwhile preserving, but don't forget the new art.

Cost I now wish to look at the costs of a few retail markets. I have analysed the costs of four retail markets built in the last decade. Let me emphasise before the figures are looked at, it is dangerous to apply these figures at random to your own specific projects. Your own Architects, Quantity Surveyors and Engineers must make use of the comparisons which the figures give, to interpret their relationship to your specific requirements.

Where complex developments are involved the separation of these costs into the actual type of building that you have asked for is very difficult to achieve. You will see that in these costs this complexity is very evident and is caused by the realisation of Local Authorities that these developments, in order to obtain full site potential, have to be mixed and therefore complex. When your treasurer adds up all the bills he has received he will arrive at a total cost for your building.

I have set out the costs, in the order in which the markets were built. Sheffield, Huddersfield 1970, Bridgend this year and Bilston will be completed at the end of this year.

As with most buildings there are always certain features which have to be taken into account because they affect cost. Sometimes these features are the physical matters on site, or the situation of the site with regard to access, or there can be restricted sites where there is nowhere for the contractor to put his materials or huts for administration, or it can involve phased operations to keep existing buildings functioning and sometimes an extremely short contract period because their is only a certain period of time available.

Sheffield is a mixed development of market, shops and offices, multi storey in places. There are mezzanine floors of reduced height and of course the market itself. Furthermore there are hidden factors which affect this cost, these being the relatively short contract time, restricted

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site, foundation problems and phased work as reported above. Huddersfield also has shops, but the cost is less complicated to analyse. It had a reasonably short contract period, but here access was not difficult. A certain amount of foundation problems were encountered and part of the ground had to be cut away to form a basement on the sloping site, and in addition, when considering costs there is a service road running through the basement and under the market which serves both the market and other parts of the shopping development.

Bridgend is part of another multi-use site and so is Bilston, but the costs are higher and as you will see when comparing the the slides now before you, the difference is attributable to foundations and services. At Bridgend the roof structure is open but includes ventilation and smoke detectors,whereas at Bilston this has been completely enclosed on the instructions of the Local Authority and there is full ventilation and sprinkler installations incorporated. All these items increase the costs and besides this the Bilston market has extensive concrete foundations as it is sited on approximately 14' of filled ground. From this explanation you will appreciate the need to allow some latitude when comparing costs. The slide showing the original costs of the buildings illustrates the difference in time when these markets were erected and therefore to be able to compare this more closely the Indecies produced by the Royal Institute of Chartered Surveyors have been applied. These are now shown on the slides and you will note that they are classified according to the building type. The four examples, are of two building types, namely concrete framed buildings and steel framed buildings therefore different indecies have to be applied. The costs I produced before are now shown again with the index applied to the Sheffield market.

Huddersfield was finished in March, 1970 and at that time estimates were available for Bridgend and therefore Bridgend can be used in the comparisons. Bilston was started some eighteen months later so this must be taken into account when considering the costs. The table shows the division between the preliminaries, foundations, structure, services and finishes all of these being self-explanatory, the preliminaries being the builders' administration costs,

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insurances etc. The next slide indicates the total area of these four markets. These areas given are market hall sales area with a separate area for the stalls coverage, the total area of the service facilies which include preparation rooms, switchgear rooms, plant rooms, offices, toilets and so on, with the storage again given separately. You will see in each case these percentages and cost ratio do produce some extremely interesting comparisons. These costs are very important and are really getting down to what is trying to be achieved, which is obtaining the maximum lettable area out of the total building area, but at the same time, not forgetting the best possible functional use of the building and also producing buildings which are attractive and acceptable as part of the townscape. It is from the lettable area that you are going to obtain your revenue and hence know what you can afford.

Referring to the statement made last year about flowing ceilings, this is not too easily answered and to produce an analysis of a normal flat roof type of structure and the roof form at Huddersfield would mean that two entirely separate designs would have to be drawn and costed in detail. Market halls are not just a series of boxes with the possibility of having one of a series of standard roof types running through the scale of dirt cheap to damned expensive. If this was so other factors would need to be altered, such as foundations, columns and glazing to name a few.

The aim is to design interesting structures within fairly rigid bounds and limits once these limits are known, but at the same time all factors must be taken into account and in order to obtain interesting buildings that are functional the full co-operation of public or private clients is essential and a full professional design team whether inside or outside the Local Authority is also necessary.

Earlier reference was made to the private developer who builds shopping centres and offices. I accept this is not a completely fair comparison in that the facilities and services you provide are greater and the return lower than that of the private developer, but the fact must not be lost as Alderman Moyes has quite correctly stated, the tenant and consumer have a right to expect you to be as reasonable as possible in the approach to outlay. The criticism made last

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year was that the Engineers or Architects are not interested in business as such. Such a statement I strongly dispute because if this is the case how does the private developer succeed, not only because he is operating on a slightly larger margin and do not forget he may have years when shops are unlet, whereas you should, if you have done your sums correctly, have a market which is fully let right from the day of opening.

Open Markets Sometimes these are attached to the enclosed retail markets, or else completely independent and in some cases they do not exist. There are approximately 275 covered markets and 513 open markets in this country. Open markets are, when compared with covered markets, relatively simple in design and first of all I am now showing you a slide of one of the Italian open markets which is really not much different to our own, but of course with the longer period of good weather tends to seem more crowded. This form of market was relatively easy to construct and consisted of lines of timber supports and cross members covered with some form of canvas awning, beneath which the traders could lease an appropriate space. The open market has the advantage of greater flexibility over the covered market and traders feel more atmosphere and character. Bad weather of course can be a deterrent to shoppers and the advantages of covered markets could in the future, certainly outweigh the disadvantages.

At Bilston the former open market is being retained but in a slightly different form, but every effort is being made to achieve the colour and atmosphere stemming from the stalls. This slide shows the Norwich market which I feel sure is another extremely successful venture, I understand that consideration is being given to the roofing in of the aisles to afford some protection against weather. An interesting point not only applicable to Norwich is that the stall holders can virtually box up their stalls and lock them, thus allowing goods to remain inside, whereas at other markets the goods are taken away at the close of the day.

At Wolverhampton, which has always had an outside open market adjoining the market hall, recently a development of the stalls has brought about a more permanent form being

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constructed instead of the normal tubular stalls, in order to meet the Public Health requirements. This slide shows the situation of the open market taken from the adjoining car park with the retail market in the background and the next slide shows the close up of one of the permanent new stalls. Of course standard permanent stall depends on what trades are going to be allowed in open markets for at Bilston this has been restricted, as always in the past, to non food trading.

A problem which I have heard referred to in the past has been that in open markets traders find great difficulty in getting their vans as close to their stalls as possible. At Bilston thought has been given to this situation and you will see that provision has been made. This now leads me on to Leicester where there is an entirely different concept in the open market. The market itself is in a prominent shopping position on a valuable site. The open market has been roofed, a contradiction I know, but I feel that this is still classified as an open market and the character and atmosphere has been retained. I feel this is a very brave and successful attempt by their City Planning Officer, W.K.Smigielski and has resulted in considerable advantage to the townscape of Leicester. The market itself is surrounded by shops and is the intersection of many streets and arcades.

Competition If you do not look after your markets whether they are open or enclosed and take a careful look at each and every situation at the present time there could be changes in our towns which could lead to the market as it is known becoming left behind. I am of course referring to the new form of trading in this Country by super stores or as they are commonly known hypermarkets which many of you have read about in the newspapers and many of your Officers and Councillors have met in the form of applications for building permission. Town shops meet the need not only of the day to day range of goods, but also those outside day to day requirements whether these are independent traders, multiples or stores. Earlier I referred to the integration of shopping and markets and I think it is worth while considering what the effect of the super stores is going to be on the preservation and redevelopment of town and city centres. I would like you to look at the two slides

continued over

concerning retail trade in this Country and you will see that retailers of the 70's are, or will be soon standing at cross roads. The table shows that there is a fall in the independent retailer's trade which could continue, the multiples trade is increasing and the departmental stores are probably just holding their own. Now how is this going to affect trade and consequently building in the town centres. You will all be fully aware of the rapid rate of growth of car ownership for in 1959 there were five million private cars on the roads, by 1970 this had increased to twelve million and by 1980 this number is expected to rise to about twenty million. If towns are going to withstand this competition from super stores it must be easier for the shopper to be able to park his car close to the shop or market. If this is not done the town centre will decline, the competition from the hypermarket is going to be great once they are allowed to build because they can provide large areas for parking and a large range of goods on display. Remember that on the continent the average hypermarket ranges from 55,000 sq.ft. of sales in the Netherlands, 60,000 sq.ft. in West Germany, 63,000sq.ft. in France, to 70,000sq.ft. in Belgium. With the advent of the Common Market there are to be even closer trading links with the countries of the Common Market. Already there are giant retailers on the continent such as Carrefour in France, G.B.Enterprizes in Belgium and don't be mislead by the name, Wartkauf in West Germany and Albert Heign in the Netherlands. What is going to happen to trading when this comes about? Retail markets have an extremely important part to play in the life of our towns. There is a great need for them, already they have the foothold through their tradition. They have a name for bargains.

The last slides show the latest developments in markets in Canada where realisation has been brought home and I would like you to think very carefullly about the cross roads that I feel retail markets have now reached.

Conclusion It was said last year that the market must be amongst the most human of all our institutions, an area of self-expression. Should you allow your markets to decline and allow buildings to be erected which are not worthy of the standard of our town centres, that are not planned properly you could very well be contributing to the degeneration of town centre shopping.

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It is not the point of whether there are pieces of sculpture on the walls or whether the buildings are monuments and I have already pointed out that you need good planning and cost control and full potential use of the site and good buildings. Do not forget the period of inflation which now exists and remember that the building industry is a basic industry of this Country. The cost indecies have shown the rise in costs during the last years and over the last year or so a very rapid increase is evident. Inflation hits hardest at the basic industries and you are going to be faced with this further rapid increase in costs, and at the same time with competition in trading from other sources as I have mentioned. With this in mind new markets must be of a high standard, must be in the correct position, and provide every facility for the housewife. It is being done in shopping and retail market developments must keep in step with this progression.

As a parallel I have before shown you how shopping precincts have, and are changing and whether you accept it or not they are progressing. Retail stall markets are part of the shopping life of this Country whether enclosed or open, they must not be allowed to decline.

I have welcomed Alderman Moyes' comments last year as I feel that it was his right to introduce these observations. I trust that I have explained his criticism and that as Architects we are not working as an isolated group, but have your problems at heart and with closer co-operation and understanding will overcome these hurdles. We are not so far apart.

Kenneth Wood, F.R.I.B.A.

(Wood, 1972)

2. Postscript

An alphabetical listing by place of buildings and public art mentioned in the current text with brief notes on subsequent events.

Note that 'Listed' refers to recognition that it is of national heritage significance. The absence of such a comment does mean it is not listed.

Aarau

Market hall (2004). In use.

Accrington

Market hall (1868), Listed 1984, is a working market. Refurbished in 2010.
Fish market and covered market (1962). Unrecorded and demolished 2003(Harwood, 2006)

Adel, Georgia

City hall in use

Algeciras

Market Hall (1934) A working market in 2010.

Figure D-21 Algeciras Market Hall (1934) in November 2009
http://eng.archinform.net/projekte/4929.htm

Figure D-22 Algeciras Market Hall (1934) in March 2010 http://eng.archinform.net/projekte/4929.htm

Altenrhein

Market hall (2001). In 2011 a cafe and gallery.

Archangelsk

Archangelsk market (1980s). A working market in 2000.

Aylesbury

Friars Square market (1968) closed by 1990 and was demolished and the centre altered in the 1990s. The architects Stanley Bragg was awarded a British Council of Shopping Centres Commendation for Best Refurbishment of a Shopping Centre Award 1994.

Barcelona

Santa Caterina Market (2005). A working market and more – a great success.

Barrow in Furness

Market (1971) is a working market; the offices and shopping precinct have undergone major changes and been clad. Interior mural insitu.

Bedford

Parkdene Infants School (1959) Roof extant. Now named Stephenson Lower School.

Texas Instruments factory (1961). Not listed, extant, altered. Building occupied by a number of businesses.

Birmingham

Market hall (1851).The 1851 fountain is thought to have been removed in 1880 and destroyed in 1923 (Noszlopy, 1998). The market was damaged by bombing in 1940, demolished in 1965.

John Poole's rotunda relief is insitu in the listed refurbished Rotunda

Market hall (1962) demolished circa 2000.

Blackburn

Six day market hall (1964) was refused listing in March 2011 and closed in June 2011. Planning consent for a bus station on part of the site was granted in October 2012 (Application 10/09/0939) Market (2011) was awarded 'UK's Best Indoor Market' by NABMA in January 2012. Occupancy was at 77% in August 2012 causing the council concern.

Bletchley

Covered market (1976). Badly damaged by arson 3 November 1994 and demolished a year or two later (personal communication, Herb Booth 10 September 2011).

Bradford

Kirkgate Market (1872), demolished 1973.

Kirkgate Market (1973), unlisted, a working market with alterations.

Figure D-23 Kirkgate Market, Bradford (2009)
http://www.flickr.com/photos/chairman8/3948602576/

John Street Market (1969) destroyed by fire 3 November 1977. Later rebuilt, now known as Oastler Shopping Centre.

Bristol

Church at Lawrence Weston (1951) Demolished.

Mound Stand (1959) insitu. Listing refused without assessment in 2011, on appeal in January 2012 and after a review request in February 2012 was again refused. There was a 2010 planning consent for demolition and redevelopment. In May 2012 a planning application for demolition and redevelopment was given consent by Bristol city Council, ref 12/01237/F. Redevelopment of the Mound Stand is expected in October 2013.

Brussels

Philips Pavilion (1958) demolished 30 January 1959
Volkswagen showroom (1958) demolished

Burnley

Market hall (1969). Not listed. In use.

Burton upon Trent

Market hall (1883). Not listed. Is a working market http://www.burton-on-trent.org.uk/category/surviving/market

Bury

Market hall (1971). Not listed. Is a working market. Roof has brise soleil additions. There is also a modern separate meat and fish market

Caen-La Guérinière

Château d'eau-marché (1956-8). Listed. Never opened as market Reported to be used as municipal office, outreach and community centre. In 2011 it was the subject of a trompe-l'œil arts project, Grange Zero; http://vimeo.com/27443786

Carmarthen

Market hall (1981)

A NABMA Management Board meeting in 2007 was told by Jonathan Fearn, Head of Corporate Property and Cyril Davies, Property Development Advisor, Carmarthenshire County Council that "The existing 1981 market suffers from extreme temperatures and poor layout and therefore the market will be demolished and rebuilt as part of a larger regeneration retail scheme and a 1,000 space car park."(NABMA, 2007)

The market was demolished on the opening of the 2009 market hall.

Casablanca

Rue D'Agadir market (1975). Listed and unaltered as a daily market.

Castle Vale

Shopping centre demolished and redeveloped (Mornement, 2005)

Cinncinati

Frisch's Mainliner restaurant, demolished.

Johnson & Hardin printing plant, extant.

Indian Hill High School, altered.

Private residences, unknown.

Coalville

Market hall (1975). In use. Stalls have been replaced. In 2008 relocation of the market was considered by the council. Late in 2011 relocation was being planned.

Colchester

Spurling's garage, petrol station canopy, North Station Road (1961). Station demolished

Coventry

Market hall (1957) in use. The fish market (factory building) and tower were demolished in 2006.

Figure D-24 Coventry Market after demolition of tower (Market Trader 5 August 2011)

To celebrate its 50th anniversary a community musical was made by BBC Coventry & Warwickshire, Coventry Market, the Musical; http://www.youtube.com/watch?v=QI9RCzN6oN0

Council plans to demolish the building were frustrated by listing in 2009. An appeal against the decision failed in July 2010.

"The move is a major blow to Coventry's hopes of bulldozing the market as part of £1 billion city centre redevelopment plans" (Anon, 2010a).

Darwen

Market hall (1975)

Extanct and in use. Bridges removed, the elevations now clad in coursed sneck and jump stonework (see Figure D-25). In May 2010 there was a contested news story about alleged structural issues; *Darwen market hall 'concrete cancer' claims* (http://www.blackburncitizen.co.uk/news/8153739.Darwen_market_hall__concrete_cancer__claims/)

Figure D-25 1975 Darwen Market with old markets beyond. Note the stone cladding and, on the right, pale concrete of the parapet indicating the site of a former bridge abutment (Google Maps 2009)

Derby

Eagle Centre (1975)

“By the 1980s, the complaints were as vociferous as ever. Then, in 1990, fate appeared to take a hand when it was found that the fire regulations had been contravened and the immediate closure of the market was ordered while it was redesigned and rebuilt” (Anon, 2007a).

Edgbaston

Five Ways Centre (1962) is altered with the exterior murals replaced.

Florence

Loggia del Mercato Nuovo (16C).18C statues insitu. Popularly known as the Loggia del Porcellino. Market in use. Part of a UNESCO World Heritage Site.

Frankfurt

Wholesale market hall (Großmarkthalle) (1929)

From 1941 the building was a collecting point for the deportation of Jewish men, women and children from Frankfurt and its region. Since 1997, this role within the holocaust has been recognised by a commemorative plaque. The building was listed in 1984 and closed as a market in 2004. It is being converted to be the headquarters of the European Central Bank. The main part of the hall will be preserved. It will mainly house the public functions of the ECB, such as a visitors' area, the staff restaurant, as well as press and conference spaces.

http://en.wikipedia.org/wiki/Gro%C3%9Fmarkthalle

Gloucester

Eastgate market (1968) in use.

Harborne

National self-service filing station (1968). Canopy demolished circa 1997. In 2011 the site was a BP filling station.

Hatfield

Swimming pool (1966) Extant. Remodelled in 1989-91 and a £750,000 refurbishment in 2006 but the roof remains. LED lighting now emphasises the ceiling.

Figure D-26 Hatfield Swim Centre, 2008
http://www.ledinside.com/LED%20fixtures%20enhance%20swim%20center%20architecture_20080611

Hendon

Boosey & Hawkes factory (1040s), demolished.

Huddersfield

The 1953 television relief was salvaged at demolition by the author in 1995, entrusted to Huddersfield Media Centre and subsequently lost.

The Peter Peri Welcome sculture was cut down and damaged in 2012 is currently on college grounds

All other art works are insitu

Ilkeston

Charnos lingerie factory(1959) Demolished in 2007(Anon, 2007b)

Jena

Zeisshttp://en.wikipedia.org/wiki/Carl_Zeiss Planetarium (1925)

The oldest continuously operating planetarium in the world. It was opened on July 18, 1926. The planets and fixed stars are projected onto the inner surface of the white cupola.
http://en.wikipedia.org/wiki/Planetarium_Jena

Jerusalem

Israel Museum (1965) In 1966 Prof. Al Mansfeld and Dora Grad were awarded for its design the Israel Prize for Architecture, the most prestigious national recognition.

In 2010 the Israel Museum completed a comprehensive changes to the campus, Mansfeld's opus.

Figure D-27 The renewed Upper Entrance Hall at The Israel Museum, Jerusalem.
Photo © Tim Hursley (Israel Museum)

“The renewal of the Museum's campus was designed by James Carpenter Design Associates, New York, and Efrat-Kowalsky Architects, Tel Aviv, with A. Lerman Architects, Tel Aviv, to reinforce and resonate with the character of Mansfeld's original

“The Museum’s Upper Entrance Hall – originally the main entrance to the galleries and today preserved as a tribute to Mansfeld’s architectural achievement – combines four such modules, the largest massing of these forms on the campus. Its roof floats above four columns; light enters from above on the east, south, and west, and through a full-height glass curtain wall on the north, facing the Knesset on the adjacent hill. The conservation of this space recognizes and celebrates the lasting power of Mansfeld’s vision for a Mediterranean modernist language – a language linking the Museum to the period in which it was created, while also reflecting the universal and timeless nature of its encyclopaedic”(Israel Museum)

Katowice

PKP station(1972), demolished 2011.

Keighley

Shopping centre is extant, much refurbished. Rombald statue is in the precinct
Market (1971) is a working market.
As the single skin roof led to condensation problems; “ indoor ‘rain’ cascaded down onto stalls every winter” (Thompson, 1985) in 1982 Bradford Council agreed to a plan to replace the roof with a double skin profiled insulated metal sheeting with double skin roof lights supported on steel trusses and columns. This also led to the replacement of all the island stalls(Keighley Market, 1985).

Over the years the Wheel and Fire sculpture was moved several times to positions outside the market until 2009 when the market was extended to the front elevation. The sculpture was to moved to Our Lady of Victories School, Guard house, Keighley(L. Campbell, 2009).

Figure D-28 Wheel and Fire sculpture at Our Lady of Victories School (2010)
http://keighleyhistory.proboards.com/index.cgi?board=general&action=display&thread=402

Kingswinford

Townsend Crescent rotunda (1963) was still a showroom for electrical goods in December 2011. Locally listed(Swift, 2000).

Leigh

Market hall (1968) demolished c1990? A subsequent market hall seems to have been built and demolished. Current market hall is on Gas Street. http://www.leighmarket.co.uk

Leicester

Braunstone School (1961) demolished

Covered market (1971). The 1971 market roof was replaced in 1978 as the GRP failed and the roof leaked. The steel frame remains supporting a saw tooth roof. In 2010 part of the market was demolished to be replaced in function by temporary gazebos.

Lincoln

Lincolnshire Motor Company Showrooms (1961). Listed in 2000. Much altered but roof insitu. The building has been a public library and is now restaurants.

Figure D-29 Former Lincolnshire Motor Company Showrooms, Lincoln
http://en.wikipedia.org/wiki/Sam_Scorer

Liverpool

London, Midland and Scottish Railway timber storage shed (1936), lost.

Mathematics and Oceanography Building and computer room (1961). The unlisted building extant. In place of the penthouse block with its cantilevering shells is “a grossly inappropriate replacement”p221(Sharples, 2004) and the large pyramidal panels have been replaced by brick(Sharples, 2004).

St John’s Market (1970) is a working market. The precinct has undergone many changes.

Llanelli

Market (1970) is a working market.

A NABMA Management Board meeting in 2007 was told by Jonathan Fearn, Head of Corporate Property and Cyril Davies, Property Development Advisor, Carmarthenshire County Council that “Llanelli market is to benefit from a £500,000 refurbishment that will include an upgrade of the market hall and precinct; the location is under a multi-storey car park and various problems are experienced. The aim is to improve and lift the lighting, provide substantial redecoration and replacement of flooring. There is also an intention to improve the fish market area element.”(NABMA, 2007)

The precinct been covered and undergone many changes.

London

Columbia Market (1869) was used as a warehouse until demolition in 1960.

London Zoo Penguin Pool (1935), listed but disused.

Two Saints School, Southwark (1960). Listed grade II in 1993. Later called Geoffrey Chaucer School. Now called the Globe Academy. In 2007 demolition was planned.
http://www.c20society.org.uk/casework/reports/2007/geoffrey-chaucer-school-faces-demolition.html
In 2011 the pentagon building was being converted into a specialist performing arts block.

The nine Dorothy Annan murals (1961) on the Fleet building, Farringdon Street were listed in November 2011 and listed building consent for their removal was granted in September 2012. They are expected to be remounted at the Barbican.

Commonwealth Institute (1962) Listed grade II* in 1989. The roof was replaced in 2000-1 and the building closed in 2002. Currently being converted for the Design Museum.

Barbara Hepworth’s Winged figure (1963) on John Lewis’s is insitu. A full size maquette of the work went on permanent display at low level at the Hepworth gallery, Wakefield in 2011.

Figure D-30 Barbara Hepworth, 'Winged Figure prototype' at Wakefield. 1961-2. Aluminium. Photo: Jonty Wilde
http://www.royalacademy.org.uk/ra-magazine/blog/ra-magazine-blog-hepworth-wakefield-wows,105,BAR.html

Petrol station canopy, Upper Thames Street (1963), no further information, fate unknown.

Serpentine restaurant (1964), demolished c1990.

The Elephant and Castle shopping centre (1965) was masterplanned by Southwark Council for redevelopment in 2004. Consent was gained in 2010. Plans for the centre have been delayed, with demolition not now scheduled until after 2014.

Longton

See Stoke

Luton

Market(1972). Is a working market.

Lydney

Factory(1941), demolished

Madrid

Frontón Recoletos (1936)

During the Spanish civil war, the building suffered several direct hits though bombimng. Unable to be repaired the damage at the time the debris was a partial collapse. In1942 Torroja presented a study on the technical causes of the collapse and the works that would be needed to bring the building back into service, however the poor condition of the work prevented realisation occur before the total collapse. In 1973 the building was completely demolished.

http://es.wikipedia.org/wiki/Front%C3%B3n_Recoletos

La Zarzuela racecourse grandstand(1935)

After long periods of being closed the course is functioning again The stand was listed in 1980.Restored in 2008.

Manchester

Manchester wholesale fish market (1873) closed in 1977. Listed grade II. The Bonehill reliefs are insitu with the building's shell having flats built within. Pigeon mesh obscures the views of the scenes.

Wythenshawe bus garage (1942) Listed grade II* in 2001. Privately owned.

Arndale Centre market (1976) Lost through a IRA bomb in June 1996. A new single-level unit for the market opened in 2006.

Markham Moor

National filling station (1960). The station closed and became derelict. The canopy survived and was converted into a roadside diner in 1989 which closed in 2012.

Figure D-31 Former National filling station, Markham Moor (Author 2004)

Figure D-32 Former National filling station, Markham Moor, interior showing painted shell soffit texture.
(Author 2004)

Figure D-33 Markham Moor February 2012 (http://www.yellojelly.com/?p=394)

Mexico City

Cosmic Rays Laboratory (1951). Listed

Coyoacán Market (1955) Existing market, hidden by later development.

Iglesia de la Virgen Milagrosa (1955) “Today it still stands in good condition, representing Candela’s mastery of discipline and play with the hyperbolic paraboloid” (Garlock & Billington, 2008).

Palacio de los Deportes (1968). In use as sports and concert hall.

Nelson

Market hall (1968) In use.

New York

Library reading room, Hunter College (1959), extant, now the Fine Arts Building of Lehman College http://www.lehman.edu/vpadvance/artgallery/arch/buildings/Lehman_FA_Shuster.html

TWA Terminal (1962) at John F.Kennedy Airport. Listed in 1994. The terminal has been renovated, partially encircled by and serves as a ceremonial entrance to a new adjacent terminal completed in 2008. Together the buildings are known Terminal 5.

Northwich

Market hall(1965) in use.

Figure D-34 Northwich Market Hall (2009) http://maps.google.co.uk

Nottingham

Victoria Centre Market(1972). Market now on upper floor only

Omaha

Commercial Federal Bank. Became a Bank of the West in 2005. In 2009, the building appeared to be vacant www.agilitynut.com

Paris

RER station at Terminal 3/Roissypole, Charles-de-Gaulle Airport (1976). In use.

Pine Mountain

Callaway Gardens Pavilion (1959) In use

Figure D-35 Callaway Gardens Pavillion (www.agilitynut.com)

Plymouth

Pannier Market (1959) Listed in 2003. In use. Murals insitu.

Preston

St Georges Centre (1965) extant but covered and totally refurbished.

Raynes Park

Garden Centre (1965). The owners, Carters Tested Seeds removed the garden centre having decided to sell the site for development only a few weeks after its construction. Was subsequently erected at a garden centre in Twyford and later demolished.

Reims

Boulingrin market hall (1929) Listed. Market closed in 1988. Following current renovation the hall is to be used again as a market as well as art museum and for cultural events – from 2012/3

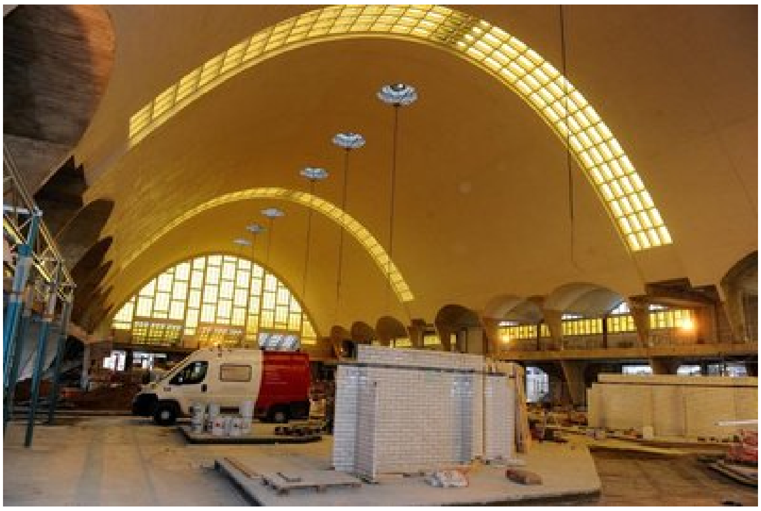

Figure D-36 Boulingrin market hall (2012)
http://www.lunion.presse.fr/article/economie-region/futur-marche-boulingrin-place-dabord-au-reglement

Rome
Palazzetto dello Sport (1957). Extant.

Rotherham

Market (1971) is a working market.

Canopy over open market (1988) in place.

Rotterdam

Naum's De Bijenkorf sculpture is insitu and listed. It has been restored at least once. Further restoration is being planned
http://sculptureinternationalrotterdam.nl/column/110216_Naum_Gabo_controverse.php?lang=en

Rotterdam Market Hall by MVRDV is due to open in September 2014

Royan

Market hall (1956) Listed and in use. It is said to have served as model for the conception of the Nanterre market and the National Centre of Industry and Technology (CNIT) in Paris's La Defense (Archibald, 2011)

Figure D-37 Royan Market, 2011 (Archibald, 2011)

St Anthony Village, Minnesota

Apache Plaza (1961). Severely damaged by a tornado April 1984, reopened without the coloured glazing late 1984. Closed and demolished 2004.

St Louis, Missouri

Lambert Airport main terminal (1956). Now known as Terminal 1, Lambert-St Louis International

Airport. It has had many alterations and interventions over the years. Following tornado damage in April 2011 It has been is undergoing alterations and restoration and will be until late in2012.

Salford

Cruikshank & Seward's 1962 Cromwell Secondary School for Girls was demolished in 2009. During demolition Boyson's Tree of knowledge was listed and in 2011 one structural bay remains with the mural insitu and intact.

Scunthorpe

Market Hall (1972) is a working market

Sète

Criée Aux Poissons (1967) in use. Changes to the infrastructure with cold stores and ice plant has altered its appearance.

Figure D-38 Criée Aux Poissons (author montage)
http://www.archicontemporaine.org/RMA/p-8-lg0-La-Criee.htm?fiche_id=1667

Access is for trade only but visits can be arranged through the tourist office.

Shipley

Market hall (1961) in use. In November 2011 the original market signage was insitu, the escalator was working and one stall still had its 1961 design and fittings.

Shrewsbury

Market hall (1965) in use.

Sidi Bel Abbes

Both market buildings extant in 2011. The vegetable market has been a planetarium since 1988 and known as the Coupole. Use of fish market unknown. Both buildings are surrounded by market stalls.

Figure D-39 Sidi Bel Abbes Planetarium, the Coupole, 2008 surrounded by a market.
http://www.flickr.com/photos/codognanais/2608039427

Southsea

Clarence Pier (1962). Pier in use. Hypar roof demolished.

Springfield

Service station toilets on I-55 (1964) Extant.

Stevenage

The concrete clock and bell tower is insitu

The Cooperative mural (1959) is insitu with a ‘Primark’ sign on it

The John Lewis distribution centre (1963) closed in 2012.

Stoke

Longton market hall (1862) remains a market. In June 2011 it was announced by Stoke City Council that a £50,000 heritage grant was about to be used to improve aspects of the building.

Sydney

Opera House (1973). In 2003 the buildings first architect Jørn Utzon received the Pritzker Prize, international architecture's highest honour. The building was added to UNESCO's World Heritage List in 2007. Hugh Tottenham has never seen the building.

Walkden

Market hall (1965) market until demolition in 2003(Chronnell, 2003) After redevelopment a new market opened in the Ellesmere Centre.

Wakefield

Market hall (1964) demolished on opening of market in 2008.
Market hall (2008), the food hall opened in2008 but was soon closed. Environmental health officers found there was the risk of contamination from poor ventilation, inadequate temperature control and drainage problems. It went underwent a re-design and reopened in 2010.

Wallsend

Forum Shopping Centre (1966) still trading. Modified and roofed, murals have been lost. Hans Schwartz's statue has been relocated nearby.

Wilton

Royal Wilton Carpet factory weaving shed (1957), demolished.

Wolverhampton

Market hall (1960) in use 2011. The restaurant is now a bric-a-brac and Collectables market. Also "A major improvement programme including the provision of a new landmark entrance, offering full access for everyone and a new market office"
http://www.wolverhampton.gov.uk/leisure_culture/entertainment/markets/wolverhampton.htm

Figure D-40 Entrance to Wolverhampton Indoor Market 2010
http://www.geograph.org.uk/photo/1928979

Wolverton

Sports pavilion (1972). The building was characterised as a Nissan hut with warts by those who could remember World War II buildings but it became more popularly infamous as the Pineapple. The structure was hated by the sports clubs. It was soon sold to a Somerset farmer for chicken housing. After it disappeared, a little Wolverton girl decided that she missed the Pineapple and wrote to the BBC TV show *Jim'll Fix It* asking if they could find it for here. The BBC arranged for her to go to Somerset and filmed her running across a field to visit the Pineapple "chicken shed". (Dunleavy, 2011)

Worcester

Berrows printing works (1965). Extant in 2012, newspaper offices and printing plant.

Xochicalco, Morelos

Xochicalgo was listed in 1994 and included on the UNESCO list of World Heritage Sites in 1999.

Yardley

Tivoli Centre, later known as the Swan Centre, demolished and under redevelopment in 2012.

Yeovil

Sports hall (c1960) in use.

York

Theatre Royal extension (1967). Theatre was listed in 1954 and is now listed Grade II*. http://list.english-heritage.org.uk/resultsingle.aspx?uid=1256767

Zurich

Cement Hall for the Swiss National exhibition of 1939 demolished at close of exhibition

Appendix E Cover Aversions by Phil Norman

Friday, 8 May 2009 http://letslooksideways.blogspot.com

David Quantick, that repository of chart-oriented bile, once memorably described Menswear's Johnny Dean as something you'd get 'if you wanted Brett Anderson for Christmas, but your mum had gone to the covered market in town and bought you a crap knocked-off version with the wrong hair and a leg that fell off as soon as you got it out of the box.' While this just about summed it up for Johnny, I've never forgiven his slight against that bastion of loose change consumerism: the covered market.

I'm not talking about those lovely Victorian covered markets like those quaint arcades you get in Leeds and Oxford. To get to the right kind of covered market you need to take a long walk down a shallow concrete ramp. It's about 4.15PM on a Saturday, by the way, the only time to pay a visit. It'll be a heavily overcast sky above, lowering clouds scudding lazily by forever teasing with the portent of a downpour that never quite arrives.

Atmospherically oppressed from above, overcoated folk hurry about to get their 'last minute bits and bobs' before the various joys of Saturday evening are upon us.

If the atmosphere above deck is one of gathering storms, unsupped pints and unclaimed dividends, at the bottom end of the ramp it's altogether more intense. I'm getting concrete, I'm getting sawdust, I'm getting freshly gutted mackerel. I'm getting… yes, all right, piss.

But the olfactory overload is nothing compared with the headache engendered by the criss-cross network of strip-lighting that illuminates the scene. Council officials have diligently ensured that a mandatory thirty percent of the overhead lighting is set to a permanent wild flicker, giving certain corners a definite 'epileptics keep out' air. God knows how the old dears manage to keep body and soul together as they browse the haberdashery stalls in ambient conditions that would have been deemed 'a bit much' at Studio 54.

The concrete cavern may be solid enough, despite being only twenty years old (FACT: all covered markets were opened by either Prince Michael of Kent or Vince Hill), but the stalls themselves are permanently on the verge of collapse. The favoured building material is pegboard. All the better to hang loads of packets of wool and Rawlplugs off, certainly, but it doesn't half give the impression of a Mexican shanty town, eking out a meagre existence under the feet of the mighty 'proper' shops, which hum with an assured briskness that will never be echoed in these little numbered cubicles with the proprietors' names spelled out in one-size-fits-all municipal stick-on lettering, those council men having dislodged a regulation one character in ten.

Quantick's hypothetical mother, despite sounding like something the Large Hadron Collider should be looking for, would head straight to the toy stall, a cubicle no more or less dour than those offering fresh meat or plumbing supplies. Eschewing a cutesy nom de commerce like 'tots' wonderland' for the more reliable 'Alan's Playthings', the range of products crammed into this 8 x 8 foot magic kingdom is not in doubt. But they're Johnny Deans all the way.

Where Alan really excels is in the novelty department. The kind of practical joking tat eschewed by the more respectable emporia is here in abundance, making Alan's gaff the nearest you could get to those mythical 'joke shops' the folk of the Beano were ever dashing into. Only without the abundance of on-premises chuckles. Novelty vending is a serious business, and customers implicitly understood that any joy to be extracted from said goods is only to be done when said goods are well out of the sight of Alan.

All this surly transaction is good practice for the progress from black soap to Black Sabbath, and a trip to the second hand record stall. The intimidating atmosphere of second hand record shopsis famed in novel and film, but the stall's an even bigger ordeal. After all, in the shop the tubby know-all with the PiL t-shirt and the thousand well-argued reasons why compilation albums are for the mentally deficient is up to six feet away. At the stall it's more like six inches. And he knows the contents of those punnets back to front - every hesitation you make in the lengthy flicking process is read, deciphered and facially disapproved of while you sweat. Bomb disposal operatives have a more placid time of it. Inevitably you leave with nothing, pining for a fantasy future where buying music involved no human interaction whatsoever.

In fact, best to get out of the covered market altogether. The stalls are battening down their unwieldy plywood hatches and that miserable bloke is disconsolately pushing a hinged double broom arrangement in your direction - a final ‘clear off out of it’ gesture if ever there was one. Time to get back to the surface people. The Pink Panther’s on in a minute.

Appendix F Wilhelm Silberkuhl

An entry in a biographical dictionary of engineers includes:
"Nach dem Studienabscluss 1935 fuhrt Wilhelm Silberkuhl zusammen mit Professor Fiederling ein Industrieplanungsburo. Nach dem krieh bis 1947 Assistant und Dozent an der Technischen Hochschule Hannover, get Ausland, vor allem von 1948 bis 1953 nach Sudamerika, woe r Fabriken und Kraftwerke plant und baut. p394 (Silgat, 2004).

This translates as;
"After his graduation in 1935 Wilhelm Silberkuhl opened an industrial design office with Professor Fiederling. After the war until 1947 he was an assistant and lecturer at Hannover Technical Univeristy and he went abroad from 1948 until 1953, to South America, where he planned and built factories and plant."

Another history suggests Silberkuhl kept bad company in South America. After World War II Argentina became a leading haven for Nazi war criminals, with explicit protection from president Juan Perón. The Compania Argentina para Proyectos y Realizaciones Industriales - Fuldner y Cía (Argentine Society for industrial projects and their execution - Fuldner & Co.) (CAPRI), was an Argentine company set by the former SS - Hauptsturmführer Horst Carlos Fuldner founded early in 1950 in Buenos Aries, under the patronage of the national water and energy corporation Agua y Energía Eléctrica. The company was set up with Perón's patronage to help Nazis fleeing from Europe, including many wanted war criminals who had entered the country on the run from criminal prosecution under a false name in the country, for example Adolf Eichmann.

"The upper echelon at CAPRI was a veritable Who's Who of Third Reich technocrats. Fuldner enrolled Fritz Maria Küper, the former public works inspector at Hitlers' transport ministry and engineer in charge of Nuremberg port, and the Reich's expert bridge builder, Beer. Engineers fresh off the boat such as Viktor Elleder, Heinz Ludwig Ostertag, Karl Laucher and Wilhelm Silberkuhl were also among the 'experts' taken under Fuldner's protective wing."p302 (Goñi, 2003)

By July 1953 the company's fortunes began to plummet, along with most of Argentina's economy, this and the political situation Argentina led to a lack of government orders in the years of 1954/55 and forced the company to file a petition for bankruptcy in 1955. The company's German associates scattered. While Eichmann had already returned to Buenos Aires in 1953 and settled down in the suburbs of Olivos, people like Küper, the former SS Officer and president of the Technical University of Graz in 1941-5, Prof. Armin Schoklitsch and the engineer Silberkuhl immigrated back to Germany or to Graz, Austria like the notorious ex Gauleiter of Steiermark, Siegfried Suiberreither. (Goñi, 2003)

Silberkuhl's wartime occupation remains obscure.