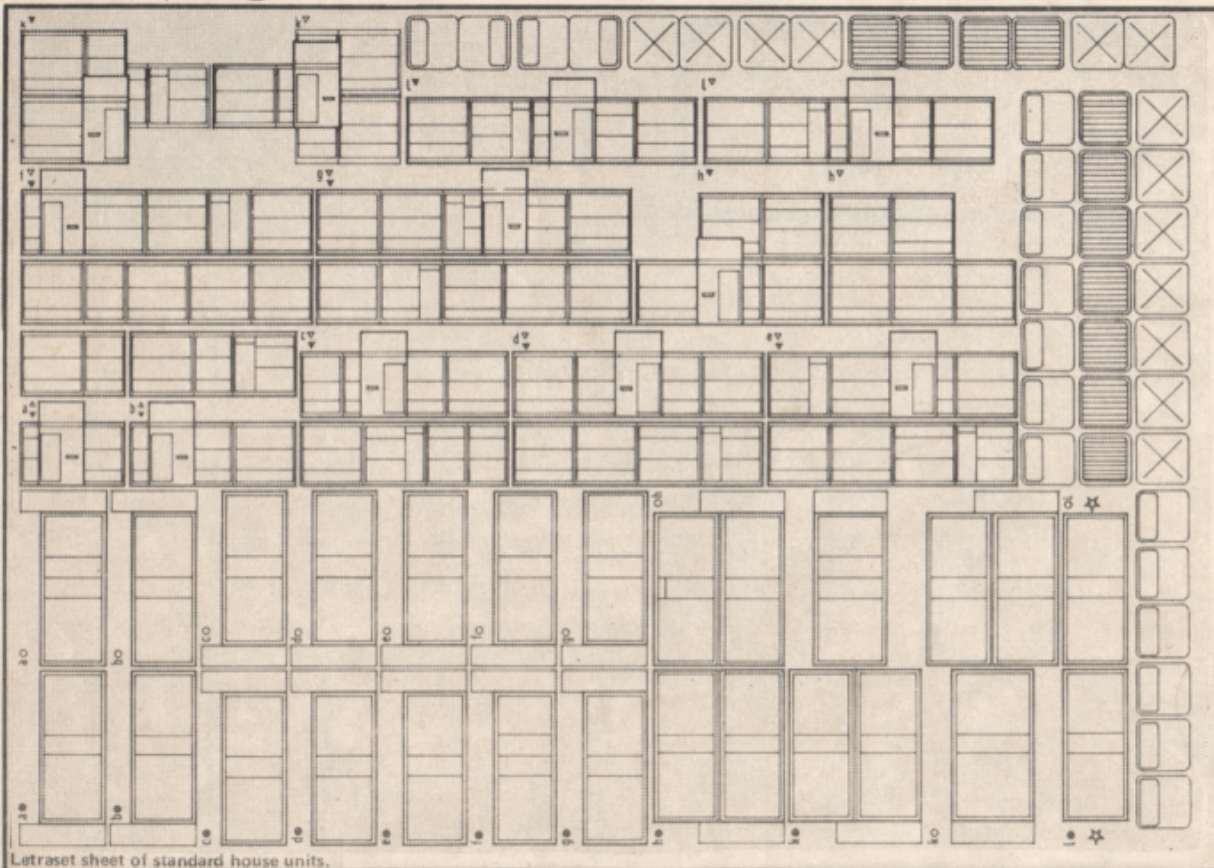
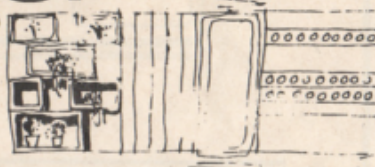
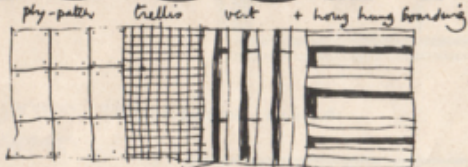
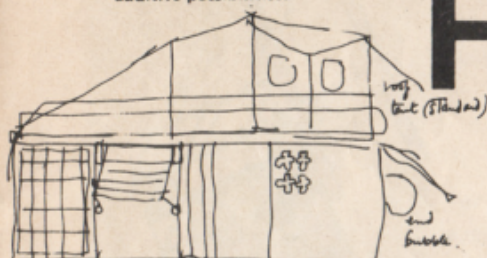


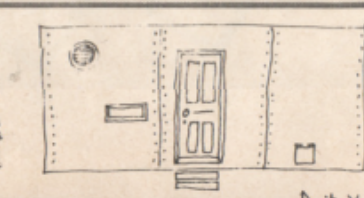
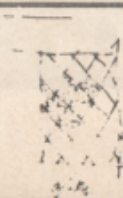
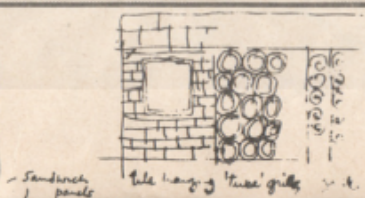
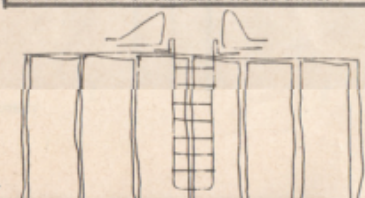
This is the fifth and last part of the serialisation of the work of Cedric Price and the second part of his research and development on housing.

Sketches showing additive possibilities.

HOUSING



Letraset sheet of standard house units.



CEDRIC PRICE SUPPLEMENT 5*

68+ 81 A35

HOUSING RESEARCH Pt 2 (See Pt 1 AD Oct 1971 p.619-630)

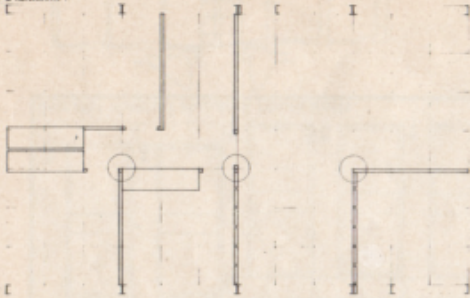
The structure is such that only single or double decked enclosures can be constructed. Thus an immediate limitation is established both in the range of socially operational patterns and in collective/structural conglomerates i.e. the capacity to extend sideways at two fixed levels restricts the three dimensional possibilities to matchbox level. The vertical external skins of the initial models provide three planes of user activated variation, on the 'sides' of the houses. The sealed fully glazed external plane can be overlaid to choice. The end walls provide the main condition for volumetric extensions and major users planned openings. The various standard stores are self-supporting and capable of interlinking.

COMMENT

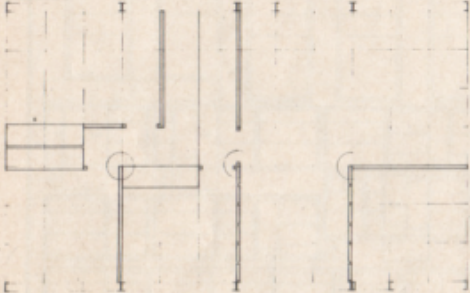
Although the roof can take average live loading and when decked can be used by people, I think there should be more investigation into varied height volumes — not possible in this scheme unless the entire unit is stood on end. (To be investigated). It will be interesting to see just how much voluntary customising is undertaken by the users.

☆ (See also AD 10/70, AD 1/71, AD 6/71, AD 10/71).

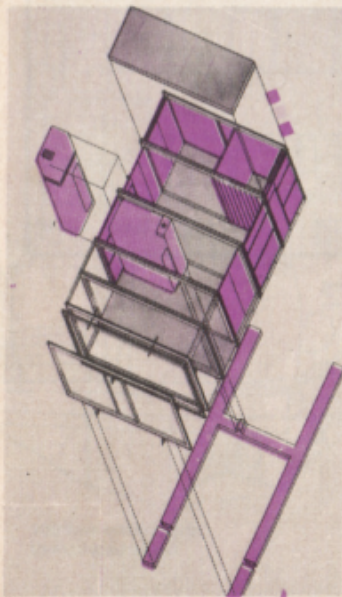
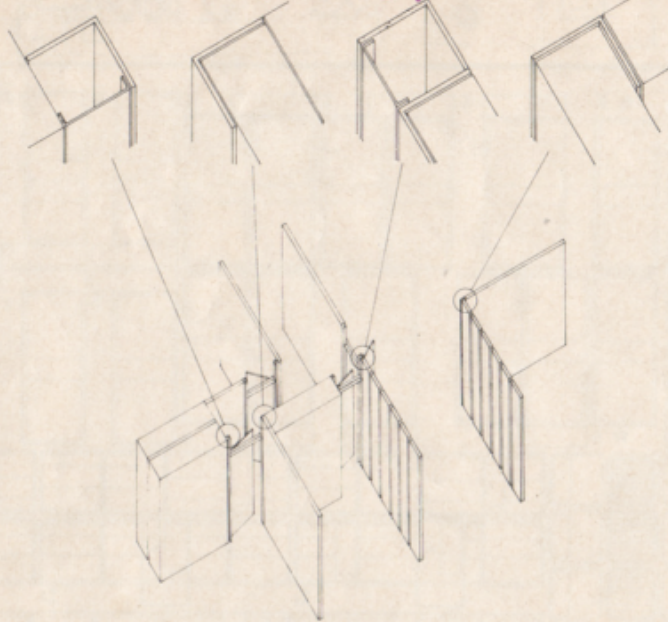
ALTERNATIVE 1



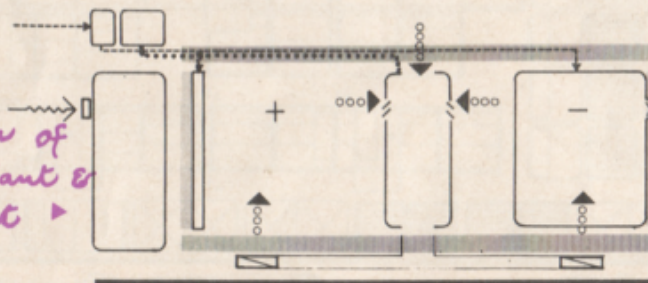
ALTERNATIVE 2



vertical tolerance?

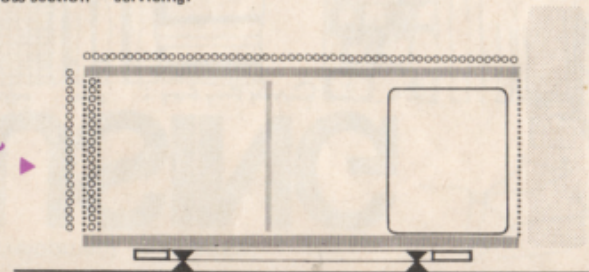


separation of
service plant &
equipment
enables
variable
installation



Cross section — servicing.

oooo: plane of
user
control



Cross section — materials and components.

Axonometric.

The off-grid positioning of internal partitions enables mechanical fixing to main structural rings. The partitions have no additional structural use thus enabling the total removal of internal barriers if required.

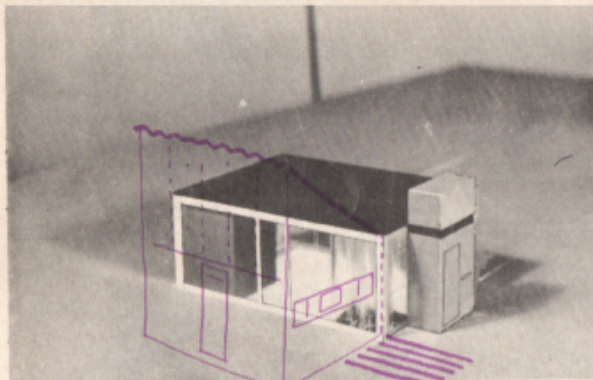
The axonometric indicates the major production separate of units — both structural and non structural. Thus the production of these separations would not need to be inter-related. It is likely the rate of replacement of the individual separations would vary considerably over 20-25 years.

Obtaining an acceptable floor deflection was the major determinant of the size of the major steel rings. There is no structural continuity between the 'rings'. Each ring is full house width and 2 or 3 modules wide (m=900). The wet services are self contained and ventilated separately from the H plan air conditioning system. Waste outlets pass through a purpose made connection block with a variable intake gasket enabling the same waste connection to service any of the wet services units through a 360° range of positioning on plan.

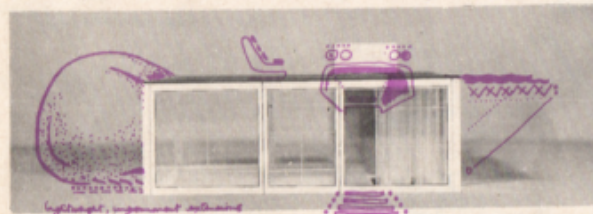
The air conditioning plant — a standard Lennox installation can be electrical or gas fired. The condenser unit is fixed on top of the porch unit which is itself a self contained structure requiring its own footing. The porch also contains the mains connection and meters which are displayed externally.

COMMENT

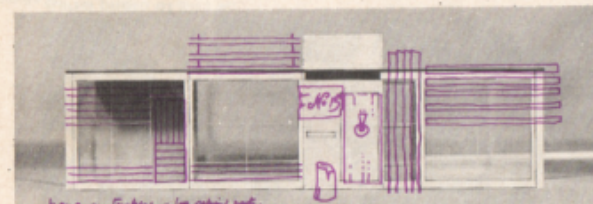
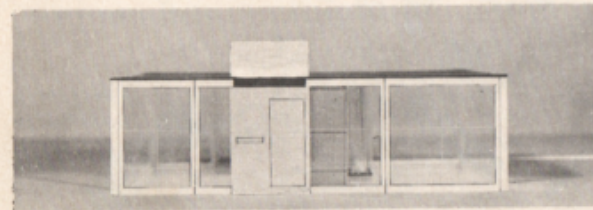
Although the full air conditioning can be afforded in the total cost and still meet the current cost yardsticks (stupid things) due to the fact that the building is totally sealed its use has been questioned by several critics of this project. Obviously if the 'ends' are opened up the plant would be switched off.



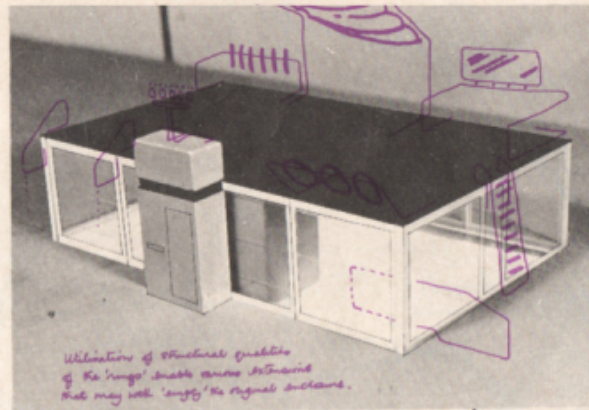
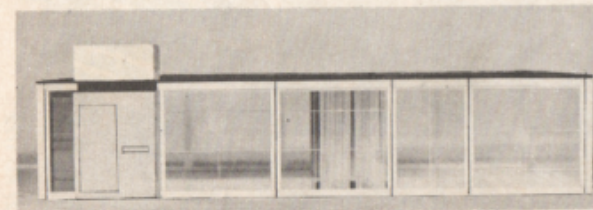
the permanent 'extension' that redefines the original unit



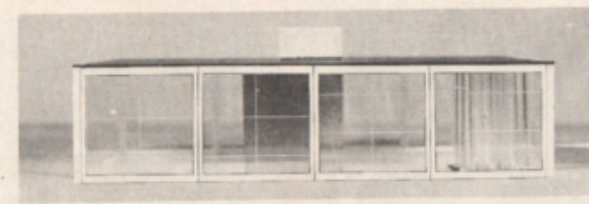
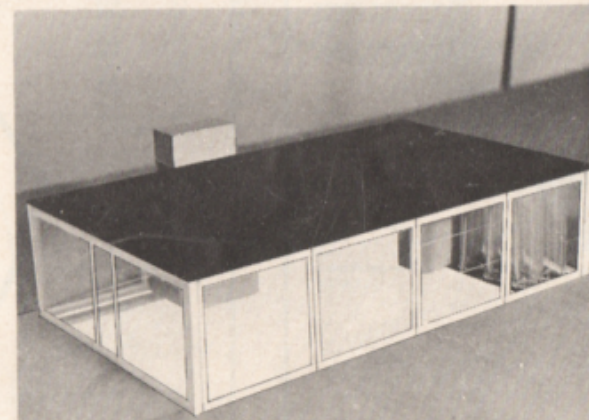
lightweight, permanent extension



hang-on timber - big cabin roof



Utilisation of structural qualities of the 'hang-on' timber cabin structure that may well 'enjoy' the original building.



Internal structure defined by permanent timber

sites which in normal soft architectural environmental terms would be extremely dissimilar. The differences had to include: Climate Air content Soil Natural and man made access National and regional siting Population trends Employment prospects Educational and social servicing Physical servicing Income patterning

Rochdale (Deeplish) and the Thames near Tilbury (Muckingford) were selected.

Although visually total opposites — the one a slum clearance and slum renewal area in a heavy industrial town, the other green fields and river marshes — the survey produced a large number of similar needs and shortages.

Both sites needed a new sewage system — one as replacement, one for the first time.

More policemen, electricity and rapid transit feeds were also common needs. In effect those who would live at Deeplish could well say "We live here at present but may well move one day" while those at Muckingford could say "We want to live here but we don't know for how long". In planning terms the same degree of uncertainty has to be accommodated for both developments.

Stage 1 development for both sites shows a dependence on the existing surrounds and infra structures Stage 2 might never happen since the demand for individual land might fill the sites. (The site sensing methodology could be a continuous process, see Part 1, AD 10/71).

However, if it did happen, the resultant imbalance on the surrounding structures and services would be likely to cause the extension of the servicing initially intended for the new development, to be poached or at least mirrored by the older surroundings — a good thing to happen. (See also NON-PLAN AD 5/69).

Stage 3 could well be a direct development of either Stages 1 or 2. Even in physical terms its valid extent cannot be fully charted on these drawings.

In both cases, it is likely that the existing environment would be 'played with' considerably — albeit with 'respect'. Stage 3+ is discussed later.

COMMENT

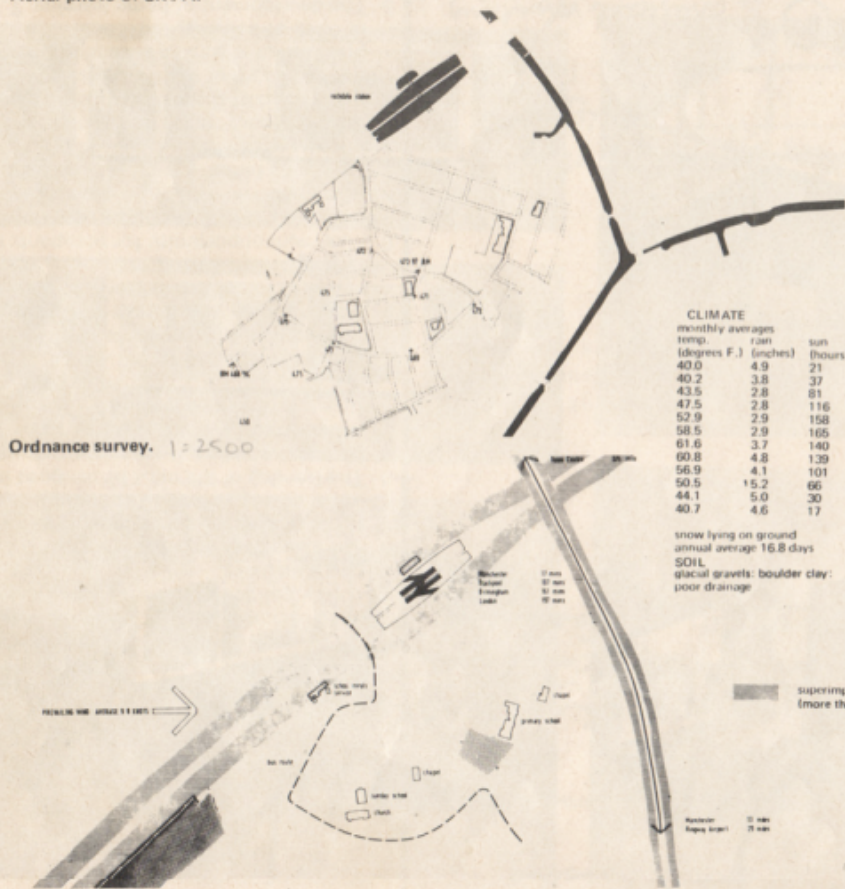
The chance of using either of these sites for a test bed has unfortunately reduced alarmingly with the arrival of the present Government.

SITE A

27 AD 1/72



Aerial photo of Site A.



Land use/communications/climate.

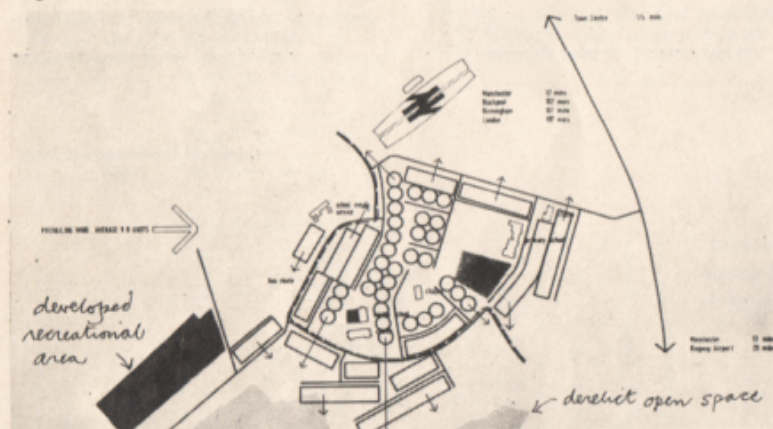
SITE B



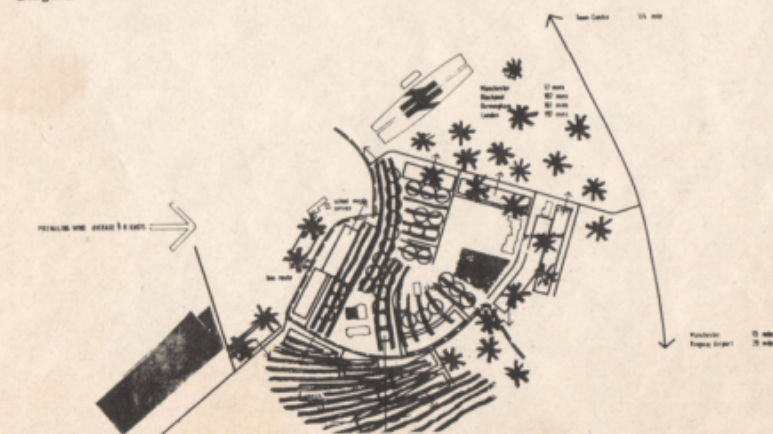
Aerial photo of Site B.



Stage 1.



Stage 2.



Stage 3.

Stage 4.

Stage 5.

Stage 6.

Stage 7.

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HOUSE TYPE	USAGE	OCCUPANTS	REASONABLE MAXIMUM No. OF OCCUPANTS					DURATION OF ACTIVITY				
			ADULTS	JUNIORS	SENIORS	VISITORS	TOTAL	DAY TIME	ALL TIME			
A	INTERMITTENT + PERMANENT + INTERPERSONAL + FAMILYGROUP	IMMEDIATE FAMILY + GROUP OF INDIVIDUALS + FAMILYGROUP	2	1	—	—	3	x	x	F	x	x
			3	—	—	—	3	x	x			
			4	—	—	—	4	x	x			
			5	—	—	—	5	x	x			
			6	—	—	—	6	x	x			
B	x	x	2	2	—	—	4	x	x	G	x	x
			4	—	—	—	4	x	x			
			2	—	—	—	2	x	x			
			2	—	—	—	2	x	x			
			2	—	—	—	2	x	x			
C	x	x	2	3	—	—	5	x	x	H	x	x
			5	—	—	—	5	x	x			
			2	1	—	—	3	x	x			
			2	—	—	—	2	x	x			
			2	—	—	—	2	x	x			
D	x	x	2	2	2	—	6	x	x	I	x	x
			4	—	—	—	4	x	x			
			2	—	—	—	2	x	x			
			2	—	—	—	2	x	x			
			2	—	—	—	2	x	x			
E	x	x	2	2	2	—	6	x	x	J	x	x
			4	—	—	—	4	x	x			
			2	—	—	—	2	x	x			
			2	—	—	—	2	x	x			
			2	—	—	—	2	x	x			

Possible occupancy patterning.

Housing needs projection: site A
(based on 1961 Census figures for
Rochdale U.D. assuming static population)

STAGE 1

Year	Average occupancy	Persons per dwelling						Total Dwellings
		1	2	3	4	5	6+	
		No of dwellings						
1971	2.64	29	110	16	22	13	11	201
1996	2.75	29	96	18	24	14	12	193
2021	2.74	30	96	18	24	14	12	194

STAGE 2

Year	Average occupancy	Persons per dwelling						Total Dwellings
		1	2	3	4	5	6+	
		No of dwellings						
1971	2.64	47	181	27	35	21	18	329
1996	2.75	48	157	30	38	23	20	316
2021	2.74	50	157	30	38	23	20	318

Housing need projection: site B
(based on 1961 census figures for
Thurrock U.D. assuming static population)

STAGE 1

Year	Average occupancy	Persons per dwelling						Total Dwellings
		1	2	3	4	5	6+	
		No of dwellings						
1971	2.79	34	82	9	33	28	5	191
1996	2.72	34	91	9	31	26	5	196
2021	2.67	34	98	9	29	25	4	199

STAGE 2

Year	Average occupancy	Persons per dwelling						Total Dwellings
		1	2	3	4	5	6+	
		No of dwellings						
1971	2.79	56	134	15	53	46	8	312
1996	2.72	57	148	14	50	43	8	320
2021	2.67	56	160	14	48	41	7	326

Variations produced in total number of households by various factors

1. All 18-23 year olds in single accommodation

1. All children leave home one
year earlier +3.58% house
holds
2. Life expectancy increases by
one year +1.79% "
3. Average marriage age increases
1 year +1.79% "
4. Children born later after
marriage no change
(Mean persons/household 2.56).

2. All 18-23 year olds in double accommodation

1. All children leave home one
year earlier +2.00%
2. Life expectancy increases by
one year +2.00%
3. Average marriage age increases
1 year no change
4. Children born later after
marriage no change
5. All 18-23 year olds change
to 1 person
households +10.14% *
(Mean persons/household 2.82).

Occupancy period of dwellings — proposed mathematical model

Assume that the occupancy period of
dwellings can be approximately described by
an equation of the form

$$dL = 100 a^2 ne^{-an}$$

where L is % leaving

n is years from commencement of
tenancy

a is constant

The closest approximation to G.L.C. figures
is given by

$$dL = 2.89ne^{-.17n}$$

This gives percentage remaining after n years
(P%)

$$P = 17e^{-.17n} (n+5.88)$$

Comparison with G.L.C. figures for period
of tenancy of remaining tenants in
September 1967 is as follows:—

Period of Residence	Calculated figure	Actual figure
0-5 years	87,451	88,286
5-10 years	54,096	49,558
10-15 years	34,179	34,408
15-20 years	17,018	23,430
Average tenure = 11.75 years		
50% turnover @ 9.9 years		
Max. rate of leaving @ 5.88 years		
Number of tenancies remaining after 60 years = .042% or 8 tenancies out of 20,000		
Number of tenancies remaining after 80 years = .002% or 2 tenancies in 100,000		
Number of tenancies remaining after 100 years = .00075% or less than one tenancy in a million		
No. of houses still occupied by 1st tenant after 30 years		3.70%
No. of 1st tenancies terminating between 20-30 years		11.00%
No. of second tenancies (relet under 20 years) term. 20-30		26.78%
No. of second tenancies still in occupation at 30 years		12.53%
No. of houses let to 3rd (or more) tenants		45.99%

Based on one or two tenancies only

%	Average Life	Product
3.70	30	111.0
11.00	23.7	260.7
26.78	23.2*	621.3
12.53	30	375.9

* estimated

Average life 25.3 years

1368.9

An approximate comparison of average yearly total cost of family car and family house

Schedule of Running Costs.

Figures from AA Technical Services

- 1 Assume a new family car of 1100 cc
- 2 Assume that this car is traded in every 24 months for a new one.
- 3 Assume a mileage of 10,000 miles p.a.
- 4 Assume the following standing charges:

Car licence	£25.00
Insurance	Av. rates — Class A Policies
Driving Licence	£0.25 per annum
Depreciation	Assumes an economical running life of 80,000 miles at 10,000 miles p.a. 20% depreciation per year
Tyres	Estimated tyre life of 20,000 miles
Servicing	As recommended by manufacturers
Repairs and Replacements	Average labour charge of £1.50 per hour: repairs, replacements and renovations spread over 80,000 miles of life
Hire purchase	@ 12% p.a. over 24 month period
Interest charges	

5 Costs of car (adjusted to 1971) prices

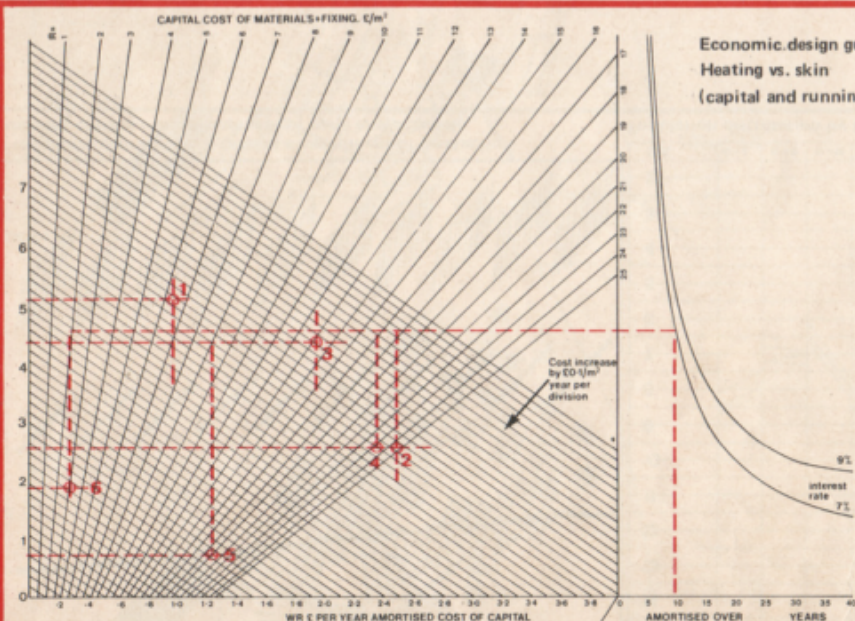
	Keep car 2 years	Keep car 8 years
Tyres	£0.05	£0.11
Servicing	£0.12	£0.12
Petrol	£1.16	£1.16
Oil	£0.05	£0.06
Repairs	£0.30	£0.53
	£1.68	£1.98
x 10,000 miles £		
Licence (tax)	168	198
Insurance	25	25
Garage	44	44
Depreciation	50	50
Hire purchase	162	94
	32	24
	481	435

NB Hire purchase rate 22% on £324 over 2 years (for 2 yr), on £600 over 3 years (for 8 yr), + £150 balance @ 11% over 3 yrs (8 yr)
Say average annual cost **£460**

6 Cost of house of 70m² area costing £60/m² = £4,200
30 year mortgage @ 8½% = £390 pa
Heating etc £120 pa (Area + 10) x 1.5
Maintenance £41 pa £20 + (Area x 0.3)
Total cost £551

7 Cost of house of 60m² area costing £55/m² = £3,300
30 year mortgage @ 8½% = £306 pa
Heating etc £105
Maint. £ 38

£449



Economic design guide.

Heating vs. skin
(capital and running costs).

Amortise @ 7% over 10 years

1. Single glazing — ¼" Cap. cost = £7/m² U value = 5 W/m²
2. Double glazing sealed units ¼" glass ½" air gap cap. cost £18/m² U value 2.5 W/m²
3. Double glazing ¼" glass 7" air gap cap. cost £14/m² U value 4.3 W/m²
4. Double glazing ¼"/plyglass 7" air gap cap. cost £17/m² U value 2.5 W/m²
5. Panels — Glasal, Asbestolux cap. cost £9.0/m² U value 0.7 W/m²
6. Ace panels — asbestolux cap. cost £2.0/m² U value 1.8 W/m²

1. Select interest rate and period of repayment.

2. Draw vertical from repayment period to interest line, then horizontal to meet capital cost of materials and fixing.

3. Draw vertical to meet horizontal from U-value.
4. Point of intersection gives amortised costs of material plus heating costs.

Housing research Subject headings.

Reports 1 & 2

1.1 Sites A & B — Enquiry check list

- Site characteristics
- Population statistics
- Servicing
- Physical communications
- Existing private and public buildings
- Finance — UGC, DES, etc

1.2 Sites A & B — Statistics

- Essex Development Plan
- Site acreages, densities, occupancy ratios
- Climatic data
- Dwelling standards, expenditure
- Climate and soil
- Population structure

1.3 Sites A & B — Research reports

- Housing needs projections
- Estimate size of families

2.1 Cost of dwellings as function of life

- General
- Long term considerations
- Economic principles
- With expanding stock
- With annual repayments over life
- Effect of interest rate

2.2 Existing cost figures

- Conversion costs
- Maintenance costs

2.3 Costs — Research Reports

- Cost of dwellings as function of life and size (ref sites A & B)
- MOHLG Cost yardstick (Ref sites A & B)

3.1 Mobility Considerations — Mathematical model

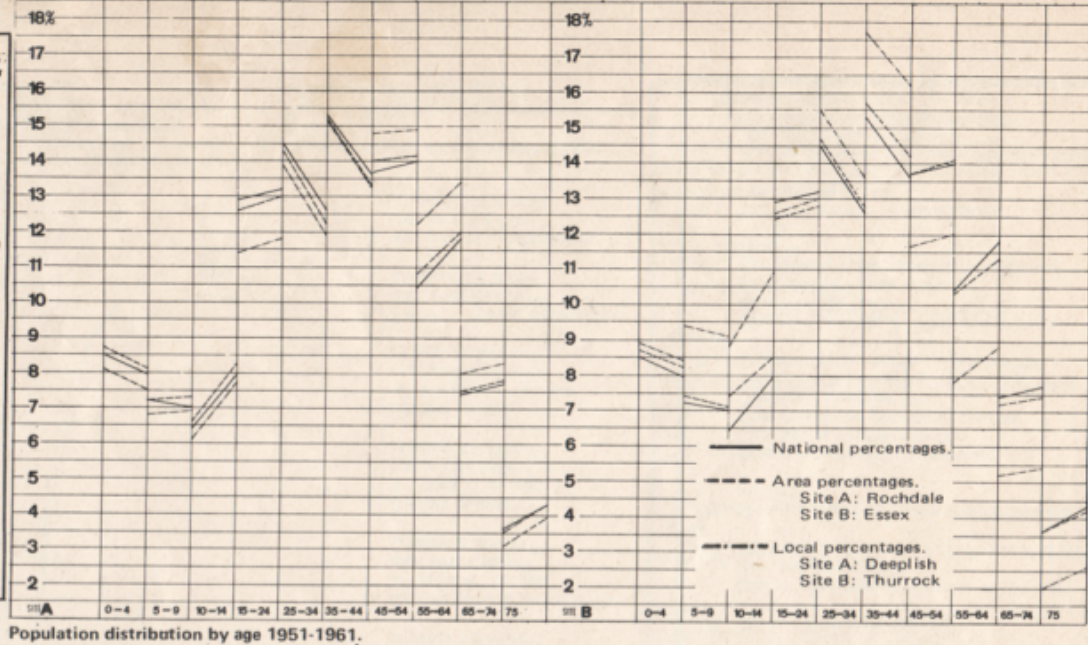
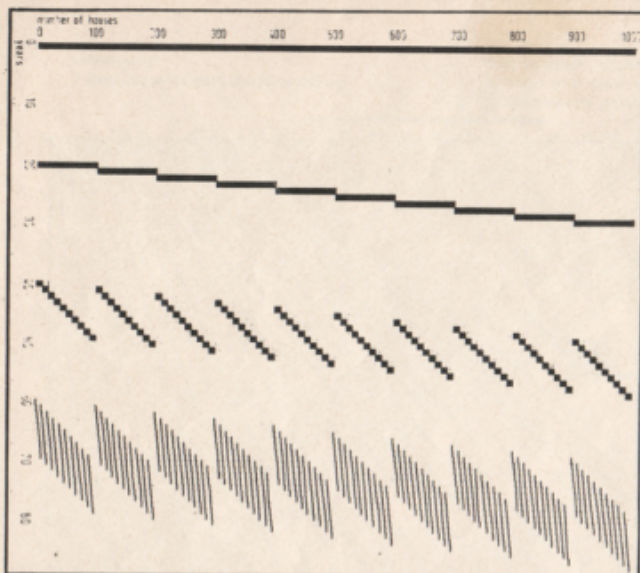
- Occupancy period of dwellings
- Occupancy mobility factor
- Distribution of occupancy period
- Optimum dwelling life

4.1 Environmental restraints & potential

- Drainage, sewage, piped/wired services
- Maintenance, Security
- Site Sensing — Audio/Visual
- Centralised v packaged material/power feed

5.1 Future variation to production method/runs

- Future variation to housing/servicing ratio
- Possible Content futures
- Demolition/re-use/rehabilitation site/materials

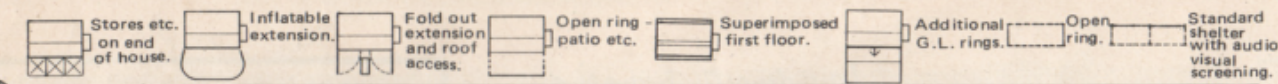


Site: Muckingford.

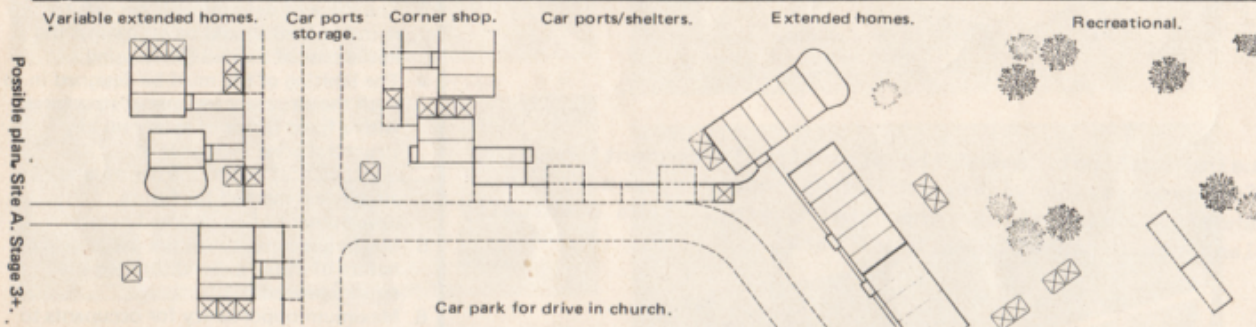


Site: Rochdale.

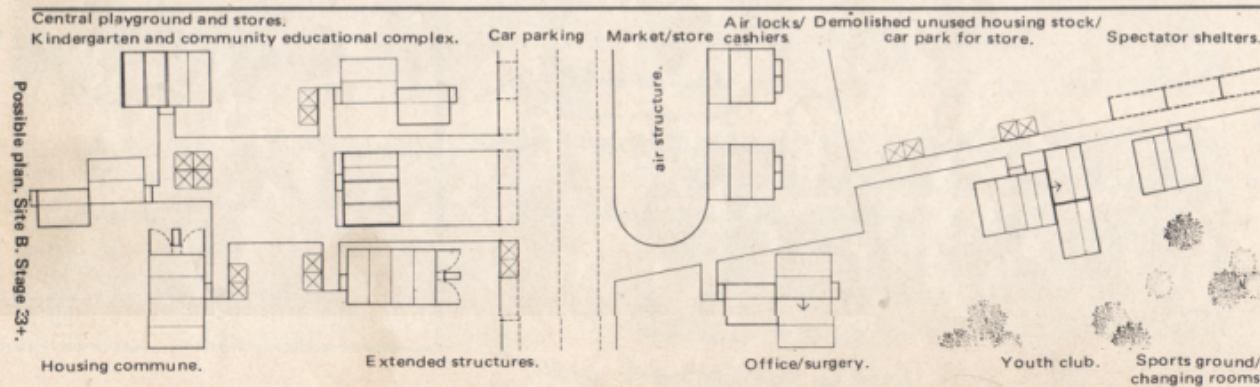




Typical site plan, Site A.



Typical site plan, Site B.



The strip plans of an earlier scheme for both sites show the equivalent of Stage 1. The extensive use of covered shelters was considered desirable in such tight development. Such shelters just as the screens and stores in future developments could be supplied by local authority, landlords etc. It is important to emphasise that in relation to shelters, stores and also direct extensions to the houses a rather standardised range has been shown graphically since it would be both futile and presumptuous to indicate possible private financed and/or private built additions since these should vary considerably at any one time.

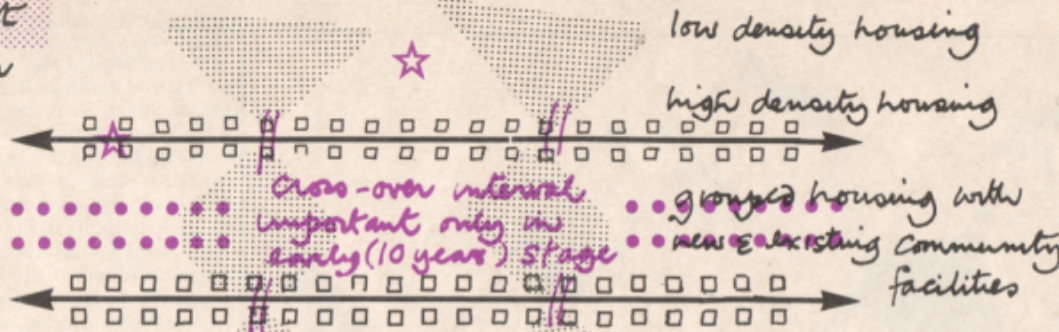
Stage 3+ is directly related to these earlier strips and again for convenience has adopted standardised graphic notations for additions and variations.

The major purpose is to indicate that should Stage 1 be retained for reasons mentioned earlier then it is likely that large areas of the original development — well within the depressingly long designed life of 20-25 years — may well be drastically re-used particularly if the Stage 3 type spread takes place. Such changes might well require the alteration of on or above surface physical services — roads, lighting, telephone, power (discussions have been started on overhead power supply) pneumatics etc. The adoption of sealed 'packaged' fixed life aerobic digestion plant for all stages of sewage servicing, centralised high level water tank storage, high (40-50m) artificial 'moons' to replace street lamps and the extensive use of P.F.A. kerbless construction for secondary roads compares favourably in cost with present practice and enables the alteration of such services to be undertaken within the 'life' of 'served' structures while allowing the content and thus demand on such services to vary.

COMMENT

I consider there is, at any time, a limit to tinkering with one's house beyond which one looks for a new one. As such a limit may be reached far faster than 20 years it is valid to look at a re-use of existing structures as long as such re-use is less socially consolidating than the original use. i.e. The reverse of converting a flour mill into a home.

present
development
proposals for
both sites



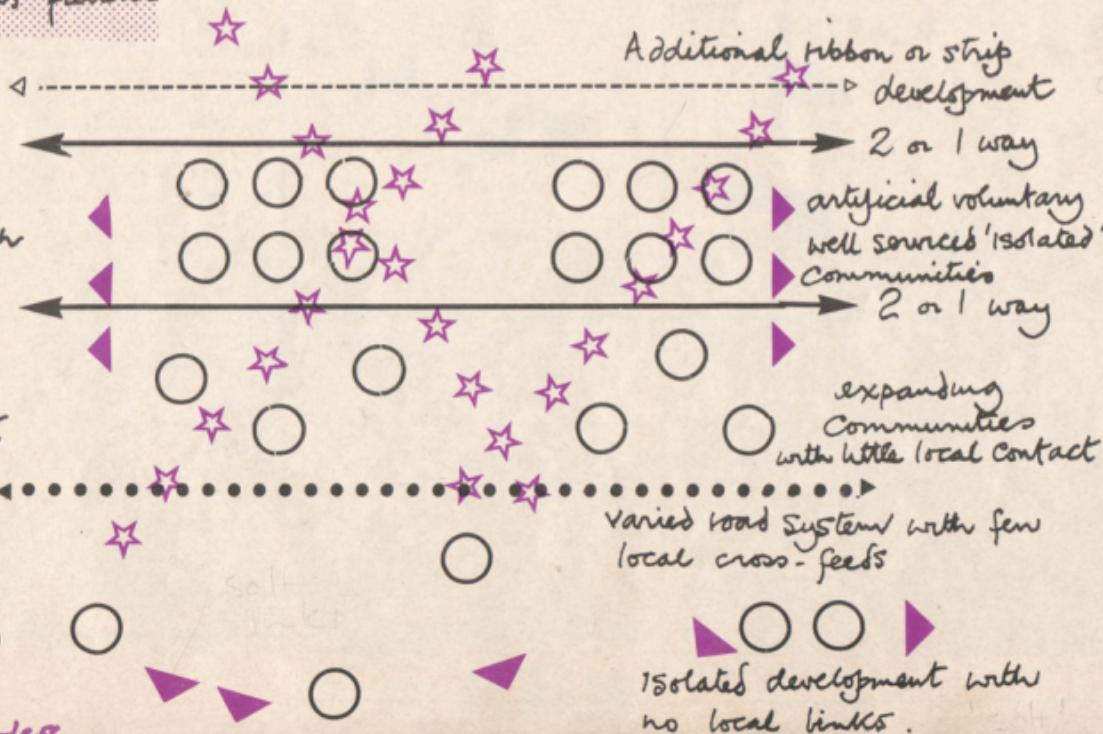
Conventional
'main' servicing
2-way roads

☆ 'additional' packaged servicing

Short life housing must not demand the attention 'permanent' housing has forced. For example, Services, including secondary roads, must have an even shorter variable life than the housing. Thus eventually Wigan and Leyland could become a national park.

possible future
development patterns

made
likely
through
the initial
use of such
housing
although
not
dependant
upon it
for final
growth
patterning



☆ ☆ ☆
service nodes

CONCLUSIONS

- 1 The change over of production and assembly processes from one area and condition to another must be accommodated even during the socio/economic life of the first production run.
- 2 No unit should be related either to the pre-assumed "room-to-activity" equation or to enclosed areas per person. The latter is only politic in establishing equivalent cost yardsticks.
- 3 The value of determinable periods for re-use of land should be set against the initial cost of limited life housing.
- 4 The limiting of life must be designed in to both the structure (eg special structures with a fixed factor of safety on key structural areas incapable of maintenance) and to the use of land already ear-marked for future development of an opposed nature.
- 5 Maximum capacity for pre-use choice of nature of initial expenditure (eg site sensing procedure).
- 6 Maximum opportunity for occupants to mess around with the house combined with minimum need — on physical well-being terms — to do so. The right to idleness must not be sacrificed.
- 7 Political appetites for alteration in the user's mind of the status of housing must not be diluted or marred by economic pressures to ensure an assumed standard or form of housing.
- 8 The development of home learning, T.V. religion, facsimile telephones, preventive medicine, unmarried parents, E.S.P., enforced idleness, pensions by Giro and other good things may well produce an invisible community environment that looks like a lot of ordinary houses — and then they may go.

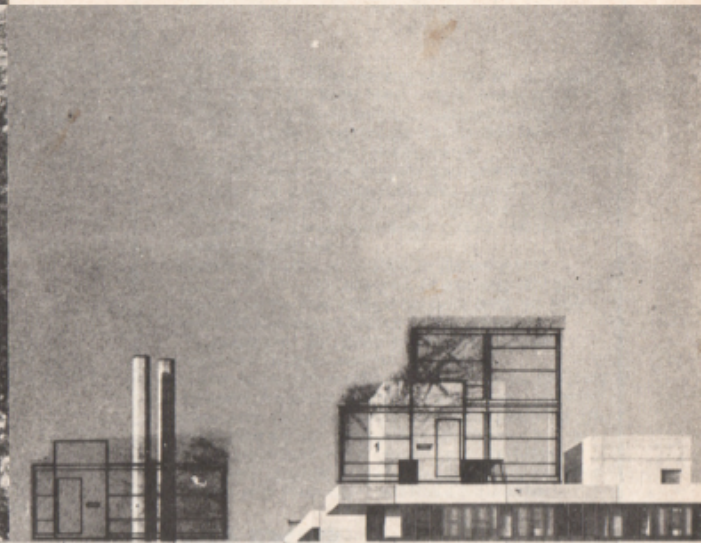
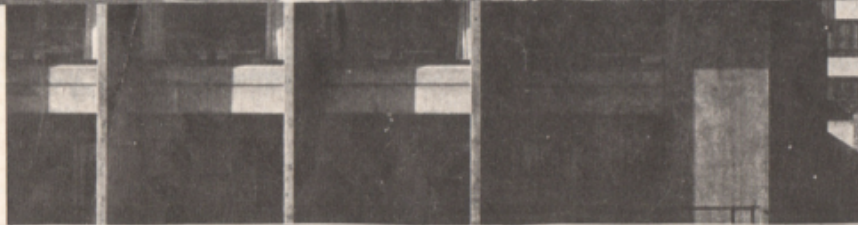
COMMENT

All that remains is to build the thing — and to thank Lord Kenner for annoying me sufficiently constructively for me to start this in the first place. I do not consider the house sufficiently important — as opposed to the next meal — for everyone to have to develop an appetite and aptitude to build his or her own.

THE BUILT ENVIRONMENT
AS A NATURAL DEVELOPMENT RESOURCE



Village infil —
to exclude traffic
& justify a ruin



"After the lecture come up home
to meet Mum."
a rapid start to
new ribbon development

ACKNOWLEDGEMENTS

PS. from the Editor of the C.P. Supplements.

Dear Cedric

Thank God that's over! The hassle I've had getting all the bits together over the last year has been quite something — all those code numbers (they'll understand them now), getting those hand written comments on in time and all those thin drawings that didn't print properly.

But it was worth it. We've shown your stuff as it really is — the good stuff and the bad — (you must admit those private houses are best forgotten!) — it's knocked your standing as a SRR — but then too much realism does that to all of them anyway (a good thing)

Some of it has been difficult to understand for me and, most probable, impossible for the readers; but then, as has often happened in the past, things tend to fit in as time goes by and we can see that you've been right all the time.

In AD last month Martin Pawley quoted Rem Koolhaas (who the hell is he!) as saying that you were a prince desperately trying to become a frog — I thought that was very true — a dandy who only wears grey, an art boy who suppresses style, a communicator who purposefully makes comprehension a task, breakfast of champagne and grouse at the Savoy and lunch with the freaks at Plum City and a real concern with the communal life style while leading a life of individuality.

But you've seen a lot of things no one else has seen, you've influenced a lot of good people and almost surreptitiously turned your hairy ideas into well researched feasibility and along into the mainstream of architectural thinking

Yours
Peter Murray

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Houses and People. Hole and Attenburrow, BRS

Douglas Smith (Baker Wilkins and Smith, Quantity Surveyors)

63/61/A13: 63/52/AB5: 66/80/AD5

63/59/B12: 64/63/AB5: 62/32/A15

62/39/B1: 68/88/4A: 61/28/D5

62/35/D15: 61/51/D15: 68+/81/A35

Frank Newby (Felix J. Samuely and Partners, Consulting Engineers)

62/AB1: 63/61/A13: 63/59/B12

62/39/B1: 68/88/4A: 62/32/A15

63/52/AB5: 62/53/AB5: 61/28/D5

62/35/D15: 61/51/D15: 70/65/A35

58/26/D3: 69/94/A13: 68+/81/A35

Zisman Bowyer and Partners (H. V. & E. Consultants)

66/88/4A: 69/94/A13

Silk and Frazier, Quantity Surveyors
69/94/A13

Corrections

64/63/AB5 — Exchange Stages 2 and 3

68/88/4A — A for a. Reverse fire door detail

62/X15/D35 — Should read 62/35/D15

70/65/A35 — Should read 65/70/A35

68+/81/A35 — Prof D. Donnison — Micro-politics of Inner City. B.A.A.S. Conference 1971

Key to system

— mid-wall additive layer

— discontinuous partitions

CODE KEY

Date	Job No	CP assessment		
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Letters — people

- A Co-operating/participating
- B Controlling
- C Choosing/questioning
- D Structuring

Numerals — Condition

- 1 Free-will time
- 2 Directed time
- 3 Learning/living
- 4 Survival/control
- 5 Quality of life

Endpiece

NOISE IS MUSIC TO HIS EARS

A man who loves noise was given permission yesterday to build a bungalow for himself between a new motorway and a railway line. Mr William Ellis, aged 42, has lived beside the railway line in Swanwick Lane, Swanwick, near Southampton, for 12 years in a house he also built himself. This was acquired through compulsory purchase by the local authority to make way for the M27.

Yesterday, the South Hampshire divisional planning committee agreed to his request to rebuild on his now smaller piece of land. Mr Ellis thinks the noise he will have to live with will be no greater than that he endures in his work as a concrete shutterer.

He said: "I love noise really. I don't know what I'd do if I had to go somewhere that was dead quiet to live. I'd probably go mad. When I'm at work the noise is tremendous. But you get used to it. It's like background music, really."

Mrs Audrey Widdicombe, supporting the application at the planning committee meeting, said: "It is not a good place to live, but as the man chooses to live there himself I do not see it is going to harm anyone."

(see Site Sensing Kits, AD, 10/71)
Reprinted from The Guardian, Sept. 17, 1971