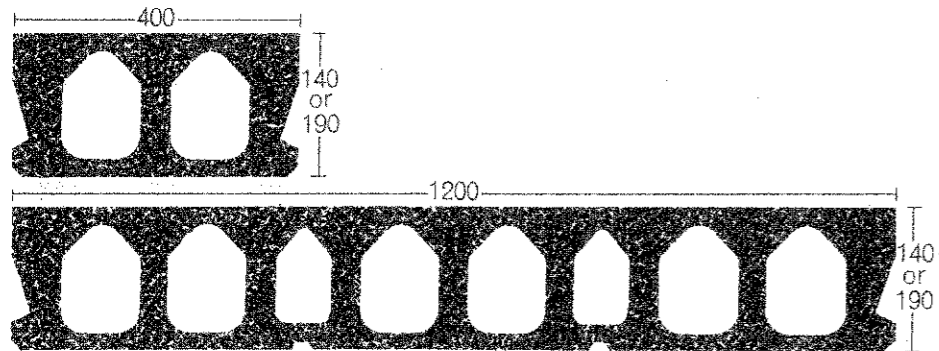
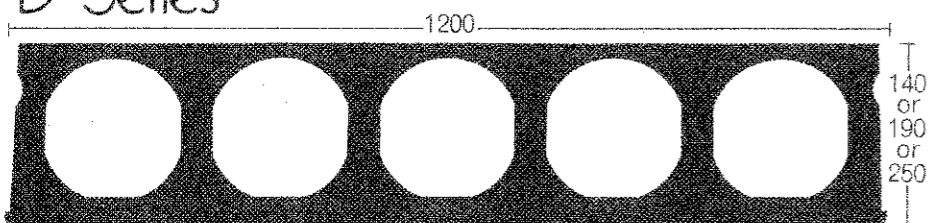


Specification 'S' and 'D' Series prestressed hollow slab construction

'S' Series



'D' Series



Soffit

Suitable for direct decoration with textured paints with a minimum of decorator's preparatory work, or to receive battens or suspended ceilings as figs. 26 and 27.

A suitable bonding agent should be used if plastered direct.

Top surface

'S' Series Units suitable to receive screeds.

'D' Series Units suitable to receive screeds or, under certain circumstances, carpet direct.

Sound insulation

Part G3 (see page 30) of the Building Regulations requires certain floors in dwellings to be constructed in accordance with any of the specification contained in Part II of Schedule 12 (see page 30).

In compliance with Specification

2 of this Schedule the average mass of 'S' and 'D' Series floors is not less than 220 Kg/m² (2.16 kN/m²).

The average mass can be increased to 365 Kg/m² (3.58 kN/m²) to comply with Specification 1 by the addition of a minimum of 50 mm of screed.

Fire resistance

The fire resistance of the floors as specified in Table 57 CP110 : 1972 is 1 hour to 1½ hours for the 'S' Series, dependent upon the pattern of stressing wires used, and 1½ hours for the 'D' Series.

In the case of the 1½ hours for the D140 Units, a minimum of 15 mm of non-combustible screed applied directly to the unit is also necessary.

This resistance may be improved by the provision of an insulating finish on the soffit or by a suitable suspended ceiling, some examples of which are given in Table 58 of CP110 (see page 26).

In addition, the resistance of the 'D' Series may be increased to 2 hours

without soffit finishes by increasing the thickness of the units by 10 mm; in the case of the 140 units a minimum of 30 mm of non-combustible screed applied directly to the units is also necessary.

Thermal insulation

The 'U' value of a floor is not normally required to meet any particular specification.

It should be noted, however, that Part F of the Building Regulations (see page 27) requires that the 'U' value of any part of a floor or roof which encloses a dwelling and is described in the Table to Regulation F3 should not exceed the value specified in that Table.

This does not apply to floors between dwellings.

Bill of Quantities

Suggested Bill of Quantities preamble.

(Where standard method of measurement is used to describe spans.)

Type	'U' value without finishes W/m ² C floor (roof)	Properties per metre width				Superimposed loading kN/m ² 1.50 kN/m ² allowed for finishes								
		Self weight kN/m ² (Kg/m ²)	Service. Moment kN m	Ult. Moment Mu kN m	Ult. Shear V kN	0.75	1.50	3.00	4.00	5.00	7.50	10.00		
													Maximum clear span m	
S140 	2.64 (3.09)	2.50 (255)	35.24	58.92	67.39	7.50	7.06	6.25	5.84	5.50	4.85	4.39		
S190 	2.51 (2.92)	3.09 (315)	63.71	109.65	101.70	9.50	9.05	8.09	7.60	7.19	6.39	5.81		
D140 	2.66 (3.12)	2.40 (245)	45.18	71.59	87.18	8.81	8.16	7.19	6.71	6.31	5.56	5.02		
D190 	2.39 (2.76)	2.53 (259)	79.90	126.91	77.24	11.00	10.65	9.44	8.82	8.31	7.35	6.65		
D250 	2.27 (2.64)	2.92 (298)	109.34	166.66	86.45	12.50	12.06	10.76	10.09	9.54	8.46	7.65		

SUSPENDED CONSTRUCTION: "TRENT" hollow core slab floor/roof units, designed to support the following loadings:-

Superimposed Loading: kN/m²
Finishes and ceiling: kN/m²
either - Partition Allowance: kN/m²
or - Weight of partitions to be calculated from drawing No(s)..... attached.

(Where applicable) Metal ceiling clips to be provided at the rate of..... per m². Alternatively, in the case of 'S' Series Units - Timber battens at 1.2 m centres between units.

Holes

Small holes may be drilled or carefully chiselled through the void positions, the maximum size of these is as shown below. This work would normally be carried out by the general contractor after fixing the units.

For larger holes, edge check outs can normally be performed in the factory and trimmed as fig. 24.

Queries regarding other shapes and sizes of holes should be referred to our Design Offices.

Recommended maximum size of holes through voids

Floor type	Circular holes	Rectangular holes
S140	100 mm	100 mm wide x 200 mm
S190	100 mm	100 mm wide x 200 mm
D140	70 mm	70 mm wide x 150 mm
D190	90 mm	90 mm wide x 150 mm
D250	110 mm	110 mm wide x 150 mm

The dimensions are based on the holes being on the centre line of the voids.

Design

The design and calculations are in accordance with CP110:1972 for Class 2 members.

Materials

All flooring is manufactured using Portland Cements, aggregates and reinforcement complying with the current edition of British Standards BS12, BS882, BS7165, BS2447, BS1077.

Manufacture

The units are manufactured in heated factories with strict quality control. A vacuum pre-tensioning system is used with the concrete being extruded by machine.

Camber

Under normal circumstances units will have an upward camber which will be no greater than 1/1000 as defined in Clause 2.7.3.1(5) of CP110:1972.

Grouting

A 1:3 sand/cement grout or 1:2:4 concrete with 20 mm maximum aggregate size should be brushed into the top of the joints between the beams after fixing.

Typical arrangement of 'S' or 'D' Series Hollow Slab Floor

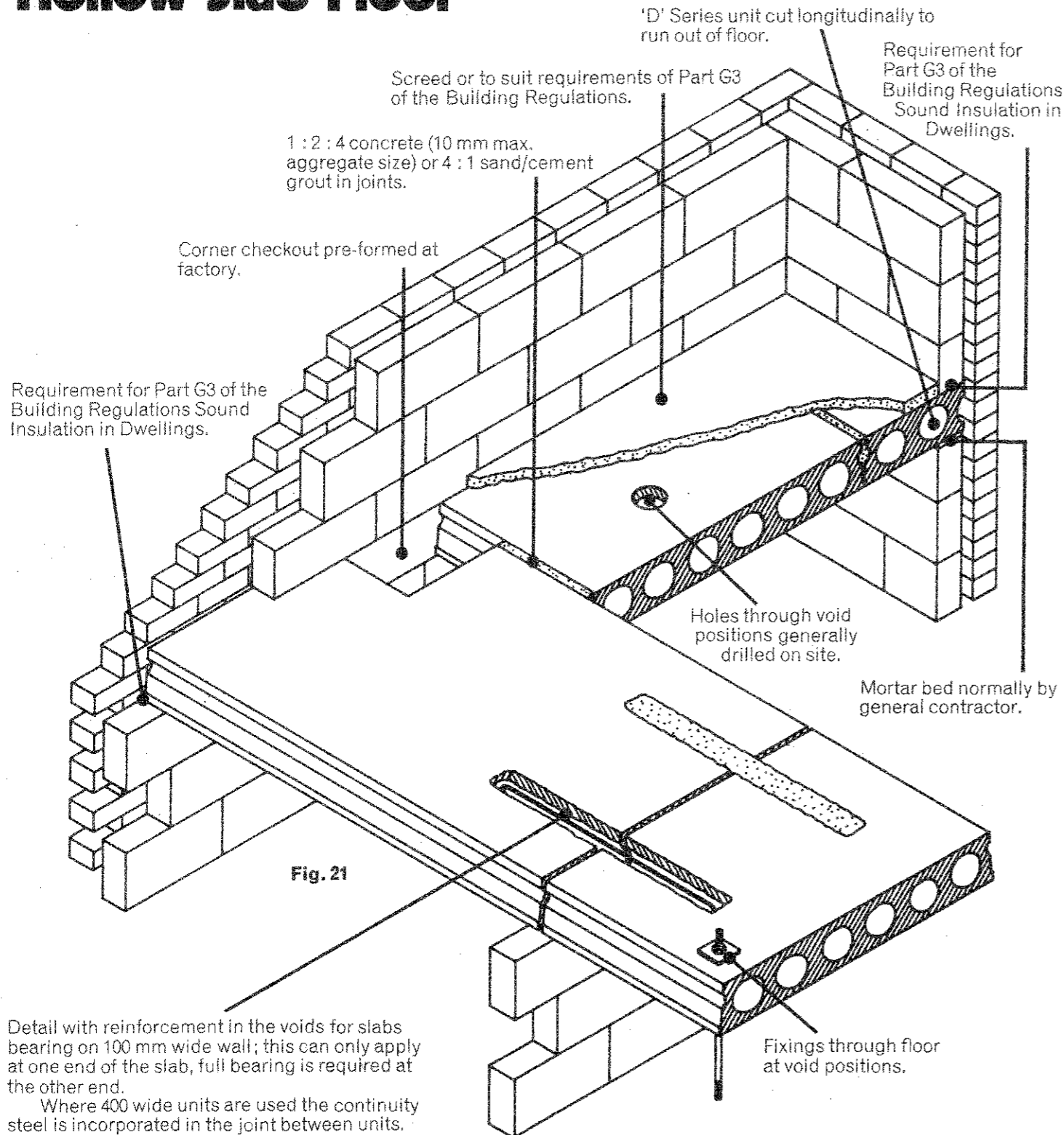


Fig. 21

Fig. 22
Floor spanning onto party wall

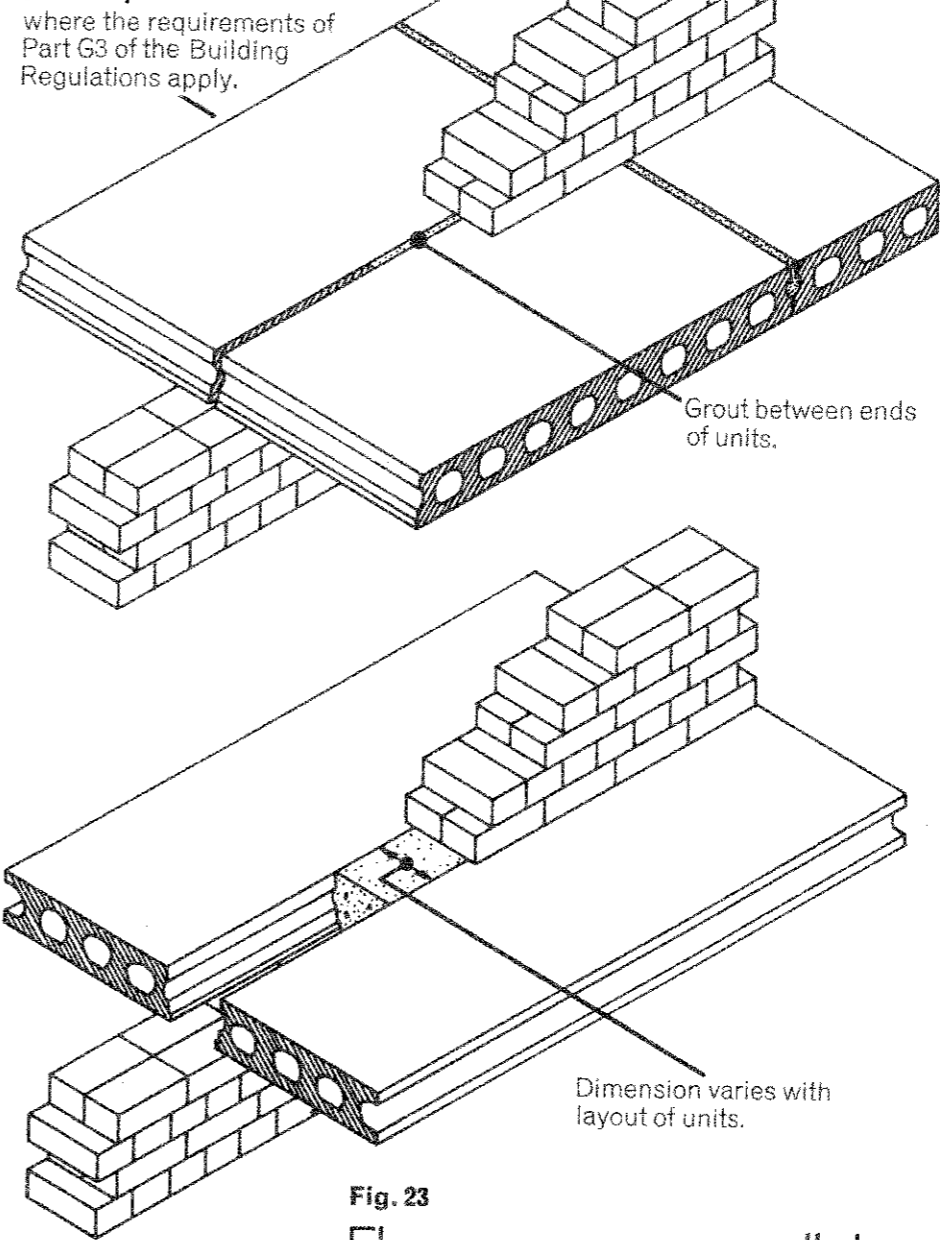


Fig. 23

Fig. 23
Floor spanning parallel to party wall
where the requirements of Part G3 of the Building Regulations apply.

Fig. 21
The requirements of Building Regulations Part G3 concerning sound insulation in dwellings are satisfied by the use of the 'D' Series unit cut longitudinally to run out of the floor. The screed is applied to the top surface of the units and the screed is grouted in the joints. The mortar bed is normally by general contractor. The mortar bed is normally by general contractor.

Openings and Balconies

Fig. 24
Typical detail for trimming openings

Suitable fire-resistant material by general contractor.

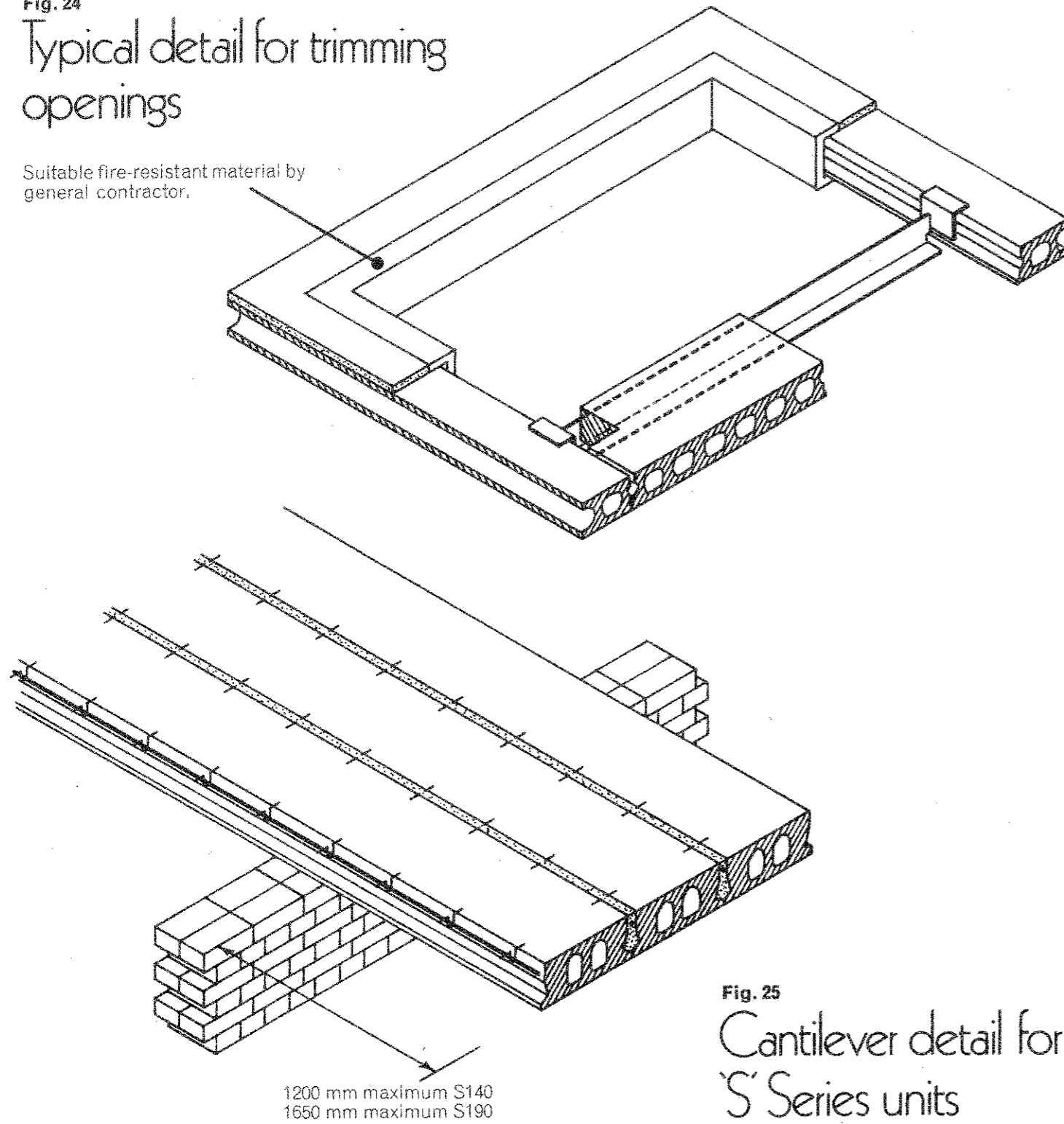


Fig. 25
Cantilever detail for 'S' Series units

Ceilings

Fig. 26
Counter battens

Galvanised steel ceiling clips or timber battens between slabs ('S' Series only) to receive counter battens.

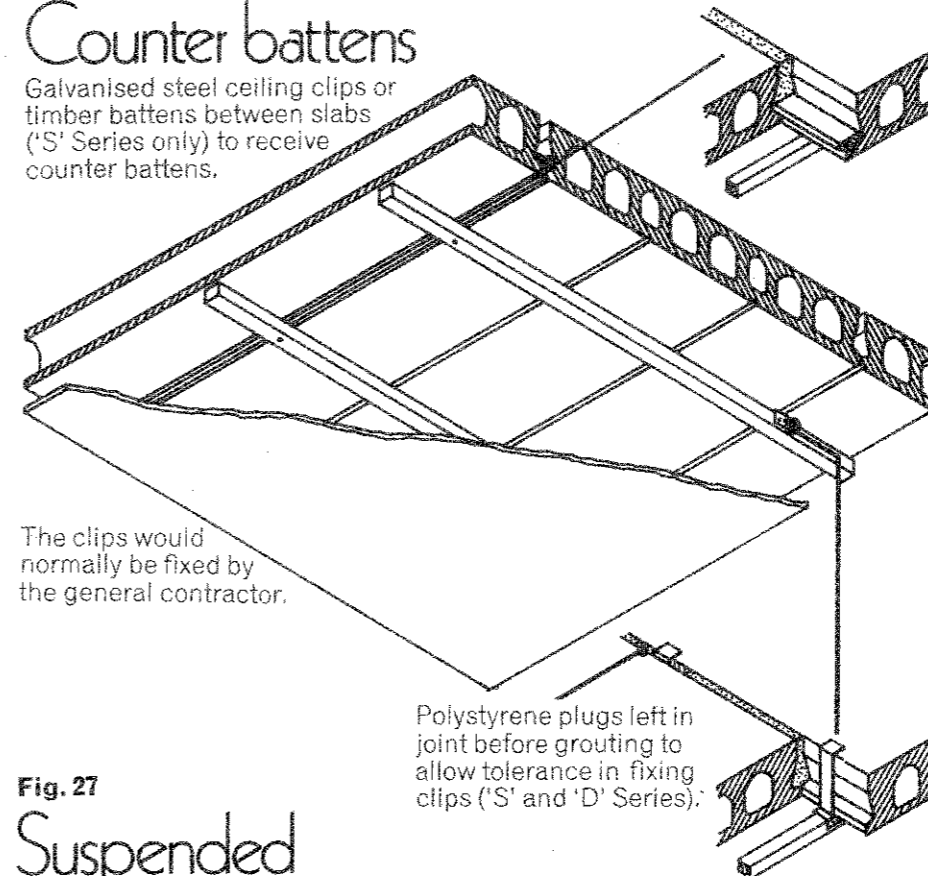
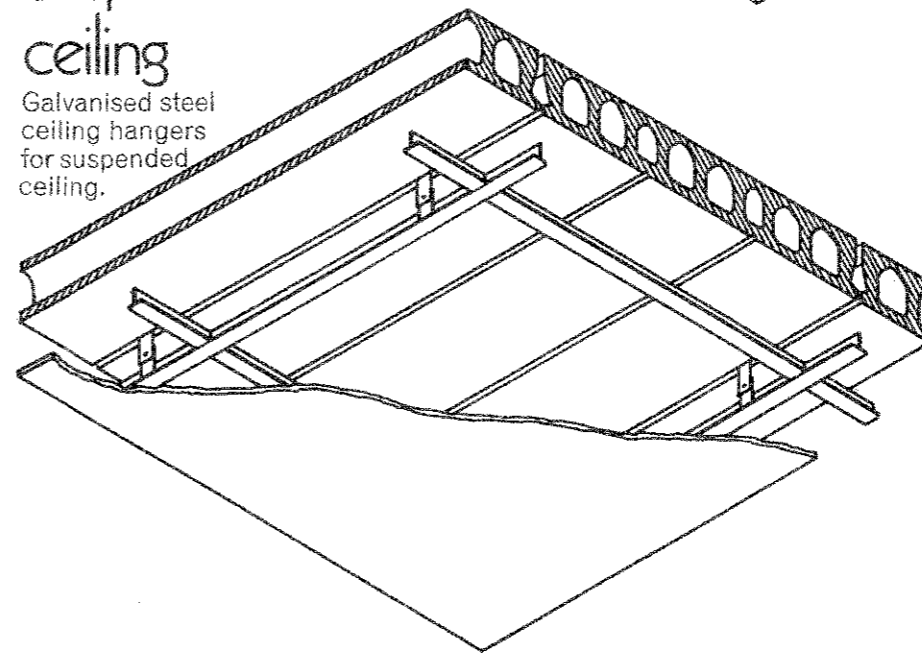


Fig. 27
Suspended ceiling
Galvanised steel ceiling hangers for suspended ceiling.



Slabs bearing on steelwork

Fig. 28
400mm wide units bearing on steel shelf angles

450 mm long cut out in top flange or removable shelf angle as fig. 29.

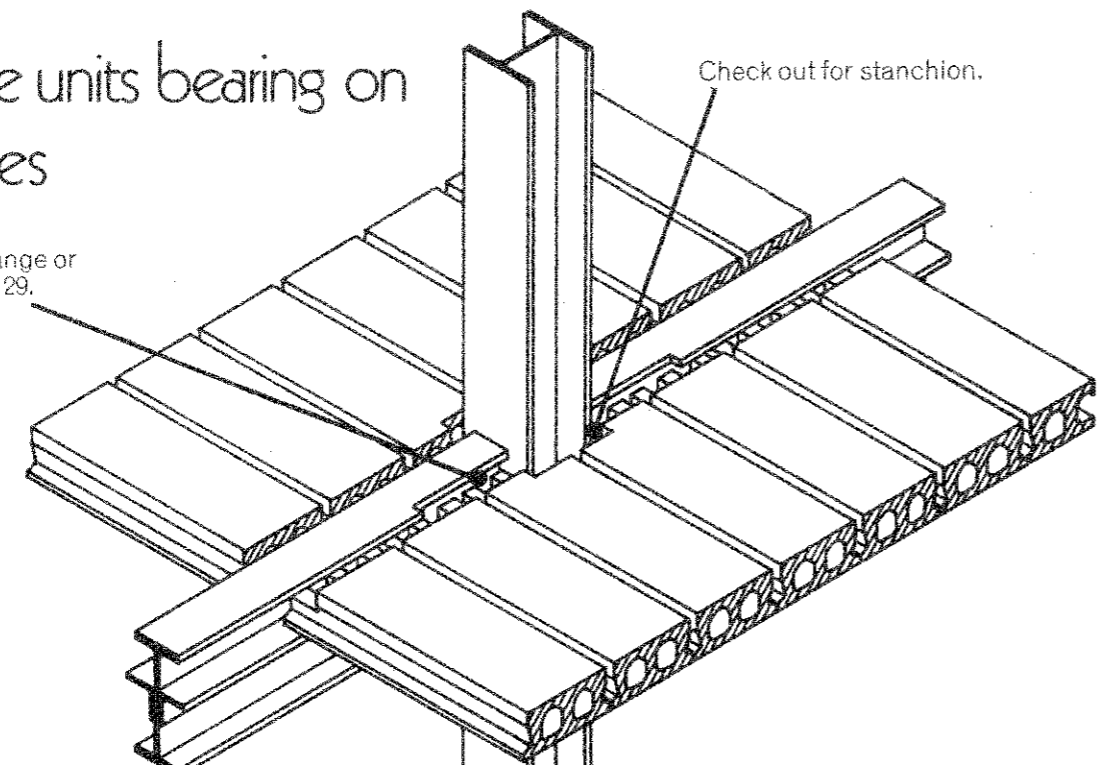


Fig. 29
Alternative detail for 400mm wide slabs with a section of removable shelf angle

The last unit is propped until the shelf angle is fixed. Please consult our Design Office before finalising this detail.

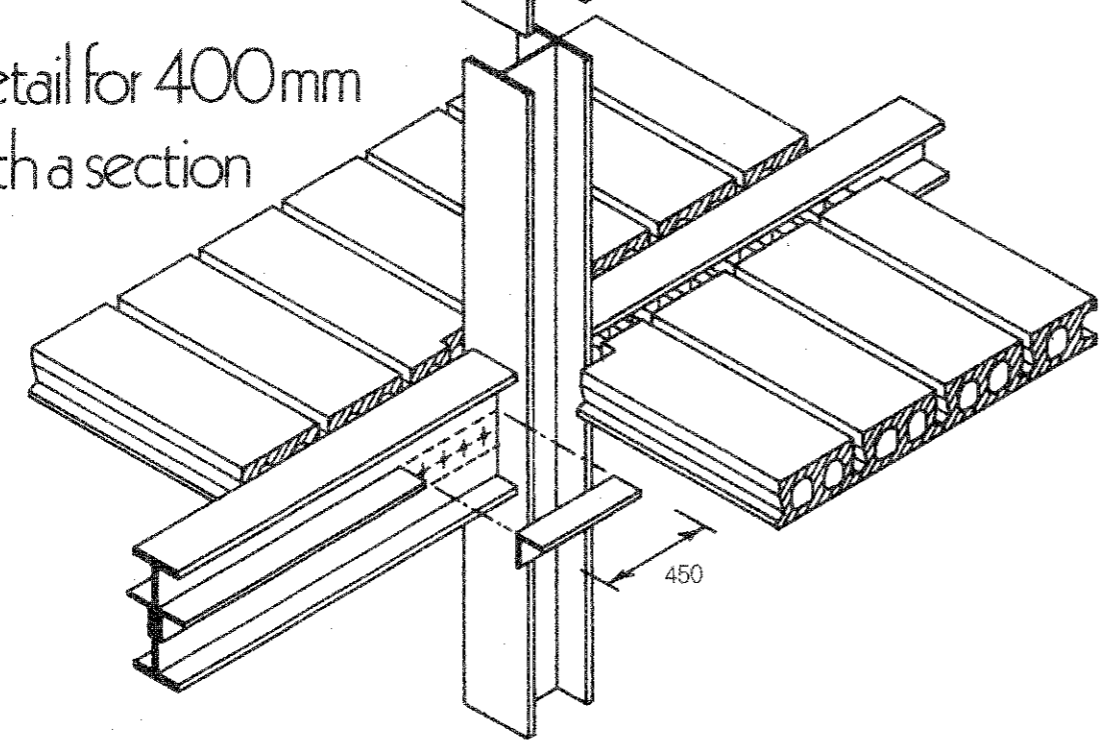


Fig. 30
Limiting dimensions of shelf angles and checkouts for 400 mm wide units where top flange of steel is cut out as Fig. 28.

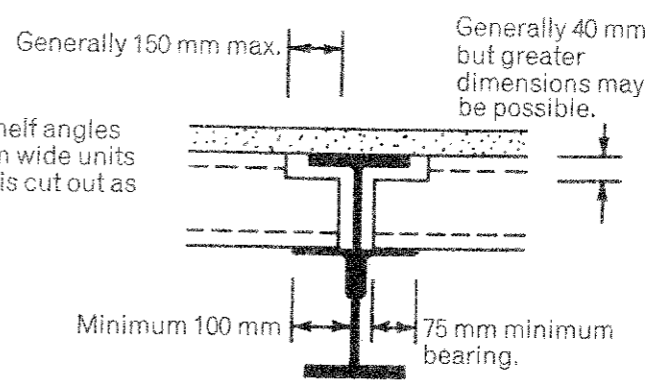


Fig. 31
Limiting dimensions of shelf angles for 1200 mm wide units. The wider shelf angle is required at one end of the unit only. This detail may not be satisfactory for wide flanged steel beams.

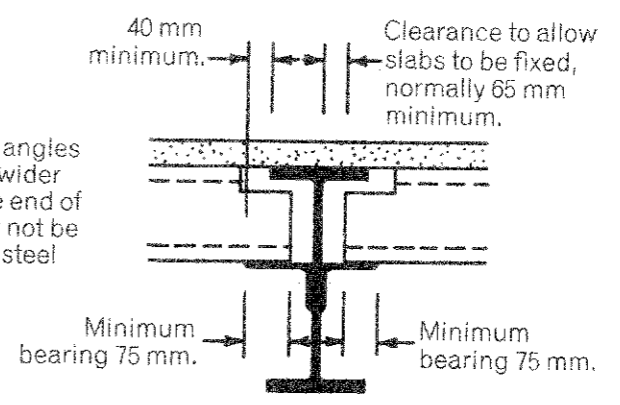


Fig. 32
Floor units bearing on encased steel beam

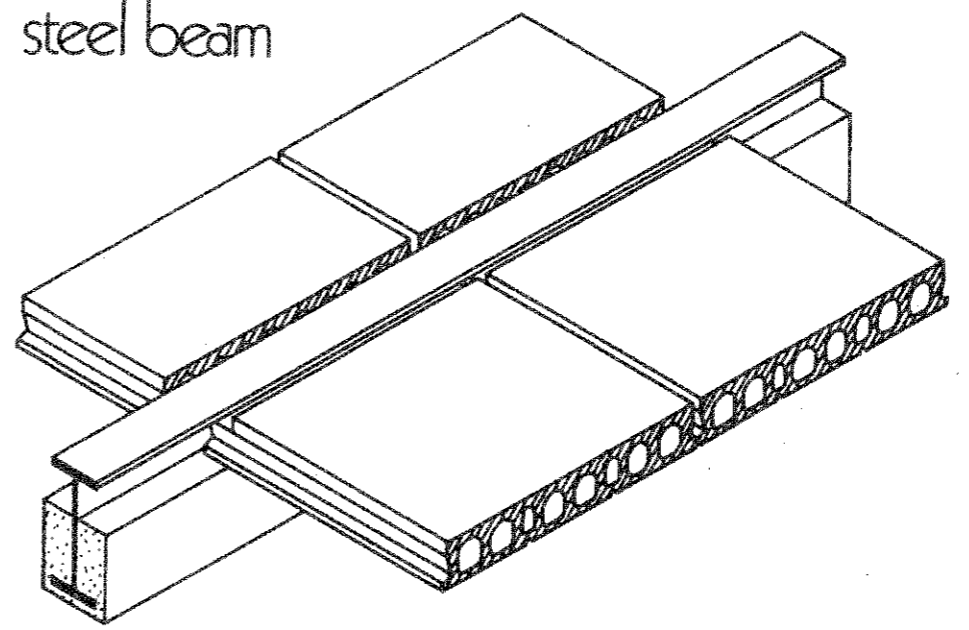
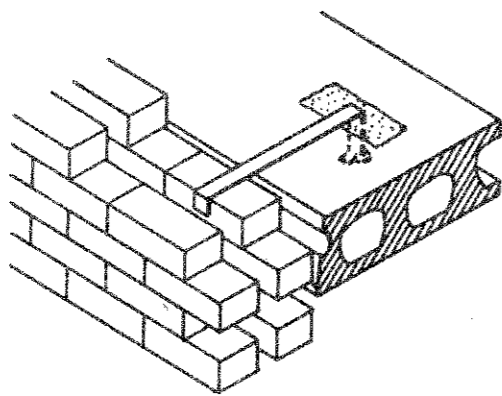


Fig. 29, 30, 31, 32
CP110 Part 1
30-31 & 32

1.2.4.3 Width of bearings for pre-cast units - the width of bearing of pre-cast units should be sufficient to ensure proper anchorage of tension reinforcement wherever possible. Precast units should have a bearing of at least 100 mm on a 40 mm brickwork support and of at least 75 mm on steel or concrete. This bearing may be reduced if the distribution of the reaction is known to be such that factors such as tolerance, loading, span, height of support and the provision of continuous reinforcement. Nevertheless, where reduced bearings are used, precautions should be taken to ensure that collapse of the unit cannot occur due to accidental displacement during erection.

Structural Ties

Fig. 33
Brickwork tie to comply with CP111
Structural Recommendations for load-bearing walls.



Figs. 34 - 38
Typical details to satisfy the structural tie requirements of CP110 for concrete structures. For further information please contact the nearest Trent Design Office.

Fig. 34
Mesh in screed to form structural tie

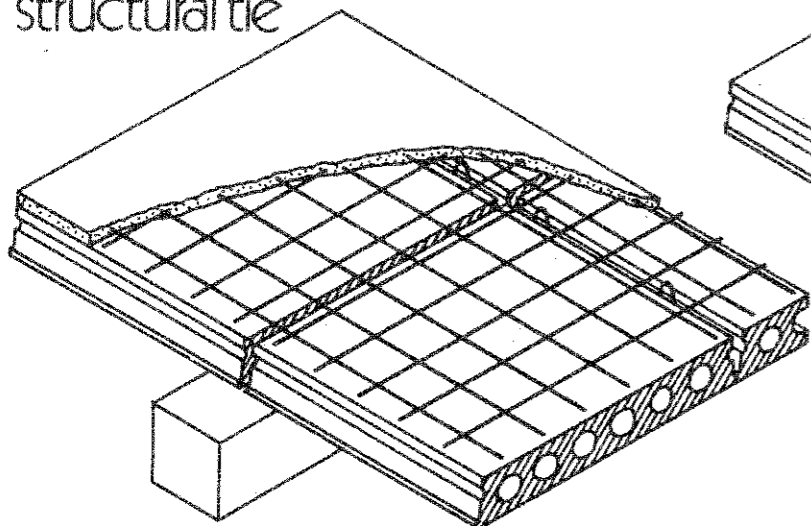


Fig. 35
Tie reinforcement in floor voids.

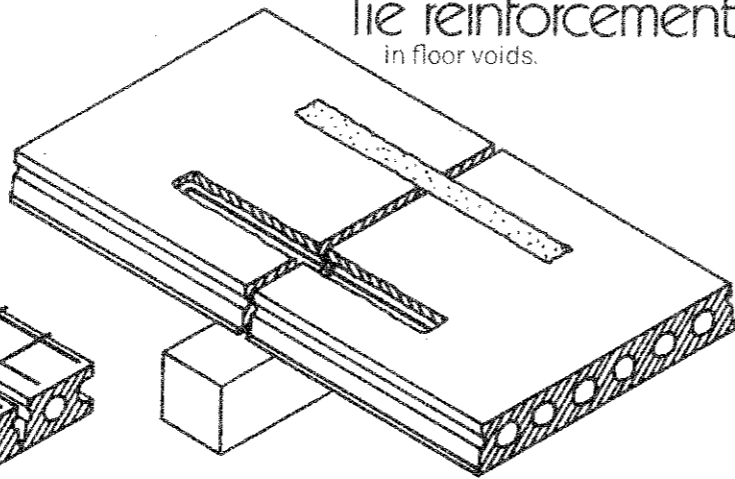


Fig. 36
Tie reinforcement contained within the floor depth using soffit units on 'S' Series slab.

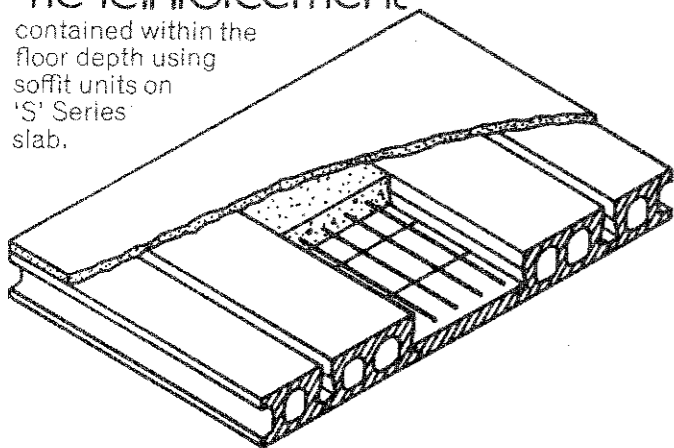
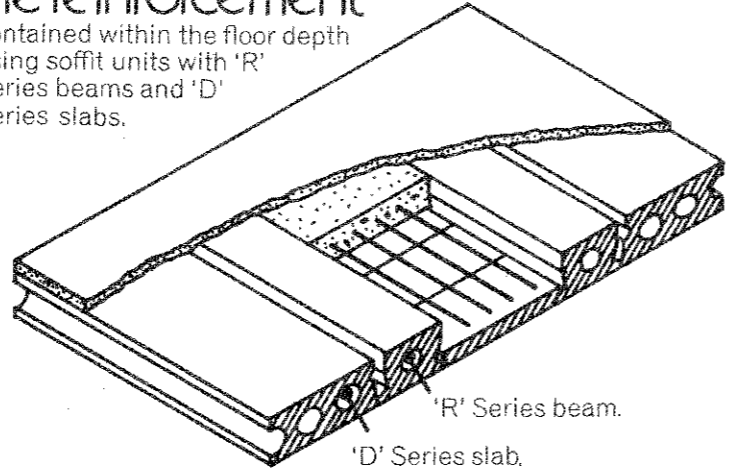


Fig. 37
Tie reinforcement contained within the floor depth using soffit units with 'R' Series beams and 'D' Series slabs.



Structural Stability

Typical details for compliance with Part D19 of the Building Regulations

Fig. 38
Insitu upstand edge beam

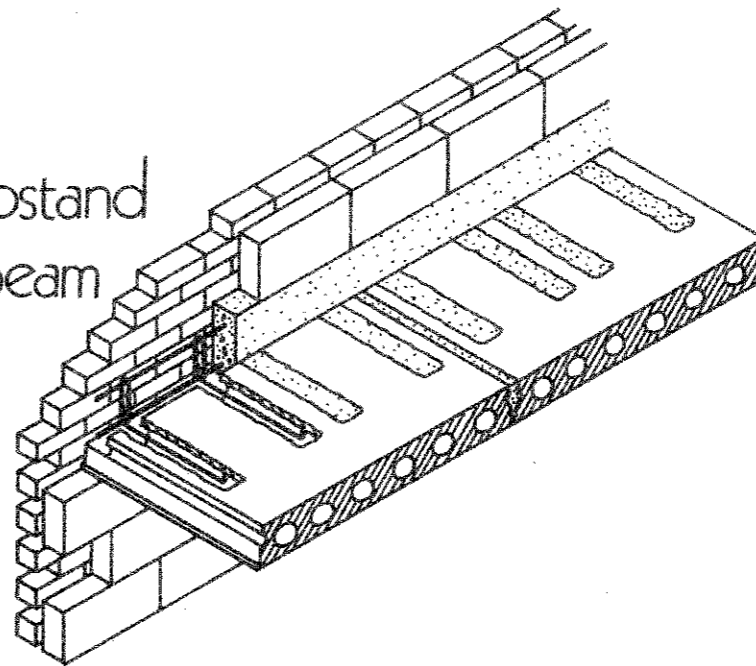


Fig. 39
Insitu upstand spine beam

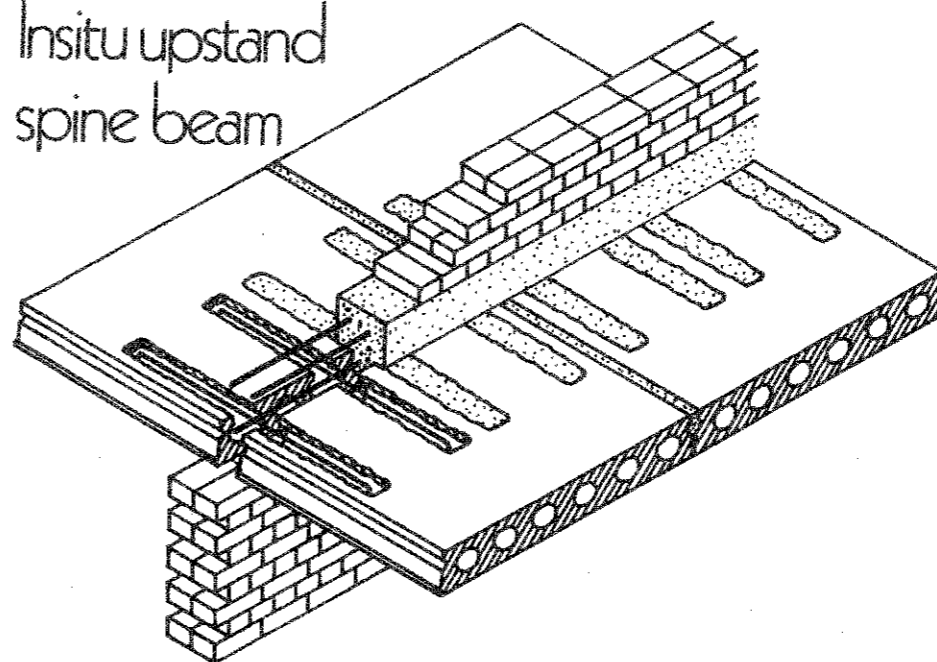


Fig. 33 CP111 - Part 2, 1970
304. Lateral support
Where the slenderness ratio is based on effective height and the concrete slabs do not bear on a wall, metal anchorages similar to those illustrated in Fig. 33 should be provided at intervals of not more than 1.6m. They should be built into the concrete slab a minimum distance of 300mm.

Figs. 34-35 CP110 - Part 1, 1972
36 & 37
3.1.2.2. Stability To accord with the criteria of 2.2.2 the layout of the structure in plan and the interaction between the structural members should be such as to ensure a robust and stable design. It is recommended that:
(4) All buildings be provided with effective horizontal ties round the periphery and internally. At re-entrant corners or at substantial changes in construction care should be taken to ensure that the ties are adequately anchored or otherwise made effective.

Figs. 38 & 39
Part D19 of the Building Regulations requires that buildings having five or more storeys (including basement storeys) shall be so constructed that if any portion of any one structural member (other than a portion which satisfies certain specified design requirements) were to be removed -
a) structural failure consequent on that removal would not occur within any storey other than the storey of which that portion forms part, the storey next above (if any) and the storey next below (if any); and
b) any structural failure would be localised within each such storey.

APPENDIX

Fire Resistance Extract from CP110: Part 1: 1972

10.4 Additional protection to floors

The fire resistance of any given form of floor construction may be improved by the provision of an insulating finish on the soffit or by a suitable suspended ceiling, some examples of which are given in Table 58.

Table 58. Effect of ceiling treatment

Ceiling finish	Thickness of finish to give an increase in fire resistance in hours.				
	3	2	1½	1	½
	mm	mm	mm	mm	mm
(1) Vermiculite/gypsum plaster* or sprayed asbestos† applied to the soffit of floor Types 1, 2 or 3 ('R', 'S' & 'D' Series floors)	25	15	15	10	10
(2) Vermiculite/gypsum plaster* or sprayed asbestos† on expanded metal as a suspended ceiling to floor Types 4 or 5 ('R' Series floors)	15	10	10	10	10
(3) Gypsum/sand or cement/sand on expanded metal as a suspended ceiling to any floor type	25	20	15	10	10

* Vermiculite/gypsum plaster should have a mix ratio in the range of 1½-2:1 by volume.

† Sprayed asbestos should conform to BS 3590.

Thermal Insulation

Extracts from the Building (Second Amendment) Regulations 1974 (relative to precast concrete construction)

Application of Part F

F1.—(1) Subject to the provisions of paragraph (2), this Part shall apply to any building, or part of a building, which is intended to be used as a dwelling.

(2) This Part shall not apply to any external wall, floor or roof of any part of a dwelling which consists of a shed or store entered from the outside or of a garage, boathouse, conservatory or porch.

Interpretation of Part F

F2.—(1) In this Part and in Schedule II—

“dwelling” means a house, flat or maisonette;

“partially ventilated space” means a space which—

(a) is either—

- (i) a passage, stairway or other common space which is not part of, but adjoins, a dwelling; or
- (ii) a part of a dwelling which consists of a shed or store entered from outside or of a garage, boathouse, conservatory or porch; and

(b) is ventilated by means of permanent vents having an aggregate area not exceeding 30% of its wall boundary area;

“perimeter walling” means those walls which together enclose all parts of a dwelling other than a partially ventilated space or a ventilated space;

“permanent vent” means an opening or duct which communicates with the external air and is designed to allow the passage of air at all times;

“U value” means thermal transmittance coefficient, that is to say, the rate of heat transfer in watts through 1m² of a structure when the combined radiant and air temperatures at each side of the structure differ by 1°C and is expressed in W/m²°C;

“ventilated space” means a space which—

(a) is either—

- (i) a passage, stairway or other common space which is not part of, but adjoins, a dwelling; or
- (ii) a part of a dwelling which consists of a shed or store entered from outside or of a garage, boathouse, conservatory, or porch; and

(b) is ventilated by means of permanent vents having an aggregate area exceeding 30% of its wall boundary area;

“wall boundary area” means the total superficial area of all walling, including any opening, bounding a partially ventilated space or a ventilated space; and

(2) For the purposes of this Part—

(a) unless the context otherwise requires, any reference to a dwelling is a reference solely to those parts of a dwelling which are enclosed by perimeter walling;

(b) any part of a roof which has a pitch of 70° or more shall be treated as an external wall; and

(c) any floor which is so situated that its upper surface is exposed to the external air shall be treated as a roof in relation to that part of the building beneath it.

Maximum U value of walls, floors, roofs and perimeter walling

F3.—(1) The U value of any part of a wall, floor or roof which encloses a dwelling and is described in column (1) of the Table to this regulation (including surface finishes thereof and excluding any openings therein) shall not exceed the appropriate value specified in column (2) of that Table.

Table to Regulation F3
(Maximum U value of walls, floors and roofs)

Element of building (1)	Maximum U value of any part of element (in W/m ² C) (2)
7. Floor between a dwelling and the external air	1.0
8. Floor between a dwelling and a ventilated space	1.0
9. Roof, including any ceiling to the roof or any roof space and any ceiling below that space	0.6

Deemed-to-satisfy provisions regarding thermal insulation

F4.—(1) The requirements of regulation F3(1) relating to the U value of any part of a wall, floor or roof shall be deemed to be satisfied if the wall, floor or roof is constructed in accordance with a specification contained in Part I, II or III respectively of Schedule 11.

SCHEDULE 11 Regulation F4
Thermal Insulation
Part II: Floors exposed to the external air

Table 3

Description of floor (1)	Type and minimum thickness of insulating material referred to in column (1) of this Table to be determined respectively by reference to column (1) of Table 4 and the column of that Table specified below. (2)
*1. Floor of slabs or hollow beams of dense concrete not less than 150 mm thick, with— (a) insulating material in direct contact with the upper or lower surface of the floor; or (b) insulating material separated by an enclosed airspace from the upper or lower surface of the floor.	(2)(a) (2)(b)

Table 4

Insulating material (1)	Minimum thickness (in mm) (2)	
	(a)	(b)
1. Compressed straw slab	58	38
2. Wood wool slab (density not exceeding 400 kg/m ³)	43	28
3. Insulating fibre building board	31	20
4. Corkboard	23	15
5. Mineral fibre mat or quilt	21	14
6. Mineral fibre slab or ceiling board	18	12
7. Expanded polystyrene insulation board	18	12
8. Polyurethane, or phenol formaldehyde, core to laminated board	13	9

*Floors of beam and lightweight hollow block construction ("R" Series) are not included in this description but their U Value is less than the floor types described and would, therefore, satisfy this requirement.

All 140 mm thick floor units in conjunction with a minimum of 40 mm sand/cement screed would generally give equivalent U Values but they should be checked with the actual U Value of the insulating material that is used.

Part III: Roofs

Table 5

Description of roof (1)	Type and minimum thickness of insulating material referred to in column (1) of this Table to be determined respectively by reference to column (1) of Table 6 and the column of that Table specified below. (2)
*4. Pitched or flat roof of dense concrete hollow or solid beams or slabs screeded to an average thickness of not less than 40 mm, with— (a) insulating material in contact with the roof covering or the soffit of the concrete members; or (b) insulating material separated from the soffit of the concrete members by an enclosed airspace.	(2)(f) (2)(g)

Table 6

Insulating material (1)	Minimum thickness (in mm) (Dimensions in brackets indicate the minimum thickness required when one side of an enclosed airspace is faced with bright reflective foil) (2)							
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
1. Autoclaved aerated concrete (density not exceeding 500 kg/m ³)	250							
2. Wood wool slab (density not exceeding 400 kg/m ³)								72
3. Insulating fibre building board								45
4. Cellular glass						60		
5. Exfoliated vermiculite loose fill	70							
6. Corkboard		46	38 (31)	35	30 (25)	50	45 (37)	40
7. Mineral fibre (glass or rock) quilt, mat or pelleted loose fill	60		46					
8. Mineral fibre (glass or rock) rigid slab, roof or ceiling board	50	38	34 (27)	32	25 (20)	43	38 (31)	32
9. Expanded polystyrene insulating board	50	38	34 (27)	32	25 (20)	43	38 (31)	
10. Polyurethane, or phenol formaldehyde, core to laminated board	35	28	20 (16)	29	15 (12)	25	22 (18)	20

*Roofs of beam and lightweight hollow block construction ("R" Series) are not included in this description but their U Value is less than the roof types described and would, therefore, satisfy requirements.

Sound Insulation

Extracts from the Building Regulations 1972 (relative to precast concrete construction)

- G3.—(1)** Any floor which separates a dwelling situated below that floor from—
 (a) another dwelling; or
 (b) any other part of the same building which—
 (i) is not used exclusively with that dwelling; and
 (ii) is a place used for purposes other than occasional repair or maintenance, or is a machinery room or tank room.

shall in conjunction with its associated structure be so constructed as to provide adequate resistance to the transmission of airborne and impact sound.

- (2)** Any floor (other than a floor to which paragraph (1) applies) which separates a dwelling situated above that floor from any other part of the same building which—
 (a) is not used exclusively with that dwelling; and
 (b) is a place used for purposes other than occasional repair or maintenance, or is a machinery room or tank room.

shall in conjunction with its associated structure be so constructed as to provide adequate resistance to the transmission of airborne sound.

Deemed-to-satisfy provisions for the insulation of floors required to resist the transmission of airborne and impact sound

G4. The requirements of regulation G3(1) shall be deemed to be satisfied if—

- (2)** the floor is constructed in accordance with any of the specifications contained in Part II of Schedule 12 and—
 (a) in the case of a concrete floor, the floor extends to the outer face of the inner leaf of any adjoining external wall and is tied with or bonded to every adjoining separating wall and every other internal wall which gives support to the floor.

Deemed-to-satisfy provisions for the insulation of floors required to resist the transmission of airborne sound only

G5. The requirements of regulation G3(2) shall be deemed to be satisfied if—

- (2)** the floor is constructed in accordance with any of the specifications contained in Part II or Part III of Schedule 12, subject to the conditions of regulation G4(2)(a) if the floor is a concrete floor.

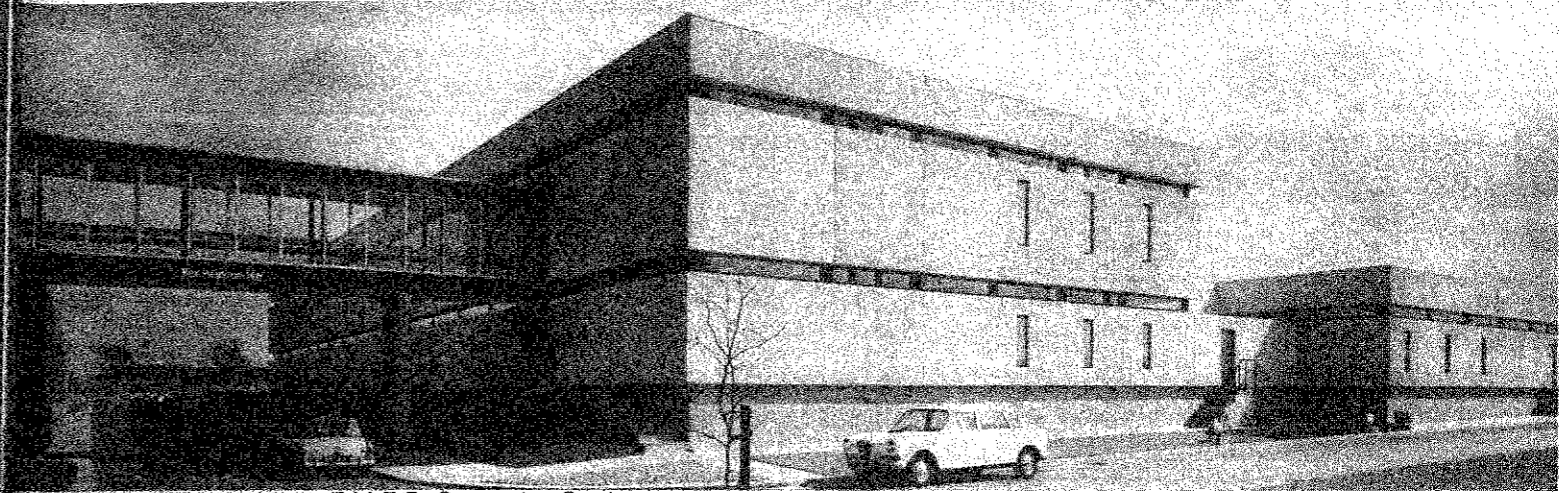
Schedule 12

Regulations
G4(2) and G5(2)

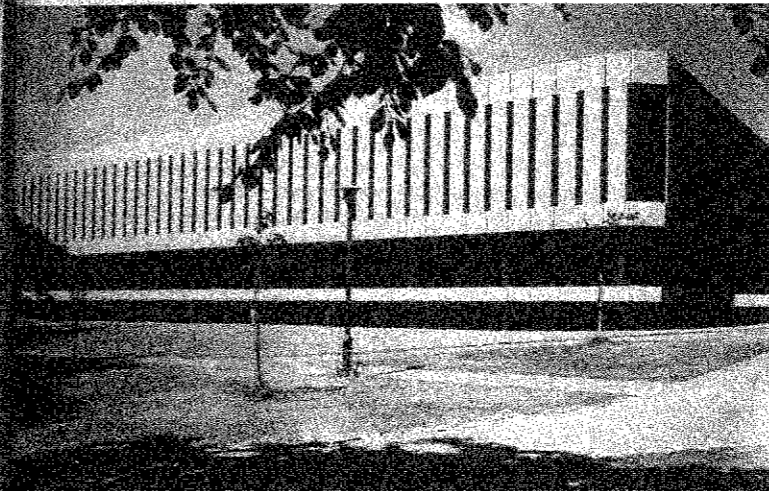
Part II: Floors providing resistance to the transmission of airborne and impact sound.

Specification (1)	Construction of floor (2)
1	<p>A floor consisting of— (a) a solid concrete slab; or ✓ (b) a slab of concrete beams and hollow infilling blocks of clay or concrete; or ✓ (c) a slab of hollow concrete beams, in each case having an average mass (calculated over any portion of the floor measuring 1 metre square and including the mass of any screed or ceiling plaster directly bonded to the slab but excluding the mass of any floating floor or suspended ceiling) of not less than <u>365 kg/m²</u> and having either of the following laid upon it— (i) rubber on sponge rubber underlay having a total thickness of not less than 4.5 mm; or (ii) cork tiles not less than 8 mm thick.</p>
2	<p>A floor consisting of— (a) a solid concrete slab; or (b) a slab of concrete beams and hollow infilling blocks of clay or concrete; or (c) a slab of hollow concrete beams, in each case having an average mass (calculated over any portion of the floor measuring 1 metre square and including the mass of any screed or ceiling plaster directly bonded to the slab but excluding the mass of any floating floor or suspended ceiling) of not less than <u>220 kg/m²</u> and having any of the following laid upon it— (i) boarding nailed to battens so laid as to float upon a layer of glass fibre or mineral wool quilt, in either case capable of retaining its resilience under imposed loading; or (ii) any covering directly applied to concrete or other cementitious screed, not less than 38 mm thick, so laid as to float upon a layer of glass fibre or mineral wool quilt, in either case capable of retaining its resilience under imposed loading; or (iii) rubber on sponge rubber underlay having a total thickness of not less than 4.5 mm or cork tiles not less than 8 mm thick, in either case laid upon a dense airtight sealing layer upon light-weight screed, not less than 50 mm thick, of a density of not more than 1100 kg/m³.</p>

Other Trent Concrete products.



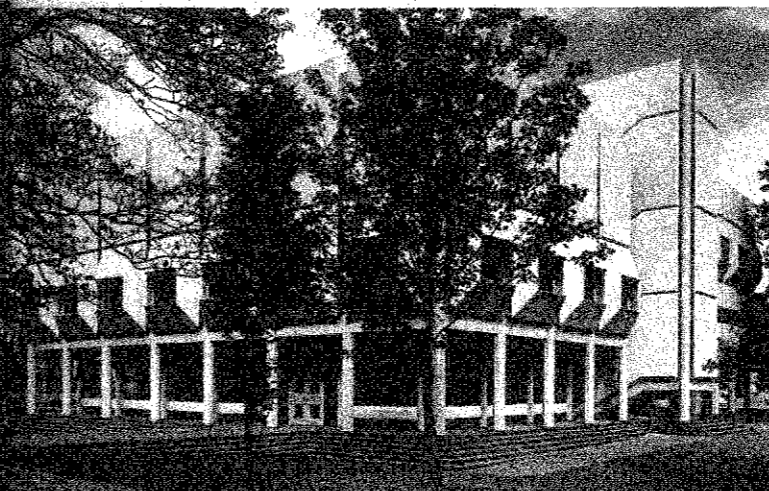
T6 frame and cladding, E.M.E.B. Computer Centre.



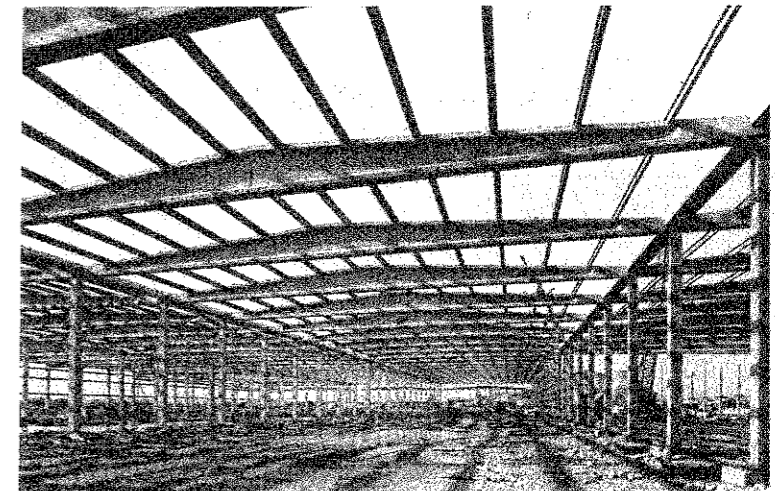
Exposed aggregate cladding, Nottingham University Library.



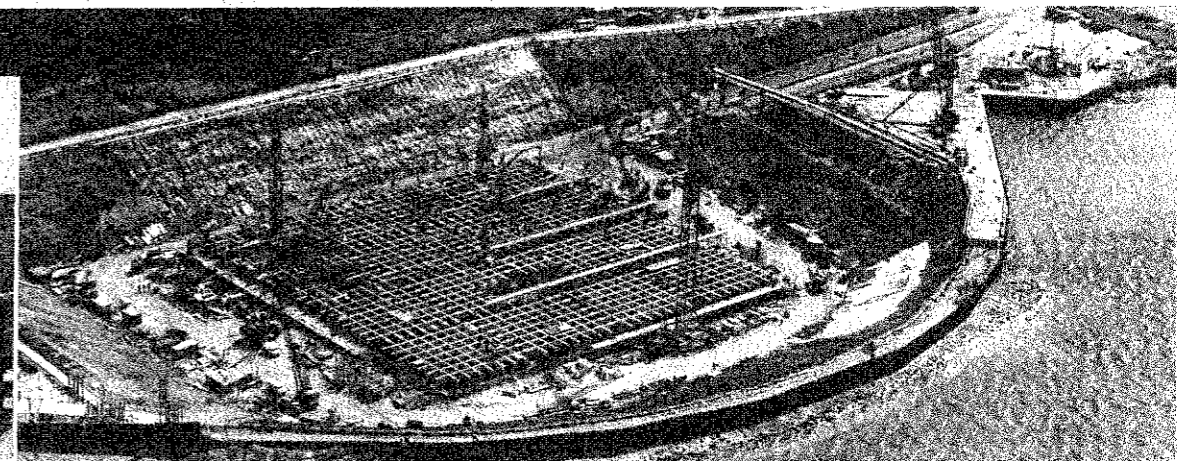
T6 multi-storey framework, Bradford.



Cladding and structural units, St. Antony's College, Oxford.



T4 single storey framework.



Concrete construction units for the McAuliffe...