LIBRARY OF STANDARD ITEM DESCRIPTIONS FOR ROAD WORKS

Contents

Series 2700	Accommodation Works, Works for Statutory Undertakers,Provisional Sums and Prime Cost Items
Series 3000	Not taken up

Introduction

General

1 The Library has been compiled in accordance with the itemisation features of the Method of Measurement for Highway Works (MMRW). This is a master library which can be used direct for manual billing, or as the basis from which individual libraries can be constructed to suit available computer facilities. Whatever process is followed the end result should produce directly comparable Bills of Quantities.

The root narratives contain numbered inserts which can, by the use of a numbered variable from the appropriate numbered group, produce unique item descriptions for all standard constructional work. For example, the information in the Specification or on the Drawings may show the requirements for fencing as "1.3 metres high standard four rail fencing with timber posts and stockproofing of a single strand of galvanized barbed wire".

By referring to **Series 300 : Fencing**, a unique item description can be built up as follows:

Root Narrative Item 2 - 10*2* fencing **7*** high with **8*3*4*5***

Variables

10*(o) = no entry - no entry to be made against 10*
2*(ii) = four rail - selected from Group 2*
7*(i) = 1.3 metres - unique height
8*(iv) = timber posts - selected from Group 8*
3*(i) = one strand of galvanized barbed wire-selected from Group 3*
4*(o) = no entry - no entry to be made against 4*
5*(o) = no entry - no entry to be made against 5*

Similarly, by referring to **Series 1600: Piling and Embedded Retaining Walls**, a unique item description for piling requirements, which may be shown as, "vertical 3.5 metre 600 mm diameter cast-in-place piles in main piling" would be as follows:

Root Narrative Item 8 - 6*7* cast-in-place piles **16*3*5*** in length **2***

Variables

6*(i) = vertical - selected from Group 6*
7*(vii) = 600 mm diameter - selected from Group 7*
16*(o) = no entry - no entry to be made against 16*
3*(o) = no entry - no entry to be made against 3*
5*(i) = not exceeding 5 metres - selected from Group 5*
2*(ii) = in main piling - selected from Group 2*

Amendments to the Library

2 Any variable not listed in a group but belonging to a group generically may be added to it and numbered sequentially. Items which cannot be compiled from the existing root narratives are rogue items and if required they should be drafted on the same principles as the Library and inserted as necessary in the Bill of Quantities.

As in the case of the MMRW, rogue items not contained in the Library but which are found to be consistently necessary and are felt to be of national application should be forwarded to the Roads Directorate for evaluation and possible incorporation into any standard amendments which may be issued.

Series 100: Preliminaries

Item	*Root Narrative*	*Unit*
	Temporary Accommodation	
1	1* of principal offices for the Overseeing Organisation 2*	item
2	1* of principal laboratories for the Overseeing Organisation 2*	item
3	1* of portable offices for the Overseeing Organisation 2*4*	item
4	1* of portable laboratories for the Overseeing Organisation 2*4*	item
5	1* of offices and messes for the Contractor	item
6	1* of stores and workshops for the Contractor	item
7	Servicing of principal offices for the Overseeing Organisation 3*	item
8	Servicing of principal laboratories for the Overseeing Organisation 3*	item
9	Servicing of portable offices for the Overseeing Organisation 3*4*	item
10	Servicing of portable laboratories for the Overseeing Organisation 3*4*	item
	Vehicles for the Overseeing Organisation	
11	5* for the Overseeing Organisation 3*	v.day
	Communication System for the Overseeing Organisation	
12	Communication system for the Overseeing Organisation 3*	item
	Operatives for the Overseeing Organisation	
13	6* for the Overseeing Organisation 3*	op.day
	Information Board	
14	Information board 7*	no
	Traffic Safety and Management	
15	Traffic safety and management	item
16	Traffic safety and management for landscape and ecology	item
17	Taking measures for or construction, maintenance, removal of contraflow arrangements	item
	Temporary Diversion for Traffic	
18	8* temporary diversion for traffic at location 9* listed in Appendix 1/18	item
19	8* temporary diversions for traffic at those locations listed in the	

	Appendix 1/18 but not measured individually	item
20	8* temporary diversions for traffic at those locations proposed by the Contractor	item

Recovery Vehicles

21	Establishment of 5* recovery vehicle	item
22	Maintenance of 5* recovery vehicle	v.day
23	Removal of 5* recovery vehicle	item

Progress Photographs

24	Set of progress photographs 10*	no
25	Set of aerial progress photographs 10*	no
26	Additional progress photographs 10*	no
27	Additional aerial progress photographs 10*	no

Temporary Closed Circuit (CCTV) System for the Monitoring of Traffic

28	Installation of temporary closed circuit (CCTV) system for the monitoring of traffic	item
29	Maintenance of temporary closed circuit (CCTV) system for the monitoring of traffic	day
30	Removal of temporary closed circuit (CCTV) system for the monitoring of traffic	item

Temporary Automatic Speed Camera System for the Enforcement of Mandatory Speed Limits at Roadworks

31	Installation of temporary automatic speed camera system for the enforcement of mandatory speed limits at roadworks	item
32	Maintenance of temporary automatic speed camera system for the enforcement of mandatory speed limits at roadworks	day
33	Removal of temporary automatic speed camera system for the Enforcement of mandatory speed limits at roadworks	item

Group	*Variables*	
1*	(i)	=Erection
	(ii)	=Servicing
	(iii)	=Dismantling

2*	(o)	=No entry
†	(i)	=provided by the Overseeing Organisation
3*	(o)	=No entry
	(i)	=until completion of the works
	(ii)	=after completion of the works
4*	(o)	=No entry
	(i)	=at place of fabrication or manufacture
5*	(i)	=light
	(ii)	=heavy
6*	(i)	=Chainman/Driver
	(ii)	=Driver/Laboratory handyman
	(iii) etc	=[stated Type]
7*	(i) etc	=[stated Type]
8*	(i)	=Taking measures for or construction of
	(ii)	=Maintenance of measures for or construction of
	(iii)	=Removal of measures for or construction of
9*	(i) etc	=[stated reference]
10*	(i)	=in monochrome
	(ii)	=in colour

Note
† The Specification for Highway Works does not cover this item. If the compiler wishes to use this variable then appropriate details must be given in Contract-specific Specification Clauses or on the Drawings.

Series 200: Site Clearance

Item	*Root Narrative*	*Unit*
	Site Clearance	
1	General site clearance	ha
2	General site clearance area 1*	ha
3	Demolition of building or structure 1*	item
4	Demolition of group of buildings or structures 1*	item
5	Partial demolition of individual structures 1*	item
	Take Up or Down and Set Aside for Re-use or Remove to Store or Tip off Site	
6	Take up or down 2*3*4*	m^3
7	Take up or down 2*5* paving 6*	m^2
8	Take up or down 2*4* brickwork 6*	m^2
9	Take up or down 2*7*19*	m
10	Take up or down 2*8*9* safety fencing 11*	m
11	Take up or down 2*10*4*13*	m
12	Take up or down 2*12* fence 13*	m
13	Take up or down 2*14*4*19*	m
14	Take up or down 2*15*16*	m
15	Take up or down 2*17*18*19*	no
16	Take up or down 2*20*	no

Group	*Variables*	
1*	(i) etc	=[stated reference]
2*	(i)	=and set aside for reuse
	(ii)	=and remove to store off Site
	(iii)	=and remove to tip off Site
3*	(i)	=blockwork
	(ii)	=stonework
4*	(i) etc	=[stated Type]
5*	(i)	=precast concrete slab
	(ii)	=stone flag
	(iii)	=brick
	(iv)	=cobble

	(v)	=granite sett
	(vi)	=block
	(vii) etc	=[stated Type]
6*	(i) etc	=[stated depth or thickness]
7*	(i)	=precast concrete kerbs
	(ii)	=granite kerbs
	(iii)	=precast concrete channels
	(iv)	=precast concrete edgings
	(v)	=combined drainage and kerb blocks
	(vi)	=linear drainage channel systems
	(vii) etc	=[stated Type and feature]
8*	(i)	=untensioned single sided
	(ii)	=untensioned double sided
	(iii)	=tensioned single sided
	(iv)	=tensioned double sided
9*	(i)	=corrugated beam
	(ii)	=open box beam
	(iii)	=rectangular hollow section beam
10*	(i)	=safety barriers
	(ii)	=pedestrian guardrails
11*	(i)	=on timber posts
	(ii)	=on steel posts
	(iii)	=attached to structures
12*	(i)	=post and rail
	(ii)	=cleft chestnut
	(iii)	=chain link
	(iv) etc	=[stated Type]
13*	(o)	=No entry
	(i)	=300 mm high
	(ii)	=375 mm high
	(iii)	=450 mm high
	(iv) etc	=525 mm high (and so on in steps of 75 mm)
14*	(i)	=copings
	(ii)	=string courses
	(iii) etc	=[stated named feature]
15*	(i)	=power cable
	(ii)	=communications cable
16*	(i)	=laid singly
	(ii)	=laid as a pair
	(iii) etc	=[stated number]
17*	(i)	=bench seat
	(ii)	=cattle trough
	(iii) etc	=permanent bollard [stated type]
	(iv)	=parking meter
	(v)	=pedestrian crossing lights
	(vi)	=lighting column including bracket arm and lantern
	(vii)	=wall mounting including bracket arm and lantern
	(viii)	=traffic sign

	(ix)	=traffic sign including posts
	(x)	=internally illuminated traffic sign
	(xi)	=internally illuminated traffic sign including posts
	(xii)	=externally illuminated traffic sign
	(xiii)	=externally illuminated traffic sign including posts
	(xiv)	=timber gate
	(xv)	=metal gate
	(xvi)	=stile
	(xvii)	=road stud
	(xviii)	=individual blocks
	(xix)	=individual masonry features
	(xx)	=individual stones
	(xxi)	=chamber cover and frame
	(xxii)	=gully grating and frame
	(xxiii)	=feeder pillars
	(xxiv)etc	=[stated named feature]
18*	(o)	=No entry
	(i) etc	=[stated Type]
19*	(o)	=No entry
	(i) etc	=[stated Size]
20*	(i) etc	=[stated Type of signal]
	(ii) etc	=[stated Type of motorwarn assembly]
	(iii) etc	=[stated Type of emergency telephone]
	(iv)	=camera pole
	(v) etc	=[stated Type of cabinet]
	(vi) etc	=[stated Type of equipment]

Series 300: Fencing

Item	*Root Narrative*	*Unit*
	Fencing, Gates and Stiles	
1	Temporary fencing 1*	m
2	10*2* fencing 7* high with 8*3*4*5*	m
3	10*6* fencing 7* high with 8*3*4*5*	m
4	Concrete foundation to timber 15* for 13* fencing	no
5	10*9*11* gate 7* high 14* wide	no
6	10*9*11* gate 7* high 14* wide with 5*	no
7	10*9* stile 12*7* high 14* wide	no
8	10*9* stile 12*7* high 14* wide with 5*	no
9	13* 16* to existing 2* fencing 7* high	m
10	13* 16* to existing 6* fencing 7* high	m
11	13* 16* to existing 9*11* gate 7* high 14* wide	no
12	Fenced tree guards 13*	no
	Remove from Store and Re-erect Fencing, Gates and Stiles	
13	Remove from store and re-erect 10*2* fencing 7* high with 8*3*4*5*	m
14	Remove from store and re-erect 10*6* fencing 7* high with 8*3*4*5*	m
15	Concrete foundation to timber 15* for re-erected 13* fencing	no
16	Remove from store and re-erect 10*9*11* gate 7* high 14* wide	no
17	Remove from store and re-erect 10*9*11* gate 7* high 14* wide with 5*	no
18	Remove from store and re-erect 10*9* stile 12*7* high 14* wide	no
19	Remove from store and re-erect 10*9* stile 12*7* high 14* wide with 5*	no
	Excavation in Hard Material	
20	Extra over excavation for excavation in Hard Material in fencing works	m^3

Group	*Variables*	
1*	(i)	=Type 1
	(ii)	=Type 2
	(iii)	=Type 3
	(iv)	=Type 4
	(v) etc	=[stated Type]
2*	(i)	=three rail
	(ii)	=four rail
	(iii)	=five rail
	(iv) etc	=[stated Type]
3*	(o)	=No entry
	(i)	=one strand of galvanized barbed wire
	(ii)	=two strands of galvanized barbed wire
	(iii)	=three strands of galvanized barbed wire
	(iv) etc	=[stated material]
4*	(o)	=No entry
	(i)	=one strand of galvanized plain wire
	(ii)	=two strands of galvanized plain wire
	(iii)	=three strands of galvanized plain wire
	(iv)	=one strand galvanized plastic coated plain wire
	(v)	=two strands galvanized plastic coated plain wire
	(vi)	=three strands galvanized plastic coated plain wire
	(vii) etc	=[stated material]
5*	(o)	=No entry
	(i)	=galvanized pig netting
	(ii)	=plastic coated pig netting
	(iii)	=galvanized sheep netting
	(iv)	=galvanized large hexagon sheep netting
	(v)	=galvanized small hexagon chicken netting
	(vi)	=galvanized chain link
	(vii)	=plastic coated chain link
	(viii) etc	=[stated material]
6*	(i)	=plastic coated chain link
	(ii)	=galvanized chain link
	(iii)	=cleft chestnut pale
	(iv)	=mild steel bar
	(v)	=wrought iron bar
	(vi)	=woven wire
	(vii)	=strained wire
	(viii)	=close boarded
	(ix)	=timber palisade
	(x)	=woven wood
	(xi) etc	=[stated material]
7*	(i) etc	=[unique height]
8*	(i)	=concrete posts
	(ii)	=concrete posts with cranked top
	(iii)	=concrete posts with bonded plastic coated extension arm
	(iv)	=timber posts
	(v)	=timber posts with bonded plastic coated extension arm

	(vi)	=steel angle posts
	(vii)	=steel angle posts with cranked top
	(viii)	=steel angle posts with extension arm
	(ix)	=plastic coated steel RHS posts
	(x)	=plastic coated steel RHS posts with cranked top
	(xi)	=plastic coated steel RHS posts with extension arm
	(xii)	=plastic coated steel pylon posts
	(xiii)	=steel standard and pillars
	(xiv)	=cast iron posts
	(xv)	=wrought iron posts
	(xvi)	=mild steel posts
	(xvii) etc	=[stated Type or material]
9*	(i)	=steel tubular frame
	(ii)	=timber
	(iii) etc	=[stated material]
10*	(o)	=No entry
	(i)	=Painted
11*	(i)	=single field
	(ii)	=half mesh single field
	(iii)	=extra wide single field
	(iv)	=double field
	(v)	=Type 1 wicket
	(vi)	=Type 2 wicket
	(vii)	=kissing
	(viii)	=bridle
	(ix) etc	=[stated Type]
12*	(i)	=Type 1
	(ii)	=Type 2
	(iii) etc	=[stated Type]
13*	(i) etc	=[stated Type]
14*	(i) etc	=[unique width]
15*	(i)	=main posts
	(ii)	=straining posts
	(iii)	=struts
	(iv)	=intermediate posts
16*	(i)	=wire
	(ii)	=wire mesh

Series 400: Safety Fences, Safety Barriers and Pedestrian Guardrails

Item	*Root Narrative*	*Unit*
	Beam Safety Fences	
1	Untensioned 3*2*12*	m
2	Tensioned 3*2*12*	m
3	4* driven post 9* for 3*2*	no
4	4* post 9* for setting in concrete or socket for 3*2*	no
5	8* surface mounted post 9* fixed to structure or foundation for 3*2*	no
6	Mounting bracket 10* fixed to structure for 3*2*	no
7	Terminal section for untensioned 3*2*	no
8	Terminal section for tensioned 3*2*	no
9	Full height anchorage for 3*2*	no
10	Expansion joint anchorage for 3*2*	no
11	11* connection of 3*2* to bridge parapet	no
12	Connection piece for 3* open box beam to 3* corrugated beam	no
13	6* concrete foundation for post for 2*	no
14	Concrete foundation 11* spanning filter drain for post for 2*	no
15	6* socketed foundation for post for 2*	no
	Remove from Store and Re-erect Beam Safety Fences	
16	1* untensioned 3*2*12*	m
17	1* tensioned 3*2*12*	m
18	1*4* driven post 9* for 3*2*	no
19	1*4* post 9* for setting in concrete or socket for 3*2*	no
20	1*8* surface mounted post 9* fixed to structure or foundation for 3*2*	no
21	1* mounting bracket 10* fixed to structure for 3*2*	no
22	1* terminal section for untensioned 3*2*	no
23	1* terminal section for tensioned 3*2*	no
24	1* full height anchorage for 3*2*	no
25	1* expansion joint anchorage for 3*2*	no
26	1*11* connection of 3*2* to bridge parapet	no
27	1*11* connection piece for 3* open box beam to 3* corrugated beam	no
28	6* concrete foundation for post 1* for 2*	no
29	Concrete foundation 13* spanning filter drain for post 1* for 2*	no
30	6* socketed foundation for post 1* for 2*	no

Post Extension Unit

31	Post extension unit 11*	no

Raising Existing Sockets

32	Raising existing sockets 11*	no

Wire Rope Safety Fences

33	Wire rope	m
34	4* driven 5*	no
35	4*5* for setting in concrete or socket	no
36	8* surface mounted post fixed to structure or foundation	no
37	6* intermediate anchorage	no
38	6* end anchorage	no
39	7*6* concrete foundation for post	no
40	40 7*6* socketed foundation for post	no
41	Concrete foundation 11* spanning filter drain for post	no

Concrete Safety Barriers

42	13* concrete safety barrier 14*	m
43	13* concrete safety barrier termination 15*	no
44	13* concrete safety barrier 15* transition to 3*2*	no

Pedestrian Guardrails and Handrails

45	11* pedestrian guardrails 16* high 17*	m
46	11* handrails 16* high 17*	m

Loading Tests on Post Foundations

47	Loading test on post foundation carried out by Contractor for post type 11* size 18*	no
48	Loading test on post foundation carried out by Overseeing Organisation for post type 11* size 18*	no

Group	*Variables*	
1*	(i)	=remove from store and re-erect
	(ii)	=removed from store and re-erected
2*	(i)	=corrugated beam

	(ii)	=open box beam
	(iii)	=open box beam with standard stiffeners
	(iv) etc	=open box beam with non-standard stiffeners [stated Type]
	(v)	=rectangular hollow section beam size 100 mm x 100 mm
	(vi)	=rectangular hollow section beam size 100 mm x 200 mm
	(vii)	=double rail open box beam
3*	(i)	=single sided
	(ii)	=double sided
	(iii)	=top fixed
	(iv)	=side fixed
4*	(o)	=No entry
	(i)	=short
	(ii)	=long
	(iii) etc	=non-standard [stated Type]
5*	(i)	=line post
	(ii)	=deflection post
	(iii)	=height restraining post
6*	(o)	=No entry
	(i)	=standard
	(ii) etc	=non standard [stated Type]
7*	(i)	=in situ
	(ii)	=precast
8*	(i) etc	=Fixed height [stated height]
	(ii)	=Adjustable
	(iii) etc	=Non-standard [stated Type]
9*	(o)	=No entry
	(i) etc	=with off-set brackets [stated Type]
	(ii)	=with standard spacers
	(iii) etc	=with non-standard spacers [stated Type]
10*	(o)	=No entry
	(i) etc	=on adaptor platform [stated Type]
11*	(i) etc	=[stated Type]
12*	(i)	=straight or curved exceeding 120 metres radius
	(ii)	=curved exceeding 50 metres radius but not exceeding 120 metres radius
	(iii)	=curved not exceeding 50 metres radius
13*	(i)	=permanent vertical
	(ii)	=higher permanent vertical
14*	(i)	=straight or curved exceeding 50 metres radius
	(ii)	=curved not exceeding 50 metres radius
15*	(o)	=No entry
	(i) etc	=[stated Type]
16*	(i) etc	=[unique height]
17*	(o)	=No entry
	(i) etc	=formed to radius of [unique radius] metres

18*	(i) etc	=[stated size]

Series 500: Drainage and Service Ducts

Item	*Root Narrative*	*Unit*
	Drains and Service Ducts (excluding Filter Drains, Narrow Filter Drains and Fin Drains)	
1	1* diameter drain specified design group 2*3*4*5*	m
2	1* diameter 6* drain 7*3*4*5*	m
3	1* diameter service duct specified design 9*3*4*5*	m
4	1* diameter 6* service duct 7*3*4*5*	m
5	Adjustment on last item for variation greater than 150 mm above or below the average depth of ... per 25 mm of variation in excess of 150 mm	m (rate only required)
	Filter Drains	
6	1* diameter filter drain in trench specified design group 2*4*5*	m
7	1* diameter 6* filter drain in trench specified design type 10*4*5*	m
8	1* diameter 6* filter drain in trench with 8*11* filter material 4*5*	m
9	Adjustment on last item for variation greater than 150 mm above or below the average depth of ... per 25 mm of variation in excess of 150 mm	m (rate only required)
10	11* filter material contiguous with filter drain	m^3
11	12* sub-base material	m^3
12	13* lightweight aggregate infill	m^3
13	Excavate and replace 8*11* filter material 4*	m^3
	Fin Drains and Narrow Filter Drains	
14	Fin drain specified design group 2* depth not exceeding 1.5 metres	m
15	Fin drain 14* depth not exceeding 1.5 metres	m
16	Narrow filter drain specified design group 2* depth not exceeding 1.5 metres	m
17	Narrow filter drain 15* depth not exceeding 1.5 metres	m
	Connections	
18	Connection of 1* diameter pipe to existing 1* diameter drain or existing piped culvert 37*	no

19	Connection of 1* diameter pipe to existing chamber 37*	no
20	Connection of 1* diameter drain to permanently severed land or mole drain 37*	no

Chambers and Gullies

21	Chamber specified design group 16* 36* with 17* and frame depth to invert 18*	no
22	Chamber specified design group 16* with 17* and frame depth to uppermost surface of base slab 18*	no
23	19* chamber 9* with 17* and frame depth to invert 18*	no
24	19* chamber 9* with 17* and frame depth to uppermost surface of base slab 18*	no
25	20* gully specified design group 9* with 17* and frame	no
26	21*20* gully with 17* and frame	no

Headwalls and Outfall Works

27	Headwall 22*23* to pipe 24*	no
28	Revetment 22*23* to pipe 24*	no

Soft Spots and Other Voids

29	Excavation of soft spots and other voids in bottom of trenches, chambers and gullies	m^3
30	Filling of soft spots and other voids in bottom of trenches, chambers and gullies with 25*	m^3

Supports Left in Excavation

31	35* supports 27* left in 26*	m^2

Drainage and Service Ducts in Structures (Including Reinforced Earth Structures and Anchored Earth Structures)

32	28* substructure - end supports	item
33	28* substructure - intermediate supports	item
34	28* superstructure	item
35	28* reinforced earth structure	item
36	28* anchored earth structure	item

Filling to Pipe Bays and Verges on Bridges

37	Filling to pipe bays and verges on bridges with 29*	m^3

Replacement, Raising or Lowering of Covers and Gratings on Existing Chambers and Gullies

38	Replacement of 31*17* cover and frame on 31*19* chamber	no
39	Replacement of 31*17* grating and frame on 31*34* gully	no
40	30* the level of 31*17* cover and frame on 31*19* chamber 32*	no
41	30* the level of 31*17* grating and frame on 31*34* gully 32*	no

Remove from Store and Reinstall Chamber Covers and Frames, and Gully Gratings and Frames

42	Remove from store and reinstall 31*17* cover and frame on 19* chamber	no
43	Remove from store and reinstall 31*17* grating and frame on 34* gully	no

Grouting up of Existing Drains and Service Ducts

44	Grouting up of existing 1* diameter drain and service duct with 33*	m

Excavation in Hard Material

45	Extra over excavation for excavation in Hard Material in drainage	m^3

Concrete Bagwork

46	Concrete bagwork 38*39*	m^3

Cleaning Existing Drainage Systems

47	Cleaning 40*31*41*	m
48	Cleaning of bridge drainage system 41*	item
49	Cleaning of chambers 31*41*	no
50	Cleaning of gullies 31*41*	no

Group	*Variables*	
1*	(i)	=75 mm internal
	(ii)	=100 mm internal
	(iii)	=150 mm internal
	(iv)	=200 mm internal
	(v)	=225 mm internal
	(vi)	=250 mm internal
	(vii)	=300 mm internal
	(viii)	=375 mm internal

	(ix)	=400 mm internal
	(x)	=450 mm internal
	(xi)	=500 mm internal
	(xii)	=525 mm internal
	(xiii)	=600 mm internal
	(xiv)	=675 mm internal
	(xv)	=700 mm internal
	(xvi)	=750 mm internal
	(xvii)	=800 mm internal
	(xviii)	=825 mm internal
	(xix)	=900 mm internal
	(xx)	=One number 100 mm internal
	(xxi)	=Two number 100 mm internal
	(xxii)	=Three number 100 mm internal
	(xxiii)	=Four number 100 mm internal
	(xxiv) etc	=[stated number and diameter]
2*	(i)	=2
	(ii)	=3
	(iii)	=4
	(iv)	=5
	(v)	=6
	(vi)	=7 [Note. These group reference numbers allow for all
	(vii)	=8 types of bed combination. Where a particular bed
	(viii)	=9 is excluded from any one group the group
	(ix)	=10 reference should be followed by the suffix X and
	(x)	=11 the excluded bed type, eg 3XD]
	(xi)	=12
	(xii)	=13
	(xiii)	=14
	(xiv)	=15
	(xv) etc	=16 [for fin drains only]
	(xvi) etc	=[stated Group]
3*	(i)	=in trench
	(ii)	=in heading
	(iii)	=by jacking or thrust boring
	(iv)	=suspended on discrete supports
4*	(o)	=No entry
	(i)	=in side slopes of cuttings or side slopes of embankments
5*	(i)	=depth to invert not exceeding 2 metres, average depth to invert ...
	(ii) etc	=depth to invert exceeding 2 metres but not exceeding 4 metres (and so on in stages of 2 metres), average depth to invert ...
6*	(i)	=vitrified clay - standard strength
	(ii)	=vitrified clay - extra strength
	(iii)	=vitrified clay - super strength
	(iv)	=vitrified clay - higher strength
	(v)	=vitrified clay - perforated
	(vi)	=concrete strength Class L
	(vii)	=concrete strength Class M
	(viii)	=concrete strength Class H
	(ix)	=concrete strengthened by glass fibre rovings or galvanized steel fibres
	(x)	=concrete - perforated

	(xi)	=concrete - porous
	(xii)	=concrete - standard
	(xiii)	=asbestos cement Class L
	(xiv)	=asbestos cement Class M
	(xv)	=asbestos cement Class H
	(xvi)	=plastic - glass reinforced
	(xvii)	=iron - ductile Class K9
	(xviii)	=UPVC
	(xix)	=UPVC - perforated or slotted
	(xx)	=plastic
	(xxi)	=plastic - perforated
	(xxii)	=corrugated steel
	(xxiii)	=vitrified clay
	(xxiv)	=ductile cast iron
	(xxv)	=ultrarib
	(xxvi) etc	=[stated Type]
7*	(o)	=No entry
	(i)	=on bed Type A
	(ii)	=on bed Type B
	(iii)	=on bed Type F
	(iv)	=on bed Type N
	(v)	=on bed Type S
	(vi)	=on bed Type T
	(vii)	=on bed Type Z
	(viii) etc	=[on stated Type of bedding detail]
8*	(i) etc	=[stated material]
9*	(i) etc	=[stated Type for ducts]
	(ii) etc	=[stated Type for chambers and street gullies]
10*	(i)	=Type G
	(ii)	=Type H
	(iii)	=Type I
	(iv)	=Type J
	(v)	=Type K
	(vi)	=Type L
	(vii)	=Type M
	(viii) etc	=[stated Type]
11*	(i)	=Type A
	(ii)	=Type B
	(iii)	=Type C
12*	(i)	=Granular Type 1
	(ii)	=Granular Type 2
13*	(i) etc	=[stated Type]
14*	(o)	=No entry
	(i)	=Type 5
	(ii)	=Type 6
	(iii)	=Type 7
15*	(o)	=No entry
	(i)	=Type 8
	(ii)	=Type 9
	(iii) etc	=[stated Type]

16*	(i)	=Type 1
	(ii)	=Type 2
	(iii)	=Type 3
	(iv)	=Type 4
	(v)	=Type 5
	(vi)	=Type 6
	(vii)	=Type 7
	(viii)	=Type 8
	(ix) etc	=[stated Group or Type]
17*	(i) etc	=[stated Type of cover]
	(ii) etc	=[stated Type of grating]
18*	(i)	=not exceeding 1 metre
	(ii) etc	=exceeding 1 metre but not exceeding 2 metres (and so on in steps of 1 metre)
19*	(i)	=Brick
	(ii)	=Precast concrete
	(iii) etc	=In situ concrete grade/mix [direct entry]
	(iv)	=Corrugated galvanized steel
20*	(i)	=Trapped
	(ii)	=Untrapped
21*	(i)	=Precast concrete
	(ii)	=Sumpless
	(iii)	=Cast iron
	(iv) etc	=In situ cast [stated type]
22*	(i) etc	=[stated Type]
23*	(o)	=No entry
	(i)	=in brickwork
	(ii)	=in mass concrete
	(iii)	=in reinforced concrete
	(iv) etc	=[stated material]
24*	(i)	=not exceeding 100 mm internal diameter
	(ii)	=exceeding 100 mm but not exceeding 300 mm internal diameter
	(iii)	=exceeding 300mm but not exceeding 600mm internal diameter
	(iv)	=exceeding 600mm but not exceeding 900mm internal diameter
25*	(i)	=pipe bedding material
	(ii) etc	=in situ concrete mix [direct entry]
	(iii) etc	=acceptable material class [direct entry]
26*	(o)	=No entry
	(i)	=trench
	(ii)	=pits
	(iii)	=heading
27*	(i) etc	=[stated Type]
28*	(i)	=Drainage of
	(ii)	=Service ducts in

29*	(i) etc	=[stated material]
30*	(i)	=Raise
	(ii)	=Lower
31*	(i) etc	=[unique size as required]
32*	(i)	=150 mm or less
	(ii) etc	=exceeding 150 mm but not exceeding 300 mm (and so on in stages of 150 mm)
33*	(i)	=cement/PFA grout
	(ii) etc	=[stated Type]
34*	(i)	=precast concrete
	(ii)	=vitrified clay
	(iii)	=cast iron
	(iv)	=in situ concrete
35*	(i)	=Timber
	(ii)	=Steel
	(iii) etc	=[stated material]
36*	(i)	=a
	(ii)	=b
	(iii)	=c
	(iv)	=d
	(v)	=e
	(vi) etc	=[stated sub-type]
37*	(i)	=depth to invert not exceeding 2 metres
	(ii) etc	=depth to invert exceeding 2 metres but not exceeding 4 metres (and so on in stages of 2 metres)
38*	(i)	=in headwalls
	(ii) etc	=[stated location]
39*	(o)	=No entry
	(i)	=with battered face
40*	(i)	=piped drainage system
	(ii)	=drainage channels
	(iii)	=linear drainage system
	(iv)	=combined drainage and kerb system
41*	(i) etc	=[stated location]

Series 600: Earthworks

Item	*Root Narrative*	*Unit*
	Excavation	
1	Excavation of acceptable material Class 5A	m^3
2	Excavation of acceptable material excluding Class 5A in 3*	m^3
3	Excavation of acceptable material excluding Class 5A in 4*5* in depth	m^3
4	Excavation of unacceptable material 2* in 3*	m^3
5	Excavation of unacceptable material 2* in 4*5* in depth	m^3
	Excavation in Hard Material	
6	Extra over excavation for excavation in Hard Material in 6*	m^3
	Processing of Unacceptable Material Class U1	
7	Processing of unacceptable material class U1 7* into 8* acceptable material	m^3
	Deposition of Fill	
8	Deposition of acceptable material 9* in 10*	m^3
	Disposal of Material	
9	Disposal of 11*	m^3
	Imported Fill	
10	Imported acceptable material 12* in 10*	m^3
11	Imported topsoil Class 5B	m^3
	Compaction of Fill	
12	Compaction of acceptable material 9* in 10*	m^3
	Soil Stabilisation	
13	Soil stabilisation 13* with 14*	m^3
	Geotextiles	
14	Geotextile 15*16*	m^2

Soft Spots and Other Voids

15	Excavation of soft spots and other voids 17*	m^3
16	Filling of soft spots and other voids 17* with 18*	m^3

Disused Sewers, Drains, Cables, Ducts, Pipelines and the Like Occurring at Formation or Sub-formation Level; Disused Basements, Cellars and the Like and Gullies

17	Removal of disused 19*20* with 21* of cover to formation level	m
18	Backfilling of disused 19*20* with 21* of cover to formation level with 18*	m^3
19	Backfilling of disused basements, cellars and the like with 18*	m^3
20	Backfilling of disused gullies 20* with 18*	no

Supports Left in Excavation

21	22*23* supports left in excavation	m^2

Topsoiling and Storage of Topsoil

22	Topsoiling 24* thick to surfaces sloping 25* to the horizontal	m^2
23	Permanent storage of topsoil	m^3

Completion of Formation and Sub-formation

24	Completion of 28* on 29*	m^2

Lining of Watercourses

25	Lining 30*31* with 32*24* thick	m^2

Clearing of Existing Ditches

26	Clearing of existing ditch at 33*	m

Ground Improvement - Establishment of Plant

27	Establishment of dynamic compaction plant at 33*	item
28	Establishment of vibrated stone columns plant at 33*	item

Ground Improvement - Dynamic Compaction

29	Dynamic compaction in 34* compaction with 35* pounder	m
30	Dynamic compaction plant standing time	hr
31	12* material in granular blanket	t

Ground Improvement - Vibrated Stone Columns

32	Vibrated stone column 65* installed by 66* in columns 67*	m
33	Vibrated stone column plant standing time	hr

Gabion Walling and Mattresses

34	Gabion walling with 36* mesh 37* filled with 24* Class 6G material 38*	m^3
35	Mattress with 36* mesh 37* filled with 24* Class 6G material installed 25* to the horizontal 38*	m^3

Crib Walling

36	Crib walling 39*40*41*42* and 43* infill	m^2

Filling and Caps to Mine Working, Well, Swallow Hole and the Like

37	Filling 44* with 43*	t
38	Caps to 44* with 45*	m^3

Ground Anchorages - Ground Anchorage Plant

39	Establishment of ground anchorage plant at 33*	item

Ground Anchorages

40	Ground anchorages 39*47* in length in 34* anchorages	m

Ground Anchorages - Waterproofing Anchorage Boreholes

41	Waterproofing borehole by 48* grouting	m

Instrumentation and Monitoring - Boring Plant

42	Establishment of boring plant at 33*	item

Instrumentation and Monitoring - Boring Holes

43	Boring 49* holes 50* in depth	m

Instrumentation and Monitoring - Instrumentation

44	Installation of 51*	no
45	Installation of 52* tubing 53* in length or depth	m
46	Installation of 52* cabling 53* in length or depth	m
47	48* grouting 53* in length or depth	m

Instrumentation and Monitoring - Instrument Hut or Cabinet

48	54* instrument 55* for the Overseeing Organisation 56*	item

Instrumentation and Monitoring - Monitoring Equipment

49	Monitoring equipment 39*	item

Ground Water Lowering

50	Ground water lowering 33*	item

Trial Pits

51	Trial pit 5* in depth	m^3

Breaking Up and Perforation of Redundant Pavements

52	61* of redundant 57*58*59*60* deep	m^2

Perforation of Redundant Slabs, Basements and the Like

53	Perforation of redundant 57* 62* 63* 64* thick	m^2

Group	*Variables*	
1*	*Not used	
2*	(i)	=Class U1
	(ii)	=Class U2
3*	(i)	=cutting and other excavation
	(ii)	=new watercourses
	(iii)	=enlarged watercourses
	(iv)	=intercepting ditches
	(v)	=clearing abandoned watercourses

	(vi)	=removal of surcharge
4*	(i)	=structural foundations
	(ii)	=gabion walling and mattresses
	(iii)	=crib walling
	(iv)	=caps to mine working, well, swallow hole and the like
	(v)	=foundations for corrugated steel buried structures and the like
5*	(i)	=0 to 3 metres
	(ii)	=0 to 6 metres
	(iii) etc	=0 to 9 metres (and so on in steps of 3 metres)
6*	(i)	=cutting and other excavation
	(ii)	=structural foundations
	(iii)	=foundations for corrugated steel buried structures and the like
	(iv)	=new watercourses
	(v)	=enlarged watercourses
	(vi)	=intercepting ditches
	(vii)	=clearing abandoned watercourses
	(viii)	=gabion walling and mattresses
	(ix)	=crib walling
	(x)	=caps to mine workings, well, swallow hole and the like
7*	(i) etc	=[stated location reference]
8*	(i) etc	=[stated Class or Classes of acceptable material]
9*	(o)	=No entry
	(i)	=Class 1C
	(ii)	=Class 6B
10*	(i)	=embankments and other areas of fill
	(ii)	=strengthened embankments
	(iii)	=reinforced earth structures
	(iv)	=anchored earth structures
	(v)	=landscape areas
	(vi)	=environmental bunds
	(vii)	=fill to structures
	(viii)	=fill above structural concrete foundations
	(ix)	=fill on sub-base material, base and capping
	(x)	=fill on bridges (under footways, verges and central reserves)
	(xi)	=upper bedding to corrugated steel buried structures and the like
	(xii)	=lower bedding to corrugated steel buried structures and the like
	(xiii)	=surround to corrugated steel buried structures and the like
	(xiv)	=fill above corrugated steel buried structures and the like
11*	(i)	=acceptable material excluding Class 5A
	(ii)	=acceptable material Class 5A
	(iii)	=unacceptable material Class U1
	(iv)	=unacceptable material Class U2
12*	(o)	=No entry
	(i)	=Class 1A
	(ii)	=Class 1B
	(iii)	=Class 1C
	(iv)	=Class 2A

	(v)	=Class 2B
	(vi)	=Class 2C
	(vii)	=Class 2D
	(viii)	=Class 2E
	(ix)	=Class3
	(x)	=Class 4
	(xi)	=Class 6A
	(xii)	=Class 6B
	(xiii)	=Class 6C
	(xiv)	=Class 6D
	(xv)	=Class 6E
	(xvi)	=Class 6F1
	(xvii)	=Class 6F2
	(xviii)	=Class 6F3
	(xix)	=Class 6G
	(xx)	=Class 6H
	(xxi)	=Class 6I
	(xxii)	=Class 6J
	(xxiii)	=Class 6K
	(xxiv)	=Class 6L
	(xxv)	=Class 6M
	(xxvi)	=Class 6N
	(xxvii)	=Class 6P
	(xxviii)	=Class 6Q
	(xxix)	=Class 6R
	(xxx)	=Class 7A
	(xxxi)	=Class 7B
	(xxxii)	=Class 7C
	(xxxiii)	=Class 7D
	(xxxiv)	=Class 7E
	(xxxv)	=Class 7F
	(xxxvi)	=Class 7G
	(xxxvii)	=Class 7H
	(xxxviii)	=Class 7I
	(xxxix)	=Class 8
	(xl)	=Class 9A
	(xli)	=Class 9B
	(xlii)	=Class 9C
	(xliii)	=Class 9D
	(xliv)	=Class 9E
	(xlv)	=Class 9F
	(xlvi)etc	=[stated Class]
13*	(o)	=No entry
	(i)	=of capping
14*	(i)	=cement
	(ii)	=lime
15*	(o)	=No entry
	(i) etc	=[stated Type]
16*	(o)	=No entry
	(i) etc	=[stated Grade]
17*	(i)	=below cuttings or under embankments
	(ii)	=in side slopes
	(iii)	=below structural foundations and foundations for corrugated steel buried structures

18*	(i)	=acceptable material
	(ii) etc	=acceptable material Class [direct entry]
	(iii) etc	=in situ concrete mix [direct entry]
19*	(i)	=sewer or drain
	(ii)	=cable
	(iii)	=duct
	(iv)	=pipeline
	(v) etc	=[stated service]
20*	(i) etc	=internal diameter [direct entry]
	(ii) etc	=external diameter [direct entry]
21*	(i)	=one metre or less
	(ii)	=exceeding one metre but not exceeding two metres
	(iii) etc	=exceeding two metres but not exceeding three metres (and so on in steps of one metre)
22*	(i)	=Timber
	(ii)	=Steel
	(iii) etc	=[stated material]
23*	(o)	=No entry
	(i)	=trench sheeting
	(ii)	=sheet piling
24*	(i)	=25 mm
	(ii)	=50 mm
	(iii)	=75 mm
	(iv) etc	=100 mm (and so on in steps of 25 mm)
25*	(i)	=at 10^{o} or less
	(ii)	=more than 10^{o}
26*	*Not used	
27*	*Not used	
28*	(i)	=sub-formation
	(ii)	=formation
29*	(i)	=material other than Class 1C, 6B or rock in cuttings
	(ii)	=Class 1C material
	(iii)	=Class 6B material
	(iv)	=rock in cuttings
30*	(i)	=new watercourse
	(ii)	=enlarged watercourse
	(iii)	=intercepting ditches
31*	(i)	=invert
	(ii)	=side slopes
32*	(i)	=precast concrete units
	(ii) etc	=in situ concrete grade/mix [direct entry]
	(iii)	=uncoursed random rubble
	(iv)	=coursed random rubble
	(v)	=bagwork
	(vi) etc	=[stated material]
33*	(i) etc	=[stated location reference]

34*	(i)	=trial
	(ii)	=main
35*	(i) etc	=[stated weight]
36*	(i)	=plastic coated galvanized wire
	(ii)	=geomesh
	(iii) etc	=[stated material]
37*	(i) etc	=[stated mesh size]
38*	(o)	=No entry
	(i)	=in environmental bunds
39*	(i) etc	=[stated Type and capacity]
40*	(o)	=No entry
	(i)	=curved on plan
41*	(o)	=No entry
	(i)	=with a battered face
42*	(o)	=No entry
	(i)	=surface finish Class F1
	(ii)	=surface finish Class F2
	(iii) etc	=[stated Class of surface finish]
43*	(i)	=sand
	(ii) etc	=in situ concrete grade/mix [direct entry]
	(iii)	=acceptable material except Class 5A
	(iv) etc	=[stated material]
44*	(i)	=mine working
	(ii)	=well
	(iii)	=swallow hole and the like
	(iv) etc	=[stated Type of cavity]
45*	(i)	=precast concrete units
	(ii) etc	=in situ concrete grade/mix [direct entry]
46*	*Not used	
47*	(i)	=not exceeding 5 metres
	(ii) etc	=exceeding 5 metres but not exceeding 10 metres (and so on in steps of 5 metres)
48*	(i)	=standard
	(ii)	=pressure
49*	(i)	=vertical
	(ii)	=raking
50*	(i)	=not exceeding 10 metres
	(ii) etc	=exceeding 10 metres but not exceeding 20 metres (and so on in steps of 10 metres)
51*	(i) etc	=[stated type of instrument]
52*	(i) etc	=[stated material]
53*	(i)	=not exceeding 10 metres

	(ii) etc	=exceeding 10 metres but not exceeding 50 metres (and so on in steps of 50 metres)
54*	(i)	=erection of
	(ii)	=servicing of
	(iii)	=dismantling of
55*	(i)	=hut
	(ii)	=cabinet
56*	(i)	=until completion of the works
	(ii)	=after completion of the works
57*	(o)	=No entry
	(i)	=reinforced
58*	(i)	=concrete
	(ii)	=rigid composite
	(iii)	=rigid
	(iv)	=flexible
	(v)	=flexible composite
	(vi) etc	=[stated type of slab construction]
59*	(i)	=slab
	(ii)	=pavement
	(iii)	=paved area
	(iv) etc	=[stated Type of slab]
60*	(i)	=not exceeding 100 mm
	(ii)	=exceeding 100 mm deep but not exceeding 200 mm
	(iii) etc	=exceeding 200 mm deep but not exceeding 300 mm (and so on in steps of 100 mm)
61*	(i)	=Breaking up
	(ii)	=Perforation
62*	(i)	=concrete
	(ii)	=brickwork
	(iii) etc	=[stated material]
63*	(i)	=slab
	(ii)	=basement
	(iii) etc	=[stated structure]
64*	(i)	=not exceeding 100 mm
	(ii)	=exceeding 100 mm thick but not exceeding 200 mm
	(iii) etc	=exceeding 200 mm thick but not exceeding 300 mm (and so on in steps of 100 mm)
65*	(i) etc	=[stated minimum diameter]
66*	(i) etc	=[stated Type of installation]
67*	(i)	=not exceeding 5 metres in length
	(ii)	=exceeding 5 metres but not exceeding 10 metres in length (and so on in steps of 5 metres)

Series 700: Pavements

Item	*Root Narrative*	*Unit*
	Sub-base	
1	1* sub-base 8*	m^2
	Pavement	
2	2*6*5* base course 7* thick 8*	m^2
3	2*6* lower base course 7* thick 8*	m^2
4	2*6* upper base course 7* thick 8*	m^2
5	3*6* binder course 7* thick 8*22*	m^2
6	4*6* surface course 7* thick 8*22*	m^2
7	4*6* surface course 7* thick with 12* coated chippings 8*22*	m^2
8	Pavement comprising 5* slab 7* thick 8*	m^2
	Regulating Course	
9	10*6*11* regulating course	t
10	10*6*11* regulating course	m^3
11	9*11* regulating course	m^3 (t)
	Surface Treatment	
12	Slurry sealing 13*7*17*	m^2
13	Surface dressing 13*7*23*17*	m^2
14	Bituminous spray 13*17*	m^2
15	Resin based surface treatment 13*7*23*17*	m^2
	Tack Coat	
16	Tack Coat 13*17*	m^2
	Cold Milling (Planing)	
17	14* pavement 15*	m^2
	In Situ Recycling - The Remix and Repave Processes	
18	21* in situ recycle process 15*	m^2

Reinstatement of Paved Areas

19	Reinstate paved area with 16*15*	m^2

Thin Bonded Repairs and Joint Repairs to Existing Concrete Carriageway

20	Thin bonded repairs 18*19*15*	m^2
21	Joint repairs 18*20*15*	m
22	Saw-cutting grooves 24*	m
23	Sealing grooves 25*	m

Full Depth Repairs and Bay Replacement Repairs to Existing Concrete Carriageway

24	Full depth repairs 26*27* thick	m^2
25	Bay replacement repairs 26*27* thick	m^2
26	Reinstatement of sub-base	m^3

Saw Cutting, Cracking and Seating Existing Jointed Reinforced Concrete Pavements

27	Removal of existing bituminous overlay	m^2
28	Main trial	item
29	Re-assessment trial	no
30	Saw-cutting existing pavement 28*	m^2
31	Cracking existing pavement 29*	m^2
32	Seating existing pavement 29*	m^2

Cracking and Seating of Existing Jointed Unreinforced Concrete Pavements and CBM Bases

33	Removal of existing bituminous overlay	m^2
34	Main trial	item
35	Re-assessment trial	no
36	Cracking 30*29*31*	m^2
37	Seating 30*29*	m^2

Overbanding and Inlaid Crack Sealing Repair Systems

38	Simple overbanding repair system with 32*	m
39	Fill and overbanding repair system 36*32*	m
40	Inlaid sealing repair system 37*32*	m

Maintenance of Arrester Beds

41	Maintenance of arrester bed 33*	item

Repairs and Patching

42	Repairs to potholes with 34*	kg
43	Repairs to depressions with 34*	kg
44	Patching 27* thick with 34*35*	m^2

Group	*Variables*	
#1*	(i)	=Granular Type 1
	(ii)	=Granular Type 2
	(iii)	=Granular Type 4
	(iv)	=Class 1D General Fill
	(v)	=Cement Bound Material Category 2
	(vi)	=Cement Bound Material Category 4
	(vii)	=Wet lean concrete 1
	(viii)	=Wet lean concrete 2
	(ix)	=Wet lean concrete 3
	(x)	=Wet lean concrete 4
	(xi) etc	=[stated type or material]
2*	(o)	=No entry
	(i)	=Cement bound material Category 2
	(ii)	=Cement bound material Category 4
	(iii)	=Wet lean concrete 1
	(iv)	=Wet lean concrete 2
	(v)	=Wet lean concrete 3
	(vi)	=Wet lean concrete 4
	(vii)	=Asphalt concrete
	(viii)	=Granular Type1
	(ix)	=Granular Type2
	(x)	=Granular Type4
	(xi) etc	=[stated type or material]
3*	(i)	=Asphalt concrete
	(ii) etc	=[stated type or material]
4*	(i) etc	=Asphalt concrete [stated design mix]
	(ii) etc	=Gussasphalt [stated design mix]
	(iii)	=Porous asphalt
	(iv)	=Thin layer
	(v) etc	=[stated type or material]
5*	(o)	=No entry
	(i)	=special permitted alternative design for concrete
	(ii)	=jointed reinforced concrete
	(iii)	=unreinforced concrete
	(iv)	=continuously reinforced concrete
6*	(o)	=No entry
	(i)	=with 12.5 mm aggregate
	(ii)	=with 19 mm aggregate
	(iii)	=with 25 mm aggregate

	(iv)	=with 37.5 mm aggregate
	(v)	=with 50 mm aggregate
	(vi) etc	=with [stated size of aggregate]
7*	(o)	=No entry
	(i) etc	=[stated thickness]
8*	(i)	=in carriageway, hardshoulder and hardstrip
	(ii)	=in emergency crossing
	(iii)	=in lay-by and bus bay
9*	(i)	=Cement bound material Category 2
	(ii)	=Cement bound material Category 4
	(iii)	=Wet lean concrete 1
	(iv)	=Wet lean concrete 2
	(v)	=Wet lean concrete 3
	(vi)	=Wet lean concrete 4
	(vii) etc	=[stated type or material]
10*	(i) etc	=Asphalt concrete [stated design mix]
	(ii) etc	=[stated type or material]
11*	(o)	=No entry
	(i)	=lower base course
	(ii)	=upper base course
	(iii)	=base course
	(iv)	=binder course
	(v)	=surface course
12*	(i)	=1/3 mm
	(ii)	=2/5 mm
	(iii)	=2.36/4.75 mm
	(iv)	=4.75/9.5 mm
	(v) etc	=[stated size]
13*	(o)	=No entry
	(i) etc	=[stated type, material or specification reference]
14*	(i)	=Milling
15*	(i) etc	=[stated depth or thickness]
16*	(i) etc	=[Unique type of pavement]
17*	(o)	=No entry
	(i) etc	=[stated rate of spread]
18*	(i) etc	=[unique type]
19*	(i)	=individual areas not exceeding 1 square metre on plan
	(ii) etc	=individual areas exceeding 1 square metre but not exceeding 2 square metres on plan (and so on in steps of 1 square metre)
20*	(i)	=individual lengths not exceeding 1 linear metre
	(ii) etc	=individual lengths exceeding 1 linear metre but not exceeding 2 linear metres (and so on in steps of 1 linear metre)
21*	(i)	=Repave
	(ii)	=Remix
	(iii)	=Remix/repave

	(iv)	=Reshape
22*	(o)	=No entry
	(i)	=in overlay
23*	(o)	=No entry
	(i)	=stated colour
24*	(i)	=depth of cut not exceeding 50mm
	(ii) etc	=depth of cut exceeding 50mm but not exceeding 75mm (and so on in steps of 25mm)
25*	(i) etc	=[stated thickness or depth]
26*	(i)	=in unreinforced slabs
	(ii)	=in reinforced slabs
27*	(i) etc	=[stated thickness]
28*	(i)	=saw-cuts exceeding 50mm but not exceeding 70mm in depth
	(ii)	=saw-cuts exceeding 70mm but not exceeding 90mm in depth
	(iii) etc	=saw-cuts exceeding 90mm but not exceeding 110mm in depth (and so on in steps of 20mm)
29*	(i)	=thickness not exceeding 50mm
	(ii)	=thickness exceeding 50mm but not exceeding 100mm
	(iii) etc	=thickness exceeding 100mm but not exceeding 150mm (and so on in steps of 50mm)
30*	(i)	=jointed unreinforced concrete pavement
	(ii)	=CBM base
31*	(i)	=transverse cracks exceeding 1.00 metre but not exceeding 2.00 metres centres
	(ii)	=transverse cracks exceeding 2.00 metres but not exceeding 3.00 metres centres
	(iii)	=transverse cracks exceeding 3.00 metres but not exceeding 4.00 metres centres
	(iv) etc	=transverse cracks exceeding 4.00 metres but not exceeding 6.00 metres centres (and so on in steps of 2.00 metres)
32*	(i) etc	=[stated material]
33*	(i) etc	=[stated location]
34*	(i) etc	=[stated repair material or system]
35*	(i)	=in areas not exceeding 5 square metres
	(ii)	=in areas exceeding 5 square metres but not exceeding 10 square metres
	(iii) etc	=in areas exceeding 10 square metres but not exceeding 15 square metres (and so on in steps of 5 square metres)
36*	(i)	= crack exceeding 5 mm but not exceeding 10 mm wide
	(ii)	= crack exceeding 10 mm but not exceeding 15 mm wide
	(iii)	= crack exceeding 15 mm but not exceeding 20 mm wide
37*	(i) etc	= [stated width of crack]

Series 800 is not taken up

Series 900 is not taken up

Series 1000 is not taken up

Series 1100: Kerbs, Footways and Paved Areas

Item	*Root Narrative*	*Unit*
	Kerbs, Channels, Edgings, Combined Drainage and Kerb Blocks and Linear Drainage Channel Systems	
1	Permitted alternative 3*1*4*	m
2	2*3*1*4*	m
	Additional Concrete for Kerbs, Channels, Edgings, Combined Drainage and Kerb Blocks and Linear Drainage Channel Systems	
3	Additional 18* for 1*2*3*	m^3
	Remove from Store and Relay Kerbs, Channels, Edgings, Combined Drainage and Kerb Blocks and Linear Drainage Channel Systems	
4	Remove from store and relay 2*3*1*4*	m
	Footways and Paved Areas	
5	19* specified design group 1*10* thick 15*11*	m^2
6	19* comprising 5* sub-base 10* thick 6*8*10* thick 7*8*10* thick with surface dressing 9*15*11*	m^2
7	10*18*19* on 5* sub-base 10* thick 15*11*	m^2
8	13*12* in 19* on 5* sub-base 10* thick and 14* bedding 15*11*	m^2
9	16* regulating course	m^3 (t)
10	17*8* regulating course	m^3 (t)
	Remove from Store and Relay Paving Flags, Slabs and Blocks	
11	Remove from store and relay 13*12* in 19* on 5* sub-base 10* thick and 14* bedding 15*11*	m^2
	Steps	
12	Flight of steps 20*	no

Group	*Variables*	
1*	(o)	=No entry

	(i) etc	=[stated Group, Type or Design]
2*	(o)	=No entry
	(i)	=precast concrete
	(ii)	=in situ unreinforced concrete grade [direct entry]
	(iii)	=in situ reinforced concrete grade [direct entry]
	(iv)	=in situ asphalt
	(v)	=granite
	(vi)	=granite sett
	(vii) etc	=[stated material]
3*	(i)	=kerb(s)
	(ii)	=channel(s)
	(iii)	=edging(s)
	(iv)	=combined drainage and kerb blocks
	(v)	=linear drainage channel systems
4*	(i)	=laid straight or curved exceeding 12 metres radius
	(ii)	=laid to curves not exceeding 12 metres radius
5*	(o)	=No entry
	(i)	=granular material Type 1
	(ii)	=granular material Type 2
	(iii)	=granular material Type 4
	(iv)	=cement bound material Category 2
	(v)	=cement bound material Category 4
	(vi)	=wet lean concrete 1
	(vii)	=wet lean concrete 2
	(viii)	=wet lean concrete 3
	(ix)	=wet lean concrete 4
	(x) etc	=[stated type or material]
6*	(i)	=Asphalt concrete
	(ii)	=Gussasphalt
	(iii) etc	=[stated material]
7*	(i) etc	=Asphalt concrete [stated design mix] surface course
	(ii) etc	=Gussasphalt [stated design mix] surface course
	(iii) etc	=[stated material]
8*	(o)	=No entry
	(i)	=with 12.5 mm aggregate
	(ii)	=with 19 mm aggregate
	(iii)	=with 25 mm aggregate
	(iv) etc	=with [stated size of aggregate]
9*	(o)	=No entry
	(i) etc	=[stated type]
10*	(i) etc	=[stated thickness in mm]
11*	(o)	=No entry
	(i)	=as cycle track
	(ii)	=as police observation platform
	(iii)	=as hardened central reserve
	(iv)	=beneath structures
	(v) etc	=[other]
12*	(o)	=No entry

	(i)	=precast concrete slabs
	(ii)	=stone paving flags
	(iii)	=concrete block paving
	(iv)	=brick paving
	(v)	=granite sett paving
	(vi) etc	=[stated type]
13*	(o)	=No entry
	(i) etc	=[stated size and thickness reference]
14*	(o)	=No entry
	(i)	=mortar
	(ii)	=fine aggregate to BS 882 Grading C
	(iii)	=fine aggregate to BS 882 Grading M
	(iv) etc	=[stated material]
15*	(o)	=No entry
	(i)	=surfaces sloping at 10o or less to the horizontal
	(ii)	=surfaces sloping at more than 10o to the horizontal
16*	(i)	=Cement bound material Category 2
	(ii)	=Cement bound material Category 4
	(iii)	=Wet lean concrete 1
	(iv)	=Wet lean concrete 2
	(v)	=Wet lean concrete 3
	(vi)	=Wet lean concrete 4
	(vii) etc	=[stated type or material]
17*	(i) etc	=Asphalt concrete [stated design mix]
	(ii) etc	=[stated type or material]
18*	(i) etc	=in situ concrete mix [direct entry]
19*	(i)	=Footway
	(ii)	=Paved area
20*	(i) etc	=[stated location reference]

Series 1200: Traffic Signs and Road Markings

Item	*Root Narrative*	*Unit*
	Traffic Signs	
1	1*2* traffic sign to 4*3*5* in area on 6*7*	no
	Remove from Store and Re-erect Traffic Signs	
2	Remove from store and re-erect 2* traffic sign to 4*3* 5* in area on 6*7*	no
	Road Markings	
3	8* solid area in 17*9*10*	m^2
4	8* continuous line in 17*9*10*11* wide	m
5	8* intermittent line in 17*9*10*11* wide with 11* line and 11* gap	m
6	8* ancillary line 17*9*10*11* wide 12*	m
7	8* raised rib lines in 17*9*10*11* with ribs at 11* centres	m
8	8* triangle in 17*9*10* to 4*	no
9	8* circle with enclosing arrows in 17*9*10*11* diameter to 4*	no
10	8* arrow in 17*9*10*11* long 13* to 4*	no
11	8* kerb marking in 17*9*10*11* long to 4*	no
12	8* letters in 17*9*10*11* high	no
13	8* numerals in 17*9*10*11* high	no
14	8* symbols in 17*9*10*14* to 4*	no
	Road Studs	
15	14*15*16* road stud with 17*18* reflectors	no
	Remove from Store and Re-install Road Studs	
16	Remove from store and re-install 14*15*16* road stud with 17*18* reflectors	no
	Traffic Signal Installations	
17	1* traffic signal installation at 21*	item
	Controlled and Uncontrolled Crossings	
18	1* controlled crossing at 21*	item

19	1* uncontrolled crossing at 21*	item
	Marker Posts	
20	19* marker post 20*	no
	Permanent Bollards	
21	Permanent bollard 22*23*24*	no
	Node Markers	
22	25* node marker 26*	no

Group	*Variables*	
1*	(o)	=No entry
	(i)	=Permanent
	(ii)	=Prescribed temporary
2*	(o)	=No entry
	(i)	=retroreflective
	(ii)	=non-retroreflective
	(iii)	=enhanced retroreflective
3*	(o)	=No entry
	(i)	=as Lit Sign Unit
	(ii)	=as non-Lit Sign Unit
4*	(o)	=No entry
	(i) etc	=[stated Traffic Signs Regulations and General Directions Diagram Number]
	(ii) etc	=[stated authorised sign number]
5*	(i)	=sign face not exceeding 0.25 square metre
	(ii)	=sign face exceeding 0.25 square metre but not exceeding 0.50 square metre
	(iii)	=sign face exceeding 0.5 square metre but not exceeding 0.75 square metre
	(iv)	=sign face exceeding 0.75 square metre but not exceeding 1 square metre
	(v)	=sign face exceeding 1 square metre but not exceeding 2 square metres
	(vi)	=sign face exceeding 2 square metres but not exceeding 3 square metres
	(vii) etc	=sign face exceeding 3 square metres but not exceeding 4 square metres (and so on in steps of 1 square metre)
6*	(o)	=No entry
	(i)	=existing
	(ii)	=one
	(iii)	=two
	(iv)	=three

	(v)	=four
7*	(i)	=timber supporting post(s)
	(ii)	=reinforced concrete post(s)
	(iii)	=prestressed concrete post(s)
	(iv)	=rectangular steel post(s)
	(v)	=tubular steel post(s)
	(vi)	=rectangular aluminium post(s)
	(vii)	=tubular aluminium post(s)
	(viii)	=bridge superstructure
	(ix)	=building
	(x)	=gantry
	(xi)	=lighting column
8*	(o)	=No entry
	(i)	=Removal of
9*	(i)	=thermoplastic screed
	(ii)	=thermoplastic spray
	(iii)	=thermoplastic extrusion
	(iv)	=road marking paint
	(v)	=preformed material
	(vi) etc	=[stated material]
10*	(o)	=No entry
	(i)	=with applied solid glass beads
11*	(i) etc	=[stated width, length or diameter]
12*	(i)	=in zigzags
	(ii)	=in hatched areas
	(iii)	=in chevrons
	(iv)	=in boxed areas
13*	(i)	=straight
	(ii)	=curved
	(iii)	=turning
	(iv)	=double headed
	(v) etc	=[stated Type]
14*	(o)	=No entry
	(i) etc	=[stated size]
15*	(o)	=No entry
	(i)	=square
	(ii)	=circular
	(iii)	=rectangular
16*	(o)	=No entry
	(i)	=one way
	(ii)	=bi-directional
	(iii) etc	=[stated Type]
17*	(o)	=No entry
	(i)	=yellow
	(ii)	=white
	(iii)	=red
	(iv)	=green
	(v)	=amber
	(vi)	=green/yellow

18*	(o)	=No entry
	(i)	=corner cube
	(ii)	=bi-convex lens
19*	(i)	=timber
	(ii)	=glass reinforced plastic
	(iii) etc	=[stated material]
20*	(i)	=Type 1
	(ii)	=Type 2
	(iii)	=Type 3
	(iv)	=Type 4
	(v)	=Type 5
	(vi)	=Type 6
	(vii)	=Type 7
	(viii)	=Type 8
	(ix)	=Type 9
21*	(i) etc	=[stated location reference]
22*	(i)	=internally illuminated
	(ii)	=non-illuminated
23*	(i) etc	=[stated Type]
24*	(o)	=No entry
	(i) etc	=[stated size]
25*	(i)	=cored thermoplastic
	(ii) etc	=[stated Type]
26*	(i) etc	=[stated diameter]

Series 1300: Road Lighting Columns, Brackets and CCTV Masts

Item	*Root Narrative*	*Unit*
	Road Lighting Columns, Brackets, Wall Mountings and CCTV Masts	
1	1* road lighting column of 3*2* and 4*5* with 6*7*8*9*	no
2	10*11* wall mounting 2*4*5* with 6*7*8*9*	no
3	CCTV mast of 3*	no
	Remove from Store and Re-erect Road Lighting Columns, Brackets and Wall Mountings	
4	Re-erection of 1* road lighting column of 3*2* and 4*5* with 6*7*8*9*	no
5	Re-erection of 10*11* wall mounting 2*4*5* with 6*7*8*9*	no

Group	*Variables*	
1*	(o)	=No entry
	(i)	=steel
	(ii)	=prestressed concrete
	(iii)	=reinforced concrete
	(iv)	=aluminium
	(v)	=cast iron
	(vi)	=glass fibre reinforced plastic
	(vii) etc	=[stated material]
2*	(o)	=No entry
	(i)	=with planted base
	(ii)	=with flange plate base
	(iii) etc	=[stated Type]
3*	(i)	=5 m nominal height
	(ii)	=6 m nominal height
	(iii)	=8 m nominal height
	(iv)	=10 m nominal height
	(v)	=12 m nominal height
	(vi)	=18 m nominal height
	(vii)	=20 m nominal height
	(viii) etc	=[stated height]
4*	(o)	=No entry
	(i)	=with single bracket arm
	(ii)	=with double bracket arm, each arm
	(iii) etc	=[stated Type]
5*	(o)	=No entry
	(i)	=having a projection of 0.5 m
	(ii)	=having a projection of 1.0 m
	(iii)	=having a projection of 1.5 m

	(iv)	=having a projection of 2.0 m
	(v)	=having a projection of 2.5 m
	(vi)	=having a projection of 3.0 m
	(vii) etc	=[stated projection]
6*	(i)	=a luminaire unit
	(ii)	=a non cut off luminaire
	(iii)	=a semi cut off luminaire
	(iv)	=a cut off luminaire
	(v)	=a subway lighting unit
	(vi)	=a floodlight
	(vii) etc	=[stated Type]
7*	(o)	=No entry
	(i)	=incorporating a 35 w SOX lamp
	(ii)	=incorporating a 55 w SOX lamp
	(iii)	=incorporating a 90 w SOX lamp
	(iv)	=incorporating a 135 w SOX lamp
	(v)	=incorporating a 180 w SOX lamp
	(vi) etc	=[stated Type]
8*	(o)	=No entry
	(i)	=incorporating a low pressure sodium lamp to provide not less than 2000 lumens in the lower hemisphere
	(ii)	=incorporating a low pressure sodium lamp to provide not less than 7200 lumens in the lower hemisphere
	(iii)	=incorporating a low pressure sodium lamp to provide not less than 12,000 lumens in the lower hemisphere
	(iv)	=incorporating a low pressure sodium lamp to provide not less than 20,000 lumens in the lower hemisphere
	(v) etc	=[stated lighting intensity]
9*	(o)	=No entry
	(i)	=and photo-electric control set to switch on at 70 lux
	(ii)	=and photo-electric control set to switch on at 100 lux
	(iii)	=and photo-electric control set to switch on at 120 lux
	(iv)	=and one part photo-electric control unit for luminaire
	(v)	=and one part dummy photo-electric control unit for luminaire
	(vi)	=and two part photo-electric control unit for luminaire
	(vii) etc	=[stated photo-electric control]
10*	(o)	=No entry
	(i) etc	=[stated Type]
11*	(o)	=No entry
	(i)	=surface mounted
	(ii)	=recessed

Series 1400 is not taken up

Series 1500 is not taken up

Series 1600 is not taken up

Series 1700: Structural Concrete

Item	*Root Narrative*	*Unit*
	In Situ Concrete	
1	In situ concrete mix reference 1*2*	m^3
2	In situ concrete mix ST 3*2*	m^3
	Precast Concrete	
3	Precast concrete 4*5*8*9*10* size 12*	no
4	Precast concrete 4*6*8*9* cross section 11*	m
5	Precast concrete 4*7*8*9* size 12*	m^2
	Surface Finish of Concrete-Formwork	
6	25* Formwork 13*8*14* more than 300 mm wide	m^2
7	25* Formwork 13*8* 300 mm wide or less at any inclination	m^2
8	25* Curved formwork 13*8* of both girth and width more than 300 mm at any inclination	m^2
9	25* Curved formwork 13*8* of girth or width 300 mm or less at any inclination	m^2
10	25* Domed formwork 13*8*	m^2
11	Void former cross section 11*8*	m
	Surface Finish of Concrete-Patterned Profile Formwork	
12	Patterned profile formwork 8*14*	m^2
13	Curved patterned profile formwork 8* at any inclination	m^2
	Steel Reinforcement for Structures	
14	15* 16* bar reinforcement nominal size 17*18* in length 19*	t
15	Fabric reinforcement to BS 20*	m^2
16	15* 16* helical reinforcement 17*	t
17	15* dowel 21*	no
	Reinforcement for Reinforced and Anchored Earth Structures	
18	15* vertical rods nominal size 17*10* metres in length	m
19	15* strip reinforcing elements cross section 11*22*10* metres in length	m
20	15* bar reinforcing elements nominal size 11*22*10* metres in length	m

21	15*23* reinforcing elements 8*	m^2

In Situ Post-tensioned Prestressing for Structures

22	8* tendon 24* construction 10* metres long	no
23	Stressing and grouting internal tendon 8* 24* construction 10* metres long	no
24	Stressing external tendon 8*24* construction 10* metres long	no
25	Final stressing and grouting 8* tendon 24* construction 10* metres long of member supplied partially prestressed	no
26	Protective covering to 8* external tendon 24* construction 10* metres long	no

Group	*Variables*	
1*	(i) etc	=[stated mix reference]
2*	(o)	=No entry
	(i)	=in blinding 75 mm or less in thickness
3*	(i)	=1
	(ii)	=2
	(iii)	=3
	(iv)	=4
	(v)	=5
4*	(o)	=No entry
	(i)	=pretensioned prestressed
	(ii)	=post-tensioned prestressed
5*	(i)	=member
	(ii)	=slab
	(iii)	=segmental unit
	(iv)	=hinge
	(v)	=specially moulded block
6*	(i)	=coping
	(ii)	=capping unit
	(iii)	=plinth
	(iv)	=culvert
7*	(i)	=facing units
8*	(o)	=No entry
	(i) etc	=[stated Type or reference]
9*	(o)	=No entry
	(i)	=curved
10*	(o)	=No entry
	(i) etc	=[unique length]
11*	(o)	=No entry
	(i) etc	=[unique cross section]

12*	(o)	=No entry
	(i) etc	=[unique dimensions]
13*	(i)	=Class F1
	(ii)	=Class F2
	(iii)	=Class F3
	(iv)	=Class F4
	(v)	=Class F5
	(vi) etc	=[stated Class]
14*	(i)	=horizontal
	(ii)	=inclined
	(iii)	=vertical
15*	(i) etc	=[stated Type or grade of steel]
	(ii)	=Aluminium alloy
	(iii)	=Copper
	(iv) etc	=[stated material]
16*	(o)	=No entry
	(i)	=deformed Type 1
	(ii)	=deformed Type 2
17*	(i)	=16 mm and under
	(ii)	=20 mm and over
18*	(i)	=not exceeding 12 metres
	(ii) etc	=exceeding 12 metres but not exceeding 13.5 metres (and so on in steps of 1.5 metres)
19*	(o)	=No entry
	(i)	=threaded through holes in members
20*	(i) etc	=[stated BS]
21*	(i) etc	=[stated diameter and length]
22*	(o)	=No entry
	(i) etc	=[unique load carrying capacity]
23*	(i)	=sheet
	(ii)	=grid
	(iii)	=mesh
24*	(i)	=for in situ concrete
	(ii)	=for segmental
25*	(o)	=No entry
	(i)	=Permanent

Series 1800 is not taken up

Series 1900 is not taken up

Series 2000: Waterproofing for Structures

Item	*Root Narrative*	*Unit*
	Waterproofing	
1	Waterproofing with 1*2*3*	m^2
	Surface Impregnation of Concrete	
2	Surface impregnation 4*5*	m^2
	Removal of Existing Waterproofing	
3	Removal of existing waterproofing 2*3*	m^2

Group	*Variables*	
1*	(i)	=mastic asphalt or proprietary waterproofing system
	(ii)	=primer
	(iii)	=protective layer
	(iv)	=[stated types or material]
2*	(o)	=No entry
	(i)	=more than 300 mm wide horizontal or at any inclination up to and including 30° to the horizontal
	(ii)	=more than 300 mm wide at any inclination more than 30° up to and including 90° to the horizontal
	(iii)	=300 mm wide or less at any inclination
3*	(o)	=No entry
	(i)	=to domed surfaces
4*	(i)	=to plain surfaces
	(ii)	=to patterned surfaces
5*	(o)	=No entry
	(i) etc	=[stated Type of system]

Series 2100 is not taken up

Series 2200 is not taken up

Series 2300 is not taken up

Series 2400: Brickwork, Blockwork and Stonework

Item	*Root Narrative*	*Unit*
	Brickwork	
1	Brickwork in 1*2* bricks in 5*3* thick 4*6*7*8*	m^2
2	Extra over 1* brickwork 4* for facing with 2* bricks in 5*	m^2
3	Brick coping in 18*1*2* bricks in 5*16*17* 6*19*	m
4	18*1*2* bricks in 5*16*17* string courses 6*19*	m
	Blockwork and Stonework	
5	9* blockwork 6*7*10* in 5*8*	m^3
6	15* stonework in 5*10*6*7*8*	m^3
7	14* coping 11* in 5*6*	m
8	14* shaped and dressed string course 11* in 5*6*	m
9	20*12*11*13* in 5*	no
	Remove from Store and Relay Brickwork, Blockwork and Stonework	
10	Remove from store and relay 9* blockwork 6*7*10* in 5*8*	m^3
11	Remove from store and relay 15* stonework in 5*10*6*7*8*	m^3
12	Remove from store and relay brickwork in 1*2* bricks in 5*3* thick 4*6*7*8*	m^2
13	Extra over relayed 1* brickwork 4* for facing with 22*2* bricks in 5*	m^2
14	Remove from store and relay 18*1*2*21* coping 11* in 5*16*17*6*19*	m
15	Remove from store and relay 18*1*2* bricks in 5*16*17* string courses 6*19*	m
16	Remove from store and relay 14* shaped and dressed string course 11* in 5*6*	m
17	Remove from store and relay 20*12*11*13* in 5*	no

Group	*Variables*	
1*	(o)	=No entry
	(i)	=common
	(ii)	=engineering
	(iii)	=engineering Class A
	(iv)	=engineering Class B
	(v) etc	=[stated brick]
2*	(o)	=No entry
	(i) etc	=[stated facing brick]
3*	(i)	=half brick
	(ii)	=one brick

	(iii)	=one and a half brick
	(iv)	=two brick
	(v)	=two and a half brick
	(vi)	=three brick
4*	(o)	=No entry
	(i)	=in stretcher bond
	(ii)	=in Flemish bond
	(iii)	=in English bond
	(iv) etc	=[stated bond]
5*	(o)	=No entry
	(i)	=in cement mortar designation (i)
	(ii)	=in cement mortar designation (ii)
	(iii)	=in cement mortar designation (iii)
	(iv)	=lime mortar
	(v) etc	=[stated Type]
6*	(o)	=No entry
	(i)	=curved on plan
7*	(o)	=No entry
	(i)	=with a battered face
8*	(i)	=in walls
	(ii)	=in facework to concrete
	(iii)	=in arches
	(iv)	=in alteration work
9*	(o)	=No entry
	(i) etc	=[stated material]
10*	(o)	=No entry
	(i) etc	=[stated coursing]
11*	(o)	=No entry
	(i) etc	=[unique dimensions]
12*	(i)	=corbel
	(ii)	=finial
	(iii)	=keystone
	(iv) etc	=[stated individual block, feature, or stone]
13*	(i) etc	=[stated mark reference]
14*	(i)	=blockwork
	(ii)	=stonework
15*	(o)	=No entry
	(i)	=reconstituted stone
	(ii)	=natural stone rubble
	(iii)	=natural stone ashlar
	(iv)	=random rubble uncoursed
	(v)	=random rubble coursed
	(vi)	=squared random rubble uncoursed
	(vii)	=squared random rubble coursed
	(viii)	=dry rubble
	(ix) etc	=[stated Type]

16*	(o)	=No entry
	(i)	=in headers
17*	(o)	=No entry
	(i)	=on edge
18*	(o)	=No entry
	(i)	=bullnose
19*	(o)	=No entry
	(i)	=with two courses of tile creasing
20*	(i)	=Natural stone
	(ii)	=Reconstituted stone
21*	(i)	=blockwork
	(ii)	=stonework
	(iii)	=brickwork
22*	(i)	=new
	(ii)	=re-used

Series 2500 is not taken up

Series 2600 is not taken up

Series 2700: Accomodation Works, Works for Statutory Undertakers, Provisional Sums and Prime Cost Items

Item	*Root Narrative*	*Unit*
1	Allow the 1* Lm.... for 2* to be 3* by 4*	sum
2	Add for labours	Lump sum
3	Add for all other charges and profit	%
4	Installation of goods and materials into the Works	Measurement as appropriate

Group	*Variables*	
1*	(i)	=Provisional Sum of
	(ii)	=Prime Cost (PC) Item of
2*	(i) etc	=[stated goods or materials]
	(ii) etc	=[stated service]
3*	(i)	=executed
	(ii)	=supplied
4*	(i)	=the Main Contractor
	(ii)	=a firm to be nominated by the Overseeing Organisation

Series 3000 is not taken up

Introduction

General

1 The Library has been compiled in accordance with the itemisation features of the Method of Measurement for Highway Works (MMRW). This is a master library which can be used direct for manual billing, or as the basis from which individual libraries can be constructed to suit available computer facilities. Whatever process is followed the end result should produce directly comparable Bills of Quantities.

The root narratives contain numbered inserts which can, by the use of a numbered variable from the appropriate numbered group, produce unique item descriptions for all standard constructional work. For example, the information in the Specification or on the Drawings may show the requirements for fencing as "1.3 metres high standard four rail fencing with timber posts and stockproofing of a single strand of galvanized barbed wire".

By referring to **Series 300 : Fencing**, a unique item description can be built up as follows:

Root Narrative Item 2 - 10*2* fencing **7*** high with **8*3*4*5***

Variables

10*(o) = no entry - no entry to be made against 10*
2*(ii) = four rail - selected from Group 2*
7*(i) = 1.3 metres - unique height
8*(iv) = timber posts - selected from Group 8*
3*(i) = one strand of galvanized barbed wire-selected from Group 3*
4*(o) = no entry - no entry to be made against 4*
5*(o) = no entry - no entry to be made against 5*

Similarly, by referring to **Series 1600: Piling and Embedded Retaining Walls**, a unique item description for piling requirements, which may be shown as, "vertical 3.5 metre 600 mm diameter cast-in-place piles in main piling" would be as follows:

Root Narrative Item 8 - 6*7* cast-in-place piles **16*3*5*** in length **2***

Variables

6*(i) = vertical - selected from Group 6*
7*(vii) = 600 mm diameter - selected from Group 7*
16*(o) = no entry - no entry to be made against 16*
3*(o) = no entry - no entry to be made against 3*
5*(i) = not exceeding 5 metres - selected from Group 5*
2*(ii) = in main piling - selected from Group 2*

Amendments to the Library

2 Any variable not listed in a group but belonging to a group generically may be added to it and numbered sequentially. Items which cannot be compiled from the existing root narratives are rogue items and if required they should be drafted on the same principles as the Library and inserted as necessary in the Bill of Quantities.

As in the case of the MMRW, rogue items not contained in the Library but which are found to be consistently necessary and are felt to be of national application should be forwarded to the Roads Directorate for evaluation and possible incorporation into any standard amendments which may be issued.

Series 100: Preliminaries

Item	*Root Narrative*	*Unit*
	Temporary Accommodation	
1	1* of principal offices for the Overseeing Organisation 2*	item
2	1* of principal laboratories for the Overseeing Organisation 2*	item
3	1* of portable offices for the Overseeing Organisation 2*4*	item
4	1* of portable laboratories for the Overseeing Organisation 2*4*	item
5	1* of offices and messes for the Contractor	item
6	1* of stores and workshops for the Contractor	item
7	Servicing of principal offices for the Overseeing Organisation 3*	item
8	Servicing of principal laboratories for the Overseeing Organisation 3*	item
9	Servicing of portable offices for the Overseeing Organisation 3*4*	item
10	Servicing of portable laboratories for the Overseeing Organisation 3*4*	item
	Vehicles for the Overseeing Organisation	
11	5* for the Overseeing Organisation 3*	v.day
	Communication System for the Overseeing Organisation	
12	Communication system for the Overseeing Organisation 3*	item
	Operatives for the Overseeing Organisation	
13	6* for the Overseeing Organisation 3*	op.day
	Information Board	
14	Information board 7*	no
	Traffic Safety and Management	
15	Traffic safety and management	item
16	Traffic safety and management for landscape and ecology	item
17	Taking measures for or construction, maintenance, removal of contraflow arrangements	item
	Temporary Diversion for Traffic	
18	8* temporary diversion for traffic at location 9* listed in Appendix 1/18	item
19	8* temporary diversions for traffic at those locations listed in the	

	Appendix 1/18 but not measured individually	item
20	8* temporary diversions for traffic at those locations proposed by the Contractor	item

Recovery Vehicles

21	Establishment of 5* recovery vehicle	item
22	Maintenance of 5* recovery vehicle	v.day
23	Removal of 5* recovery vehicle	item

Progress Photographs

24	Set of progress photographs 10*	no
25	Set of aerial progress photographs 10*	no
26	Additional progress photographs 10*	no
27	Additional aerial progress photographs 10*	no

Temporary Closed Circuit (CCTV) System for the Monitoring of Traffic

28	Installation of temporary closed circuit (CCTV) system for the monitoring of traffic	item
29	Maintenance of temporary closed circuit (CCTV) system for the monitoring of traffic	day
30	Removal of temporary closed circuit (CCTV) system for the monitoring of traffic	item

Temporary Automatic Speed Camera System for the Enforcement of Mandatory Speed Limits at Roadworks

31	Installation of temporary automatic speed camera system for the enforcement of mandatory speed limits at roadworks	item
32	Maintenance of temporary automatic speed camera system for the enforcement of mandatory speed limits at roadworks	day
33	Removal of temporary automatic speed camera system for the Enforcement of mandatory speed limits at roadworks	item

Group	*Variables*	
1*	(i)	=Erection
	(ii)	=Servicing
	(iii)	=Dismantling

2*	(o)	=No entry
†	(i)	=provided by the Overseeing Organisation
3*	(o)	=No entry
	(i)	=until completion of the works
	(ii)	=after completion of the works
4*	(o)	=No entry
	(i)	=at place of fabrication or manufacture
5*	(i)	=light
	(ii)	=heavy
6*	(i)	=Chainman/Driver
	(ii)	=Driver/Laboratory handyman
	(iii) etc	=[stated Type]
7*	(i) etc	=[stated Type]
8*	(i)	=Taking measures for or construction of
	(ii)	=Maintenance of measures for or construction of
	(iii)	=Removal of measures for or construction of
9*	(i) etc	=[stated reference]
10*	(i)	=in monochrome
	(ii)	=in colour

Note
† The Specification for Highway Works does not cover this item. If the compiler wishes to use this variable then appropriate details must be given in Contract-specific Specification Clauses or on the Drawings.

Series 200: Site Clearance

Item	*Root Narrative*	*Unit*
	Site Clearance	
1	General site clearance	ha
2	General site clearance area 1*	ha
3	Demolition of building or structure 1*	item
4	Demolition of group of buildings or structures 1*	item
5	Partial demolition of individual structures 1*	item
	Take Up or Down and Set Aside for Re-use or Remove to Store or Tip off Site	
6	Take up or down 2*3*4*	m^3
7	Take up or down 2*5* paving 6*	m^2
8	Take up or down 2*4* brickwork 6*	m^2
9	Take up or down 2*7*19*	m
10	Take up or down 2*8*9* safety fencing 11*	m
11	Take up or down 2*10*4*13*	m
12	Take up or down 2*12* fence 13*	m
13	Take up or down 2*14*4*19*	m
14	Take up or down 2*15*16*	m
15	Take up or down 2*17*18*19*	no
16	Take up or down 2*20*	no

Group	*Variables*	
1*	(i) etc	=[stated reference]
2*	(i)	=and set aside for reuse
	(ii)	=and remove to store off Site
	(iii)	=and remove to tip off Site
3*	(i)	=blockwork
	(ii)	=stonework
4*	(i) etc	=[stated Type]
5*	(i)	=precast concrete slab
	(ii)	=stone flag
	(iii)	=brick
	(iv)	=cobble

	(v)	=granite sett
	(vi)	=block
	(vii) etc	=[stated Type]
6*	(i) etc	=[stated depth or thickness]
7*	(i)	=precast concrete kerbs
	(ii)	=granite kerbs
	(iii)	=precast concrete channels
	(iv)	=precast concrete edgings
	(v)	=combined drainage and kerb blocks
	(vi)	=linear drainage channel systems
	(vii) etc	=[stated Type and feature]
8*	(i)	=untensioned single sided
	(ii)	=untensioned double sided
	(iii)	=tensioned single sided
	(iv)	=tensioned double sided
9*	(i)	=corrugated beam
	(ii)	=open box beam
	(iii)	=rectangular hollow section beam
10*	(i)	=safety barriers
	(ii)	=pedestrian guardrails
11*	(i)	=on timber posts
	(ii)	=on steel posts
	(iii)	=attached to structures
12*	(i)	=post and rail
	(ii)	=cleft chestnut
	(iii)	=chain link
	(iv) etc	=[stated Type]
13*	(o)	=No entry
	(i)	=300 mm high
	(ii)	=375 mm high
	(iii)	=450 mm high
	(iv) etc	=525 mm high (and so on in steps of 75 mm)
14*	(i)	=copings
	(ii)	=string courses
	(iii) etc	=[stated named feature]
15*	(i)	=power cable
	(ii)	=communications cable
16*	(i)	=laid singly
	(ii)	=laid as a pair
	(iii) etc	=[stated number]
17*	(i)	=bench seat
	(ii)	=cattle trough
	(iii) etc	=permanent bollard [stated type]
	(iv)	=parking meter
	(v)	=pedestrian crossing lights
	(vi)	=lighting column including bracket arm and lantern
	(vii)	=wall mounting including bracket arm and lantern
	(viii)	=traffic sign

	(ix)	=traffic sign including posts
	(x)	=internally illuminated traffic sign
	(xi)	=internally illuminated traffic sign including posts
	(xii)	=externally illuminated traffic sign
	(xiii)	=externally illuminated traffic sign including posts
	(xiv)	=timber gate
	(xv)	=metal gate
	(xvi)	=stile
	(xvii)	=road stud
	(xviii)	=individual blocks
	(xix)	=individual masonry features
	(xx)	=individual stones
	(xxi)	=chamber cover and frame
	(xxii)	=gully grating and frame
	(xxiii)	=feeder pillars
	(xxiv)etc	=[stated named feature]
18*	(o)	=No entry
	(i) etc	=[stated Type]
19*	(o)	=No entry
	(i) etc	=[stated Size]
20*	(i) etc	=[stated Type of signal]
	(ii) etc	=[stated Type of motorwarn assembly]
	(iii) etc	=[stated Type of emergency telephone]
	(iv)	=camera pole
	(v) etc	=[stated Type of cabinet]
	(vi) etc	=[stated Type of equipment]

Series 300: Fencing

1 Temporary Fencing

The Specification requires the Contractor to erect temporary fencing in all situations where he does not provide permanent fencing immediately. To comply with the Specification, Health and Safety Regulations and the Conditions of Contract the Contractor has the choice of a range of four specified types of temporary fencing. This temporary fencing is not shown on the Drawings nor is it included in the Bill of Quantities. However, should some specific temporary fencing be required by the Overseeing Organisation then this should be shown on the Drawings and included within Appendix 3/1 and the Bill of Quantities.

The Compiler should ensure that the obligations under the Form of Contract being utilised are sufficient and adequately cover the particular requirements of an individual scheme.

2 Concrete Foundations or Longer Posts

Items are provided in the MMRW for concrete foundations to timber posts. These are only to be measured where such a requirement is identified in Appendices 1/15 or 3/1 of the Specification.

Foundations in all other circumstances, including those for all posts other than timber, shall be deemed to be included within the fencing item to which they relate.

Locations where longer posts are required should also be identified in Appendices 1/15 or 3/1, a specific Type reference should be given, and reference made in item descriptions.

Series 600: Earthworks

Item	*Root Narrative*	*Unit*
	Excavation	
1	Excavation of acceptable material Class 5A	m^3
2	Excavation of acceptable material excluding Class 5A in 3*	m^3
3	Excavation of acceptable material excluding Class 5A in 4*5* in depth	m^3
4	Excavation of unacceptable material 2* in 3*	m^3
5	Excavation of unacceptable material 2* in 4*5* in depth	m^3
	Excavation in Hard Material	
6	Extra over excavation for excavation in Hard Material in 6*	m^3
	Processing of Unacceptable Material Class U1	
7	Processing of unacceptable material class U1 7* into 8* acceptable material	m^3
	Deposition of Fill	
8	Deposition of acceptable material 9* in 10*	m^3
	Disposal of Material	
9	Disposal of 11*	m^3
	Imported Fill	
10	Imported acceptable material 12* in 10*	m^3
11	Imported topsoil Class 5B	m^3
	Compaction of Fill	
12	Compaction of acceptable material 9* in 10*	m^3
	Soil Stabilisation	
13	Soil stabilisation 13* with 14*	m^3
	Geotextiles	
14	Geotextile 15*16*	m^2

Soft Spots and Other Voids

15	Excavation of soft spots and other voids 17*	m^3
16	Filling of soft spots and other voids 17* with 18*	m^3

Disused Sewers, Drains, Cables, Ducts, Pipelines and the Like Occurring at Formation or Sub-formation Level; Disused Basements, Cellars and the Like and Gullies

17	Removal of disused 19*20* with 21* of cover to formation level	m
18	Backfilling of disused 19*20* with 21* of cover to formation level with 18*	m^3
19	Backfilling of disused basements, cellars and the like with 18*	m^3
20	Backfilling of disused gullies 20* with 18*	no

Supports Left in Excavation

21	22*23* supports left in excavation	m^2

Topsoiling and Storage of Topsoil

22	Topsoiling 24* thick to surfaces sloping 25* to the horizontal	m^2
23	Permanent storage of topsoil	m^3

Completion of Formation and Sub-formation

24	Completion of 28* on 29*	m^2

Lining of Watercourses

25	Lining 30*31* with 32*24* thick	m^2

Clearing of Existing Ditches

26	Clearing of existing ditch at 33*	m

Ground Improvement - Establishment of Plant

27	Establishment of dynamic compaction plant at 33*	item
28	Establishment of vibrated stone columns plant at 33*	item

Ground Improvement - Dynamic Compaction

29	Dynamic compaction in 34* compaction with 35* pounder	m
30	Dynamic compaction plant standing time	hr
31	12* material in granular blanket	t

Ground Improvement - Vibrated Stone Columns

32	Vibrated stone column 65* installed by 66* in columns 67*	m
33	Vibrated stone column plant standing time	hr

Gabion Walling and Mattresses

34	Gabion walling with 36* mesh 37* filled with 24* Class 6G material 38*	m^3
35	Mattress with 36* mesh 37* filled with 24* Class 6G material installed 25* to the horizontal 38*	m^3

Crib Walling

36	Crib walling 39*40*41*42* and 43* infill	m^2

Filling and Caps to Mine Working, Well, Swallow Hole and the Like

37	Filling 44* with 43*	t
38	Caps to 44* with 45*	m^3

Ground Anchorages - Ground Anchorage Plant

39	Establishment of ground anchorage plant at 33*	item

Ground Anchorages

40	Ground anchorages 39*47* in length in 34* anchorages	m

Ground Anchorages - Waterproofing Anchorage Boreholes

41	Waterproofing borehole by 48* grouting	m

Instrumentation and Monitoring - Boring Plant

42	Establishment of boring plant at 33*	item

Instrumentation and Monitoring - Boring Holes

43	Boring 49* holes 50* in depth	m

Instrumentation and Monitoring - Instrumentation

44	Installation of 51*	no
45	Installation of 52* tubing 53* in length or depth	m
46	Installation of 52* cabling 53* in length or depth	m
47	48* grouting 53* in length or depth	m

Instrumentation and Monitoring - Instrument Hut or Cabinet

48	54* instrument 55* for the Overseeing Organisation 56*	item

Instrumentation and Monitoring - Monitoring Equipment

49	Monitoring equipment 39*	item

Ground Water Lowering

50	Ground water lowering 33*	item

Trial Pits

51	Trial pit 5* in depth	m^3

Breaking Up and Perforation of Redundant Pavements

52	61* of redundant 57*58*59*60* deep	m^2

Perforation of Redundant Slabs, Basements and the Like

53	Perforation of redundant 57* 62* 63* 64* thick	m^2

Group	*Variables*	
1*	*Not used	
2*	(i)	=Class U1
	(ii)	=Class U2
3*	(i)	=cutting and other excavation
	(ii)	=new watercourses
	(iii)	=enlarged watercourses
	(iv)	=intercepting ditches
	(v)	=clearing abandoned watercourses

	(vi)	=removal of surcharge
4*	(i)	=structural foundations
	(ii)	=gabion walling and mattresses
	(iii)	=crib walling
	(iv)	=caps to mine working, well, swallow hole and the like
	(v)	=foundations for corrugated steel buried structures and the like
5*	(i)	=0 to 3 metres
	(ii)	=0 to 6 metres
	(iii) etc	=0 to 9 metres (and so on in steps of 3 metres)
6*	(i)	=cutting and other excavation
	(ii)	=structural foundations
	(iii)	=foundations for corrugated steel buried structures and the like
	(iv)	=new watercourses
	(v)	=enlarged watercourses
	(vi)	=intercepting ditches
	(vii)	=clearing abandoned watercourses
	(viii)	=gabion walling and mattresses
	(ix)	=crib walling
	(x)	=caps to mine workings, well, swallow hole and the like
7*	(i) etc	=[stated location reference]
8*	(i) etc	=[stated Class or Classes of acceptable material]
9*	(o)	=No entry
	(i)	=Class 1C
	(ii)	=Class 6B
10*	(i)	=embankments and other areas of fill
	(ii)	=strengthened embankments
	(iii)	=reinforced earth structures
	(iv)	=anchored earth structures
	(v)	=landscape areas
	(vi)	=environmental bunds
	(vii)	=fill to structures
	(viii)	=fill above structural concrete foundations
	(ix)	=fill on sub-base material, base and capping
	(x)	=fill on bridges (under footways, verges and central reserves)
	(xi)	=upper bedding to corrugated steel buried structures and the like
	(xii)	=lower bedding to corrugated steel buried structures and the like
	(xiii)	=surround to corrugated steel buried structures and the like
	(xiv)	=fill above corrugated steel buried structures and the like
11*	(i)	=acceptable material excluding Class 5A
	(ii)	=acceptable material Class 5A
	(iii)	=unacceptable material Class U1
	(iv)	=unacceptable material Class U2
12*	(o)	=No entry
	(i)	=Class 1A
	(ii)	=Class 1B
	(iii)	=Class 1C
	(iv)	=Class 2A

	(v)	=Class 2B
	(vi)	=Class 2C
	(vii)	=Class 2D
	(viii)	=Class 2E
	(ix)	=Class3
	(x)	=Class 4
	(xi)	=Class 6A
	(xii)	=Class 6B
	(xiii)	=Class 6C
	(xiv)	=Class 6D
	(xv)	=Class 6E
	(xvi)	=Class 6F1
	(xvii)	=Class 6F2
	(xviii)	=Class 6F3
	(xix)	=Class 6G
	(xx)	=Class 6H
	(xxi)	=Class 6I
	(xxii)	=Class 6J
	(xxiii)	=Class 6K
	(xxiv)	=Class 6L
	(xxv)	=Class 6M
	(xxvi)	=Class 6N
	(xxvii)	=Class 6P
	(xxviii)	=Class 6Q
	(xxix)	=Class 6R
	(xxx)	=Class 7A
	(xxxi)	=Class 7B
	(xxxii)	=Class 7C
	(xxxiii)	=Class 7D
	(xxxiv)	=Class 7E
	(xxxv)	=Class 7F
	(xxxvi)	=Class 7G
	(xxxvii)	=Class 7H
	(xxxviii)	=Class 7I
	(xxxix)	=Class 8
	(xl)	=Class 9A
	(xli)	=Class 9B
	(xlii)	=Class 9C
	(xliii)	=Class 9D
	(xliv)	=Class 9E
	(xlv)	=Class 9F
	(xlvi)etc	=[stated Class]
13*	(o)	=No entry
	(i)	=of capping
14*	(i)	=cement
	(ii)	=lime
15*	(o)	=No entry
	(i) etc	=[stated Type]
16*	(o)	=No entry
	(i) etc	=[stated Grade]
17*	(i)	=below cuttings or under embankments
	(ii)	=in side slopes
	(iii)	=below structural foundations and foundations for corrugated steel buried structures

18*	(i)	=acceptable material
	(ii) etc	=acceptable material Class [direct entry]
	(iii) etc	=in situ concrete mix [direct entry]
19*	(i)	=sewer or drain
	(ii)	=cable
	(iii)	=duct
	(iv)	=pipeline
	(v) etc	=[stated service]
20*	(i) etc	=internal diameter [direct entry]
	(ii) etc	=external diameter [direct entry]
21*	(i)	=one metre or less
	(ii)	=exceeding one metre but not exceeding two metres
	(iii) etc	=exceeding two metres but not exceeding three metres (and so on in steps of one metre)
22*	(i)	=Timber
	(ii)	=Steel
	(iii) etc	=[stated material]
23*	(o)	=No entry
	(i)	=trench sheeting
	(ii)	=sheet piling
24*	(i)	=25 mm
	(ii)	=50 mm
	(iii)	=75 mm
	(iv) etc	=100 mm (and so on in steps of 25 mm)
25*	(i)	=at 10^{o} or less
	(ii)	=more than 10^{o}
26*	*Not used	
27*	*Not used	
28*	(i)	=sub-formation
	(ii)	=formation
29*	(i)	=material other than Class 1C, 6B or rock in cuttings
	(ii)	=Class 1C material
	(iii)	=Class 6B material
	(iv)	=rock in cuttings
30*	(i)	=new watercourse
	(ii)	=enlarged watercourse
	(iii)	=intercepting ditches
31*	(i)	=invert
	(ii)	=side slopes
32*	(i)	=precast concrete units
	(ii) etc	=in situ concrete grade/mix [direct entry]
	(iii)	=uncoursed random rubble
	(iv)	=coursed random rubble
	(v)	=bagwork
	(vi) etc	=[stated material]
33*	(i) etc	=[stated location reference]

34*	(i)	=trial
	(ii)	=main
35*	(i) etc	=[stated weight]
36*	(i)	=plastic coated galvanized wire
	(ii)	=geomesh
	(iii) etc	=[stated material]
37*	(i) etc	=[stated mesh size]
38*	(o)	=No entry
	(i)	=in environmental bunds
39*	(i) etc	=[stated Type and capacity]
40*	(o)	=No entry
	(i)	=curved on plan
41*	(o)	=No entry
	(i)	=with a battered face
42*	(o)	=No entry
	(i)	=surface finish Class F1
	(ii)	=surface finish Class F2
	(iii) etc	=[stated Class of surface finish]
43*	(i)	=sand
	(ii) etc	=in situ concrete grade/mix [direct entry]
	(iii)	=acceptable material except Class 5A
	(iv) etc	=[stated material]
44*	(i)	=mine working
	(ii)	=well
	(iii)	=swallow hole and the like
	(iv) etc	=[stated Type of cavity]
45*	(i)	=precast concrete units
	(ii) etc	=in situ concrete grade/mix [direct entry]
46*	*Not used	
47*	(i)	=not exceeding 5 metres
	(ii) etc	=exceeding 5 metres but not exceeding 10 metres (and so on in steps of 5 metres)
48*	(i)	=standard
	(ii)	=pressure
49*	(i)	=vertical
	(ii)	=raking
50*	(i)	=not exceeding 10 metres
	(ii) etc	=exceeding 10 metres but not exceeding 20 metres (and so on in steps of 10 metres)
51*	(i) etc	=[stated type of instrument]
52*	(i) etc	=[stated material]
53*	(i)	=not exceeding 10 metres

	(ii) etc	=exceeding 10 metres but not exceeding 50 metres (and so on in steps of 50 metres)
54*	(i)	=erection of
	(ii)	=servicing of
	(iii)	=dismantling of
55*	(i)	=hut
	(ii)	=cabinet
56*	(i)	=until completion of the works
	(ii)	=after completion of the works
57*	(o)	=No entry
	(i)	=reinforced
58*	(i)	=concrete
	(ii)	=rigid composite
	(iii)	=rigid
	(iv)	=flexible
	(v)	=flexible composite
	(vi) etc	=[stated type of slab construction]
59*	(i)	=slab
	(ii)	=pavement
	(iii)	=paved area
	(iv) etc	=[stated Type of slab]
60*	(i)	=not exceeding 100 mm
	(ii)	=exceeding 100 mm deep but not exceeding 200 mm
	(iii) etc	=exceeding 200 mm deep but not exceeding 300 mm (and so on in steps of 100 mm)
61*	(i)	=Breaking up
	(ii)	=Perforation
62*	(i)	=concrete
	(ii)	=brickwork
	(iii) etc	=[stated material]
63*	(i)	=slab
	(ii)	=basement
	(iii) etc	=[stated structure]
64*	(i)	=not exceeding 100 mm
	(ii)	=exceeding 100 mm thick but not exceeding 200 mm
	(iii) etc	=exceeding 200 mm thick but not exceeding 300 mm (and so on in steps of 100 mm)
65*	(i) etc	=[stated minimum diameter]
66*	(i) etc	=[stated Type of installation]
67*	(i)	=not exceeding 5 metres in length
	(ii)	=exceeding 5 metres but not exceeding 10 metres in length (and so on in steps of 5 metres)

Series 500: Drainage and Service Ducts

Definitions

1 Any reference to 'drain' shall be deemed to include sewers and piped culverts.

2 Drains exceeding 900 mm internal diameter, box culverts, piped culverts and all associated chambers, headwalls, outfall works and concrete bagwork shall be measured in accordance with Series 2500 Special Structures.

3 Trenches and ducts in connection with electrical work for road lighting and traffic signs cabling shall be measured in accordance with Series 1400.

4 Trenches and ducts in connection with motorway communications cabling shall be measured in accordance with Series 1500.

5 The Earthworks Outline is defined in Series 600 Earthworks paragraphs 1 to 6 inclusive and shall apply equally to this Series.

6 Where the ground level has been subjected to treatment, under the Contract, in respect of ground improvement, mine workings, swallow holes and the like, for the purposes of this Series Existing Ground Level shall be the level obtained upon completion of any such treatment of the areas affected.

7 Sub-soil Level is defined as the level of the ground after the removal of topsoil required by the Contract.

8 Surcharge is defined as material placed on embankments for the purpose of loading the embankment for the periods stated in the Contract.

Drains and Service Ducts (Excluding Filter Drains, Narrow Filter Drains and Fin Drains)

Unit

9 The unit of measurement for drains and service ducts shall be:

(i) drains, service ducts ..... linear metre.

Measurement

10 The measurement of drains and service ducts shall be the summation of their individual lengths measured along the centre lines of the pipes between any of the following:

(a) the internal faces of chambers;

(b) the external faces of headwalls;

(c) the intersections of the centre lines at pipe junctions;

(d) the centre of gully gratings (or where no grating is provided, the centre of the gully);

(e) the position of terminations shown in the Contract;

(f) the point of change of stage depth.

11 The depth of drains and service ducts shall be the vertical measurement between the invert and the following:

(a) where the invert is below the Existing Ground Level - the Existing Ground Level except that where the Earthworks Outline is below the Existing Ground Level the measurement shall be taken to the Earthworks Outline;

(b) where the invert is at or above the Existing Ground Level - the

datum stated in the Contract, or where none is stated, the Earthworks Outline.

Notwithstanding the foregoing, where in the Contract a commencing level or a minimum level of cover is stated from which excavation shall commence, then the depth shall be taken to that stated level.

12 The average depth to invert shall be the calculated arithmetic mean of the depths taken at intervals of 10 metres along the pipelines starting from the outfall end. For terminal lengths and pipelines less than 10 metres long the measurement of depths shall be taken at their ends.

13 The measurement of service ducts shall be for the complete construction irrespective of the number of ducts contained within any one trench.

Where more than one duct is laid in a trench then the number of ducts shall be stated in the item description.

14 Drains and service ducts required to be designed by the Contractor shall be measured in accordance with Series 2500.

Itemisation

15 Separate items shall be provided for drains and service ducts (excluding filter drains, narrow filter drains and fin drains) in accordance with Chapter II paragraphs 3 and 4 and the following:

Group	Feature	
I	1	Drains.
	2	Service ducts.
II	1	Different internal diameters.
III	1	Depths to invert not exceeding 2 metres. The average depth to invert to be stated to the nearest 25 mm.
	2	Depths to invert exceeding 2 metres but not exceeding 4 metres and so on in steps of 2 metres. The average depth to invert to be stated to the nearest 25 mm.
IV	1	Specified design groups.
	2	Particular designs stated in the Contract
V	1	Construction in trench.
	2	Construction in heading.
	3	Construction by jacking or thrust boring.
	4	Suspended on discrete supports.
VI	1	In side slopes of cuttings or side slopes of embankments.

Note: For each item which includes Group III Feature 1 or 2, an associated item shall be provided for adjustment of the rate for each 25 mm of difference in excess of 150 mm where the average depth to invert calculated from site measurement varies from that stated in the Bill of Quantities. The foregoing shall apply to both increases and decreases of average in excess of 150 mm, and will result in

either a positive or negative adjustment of the rate.

Drains and Service Ducts

16 The items for drains and service ducts shall in accordance with the Preambles to Bill of Quantities General Directions include for:
Item coverage

(a) excavation of acceptable material (as Series 600 paragraphs 17 and 18);
(b) excavation of unacceptable material (as Series 600 paragraph 19);

(c) access shafts to headings and their subsequent reinstatement;

(d) thrust pits and thrust blocks for pipe jacking and their removal on completion;

(e) articulated pipes and fittings;

(f) cutting, laying, jointing and bedding;

(g) building in pipes to headwalls and outfall works;

(h) hangers, stools and discrete supports;

(i) bedding, haunching and surrounding;

(j) formwork (as Series 1700 paragraph 15);

(k) backfilling and compaction;

(l) disposal of material (as Series 600 paragraph 39);

(m) movement joints to beds, surrounds and the like;

(n) reinstatement of unpaved areas;

(o) checking and cleaning;

(p) recording, staking and labelling;

(q) in the case of ducts, fixing draw ropes, removable stoppers, marker blocks and posts;

(r) pipe schedules;

(s) lubricants, packing, grouting and caulking;

(t) surveys and recordings;

(u) protective system (as Series 1900 paragraph 4).

Filter Drains

Units

17 The units of measurement for filter drains shall be:

(i) filter drains ..... linear metre.

(ii) filter material contiguous with filter drains ..... cubic metre.

(iii) sub-base material ..... cubic metre.

(iv) lightweight aggregate infill ..... cubic metre.

(v) excavate and replace filter material ……. cubic metre.

Measurement

18 The measurement of filter drains, excluding narrow filter drains, shall be the summation of their individual lengths measured along the center lines of the pipe (or trench where no pipe is provided), between any of the following:

(a) the internal faces of chambers;

(b) the external faces of headwalls;

(c) the intersection of centre lines at junctions;

(d) the centre of gully gratings (or where no grating is provided the centre of the gully);

(e) the position of terminations shown in the Contract;

(f) the point of change of stage depth.

19 The depth of filter drains shall be the vertical measurement between the invert (or the centre line of the trench bottom where no pipe is provided) and the following:

(a) where the invert is below the Existing Ground Level - the Existing Ground Level or the Earthworks Outline whichever is the lower, except that where the finished level of the filter material is above the Existing Ground Level the measurement shall be taken to the finished level of the filter material;

(b) where the invert is at or above the Existing Ground Level - the datum stated in the Contract, or where none is stated, the finished level of the filter material.

The calculation of average depth to invert of filter drains shall be as paragraph 12 of this Series taken along the centre line of the filter drain.

Narrow filter drains shall be measured in accordance with paragraphs 25 to 28 of this Series.

20 The measurement of contiguous filter material shall be the volume of the material occupying the void between the filter drain and the adjacent carriageway, hardshoulder and hardstrip. The side of the contiguous filter material next to the filter drain shall be taken as the vertical extension of the trench side above capping or where no capping is provided above subgrade level.

The measurement of sub-base material shall be the volume of the sub-base material within non-pavement verge or central reserve adjacent to the carriageway, hardshoulder and hardstrip filled to the outline stated in the Contract.

The measurement of lightweight aggregate infill shall be the volume of the lightweight aggregate infill above the filter drain filled to the outline stated in the Contract.

The measurement of excavate and replace filter material shall be the product of the lengths, widths and depths instructed by the Overseeing Organisation with no deduction for pipes, ducts or chambers. Lengths and widths shall be taken asthe lengths and widths at the level of the drain invert or, in the case that partial excavation is instructed, at the depth to which excavation is instructed by the Overseeing Organisation.

Itemisation

21 Separate items shall be provided for filter drains in accordance with Chapter II paragraphs 3 and 4 and the following:

Group	Feature	
I	1	Filter drains.
	2	Filter material contiguous with filter drains.
	3	Sub-base material.
	4	Lightweight aggregate infill.
	5	Excavate and replace filter material.
II	1	Different internal diameters.
	2	Different types of filter material.
	3	Different types of sub-base material.
	4	Different types of lightweight aggregate infill.
III	1	Depths to invert not exceeding 2 metres. The average depth to invert to be stated to the nearest 25 mm.
	2	Depths to invert exceeding 2 metres but not exceeding 4 metres and so on in steps of 2 metres. The average depth to invert to be stated to the nearest 25 mm.
IV	1	Specified design groups.
	2	Particular designs stated in the Contract.
V	1	In side slopes of cuttings or side slopes of embankments.

Note: For each item which includes Group III Feature 1 or 2 an associated item shall be provided for adjustment of the rate for each 25 mm of difference in excess of 150 mm where the average depth to invert calculated from site measurement varies from that stated in the Bill of Quantities. The foregoing shall apply to both increases and decreases of average in excess of 150 mm, and will result in either a positive or negative adjustment of the rate.

Filter Drains

22 The items for filter drains shall in accordance with the Preambles to Bill of Quantities General Directions include for:

Item coverage

(a) excavation of acceptable material (as Series 600 paragraphs 17 and 18);

(b) excavation of unacceptable material (as Series 600 paragraph 19);

(c) disposal of material (as Series 600 paragraph 39);

(d) articulated pipes, and fittings;

(e) cutting, laying, jointing and bedding;

(f) bedding, haunching and surrounding;

(g) formwork (as Series 1700 paragraph 15);

(h) filter material and compaction;

(i) reinstatement of unpaved areas;

(j) checking and cleaning;

(k) recording, staking and labelling;

(l) geotextiles;

(m) topsoiling, seeding and turfing;

(n) mesh;

(o) pipe schedules;

(p) protective system (as Series 1900 paragraph 4).

Filter Material Contiguous with Filter Drains, Sub-base Material and Lightweight Aggregate Infill

23 The items for filter material contiguous with filter drains, sub-base material and lightweight aggregate infill shall in accordance with the Preambles to Bill of Quantities General Directions include for:

Item coverage

(a) compaction;

(b) formwork (as Series 1700 paragraph 15);

(c) geotextiles;

(d) mesh.

Excavate and Replace Filter Material

24 The items for excavate and replace filter material shall in accordance with the Preambles to Bill of Quantities General Directions include for:

Item coverage

(a) excavation (as Series 600 paragraphs 18 and 19);

(b) disposal of material (as Series 600 paragraph 39);

(c) compaction of fill (as Series 600 paragraph 52);

(d) geotextiles.

Fin Drains and Narrow Filter Drains

Units

25 The unit of measurement shall be:

(i) fin drains ..... linear metre.

(ii) narrow filter drains ..... linear metre.

Measurement

26 The measurement of fin drains and narrow filter drains shall be the summation of their individual lengths measured along their centre lines between any of the following:

(a) the internal faces of chambers;

(b) the position of terminations shown in the Contract;

(c) the external faces of headwalls.

The depth of the fin drain or narrow filter drain shall be the vertical measurement between the invert and the Earthworks Outline.

Itemisation

27 Separate items shall be provided for fin drains and narrow filter drains in accordance with Chapter II paragraphs 3 and 4 and the following:

Group	Feature	
I	1	Fin drains.
	2	Narrow filter drains.
II	1	Specified design group.
	2	Particular designs stated in the Contract.
III	1	Depth not exceeding 1.5 metres.

Fin Drains and Narrow Filter Drains

28 The items for fin drains and narrow filter drains shall in accordance with the Preambles to Bill of Quantities General Directions include for:

Item coverage

(a) geotextiles and cores;

(b) backfilling and compaction;

(c) filter drains (as this Series paragraph 22);

(d) protection from ultra-violet light;

(e) marker tapes;

(f) lapping and jointing;

(g) connections, attachments and fittings;

(h) treatment at chambers, gullies, pipelines and the like.

Connections

Units

29 The unit of measurement for connections shall be:

(i) connection to existing drain, existing piped culvert, existing chamber, permanently severed land or mole drain ..... number.

Measurement

30 Connections shall only be separately measured for connection to existing drains, existing piped culverts or existing chambers, and permanently severed land or mole drains.

Itemisation

31 Separate items shall be provided for connections in accordance with Chapter II paragraphs 3 and 4 and the following:

Group	Feature	
I	1	Connection to existing drain and existing piped culvert.
	2	Connection to existing chamber.
	3	Connection to permanently severed land or mole drain.
II	1	Different diameters.
III	1	Depths to invert not exceeding 2 metres.
	2	Depths to invert exceeding 2 metres but not exceeding 4 metres and so on in steps of 2 metres.

Connections to Existing Drains, Existing Piped Culverts, Existing Chambers, Permanently Severed Land or Mole Drains

32 The items for connection to existing drains, existing piped culverts, existing chambers, permanently severed land or mole drains shall in accordance with the Preambles to Bill of Quantities General for:

Item coverage

(a) excavation of acceptable material (as Series 600 paragraphs 17 and 18);

(b) excavation of unacceptable material (as Series 600 paragraph 19);

(c) locating and making entry;

(d) backfilling and compaction;

(e) disposal of material (as Series 600 paragraph 39);

(f) making entry into chambers, concrete benching and channels, and making good the benching, channels and walls;

(g) locating severed ends of land and mole drains;

(h) pipes, fittings and saddles;

(i) bedding, haunching and surrounding, and filter material;

(j) formwork (as Series 1700 paragraph 15);

(k) sealing off disused ends;

(l) re-laying existing pipes disturbed.

Chambers and Gullies

Units

33 The unit of measurement shall be:

(i) chambers, gullies ..... number.

Measurement

34 The measurement shall be of the complete chamber or gully.

35 Depths of chambers shall be the distance between the top surface of the cover and the invert of the main channel, or where no channel is required by the Contract, the uppermost surface of the base slab. Where no base slab is required the depth shall be taken to the bottom of the excavation.

Itemisation

36 Separate items shall be provided for chambers and gullies in accordance with Chapter II paragraphs 3 and 4 and the following:

Group	Feature	
I	1	Chambers.
	2	Gullies.
II	1	Specified design groups.
	2	Particular designs stated in the Contract.
III	1	Depths not exceeding 1 metre.
	2	Depths exceeding 1 metre but not exceeding 2 metres
	3	and so on in steps of 1 metre
IV	1	Different types of covers or gratings.

Chambers

37 The items for chambers shall in accordance with the Preambles to Bill of Quantities General Directions include for:

Item coverage

(a) excavation of acceptable material (as Series 600 paragraphs 17 and 18);

(b) excavation of unacceptable material (as Series 600 paragraph 19);

(c) locating existing drains;

(d) breaking into existing drains;

(e) connecting and re-connecting existing drains;

(f) construction of bases, walls, roof and cover slabs and shafts, surrounds and corbelling for cover;

(g) channels, fittings, benchings, building in pipes and fin drain connections;

(h) cleaning;

(i) steps, safety chains, ladders, handholds and the like;

(j) covers, frames, seatings and bedding;

(k) lifting keys;

(l) concrete (as Series 1700 paragraphs 5 and 10);

(m) formwork (as Series 1700 paragraph 15);

(n) reinforcement (as Series 1700 paragraph 26);

(o) backfilling and compaction;

(p) disposal of material (as Series 600 paragraph 39);

(q) filling;

(r) notices;

(s) sealants (as Series 2300 paragraph 10);

(t) brickwork (as Series 2400 paragraph 4);

(u) re-laying existing pipes disturbed;

(v) pipework and fittings;

(w) penstocks and ancillary equipment.

Gullies **38** The items for gullies shall in accordance with the Preambles to Bill of Quantities General Directions include for:

Item coverage

(a) excavation of acceptable material (as Series 600 paragraphs 17 and 18);

(b) excavation of unacceptable material (as Series 600 paragraph 19);

(c) fittings including in situ concrete (as Series 1700 paragraph 5) bed and surround and jointing to pipes;

(d) gratings, frames, slabs, surrounds, aprons, seatings, liners and bedding;

(e) formwork (as Series 1700 paragraph 15);

(f) cleaning;

(g) backfilling and compaction;

(h) disposal of material (as Series 600 paragraph 39);

(i) brickwork (as Series 2400 paragraph 4);

(j) re-laying existing pipes disturbed.

Headwalls and Outfall Works

Measurement **39** Headwalls and outfall works and the like to pipes up to 900 mm internal diameter shall be measured in accordance with this Series paragraphs 40 to 42.

Headwalls and outfall works and the like to pipes exceeding 900 mm internal diameter shall be measured in accordance with Series 2500.

Headwalls and outfall works and the like constructed using concrete bagwork shall be measured in accordance with this Series paragraphs 77 to 80.

Units **40** The unit of measurement shall be:

(i) headwalls, revetments ..... number.

Itemisation **41** Separate items shall be provided for headwalls and revetments in accordance with Chapter II paragraphs 3 and 4 and the following:

Group	Feature

I	1	Headwalls.
	2	Revetments
II	1	Different types.
III	1	Different materials
IV	1	Pipe not exceeding 100 mm internal diameter.
	2	Pipe exceeding 100 mm but not exceeding 300 mm internal diameter.
	3	Pipe exceeding 300 mm but not exceeding 600 mm internal diameter.
	4	Pipe exceeding 600 mm but not exceeding 900 mm internal diameter.

Headwalls and Outfall Works

42 The items for headwalls and outfall works shall in accordance with the Preambles to Bill of Quantities General Directions include for:

Item coverage

(a) excavation of acceptable material (as Series 600 paragraphs 17 and 18);

(b) excavation of unacceptable material (as Series 600 paragraph 19);

(c) concrete (as Series 1700 paragraphs 5 and 10);

(d) formwork (as Series 1700 paragraph 15);

(e) backfilling and compaction;

(f) disposal of material (as Series 600 paragraph 39);

(g) brickwork, copings, string courses and the like (as Series 2400 paragraph 4);

(h) blockwork, stonework, copings, string courses, individual blocks, features or stones (as Series 2400 paragraph 8);

(i) lining of watercourses (as Series 600 paragraph 89);

(j) drainage channel blocks (as Series 1100 paragraph 4);

(k) building in pipes and fin drain connections;

(l) reinforcement (as Series 1700 paragraph 26);

(m) miscellaneous metalwork (as Series 1800 paragraph 14);

(n) waterproofing (as Series 2000 paragraph 4);

(o) flap valves.

Soft Spots and Other Voids

Units

43 The unit of measurement shall be:

(i) soft spots, other voids ..... cubic metre.

Measurement

44 The measurement of soft spots and other voids shall be the volume

of the void directed to be excavated or filled. For this measurement the width shall be taken for drains, service ducts and filter drains, as the internal diameter of the pipe plus 600 mm. Where no pipe is required the width shall be taken as 600 mm. For chambers, gullies and the like the measurement shall be taken as the horizontal area of the base slab or where no base slab is required the bottom of the excavation. The depths shall be measured from the underside of the
thinnest permitted bed in any one group for trenches and from the underside of the base slab for chambers, gullies and the like.

Itemisation **45** Separate items shall be provided for soft spots and other voids in accordance with Chapter II paragraphs 3 and 4 and the following:

Group	Feature	
I	1	Excavation of soft spots and other voids.
	2	Filling of soft spots and other voids.
II	1	Different types of fill.

Excavation of Soft Spots and other Voids **46** The items for excavation of soft spots and other voids shall in accordance with the Preambles to Bill of Quantities General Directions include for:

Item coverage (a) excavation of acceptable material (as Series 600 paragraphs 17 and 18);
(b) excavation of unacceptable material (as Series 600 paragraph 19);

(c) disposal of material (as Series 600 paragraph 39).

Filling of Soft Spots and Other Voids **47** The items for filling of soft spots and other voids shall in accordance with the Preambles to Bill of Quantities General Directions include for:

Item coverage (a) deposition of fill (as Series 600 paragraph 33);

(b) compaction of fill (as Series 600 paragraph 52);

(c) in situ concrete (as Series 1700 paragraph 5);

(d) formwork (as Series 1700 paragraph 15).

Supports Left in Excavation

Units **48** The unit of measurement shall be:

(i) supports left in excavation ..... square metre.

Measurement **49** The measurement shall be the area of face required by the Contract to be left with supports in position
.

Itemisation **50** Separate items shall be provided for supports left in excavation in accordance with Chapter II paragraphs 3 and 4 and the following:

Group	Feature	
I	1	Supports.

II	1	Timber.
	2	Steel
III	1	Different types.
IV	1	Construction in trench.
	2	Construction in pits.
	3	Construction in heading.

Supports Left in Excavation

51 The items for supports left in excavation shall in accordance with the Preambles to Bill of Quantities General Directions include for:

Item coverage

(a) struts, walings and the like and working around them.

Drainage and Service Ducts in Structures (Including Reinforced Earth Structures and Anchored Earth Structures)

Units **52** The unit of measurement shall be:

(i) drainage and service ducts in structures ..... item.

Measurement **53** The components comprising the items of drainage and service ducts in structures shall be identified and scheduled in the Contract.

Itemisation **54** Separate items shall be provided for drainage and service ducts in structures in accordance with Chapter II paragraphs 3 and 4 and the following:

Group	Feature	
I	1	Drainage.
	2	Service ducts
II	1	Substructure - end supports.
	2	Substructure - intermediate supports.
	3	Superstructure.
	4	Reinforced earth structure.
	5	Anchored earth structure.

Drainage and Service Ducts in Structures **55** The items for drainage and service ducts in structures shall in accordance with the Preambles to Bill of Quantities General Directions include for:

Item coverage

(a) drains, service ducts, filter drains, fin drains and narrow filter drains and connections (as this Series paragraphs 16,22, 28 and 32);

(b) chambers (as this Series paragraph 37);

(c) gullies (as this Series paragraph 38);

(d) pipework, gullies, downpipes, fittings and the like including brackets, hangers and straps, fixing to or building into the structure;

(e) making good protective system, waterproofing;

(f) permeable backing including compaction and supports;

(g) channels.

Filling to Pipe Bays and Verges on Bridges

Units **56** The unit of measurement shall be:

(i) filling to pipe bays and verges on bridges ..... cubic metre.

Measurement **57** The measurement shall be the volume of the void stated in the Contract to be filled except that no deduction shall be made for drains, service ducts, services, supplies and the like and their supports.

Itemisation **58** Separate items shall be provided for filling to pipe bays and verges on bridges in accordance with Chapter II paragraphs 3 and 4 and the following:

Group	Feature	
I	1	Filling to pipe bays and verges on bridges.
II	1	Different types.

Filling to Pipe Bays and Verges on Bridges **59** The items for filling to pipe bays and verges on bridges shall in accordance with the Preambles to Bill of Quantities General Directions include for:

Item coverage

(a) deposition;

(b) complying with any restrictions on the placing and compacting of materials;

(c) compaction around drains, service ducts, services, supplies, supports and the like.

Replacement, Raising or Lowering of Covers and Gratings on Existing Chambers and Gullies

Definition **60** For the purpose of paragraphs 61 to 64 of this Series any reference to covers and gratings shall be deemed to include associated frames.

Units **61** The units of measurement shall be:

(i) replacement of covers and gratings on existing chambers and gullies …… number.

(ii) raising or lowering of covers and gratings on existing chambers and gullies …….. number.

Measurement **62** When an existing cover or grating is to be raised/lowered and replaced, separate items shall be measured for raising/lowering and replacement.

Itemisation **63** Separate items shall be provided for replacement, raising or lowering of covers and gratings on existing chambers and gullies in accordance with Chapter II paragraphs 3 and 4 and the following:

Group	Feature	
I	1	Replacement.
	2	Raising the level.
	3	Lowering the level.
II	1	Different sizes of cover.
	2	Different sizes of grating.
III	1	Different types of cover.
	2	Different types of grating.
IV	1	Different sizes of chamber.
	2	Different sizes of gully.
V	1	Different construction of chamber.
	2	Different construction of gully.
VI	1	Not exceeding 150 mm.
	2	Exceeding 150 mm but not exceeding 300 mm and so on in steps of 150 mm.

Replacement, Raising or Lowering of Covers and gratings on existing Chambers and Gullies

64 The items for replacement, raising or lowering of covers and gratings on existing chambers and gullies shall in accordance with the Preambles to Bill of Quantities General Directions include for:

Item coverage

(a) excavation of acceptable material (as Series 600 paragraphs 17 and 18);

(b) excavation of unacceptable material (as Series 600 paragraph 19);

(c) excavation of Hard Material (as Series 600 paragraph 23);

(d) take up existing cover or grating including frame and clean and set aside for re-use;

(e) demolition and preparation to receive new construction;

(f) construction of walls, roof and cover slabs and shafts, surrounds and corbelling for cover and making good;

(g) steps, safety chains, ladders, handholds, lifting keys and the like;

(h) bedding cover or grating including frame;

(i) concrete (as Series 1700 paragraphs 5 and 10);

(j) formwork (as Series 1700 paragraph 15);

(k) reinforcement (as Series 1700 paragraph 26);

(l) backfilling and compaction;

(m) disposal of material (as Series 600 paragraph 39);

(n) taking precautions to avoid damage to drains;

(o) cleaning;

(p) reinstatement of adjacent surfaces;

(q) brickwork (as Series 2400 paragraph 4);

(r) sealants (as Series 2300 paragraph 10);

(s) modification and new materials;

(t) replacing items damaged during the foregoing operations.

Remove from Store and Reinstall Chamber Covers and Frames, and Gully Gratings and Frames

Units **65** The unit of measurement shall be:

(i) remove from store and reinstall chamber covers and frames, and gully gratings and frames ..... number.

Measurement **66** The measurement of remove from store and reinstall chamber covers and frames and gully gratings and frames shall be the complete installation.

Itemisation **67** Separate items shall be provided for remove from store and reinstall chamber covers and frames and gully gratings and frames in accordance with Chapter II paragraphs 3 and 4 and the following:

Group	Feature	
I	1	Remove from store and reinstall different types of chamber covers and frames.
	2	Remove from store and reinstall different types of Gully gratings and frames.
II	1	Different sizes.

Remove from Store and Reinstall Chamber and Frames and Gully Gratings and Frames

68 The items for remove from store and reinstall chamber covers and frames and gully gratings and frames shall in accordance with t the Preambles to Bill of Quantities General Directions include for:

Item coverage

(a) loading, transporting from store, unloading and positioning for reinstallation;

(b) replacing items damaged during the foregoing operations;

(c) modification and new materials;

(d) replacement, raising or lowering of covers and gratings on existing chambers and gullies (as this Series paragraph 64).

Grouting Up of Existing Drains and Service Ducts

Units **69** The unit of measurement shall be:

(i) grouting up of existing drains and service ducts ..... linear metre.

Measurement **70** The measurement of grouting up of existing drains and service ducts shall be the length to be grouted as stated in the Contract.

Itemisation **71** Separate items shall be provided for grouting up of existing drains and service ducts in accordance with Chapter II paragraphs 3 and 4 and the following:

Group	Feature	
I	1	Grouting up of existing drains and service ducts.
II	1	Different diameters.
III	1	Different types of grout.

Grouting Up of Existing Drains and Service Ducts

72 The items for grouting up of existing drains and service ducts shall in accordance with the Preambles to Bill of Quantities General Directions include for:

Item coverage

(a) excavation of acceptable material (as Series 600 paragraphs 17 and 18);

(b) excavation of unacceptable material (as Series 600 paragraph 19);

(c) breaking into drain or service duct and cleaning;

(d) mixing and placing grout;

(e) in situ concrete (as Series 1700 paragraph 5);

(f) formwork (as Series 1700 paragraph 15);

(g) backfilling and compaction;

(h) disposal of material (as Series 600 paragraph 39).

Excavation in Hard Material

Units **73** The unit of measurement shall be:

(i) extra over excavation for excavation in Hard Material in drainage ..... cubic metre.

Measurement **74** The measurement shall be the volume of the voids formed by the removal of the Hard Material.

For the measurement of:

(a) drains, service ducts and filter drains (except fin drains and narrow filter drains), the width shall be taken as the internal diameter of the pipe plus 600 mm. Where no

pipe is required the width shall be taken as 600 mm;

(b) fin drains and narrow filter drains the width shall be taken as 300mm

(c) chambers, gullies and the like the area shall be taken as the horizontal area of the base slab or where no base slab is required the area of the bottom of the excavation;

(d) Excavation in hard material shall not be measured separately in connection with replacement and raising or lowering of covers and gratings on existing chambers and gullies.

Itemisation **75** Separate items shall be provided for extra over excavation for excavation in Hard Material in drainage in accordance with Chapter II paragraphs 3 and 4 and the following:

Group	Feature	
I	1	Extra over excavation for excavation in Hard Material in drainage.

Extra Over Excavation for Excavation in Hard Material

76 The items for extra over excavation for excavation in Hard Material in drainage shall in accordance with the Preambles to Bill of Quantities General Directions include for:

Item coverage

(a) excavation in Hard Material (as Series 600 paragraph 23).

Concrete Bagwork

Units **77** The unit of measurement shall be:

(i) Concrete bagwork ……..cubic metre.

Measurement **78** No deduction shall be made for holes, ducts, pockets, sockets, mortices and the like not exceeding 0.15 cubic metres each in volume.

Itemisation **79** Separate items shall be provided for concrete bagwork in accordance with Chapter II paragraphs 3 and 4 and the following:

Group	Feature	
I	1	Concrete bagwork.
II	1	In headwalls.
	2	Other stated location.
III	1	With battered face.

Concrete Bagwork

80 The items for concrete bagwork shall in accordance with the Preambles to Bill of Quantities General Directions include for:

Item Coverage

(a) excavation (as Series 600 paragraphs 18 and 19);

(b) disposal of material (as Series 600 paragraph 39);

(c) trials and trial panels;

(d)deposition, fill and compaction (as Series 600 paragraphs 33, 45 and 52);

(e) filling bags with concrete and tucking in ends of bags;

(f) shaping bags and soaking;

(g) dowel bars (as Series 1700 paragraph 27);

(h) building in pipes;

(i) tying into existing work;

(j) construction of bagwork in more than one lift;

(k) in situ concrete (as Series 1700 paragraph 5);

(l) formwork (as Series 1700 paragraph 15);

(m) reinforcement (as Series 1700 paragraph 26);

(n) geotextiles (as Series 600 paragraph 60);

(o) water supply.

Cleaning Existing Drainage Systems

Units

81 The units of measurement shall be:

(i) cleaning of piped drainage systems, drainage channels, linear drainage channel systems, combined drainage and kerb systems…….linear metre.

(ii) cleaning of bridge drainage system ……item.

(iii) cleaning of chambers, gullies …….number.

Measurement

82 The measurement of cleaning piped drainage systems, drainage channels, linear drainage channel systems and combined drainage and kerb systems shall be the individual lengths measured along the centre lines between any of the following:

(a) the internal faces of chambers;

(b) the external faces of headwalls;

(c) the intersections of the centre lines at pipe junctions;

(d) the centre of gully gratings (or where no grating is provided, the centre of the gully);

(e) the position of terminations shown in the Contract.

The measurement of cleaning drainage channels, linear drainage channel systems, combined drainage and kerb systems and bridge drainage systems shall be deemed to include associated chambers, sumps and the like.

Itemisation **83** Separate items shall be provided for cleaning existing drainage systems in accordance with Chapter II paragraphs 3 and 4 and the following:

Group	Feature	
I	1	Cleaning.
II	1	Piped drainage system.
	2	Drainage channels.
	3	Linear drainage channel system.
	4	Combined drainage and kerb system.
	5	Bridge drainage system.
	6	Chambers.
	7	Gullies.
III	1	Different stated sizes.
IV	1	Different stated locations.

Cleaning Existing Drainage Systems **84** The items for cleaning existing drainage systems shall in accordance with the Preambles to Bill of Quantities General Directions include for:

Item Coverage

(a) marking;

(b) lifting chamber covers, replacement and bedding;

(c) rodding;

(d) flushing;

(e) water supply;

(f) mandrelling;

(g) disposal of material (as Series 600 paragraph 39);

(h) recording and reporting;

(i) greasing;

(j) cleaning covers, gratings and frames, offlets and the like;

(k) filling with water;

(l) vacuum/air suction;

(m) locating obstructions and the like;

(n) contamination prevention measures;

(o) locating chambers and gullies.

ROAD PAVEMENTS - GENERAL

Contents

ROAD PAVEMENTS – GENERAL

701 Pavement Construction

1 Road pavements shall be constructed from one of the permitted options described in Appendix 7/1 and in compliance with this Series and the appropriate Clauses of Series 800, 900 and 1000.

The naming of the various pavement layers according to BS will be subject to change over the next few years to reflect European harmonisation: Wearing Course will become Surfacing, Basecourse will become Binder Course and Roadbase will become Base Course. Cement Stabilisation as described in the 'Directives for The Standardization of Pavements for Traffic Areas' will become Cement Bound Material (CBM). Specification uses the new namings.

2 The Contractor shall, in his choice of permitted materials for sub-bases (foundation course or Cement bound material) and base courses, have regard to the nature of those materials and of the subgrade or any capping and the need to protect them from deterioration due to the ingress of water, the adverse effects of weather and the use of construction plant. The Contractor shall programme the laying and compaction of the sub-base and the subsequent pavement courses and take such other steps as may be considered necessary, to provide protection to the base course, sub-base and subgrade.

702 Horizontal Alignments, Surface Levels, Thickness and Surface Regularity of Pavement Courses

Horizontal Alignments

1 Horizontal alignments shall be determined from one edge of the pavement surface as described in Appendix 1/12. The edge of the pavement as constructed and all other parallel alignments shall be correct within a tolerance of 25mm therefrom, except for kerbs, channel blocks and edge lines which shall be laid with a smooth alignment within a tolerance of ±13 mm.

Surface Levels and Thickness of Pavement Courses

2 The design levels of pavement courses shall be calculated from the vertical profile, crossfalls and the pavement course thicknesses described in Appendix 7/1. The level of any point on the constructed surface of the pavement courses shall be the design level subject to the appropriate tolerances stated in Table 7/1.

TABLE 7/1: Tolerances in Surface Levels of Pavement Courses

Road surfaces	
-Wearing course on binder course	± 4mm
-Wearing course on base course	± 6mm
-Adjacent to a surface water channel*	+ 5 to +10mm
-Combined base / wearing course	± 10mm
Binder course*	± 6mm
Asphalt base course*	± 10mm
Unbound base course*	± 20mm
Foundation course	± 20mm
Cement bound material	
-Below asphalt course	± 15mm
-Below unbound course	± 20mm
Formation level	
-Below course with binder	± 20mm
-Below unbound course	± 25mm

Where a surface water channel is laid before the adjacent road pavement layer the top of that layer, measured from the top of the adjacent edge of the surface water channel, shall be to the tolerances given in Table 7/1.

3 Notwithstanding the tolerances permitted in surface levels of pavement courses, the cumulative tolerance shall not result in a reduction in thickness of the pavement,. The layer thickness will be calculated as the mean value over the whole construction area. A minimum of 20 values are necessary for the calculation of the mean value. The layer thickness may be determined for partial sections. The partial section should correspond at least to one day of construction work.

Higher thicknesses than specified are used to compensate lower thicknesses of courses below the

course in question. Clause 925, sub-clause 8 is applied for the payment.

a) Cement bound material, foundation course, and base courses:

The layer thickness after compaction shall not be less than 10% from the specified thickness.

Independently of the mean value, single values of the layer thickness shall not fall below the specified thickness as follows:

-Cement bound material	30mm
-Foundation course	30mm
-Unbound base course	30mm
-Asphalt base course	25mm

Single values which exceed the specified thickness by more than 30mm are not considered for the calculation of the mean value.

b) Surfacing (binder course and/or wearing course):

The limit values for mean values and single values (percentage from the specified thickness) of Table 7/2 shall not be exceeded.

4 For checking compliance with sub-Clause 2 and sub-Clause 3 of this Clause, measurements of the surface levels of all courses will be taken on a grid of points located as described in Appendix 7/1. Measurements may be taken at a longitudinal distance of 10m and at three points in the transversal direction of a carriageway actually in the axle and the two exterior third points of half of the carriageway width (for a 7.5m carriageway at a distance of 2.5 m from the axle). In any length of pavement, compliance shall be deemed to be met for all surfaces, other than the final road surface, when not more than one of ten consecutive measurements taken longitudinally or one in any transverse line, exceeds the tolerances permitted in Table 7/1, provided that this one measurement shall not exceed by more than 5 mm the tolerance for the course concerned. For the final road surface the tolerance given in Table 7/1 shall apply to any point on that surface.

Surface Regularity

5 The longitudinal regularity of the surfaces of wearing courses, binder courses, base courses, and sub-bases in pavements and concrete slabs shall be such that the number of surface irregularities is within the relevant limits stated in Table 7/3.
An irregularity is a variation of not less than the permissible value specified of the profile of the load surface or the course in question as measured by a 4m long straight edge or by a rolling straight-edge capable of measuring irregularities over a 4m length.

TABLE 7/3: Maximum Permitted Number of Surface Irregularities

	Surfaces of carriage-ways, hard strips and hard shoulders				Surfaces of all other courses			
Irregularity					Tol. (mm)		Tol.+3mm (mm)	
Case a	4mm		7mm					
Case b	6mm		9mm					
≤10mm	10mm		13mm					
Length (m)	300	75	300	75	300	75	300	75
A: Arterial and Distributor roads*	20	9	2	1	40	18	4	2
B: Other traffic areas*	40	18	4	2	60	27	6	3

** The Category of each section of road is described in Appendix 7/1.*

No irregularity exceeding 10mm shall be permitted for case (a) and case (b) and no irregularity exceeding 14mm shall be permitted for areas with slow traffic, mechanically laid combined base wearing course and hand laid wearing course. No irregularity exceeding the tolerance by more than 4mm shall be permitted for all other courses (e.g. foundation course: 24mm)

a) Tolerances for irregularities of base courses and sub-bases:

Asphalt base course:	10mm
Unbound base course:	20mm
Foundation course:	20mm

Cement bound material:

Below asphalt	15mm
Below unbound base course	20mm

b) Tolerances for surface irregularities of surfacings:

Surface irregularities must not exceed the permissible tolerances of Table 7/4.

TABLE 7/2: Limiting Values for Layer Thicknesses lower than Specified

	Wearing course [1], binder course and asphalt base course together	Wearing course [1] and asphalt base course together	Wearing course[1] and binder course together	Wearing course[1]	Combined Base/Wearing course
a) Mean Value					
1. Construction areas greater 3000m² or urban roads over 500m² and wearing courses with more than 50kg/m²	-	-	≤10%	≤10%	≤10%
2. Small construction areas and wearing courses up to 50kg/m²	-	-	≤15%	≤15%	≤15%
b) Single values	≤10%	≤15%	≤15%	≤25%	≤25%

1) The values of line b) are applied analogously in case of stage construction, that means if the final surfacing (binder course and wearing course) will be laid later: therefore a value of 25% is allowed for the upper layer of the provisional surfacing of the first stage, for the provisional surfacing and the asphalt base course together a value of 15%.

TABLE 7/4: Tolerances for Surface Irregularities after mechanical laying (4m length).

	Combined base/wearing courses	Binder courses	Wearing courses
On base which is not bound by binder	≤10mm	≤10mm	-
On base which is bound by binder and the permissible irregularity of the base is higher than 6mm	≤10mm	≤6mm	≤6mm (case b)
On asphalt base with permissible irregularity of less than 6mm	-	-	≤4mm (case a)

Higher tolerances than those of Table 7/4 may be allowed for areas with slow traffic but not more than 10mm. The permissible irregularities of the surface must only arrive in gradual transition and not in shorter regular distances. In cases of hand laid areas the permissible tolerances are 15mm for combined base/wearing courses and 10mm for binder courses and wearing courses.

Deviations of the required cross slope of the road surface must not be more than ± 0.4% and for combined base/wearing courses not more than ± 0.5%. If the cross slope is below 1.5% and the longitudinal slope below 0.5% for transition curves of carriageways for rapid traffic, the difference between the specified cross slope and the achieved cross slope must not be more than 0.2%

6 Prior to checking any final road surface or course it shall be cleaned of loose or extraneous materials. These operations shall be carried out without damaging the surface, as soon as possible and within 3 days of construction of the pavement.

7 Compliance with the required tolerances and the permitted number of surface irregularities shall be checked by the rolling straight-edge along any line or lines parallel to the edge of pavement on sections of 300 m at regular intervals as stated in Appendix 7/1, whether or not it is constructed in shorter lengths. Sections shorter than 300 m forming part of a longer pavement shall be assessed using the number of irregularities for a 300 m length pro-rata to the nearest whole number.

Where the total length of pavement is less than 300 m, the measurements shall be taken on 75 m lengths.

8 Pavements shall be measured transversely for irregularities at regular intervals as stated in Appendix 7/1, by a 4 m long straight-edge placed at right angles to the centre line of the road. The maximum allowable difference between the course surface and the straight-edge is the same like for the longitudinal direction.

9 Testing of the longitudinal surface regularity is generally carried out in the middle of the lane.

Rectification

10 Where any pavement area does not comply with the Specification for regularity, surface tolerance, thickness, material properties or compaction, the full extent of the area which does not comply with the Specification shall be made good and the surface of the pavement course shall be rectified in the manner described below:

(i) Unbound materials

The top 75 mm shall be scarified, reshaped with material added or removed as necessary, and re-compacted. The area treated shall be not less than 20 m long and 2 m wide.

(ii) Cement bound sub-bases

The method of correction will depend on the period which has elapsed between detection of the error and the time of mixing of the material. If this is less than 4 hours, the surface shall be scarified to a depth of not less than 50 mm, surplus material removed or freshly mixed material added as necessary, and re-compacted in accordance with the Specification. If the period is 4 hours or more the full depth of the layer shall be removed from the pavement and replaced with material in accordance with the Specification. In either case the area treated shall be at least 5 m long and the full width of the paving laid in one operation. If the Contractor proposes rectification within 7 days of laying he shall comply with sub-Clause 1048.4. Alternatively, for sub-bases under concrete pavements the Contractor may make up low areas to a level within the tolerances of this Clause with a 1:4 cement and sand mortar or with 3 mm size fine graded wearing course complying with BS 4987 : Part 1.

(iii) Bituminous base courses

With asphalt base courses, the full depth of the top layer as laid shall be removed and be replaced with fresh material laid and compacted in accordance with the Specification. Any area so treated shall be at least 5 m long and the full width of the paving laid in one operation. Alternatively for low areas in bituminous base courses to be overlaid with a binder course, the Contractor may make up the level with additional binder course material.

(iv) Wearing courses, base/wearing courses, binder courses and top surface of base courses in pavements without binder course.

These shall have the full depth of the course removed, or in the case of base courses in pavements without binder course, the topmost layer, and replaced with fresh material laid and compacted in accordance with the Specification.

The area rectified shall be the full width of the paving laid in one operation, and at least 5 m long if binder course or base course on pavements without binder course, or 15 m if wearing course or base/wearing course.

Where the number of surface irregularities exceeds the limits in Table 7/3, the area to be rectified shall be 300 m or 75 m long as appropriate and the full width of the lanes affected, or such lesser length as necessary to make the number of surface irregularities conform with the limits and shall be the full width of the lanes affected.

Checking of the wearing course for compliance with this Clause shall be carried out as soon as possible after completion of the surfacing and remedial works completed before the road is opened to traffic.

Areas to be removed shall be delineated both longitudinally and transversely by saw cutting prior to the material being removed. Joints shall be formed by coating the exposed sawn face with hot bitumen.

(v) Concrete slabs

Concrete slabs shall be rectified by planing, grinding or bump cutting. Large depressions, which cannot be dealt with in this way, shall be rectified by cutting out the surface and replacing by a thin bonded surface repair complying with Clause 1032.

Retexturing of hardened concrete shall be carried out by sawing grooves in accordance

with the Specification. Texturing of replaced surfaces shall be by brushing in accordance with the Specification. Where the slab cannot be rectified as above, the full depth of slab shall be removed and replaced with a slab constructed in compliance with Clause 1033 to the extent required to obtain compliance to the Specification. Remedial works involving the placing of fresh concrete shall be completed in sufficient time for the concrete strength to have developed as required in Clause 1048, before that section of pavement is opened to traffic.

703 Weather Conditions for Laying of Unbound Granular and Cementitious Materials

1 Road Pavement materials in a frozen condition shall not be incorporated in the Works but may be used, if acceptable, when thawed.

2 Road Pavement materials shall not be laid on any surface which is frozen or covered with ice.

3 The temperature of concrete or cement-bound material in any pavement layer shall not be less than 5^{o}C at the point of delivery. These materials shall not be laid when the air temperature fall below 3^{o}C and laying shall not be resumed until the rising air temperature reaches 3^{o}C unless, with the agreement of the Engineer, all surfaces of the concrete slabs are protected by thermal insulation blankets laid immediately after placing and finishing the concrete. The insulation shall be placed before the temperature of the concrete surface has dropped below 2^{o}C and shall be retained for a minimum of 3 days or until the concrete is assessed to have reached 50% of the specified characteristic compressive strength provided that the air temperature is above 0^{o}C and rising at that time. Thermal insulation blankets shall be closed cell polyethylene foam sheets, minimum 10mm thick with a "U" value of 4 watts/mC (or K value of 0.04 watts/m Kelvin) or suitable material with an equivalent or lower thermal conductivity. They shall be sufficiently robust and capable of being held in place for the necessary curing time.

704 Use of Surfaces by Traffic and Construction Plant

1 Construction plant and traffic used on pavements under construction shall be suitable in relation to the material, condition and thickness of the courses it traverses so that damage is not caused to the subgrade or the pavement courses already constructed.

2 The wheels or tracks of plant moving over the various pavement courses shall be kept free from deleterious materials.

3 Where the Contractor proposes to use the sub-base for construction plant he shall improve the sub-base where necessary, to accommodate the method of construction and the type of plant and vehicles which he proposes to use, in order to avoid damage to the sub-base, any capping and the subgrade. Any permanent thickening shall be across the whole width of the pavement, unless otherwise agreed by the Engineer. Temporary thickening shall not impede drainage of the sub-base or the subgrade.

4 Concrete slabs may be used by traffic when the characteristic compressive strength is assessed to have reached 25 N/mm^2 for pavement surface slabs, or 20 N/mm^2 for base courses with asphalt surfacing. The method of assessing the time when this strength is reached shall be as described in Clause 1004, or as otherwise agreed with the Engineer.

5 In the absence of test data establishing compliance with sub-Clause 4 of this Clause, no vehicle with an axle loading greater than 2 tonnes shall run on concrete slabs within a period of 14 days after placing the concrete. Vehicles with rubber tyres with an axle loading less than 2 tonnes, or wheels or tracks of concreting plant, shall not use any part of a newly constructed pavement within 7 days. The above periods shall be increased at the discretion of the Engineer if the 7-day cube strength is below that required. These periods shall be extended by one day per each night for which the temperature of the layer falls to 0^{o}C or below.

6 Cement bound material (sub-base) has to be kept moist for at least 3 days or to be protected against drying by other measures according to Clause 1035, sub-Clause 16. Further layers may be applied earlier if during laying no deformations of the sub-base arrive and if curing is not endangered by water content reduction (e.g. application of tack coat before laying of an asphalt base courses). Opening to traffic of the Cement bound material or the

pavement including the Cement bound material is only allowed if 70% of the required compressive strength is achieved. Otherwise no vehicle shall run on cement bound material within 7 days of construction. This period shall be extended by one day for each night on which the temperature of the layer falls to 0^{o}C or below.

705 General Requirements for Sub-bases and Base Courses

1 The Contractor shall, in his choice of materials for base courses have regard to the nature of those materials and of the sub-base, subgrade or any capping and the need to protect them from deterioration due to the ingress of water, the adverse effects of weather and the use of construction plant. The Contractor shall programme the laying and compaction of the sub-base and the subsequent pavement courses and take such other steps as may be considered necessary, to provide protection to the base course, sub-base and subgrade.

Transporting

2 Unbound and cement bound plant-mixed material shall when mixed be removed at once from the mixer, transported directly to the point where it is to be laid and protected from the weather both during transit from the mixer to the laying site and whilst awaiting tipping.

Laying

3 All material shall be placed and spread evenly. Spreading shall be undertaken either concurrently with placing or without delay. Unbound and cement bound material shall be spread using a paving machine and operated with a mechanism which levels off the material to an even depth.

706 Excavation, Trimming and Reinstatement of Existing Surfaces

General

1 The Contractor shall not excavate pits, trenches or other openings in paved areas which have been constructed as part of the Permanent Works in order to construct other parts of the Works, including Statutory Undertakers and other service works, except with the prior approval of the Overseeing Organisation.

2 Where excavation and trimming of existing paved areas and roads not constructed as part of the Permanent Works are required in Appendix 7/2, they shall be carried out and reinstated in compliance with this Clause and with any additional requirements described in Appendix 7/2. Excavations shall be carried out to the dimensions described in Appendix 7/2, or, if not so described, to the minimum dimensions, subject to sub-Clause 3 of this Clause, necessary to carry out the work.

Excavations

3 Excavations in asphalt layer of existing pavements and other paved areas, except those described in sub-Clause 4 of this Clause, shall be cut to neat lines to dimensions at least greater on each side than the dimensions of any further excavation below formation level as follows: 15cm for excavation depths up to 2m and 20cm for excavation depths equal or greater than 2m. Planing shall be carried out in accordance with Clause 917. Concrete surfacing and concrete roadbases, shall be cut back by sawing by at least 300 mm on each side to the level of any reinforcement in reinforced slabs and to the full depth of the slab in unreinforced slabs.

If excavations are required to inspect the condition of lower layers, each layer shall be excavated separately and cleaned of debris to permit inspection.

4 Concrete blocks, precast concrete flags, kerbs and channels shall be lifted without cutting, to the nearest joint satisfying sub-Clause 3 of this Clause and carefully stored for re-use or dealt with as described in Appendix 2/3. In situ kerbs and channels shall be broken out to at least 150mm beyond the excavation.

Reinstatement of Paved Areas

5 Immediately before bituminous layers are reinstated, the edges of the existing material shall be cleaned of all loose material and be coated with an appropriate hot bituminous binder, or equivalent treatment. Where joints in concrete slabs are affected by the excavation they shall be reinstated by cutting back to at least 0.5 m on each side of a transverse joint and forming an expansion joint on one side of the excavation and a contraction joint on the other and provide longitudinal joints where necessary in the same line before reinstatement in

compliance with Series 1000 to match the existing construction.

Reinstatement of Other Areas

6 Where the excavation affects grassed areas, unpaved footpaths, footways, verges and bridleways they shall be reinstated to match the existing surface, after backfilling with acceptable material described in Appendix 7/2 to a depth of not less than 150 mm below the finished surface.

Junctions Between New Pavement Construction and Existing Pavement or Other Paved Areas

7 Where new pavement construction abuts an existing bituminous pavement which has to be reduced in level or overlaid to match alignment and levels, the existing surface shall be trimmed by the minimum amount of cold-milling (planning) to a depth which will allow the specified thickness of new construction to be laid, the edge being trimmed and treated in compliance with this Clause. Where the difference in level makes it necessary, a regulating course as described in Appendix 7/1 and specified in Clause 907 shall be provided. The locations of areas to be trimmed are given in Appendix 7/2.

8 Junctions between concrete pavements and between concrete and bituminous pavements shall be constructed as described in Appendix 7/2.

Compressed Air

9 When compressed air is used to clean dust, dirt and debris from prepared faces of existing concrete or bituminous pavements which are otherwise ready for reinstatement, only oil-free compressed air shall be used and this shall be at a pressure of not less than 0.5 N/mm².

707 Breaking Up or Perforation of Redundant Pavement

1 Where redundant pavement construction is to be perforated or broken up, the pavement shall be treated as described in Appendix 7/6.

708 Weather Conditions for Laying of Asphalt Wearing Course and Other Bituminous Pavement Layers

1 Laying of road pavement materials containing bituminous binders may proceed during light precipitation (receiving layer not covered by the water film) provided the temperature of the surface to be covered is 2°C or more and the air temperature is above 3°C for wearing courses, and above 0°C for binder and base courses. Responsibility for working methods shall remain with the Contractor including all necessary adjustments to suit fluctuations in weather conditions.

2 Laying of road pavement materials containing bitumen binders may proceed provided the temperature of the surface to be covered is 2°C or more, the air temperature is at or above -1°C and rising and the surface to be covered is dry, unfrozen and free from ice, snow, salt and grit

709 Cold Milling (Planing) of Bituminous Bound Flexible Pavement. (Cold Milling is described in Clause 917)

710 Testing for Constituent Materials in Recycled Coarse Aggregate and Recycled, Concrete Aggregate

Constituent materials shall be tested analogous to prEN13108-8.

711 Not Used

712 Not Used

713 Not Used

714 Not Used

715 Not Used

716 Not Used

Series 1100: Kerbs, Footways and Paved Areas

Kerbs, Channels, Edgings, Combined Drainage and Kerb Blocks and Linear Drainage Channel Systems

Units

1 The unit of measurement shall be:

(i) kerbs, channels, edgings, combined drainage and kerb blocks and linear drainage channel systems ..... linear metre.

Measurement

2 The measurement of kerbs, channels, edgings, combined drainage and kerb blocks and linear drainage channel systems shall be the lengths required by the Contract. No deduction shall be made for gaps of 1 linear metre or less.

Itemisation

3 Separate items shall be provided for kerbs, channels, edgings, combined drainage and kerb blocks and linear drainage channel systems in accordance with Chapter II paragraphs 3 and 4 and the following:

Group	Feature	
I	1	Kerbs.
	2	Channels.
	3	Edgings.
	4	Combined drainage and kerb blocks.
	5	Linear drainage channel systems.
II	1	Permitted alternative materials and designs.
	2	Different materials and designs.
	3	Group reference.
III	1	Straight or curved exceeding 12 metres radius.
	2	Curved not exceeding 12 metres radius.

Kerbs, Channels, Edgings, Combined Drainage and Kerb Blocks and Linear Drainage Channel Systems

4 The items for kerbs, channels, edgings, and combined drainage and kerb blocks and linear drainage channel systems shall in accordance with the Preambles to Bill of Quantities General Directions include for:

Item coverage

(a) trial mixes;

(b) making good after sampling and testing;

(c) excavation of acceptable material (as Series 600 paragraphs 17 and 18);

(d) excavation of unacceptable material (as Series 600 paragraph 19);

(e) excavation in Hard Material (as Series 600 paragraph 23);

(f) disposal of material (as Series 600 paragraph 39);

(g) concrete (as Series 1700 paragraphs 5 and 10);

(h) formwork (as Series 1700 paragraph 15);

(i) reinforcement (as Series 1700 paragraph 26);

(j) mixing materials and extruding kerbs;

(k) bedding, bonding, jointing, including movement joints, filling and sealing of joints;

(l) keying of surfaces and tack coats;

(m) surface finishing, curing and protecting;

(n) gratings, frames, bedding and seatings;

(o) tie bars;

(p) drainage holes or pipes through concrete;

(q) quadrants, dropper kerbs and other special kerb units;

(r) edge support;

(s) preservation of timber;

(t) cutting;

u) drainage layer;

(v) additional pavement material below channels;

(w) backfilling and compaction;

(x) special units and fittings;

(y) connections to chambers;

(z) in the case of combined drainage and kerb blocks and linear drainage channel systems - design, certificates, provision of data and drawings, resubmissions, modifications and amendments to the Works.

(aa) in the case of combined drainage and kerb blocks and linear drainage channel systems - internal checking and cleaning;

(bb) reinstatement of surfaces.

Additional Concrete for Kerbs, Channels, Edgings, Combined Drainage and Kerb Blocks and Linear Drainage Channel Systems

Units

5 The unit of measurement shall be:

(i) additional concrete for kerbs, channels, edgings, combined drainage and kerb blocks and linear drainage channel systems ..... cubic metre.

Measurement

6 The measurement of additional concrete for kerbs, channels, edgings, combined drainage and kerb blocks and linear drainage channel systems shall be the volume required by the Contract in excess of the standard requirements of the Contract for each type of kerb, channel, edging, combined drainage and kerb block or linear drainage channel system.

Itemisation

7 Separate items shall be provided for additional concrete for kerbs, channels, edgings, combined drainage and kerb blocks and linear drainage channel systems in accordance with Chapter II paragraphs 3 and 4 and the following:

Group	Feature	
I	1	Additional concrete of different mixes, classes or grades.
II	1	To kerbs.
	2	To channels.
	3	To edgings.
	4	To combined drainage and kerb blocks.
	5	To linear drainage channel systems.

Additional Concrete for Kerbs,Channels,Edgings, Combined Drainage and Kerb Channel Systems

8 The items for additional concrete for kerbs, channels,edgings, combined drainage and kerb blocks and linear drainage channel systems shall in accordance with the Preambles to Bill of Quantities General Directions include for:

Item coverage

(a) excavation of acceptable material (as Series 600 paragraphs 17 and 18);

(b) excavation of unacceptable material (as Series 600 paragraph 19);

(c) excavation in Hard Material (as Series 600 paragraph 23);

(d) in situ concrete (as Series 1700 paragraph 5);

(e) formwork (as Series 1700 paragraph 15);

(f) reinforcement (as Series 1700 paragraph 26);
(g) forming, filling and sealing joints;

(h) surface finishing, curing and protecting;

(i) movement joints;

(j) drainage holes or pipes through concrete;

(k) disposal of material (as Series 600 paragraph 39).

Remove from Store and Relay Kerbs, Channels, Edgings, Combined Drainage and Kerb Blocks and Linear Drainage Channel Systems

Units

9 The unit of measurement shall be:

(i) remove from store and relay kerbs, channels, edgings, combined drainage and kerb blocks and linear drainage channel systems ..... linear metre.

Measurement

10 The measurement for remove from store and relay kerbs, channels, edgings, combined drainage and kerb blocks and linear drainage channel systems shall be the length required by the Contract. No deduction shall be made for gaps of 1 linear metre or less.

Itemisation

11 Separate items shall be provided for remove from store and relay kerbs, channels, edgings, combined drainage and kerb blocks and linear drainage channel systems in accordance with Chapter II paragraphs 3 and 4 and the following:

Group	Feature	
I	1	Remove from store and relay kerbs.
	2	Remove from store and relay channels.
	3	Remove from store and relay edgings.
	4	Remove from store and relay combined drainage and kerb blocks.
	5	Remove from store and relay linear drainage channel systems.
II	1	Different materials and designs.
III	1	Straight or curved exceeding 12 metres radius.
	2	Curved not exceeding 12 metres radius.

Remove from Store and Relay Kerbs, Channels, Edgings, Combined Drainage Kerb Blocks and Linear Drainage Channel Systems

12 The items for remove from store and relay kerbs, channels, edgings, combined drainage and kerb blocks and linear drainage channel systems shall in accordance with the Preambles to Bill of Quantities General Directions include for:

Item coverage

(a) loading, transporting from store, unloading and positioning for relaying;

(b) replacing items damaged during the foregoing operations;

(c) modification and new materials;

(d) kerbs, channels, edgings, combined drainage and kerb blocks and

linear drainage channel systems (as this Series paragraph 4).

Footways and Paved Areas

Units

13 The units of measurement shall be:

(i) footways and paved areas ..... square metre.

(ii) bituminous regulating course ..... tonne.

(iii) cement bound regulating course ..... cubic metre.

Measurement

14 The measurement of footways and paved areas shall be calculated using the width of the top surface stated in the Contract.

15 In the case of flexible construction where a Group reference is given for the whole construction, the total thickness of the combined sub-base, binder course, surface course and/or surface dressing shall be stated.

16 In all other cases of flexible construction the thickness of each course shall be stated in the item description except that where a surface dressing is an integral part of any course then the combined thickness of the course and surface dressing shall be stated.

17 In the cases of in situ and precast concrete, stone, slab and block paving the thickness of the sub-base, bedding and paving shall be separately stated in the item description.

18 The measurement of bituminous regulating course shall be the tonnage certified by the Overseeing Organisation, being only that material included on delivery tickets which is incorporated in the Permanent Works in the locations and to the extent and thickness required by the Contract.
The measurement of cement bound regulating course shall be the volume of material measured to the outlines stated in the Contract.

19 No deduction shall be made for openings of 1 square metre or less.

Itemisation

20 Separate items shall be provided for footways and paved areas in accordance with Chapter II paragraphs 3 and 4 and the following:

Group	Feature	
I	1	Footways.
	2	Paved areas.
II	1	Different types of construction.
III	1	Different thicknesses.

IV	1	Different sizes, groups or types.
V	1	Surfaces sloping at 10o or less to the horizontal.
	2	Surfaces sloping at more than 10o to the horizontal.
VI	1	Regulating course of different groups or types.

Footways and Paved Areas

21 The items for footways and paved areas shall in accordance with he Preambles to Bill of Quantities General Directions include for:

Item coverage

(a) sub-base (as Series 700 paragraph 5);

(b) edge support;

(c) concrete (as Series 1700 paragraphs 5 and 10);

(d) formwork (as Series 1700 paragraph 15);

(e) void formers (as Series 1700 paragraph 16);

(f) reinforcement (as Series 1700 paragraph 26);

(g) joint filler and sealant (as Series 2300 paragraphs 9 and 10);

(h) trial mixes;

(i) laying to levels and falls;

(j) bedding, jointing and pointing;

(k) straight, circular and radial cutting and fitting;

(l) rough and fair cutting and fitting;

(m) base, lower base, upper base, binder course, surface course and concrete slab (as Series 700 paragraph 9);

(n) compacting;

(o) membrane;

(p) topsoiling (as Series 600 paragraph 80);

(q) grass seeding (as Series 3000 paragraph 9).

Bituminous and Cement Bound Regulating Course

22 The items for bituminous and cement bound regulating course shall in accordance with the Preambles to Bill of Quantities General Directions include for:

Item coverage

(a) bituminous and cement bound regulating course (as Series 700 paragraph 14).

Remove from Store and Relay Paving Flags, Slabs and Blocks

Units

23 The unit of measurement shall be:

(i) remove from store and relay paving flags, slabs and blocks ..... square metre.

Measurement

24 The measurement of remove from store and relay paving flags, slabs and blocks shall be the area of the top surface of the work stated in the Contract.

No deduction shall be made for openings of 1 square metre or less.

Itemisation

25 Separate items shall be provided for remove from store and relay paving flags, slabs and blocks in accordance with Chapter II paragraphs 3 and 4 and the following:

Group	Feature	
I	1	Remove from store and relay paving in footways.
	2	Remove from store and relay paving in paved areas.
II	1	Different types of construction.
III	1	Different thicknesses.
IV	1	Different sizes groups or types.
V	1	Surfaces sloping at 10o or less to the horizontal.
	2	Surfaces sloping at more than 10° to the horizontal.

Remove from Store and Relay Paving Flags, Slabs and Blocks

26 The items for remove from store and relay paving flags, slabs and blocks shall in accordance with the Preambles to Bill of Quantities General Directions include for:

Item coverage

(a) loading, transporting from store unloading and positioning for relaying;

(b) replacing items damaged during the foregoing operations;

(c) modification and new materials;

(d) footways and paved areas (as this Series paragraph 21).

Steps

27 The unit of measurement shall be:

(i) flights of steps ..... number.

Measurement

28 The measurement of steps shall be the complete flight including landings.

Itemisation

29 Separate items shall be provided for steps in accordance with Chapter II paragraphs 3 and 4 and the following:

Group	Feature	
I	1	Flight of steps.
II	1	Different locations.

Steps

30 The items for steps shall in accordance with the Preambles to Bill of Quantities General Directions include for:

Item coverage

(a) excavation of acceptable material (as Series 600 paragraphs 17 and 18);

(b) excavation of unacceptable material (as Series 600 paragraph 19);

(c) excavation in Hard Material (as Series 600 paragraph 23);

(d) backfilling, compaction and reinstatement;

(e) disposal of material (as Series 600 paragraph 39);

(f) completion of formation (as Series 600 paragraph 85)

(g) brickwork, blockwork and stonework (as Series 2400 paragraphs 4 and 8);

(h) kerbs, channels, edgings, combined drainage and kerb blocks and linear drainage channel systems (as this Series paragraph 4);

(i) footways and paved areas (as this Series paragraph 21);

(j) surface finishing and non-slip treatment;

(k) tread nosings;

(l) pedestrian guardrails and handrails (as Series 400 paragraph 46);

(m) fencing (as Series 300 paragraph 4);

(n) concrete foundation to timber posts (as Series 300 paragraph 5);

(o) gates and stiles (as Series 300 paragraph 6);

(p) reinstatement of surfaces.

Series 1200

TRAFFIC SIGNS

Contents

TRAFFIC SIGNS

1201 Regulations, Sign Classification and Standards Regulations

1 Subject to paragraphs 2 and 3 below, all traffic signs used (including retro-reflecting road studs and road markings), whether permanent or temporary, shall be of the size, shape, colour and type prescribed for that use in The Traffic Signs Regulations and
General Directions 1994 (Statutory Instrument 1994 No. 1519), including Working Drawings for Traffic Sign Design and Manufacture (Volumes 1, 2 and 3), the Zebra, Pelican and Puffin Pedestrian Crossings Regulations and General Directions 1997 (Statutory Instrument 1997 No. 2400) and subsequent amending Regulations. Other relevant requirements are contained in the above Regulations and General Directions.

2 Signs that are not prescribed in Regulations need to be specially authorised by the ADT. Where the Contractor proposes to use non-prescribed temporary traffic signs, he shall obtain the agreement of the Overseeing Organisation to their intended design and location. Where the Contractor proposes to use prescribed temporary traffic signs, he shall obtain the agreement of the police and the highway authority to their intended location. The Contractor shall obtain authorisation and approval from the Overseeing Organisation for the use of the signs at the specific locations proposed.

3 Signs that are changeable by means other than the purely mechanical require statutory type approval for their construction and operating mechanisms by the ADT. This requirement is in addition to the need for the design of the sign to be prescribed or specially authorised. The Contractor's proposal for signs that require statutory type approval shall include the reference numbers of any approval already issued in respect of that equipment. The signs shall not be installed until appropriate approval or confirmation of existing approval, by the Overseeing Organisation has been obtained.

Sign Classification

4 For the purposes of the Contract the following classifications apply:

(i) permanent traffic signs. Any of the traffic signs prescribed in the Regulations, or specially authorised by the ADT, or any part thereof, designed to remain in position at the completion of the Permanent Works or a traffic cone, cylinder or other traffic delineator to be retained by the Employer;

(ii) prescribed temporary traffic signs. Any of the traffic signs defined in the Regulations, or specially authorised by the ADT, or any part thereof, described in Appendix 12/1 which, unless otherwise described in Appendix 12/1, comply with the requirements of a permanent traffic sign but which will not remain in position at the completion of the Permanent Works;

(iii) temporary traffic signs. Any of the traffic signs defined in the Regulations, or specially authorised by the ADT, or any part thereof, designed by the Contractor, in compliance with Clause 1216 which will not remain in position at the completion of the Permanent Works.

1202 General Requirements for Permanent Traffic Signs

1 Materials for permanent traffic signs and their construction, assembly, location and erection shall comply with this Series, Series 1400 and the requirements described in Appendix 12/1. The manufacture and installation of traffic signs shall be in accordance with the quality management scheme described in Appendix A.

2 Each complete traffic sign or part thereof shall be capable of passing the tests in BS 873 : Part 1.

3 Sign panels of internally illuminated signs and luminaire face panels shall, unless otherwise described in Appendix 12/1, comply with impact Category 1 of BS 873 : Part 5.

4 All lit traffic signs shall comply with Category 1 luminance of BS 873 : Part 5 unless otherwise described in Appendix 12/1.

5 Before the commencement of fabrication of any traffic sign, unless otherwise stated in Appendix 12/1, the Contractor shall submit for the Overseeing

Organisation's approval:

(i) fabrication drawings for 'directional informatory' and 'informatory' signs as required in Appendix 1/4;

(ii) the information about 'warning', 'regulatory' and other traffic signs required in Appendix 12/1.

6 All traffic sign housings shall be provided with vandal and weather resistant locks. Keys, in the quantities stated in Appendix 12/1, shall be provided to the Overseeing Organisation. Types of lock shall be kept to a minimum.

7 The backs of traffic signs shall have a location identifying mark as described in Appendix 12/1.

8 Traffic signs shall be carefully handled to prevent damage, transported and stored in accordance with the sign face manufacturer's instructions.

1203 Foundations for Permanent Traffic Signs and Signals

1 The type and size of foundations for permanent traffic signs and signals shall be as described in, and unless otherwise stated therein shall comply with, this Clause.

2 All excavations for foundations shall be carried out in compliance with Clause 604 and shall be cleared of all loose material before placing of concrete and backfilling.

3 Unless otherwise described in Appendix 12/1 traffic signs and signals supported by a single post placed in the ground shall have the post installed centrally in 300 mm diameter or square holes filled in compliance with Clause 2602 with mix ST2 concrete to within 150 mm of the ground surface.

4 Unless otherwise described in Appendix 12/1, posts shall be supported for a minimum of 3 days after placing the concrete and backfilling shall not take place
until at least 48 hours after placing.

5 For traffic signals and illuminated signs provision shall be made for cable entry through the foundation by means of ducting as described in Appendix 12/1.

6 Where pockets are formed in concrete foundations their plan dimensions shall be sufficiently larger than those of the post to

allow for positioning and bedding of the post and backfilling of the pocket.

7 All backfilling of foundations shall comply with Clause 611 except that where pipes or buried cables are installed it shall comply with Clauses 505 and 1421 respectively.

8 Reinstatement of existing surfaces above foundations shall comply with Clause 706.

1204 Posts for Permanent Traffic Signs

1 Posts for permanent traffic signs shall be as described in Appendix 12/1 and shall comply with BS 873 : Part 7, the surface protection requirements of BS 873 : Part 6 and with the following:

(i) steel posts shall be tubular or rectangular hollow section complying with BS EN 10 210, joists, universal beams or columns complying with BS 4, and shall be manufactured from steel complying with grade S275 JO or S275 J2;

(ii) aluminium posts shall be of tubular or rectangular hollow section;

(iii) concrete for reinforced or prestressed concrete posts shall comply with Series 1700 and Appendix 12/1.

2 Posts shall not protrude above the top of the sign unless supporting an external luminaire, in which case the protrusion shall be kept to a minimum.

3 Internally illuminated posts for pedestrian crossing beacons shall comply with this Clause and where appropriate with BS 873 : Part 7.

4 Signs erected on a single post shall be positioned so that the post is in the centre of the sign, unless otherwise described in Appendix 12/1.

5 Compartments for electrical equipment shall be as described in Appendix 12/1 and, wherever practicable, access doors shall be on the side of the compartment furthest from approaching traffic. In the case of signs supported by more than one post, such compartment shall be on the post furthest from the carriageway unless otherwise described in Appendix 12/1.

6 Flange plates shall have holes or slots as described in Appendix 12/1 to accommodate the attachment system.

1205 Sign Plates for Permanent Traffic Signs

1 All permanent sign plates shall comply with BS 873 : Part 6, and with this Clause.

2 Plate signs not exceeding 1.2 m in height and 2.4 m width shall be made of a single sheet. Where more than one sheet is used to make up a sign, the number of sheets shall be kept to a reasonable minimum and the separate sheets shall be rectangular and of comparable size and shape.

3 Extruded plank signs up to 4.8 m wide shall have no vertical joints. Above this size, joints in extruded planks should preferably be positioned at a vertical support; if not, then the vertical joints in adjacent planks should not be less than 1.0 m apart and only one joint per extruded plank is permitted.

4 Fabricated plank signs up to 4.8 m wide shall have no vertical joints, but each plank may be constructed from a maximum of two pieces of sub-strate material, producing one split line. Split lines should be lined up vertically or horizontally. Above 4.8 m wide, joints in the stiffening extrusions of adjacent planks should preferably be positioned at a vertical support; if not, then the vertical joints in the stiffening

extrusions of adjacent planks should not be less than 1.0 m apart and only one such joint per fabricated plank shall then be permitted.

5 Where top and bottom light spill screens are required in Appendix 12/1, these shall extend for the whole width of the sign and be fabricated out of the same material as the sign plate.

6 Top and bottom light spill screens shall be considered as part of the sign plate and any stiffeners and mounting fittings shall be designed to accommodate the combined size.

1206 Faces for Permanent Traffic Signs

1 Faces for permanent traffic signs shall be as described in Appendix 12/1. They shall comply with BS 873 : Part 6 and with this Clause.

2 All plastics sheeting shall be fixed in accordance with the sheeting manufacturer's instructions.

3 Only vertical and horizontal joints shall be permitted and all joints in plastics sheeting shall be overlapped by not less than 6 mm. The overlap in the horizontal joints shall be from the top. Butt joints in plastics sheeting shall not be used, except between individual planks or in electro cutable overlay film, or as recommended by the sheeting manufacturer.

4 All materials comprising the sign face, including the background, border and legends shall be carefully matched for colour at the time of sign fabrication to provide uniform appearance both by day and night. The sheeting manufacturer's recommendations on colour matching methods shall be observed.

5 Letters, numerals, symbols and borders shall be clear cut, sharp edged and without cracks.

6 Any cut-out letters, numerals, symbols and borders shall be of material compatible with the sheeting to which they are applied. They shall be applied in accordance with the sheeting manufacturer's instructions.

7 Screen processed letters, numerals, symbols and borders shall be screen printed with materials in accordance with the sheeting manufacturer's instructions. Any inks, pastes and finishing coats used shall be compatible with the sheeting material or the face panel of internally illuminated signs.

8 Sheeting materials including letters, numerals, symbols and borders shall be fully adhered and there shall be no air bubbles, creases, cracks or other blemishes. Where the sheeting manufacturer requires the assembled materials to be provided with a coat of clear lacquer, it shall be uniform and continuous. All lacquer shall be applied at the time of fabrication of the sign face and shall be of a type specified or supplied by the sheeting manufacturer.

1207 Construction and Assembly of Permanent Traffic Signs

General

1 Construction and assembly of traffic signs shall comply with BS 873 : Part 6 and with this Clause.

2 All sign plates and planks, frames, purlins, posts and other components shall be de-burred prior to assembly.

3 Where framing and stiffening are not an integral part of the sign plate their joints shall be welded or joined with suitable brackets utilising nuts, bolts and washers.

4 Where purlins are adopted they shall be attached to each vertical member of the sign frame and the sign stiffening and framing shall

be continuous in the vertical direction. Purlins shall be spaced equally apart. Connections shall be made at every point where a purlin crosses a post.

5 Where purlins are not adopted the sign stiffening and framing shall be continuous in the horizontal direction.

6 Rivets and other devices used for fixing sheet sign plates to their stiffeners or framework, or in the construction of housings, shall be of a material compatible with the materials being joined. Spacing of rivets or other fixing devices shall be uniform and shall not exceed 150 mm around the outside edge of any sheet or section of sheet, and shall not exceed 300 mm on cross braces. Hollow rivets shall not be used. Where sign plates need to be stiffened this shall be achieved in a manner such that the sign face material is not punctured or otherwise damaged to accommodate the stiffening.

7 An additional washer of neoprene, nylon or other suitable material shall be used between the sign face and any metal nuts, bolts, washers and screws to protect it from corrosive or other damaging effects.

8 Where supports to traffic signs, including external lighting luminaires, are required to have flange plates these shall be secured by anchorages and attachment systems complying with Series 1300. The bolts shall be lightly greased before final installation and they and their anchorages shall be installed so as to achieve the loadings, torque settings and other requirements described in Appendix 12/1.

9 Sheet and plank signs shall be connected to posts by an appropriate method. Banding systems shall be of stainless steel complying with AISI Grade 201.

10 Plank signs shall be assembled in accordance with the manufacturer's instructions.

11 Where ferrous components are permitted any drilling of them shall be completed before the application of any finish.

12 Any hole drilled in plates with plastics sheeting to accommodate a rivet or bolt shall immediately prior to the insertion of the rivet or bolt have a clear lacquer, recommended by the plastics sheeting manufacturer, applied to its edge to prevent the ingress of moisture. The surfaces of rivets or bolts exposed on the sign face shall be covered by a suitable material of a colour to match that part of the face.

13 Prior to fitting any sign to any lighting column, the Contractor shall ensure that the sign is included in the technical approval of the lighting column in accordance with the Technical Approval Scheme adopted by the Overseeing Organisation and with Standard BD 26. No holes shall be drilled in the lighting column except those whose location and size are included in the technical approval.

14 Traffic signs to be erected on road lighting columns shall have fixings compatible with the column cross-section and finish. Wiring shall be contained in external conduit complying with BS 4568. Conduits shall be affixed to concrete lighting columns with stainless steel banding systems complying with AISI Grade 201. Conduits shall be affixed to other lighting columns with stainless steel clamps, which shall be screwed with stainless steel screws into tapped holes in the lighting column. Alternatively permanent cabling shall be placed on the inside of the lighting column and shall exit via a bushed drilled hole.

Variable Message Traffic Signs

15 Variable message traffic signs shall comply with this Clause.

1208 Location and Erection of Permanent

Traffic Signs

1 The approximate location of each traffic sign is described in Appendix 12/1. All traffic signs shall have their exact location determined and recorded in compliance with Clause 1403.

2 All posts shall be erected plumb and where two or more posts are provided for any one sign, the faces of the posts shall be lined up.

3 Signs erected on two posts shall have each post positioned so that the distance from the centre of the post to the edge of the sign plate is 300 mm unless otherwise described in Appendix 12/1.

4 Any pockets formed in concrete foundations to receive the posts shall be cleaned out immediately prior to erection. The posts shall be placed centrally in the pockets and be bedded on mortar designation

(i) complying with Clause 2404 and, unless otherwise described in Appendix 12/1, the pockets shall be filled up to finished foundation level with mix ST5 concrete.

5 Traffic signs mounted on posts, except those on gantries, shall be erected to have their face plumb and be orientated in relation to the carriageway in accordance with Chapter 1 of the Traffic Signs Manual.

6 Traffic signs mounted on gantries shall be erected as described in Appendix 12/6 and all other traffic signs shall be erected as described in Appendix 12/1.

7 The site records required by Clause 1402, shall include daily records for non-lit traffic signs.

8 No traffic sign shall be dismantled, re-sited or removed without the prior approval of the Overseeing Organisation.

1209 Covering of Permanent Traffic Signs

1 Where it is required in Appendix 12/1 that permanent traffic signs be blanked-out or have an alternative message, the method to be adopted shall comply with the following, unless otherwise described in Appendix 12/1:

(i) for plate signs: A cover plate compatible with the plate sign's material, or a covering of a suitable, opaque, non damaging material, or, for covering periods of up to one year, a self adhesive plastic film to support the temporary sign face sheeting;

(ii) for other traffic signs: A covering of a suitable, opaque, non damaging material.

2 Cover plates shall be suitably fixed to give a 10 mm minimum air gap between the sign face and cover plate. The fixing method shall not cause damage or staining to the sign face. Any holes remaining in the finished sign face after removal of the plate shall be filled with a suitable material, of a colour to match that part of the face.

3 Where self-adhesive plastic film is used it shall be compatible with the sign face materials and be applied and removed in compliance with the manufacturer's instructions.

4 Any loose covering used must be sufficiently opaque to prevent reflection from and legibility of the covered sign and be securely fastened to the back of the sign. Under no circumstances shall tape or other adhesive material be applied to the face of the sign. Sufficient space shall be left between the covering and the face to permit air flow over the sign.

5 Traffic signs which are to be covered shall not be erected on trafficked highways without the covering in place.

6 Removal of any covering shall be carried out with the minimum disturbance to traffic.

7 Irrespective of any requirement in Appendix 12/1 to cover signs, any traffic sign erected at such a time that its legend does not relate either wholly or in part to the traffic movement and route in operation, shall have its sign face securely covered with one of the materials in sub-Clause 1 of this Clause until such time as its legend is applicable.

1210 Permanent Bollards

1 Permanent bollards shall be as described in Appendix 12/1 and shall comply with appropriate Clauses of this Series.

2 Internally illuminated bollards and, unless otherwise described in Appendix 12/1 reflective-only bollards, shall be secured by stainless steel holding down bolts, nuts and washers. Holding down bolts and anchorages cast into the foundation shall be capable of complying with the performance requirements of BS 873 : Part 3 when tested as described therein.

3 All bolts shall be lightly greased before final installation and tightening to the bollard manufacturer's torque setting.

1211 Permanent Marker Posts

General

1 Permanent marker posts shall be constructed to the dimensions and be installed in the locations and by methods described in Appendix 12/2 and shall comply with this Series and sub-Clauses 2 and 3 of this Clause.

Distance Marker Posts

2 Distance marker posts shall be made from plastics, timber, or other materials described in Appendix 12/2.

Hazard Marker Posts

3 Hazard marker posts shall comply with BS 873 : Part 2. Post construction and colour and type of reflective marker shall be as described in Appendix 12/2.

1212 Road Markings

General

1 Road markings shall be white or yellow (Classes Y1 and Y2) complying with BS EN 1436 Table 6, as appropriate except where an alternative shade has been specified in Appendix 12/3. The markings shall consist of continuous or intermittent lines, letters, figures, arrows or symbols and comply with sub-Clauses 2 to 12 of this Clause. Statutory requirements controlling road markings are contained in The Traffic Signs Regulations and General Directions 1994 (Statutory Instrument 1994 No. 1519) and subsequent amending Regulations.

Permanent Road Markings

2 Permanent road markings shall be one of the following materials and comply with the colour, location and material type requirements described in Appendix 12/3:

(i) thermoplastic road marking material or paint in accordance with BS EN 1871;

(ii) permanent preformed road markings in accordance with BS EN 1790;

(iii) other materials as described in Appendix 12/3 to BS EN 1871.

They shall be also tested in road trials to the Roll-over class P5 in accordance with the procedure stated in BS EN 1824 to demonstrate compliance with the performance requirements as stated in sub-Clauses 3 to6. The test report shall give particulars of the quality and quantity of the material, including drop on glass beads laid at the test site for future reference and comparison purposes should such a need arise.

3 Road markings shall have the following road performance as defined in BS EN 1436 for the period of the functional life starting from the date of application or when the road is trafficked, whichever is later. The materials to be used shall be to the same mix, material quality, quantity and rate of application as used on the test site.

Property	BS EN 1436 Reference	Requirement*	Value
Colour	Table 6	1. White 2. Yellow Class Y1, Y2	X,y co-ordinates given x,y, co-ordinates given
Luminance Factor	Table 5	1.Class B2 2.Class B1	0.3 0.2
Skid Resistance	Table 7	1. Class S1 2. Class S1	45 45
Retroreflectivity	Table 2 Class of R, For dr markings	1. Class R2 2. Class R1	100 80

* Note: 1 = White, 2 = Yellow

4 The width tolerances and thickness for screed, spray, preformed and extruded white or yellow lines shall be in accordance with The Traffic Signs Regulations and General Direction 1994. With the exception of the road markings listed in Article 29 (2) of The Traffic Signs Regulations and General Directions, in no case shall any materials be laid more than 5 mm thick. Unless specified, all white markings shall be reflectorised with glass beads in accordance with BS EN 1423 and BS EN 1424 by incorporation (apart from preformed markings) into the road marking mixture and to the wet surface of the marking.

Property	BS EN 1436 Reference	Requirements	Value
Retroreflectivity	Table 3	Class RW3	50

5 Where there is requirement for improved visibility in wet conditions at night, products showing the following performance in addition to that stated in sub- Clause 3 shall be used.

6 Where there is a requirement for improved skid resistance as referred to in Appendix 12/3 products showing the following performance in addition to that stated in sub-Clause 3 shall be used.

Property	BS EN 1436 Reference	Requirements	Value
Skid Resistance	Table 7	Class S3	55

7 The pavement shall be prepared in accordance with the following:

(i) Where the marking is to be applied on concrete carriageways, the transverse texturing shall be freed from all traces of curing compound by wire brushing or other approved means. Prior to the application of the thermoplastic material a tack coat compatible with the road surface and the marking material shall be applied in accordance with the manufacturer's instructions.

(ii) On surface dressed carriageways, all loose chippings where the marking is to be applied shall be removed prior to application.

8 The application of permanent road markings shall be in accordance with the Sector Scheme described in Appendix A. Road marking materials shall only be applied to surfaces, which are clean and dry. Markings shall be free from raggedness at their edges and shall be uniform and free from streaks. Longitudinal road markings shall be laid to a regular alignment.

Raised Rib Road Markings

9 Raised Rib Road Markings shall only be used on motorways with full width hardshoulders or all-purpose roads (both single and dual carriageway) with at least 1 metre wide hardstrips. They shall comply with sub-Clauses 1, 2(i), 3, 5, 6, 7 and 8 of this Clause.

10 Raised Rib Road Markings shall be white lines, which are continuous over the sections where they are specified in Appendix 12/3. Where specified in Appendix 12/3 gaps shall be provided for drainage purposes.

11 Raised Rib Road Markings shall be in accordance with The Traffic Signs Regulations and General Directions 1994 (Statutory Instrument 1994 No. 1519), Diagrams 1012.2 and 1012.3, as appropriate. Spacing of the transverse raised ribs shall be 500 mm or 250 mm as specified in Appendix 12/3.

12 Raised Rib Road Markings shall not be used adjacent to hatched areas or central reserve crossings except as prescribed for use with diagrams 1040.3, 1040.5 and 1042.

Temporary Road Markings

13 Temporary road markings shall only be adopted with the prior approval of the Overseeing Organisation. They shall comply with sub-Clauses 1 to 8 of this Clause or if required to be removable, be constructed only from a proprietary preformed road marking material complying with BS EN 1790.

14 When temporary road markings are used on surfaces that will continue to be used by public traffic after their removal, any shadow trace remaining after their removal shall be permanently obliterated. Preformed materials shall not be used for this obliteration.

15 Temporary road markings constructed from a proprietary preformed road marking material shall only be adopted in locations and on types of road surface as described in Appendix 12/3 and shall comply with any other requirement therein. The marking material shall be new and together with any primer shall be stored and installed in accordance with the manufacturer's instructions and within the recommended shelf life.

16 Temporary preformed road markings shall only be applied to surfaces that are clean and dry. Upon removal they shall be disposed of off Site and if any making good is necessary to the road surface it shall be satisfactorily carried out before the road is opened to traffic.

Road Markings on Porous Asphalt Surfacing

17 Spray paint, thermoplastic applied by machine screed, spray or extrusion or preformed road markings shall be used for carriageway markings on porous asphalt surfacing. Manual screeding shall not be permitted except for directional arrows and similar markings.

Removal of Road Markings

18 The removal of road markings on surfaces that will continue to be used by traffic shall be undertaken in a manner that will avoid damage to the surface. The removal of temporary road markings shall comply with sub-Clauses 14 and 15 of this Clause.

The removal of permanent road markings shall be by mechanical means only. The Contractor shall submit details of the system he proposes to use to the Overseeing Organisation for approval.

Masking of Road Markings

19 When black masking materials are required to cover existing permanent road markings, they shall either comply with BS 7962 or have received written type approval from the Overseeing Organisation and if required to be removable, be constructed from a proprietary preformed removable black masking material.

1213 Road Studs

Retro-reflecting Road Studs

1 Statutory requirements controlling retro-reflecting road studs are contained in The Traffic Signs Regulations and General Directions 1994 (Statutory Instrument 1994 No. 1519) Regulations 28, 29 and Direction 50 and subsequent amending Regulations.

2 All retro-reflecting road studs shall comply with BS EN 1463-1 and 1463-2, and shall be installed in accordance with the manufacturer's instructions and the Sector Scheme described in Appendix A.

3 Retro-reflecting road studs and components which do not fall into a category of BS EN 1463, but which have statutory type approval by the ADT for the Overseeing Organisation can be incorporated into the Works. They shall be installed in accordance with the manufacturer's instructions.

4 The Contractor shall submit details of the retro-reflecting road studs he proposes to use in the Works to the Overseeing Organisation for approval.

Retro-reflecting Road Studs

5 Permanent retro-reflecting road studs shall be installed in the locations and to any other requirements as described in Appendix 12/3.

Temporary Retro-reflecting Road Studs

6 Temporary retro-reflecting road studs shall be of the fluorescent green-yellow type to BS EN 1463-1 and shall be appropriate for the situation concerned. They shall not be used for a second application. Adhesive used for the temporary retro-reflecting road studs shall be removed from the carriageway on completion of the Works.

Non retro-reflecting Road Studs

7 All non retro-reflecting road studs shall be installed in accordance with the manufacturer's instructions in locations, and complying with any other requirements, described in Appendix 12/3.

Retro-reflecting Road Studs on Porous Asphalt Surfacing

8 The edges of recesses for inset retro-reflecting road studs in porous asphalt surfacing shall be milled when the material has cooled to ambient temperature. Care shall be exercised when removing porous asphalt to form the recess to prevent damage occurring to the cut edges and to prevent detritus clogging the porous asphalt surfacing. Surface applied road studs should not be applied if there is evidence of moisture present on the surface of porous asphalt, nor should inset road studs be installed if moisture is present in the recess after milling of the asphalt.

1214 Traffic Cones, Traffic Cylinders, Flat Traffic Delineators and Other Traffic Delineators

General

1 Traffic cones and traffic cylinders, hereinafter termed cones and cylinders, shall comply with

Designation 1 or Designation 2 of BS 873 : Part 8. Cones shall be to Category A.

2 Flat Traffic Delineators, hereinafter termed FTDs, shall comply with sub-Clauses 3 to 17 of this Clause.

3 An FTD shall comprise a flat blade fixed to a base. The flat blade may incorporate stiffeners provided that they do not encroach into the white retro-reflective area.

4 FTDs shall be constructed of rubber or plastic materials. It shall be possible to insert and remove blades without requiring a special tool. The height of the FTD shall be 750 mm or 1000 mm as stated in Appendix 12/4. The width of the top of the blade shall be 45 ± 10 mm. Other dimensions shall be in accordance with Diagram 7102 of TSRGD 1994.

5 FTD bases shall be so designed that they will stack without binding and without causing damage to the retro-reflective surfaces. Additionally the blades and their attachment to the base or fixing shall be so designed that the blade's face presents throughout its design life a plane to the approaching traffic no more than 12.5° from the vertical.

6 FTD bases may be coloured red, black, grey or brown. They may have a 100 mm wide white reflective line placed on one edge of the base provided:

(i) the edge of the base where the white line is to be attached comprises a sloping surface which is at an angle to the road surface of no more than 60° and is of such dimensions either to fully accommodate the 100 mm wide white line or, where the angle between the road surface and the sloping surface exceeds 30°, to accommodate at least 80 mm of the width of the white line, the excess (maximum 20 mm) being returned onto the top surface of the base;

(ii) the material from which the base is manufactured allows proper adhesion or attachment of the white reflective line to prevent it becoming detached during normal use;

(iii) the coverage of white reflective material is maintained at more than 70% of the area treated.

7 The white reflective strip material shall comply with BS EN 1436 and BS EN 1871 or BS EN 1790 as appropriate. Additionally when tested using a portable retro-reflectometer the white line shall have a coefficient of retro-reflectance of Class R2 or better to Table 2 of BS EN 1436.

8 FTD blades shall be coloured red and white as indicated in Diagram 7102 of TSRGD 1994.

9 The white portions of the FTD blades shall comply with the chromaticity co-ordinates and luminance factor given in BS 873 : Part 6.

10 The red portions of the FTD shall comply with the chromaticity co-ordinates and luminance factor for traffic cones given in BS 873 : Part 8 when measured in accordance with BS 873 : Part 1.

11 That part of the blade coloured white shall comprise retro-reflective material, complying with the requirements for Class 1 or Class 2 as specified in BS 873 : Part 6, which shall be securely applied or attached to the blade to prevent it becoming detached during normal use.

12 The red portions may also be retro-reflective.

13 The minimum mass of the FTD including any ballast recommended by the manufacturer

shall comply with the mass of a traffic cone as defined in BS 873 : Part 8.

14 FTDs shall be clearly and durably marked with the following information in the following order:

(a) the name, trade mark or other means of identification of the manufacturer or vendor;

(b) the title and date of this document, e. Specification for Road Works, with appropriate date.

The marking shall be in characters legible at a normal reading distance such that the total area of the marking does not exceed 30 cm². Additionally the legend 'DUAL CARRIAGEWAY AND MOTORWAY USE ONLY' shall be applied to the lowermost red portion of the blade, using block capitals of minimum height 15 mm, in such a location that it can be clearly seen when the FTD is in position.

15 All markings shall be sufficiently durable to last the expected life of the FTD to which they are applied and in no case less than 5 years.

16 When checked by inspection and by rubbing lightly, first for 15 seconds with a piece of cloth soaked in water and then for 15 seconds with a piece of cloth soaked in petroleum spirit, followed by 15 seconds with a piece of cloth soaked in diesel oil, the marking shall still be legible.

17 FTDs shall be supplied with the following information:

(a) instructions for ballasting (if required);

(b) instructions for fixing blades to bases.

18 Other traffic delineators hereinafter termed delineators shall be as described in Appendix 12/4.

19 The Contractor shall submit to the Overseeing Organisation a copy of a test certificate confirming that samples of the identical type of cone, cylinder, FTD or delineator as those to be used in the Works and supplied as permanent cones, cylinders, FTDs or delineators under the Contract, have been tested and found to comply with sub-Clauses 1 to 18 of this Clause.

Permanent Cones, Cylinders, FTDs and Other Delineators

20 Where required in Appendix 1/5 the Contractor shall arrange for the tests described in sub- Clauses 22 to 56 of this Clause, for cones, cylinders, FTDs and other delineators, to be carried out at a UKAS approved testing laboratory. The numbers to be tested, as given in Appendix 1/5, are to be selected at random from the batch to be supplied under the Contract. Failure of any test will result in rejection of the batch.

Temporary Cones, Cylinders, FTDs and Other Delineators

21 The Contractor shall submit to the Overseeing Organisation certification substantiating that at least 1 in every 500 of any batch of cones, cylinders, FTDs and delineators to be used in the Temporary Works have passed the tests described in sub-Clauses 22 to 56 of this Clause as appropriate.

Testing

22 Cones and cylinders shall be tested in compliance with BS 873 : Part 8.

23 FTDs shall be tested in compliance with sub- Clauses 24 to 55 of this Clause.

24 Test procedures shall be carried out on each size of FTD and each method of attachment between blade and base.

25 When tested in accordance with sub-Clauses 31 to 38 of this Clause with the exception of the white retro-reflective material, no part of the FTD shall crack,
split or deform.

26 When samples with retro-reflective portions attached are tested in accordance with sub-Clauses 31 to 38 of this Clause the coefficient of luminous intensity, R (as defined in Publication CIE No 54; Retro-reflection, definition and measurement), after testing shall be not less than 80% of the value previous to the test.

27 When tested in accordance with sub-Clauses 39 to 43 of this Clause, no part of the FTD with the exception of white retro-reflective material, shall crack, fracture or split and any ballast or ballast container shall not have become displaced within the base or separated from it. Any ballast container as either an integral part of the base or enclosed within it shall not have been damaged to the extent that ballast is discharged. Caps or bungs to ballast containers shall not have been forced from their sockets or other fixings.

28 When tested in accordance with sub-Clauses 44 to 49 of this Clause, no part of the FTD with the exception of white retro-reflective material shall crack, fracture or split. Bases shall remain in contact with the reference surface.

29 When tested in accordance with sub-Clauses 50 to 55 of this Clause, no part of the FTD with the exception of the white retro-reflective material shall crack, fracture or split. Bases shall remain in contact with the reference surface.

30 Throughout the tests in sub-Clauses 31 to 38, 44 to 49, and 50 to 55 of this Clause, the blade shall remain fixed in position. On completion of the testing in accordance with sub-Clauses 44 to 49 and 50 to 55 of this Clause the residual deflection of the top of the blade in any horizontal direction, measured 30 seconds to 60 seconds after completion of the tests, shall be not more than 12.5% of the height of the FTD. The height of the FTD, H, is as measured from the reference surface.

Low Temperature Impact Test

31 The test shall be conducted using a steel ball swung on a pendulum. The apparatus shall be as shown in RCD Drawing Number K3. The steel ball shall have a mass of 0.9 ± 0.045 kg and be suspended by one or two steel pendulum wires of not more than 1 mm diameter so that the pendulum radius is 1750 ± 10 mm. The point of impact shall be vertically beneath the centre of radius of the pendulum and at a height on the specimen of H/2 ± 10 mm where H is the height of a FTD above the reference surface.

32 FTDs shall be fixed to the reference surface using the base.

33 The test shall be carried out on specimens with and without retro-reflective portions attached.

34 For samples with retro-reflective portions attached, the coefficient of luminous intensity, R, of every such face at an observation angle of 20° and at an entrance
angle normal to the face of the blade prior to the conditioning shall be determined; the definitions of observation angle and entrance angle being those given in BS 873 : Part 1.

35 All test samples shall be conditioned for a period of not less than 2 hours at a temperature of -16 ± 2°C. Impact testing shall be carried out within 60 seconds after conditioning.

36 Impact shall be made in ambient conditions of not greater than 20°C.

37 Within 1 hour of impacting, samples shall be immersed with retro-reflective portions attached, in water at 20 ± 5°C for 10 minutes. After draining for 10 minutes the coefficient of luminous intensity, R, shall be measured in accordance with sub-Clause 34 of this Clause.

38 The sample shall be examined and any damage, percentage change in the coefficient of luminous intensity, or any detachment of a blade from its base shall be reported.

Drop Test

39 FTDs requiring the addition of ballast shall be ballasted as instructed by the manufacturer.

40 The FTD shall be conditioned for a period of not less than 2 hours at a temperature of 32 ± 2°C.

41 Within 1 minute after conditioning the FTD shall be suspended with its normal vertical axis horizontal (any cap or bung to a ballast container forming an integral part of the FTD shall be positioned uppermost) and with its lowest part 1500 ± 5 mm above a solid horizontal surface and dropped once vertically from rest onto the solid surface.

42 The test detailed in sub-Clause 41 shall be repeated after conditioning at a temperature of -16 ± 2°C.

43 Any damage observed shall be reported.

Bending Test

44 The test shall be carried out on specimens with and without retro-reflective portions attached.

45 The blade shall be fixed to the base in accordance with the manufacturer's instructions. The blade and its base shall be conditioned for a period of not less than 2 hours at a temperature of -16 ± 2°C. Within 1 minute after conditioning, the blade shall be bent over about its base line by applying a force to the face of the blade at a point on its vertical centre line H/2 ± 10 mm from the top, so that the top edge touches the reference surface or a surface coplanar with it as indicated in the RCD Drawing Number K3. H is the height of the FTD. When the top edge of the blade touches the reference surface the bending force shall be removed immediately.

46 From 30 seconds to 60 seconds after completion the maximum residual horizontal deflection of the top of the blade shall be measured from the vertical axis passing through the centre of the base of the blade and perpendicular to the reference surface.

47 The test shall be repeated in the opposite direction.

48 The procedure in sub-Clauses 45 to 47 of this Clause shall be repeated at a temperature of 32 ± 2°C.

49 The deflections, any damage observed, any detachment of the blade from its base, and any movement of the base shall be reported.

Fatigue Test

50 The test shall be carried out on specimens with and without retro-reflective portions attached. This test is to be carried out on a different specimen to that or those tested in sub-Clauses 31 to 38 and 44 to 49 of this Clause.

51 The blade shall be fixed to the base in accordance with the manufacturer's instructions. The test shall be carried out after conditioning the blade and its base for a period

of not less than 2 hours at a temperature of -16 ± 2°C.

52 By applying a force to the face of blade at a point on its vertical centre line H/2 ± 10 mm from the top, the top of the blade shall be oscillated as indicated in the RCD Drawing Number K3 at a frequency of 60 oscillations per minute to 90 oscillations per minute at an amplitude of H/4 for 10 minutes with the reference surface held in a horizontal position. H is the height of the FTD. One oscillation is the movement from the upright position to the maximum amplitude in one direction, then to the maximum amplitude in the opposite direction and then the return to the upright position.

53 From 30 seconds to 60 seconds after completion the maximum residual horizontal deflection of the top of the blade shall be measured from the vertical axis passing through the centre of the base of the blade and perpendicular to the reference surface.

54 The procedure in sub-Clauses 51 to 53 of this Clause shall be repeated at a temperature of 32 ± 2°C.

55 The deflection, any damage observed and any detachment of the blade from its base shall be reported.

56 Other traffic delineators shall be tested in compliance with Appendix 12/4.

1215 Road Danger Lamps and High Intensity Flashing Beacons

1 Road danger lamps and high intensity flashing beacons shall be used in accordance with Regulations 43 and 42 respectively of TSRGD 1994, or Regulations 44 and 43 and shall comply with BS 3143.

1216 Temporary Traffic Signs

1 Temporary traffic signs shall be designed by the Contractor, comply with Clause 1201, satisfy Clause 117, have the consent of the Overseeing Organisation prior to installation, and comply with sub- Clauses 2 to 6 of this Clause.

Temporary traffic signs shall comply with The Traffic Signs Regulations and General Directions 1994, or The Traffic Sign (Welsh and English Language Provisions) Regulations and General Directions 1985, and be designed in accordance with Working Drawings for Traffic Sign Design and Manufacture (Volumes 1, 2 and 3) and where appropriate Local Transport Notes.

2 Temporary traffic signs shall be constructed as follows:

(i) plate signs and internally illuminated signs:

(a) the coefficient of retro-reflection of the material for the faces of signs used for Type A or Type B works, as defined in Chapter 8 of the Traffic Signs Manual, and any amendment thereto including the amendments specified in sub-Clause 117.8, shall be as given in BS 873 : Part 6 for Class 1 material;

(b) where the sign is to be erected for less than 6 months, it shall, unless Appendix 12/1 requires it to be constructed to a similar standard as a permanent sign, be either portable sign complying with BS 873: Part 2 or a fixed short life sign complying with sub-Clause 3 of this Clause;

(c) where the sign is to be erected for periods of 6 months or more, or

where Appendix 12/1 requires it to be constructed to the standard for a permanent sign, it shall comply with the requirements for permanent traffic signs;

(d) in addition to either (b) or (c) above, electrical work related to temporary traffic signs shall comply with the Series 1400 except Clauses 1402, 1410 and 1425;

(ii) bollards and marker posts shall comply with Clauses 1210 and 1211;

(iii) road studs:

(a) temporary retro-reflecting road studs shall comply with Clause 1213 and only be installed for periods of up to 3 months and thereupon be replaced;

(b) if permanent retro-reflecting road studs are used for temporary purposes they shall comply with Clause 1213 and have the prior approval of the Overseeing Organisation;

(iv) road markings, cones, cylinders and delineators, road danger lamps and high intensity flashing beacons shall comply with Clauses 1212, 1214 and 1215 as appropriate;

(v) portable traffic signals and haul route crossing signals shall, where relevant, comply with Clause 1217;

(vi) any other signal, lamp, barrier or device shall be suitable for its intended purpose and where relevant shall comply with appropriate British Standards.

3 Fixed short life signs shall be constructed as follows:

(i) materials:

(a) sign plates may be constructed of materials to the standard for a permanent sign, or alternatively shall be constructed of timber, hardboard, plywood or chipboard;

(b) stiffening frames for sign plates constructed of timber, hardboard, plywood or chipboard, shall be constructed of timber, mild steel or aluminium sections;

(c) mounting posts shall be constructed of steel, cast iron, aluminium alloy, reinforced or prestressed concrete or timber;

(d) fittings for signs made of materials to the standard for a permanent sign shall be similar to those used for permanent signs. For signs made of timber, hardboard, plywood or chipboard, fittings shall be of steel, stainless steel, or brass wood screws, or wire nails. Adhesives may be used for fixing provided they are weatherproof and are not affected by variations in temperature;

(e) sign plates constructed of timber, hardboard, plywood or chipboard shall be sealed or otherwise treated to ensure that the final finish will provide a satisfactory appearance and will not deteriorate during the period the sign is expected to be in use;

(ii) construction:

(a) sign plates shall be constructed on similar principles to those required for permanent signs, although stiffening may be omitted provided the sign plate passes the bending test given in BS 873 : Part 1;

(b) stiffening frames constructed of timber members shall be jointed so that they withstand adverse weather conditions;

(c) mounting posts constructed of timber shall have dimensions that are sufficient to withstand the estimated loading on the sign;

(d) fixing of signs to the stiffening frame where required, and to the mounting posts shall be by screwing, nailing or gluing;

(e) timber sign plates, stiffening frames and mounting posts shall be preserved with copper/ chrome/ arsenic (CCA) complying with BS 4072. The sign plate face shall be finished to comply with BS 873 : Part 6.

4 Erection of temporary traffic signs mounted on posts shall comply with Clause 1208.

5 Any temporary covering of temporary traffic signs shall comply with Clause 1209. Any temporary covering of road studs and road markings shall comply with any requirements described in Appendix 12/3.

6 Removal of temporary traffic signs shall be carried out as soon as they become superfluous or a hazard to traffic. Methods of removal shall ensure the minimum disturbance to traffic consistent with safety. Making good shall be carried out immediately after removal of the traffic sign.

7 Posts shall not protrude above the top of the sign unless supporting an external luminaire, in which case the protrusion shall be kept to a minimum.

1217 Traffic Signals

General

1 Traffic signals shall comprise road junction signals, pelican and puffin pedestrian crossing signals, haul route signals and wig-wag signals and shall be of the type described in Appendix 12/5.

2 Traffic signals shall comply with sub-Clauses 3 to 15 of this Clause and the requirements described in Appendix 12/5. The installation and maintenance of traffic signals shall be in accordance with the quality management scheme described in Appendix A.

3 Traffic signal equipment shall comply with BS 505 : 1971 (AMD 1990, 1976) as amended by Specification TR 0102. It shall consist of control equipment including detector loops of a type which has received statutory type approval by the ADT in accordance with the procedure described in Specification TRG 0500. They shall be maintained and serviced as described in Appendix 12/5.

4 All traffic safety and management measures associated with work on traffic signals shall comply with Clause 117, and any work entailing the switching off of existing signals shall not be carried out until the highway authority has been informed and until agreed alternative traffic management measures are in operation to safeguard and control vehicles using the highway.

Controllers

5 Controllers shall be provided and installed as described in Appendix 12/5. The cabinet shall be mounted on a foundation, with or without an adjacent inspection chamber as described in Appendix 12/5. The foundation shall make provision for the entry of the appropriate number of cable ducts.

6 Traffic signal controllers shall, in addition to any testing carried out in compliance with Clause 1424 be tested before delivery to Site and again after installation but before commissioning, to ensure they comply with the specification in Appendix 12/5.

Cabling and Electrical Requirements

7 Traffic signal equipment on each post shall be connected to the controller in accordance with the requirements described in Appendix 12/5.

8 The installation shall comply with BS 7671 Regulations for Electrical Installations (IEE Wiring Regulations) and the rules and regulations of the electricity supplier which provides the supply.

9 Cables shall be PVC insulated and sheathed 600/1000 V grade with steel wire armouring to BS 6346 and shall be installed in ducts in compliance with Clause 1421 and terminated in compliance with Clause 1423. Reinstatement shall be in compliance with Clause # 706.

10 Earthing of all posts, pushbutton boxes and the controller cabinet shall comply with Clause 1420. One conductor in each cable between a post and the equipment cabinet shall be a protective conductor and shall bond the earth terminal at the post to the main earth terminal.

11 Cable testing shall be in accordance with Clause 1424. Tests (a), (b), (c), (e), (f), (g), (h) and (j) as defined in sub-Clause 1424.2 shall be conducted and all measurements recorded.

Telecommunications Carrier Interface

12 Where a connection interface to the plant of a telecommunications carrier is specified in Appendix 12/5 the installation shall comply with th rules and regulations of that carrier.

Posts

13 Posts for traffic signals shall be installed in compliance with Clause 1203 and in the locations specified in Appendix 12/5.

Signal Heads

14 All backing boards shall have a border of Class 1 retro-reflective material (white). Pressure sensitive material shall normally be supplied but vacuum applied material may be used in accordance with the manufacturer's process. Application of pressure sensitive material shall take place only on dry surfaces. An ambient temperature of 15°C minimum is recommended for satisfactory adhesion. The material shall have a 50 mm width throughout. Where the continuous border bridges each backing board/signal head a distinct cut edge shall be made to avoid any subsequent stretching/ shrinkage of dissimilar surfaces. The finished border shall be of a neat appearance and not made up of short lengths of cuttings.

Road Markings

15 Road markings associated with traffic signals shall comply with Clause 1212.

1218 Detector Loops

1 The installation and testing of detector loops shall be in accordance with Specification MCH 1540.

1219 Controlled and Un-controlled Crossings

1 The location of controlled and un-controlled crossings shall be as described in Appendix 12/5. Details shall be as described in Appendix 12/5.

2 Surfacing of Zebra crossing areas shall be laid with materials and to methods specified in Appendix 12/5. The finished surfacing shall have a minimum skid resistance Class of S3 when tested in compliance with BS EN 1436.

3 Non retro-reflecting road studs shall comply with Clause 1213.

4 Road markings shall be white and comply with Clause 1212 for permanent markings and be of the material described in Appendix 12/5.

5 Traffic signals, related control and other equipment where incorporated in controlled crossings together with installation and reinstatement shall comply with Clause 1217 for permanent traffic signals.

1220 Traffic Signs on Gantries

1 Where traffic signs (including signals) are erected on gantries the signs shall comply with the requirements of the relevant Clauses of this Series.

2 Fabricated steel gantries shall be constructed to the requirements described in Appendix 12/6, and to comply with Series 1800. Reinforced or prestressed concrete gantries shall be as described in Appendix 12/6 and shall comply with Series 1700.

1221 Preparation and Finish of Metal and Other Surfaces

General

1 Permanent traffic signs and, where specified in Appendix 12/1 prescribed temporary traffic signs shall be prepared, protected against corrosion and finished in compliance with BS 873 : Part 6 and with sub-Clauses 2 to 9 of this Clause.

Faces

2 Faces of sign plates shall be prepared to receive sign face materials in compliance with BS 873 : Part 6 and to the recommendations of the sign face material manufacturer following completion of any preparation and finish in sub-Clauses 3 and 6 of this Clause.

Steel Sign Plates, Purlins, Frames and Fittings

3 Steel sign plates, frames and fittings and purlins shall be prepared and protected in compliance with BS 873 : Part 6 and be as described in Appendix 12/1. Preparation to clean steel 2nd Quality and painting of surfaces shall comply with Series 1900.

Steel Posts and Post Housings

4 Steel posts and post housings shall be prepared and protected in compliance with BS 873 : Part 7. Painting shall comply with Series 1900 and be as described in Appendix 19/2.

Aluminium or Aluminium Alloy Posts and Post Housings

5 Aluminium or aluminium alloy posts and post housings shall, unless otherwise required in Appendix 19/2, be left unpainted, except for the bituminous coating required by BS 873 : Part 7 below ground level. A matt appearance shall be achieved in accordance with sub-Clause 6(ii) of this Clause.

Aluminium or Aluminium Alloy Sign Plates, Framework and Stiffening and Luminaire Housings

6 Backs of aluminium or aluminium alloy sheet and planks forming plate signs and external parts of luminaire housings and other permanently exposed components shall, to prevent specular reflection, be dulled using a method to be agreed by the Overseeing Organisation or be coated with either paint or plastics as follows:

(i) plastics coating, and pre-treatment before its application, shall be in compliance with BS 873 : Part 6;

(ii) surfaces to be painted shall be lightly abraded in accordance with sub-Clauses 1903.5 and 1903.6 or degreased and etch primed with primer detailed in Standard BD35, Item No. 14. Except for etch primed surfaces, all surfaces shall be immediately cleaned in accordance with sub-Clause 1903.9. All surfaces, including etch primed surfaces, shall be applied with one coat of matt polyurethane paint to Standard BD35, Item No. 168, and colour as described in Appendix19/2. The paint application shall comply with the appropriate recoat time (over etch primer) as detailed in the paint manufacturer's data sheet and Clauses in Series 1900.

Internally Housed Electrical Components and Ancillary Equipment

7 Ferrous steel shall be finished inside and out by galvanizing, electro-plating or zinc or aluminium spray all in accordance with Series 1900, or other equivalent preparation and finish. Aluminium and other metals shall unless otherwise required in Appendix 14/4 be left untreated.

Stainless Steel Components

8 Unless otherwise required in Appendix 19/2 stainless steel shall be left untreated except where the component is visible against the sign face when it shall be covered by a suitable material, of a colour to match that part of the face.

Cast Iron and Cast Steel Components

9 External surfaces shall be prepared and protected as described in Appendix 19/2. Cabinets and feeder pillars shall have final coats of paint applied on Site after final installation including the fitting of any internal apparatus required as part of the Permanent Works. Internal surfaces shall unless otherwise specified in Appendix 19/2 receive the same treatment as for external surfaces except that final paint coats shall be applied before internal components are installed.

Road Markings

Permanent Road markings

1 Road marking shall have the following road performance as defined in BS EN 1436 for the period of the functional life starting from the date of application or when the road is trafficked, whichever is later. The materials to be used shall be to the same mix, material

quality, quantity and rate of application as used on the test site.

Property	BS EN 1436 Reference	Requirement*	Value
Colour	Table 6	1. White 2. Yellow Class Y1, Y2	X,y co-ordinates given x,y, co-ordinates given
Luminance Factor	Table 5	1.Class B2 2.Class B1	0.3 0.2
Skid Resistance	Table 7	1. Class S1 2. Class S1	45 45
Retroreflectivity	Table 2 Class of R, For dr markings	1. Class R2 2. Class R1	100 80

* Note: 1 = White, 2 = Yellow

2 The width tolerances and thickness for screed, spray, preformed and extrusion white or yellow lines shall be in accordance with the Traffic Signs Regulations (Northern Ireland) 1997. With the exception of the road markings listed in Article 29 (2) of The Traffic Signs Regulations (Northern Ireland), in no case shall any materials be laid more than 5 mm thick. Unless otherwise specified, all white markings shall be reflectorised with glass beads in accordance with BS EN 1423 and 1424 by incorporation (apart from preformed markings) into the road marking mixture and to the wet surface of the marking.

3 Where there is requirement for improved visibility in wet conditions at night, products showing the following performance in addition to that stated in sub- Clause 3 shall be used.

Property	BS EN 1436 Reference	Requirements	Value
Retroreflectivity	Table 3	Class RW3	50

4 Where there is a requirement for improved skid resistance as referred to in Appendix 12/3, products showing the following performance in addition to that stated in sub clause 3 shall be used.

Property	BS EN 1436 Reference	Requirements	Value
Skid Resistance	Table 7	Class S3	55

5 The pavement shall be prepared in accordance with the following:

(i) where the marking is to be applied on concrete carriageways, the transverse texturing shall be freed from all traces of curing compound by wire brushing or other approved means. Prior to the application of the thermoplastic material a tack coat compatible with the road surface and the marking material shall be applied in accordance with the manufacturer's instructions;

(ii) on surface dressed carriageways, all loose chippings where the marking is to be applied shall be removed prior to application.

6 The application of permanent road markings shall b in accordance with the Sector Scheme described in Appendix A. Road marking materials shall only be applied to surfaces which are clean and dry. Markings shall be free from raggedness at their edges and shall be uniform and free from streaks. Longitudinal road markings shall be laid to a regular alignment.

Raised Rib Road Markings

7 Raised Rib Road Markings shall only be used on motorways with full width hard shoulders or all-purpose roads (both single and dual carriageway) with at least 1 metre wide hard strips. They shall comply with sub- Clauses 1, 2(i), 3, 5, 6, 7 and 8 of this Clause.

8 Raised Rib Road Markings shall be white lines which are continuous over the sections where they are specified in Appendix 12/3. Where specified in Appendix 12/3 gaps shall be provided for drainage purposes.

9 Raised Rib Road Markings shall be in accordance with The Traffic Signs Regulations (Northern Ireland) 1997, Diagrams 1012.2 and 1012.3, as appropriate. Spacing of the transverse raised ribs shall be 500 mm or 250 mm as specified in Appendix 12/3.

10 Raised Rib Road Markings shall not be used adjacent to hatched areas or central reserve crossings except as prescribed for use with diagrams 1040.3,1040.5 and 1042.

Temporary Road Markings

11 Temporary road markings shall only be adopted with the prior approval of the Overseeing Organisation. They shall comply with sub-Clauses 1 to 8 of this Clause or if required to be removable, be constructed only from a proprietary preformed road marking material complying with BS EN 1790.

12 When temporary road markings are used on surfaces that will continue to be used by public traffic after their removal, any shadow trace remaining after their removal shall be permanently obliterated. Preformed materials shall not be used for this obliteration.

13 Temporary road markings constructed from a proprietary preformed road marking material shall only be adopted in locations and on types of road surface as described in Appendix 12/3 and shall comply with any other requirement therein. The marking material shall be new and together with any primer shall be stored and installed in accordance with the manufacturer's instructions and within the recommended shelf life.

14 Temporary preformed road markings shall only be applied to surfaces that are clean and dry. Upon removal they shall be disposed of off Site and if any making good is necessary to the road surface it shall be satisfactorily carried out before the road is opened to traffic.

Road Markings on Porous Asphalt Surfacing

15 Spray paint, thermoplastic applied by machine screed, spray or extrusion. or preformed road markings shall be used for carriageway markings on porous asphalt surfacing. Manual screeding shall not be permitted except for directional arrows and similar markings.

Removal of Road Markings

16 The removal of road markings on surfaces that will continue to be used by traffic shall be undertaken in a manner that will avoid damage to the surface. The removal of temporary road markings shall comply with sub-Clauses 14 and 15 of this Clause.
The removal of permanent road markings shall be by mechanical means only. The Contractor shall submit details of the system he proposes to use to the Overseeing Organisation for approval.

Masking of Road Markings

17 When black masking materials are required to cover existing permanent road markings, they shall either comply with BS 7962 or have received written type approval from the Overseeing Organisation and if required to be removable, be constructed from a proprietary preformed removable black masking material.

1213 Road Studs

Retro reflecting Road Studs

1 Statutory requirements controlling retro-reflecting road studs are contained in The Traffic Signs Regulations (Northern Ireland) 1997 and subsequent amending Regulations.

2 All retro reflecting road studs shall comply with BS EN 1463-1 and 1463-2, and shall be installed in accordance with the manufacturer's instructions and the Sector Scheme described in Appendix A.

3 Retro reflecting road studs and components which do not fall into a category of BS EN 1463, but which have type approval of the Overseeing Organisation can be incorporated into the Works. They shall be installed in accordance with the manufacturer's instructions.

4 The Contractor shall submit details of the retro reflecting road studs he proposes to use in the Works to the Overseeing Organisation for approval.

Permanent Retro-reflecting Road Studs

5 Permanent retro reflecting road studs shall be installed in the locations and to any other requirements as described in Appendix 12/3.

Temporary Retro-reflecting Road Studs

6 Temporary retro reflecting road studs shall be of the fluorescent green-yellow type to BS EN 1463-1 and shall be appropriate for the situation concerned. They shall not be used for a second application. Adhesive used for the temporary retro reflecting road studs shall be removed from the carriageway on completion of the Works.

Non retro-reflecting Road Studs

7 All non-retro reflecting road studs shall be installed in accordance with the manufacturer's instructions in locations, and complying with any other requirements, described in Appendix 12/3.

Retro-reflecting Road Studs on Porous Asphalt Surfacing

8 The edges of recesses for inset retro reflecting road studs in porous asphalt surfacing shall be milled when the material has cooled to ambient temperature. Care shall be exercised when removing porous asphalt to form the recess to prevent damage occurring to the cut edges and to prevent detritus clogging the porous asphalt surfacing. Surface applied road studs should not be applied if there is evidence of moisture present on the surface of porous asphalt, nor should inset road studs be installed if moisture is present in the recess after milling of the asphalt.

SERIES 1300

ROAD LIGHTING COLUMNS AND BRACKETS AND CCTV MASTS

Contents

ROAD LIGHTING COLUMNS AND BRACKETS AND CCTV MASTS

1301 General

1 This Series shall apply to the design, supply and installation of lighting columns and brackets and CCTV masts within the following dimensional limitations:

(i) For steel, aluminium and concrete lighting columns:

  (a) post top columns not exceeding 20 m nominal height;

  (b) columns with brackets not exceeding 18 m nominal height;

  (c) bracket projections not exceeding 0.25 x nominal height or 3 m whichever is the lesser.

(ii) For glass fibre reinforced plastic lighting columns:

  (a) columns not exceeding 10 m nominal height;

  (b) bracket projections not exceeding 1.5 m.

(iii) For steel CCTV masts:

  (a) post top masts not exceeding 25 m nominal height.

2 The Contractor shall propose lighting columns and brackets and CCTV masts, which have been designed by the manufacturer. The manufacture, supply and verification of lighting columns and bracket arms shall comply with the quality management scheme described in Appendix A. The Contractor shall design foundations for planted lighting columns as described in Appendix 13/1.

The Contractor shall where required design:

(i) anchorages and attachment systems for columns and masts with flange plates to foundation or bridge deck;

(ii) foundations for columns and masts with flange plates; as described in Appendix 13/1 and Appendix 13/4.

3 Lighting columns and brackets and CCTV masts shall be supplied and installed in compliance with BS EN 40 : Part 1 and BS 5649 : Parts 2, 3, 5, 6, 7, 8 and 9 together with the amendments and additions stated in Clauses 1309, 1310 and 1311 and all the other requirements of this Series.

4 Brackets for lighting columns shall include wall mounted brackets and fixtures.

5 Temporary lighting on temporary diversions for traffic, and crossovers, shall comply with this Series.

6 Where lighting columns and CCTV masts are to be in the vicinity of overhead power lines the Contractor shall ensure that the appropriate Electricity Authorities are notified and give written agreement to the specific clearances to be provided and that warning notices as described in Appendix 13/1 and Appendix 13/4 are permanently fixed to the columns affected prior to erection.

1302 Design of Lighting Columns, Brackets, CCTV Masts, Foundations, Anchorages and Attachment Systems

1 Lighting columns, brackets, CCTV masts, the foundations of both planted columns and columns and masts with flange plates, and the anchorages and attachment systems for columns and masts with flange plates shall be designed to comply with the requirements of Standards BD 26, BD 83 and the technical approval scheme adopted by the Overseeing Organisation.

The Contractor shall submit to the Overseeing Organisation a copy of the design and check certificates for lighting columns, brackets, CCTV masts and foundations.

Aesthetic Requirements

2 The aesthetic design of lighting columns, luminaires including those with bracket arms and CCTV masts shall be submitted by the Contractor to the Overseeing Organisation. The design of lighting columns and luminaires including those with bracket arms shall comply with the general advice given in BS 5489 for the appearance of lighting installations by day and by night both from the viewpoint of the road and from the surrounding neighbourhood.

Foundations for Planted Lighting Columns

3 The Contractor shall submit designs appropriate to the soil types encountered on Site, as identified in Appendix 13/1, to the Overseeing Organisation for its acceptance.

1303 Data Sheets

1 The Contractor shall complete the details in Appendix 13/2 Sheet 1 and Sheet 2, and Appendix 13/5 in accordance with the instructions given in Appendices 13/3 and 13/6. He shall provide the Overseeing Organisation with triplicate copies of the completed Data Sheets for each type of column and bracket and CCTV mast not later than the date stated in Appendices 13/1 and 13/4.

2 The columns and brackets and CCTV masts shall not be ordered or erected until the Overseeing Organisation has notified its acceptance of the completed Data Sheet in writing to the Contractor.

1304 Identification and Location Markings

1 All lighting columns and brackets and CCTV masts shall carry unique identification marks which indicate the name of the manufacturer, year of production, and other information, to enable details of the lighting column and bracket, and CCTV masts to be determined by reference to the appropriate Lighting Column and Bracket and CCTV Mast Data Sheets.

2 The column and mast identification marks shall be permanent, legible and clearly visible and be:

(i) on a permanent fixed label; or

(ii) hard stamped; or

(iii) formed in the material of the column/mast on an external face only.

It shall be located either within the base compartment or, except in the case of hard stamping, immediately above or below the door. It shall not be located on the door. All hard stamping shall be made only in a secondary member of the column/mast and shall be done in a
manner, which will not induce any stresses in the material of the main member of the column/mast.

3 The bracket identification mark shall be permanent and legible and be:

(i) hard stamped; or

(ii) formed in the material of the bracket on an external face only. The mark

shall be located either on the luminaire spigot or on the underside of the bracket adjacent to the column shaft or wall or pole mounting plate.

4 Alternatively the bracket identification mark shall be hard stamped or formed in a detachable label supplied fixed to the bracket. This label shall be moved from its temporary position and fixed on erection to a suitably provided hole next to the label on the column.

5 In addition, location marks for inspection and maintenance purposes shall be applied to each column as described in Appendix 13/1 and Appendix 13/4.

1305 Installation of Foundations, Anchorages and Attachment Systems

Planted Lighting Columns

1 A layer of concrete mix ST4, 75 mm thick, complying with Clause 2602 shall be placed and compacted in the bottom of the excavation up to the base of the column.

2 The cable entry slot shall be temporarily plugged as necessary in order to prevent any ingress of concrete or filling material during the concreting and backfilling operations.

3 The hole into which the column is placed shall be backfilled as follows:

(i) in the case of metal and glass fibre reinforced plastic columns with concrete or other material described in Appendix 13/1;

(ii) in the case of concrete columns with concrete or earth fill complying with sub-Clause 5 of this Clause or other material described in Appendix 13/1.

4 Concrete backfill shall be mix ST5 complying with Clause 2602, well compacted by vibration over the full planting depth of the column. A duct equal in size to the width of the cable entry hole, shall be formed through the concrete filling using a suitable preformed lining tube capable of retaining its cross-sectional shape during compaction. The concrete shall be placed 10 mm above ground level adjacent to the column and taper to ground level 100 mm from the column face.

5 Earth backfill shall be Class 8 material complying with Clause 601, Table 6/1 unless otherwise described in Appendix 13/1. The material shall be placed in 150 mm thick layers and shall be well rammed and compacted in order to provide full lateral support to the planting depth of the column. If the backfilling is disturbed for any reason it shall be reinstated in compliance with this Clause. A duct equal in size to the width of the cable entry hole, shall be made through the backfill material using a suitable preformed lining tube capable of retaining its cross-sectional shape during compaction.

Columns and Masts with Flange Plates

6 Concrete in the foundations shall comply with Series 1700.

7 The bedding mortar between the underside of the column/mast flange plate and the top of the concrete base shall comply with Clause 2601.

8 A cable duct, 75 mm diameter, shall be provided through the foundation or bridge component as described in Appendix 13/1 and Appendix 13/4.

9 Steel anchorages and attachment systems shall be used and the anchorage shall include an internally threaded component to receive the attachment system, i.e. holding down bolt or stud.

10 Where anchorages in drilled holes are to be used, the Contractor shall, unless otherwise described in Appendices 13/1 or 13/4, submit to the Overseeing Organisation at least 4 weeks before installation well attested and documented evidence that the proposed anchorage is:

(i) capable of complying with the test requirements specified in Clause 1306; and

(ii) capable of resisting pulsating loading. Anchorages in drilled holes of an expanding type shall not be used.

11 For anchorages in drilled holes the hole location shall be checked to ensure that the hole will be clear of reinforcement before drilling is carried out.

12 Before installation of anchorages in drilled holes, the hole shall be sound, clean and dry and the tolerance of the hole shall be within the values given by the anchorage manufacturer.

13 The threads of steel anchorages shall be lined with grease having a high resistance to creep and being suitable for hot or cold smearing. The grease shall provide protection to the threads for a minimum of either 18 months under cover or 6 months exposed on Site.

14 Attachment systems shall be tightened to the appropriate torque and have the minimum thread engagement calculated in accordance with the requirements of BS 6779 : Part 1 : 1992 : sub-Clause 12.4.1

1**5** All voids in anchorages, attachment systems and flange plates shall be filled with a non-setting passive filler to prevent the collection of water.

1306 Site Tests on Anchorages in Drilled Holes

1 The Contractor shall carry out site tests on anchorages in drilled holes. For the purpose of this sub-Clause the types of fixing referred to in Clause 1 of BS 5080: Part 1:1993 shall include “anchorages”. Where anchorages are tested they shall be loaded incrementally in tension in accordance with BS 5080: Part 1: 1993 except that they shall be capable of resisting a test load equal to 10 per cent above the nominal tensile load to be resisted by the anchorage in lieu of testing to failure. The tensile load shall be determined in accordance with the criteria given in sub-Clauses 8.15 to 8.18 of Standard BD 26 and Section 7 of Standard BD 83. Incremental loads shall be held for not less than half a minute and the test load for not less than five minutes. Readings shall be taken immediately after applying load and at the end of the time intervals stated above.

2 The total movement of the anchorage shall not exceed 1.0 mm during the test. Any evidence of slip during loading up to the test load, as demonstrated by a significant change in the slope of the load/extension curve, shall constitute failure. A test rig deemed to be equivalent to that shown in Figure 3 of BS 5080 : Part 1 : 1993 is contained in the RCD : Section 2.

3 The Contractor shall test anchorages selected on behalf of the Overseeing Organisation at the testing frequency in accordance with Appendix 1/5.

1307 Materials and Surface Finishes

1 All steel fixings including doors, door hinges, chains and locks shall be stainless steel to BS EN 10029, BS 970:Part 1 or BS EN ISO 3506 Parts 1 and 2 as appropriate or steel to BS EN 10 025, or BS 5649:Part 3: 1982 galvanized in compliance with Series 1900.

2 Where different metals are in contact, consideration shall be given to the necessary measures to avoid galvanic corrosion.

3 The surface preparation and protection of steel lighting columns, brackets and wall mountings and CCTV masts, mountings and housings shall comply with Appendix 19/1 and the relevant Clauses in Series 1900.

4 The exterior and interior surfaces of the intended planted depth of an aluminium alloy column shaft and a length of 250 mm above the ground level shall be coated with a non-porous electrically insulating bitumen with a minimum layer thickness of 250 microns. The coating shall only be applied after degreasing and after an approved preliminary treatment in order to ensure adhesion.

5 The underside of an aluminium alloy flange plate shall be treated before erection with bituminous paint complying with BS 3416 or BS 6949.

6 The finish to concrete lighting columns and brackets shall be Class F3 in compliance with Clause 1708.

1308 Handling, Transport and Erection

1 Lighting columns and brackets and CCTV masts shall be handled, transported and stored in such a way as to avoid any structural damage or damage to the surface protection system. Any damage incurred shall be made good in such a way that the structural performance and durability of the item shall be in no way reduced.

2 Lighting columns and brackets and CCTV masts shall be stored clear of the ground in such a way that contact with cement, groundwater, soil or ash or other deleterious material is prevented and that water does not accumulate on any surfaces or inside sections. Suitable packings shall be placed between the columns to allow a free passage of air and dispersion of water.

3 All rivets, bolts, nuts, washers, screws, small plates and small articles generally shall be suitably packed and identified. All such items shall be stored under cover.

4 Columns and masts shall be installed in accordance with the manufacturer's recommendations. The door shall face the direction described in Appendices 13/1 and 13/4.

5 Wall mounted lighting brackets and fixtures shall be fixed as described in Appendix 13/1.

1309 Amendments and Additions to BS 5649 : Part 2 : 1978 (AMD 3136, 1979) for Lighting Columns

Page 4 - Clause 3

Delete Note "Lantern fixing angle 5° or 15°" and

Insert Note "Lantern fixing angle 3°, 5° or 15°".

In the Table insert additional bracket projections w of "0.5 m, 1.0 m, 1.5 m and 2.5 m".

Page 5 - Clause 4

Delete cable entry slot width dimension "50 mm" and

Insert cable entry slot width dimension "X".

Insert additional note as follows:

"5) Cable entry slot width dimension "X" shall be either 75 mm or 50 mm as described in Appendix 13/1."

Page 7 - Clause 6

Delete existing Tables and replace by the following:

h m	s min	a	d_1 min	d_2 min
≤5	8	200	M12	13
≤12	10	300	M16	17
≤20	15	300 400	M24	26

Delete '1'from Figure 7 and 'c' from Figure 8.

Insert additional notes as follows:

"2 Unless otherwise described in Appendix 13/1 circumferential slotted holes shall be used instead of round holes in the flange plates in order to allow ± 5° of rotational adjustment.

3 Where slotted holes are required in the flange plate to allow for rotational adjustment of the column then the flange plate sizes shall be increased to give a suitable edge distance.

4 The distance from the edge of the hole or slot to the edge of the plate shall be not less than d2.

5 Washers complying with BS 4320 shall be used between the holding down fastener and the flange plate."

Page 8 - Clause 7

Delete existing Table for post top lanterns and replace by the following:

Delete existing Table for side entry lanterns and replace by the following:

Page 9 - Clause 8

8.7 Column cross-section

Insert additional sub-Clause as follows:

"8.7.1.3 Material thickness tolerance

(+ unspecified, - 5%)".

8.7.2.2 Deviation in shape

Delete content of entire sub-Clause and insert the following:

"Cross-section dimensional tolerances ± 5% with a maximum of ± 10 mm."

1310 Amendments and Additions to BS 5649 : Part 3 : 1982 for Lighting Columns and Brackets and CCTV Masts

1310.1 For Lighting Columns and Brackets:

Page 2 - Clause 7

Delete sub-Clause 7.1 and insert the following:

"7.1.Steel and Aluminium Lighting Columns

7.1.1 General. Arc welding of carbon manganese steels shall comply with BS 5135. Arc welding of stainless steels shall comply with BS 4677. Arc welding of aluminium alloys shall comply with BS 3019 or BS 3571 as appropriate.

7.1.2 Procedures. Written welding procedures shall be used with testing to BS EN 288 Parts 1, 2 and 3 for steel and BS EN 288 Parts 1, 2 and 4 for aluminium alloys and shall apply to all production and repair procedures. These shall be subject to reapproval after a period of seven years. When applying BS EN 288 Parts 1, 2 and 3 the welding consumables and procedures used for steel shall be such that the mechanical properties of deposited weld metal will not be less than the respective minimum specified values of the parent metal being welded. Testing shall be by a laboratory appropriately accredited for weld testing. Approval shall be by an Independent Inspecting Authority using Registered Welding Engineers, Registered Welding Quality Engineers or equivalent.

7.1.3 Welder Qualification. All welders shall be approved to BS EN 287 Part 1 for steel and BS EN 287 Part 2 for aluminium alloys. The tests shall include in addition an application test representative of the 'main structural' joints on which the welder is to be approved to work. The main structural joints shall include, where relevant, the flange plate joint, the base compartment to shaft joint, the door reinforcement, any intermediate column joint, the column to bracket joint and the column seam weld. Welders shall be subject to reapproval in accordance with BS EN 287. Testing shall be by a laboratory appropriately accredited for weld testing. Approval shall be by an Independent Inspecting Authority using Registered Welding Engineers, Registered Welding Quality Engineers

7.1.4 Inspection and Non-Destructive Testing

7.1.4.1 Inspection Personnel. The manufacturer shall provide suitable personnel to carry out inspection of production welds as required in 7.1.4.2 to 7.1.4.4. Personnel conducting visual inspection shall have a nationally recognised certificate of competence appropriate to the type of welding being inspected. Personnel conducting non-destructive testing (NDT) shall be certified according to a nationally recognized certification scheme appropriate to the equipment used and the weld groups inspected. Evidence of training and qualification shall be retained and made available for examination when required. The results of all weld inspections shall be recorded.

7.1.4.2 Visual Inspection. All welds shall be subject to visual inspection in accordance with BS EN 970 : 1997 prior to any NDT and galvanizing. Weld surfaces shall be free of slag residues and sharp edges. All surfaces shall be free of traces of weld spatter, arc strikes and contaminants. The apparent throat dimensions of butt welds and the apparent leg length and apparent throat dimensions of fillet welds, as measured by a welding gauge and taking into account any known lack of fit, shall not be less than those specified, except that local shortfalls up to 0.5 mm may be accepted provided the average over any 50 mm length is not less than the specified dimension. The toe angle shall not be less than 110°. The surface of all welds shall be free from cracks, lack of fusion including overlap, and slag. Isolated discontinuous porosity may be accepted provided it is not detrimental to the galvanizing process. Undercut shall not result in a section loss of more than 5% over any 50 mm length of joint, nor shall its depth exceed 0.5 mm or 10% of the thickness, whichever is the less.

7.1.4.3 Magnetic Particle Inspection (MPI) and Liquid Penetrant Inspection. MPI shall be applied in accordance with BS 6072 to joints in steel lighting columns selected in accordance

with 7.1.4.5, where any of the material thickness exceeds 20 mm. Liquid penetrant inspection in accordance with BS EN 571-1 shall be applied to transverse welds in aluminium columns selected in accordance with 7.1.4.5. Notwithstanding the requirements of 7.1.4.5, one of the
above methods shall be applied as appropriate where on visual inspection the presence of cracking or lack of fusion may be suspected. To aid inspection the profile of the weld may be dressed by burr grinding provided that the specified throat size and leg length is still maintained. The surface of the weld shall be free of cracks, lack of fusion and slag.

7.1.4.4 Ultrasonic Testing. All butt joints selected in accordance with 7.1.4.5 shall be ultrasonically tested in accordance with BS EN 1714 where the column shaft is 8 mm thick or greater. For aluminium the principles in BS 3923 shall be applied. The weld shall be free of cracks. The height of buried slag, lack of fusion or lack of penetration shall not exceed 3 mm. Within 6 mm of the outer surface, their individual length shall not exceed 5 mm. The resulting net throat area loss over any 50 mm length of weld shall not exceed 5%.

7.1.4.5 Frequency of Testing. Joints for MPI, liquid penetrant inspection or ultrasonic testing shall be selected as follows:

10% of lighting columns of each type shall be inspected. The sample shall include all variations in joint geometry, material thickness and weld size covered by the basic type, that are within the scope of 7.1.4.3 and 7.1.4.4. If non-conformances are found the scope of MPI, liquid penetrant inspection and ultrasonic testing shall be doubled. If further non-conformances are found, the whole batch shall be tested.

7.1.4.6 Reporting. Inspection records for production welds shall be retained by the manufacturer for seven years and those covering the production periods relating to the lighting columns supplied shall be made available for examination.

7.1.5 Destructive Testing. Copies of certified reports of destructive tests on lighting columns supplied under earlier contracts with the Overseeing Organisation shall be made available for examination.

The Contractor shall supply sample joints cut from complete lighting columns for destructive testing as selected on behalf of the Overseeing Organisation. The sample joints shall be cut from the column, extension piece, bracket and welded anchorage where relevant. The basis of selection shall be as follows:

a) For orders of 1 to 10 lighting columns – one complete lighting column for each type, unless destructive testing has been carried out within the last year on a lighting column of that type. The manufacture, supply and verification of lighting columns and bracket arms shall comply with the quality management scheme described in Appendix A.

b) For orders of 11 to 300 lighting columns - one complete lighting column for each type unless destructive testing has been carried out within the last month on a lighting column of that type where the lighting column to be tested was also selected on behalf of the Overseeing Organisation.

c) For orders exceeding 300 lighting columns - two complete lighting columns for each type.

Acceptance criteria shall be as specified in 7.1.4, except that in 7.1.4.2 the throat and leg

dimension shall apply to the true rather than the apparent dimension.

In the event that there is a non-conformance arising from a serious deviation in materials, preparation, assembly, or welding procedure, the batch concerned shall be rejected and further production of the columns affected stopped until such time as the fault has been corrected. A minor non-conformance shall only be accepted on the basis that further sampling and testing shows that fault is not repetitive and in the view of the Overseeing Organisation will not in that instance impair structural integrity.

If the problem can be traced to a particular manufacturing period, operator, piece of equipment or batch of materials and if proper trace ability to individual batches of components can be assured, only those batches affected may be subject to rejection.
The destructive test reports shall be retained by the manufacturer and recorded in a register for a period of two years. The destructive test specimens shall be retained for a period of 12 months. These shall be made available for examination on future contracts with the Overseeing Organisation.

7.1.6 Remedial Work. Welds which do not comply with the Specification may be repaired to an approved procedure, as described in 7.1.2."

Page 2 - Clause 7

Delete sub-Clause 7.2 in its entirety.

1310.2 For CCTV Masts:

BS 5649 : Part 3 : 1982: Clause 2, Clause 6, sub-clause 7.1 and sub-clauses A1 and A3 shall apply, subject to the following amendments:

Page 2 - Clause 2

Delete the last sentence and replace with: "The steel shall be equivalent to or better than BS EN 10025, Grade S275 JR".

Page 2 - Clause 6

Delete and replace with: "The steel used for foundation bolts shall be equivalent to or better than BS EN 10025, Grade 275 JR".

Page 2 - Clause 7

Delete sub-Clause 7.1 and insert the following:

"7.1.Steel CCTV masts
7.1.1 General. Arc welding of carbon manganese steels shall comply with BS 5135. Arc welding of stainless steels shall comply with BS 4677.

7.1.2 Procedures. Written welding procedures shall be used with testing to BS EN 288 Parts 1, 2 and 3 for steel and shall apply to all production and repair procedures. These shall be subject to reapproval after a period of seven years. When applying BS EN 288 Parts 1, 2 and 3 the welding consumables and procedures used for steel shall be such that the mechanical properties of deposited weld metal will not be less than the respective minimum specified values of the parent metal being welded. Testing shall be by a laboratory appropriately accredited for weld testing. Approval shall be by an Independent Inspecting Authority using Registered Welding Engineers, Registered Welding Quality Engineers or equivalent.

7.1.3 Welder Qualification. The tests shall include in addition an application test representative of the 'main structural' joints on which the welder is to be approved to work. The main structural joints shall include, where relevant, the flange plate joint, the base compartment to shaft joint, the door reinforcement, any intermediate mast joint, the mast to bracket joint and the mast seam weld. Welders shall be subject to reapproval in

accordance with BS EN 287. Testing shall be by a laboratory appropriately accredited for weld testing. Approval shall be by an Independent Inspecting Authority using Registered Welding Engineers, Registered Welding Quality Engineers or Welding Inspectors or equivalent.

7.1.4 Inspection and Non-Destructive Testing

7.1.4.1 Inspection Personnel. The manufacturer shall provide suitable personnel to carry out inspection of production welds as required in 7.1.4.2 to 7.1.4.4. Personnel conducting visual inspection shall have a nationally recognized certificate of competence appropriate to the type of welding being inspected. Personnel conducting non-destructive testing (NDT) shall be certified according to a nationally recognized certification scheme appropriate to the equipment used and the weld groups inspected. Evidence of training and qualification shall be retained and made available for examination when required. The results of all weld inspections shall be recorded.

7.1.4.2 Visual Inspection. All welds shall be subject to visual inspection in accordance with BS EN 970 : 1997 prior to any NDT and galvanizing. Weld surfaces shall be free of slag residues and sharp edges. All surfaces shall be free of traces of weld spatter, arc strikes and contaminants. The apparent throat dimensions of butt welds and the apparent leg length and apparent throat dimensions of fillet welds, as measured by a welding gauge and taking into account any known lack of fit, shall not be less than those specified, except that local shortfalls up to 0.5 mm may be accepted provided the average over any 50 mm length is not less than the specified dimension. The toe angle shall not be less than 110°. The surface of all welds shall be free from cracks, lack of fusion including overlap, and slag. Isolated discontinuous porosity may be accepted provided it is not detrimental to the galvanizing process. Undercut shall not result in a section loss of more than 5% over any 50 mm length of joint, nor shall its depth exceed 0.5 mm or 10% of the thickness, whichever is the less.

7.1.4.3 Magnetic Particle Inspection (MPI). MPI shall be applied in accordance with BS 6072 to joints in steel CCTV masts selected in accordance with 7.1.4.5, where any of the material thickness exceeds 20 mm. Notwithstanding the requirements of 7.1.4.5, one of the above methods shall be applied as appropriate where on visual inspection the presence of cracking or lack of fusion may be suspected. To aid inspection the profile of the weld may be dressed by burr grinding provided that the specified throat size and leg length is still maintained. The surface of the weld shall be free of cracks, lack of fusion and slag.

7.1.4.4 Ultrasonic Testing. All butt joints selected in accordance with 7.1.4.5 shall be ultrasonically tested in accordance with BS EN 1714 where the mast shaft is 8 mm thick or greater. The weld shall be free of cracks. The height of buried slag, lack of fusion or lack of penetration shall not exceed 3 mm. Within 6 mm of the outer surface, their individual length shall not exceed 5 mm. The resulting net throat area loss over any 50 mm length of weld shall not exceed 5%.

7.1.4.5 Frequency of Testing. Joints for MPI or ultrasonic testing shall be selected as follows:

10% of CCTV masts of each type shall be inspected. The sample shall include all variations in joint geometry, material thickness and weld size covered by the basic type, that are within the scope of 7.1.4.3 and 7.1.4.4. If non-conformances are found the scope of MPI and ultrasonic testing shall be doubled. If further non-conformances are found, the whole batch shall be tested.

7.1.4.6 Reporting. Inspection records for production welds shall be retained by the manufacturer for seven years and those covering the production periods relating to the CCTV masts supplied shall be made available for examination.

7.1.5 Destructive Testing. Copies of certified reports of destructive tests on CCTV masts supplied under earlier contracts with the Overseeing Organisation shall be made available for examination.

The Contractor shall supply sample joints cut from complete CCTV masts for destructive testing as selected on behalf of the Overseeing Organisation. The sample joints shall be cut from the mast, extension piece, bracket and welded anchorage where relevant. The basis of selection shall be as follows:

a) For orders of 1 to 10 CCTV masts – one complete CCTV mast for each type, unless destructive testing has been carried out within the last year on a CCTV mast of that type.

b) For orders of 11 to 300 CCTV masts – one complete CCTV mast for each type unless destructive testing has been carried out within the last month on a CCTV mast of that type where the CCTV mast to be tested was also selected on behalf of the Overseeing Organisation.

c) For orders exceeding 300 CCTV masts – two complete CCTV masts for each type.

Acceptance criteria shall be as specified in 7.1.4, except that in 7.1.4.2 the throat and leg dimension shall apply to the true rather than the apparent dimension.

In the event that there is a non-conformance arising from a serious deviation in materials, preparation, assembly, or welding procedure, the batch concerned shall be rejected and further production of the columns affected stopped until such time as the fault has been corrected. A minor non-conformance shall only be accepted on the basis that further sampling and testing shows that fault is not repetitive and in the view of the Overseeing Organisation will not in that instance impair structural integrity.

If the problem can be traced to a particular manufacturing period, operator, piece of equipment or batch of materials and if proper traceability to individual batches of components can be assured, only those batches affected may be subject to rejection.

The destructive test reports shall be retained by the manufacturer and recorded in a register for a period of two years. The destructive test specimens shall be retained for a period of 12 months. These shall be made available for examination on future contracts with the Overseeing Organisation.

7.1.6 Remedial Work. Welds which do not comply with the Specification may be repaired to an approved procedure, as described in 7.1.2.”

Page 2 - Clause 7

Delete sub-Clause 7.2 in its entirety.

Page 3, Appendix A1

Delete and replace with: “The following grades of steel are considered to comply with Clause 2 of this standard.

BS EN 10025 :	Grades	S275 JR, S275 JO, S275 J2G3, S275 J2G4, S355 JR, S355 JO, S355 J2G3, S355 J2G4
BS EN 10210 :	Grades	S275 JOH, S275 J2H, S355 JOH, S355 J2H”.

Page 3 - Appendix A3

Delete and replace with: “The following grades of steel are considered to comply with Clause 6 of this standard Foundation bolts: BS 4190 Grades 4.6 and 4.8 BS 3692 Grade 8.8”.

1311 Amendments and Additions to BS 5649 : Part 5 : 1982 for Lighting Columns and CCTV Masts

1311.1 For Lighting Columns and CCTV Masts:

Page 3
3.2, after paragraph 2

Insert additional paragraphs as follows:

"The door arrangement shall be such that it can be opened by releasing a single threaded locking fastener. The fastener shall be of stainless steel to BS 6105 or BS 970 : Part 1 with the dimensions given in RCD Drawing Number K1.

When the door is secured the fastener head shall be completely recessed into the door in a circular recess as indicated in RCD Drawing Number K1.

Six door keys as shown on RCD drawing No. K1, or for alternative vandal resistant locks approved by the Overseeing Organisation shall be supplied to the Overseeing Organisation.
The locking fastener shall be suitable for opening with the standard key detailed in RCD Drawing Number K1."

1311.2 For Lighting Columns:

Page 3

3.4, after paragraph 2

Insert additional paragraph as follows:

"Where a cable entry slot width of 75 mm is provided, the minimum size of cableway from the cable entry slot to the base compartment shall be 75 mm"

After Page 3

Insert "RCD Drawing Number K1."

1312 Attachments to Lighting Columns and CCTV Masts

1 Attachments to lighting columns and CCTV masts shall be by means of circumferential clamps of stainless steel complying with AISI Grade 201 or other suitable material which shall not damage the column or its protective coating.

1313 Laminated Glass Fibre Reinforced Plastic (GFRP) Lighting Columns

Manufacture of GFRP Laminates

1 The columns shall be produced either by hand layup for mechanical moulding technique. The mechanical manufacture shall be carried out either by filament winding, centrifugal casting, compression moulding, resin injection or any other appropriate method accepted by the Overseeing Organisation.
2 An exterior resin rich layer of at least 0.25 mm thickness shall be provided to ensure adequate protection of the reinforcing fibres against adverse effects of the weather and possible chemical attack.

3 Columns containing bubbles, cracks, holes, pits or other voids each greater than 7 mm² in area shall be rejected.

4 The dimension and tolerances shall be those given in BS 5649 : Part 2: 1978 for seamless metal columns. The outer surface shall have a smooth uniform taper along its total length.

Materials for GFRP Laminates

5 The fibre reinforced plastic shall be in the form of laminate made of thermosetting resin, fibre reinforcement (mainly glass fibre), catalyst system and filler.

6 The resins used shall conform to the appropriate British Standards. Polyester resins shall be based on isophthalic acid and conform to BS 3532, Type B.

7 Any fillers and pigments incorporated in the resin shall form part of the total resin system and shall be subject to acceptance of the Overseeing Organisation.

8 Fibre reinforcement shall conform to the appropriate British Standards. Where glass fibre is used as the base for mat or chopped fibre it shall conform to BS 3691 and shall be treated with an appropriate finish compatible with the resin system used.

9 All accelerators, catalysts and hardeners shall be used in accordance with the resin manufacturer's instructions.

Testing of GFRP Laminates

10 The properties of the laminates shall be verified by testing as described in sub-Clauses 13 to 18 of this Clause. Any material failing any of the tests listed shall be rejected. Such tests shall, unless otherwise described in Appendix 13/1, be carried out on samples representing the batch of columns to be supplied under the Contract.

11 Two types of samples shall be provided for the tests:

(i) Samples from a specially prepared flat laminate for type tests or where changes in raw materials or manufacturing techniques are proposed. These shall comprise tests for colour fastness, electric strength, water absorption and impact strength.

(ii) Samples cut from complete columns to be used for quality control purposes, to be carried out at a frequency of one in each two hundred-production columns. Each column for tests will be selected on a random basis and will be examined by visual inspection and for loss on ignition.

12 A flat laminate sample 300 mm ± 10 mm square by 3 mm + 0.5 mm/-0.0 mm thick shall be prepared by hand lay-up method using the same curing conditions resin and reinforcement systems as used for production columns. The total glass fibre content shall not exceed 40% by weight.

13 The colour fastness test shall be conducted in accordance with BS 2782 : Part 5 : Method 550A and the results assessed by Method 552A. Material with a colour change assessed greater than moderate will not be accepted.

14 The electric strength test shall be carried out in accordance with BS 2782 : Part 2 : Method 221. The electric strength shall be not less than 10 kV/mm.

15 The water absorption test shall be carried out in accordance with BS 2782 : Part 4 : Method 430A. The absorption of water shall be not greater than 50 milligrammes.

16 The impact strength test shall be carried out in accordance with BS 2782 : Part 3 : Method 359. The impact resistance shall be at least 30 kJ/m².

17 The loss on ignition tests shall be carried out in accordance with BS 2782 : Part 10 : Method 1002. The loss on ignition on samples taken at random throughout the length of a column shall not exceed 60% after subtracting the amount allowed for non-combustible fillers. The percentage of glass fibre remaining following ignition shall be at least 40% by weight.

18 Samples cut randomly throughout the length of a column shall be visually inspected to confirm that there are no delaminations or voids greater than specified in sub-Clause 3 of this

Clause and that the laminate is fully densified and includes the required number of laminations.

1314 Brackets for Laminated GFRP Lighting Columns

General

1 Brackets shall consist of a galvanized steel tube assembly with an external self-skinning rigid polyurethane foam moulding.

Materials

2 The steel tube assembly shall comply with BS EN 40 : Part 1 and BS 5649 and the requirements of this Series.

3 The rigid polyurethane foam shall be moulded in accordance with the manufacturer's instructions to give a bulk density within the range of 500 ±50 kg/m3, when in the form of a test sheet in accordance with sub-Clause 5 of this Clause. The surface shall be free from obvious defects such as voiding, pitting or cracking. It shall have a surface hardness of at least D/30/1 when measured in accordance with BS 2782 : Part 3 : Method 365B.

4 The polyurethane moulding shall be primed with a two part polyurethane primer and finished with a two part polyurethane top coating all in accordance with the manufacturer's instructions.

Testing of Polyurethane Foam

5 Properties of foam shall be verified by testing using specimens cut from moulded test sheets of 10 mm nominal thickness using the same material as in the manufacture of the bracket arms.

6 The apparent bulk density of a specimen shall be determined and be within the range of 500 ± 50 kg/m3. The method of testing shall be in accordance with the polyurethane foam manufacturer's instructions.

7 The impact strength of a specimen shall be determined in accordance with BS 2782 : Part 3 : Method 359 and shall be at least 6.0 kJ/m².

8 The flexural stress at a deflection of 10 mm carried out on a specimen shall be in the range of 24 to 30 MPa. The method of testing shall be in accordance with the polyurethane foam manufacturer's instructions.

9 The tests specified in sub-Clauses 6, 7 and 8 of this Clause shall each be carried out on two specimens and, unless otherwise stated in Appendix 13/1, the results shall be representative of the batch of columns to be supplied.

10 Evidence of quality control including results of tests similar to those required in sub-Clauses 6, 7 and 8 of this Clause shall be made available when required by the Overseeing Organisation.

11 Tests specified in sub-Clauses 6, 7 and 8 of this Clause shall be carried out when changes in raw materials or manufacturing techniques are proposed. For quality control purposes testing shall be carried out in accordance with sub-Clause 3 of this Clause on each production batch of brackets, which are to be fitted to columns.

STRUCTURAL CONCRETE

Contents

SERIES 2400

BRICKWORK, BLOCKWORK AND STONEWORK

Contents

BRICKWORK, BLOCKWORK AND STONEWORK

2401 Cement

1 Cement shall be one of the following:

(i) Portland cement CEMI complying with MSA EN 197-1;

(ii) Masonry cement complying with BS 5224;

(iii) Sulfate-resisting Portland cement complying with MSA EN 197-1 where described in Appendix 24/1.

2402 Aggregates

1 Sand shall comply with BS 1199 and 1200.

2403 Water

1 If water for the Works is not available from a water company's supply, the Contractor shall ensure that the water complies with the guidance given in BS 3148. Water from the sea or tidal rivers shall not be used.

2404 Mortar

1 Cement mortar for brickwork, blockwork and stonework shall be mixed in the proportions given in Table 24/1 according to the mortar designation described in Appendix 24/1.

2 The chloride ion content of the mortar determined in accordance with BS 812 : Part 117 shall not exceed 0.3% of the mass of cement for mortar made with Portland cement and 0.2% for mortar made with sulfate-resisting Portland cement. Calcium chloride or admixtures containing calcium chloride shall not be used.

3 For work in which cement mortars of designation (ii) or (iii) as defined in BS 5628 : Part 3 are required, the Contractor shall select the appropriate mortar from one of the mixes for the designation given in Table 24/ 1. Admixtures shall comply with either BS 4887 or BS 5075 and shall not contain calcium chloride.

TABLE 24/1: Mortar Proportions by Volume

Mortar designation	Cement Lime: sand	Masonary Cement: sand	Cement Sand with plasticiser
(i)	1:0 to 1 / 4: 3	-	-
(ii)	1: ½ 4 to 4 ½	1:2 ½ to 3 ½	1:3 to 4
(iii)	1:1:5 to 6	1: 4 ½	1:5 to 6

4 The inclusion of lime in mortar designation (i) is optional. The proportions of lime given in Table 24/1 are for lime putty complying with BS 890. If the lime is measured as the dry hydrate, the amount may be increased up to 1.5 volumes for each volume of lime putty. Where a range of sand contents is given in the Table, the higher shall be used for sand that is well graded and the lower for coarse or uniformly fine sand.

5 Mortar shall be mixed thoroughly either by hand or mechanically until its colour and consistency are uniform. The constituent materials shall be accurately gauged, allowance being made for bulking of sand. Mortar shall be made in small quantities only as and when required. Mortar which has begun to set or which has been mixed for a period of more than one hour in the case of a mortar designation (i) or more than two hours in the case of other designations shall be discarded.

2405 Lime Mortar

1 Lime mortar shall consist of one part by volume of hydrated lime complying with BS 890 to 2.5 parts by volume of sand.

2406 Bricks

1 Clay bricks shall comply with the particular requirements of BS 3921 as described in Appendix 24/1.

2 Calcium silicate bricks (sand lime and flint lime) shall comply with BS 187.

3 Concrete bricks shall comply with BS 6073 : Part 1.

4 Bricks beneath frames for chambers and gullies, and for the construction of brick chambers, shall, unless otherwise described in Appendix 24/1, be Class B clay engineering bricks complying with BS 3921; or concrete bricks complying with BS 6073 : Part 1 having a crushing strength not less than 20 N/mm² when used for surface water drainage, or special purpose concrete bricks having a minimum cement content of 350 kg/m^3 when used for foul drainage and for situations where improved durability is required

2407 Blocks

1 Concrete blocks shall comply with the particular requirements of BS 6073 : Part 1 as described in Appendix 24/1.

2408 Reconstructed Stone

1 Reconstructed stone shall be used only in blockwork and shall comply with BS 6457 and any particular requirements described in Appendix 24/1.

2409 Natural Stone

1 Building stone shall be of the type and quality described in Appendix 24/1.

2410 Reinforcement

1 Wire or fabric, laid between brickwork or blockwork shall be austenitic stainless steel to BS 970 : Part 1 Type 304 S 15, 316 S 31 or 316 S 33, softened condition, excluding free machining specifications.

2 Steel bars laid between brickwork or blockwork shall be austenitic stainless steel to BS 6744 Grade 250 or 460, Type 304 S 31 or 316 S 33, softened condition, excluding free machining specifications.

2411 Anchorages, Dowels, Fixings and Ties

1 Anchorages, dowels, fixings and ties shall be austenitic stainless steel Type 304 S 15, 316 S 31 or 316 S 33, softened condition, excluding free machining specifications, complying with the requirements given in the British Standards listed in Table 24/2.

TABLE 24/2: Austenitic Stainless Steel

Form	Standard to be complied with
Strip	BS 1449 : Part 2
Rod	BS 970 : Part 1
Bar	BS 6744
Tube	BS 6323 : Part 8
Wire	BS 1554

2412 Brickwork and Blockwork

1 Brickwork and blockwork shall be laid on a full bed of mortar and bonded as described in Appendix 24/1. Single frogged bricks shall be laid with the frog uppermost. Perpends between bricks and blocks shall be filled with mortar before the next mortar bed is laid. Whole bricks and blocks shall be used except where it is necessary to cut closers or where otherwise agreed by the Engineer.

2 Brickwork and blockwork shall be built uniformly. Corners and other advanced work shall be stepped back and not raised above the general level more than 900 mm. Courses shall be kept horizontal and matching perpends shall be in vertical alignment.

3 Unless stated in Appendix 24/1, overhand work shall not be permitted.

4 Bed-joint reinforcement may have a 15 mm minimum of mortar cover to each masonry face. It shall not be laid dry on a bed face, but shall be completely embedded within the mortar bed thickness.

5 Where pointing is required in Appendix 24/1 the joint shall be raked out to a depth of 12 mm and after the completion of the entire facework, pointed in mortar as described in Appendix 24/1.

6 Where jointing is required in Appendix 24/1 it shall be done as the work proceeds to the finish described in Appendix 24/1.

2413 Stonework

General

1 Except where otherwise described in Appendix 24/1, the length of any stone shall not exceed three times its height. The breadth on the bed shall be not less than 150 mm, nor greater than three-quarters of the thickness of the wall.

2 All stratified stone possessing bedding planes shall be laid with its natural bed as nearly as possible at right angles to the direction of load. In the case of arch rings, the natural bed shall be radial.

3 Facework quoins shall be built to a height not exceeding 900 mm in advance of the main body of the work and adjacent walling stepped down on either side.

4 Stone facework between the quoins shall then be built to a height not exceeding 450 mm above the backing which shall then be brought up level with the completed facework. At no time shall the backing be built up higher than the facework.

5 Except for dry rubble walling, all joints shall be sufficiently thick to prevent stone-to-stone contact and shall be completely filled with mortar.

Ashlar

6 All stones shall be dressed to accurate planes on the beds and joints, and they shall be fair and neatly or fine tooled on the face as described in Appendix 24/1.

Block-in-course

7 Beds and joints shall be squared and dressed for a distance of at least 225 mm from the exposed face. Bond stones shall

form not less than one sixth of the area of the exposed face and shall extend at least 900 mm into the wall or for the full thickness of the wall if the latter is less than 900 mm. Unless described in Appendix 24/1 as tooled or worked, the exposed face of all stone shall be blocked and left rough. Arrises shall be dressed square at all beds and joints.

Squared Random Rubble Coursed and Uncoursed

8 All stones shall be truly squared and dressed on the beds and joints for a distance of at least 125 mm from the exposed face. Bond stones shall be provided at the rate of not less than one to every square metre of exposed face, and shall measure not less than 150 mm x 150 mm on the face, and not less than 450 mm or the full thickness of the wall if the latter is less than 450 mm. Sneck stones shall be not less than 75 mm in any dimension. Vertical joints shall not include more than three consecutive stones, and the horizontal lapping of the stones shall be not less than 100 mm.

Random Rubble Coursed and Uncoursed

9 All stones shall be carefully set with a bond stone provided at the rate of not less than one to every square metre of exposed face. Bond stones shall measure not less than 150 mm x 150 mm on the exposed face, and not less than 450 mm in length or the full thickness of the wall if the latter is less than 450 mm unless otherwise described in Appendix 24/1. For coursed work the joints shall be levelled as described in Appendix 24/1 and the backing flushed up in mortar.

Dry Rubble

10 Dry rubble stonework shall be constructed generally to the requirements of uncoursed random rubble stonework, as specified in sub-Clause 9 of this Clause but without mortar. All stones shall be carefully shaped to obtain a close fit at all beds and joints, any interstices between the stones being filled with selected stone chippings or spalls. The exposed tops or copings of dry rubble walls shall be formed as shown on the Drawings.

Special Stonework Including Quoins, Copings, Plinths, Voussoirs etc

11 Special stonework shall consist of selected stones dressed to the shapes and dimensions, and where required their faces worked, all as shown on the Drawings.

2414 Cold Weather Working

1 No bricks, blocks or stones shall be laid when the air temperature in the shade is below 3°C unless precautions are taken in accordance with BS 5628: Part 3.

2415 Protection of New Work

1 Immediately after laying and for 3 days thereafter, brickwork, blockwork and stonework shall be protected against the harmful effects of weather. The upper surface of newly laid brickwork, blockwork and stonework shall be protected against rain as the work proceeds until such time as the work is completed and the upper damp-course, coping or other finishing feature is laid.

2 All visible brickwork, blockwork and stonework and any surface below such work which is visible at the completion of the Works shall be clean and free from damage

and spillage. All purpose-made open joints shall be free from debris of any description.

2416 Brick, Block and Stone Facework Fixed to Concrete

1 Any loose material shall be removed from the concrete, and its surface washed with clean water before any bricks, blocks or masonry is laid.

2 The portion of the stainless steel fixing projecting from the concrete shall be completely embedded in the mortar of the facework and shall be kept back a minimum of 30 mm from the face of the brickwork and blockwork or 40 mm from the face of the masonry.

3 The cavity between brick and block facework and the concrete shall be completely filled as the work proceeds with mortar of the same mix as that specified for the facework.

4 The variation in depth, front to back of stones for natural stone facework shall not exceed that described in Appendix 24/1 and the space between the facework and the backing shall be completely filled as the work proceeds with concrete Class 15/10 complying with the 1700 Series.