CHAPTER 9 ADDITIONAL FILLING

Site and extent of filling.

S901. The Site as shown on the Drawing is to be reclaimed to the level of 20 feet above the Work Datumn by a local contractor. The work required hereof shall include additional filling from +20 feet to +23 feet, demolition and removal of temporary timber fence, concrete foundation of the old Customs Building, concrete structure in the water, and execution of sand drain method. The finished levels of the land shall be as specified on the Drawings.

The earthwork for the additional filling shall generally comply with Chapter 4, Section 4-2.

Removal of obstacle.

S902. The concrete and brick structures located on and about Pending Point shall be demolished to the extent that they no longer hinder the execution of the Works, and disposed of. Any other obstruction to the additional filling and the sand drain method shall be completely removed.

Materials from felling and demolition.

S903. The Contractor shall obtain the approval of the Engineer when he desires to use materials arising from the felling, demolition and removal.

Filling, generally.

S904. The additional filling shall be finished to within one inch of the level specified on the Drawings taking into consideration levels of the foundation of buildings and civil engineering structures, pavement, etc. The Contractor shall bring into the Site adequate quantity of fill taking into account the compaction by the roller, ground settlement, washout or loss by water, etc. Except where otherwise specified, the grade of all side slopes shall be 1:2.

Settlement of reclaimed land.

S905. The Contractor shall, at his own cost, make good all the settlement which may occur in the reclamation area during the period of the Works.

Survey of reclamation area.

S906. Before the commencement of the work, the Contractor shall carry out the plane survey as well as the levelling at the intervals of 100 feet of the reclamation area. The results of the surveys shall be arranged and submitted to the Engineer in the form of drawings. The cadastral survey pegs Nos. TBM 301, 494 and 495 shall be entered into such drawings.

Inspection and acceptance of additional filling.

S907. The difference of the original ground level and the finished level of the ground shall be measured. In order to measure the difference, holes shall be bored by means of earth augers or similar tools at a 100-foot grid or such other spacing as may be directed by the Engineer. For clear distinction and easy identification of the original ground, powdered lime or such other materials agreed shall

be placed at positions directed by the Engineer before the commencement of the additional filling.

The inspection and acceptance of the filling work and of the quantity of fill used shall be conducted after the completion of the work and immediately before the commencement of construction works on the reclaimed land. The date for the inspection shall be decided by the Engineer.

Execution of sand drain method.

S908. The displacement-type sand drain method shall be applied to the area indicated on the Drawing. All the details of the method and the order of execution shall be approved by the Engineer.

Sand mat.

S909. The sand used for the sand drain method shall be such that more than 80% is retained on No.200 sieve. The thickness of the mat shall be 2 feet, and its width shall be made at least 10 feet longer than the banking of fill as superimposed load. The sand mat shall be spread evenly on the surface of the reclaimed land within the tolerance of 2 inches.

In case the quality of fill used in the reclamation up to the level of 20 feet is, in the opinion of the Engineer, suitable for the aforesaid sand mat, the Engineer may order suspension of the execution of the sand mat for the area as shown on the Drawing.

Equipment used for sand drain method.

S910. The steel pipe and the driving equipment used in the execution of the sand drain method shall be approved by the Engineer. The outside diameter of the steel pipe shall be 16 inches and the thickness of its wall 1/2 inch. The pipe shall be equipped with a bottom shoe which may be opened and shut freely, a sand dumping inlet, an inlet for compressed air, accessorial devices for the driving and extraction of the pipe, and all other devices required for the formation of sand piles. The driving equipment of the steel pipe shall be mounted on a crawler or other type vehicle and equipped with the scaffold and hammer and the whole assembly shall be able to move freely. A sufficient number of spare pipes shall be provided on the Site.

Sand for sand piles.

S911. The sand to be used for the sand piles shall have the following grading:

Sieve Nos.	Percentage by weight passing sieves
200	0
100	10 - 25
50	30 - 70
40	40 - 85

30	50 - 95
16	65 - 98
10	75 - 100
8	80 - 100

The Contractor shall carry out the sieve analyses, bulk density test and specific gravity test of the sand used for sand piles, and submit the results together with samples to the Engineer for his approval. He shall carry out these tests at any time directed by the Engineer during the execution of the work.

Execution of sand drain method.

S912. The sand piles shall be driven on a 4-ft. grid, and these positions must be determined by an accurate survey and be clearly marked by pegs.

The steel pipe shall be driven vertically with the bottom shoe completely closed. If any earth has entered the pipe, the pipe shall be extracted and the earth removed before redriving. The pipe shall be driven through the clayey stratum down to the sand layer. The sand shall be fed into the pipe after ascertaining that the pipe has been driven down to the sand stratum. When extracting the pipe, the ascending of any sand along the inner shell wall must be checked without fail by means of an appropriate device. The breaking of sand pile halfway shall be rejected, and the Contractor shall redrive such sand piles if in the Engineer's opinion, found broken or sheared off inside.

Superimposed load.

S913. Materials having the same quality as that for the additional filling shall be used for the superimposed load, or banking load. The banking shall be done to the level of +28 feet or higher, and to the widths at least 10 feet longer than the specified piling area as measured at the top of slope. The fill used for the banking load shall be removed down to the specified level after the ground improvement work by sand drain method had, in the opinion of the Engineer, been completed, and the removed fill shall be used for filling.

The banking shall be done in uniform layers of 2 feet, and shall not be done to the specified level in one operation. A careful observation of all the behavior of the ground shall be continued during the banking, and if any abnormality is discovered, the operation shall forthwith be suspended for the instructions of the Engineer.

Appropriate protective measures shall be taken for the side slopes of the banking from being damaged by the rainfall. Should any slope be damaged, it shall forthwith be restored to the original state.

Consolidation period.

S914. The consolidation period by superimposed load shall be about 90 days from the date when the banking has been completed to the specified level.

Records of sand piles.

S915. The Contractor shall maintain daily record given below on all the driven piles and submit same to the Engineer at the close of the day's work:

1. Depth of driven pipe.

2. Quantity of sand used per pile.

Control of execution.

S916. The Contractor shall, during the execution of sand drain work, conduct the observation of the amount of settlement at 10 places designated by the Engineer by installing settlement measuring boards under the sand mat. The measuring board shall be made by connecting a steel pipe to a 4-ft. square steel plate, and be strong enough to withstand the impact of the banking operation and for subsequent observations, to the satisfaction of the Engineer. The observation of the amount of settlement shall be made daily by means of level surveying at fixed time from appropriate points free from the influence by consolidation. The results of the observation shall be arranged, plotted out and submitted to the Engineer.

In addition to the observation, the Contractor shall according to the instructions of the Engineer obtain undisturbed samples by boring, for the measurement of the uniaxial compressive strength. The number of bore holes required shall be 3 with boring depth of 40 feet each. The undisturbed samples shall be collected from silty layer at intervals of every 7 feet down.

Change of design.

S917. The Engineer may order the Contractor to modify the superimposed load and/or the loading time, depending on the results obtained in the execution control tests. The Contractor shall not be permitted to raise any objection to such order of the Engineer, but obey thereto.

CHAPTER 10 PAVEMENT

Extent of pavement.

S1001. All the roadways, open storage area and open parking lot in the area indicated on the Drawing shall be paved with asphalt.

Construction of pavement.

S1002. All the pavement shall be of the same construction and have a total thickness of 16-1/4 inches above the subgrade, consisting of 8-inch crusher run sub-base, 5½ inch graded base and 2¾ inch surface of wearing course and base course of hot rolled asphalt as described in the clauses following.

Kerb.

S1003. Clause S533 shall apply.

Compacting subgrade.

S1004. As described in the provisions of Chapter 4, Section 4-2, all the subgrade for the pavement shall be compacted to a CBR value of 5% or higher.

Compaction shall be carried out by means of approved compaction equipment operating over the whole area to ensure uniform compaction. Where the required CBR value cannot be obtained the Contractor shall excavate to a depth as directed by the Engineer, refill it with suitable material and compact to the required density. Where the suitable material cannot be obtained the Engineer may order to increase the total thickness of the pavement to achieve equal stability, but any increase in the cost will be borne by the Contractor.

CBR tests shall be conducted once in every 250 sq.yd., and if the results are unsatisfactory, two additional tests shall be conducted in the vicinity of the original site. If both tests satisfy the specification, the area represented by the tests shall be accepted.

Finish of subgrade.

S1005. The subgrade shall be finished to within 1/2 inch of the levels and profile indicated on the Drawings.

Structures adjacent to pavement.

S1006. All drains, manholes, kerbs and foundations of buildings adjacent to the pavement shall be completed, backfilled and consolidated before the sub-base is laid to the satisfaction of the Engineer.

Small spaces around the completed structures shall be compacted by hand or power operated hand rammer so that a density of not less than 95% at optimum moisture content, according to B.S. 1377 (1967), is achieved throughout.

Special attention shall be paid to the compaction of filling material placed over a distance 3 times the width of culverts from their sides so that 100% density may be achieved throughout. In this case, stricter selection of material for the subgrade shall apply.

Sub-base material.

S1007. Material for the sub-base shall be gravel or crusher run, unscreened and having the maximum particle size of 2 inches, and the plastic index of the material passing through No.40 sieve shall be not more than 6. The corrected CBR value shall be not less than 20%.

Laying of sub-base.

S1008. Material shall be spread and levelled in one layer by use of machines such as bulldozers, graders, aggregate spreaders, etc. The material shall be compacted by a macadam roller of 10 tons and above, or pneumatic roller of 8 to 15 tons or vibration roller of equivalent capacity.

When the material may have dried out excessively during the works, adequate water shall be sprinkled over the surface so that rolling may be performed at the optimum moisture content. If, prior to the completion of sub-base, the moisture content has become so high due to rain or other causes that the rolling cannot be done, then the rolling shall be postponed until the material is sufficiently dried, or a little quantity of cement or slaked lime shall be sprayed and mixed therein.

Finish of sub-base.

S1009. The sub-base shall be finished to the same accuracy as stipulated in Clause S1005. At the junction of sub-bases with different thickness or where the thickness has been changed by order of the Engineer, the bottom surface of such sub-base shall be formed by an even slope extending over a distance of at least 30 feet.

Base material.

S1010. Material for the base shall be a mixture of gravel, crusher run and sand at a proper ratio, and within the following grading limits:

Passing Sieve	Percentage by Weight
1½ in.	95 - 100
¾ in.	60 - 100
No. 8	20 - 50
No. 200	2 - 10

The maximum particle size of material shall be 1½ inch or smaller than a half of the thickness of the finished layer. The plastic index of the material passing through No.40 sieve shall be not more than 4, and the corrected CBR value of the graded mixture shall be not less than 80%.

Grading of material for base.

S1011. The material for the base shall be graded and shall satisfy the grading requirements stipulated in the preceding clause. The method of mixing and the type of mixer for the grading shall be subject to the approval of the Engineer.

Spreading and compaction of base material.

S1012. After the material has been uniformly mixed, it shall be spread evenly and levelled to the specified level and profile by means of a motor grader, or an aggregate spreader or manually where such machines cannot be used. The spreading and levelling of the material may be done in one layer. The base, after compaction, shall have a total thickness of 5½ inches.

The material thus spread shall first be lightly rolled by a roller of about 2 tons in weight, after which the surface shall again be graded to the required profile and levels. Main compaction shall then commence until the specified density is achieved. The compaction machine to be used shall be the same as specified for the sub-base, and different types of machines shall be jointly used as far as possible.

The material shall be at or near the optimum moisture content whenever the compaction is made. When excessively dried out, the surface shall be sprinkled with water and when the moisture content is too high, it shall be properly dried. The material spread and graded shall be fully compacted. When it is feared, before and during the compaction that fine aggregate may be washed away or that the sub-base or subgrade may be damaged by rain, the material shall be protected by suitable covers.

Finish of base.

S1013. The base shall be finished to within 1/4 inch of the levels and profile indicated on the Drawings.

Prime coat.

S1014. After the base has been completed, the prime coat shall be applied immediately and within the day of the work. Cutback asphalt or asphalt emulsion complying with B.S. 434 (1960) shall be used for the primer at the rate of 0.4 British gallon per square yard. In applying a proper viscosity shall be given to the primer under normal temperature or by heating it if necessary, which should be sprayed evenly by means of the distributor or sprayers.

The base coated with the primer shall then be cured for at least 24 hours after spraying to allow full permeation of the primer and the evaporation of its volatile contents.

When vehicles are to be allowed on the coated base due to unavoidable reasons after the spraying of the primer, a layer of coarse sand shall be spread

over the surface for protection. Any primer coat damaged by the traffic shall forthwith be made good by spraying another coat. Any loose sand on the primer shall be completely removed prior to the paving of the road surface.

Tests for base.

S1015. Before or during the paving works, the Engineer shall inspect and carry out tests, where necessary, to ensure that the required compaction is maintained on the base. The Contractor shall not proceed with the subsequent stages of work without the approval of the Engineer.

The Contractor shall provide all the equipment and devices necessary for the tests given below, and carry out the tests in the presence of the Engineer.

1. Tests on moisture content and density.
2. Measurement of density in situ.
3. CBR tests in situ.

These tests shall be conducted in accordance with B.S. 1377 (1967) and B.S. 1924 (1967), at least once in every 250 sq.yd. of the area to be paved.

Asphalt mixture general.

S1016. Except where otherwise specified or directed by the Engineer, the mixing and laying of asphalt mixture shall comply with B.S. 594 (1961), "Rolled asphalt (hot process)".

Tack coat.

S1017. Where the surface of the prime coat is soiled, or where directed by the Engineer, a tack coat of cutback asphalt or asphalt emulsion shall be applied at the rate of 0.2 British gallon per square yard.

Mix for base course and wearing course.

S1018. The surface of hot asphalt mixture shall comprise a 1½-inch base course and a 1¼-inch wearing course. The compacted and finished surface shall have a total thickness of 2-3/4 inches.

Aggregates and the quantity of bitumen for the base course shall be graded as follows:

Passing Sieve No.	Percentage by Weight
1 in.	100
¾ in.	95 -100
½ in.	70 - 90
No.4	45 - 55
No.8	20 - 35
No.30	10 - 22
No.50	6 - 16
No.100	4 - 12
No.200	2 - 6
Bitumen % by weight	4.5 - 6.5
Max. particle size	3/4in.

The following shall apply to the wearing course:

Passing Sieve No.	Percentage by weight
3/4 in.	100
1/2 in.	95 - 100
No.4	55 - 75
No.8	35 - 50
No.30	18 - 29
No.50	13 - 23
No.100	6 - 16
No.200	4 - 8
Bitumen % by weight	5.0 - 7.0
Max. particle size	1/2 in.

Stones for asphalt pavement.

S1019. The aggregates used for the asphalt pavement shall be crushed stones, homogeneous, clean, hard and durable, and shall not contain flaky or elongated particles, clay, organic impurities, etc. in any amount deleterious to the strength of the pavement. The specific gravity shall be not less than 135 lbs. per cu.ft., the moisture absorption not more than 3.0% and the abrasion loss not more than 35%. Bitumen shall comply with the provision of Chapter 3, where applicable.

Supply of Pre-mix asphalt.

S1020. All the pre-mix asphalt for the surfacing of roadways, open storage yard and other work in the Contract will be supplied, under the Provisional Sums item, by the Employer ex. Pre-mix Asphalt Plant operated by the Sarawak Public Works Department at Stabar Quarry, Kuching.

Transport of Pre-mix asphalt, etc.

S1021. The Contractor shall make his own arrangement for the supply of labour and suitable tipping lorries to transport asphalt mixture from the Plant at Stabar Quarry to the Site, and shall place such asphalt surfacing materials as quickly as possible and directly from the tipping lorries at all times. The lorries shall be thoroughly cleaned each time before loading, and the inside surface of the loading platforms shall be coated with oil as necessary to prevent the mixtures from sticking to the surface.

Laying of asphalt pavement.

S1022. Asphalt finishers shall be used for the laying of the asphalt pavement. Before laying, the surface of the base or the base course shall be thoroughly cleaned and blown of all dust, mud, loose aggregates, etc. and checked for the accuracy of the prepared surface.

At the time of laying, the temperature of the mixture shall not be below 230°F. The work shall forthwith be suspended at the time of rain. The laying shall be done continuously, and the types of finishers, the methods and the speed of work shall be subject to the approval of the Engineer.

At places where the operation of finishers is difficult, the mixture shall be laid by hand. The Contractor shall engage skilled experienced labourers in the work.

Compaction of asphalt mixture.

S1023. Upon the completion of the laying the compaction shall be commenced immediately. Three-wheeled rollers, tandem rollers and pneumatic rollers shall be used for the compaction, and their specifications shall be subject to the approval of the Engineer.

The initial rolling shall be done by the three-wheeled roller of 8-10 tons weight. The standard number of passes of each roller shall be 2 times, and the rolling shall be done from the edge towards the center of the pavement. Pneumatic roller shall be used for the second rolling, and tandem roller for the finish rolling shall be done while the creases may be ironed out. Rolling shall continue until the required density and finish surface are obtained. The rollers shall not be allowed to stand for too long a time on the freshly finished surface.

Joints.

S1024. The transverse and longitudinal joints of the pavements and the joints alongside any structures shall be thoroughly compacted. All joints of different layers shall be staggered vertically. Tack coat shall be applied to the joints and surfaces of the pavements in contact with structures so that the asphalt mixtures may be well bonded thereto.

Surface finish.

S1025. The finished surface of the wearing course shall not depart more than 1/4 inch from the levels and profile shown on the Drawings or as directed by the Engineer.

Testing.

S1026. The testings of bituminous materials and asphalt mixtures used for the paving shall comply with B.S. 3235 (1964), "Test methods for bitumen", and the frequency of tests shall be determined by the Engineer. The cores of the laid and hardened asphalt mixtures shall be taken by boring at the rate of one per every 1,000 sq.yd.

Traffic on completed work.

S1027. No traffic shall be allowed on the completed work until the surface has been cured to the satisfaction of the Engineer. For two weeks after any roadway has been opened to traffic, steps shall be taken to avoid the concentration of vehicles along a single lane.

Parking line.

S1028. Over the whole paved surface of the parking lot, 4-inch broad parking lines shall be clearly and neatly drawn with approved white paint, a drawing of which will be provided by the Engineer. The surfaces to be marked out shall be clean and dry.

CHAPTER 11 DRAINAGE

Drainage.

S1101. For the drainage of rain water, and disposal of sewage and other waste water, drains shall be provided as shown on the Drawing. The drains shall consist of open drains, culverts, manholes, outfalls leading to the rivers, and gratings. Under the existing road the drains shall be connected with culverts as shown on the Drawing.

Excavation and backfilling.

S1102. The excavation for the construction of drains and backfilling upon completion shall be executed in accordance with Chapter 4, Section 4-2. The backfill in the vicinity of the drains adjacent to pavements or other structures shall be compacted according to foregoing provisions where applicable and in such a manner that it will in no way adversely affect the pavements, or other structures. Should the surface of the adjoining pavements or other structures be damaged, they shall be made good all at the expense of the Contractor.

Open drains.

S1103. All the open drains excavated to the required cross sections and falls shall be inspected by the Engineer, and block stones shall be placed on foundation and thoroughly rammed down to the levels and falls as indicated on the Drawing. Stones to be used shall comply with provisions of Chapter 3. Sand shall be spread over the stones to the specified thickness, and well sprinkled with water before concrete is placed.

Open drains shall be of reinforced concrete, and have such cross section and fall as indicated on the Drawing at the respective positions. The junctions with manholes shall be formed with such a sharp fall as indicated. The concrete work, and the cutting and bending of reinforcing bars shall comply with Chapter 4, Section 4-1. Precast concrete slabs shall be used for the side slopes of the main drains.

Culverts.

S1104. The drains crossing the roadways at four specified locations shall be finished in the form of culverts. Upon the completion of excavation, block stones shall be placed on the bed and thoroughly rammed down, and sand spread over the stones. A layer of concrete shall be applied on top of the sand, before the reinforced concrete pipes as specified in Chapter 3 and shown on the Drawing are to be laid to the specified falls. The joints of R.C. pipes shall be fitted with collars or socket joints which shall in turn be sealed by cement mortar to prevent any leakage of water. The connection with manholes, etc. shall also be sealed in the similar manner. The backfilling shall be done with special care, and only selected materials shall be used.

Manholes.

S1105. For the connection of open drains with culverts, manholes shall be provided at the 6 locations shown on

the Drawing. The manholes shall be made of reinforced concrete to the shape and dimensions as shown on the Drawing. Each manhole shall be provided with a cast iron manhole cover and frame as specified in Chapter 3. The reinforced concrete work shall comply with Chapter 4, Section 4-1.

On the bottom of manholes, mortar shall be placed to form an invert flush with the shape of open drains or culverts so that water can flow freely.

Outfalls.

S1106. The outfalls of drains to the Sungai Sarawak and Sungai Kuap shall be of such construction as indicated on the Drawing. The outfalls are to be provided within the anti-erosion work, and their junction shall be done according to the instructions of the Engineer.

Sungai Sarawak: The ground shall be excavated or backfilled to the specified shapes and dimensions. For the foundation of the outfall, 8in. x 2in. x 10ft. Belian sheet piles shall be driven in accordance with provisions of Clauses S325 and S703. The front of apron shall be enclosed by Belian sheet piles driven on three sides, the interior thereof being covered with Stellar sheet stated in Clause S340, and on the top, stone blocks weighing more than 450 lbs. a piece shall be placed. Belian piles shall be driven under the side walls of the fallout proper and, besides, Bakau piles of 6 inches in diameter at mid-length and 20 feet in length shall be driven at positions indicated on the Drawing as foundation piles. The driving of piles shall be done in accordance with Chapter 4, Section 4-3. Above the Belian sheet piles and Bakau piles, block stones shall be laid one foot thick, and then a layer of 3 inch thick concrete shall be placed on top. The outfall proper shall be made of reinforced concrete complying with provisions of Chapter 4, Section 4-1.

Sungai Kuap: The construction of the outfall shall conform to that of the open drains. Belian sheet piles similar to those used for the Sungai Sarawak shall be driven for the foundation and also for protection against erosion.

Gratings.

S1107. Mild steel gratings shall be of the quality as specified in Chapter 3. The shape and size of the gratings and the positions to be fitted are shown on the Drawing. Anchor bars shall be welded to the angle frame to receive the grating, except the Types D and E. The angle in contact with the grating shall be straight, and its surface flat.

The gratings shall be securely placed in position so that they will not give off any rattling sound, or otherwise sanctioned by the Engineer.

BUILDING AND SANITARY WORKS

Dimensions.

S1201. Written or figured dimensions on the Drawings are in all cases to be preferred to scaled dimensions, and where these have been omitted the Contractor is to refer to the Engineer.

Quality of materials and standards of workmanship.

S1202. Clause S301 shall apply.

Notice board.

S1203. The Contractor shall provide and fix in a position to be determined by the Engineer a framed notice board, size 8'0" x 9'0", of required design and wording. The notice boards shall include for Sub-contractor, Nominated Sub-Contractor, the Engineer, and others, when required, and be fixed in accordance with the direction of the Engineer.

No other boards or advertisements will be permitted to be displayed on or around the Site.

All boards shall be removed on completion of the Works.

Setting out.

S1204. The Works shall be set out by the Contractor with 2" x 2" pegs standing about 3'0" above ground level and painted white, and all setting out shall be approved by the Engineer before any work is commenced. No such approval shall in any way relieve the Contractor of his responsibility for the accuracy of the setting out of any works.

Measurement on site.

S1205. All joinery and similar works shall be subject to inspection and exact measurements on the Site, where necessary, to ensure the accurate fitting of work.

Protection of materials on site.

S1206. The Contractor including the Nominated Sub-Contractors shall provide all stores, sheds, covers, etc., necessary to prevent damage or loss by weather or any other cause to materials delivered for use in the Works.

Stair nosings shall be specially protected, and sanitary fittings and other works and fittings liable to be damaged shall be cased up. All such coverings shall be removed on completion, and any ground on surfaces requiring reinstatement shall be made good.

Nominated Sub-Contractor.

S1207. Where Provisional Sums are included in the Contract for materials to be obtained from Nominated Sub-Contractors, the Contractor shall take delivery at the place stated, load and transport to the Site, if so required, and unload, store and distribute, assemble and fix in the Works as specified.

Any landing dues or charges, wharf labour costs, storage charges, stamp duties, bank charges, customs import duty, and any other commissions and charges incurred shall be paid and allowed for by the Contractor. This does not, however, apply to such charges incurred before the point of delivery to the Contractor.

The Provisional Sums for materials obtained from Nominated Sub-Contractors shall be deemed to include normal unavoidable waste in cutting and fixing; the Contractor shall also allow for the cost of replacing any material otherwise damaged or lost, which will not be paid as part of the Provisional Sum.

Application of this Specification.

S1208. Preliminaries and descriptions of materials, goods and workmanship given in any one chapter or work are to apply throughout this Specification unless otherwise specified. Where British Standards or Codes of Practice (hereinafter referred to as "B.S." and "C.P." respectively) differ therefrom in any respect they shall be regarded as superseding this Specification unless otherwise specified.

Access.

S1209. The Contractor shall provide at all times during the execution of the Works and Maintenance Period proper means of access, with ladders, gangways, etc. and necessary attendance for the inspection or measurement of the Works by the Engineer or his representatives.

Barricades, fans, screens, etc.

S1210. The Contractor shall provide all necessary barricades, fans, fence, screens, etc. for the protection of the workpeople, other occupants, adjoining property and the public; and alter, adapt and maintain them as necessary.

Leave Works perfect.

S1211. On completion, the whole of the Works is to be left clean, perfect and in good order. Floors and glass are to be thoroughly cleaned, gutters, channels and drains are to be cleared out, ironmongery and all other moving parts are to be oiled and adjusted as appropriate, and any chipped or marked decorations shall be made good.

All plant and surplus materials are to be cleared away on completion, and all works and any area disturbed shall be made good.

Commencement of building works.

S1212. No building works shall be commenced until the expiry of the period of at least 8 months after the completion of filling, except the transit shed, or otherwise approved by the Engineer in writing.

Standards to be kept on Site.

S1213. B.S., C.P. and other standards related to the Works shall be kept by the Contractor on the Site for use by the Engineer, when necessary.

CHAPTER 13 EXCAVATION AND EARTHWORK

General.

S1301. The Site for the building work will be reclaimed to a level of 23.0' as specified in the Civil Engineering Works. (See the Specification for the Civil Engineering Works) and any excavation below the said level shall be included in the Building Works.

The Contractor must obtain the written approval of the Engineer before the commencement of excavation for buildings including sanitary works.

Nature of ground.

S1302. With regard to the ground conditions, reference is made to the boring logs and other data given in the drawings for Civil Engineering Works.

Unless otherwise specified the Contractor shall allow in for excavation in ground of any nature with the exception of rock as defined below, for which additional payment will be made provided that the Engineer is notified at the time when the excavation is carried out.

"Rock" means material which cannot be removed by changkol, spade, pick or by hand without the use of hammer and wedges, levers, explosives or similar means, but does not include loose stones, weathered shales or boulders smaller than 1 cu.ft. which can be removed without being broken up.

Inspection of excavation.

S1303. The Contractor shall give notice to the Engineer on completion of excavation. Foundations, drains, etc. shall not be laid until the excavations have been inspected and approved by the Engineers.

Existing Services.

S1304. Where existing drains, electricity and water mains or other services are encountered during excavation, the Contractor shall carefully support and protect such services and forthwith notify the Engineer for his instruction.

Excavation below required depth.

S1305. Should any excavation be made without authority to greater depths than shown on the Drawings or instructed by the Engineer, the Contractor shall fill in to the correct level with Class Z concrete.

Planking and strutting.

S1306. The Contractor is to plank and strut or shore up the sides of all excavations as necessary, and is to carefully remove and clear away same on completion. The Contractor is to be absolutely responsible for the safety of any excavation.

Levelling and ramming.

S1307. Bottom of all excavations shall be levelled, trimmed and well rammed to required level or fall.

Water in excavation.

S1308. No water may be allowed to accumulate in any excavations which shall be kept dry by pumping, baling or otherwise to the satisfaction of the Engineer.

Filling.

S1309. Excavation around all foundations, etc. shall be backfilled with selected excavated material up to original ground or required level.

Filling and reinstatement shall be deposited in each layer not exceeding 9" in thickness and then consolidated thoroughly with the addition of water if and where required.

All mud, rubbish, timbers and similar materials are to be removed before any filling is commenced.

No back-filling is to be carried out until the foundations have been inspected and approved by the Engineer.

Hardcore.

S1310. Hardcore shall be hard and dry stone or concrete broken to pass a 4" ring graded sufficiently for adequate consolidation, and free from dust.

Hardcore is to be well rammed and consolidated, and the surface is to be levelled or graded as required and blinded with sand or other approved fine material.

Samples of hardcore and blind shall be submitted to the Engineer for his approval before use.

Reinstatement of pavings.

S1311. Where existing pavings, roadways, etc. which are not covered by the Works are broken up or damaged during the excavations, the Contractor shall make good to the satisfaction of the Engineer, or pay to the authorities concerned for any charges for such damages, according to regulations.

Permanent reinstatement shall not be carried out until materials back-filled have been left to settle for at least one month or longer, and a temporary surfacing shall be formed where necessary and instructed by the Engineer until then.

Disposal of surplus material.

S1312. Surplus excavated material shall be removed or deposited and spread over the lowland outside the Site in accordance with the direction of the Engineer.

Excavation drawings.

S1313. Before the commencement of any excavations, the Contractor shall submit to the Engineer for his approval the drawings indicating positions, widths and depths of these works and methods of shoring and drainage.

CHAPTER 14 PILING

Bakau piles.

S1401. Bakau piles shall be 5" in diameter and 30' long and shall be cut from a live, sound tree above the ground swell. The diameter specified is to be taken as that at mid-length, but the toe-end shall not be smaller than 3½". The piles shall be straight and free from warp as far as possible, and if warped, no part of the trunk shall protrude for its full girth beyond the centre line between both ends of the piles.

The tip of pile shall be tapered in the form of symmetric cone and the head shall be fixed with suitable steel ring as required during driving.

Belian piles.

S1402. Belian piles shall be 8" x 8" x 30' long. The point of pile shall be fixed with suitable steel shoe which should be truly concentric and firmly embedded on to the end of the pile. The head of pile shall be provided with steel bands for protecting the pile during driving. The design and type of the shoe and band shall be approved by the Engineer.

Storage of piles.

S1403. Storage of piles shall comply with Clause S428.

Pithcing, driving and trimmings.

S1404. Pitching, driving and trimmings of piles shall comply with Clauses S431 and S433 respectively.

In addition, the position of pile heads shall be measured at times during pitching and driving and the tolerance of the piles driven shall not be more than 4" out of position. Proper driving guide shall be provided for the accurate positioning of piles where necessary.

Piles which do not conform to the Clauses herein shall be condemned, extracted and correct piles be driven, at the Contractor's sole expense. The Engineer may at his discretion allow the condemned pile to remain.

Piles shall be pitched carefully and driven carefully to the specified depths. On completion of driving, the head of the piles shall be cut off square to the required level. Where piles have been driven beyond the specified level, stones shall be spread around such piles and rammed down with even slope to the specified level. Class Z concrete is then to be placed on the hollow above the hardcore.

If concrete caps are provided, the piles should be embedded for a depth sufficient to ensure transmission of load. The concrete shall be at least 6 in. thick outside the piles and be suitably reinforced to prevent splitting.

Piling programme.

S1405. Before piling is commenced the Contractor shall submit to the Engineer for his approval piling programme (including drawings) stating positions and descriptions of pile, pile driving procedure and particulars of pile driving equipment to be used.

Trial piles.

S1406. Before main piling is commenced for all buildings and structures, trial piles shall be driven at a position designated by the Engineer. The numbers of trial piles to be driven are as follows:-

Location	Type of Piles	Number
Transit shed	Belian	8
Vehicle shed	Bakau	6
Labourers canteen	do	6
Security & time-keepers offices	do	1
First aid & fire stations	do	2
Sheltered carpark	do	3
Sheltered exit	Belian	4
Toilet	Bakau	1
Toilet and washroom	do	1
Incinerator	do	1
Septic tank	do	3

Trial piles shall be driven by using the same piles and pile driving equipment intended for the main piling.

All pile driving records shall be taken in accordance with the items listed in Clause S435 and the results are to be submitted to the Engineer everyday after completion of the work.

All the trial piles driven shall be regarded as regular piles if such piles are acceptable to the Engineer.

Permanent bearing loads designed for Belian and Bakau piles are as follows:-

i) Belian piles for transit shed - 5^{T}/pile.

ii) Belian piles for sheltered exit - 3.5^{T}/pile.

iii) Bakau piles for all buildings - 1.7^{T}/pile.

Load test.

S1407. Before main piling is commenced, load test shall be carried out on 4 Belian and 4 Bakau piles designated by the Engineer. Test load on piles shall be three times the design bearing capacity and shall be applied in 5 increments or more, and both the increment load and settlement against time shall be recorded during the loading. The Contractor shall submit to the Engineer for his approval a detailed programme and a list of equipment for the test.

Record of pile driving.

S1408. The Contractor shall take full records on all the regular piles driven in accordance with the items listed in Clause S435, and these records shall be neatly arranged and submitted to the Engineer for his approval on the day following the piling.

Cement.

S1501. Portland cement shall comply with Clauses S316 and S317.

Fine aggregate.

S1502. Fine aggregate shall comply with Clauses S318, S320 and S321.

Coarse aggregate.

S1503. Coarse aggregate shall comply with Clauses S318, S319 and S321 and, in addition, coarse aggregate is to be of ¾" nominal size which should be graded to comply with the following:-

Mesh of square screen (measured in clear)	Percentage by weight passing sieve
1½"	100
3/4"	90 - 100
3/8"	25 - 55
3/16"	0 - 10

All-in aggregate.

S1504. All-in aggregate shall comply with Clauses S1502 and S1503 and also with the following grading:-

Mesh of square screen (measured in clear)	Percentage by weight passing sieve
1½"	100
3/4"	90 - 100
3/16"	30 - 50
B.S. No. 25	10 - 35
B.S. No. 100	0 - 6

Steel reinforcement.

S1505. Steel reinforcement shall comply with Clauses S310 and S311.

Unless otherwise sanctioned by the Engineer, test certificates shall be submitted with every consignment of steel, marked to correspond with the identification marks on each batch of steel supplied.

Where the test certificates are unsatisfactory to the Engineer, further tests shall be carried out in accordance with the instruction of the Engineer.

If any sample failed to meet the specified requirements, the entire batch from which it was taken shall be condemned and removed from the Site at the Contractor's sole cost.

As for the test on reinforcement, tension and bending tests on representative samples, in principle, of each 10 ton lot or part thereof for each dimension are to be carried out.

Admixtures.

S1506. Admixtures are not to be used without the permission of the Engineer.

Water.

S1507. Water to be used in the concretor shall be clean water, and no sea water is to be used. Clause S324 shall apply.

Bending and fixing reinforcement.

S1508. Bending and fixing of reinforcements shall comply with Clause S411.

In addition, steel reinforcements shall be lapped at the point of least shear stress. Unless otherwise specified, the lap and anchor length of joints shall comply with the requirements shown in the table below:-

	Deformed bar	Ordinary round bar
Tension Bars	40 D	35 D
Compression bars and bars with small stress	30 D	25 D

Note:- D means nominal diameter of bar.

No hook is required for the ends of deformed bar, but for ordinary round bars, hooks complying with C.P. 114 (1957) are to be used at the ends. The measurement of anchor and lap lengths is taken to the centre of diameter respectively.

The cover to bars shall comply with the following, unless otherwise specified or shown on the Drawings:-

Suspended slabs and walls	7/8"
Columns and beams	1½"
Walls, columns and beams in direct contact with earth	1-5/8"
Foundations (excluding blinding layer of concrete)	2-3/8"

The minimum horizontal or vertical distance between two parallel steel reinforcements shall be less than one and half times the diameter of the bar or 1", whichever is the greater.

Formwork and centering.

S1509. Formwork and centering shall comply with Clause S409.

In addition, formwork is to be used for the sides and underside of all reinforced concrete work, including that in the ground, except as provided below:

(a) above a hardcore or similar bed blinded with fine material,

(b) above a layer of waterproof building paper (30/30 grade "Sisalkraft" or equal approved) or other approved material, or

(c) above a 2" blinding layer of concrete.

Wire ties are not to be used.

Formwork to columns and walls is to be so constructed, by forming temporary openings on the most lightly reinforced face, that the height of pouring concrete shall not exceed 5 feet. Temporary openings for cleaning of rubbish and loose materials are to be formed at the lower part of formwork. The interior faces of formwork are to be wetted with clean water before concrete is placed. Shutter oil in principle is not to be used.

Unless written approval is given by the Engineer, no formwork and centering is to be removed until the expiry after concreting of the periods stated below, and the Engineer may require these periods to be extended if the concrete test cube results make this desirable or if, in his opinion, the concrete has not set sufficiently:-

Slabs:	Soffits (props left under)	4 days
	Props	10 "
Beams:	Sides	3 "
	Soffits and props	16 "
Columns and walls:	.....	3 "

Concrete quality.

S1510. The concrete quality required for the various classes specified is to be as tabulated below, each class complying with both the following requirements:-

(a) 6" Works test cube 28-day strength.
(b) Stated limits for mix proportions,
either (i) by minimum weight of cement per cubic yard of concrete.
or (ii) by nominal volumetric mix.

Class	(a) Minimum 28-day strength	(b) Mix Proportions	
		EITHER (i) Minimum weight of cement per cu.yd. concrete	OR (ii) Nominal volume-tric Mix
X	3,750lbs./sq.in.	600 lbs.	(1:1½:3)
Y	3,000 "	500 "	(1:2:4)
Z	1,650 "	(330 ")	1:3:6

Class X and Class Y concrete are to be determined in accordance with (a)(b)(i) and Class Z concrete with (a)(b)(ii).

Proportioning by minimum weight of cement.

S1511. Where mix proportions are determined by (a)(b)(i) of Clause S1510 (Class X and Class Y concrete), the actual mix proportions will be based on the results of 28-day preliminary test on test cubes made from trial mixes of varying proportions. The degree of quality control on Site is also to be considered and the actual mix proportions to be used on the work to achieve the specified quality are to be agreed with the Engineer on the basis of the following table of strengths:-

Class	Minimum 28-day works test strength (lbs./sq.in.)	Required 28-day preliminary test strength (lbs./sq.in.)		Indicative 7-day preliminary test strength (lbs./sq.in.)	
		Control^{x}	Control^{y}	Control^{x}	Control^{y}
X	3,750	5,400	6,500	3,700	4,500
Y	3,000	4,300	5,500	3,000	3,800

Degree of Control 'x' For this degree of control the aggregate is to be of first quality and the fine and coarse aggregates are to be batched separately and by weight only, the moisture content of the aggregates is to be tested throughout the day as atmospheric conditions vary, mixing is to be by machine with full tests for strength and workability being carried out, and concrete is to be manufactured under strict supervision.

Degree of Control 'y' For this degree of control the aggregate may be of normal quality (including all-in aggregates) with volumetric batching of aggregates.

Preliminary tests are to comply with the requirements mentioned above and Clause S402.

Proportioning by volumetric control.

S1512. Where the mix proportions are determined by (a)(b)(ii) of Clause S1510 (Class Z concrete), the dry proportions are to be as follows:-

Cement	Fine aggregate	Coarse aggregate
1 cwt.	3-3/4 cu.ft.	7½ cu.ft.

The ratio of fine to coarse aggregate, however, may be varied with the approval of the Engineer, and shall be varied if so required by him, where the nature of the aggregates makes this necessary in order to produce a dense and workable concrete.

All-in aggregates.

S1513. Where separate coarse and fine aggregates are not available, and if approved in writing by the Engineer, all-in aggregate may be used. The mix proportions are to be determined by sieve analyses and trial mixes of the aggregate.

Testing of concrete.

S1514. Testing of concrete, remedial action to be taken when samples are rejected by the Engineer and laboratory are to comply with Clause S403, S404 & S405 respectively.

Two test cubes are to be taken for each day's concreting or for each 20 cubic yards of concrete as the concrete comes from the mixers. One is to be used for 7-day test and another 28-day test.

Measurement of all materials for concrete.

S1515. Measurement of all materials for concrete is to comply with Clause S406.

Producing plant.

S1516. Concrete producing plant is to comply with Clause S407.

Mixing.

S1517. Mixing of concrete is to comply with Clause S408.

Conveying and placing.

S1518. Coveying and placing of concrete is to comply with Clauses S412 and S413 respectively.

Compacting.

S1519. Concrete is to be thoroughly compacted with flat tampers, shovels and rodding when in position so that it may flow entirely and solidly around the reinforcement without leaving any void.

Mechanical vibration is to be adopted only where so specified or approved, and subject to the following conditions:-

(a) Methods of vibration shall not cause separation or segregation of the aggregate and cement components of the wet concrete.

(b) Vibration shall not disturb concrete which has recently begun to set.

(c) All details of the proposed vibration plant and manner of application shall be submitted to, and shall be subject to the approval, of the Engineer. Permission and/or approval do not relieve the Contractor from his liability to make good work which may be damaged by excessive or ill-applied vibration.

Consistency.

S1520. The consistency of the concrete is to be checked approximately 10 times a day, as directed by the Engineer, by means of the standard slump test. The details of the test are to be as follows:-

The test specimen is to be formed in a mould in the form of a truncated cone open at both ends, constructed of iron or brass. The height of the cone is to be 12", its bottom diameter 8" and its top diameter 4". The mould is to be placed on an iron plate. Concrete is to be filled in layers not exceeding 4" deep, each layer being punned 25 times with a 5/8 " diameter pointed rod. The top of the concrete is to be struck off and smoothed flush with the rim of the mould. The mould is then to be removed by a steady vertical lift, and the concrete allowed to subside until it comes to rest. The slump is then to be measured and for good aggregates should not exceed the following:-

For Class X and Y concrete ..... 3"

For Class Z concrete ..... 4"

The Contractor is to provide two sets of apparatus for slump test and necessary labours for the measurement.

Where the consistency, in the opinion of the Engineer, is not adequate for the requirements of this Specification, judging from the conditions of the concrete after removal of the mould, trial mixes of other mix proportions are to be carried out in accordance with the directions of the Engineer. Where so required by the Engineer, trial concreting is to be carried out in such a manner as:-

The Contractor is to provide a section of formwork complete with reinforcement fixed in position and generally representative of the sections commonly to be employed during the Contract. The capacity of this trial section of formwork is to be at least half a batch of concrete, but in any case not less than 8 cu.ft.

The mould is to be filled, in the presence of the Engineer, with concrete of the same mix and batch from which the preliminary test cubes are made and is to be compacted in the same manner and with the same equipment proposed for

the Works, and the time of mixing and conveying is to be noted.

The forms are to be removed within two hours of placing the trial mix, and the concrete is to be inspected. This procedure is to be repeated with modified mixes until the appearance of the concrete is acceptable to the Engineer, after which it is to be used as the standard for that grade.

Notice of concreting.

S1521. Before concreting is commenced the Contractor is to give notice to the Engineer and obtain his approval. If due notice is not given, the Engineer may require the Contractor to remove at his expense any concrete so placed.

Depositing concrete under water.

S1522. No concrete is to be deposited under water unless the specific direction of the Engineer has been obtained in writing that the work should be so undertaken. The cement content of such concrete is to be increased by an amount not less than 25 per cent of the minimum quantities. The process of concreting is to be approved by the Engineer.

Construction joints.

S1523. All construction joints, whether at the end of the day's work or at any other stoppage exceeding two hours, are to be made as directed by the Engineer. The shape and positions are to be approved by the Engineer.

Unless otherwise specified, joints are to be made at places of minimum shear stress, generally at right angles to the main reinforcement. Joints at the top of columns are to be 1" below the level of the lowest beam.

All joints in slabs, beams and walls, and in columns exceeding 12" x 12", are to be rebated or joggled unless otherwise required or approved. Joints, except where unnecessary, are to be accurately formed with the formwork to prevent undue leakage of mortar through reinforcement.

Within 24 hours, where practicable, after placing of the concrete, the surface of concrete at a construction joint is to be roughened, all laitance and scum are to be removed and any concrete which has flowed past the formwork is also to be removed.

Before placing any concrete against existing at a construction joint, the existing face is to be wire brushed to remove all loose material and soaked with water, and a thick mortar of cement and sand is to be applied, the proportion of cement to sand in the mortar being the same as in the concrete. The mortar is to be applied while freshly mixed and immediately before the new concrete is placed.

Curing.

S1524. Curing of concrete is to comply with Clause S415.

Testing of liquid-retaining structures.

S1525. Every concrete structure (including septic tank and filter) designed to retain liquid is to be tested for water-tightness on completion, in the following manner:-

All internal surfaces are to be cleaned and washed down as soon as possible after completion of the structure and the installation of associated pipes, valves, etc. All valves and outlets are then to be closed or stoppered, and the structure filled with water and the level recorded. The water is to be maintained at this level for a preliminary period of 14 days, and brought exactly to level at the end of that period. The work is then to stand for a test period of 24 hours, during which period no further water is to be allowed to enter from rainfall or other source. The level at the end of test period is to be recorded.

If during the test period there is a fall in water level which is not in the opinion of the Engineer due to evaporation, or if during either period the external surface of the concrete shows signs of dampness, the Contractor shall at his own expense investigate and make good all defects and subsequently re-test the work in the same manner, and this shall be repeated if necessary until the work is approved.

The Engineer may order any test to be stopped before completion if he considers the work to be insufficiently watertight, and the Contractor is then to investigate and make good all defects before re-testing.

On completion of testing the Contractor is to remove the water by approved means.

Normal surface finish.

S1526. After removal of the shuttering, the surface of all concrete is to be brought to a true surface and all defective portions of the face repaired, all cavities filled and any projection removed. In the event of parts of the concrete being honeycombed, such portions are to be cut to a depth and shape required by the Engineer and made up with fine concrete of equal quality. For plastering and asphalt finishes, concrete surfaces are to be hacked to form a key.

Watering of beds.

S1527. Hardcore and other beds, including excavated or filled formations, are to be well watered before concrete is laid thereon unless a layer of waterproof building paper (30/30 Grade "Sisalkraft" or equal approved) or other approved material is used.

Classes of concrete.

S1528. Unless otherwise stated, the classes of concrete to be used are as follows:-

Class X ... Weighbridge pits, septic tanks, filters and precast concrete,

Class Y ... Reinforced concrete (including foundations, footings, ground slabs and steps,)

Class Z ... Blinding layer, plain aprons and steps.

Foundations.

S1529. No brick is to be laid on concrete foundations or footings until at least three days after the concrete has been laid.

Beds and pavings.

S1530. All ground slabs, aprons and pavings (not being structural reinforced concrete) are to be laid in alternate bays not exceeding 15' 0" in either direction unless otherwise specified. Where no expansion joint is specified a strip of bituminous felt is to be cast in the joint (including abutments against columns, walls, beams, etc.) for the full depth of concrete (or for the full depth of the concrete above the reinforcement in the case of lightly reinforced slabs).

Aprons around buildings and pavings outside buildings are to have expansion joints between each bay, formed with ½" fibreboard for the full depth of the concrete and with the top 3/4" depth filled in with approved mastic jointing compound (finished level with the top of the cement or other paving, if any).

Aprons.

S1531. Aprons around buildings are to be 4" thick Class Z concrete unless otherwise stated and are to be laid to falls and rendered while still green in cement and sand (1:3) 3/4" thick trowelled smooth.

Precast concrete.

S1532. Precast concrete work is to comply generally with the requirements for in-situ concrete.

Reinforced members such as lintels are to be clearly marked to show the correct way up, and all reinforced members are to be handled carefully to avoid undue stress.

Members for which no reinforcement is specified are to be suitably reinforced if necessary to avoid undue breakage in handling.

All exposed faces of precast concrete are to be finished fair or trowelled smooth. Faces to be plastered, rendered, etc. are to be left rough to form a key.

Precast concrete members are to be hoisted into position, set and jointed in cement mortar (1:3) and pointed on exposed faces, and are to be adequately strutted and supported.

Lintels.

S1533. The top ends of openings in brick are to have reinforced concrete lintels either precast or cast in-situ. Lintels are to be for the full thickness of the wall and are to comply with the following table unless otherwise stated:-

Clear span not exceeding	Bearing at each end	Depth	Reinforcement to each 4½" width or part thereof
4' 0"	6"	6"	One ½" diameter deformed bar
6' 0"	9"	9"	One 5/8" dia. deformed bar

Lintels exceeding 6'0" clear span are to be as shown on the Drawings.

Reinforcement is to be placed at bottom of lintel with 1" concrete cover.

Heelstones. S1534. Precast concrete heelstones are to be provided to feet of door frames where so shown on the Drawings. These are to be 6" high, shaped to the profile of the door frame, built 9" back in to the wall, and dowelled to the door frame.

Copings, cills, etc. S1535. Copings, cills, etc. are to be weathered on top and throated on underside, with all angles and stoolings neatly and accurately formed.

Bonding ties. S1536. Bonding ties are to be provided for all brick walls abutting concrete columns, walls, etc. Ties are to be 3/4" x 1/8" mild steel flats 12" long with fishtailed ends, and are to be bent and fixed to the formwork so that one end is cast into the concrete and the other end can be bent down after removal of the formwork and built into the walling. Ties are to be fixed 12" apart for walls not exceeding 4½" thick and 24" apart for those exceeding 4½" thick.

Items cast in. S1537. Where required to be cast in, anchor bolts, brackets, joists, pipes, etc. are to be accurately positioned and firmly supported until the concrete has set, and subsequently protected from damage.

Sundry labours. S1538. Leave or form all holes, mortices, chases, rebates, etc. and carry out all other labours shown on the Drawings or as necessary for the execution of the work. Such labours are to be carried out wherever possible by the use of sleeves, boxings, fillets, etc. fixed in the formwork: in the case of reinforced concrete these are to be approved by the Engineer before the concrete is poured unless shown on the Drawings, and reinforcement is to be adjusted to suit.

All bolts, brackets, lugs, etc. are to be grouted or pinned in solidly with cement mortar, and holes and chases for pipes, conduits, etc. are to be packed solidly with cement mortar or fine concrete.

Cutting reinforced concrete.

S1539. No reinforced concrete is to be cut away whether for holes, chases, mortices or any other purpose, without the written permission of the Engineer, except for plugging for screw or nail fixing, which is to be carried out by approved means.

Stanchion bases, etc.

S1540. Grouting to stanchion or machinery bases is to be carried out where possible by packing aggregate tightly under the base plate and then grouting in solidly with neat cement; where this is not possible cement and sand (1:1) mortar is to be run in solidly.

Waterproof concrete.

S1541. Waterproofing of concrete where specified is to be carried out with "Pudlo" or equal approved compound used in accordance with the manufacturer's instructions.

Working diagram of concretor.

S1542. Before concretor is commenced the Contractor is to submit to the Engineer for his approval the working diagram showing dimensions of concrete structurers or concrete parts of other structures, fixing of reinforcements, positions and dimensions of openings and classes of concrete.

CHAPTER 16 BRICKLAYER

Bricks.

S1601. Bricks are to be clay bricks of best quality locally manufactured, and to be evenly burnt and free from cracks and other defects. The average compressive strength, when tested in accordance with B.S. 3921 (1965), is to be not less than 1,000 lbs. per square inch.

The firebricks are to be obtained from an approved manufacturer and are to be made from fireclay containing a high percentage of silica, reasonably free from fluxes. The fireclay is to be obtained from the same manufacturer. Alternatively, an approved proprietary brand of fire-cement may be used.

Cement, sand and water.

S1602. Cement, sand and water are to be as described in Chapter 15 (Concretor).

Lime.

S1603. Quick-lime is to be properly slaked and run to putty, and matured for at least two weeks before use in the case of non-hydraulic and semi-hydraulic limes (B.S. 890: 1966) and for at least 36 hours in the case of hydraulic limes (C.P. 121. 101: 1951).

Hydrated lime is to be run to putty, mixed with sand and water, and allowed to stand for at least 16 hours before use, or, where of an approved type free from unslaked particles, may be used dry.

Mortar.

S1604. Unless otherwise specified mortar is to be cement-lime mortar and is to consist of one part cement to two parts of lime and eight to nine parts of sand all by volume. Where quick-lime mortar or cement-mortar is used, quick-lime mortar is to consist of one part of lime to two to three parts of sand by volume, and cement-mortar is to consist of one part of cement to three parts of sand by volume. The exact amount of sand is to be fixed so as to obtain adequate workability.

Mixing of all mortar is to be done either by means of a mechanical batch mixer, or by hand on a water-tight platform of adequate size, the materials being turned over twice in a dry state and twice while water is added. The materials for mortar are to be measured in accurate gauge boxes, which are to be completely filled and the top struck off level.

No mortar containing cement is to be used later than one hour after the addition of water to the cement or after it has commenced to set, and no mortar which has commenced to set is to be knocked up for re-use.

Lime mortar, or the lime and sand for cement-lime mortar, may be mixed and stored providing it is not allowed to dry out.

Brickwork.

S1605. Bricks are to be well soaked with water before being used, and foundations, etc. on which they are to be laid is also to be wetted if dry.

All bricks are to be well buttered with mortar before being laid and all joints are to be completely filled with mortar as the work proceeds. Brickwork is to be laid to rise four courses to the foot.

Brickwork generally is to be in English bond. Half-brick walls and brick-on-edge walls are to be in stretcher bond. Bats are not to be used except where necessary for bond.

Brickwork is to be carried up uniformly, no portion under construction being raised more than 3'0" above another at any time. All perpends, quoins, etc. are to be kept strictly perpendicular, true and square, and every course is to be kept truly level.

Reinforcement.

S1606. All half-brick and brick-on-edge walls are to be reinforced with 2½" "Exmet" or equal approved reinforcement at every fourth course (brick-on-edge walls at every third course) properly lapped at joints. Where such walls are interrupted by timber post, etc., the reinforcemnt is to be turned up and fixed to these with galvanized staples. With regard to bonding ties, confer Clause S1536.

Pinning-up.

S1607. All brick walls are to be carefully wedged and pinned up to soffits over in mortar, which is to be tightly and solidly packed in.

Key for plaster.

S1608. All joints of new brickwork to be plastered, rendered or screeded are to be raked out to form a key.

Sundry labours.

S1609. Leave or form all holes, mortices, chases, etc., cut and fit brickwork around steelwork and concrete, built in ends of cills, joists, etc., and carry out all other labours shown on the Drawings or as necessary for the execution of the work.

All bolts, brackets, lugs, etc. are to be grouted or pinned in solidly with cement mortar, and holes and chases for pipes, conduits, etc. are to be packed solidly with cement mortar or fine concrete.

Samples.

S1610. Samples of bricks, fire-bricks, cement, lime, sand, reinforcement (including bonding ties), etc. are to be submitted to the Engineer for his approval before bricklayer is commenced.

Corrugated asbestos cement sheet roofing.

S1701. Corrugated asbestos cement sheet shall comply with B.S. 690 (1963) and be laid in accordance with the manufacturer's instructions, using all the recommended accessories and fixing devices.

The corrugated asbestos cement sheets to be used shall be of standard weight ("Standard", "Big Six" or similar) and be laid with an end lap of 6" and side lap of half corrugation unless otherwise provided. Fixing holes are to be drilled and mitres are to be neatly sawn. Each sheet is to be fixed twice to each purlin with ¼" diameter galvanized hook-bolts and lead angle washers (or when special washers were used, those approved by the Engineer.)

Ridges are to be finished with two-piece cappings with corrugated wings and fixed with galvanized hook-bolts and washers as above, or fixed to the roofing sheets with galvanized seam bolts and washers. Both ends of ridge shall be fitted with asbestos-cement finals and asbestos-cement verge boards shall be fitted to the verges.

All fixing shall be finished not too tightly but with a certain degree of play.

Translucent sheets.

S1702. 1/16" thick glass-fibre reinforced translucent polyester sheets which will fit the large section corrugated asbestos cement sheets made by a company approved by the Engineer shall be used for roofing the area indicated on the Drawings.

These sheets are to be fixed with fixtures made or recommended by the manufacturer of the sheets. The sheets are to be laid in the same manner as applied for corrugated asbestos cement sheets.

Bituminous felt roofing.

S1703. All bituminous felt roofing shall be carried out by an approved specialized sub-contractor.

The felt roofing to be used is to comply with B.S. 747 (1961) and shall consist of three layers of bituminous felt weighing not less than 30, 40 and 50 lbs. per roll of 12 square yards for bottom, middle and top layers respectively, each layer to be bedded in hot bitumen. Lateral laps are to be 2" and longitudinal laps 3", and successive layers are to be laid breaking joints.

Before laying the bottom layers, 9" wide belts of 50 lb. felt shall be placed without being bonded on screeded surface of concrete over the cuts formed to mid depth whilst still green at the positions of the roof deck joints and not more than 10' centres horizontally.

The top layer of roofing shall be finished with grey-coloured ½" granite chips in hot bitumen compound laid shoulder to shoulder. The granite chips shall not be applied for the area near the edges.

Where the chipping finish is not made, specified-coloured mineral-finished bituminous felt complying with B.S.747 (1961), IE, and weighing 80 lbs per 12 square yards is to be used in place of the top layer of roofing for finishing.

The piping and the like penetrating the roof shall be primed with bituminous solution and be provided with flanges at an angle of 45° with hot bitumen.

Roofing felt shall be raised along the pipe, and cover the flange of pipe with drain felt, and bind it tightly with four binding of a strong copper wire.

Asbestos-cement boarding for outer walls.

S1704. Asbestos cement sheets for the outer walls as shown on the Drawings shall be corrugated asbestos cement sheets of small section. They shall be fixed to the walls in the same manner as used for large section for the roof. Corner pieces shall be used for all corners.

Submission of samples.

S1705. Samples of corrugated asbestos cement sheets, two-piece ridges, eaves, closures, verge boards, hook-bolts and nuts, washers, roofing felt, bitumen and all other roofing materials shall be submitted to the Engineer for approval before they are used in the Works.

CHAPTER 18 CARPENTER AND JOINER

Timber.

S1801. Timber for carpenter and joiner work shall be one of the types listed below unless otherwise specified or approved in writing by the Engineer and shall be the best of its kind and equal to a sample submitted to and approved by the Engineer.

(a) For structural purposes (posts, beams, struts, rafters, joists, window and door frames, etc):-

Common Name	Botanical Name	Other Common Names or Varieties
Penyau	Upuna Borneensis	Upun batu
Kapur Bukit	Dryobalanops spp.	Keladan; Kapur peringgi; Kapur empedu; Kapur paji; Lelansau
Keruing	Dipterocarpus	Gurjun; Laran
Keruntum	Combretocarpus rotandatus	Perepat paya
Red Selangan	Shorea spp.	Alan; Meraka Alan; Semayur; Empenit
Kempas	Kooompassia Malaceensis	Mengris; Impas
Resak	Cotylelobium spp. and Vatica spp.	

(b) For other carpentry works (plates, studs, noggings, battens, sawn wall boarding, etc.).

Common Name	Botanical Name	Other Common Names or Varieties
Meranti (Dark Red, Red or Yellow)	Shorea spp.	Red Seraya Perawan Lun Meraka Kerukup
Kapur Paya	Dryobalanops spp.	Keladan; Kapur peringgi; Kapur empedu; Kapur paji; Kelansau
Selangan	Hopea spp.	Merawan; Luis

(c) For joinery (doors, windows, wall boarding, fittings,

skirtings, etc.)

All timbers as at (b) above.

Defects.

S1802. All timber is to be sawn die square with the slope of the grain not exceeding one in eight, and is to be free from sapwood, twists, splits, cracks, large, loose or dead knots, large resin pockets, waney edges, live or extensive insect attack or other defects except to such extent as may be permitted by the Engineer where the strength, durability or appearance of the Work will not be affected.

Seasoning.

S1803. Timber for structural purposes and other carpentry is to be adequately seasoned before use so as to prevent undue shrinkage, distortion or splitting. Any timber which subsequently develops before the end of the Maintenance Period such defects so as, in the opinion of the Engineer, to affect unduly the strength, durability or appearance of the works is to be replaced at the Contractor's own cost. If fully seasoned timber is not available the Contractor is to use only those types of timber which are less liable to develop seasoning defects, but fully seasoned timber is to be used whenever available.

Timber for joinery is to be well seasoned before use for a period of at least three months, either before or after delivery to site, and the Contractor is to allow for programming his work accordingly.

Timber in which any seasoning defect occurred before the end of the Maintenance Period and which defect, in the opinion of the Engineer, might affect the Works adversely, shall be replaced at the Contractor's own cost.

All timber required for the Works is to be purchased as early as possible after the Contract is signed and is to be delivered to the site or to the Contractor's woodworking shops and properly stored indoors and stacked to the satisfaction of the Engineer.

Wood preservative.

S1804. Timber for carpenter's work, except Belian, is to be treated before fixing with creosote or other approved wood preservative unless required to be painted. Treatment is to be by brush in two coats, or by immersion to the satisfaction of the Engineer. Surfaces subsequently cut are to be re-treated. This clause shall apply to all carpentry timber, including studding, nogging, grounds, bearers, etc. Exposed carpentry timber is to be treated with approved clear wood preservative instead of creosote.

Dimensions.

S1805. All sawn timber are to be of the full dimensions specified or shown on the Drawings. For wrought timber, unless finished sizes are specified, three thiry-seconds of an inch shall be allowed off the stated sizes for each wrought surface.

Finishes.

S1806. All exposed surfaces of timber are to be wrought unless otherwise specified. Wrought faces are to be rubbed down with glass paper and finished perfectly smooth with slightly rounded exposed arrises.

Joinery timber with natural finish , or clear varnished or polished finish, is to be selected to match grain and colour and to be free from knots and other defects, and is to be finished clean.

Nails, bolts, etc.

S1807. All nails, screws, bolts and other fastenings are to be of a suitable type and size and in sufficient number.

Where necessary to avoid splitting, holes for nails are to be pre-bored of diameter not exceeding four-fifths that of the nail. Holes for bolts are to be bored from both surfaces of the timber and the diameter is to be 1-1/16 that of all bolts and nuts. Washers are to be used under all nuts and bolt heads. Nuts are to be brought up tight but not so as to crush the timber.

Timber connectors are to be toothed-plate type complying with B.S. 1579(1960). The teeth are to be fully embedded in the timber by the use of a high tensile threaded rod with large plate washers instead of the permanent bolt where necessary.

Where fixing with cups and screws is specified the cups are to be brass turned or heavy pressed pattern. Surface pattern cups are not to be used.

Glue.

S1808. Glue is to be an approved resin-based or synthetic resin-based adhesive of appropriate type, and is to be used in accordance with the manufacturer's instructions.

Carpentry framing.

S1809. Joints in carpentry timber are to be accurately formed and of appropriate type to transmit loading and resist the stresses to which they are subject.

Abutting surfaces in timber exposed to the weather are to be thickly coated with priming paint immediately before assembly, unless required to be glued.

Joints in plates, heads and cills of partitions and similar members are to be halved 6" long or, at angles, for the width of the member. Joints in purlins, ridges and similar members are to be scarfed for a length equal to twice the depth of the member, and tightly wedged. Rafters or joists around openings are to be correctly framed with tusk-tenon joints and dovetailed housings.

Studs in partitions are to be stub-tenoned at head and cill.

Timbers to be continuous.

S1810. Every post, beam, joist, rafter, purlin, stud, strut, tie and similar member is to extend in one piece between its supports or fixings unless otherwise specified or approved in writing, in which case it is to be adequately jointed in an approved manner.

Plates, heads and cills of partitions, and similar members are to be in one piece between points of change of direction provided that scarfed joints may be used to avoid the use of timbers exceeding 20 feet long.

Trimming around openings.

S1811. Where joists or rafters are trimmed around openings or projections, the members around the openings are to be of the same depth as the other joists or rafters but are to be 1" more in breadth.

Notching and holes.

S1812. Where joists, rafters, etc. are notched over supports the depth of the notch is not to exceed two-fifths of the depth of the member.

Holes in joists for pipes are to be bored as near to the neutral axis as possible and are not to exceed one-quarter of the depth of the member.

Formwork.

S1813. See Chapter 15 (Concretor) for formwork.

Noggings.

S1814. Where ceilings are lined with hardboard, asbestos cement or similar material, 2" x 2" noggings are to be fixed between the ceiling joists or rafters at right angles to support the linings, at not exceeding 24" centres and as necessary to provide fixing for all edges of ceiling sheets. Noggings are to be tightly fitted between the joists or rafters and skew-nailed.

Similar furring strips are to be fixed for wall linings where such support is not provided by the timber construction.

Plugging.

S1815. Plugging for fixing carpentry or joinery to brickwork or concrete is to be of wood plugs cut with a slightly twisted taper to fit tightly into the joint or mortice into which they are driven, or dovetailed where cast in-situ or built in. Wood plugs are to be treated with wood preservative. Alternatively, for screwed fixings, "Rawlplugs" or similar fibrous plugs may be used.

Plywood.

S1816. Plywood is to comply with the requirements of B.S. 1455 (1963).

Plywood for use externally, specified doors or panels, is to be type WBP (bonded with weather- and boil-proof adhesive). Plywood for use internally is to be type MR (bonded with moisture-resistant adhesive).

Plywood for polished, varnished or other clear finish, or for natural finish in exposed positions is to be Grade 1. Plywood for painted or veneered finish is to be Grade 2. That for use in concealed positions (not including shelving, divisions, etc. in cupboards) is to be Grade 3.

Joinery framing.

S1817. Framed joints in joinery are to be accurately formed, using pinned and wedged mortice and tenon joints where possible. Members exceeding 1½" thick are to be double tenoned. Abutting surfaces are to be thickly coated with priming paint immediately before assembly unless required to be glued. Edge joints are to be crosstongued and glued. Joints in panelled doors and similar items are to be glued.

All framed joinery work is to be prepared as early as possible but is not to be wedged, glued or finally assembled until required.

Mouldings.

S1818. All joinery mouldings are to be accurately processed to the required profile and all moulded members are to be neatly mitred or scribed as appropriate at angles, intersections, etc.

Panelled doors.

S1819. In panelled doors, bottom rails and lock rails are to be 8" or more and other rails, styles and muntins are to be 4½" or more wide. Framing is to be mortised and tenoned or is to be dowelled with dowels not less than 5/8" diameter x 5" or longer. Panels shall be 3" x 1", tongued, grooved and V jointed. Only first grade Belian timber shall be used for all panelled doors in kitchens, washrooms and toilets.

Flush doors.

S1820. Flush doors are to be of approved manufacture with either solid cores or skelton cores. Skelton framed cores are to consist of outer frame and three intermediate rails not less than 3" wide, blocked out for lock, and light vertical framing, all framed and glued together; or are to be of equivalent construction. Adequate ventilation holes are to be formed in the framing.

Unless otherwise specified, doors are to be faced on both sides with 3/16" plywood as specified above.

Doors are to be lipped on all edges with hardboard lippings tongued to frame. Lippings are to be at least 3/8" (finished) visible thickness, and are to be increased in thickness as necessary for rebated meeting stiles.

Hanging door.

S1821. Doors are to be hung truly plumb. The clearance around doors, including the bottom edge, is to be as little as possible.

Window and door frames.

S1822. Joints in window and door frames are to be formed, using tenon joints, to obtain adequate strength and firmness.

Window frames are to be delivered to the site with their lintels and cills protruding 2" beyond both ends of the total breadth.

Only first grade Belian timber shall be used for all window frames (and door frames) on external walls.

Fixing frames. S1823. Door and window frames are to be fixed to brick reveals with metal holdfasts and to door-cill with dowels. Where against concrete columns or walls, frames are to be screwed at 3' centres to plugs cast or driven into the concrete with screw heads sunk and filled if exposed.

Drawers. S1824. Running surfaces of drawers and their runners or bearers are to be wax polished to permit easy movement.

Protection. S1825. Joinery fittings, floors, nosings, etc. are to be covered up and protected when necessary as described in Chapter 12 (Preliminary).

Ironmongery. S1826. Where specified to be supplied by the Contractor, ironmongery is to be of approved type and a sample of each item is to be submitted, if required, to the Engineer.

Door furnitures are to be of Union (England) or Miwa (Japan) brand or other approved manufacturers'.

All ironmongery is to be fixed with screws to match.

Ironmongery is to be fixed before painting is carried out; handles, plated, escutcheons, etc. are then to be removed, and refixed after painting has been carried out.

Ironmongery is to be oiled and adjusted as required, and left in perfect working order. Screws and ironmongery damaged or scratched during fixing are to be replaced at the Contractor's expense.

Lock master system is required and the Contractor is to obtain all necessary fixing schedules from the suppliers and is to ensure that all locks are fixed in their correct locations. The Contractor is to arrange for all master keys and sub-master keys to be sent under sealed cover direct from the suppliers to Engineer.

Submitting of samples. S1827. The Contractor is to submit a sample of each item of timber and ironmongery to the Engineer for his approval before making arrangements for obtaining them, and is also to obtain approval in advance of the Engineer for the methods of jointing members, the required degree of finishing, construction of joinery, etc.

CHAPTER 19 STRUCTURAL STEEL WORK

Materials.

S1901. Steel sections used structurally are to comply with B.S. 4360 (1968) (grade 43A) and with B.S. 4 (1962).

Welding electrodes are to comply with B.S. 639 (1964). Bolts and nuts are to have a tensile strength of 28 ton/sq.in. or more and minimum elongation strength of 17% or more as specified in Chapter 2 of B.S. 916 (1953) or B.S. 2708 (1956).

Taper washers are to be made of steel or malleable cast iron.

Rivet dimensions are to comply with B.S. 275 (1927).

Material tests.

S1902. No material tests will be carried out on the materials complying with specified standards where the Contractor has submitted to the Engineer mill sheets explicitly certifying that the materials comply with the standards and the approval of the Engineer has been obtained, provided that the tests are to be carried out where it is not clear that the materials described in the mill sheet are the materials to be used in the Works.

Material tests are to be carried out as described below.

(a) The number of steel materials to be subject to testing shall be increased by one for each different section and for each 20 tons or fraction thereof. However, the testing may be omitted for the materials of less than 2 tons for each different section excluding bolts and nuts.

(b) Steel materials are to be subjected to tension and bending tests to be carried out in the manner approved by the Engineer.

(c) The Contractor shall, as directed by the Engineer, supply conveniences such as collecting and shaping of test materials, provision of testing facilities, arrangements for carrying out tests at a laboratory approved by the Engineer, provision of assistants, etc. at the Contractor's own expenses. The results of testing shall be submitted immediately to the Engineer at the cost of the Contractor.

Inspection.

S1903. The Contractor shall be responsible for the accuracy of the Works and any works done or materials supplied not in accordance with the Drawings and the Specification shall be rejected by the Engineer at the Contractor's sole cost.

Working drawings.

S1904. The Contractor shall prepare working drawings of any parts of the Works and manufacture templates and rulers as and when required by the Engineer for his approval.

Straightness. S1905. All materials are to be straight and free from twist whether before or after manufacture except where curves are required. Any material which is not straight shall be corrected before assembly.

Clearance. S1906. Care shall be taken to provide for all the specified clearances without fail.

As a general rule, the clearance in the erection at cleat end of members connecting steel sections shall not exceed 1/16" at either end and the beam without web cleat is to have clearance not exceeding 1/8".

Cutting. S1907. Except where otherwise specified each steel material is to be cut at right angles to the axis of the material. Cutting is to be made by shearing, cropping, sawing or machine cutting, or by hand flame cutting as required with the approval of the Engineer.

The cut end section is to be smooth and free from notches, burrs and distortion.

Load-bearing surfaces. S1908. Base of column, post joints, etc. are to be plane finished so that they may be brought into close contact.

Boring. S1909. Where boring holes in more than two sheets of steel, they are to be collected together and bound tightly or bolted, if practical, for boring holes in them.

Holes are to be drilled or punched 1/8" smaller than the required diameter before assembly so that they may be reamed to the necessary size after assembly. However, holes may be punched to the finished size when the materials do not exceed 3/8" in thickness. The thickness of the materials to be punched is not to exceed 5/8".

Burrs and distortion around the bored hole are to be removed.

Holes are to be large enough to allow a gauge, 1/16" smaller than the diameter of the holes, to pass through them freely in direction at right angles to material. Unless otherwise directed by the Engineer, rivet and bolt holes are not to be more than 1/16" larger than the diameter of designed rivets or bolts. Holes for anchor bolts are not to be more than 3/16" or larger than the diameter of the anchor bolt.

Assembly. S1910. Steel materials are to be so fabricated as to be free from twist and any other damage. Where camber is to be applied, care shall be taken that the specified camber is provided.

Riveting.

S1911. Rivets are to be heated evenly over the full length so that they may not be flaming or produce excessive scales. Rivets shall be sufficiently long as required for forming a head of standard size. Rivets are to completely fill up the holes when hammered in place. In countersunk riveting, the heads are to be sufficiently recessed into the plate so that they are finished flat with the riveted surface.

All parts of the steel materials to be riveted are to be securely pulled together and firmly held down before and during riveting. This precaution is particularly needed where a single rivet is used for jointing. Where many rivets are used, service bolts shall be used at the interval of three or four rivets.

Riveting is to be carried out by riveting machine, which is to be one of constant-pressure type when possible.

Any rivet which is fitted loosely, burnt excessively, irregularly shaped, or in which the centre of head is not aligned with that of the shank, or whose head has developed cracks or fails to come into close contact with the plate to be riveted, or which has any other defect shall be cut out in a manner that causes no damage to the surrounding areas for re-riveting. Special care is needed where only one rivet is used.

Bolting.

S1912. Angle washers and the like are to be used where required so that the nuts and bolts may have sufficient bearing surfaces.

The threaded section of bolt is to be protruding through the nut by at least one thread.

Where the whole bearing surfaces of bolt are subjected to pressure, a sufficiently thick washer is to be used under the nut to prevent the threads of bolt from cutting into the bolted plate. Anchor bolt is to be provided with double nuts.

Welding.

S1913. Clauses S437, S438 and S439 shall apply. Cutting of steel materials may be carried out by other method approved by the Engineer.

Marking.

S1914. All steel materials are to be clearly marked in accordance with the marking table before shipment to the site. Besides, different mark for erection shall be applied.

Painting.

S1915. Surfaces to be painted are to be made clean and free from loose scale and rust. No painting is required for the surfaces to be brought into close contact with each other at the factory. The surfaces which are not in close contact with each other but are inaccesible after assembly at the factory or at the

site shall be subjected to protective coating of paint with thoroughness before assembly at the factory or at the site. Welds and surfaces of the base metal within 1" from the welds are to be painted after inspection of the Engineer.

All steel work to be built in the concrete does not need painting.

Coating of paint which has been scratched or deteriorated after delivery to the site shall be repainted properly.

Erection. S1916. The performance and suitability of all machinery and equipment to be used for erection shall be approved by the Engineer.

All structural steel materials are to be stored and handled at the site in such a manner as may not be subjected to excessive stress and damage.

Before erecting, marking is to be applied for location and level and to be approved by the Engineer. After erection, thorough adjustment shall be made as to alignment and distortion, which shall be approved by the Engineer and thereafter, regular joining shall be carried out.

The steel materials are to be jointed with bolts or other suitable means during erection, and temporary diagonal bracings are to be inserted as required in order to cope with all stresses and conditions including the stresses due to the erecting equipment and its operation.

Installing base. S1917. The position in which anchor bolt is to be embedded shall be determined precisely by the use of template, and the anchor bolt shall be truly vertical and held steady in place so that it may not be displaced or inclined during concrete placing.

Base shall not be installed until the steel structure has been finally corrected in its height and verticality. During the above process, the base is to be supported with steel wedges and the space under the base shall be made thoroughly clean immediately before grouting.

The space under the base shall be thoroughly filled up with stiff-consistency cement mortar of 1:2 and compacted with tamping rod or by other method approved by the Engineer.

Before the work of installing the base, the Contractor shall prepare drawings showing the positions of anchor bolts and other details for the approval of the Engineer.

Transit Shed.

S1918. Steel frames for the transit shed are to be processed by the Sub-contractor nominated by the Engineer and is to be shipped to the Port of Kuching on C.I.F. basis.

The Contractor shall allow for all the costs for receiving, loading, warehousing, if required, conveyance to the site, unloading, storing, and erecting. Steel materials to be embedded in concrete (anchor bolts, rails for sliding doors) shall be supplied by the Nominated Sub-contractor.

The Contractor shall be responsible for the supply of materials except steel frames, and sheeting for sliding doors, erection and installation of same at the site.

An erection instructor from the Nominated Sub-contractor will stay at the site for a period of 30 days.

CHAPTER 20 STEEL AND IRON WORKER

General. S2001. All materials are to be of good quality, sound and free from defects.

Steel work. S2002. Steel and ironworks shall comply with the relevant clauses in Chapter 19 (Structural Steelwork), unless otherwise specified.

Ragged ends. S2003. Ends of rails, balustrades, standards, brackets, fitting, etc. to be built into concrete or brickwork are to be ragged, fishtailed or split and turned as appropriate.

Railings, etc. S2004. Railings and similar framed work are to be constructed exactly as shown on the Drawings, with all bends, ramps, curves, etc. perfectly true. All joints are to be securely welded, riveted or screwed as approved by the Engineer.

Steel doors. S2005. Steel doors are to be made by an approved manufacturer and all accessories are to be made or recommended by the same manufacturer.

Steel doors are to be handled carefully. They shall be placed on level platforms and be leant evenly against walls or vertical supports.

As a rule, steel doors are to be fixed by the manufacturer. They are to be installed straight, truly perpendicular and level so that they move satisfactorily.

Metal material is to be packed to avoid damage until all rough work is finished.

The manufacturer is to submit detailed full-size drawings showing dimensions and relations with all metal and other works to the Engineer for his approval.

Steel hinged door frames are to be fixed by lugs built into the concrete wall and solidly bedded in cement mortar of (1:3) and the face side are to be finished joints.

Steel sliding doors are to be made exactly as shown on the Drawing. Rails, wheels, guide rails, etc. are to match the doors.

Metal louvre windows. S2006. Metal louvre windows are to have aluminium frames and non-ferrous metal bearings and working parts, complete with lever handles, locking devices and rattleproof spring clips for glass louvres, and are to be fixed with screws to match. The type and manufacturers shall be approved by the Engineer. Security grille shall be provided where shown on the Drawings.

Holdfasts.

S2007. Wood door and window frames set against brick reveals are to be fixed with 1¼" x 1-1/8" mild steel holdfasts (15" girth), one end bent up and twice screwed to frame and other end fishtailed and built in.

Holdfasts are to be fixed to the jambs not more than 3' apart, the outer holdfasts being 1' or less from the ends of the jamb. Where the foot of the frame is secured by a dowel or is framed to a cill or threshold secured by a water bar, the lowest holdfast may be fixed up to 3' from the foot.

Dowels.

S2008. Feet of door frames are to be secured with ½" diameter mild steel dowels 3" long let into the frame and into the paving. No dowels are required for door frames with framed cills or thresholds.

Bonding ties.

S2009. See Chapter 15 (Concretor) for bonding ties between brick walls and concrete columns.

Rainwater goods.

S2010. Vertical pipes are to be galvanized steel pipes complying with B.S. 1968 (1964) medium grade, or cast iron pipes complying with B.S. 460 (1964) medium grade with painted finish.

Pipes and fittings are to be fixed with galvanized steel or cast iron two-piece bolted holdfasts or brackets cut into brickwork or concrete or with ears fixed with galvanized screws to timber, not more than 4' apart or one for every pipe.

Eaves gutters are to be specified S.W.G., well galvanized and free from imperfections, and are to be of the size and shape as shown on the Drawings, soundly welded or soldered. Nails and screws are to be galvanized. Eaves gutters are to be laid to even falls of 1" to 10' and are to be fixed with solid galvanized brackets not more than 3' apart fixed with galvanized screws. Brackets are to be shaped to suit the eaves gutter and fitted with galvanized sheet steel clips riveted to the bracket and clipped over both edges of the gutter. Joints of eaves gutter are to be lapped 3" in the direction of flow and either made in red lead or approved compound and bolted with galvanized bolts and nuts, or fixed by soldering.

Galvanized steel.

S2011. Galvanized steel sheet for flashings, and are to be soldered at angles where necessary. Nails and screws are to be galvanized.

Steel pipes.

S2101. Steel pipes shall be galvanized steel to comply with B.S. 1387 (1967). Water supply pipes shall be heavy weight pipes; overflows, wastes and vents shall be medium weight or heavy weight pipes.

Fittings for use with steel pipes shall be galvanized malleable cast iron beaded fittings to comply with B.S.1256 (1952).

Joints shall be screwed and socketed with B.S.P. taper thread, and made in boss white and hemp. Piping on surface shall be fixed with strong galvanized or tinned two-piece spacing clips or by other approved brackets to keep the pipes 1" clear of the walls, and that built in or in roof spaces, etc. shall be fixed with plain galvanized clips. Clips shall be spaced so as to hold the pipes rigidly, and shall be screwed, or plugged and screwed to the walls.

Pipes built or cast in to brickwork or concrete, or laid under concrete ground floors, shall be wrapped with "Denso" tape or equal approved anti-corrosion wrapping.

Lead pipes.

S2102. Lead pipes for use at joints of closet, floor drain outlet, etc. shall comply with B.S. 602 (1956) and shall be jointed with wiped soldered joints or "PLUSTAN" joints. Screwed unions shall be used at all connections of lead pipe to fittings and valves.

Cast iron pipes.

S2103. Cast iron pipes to be used for internal soil pipes shall comply with B.S. 437 (1933) medium grade and shall be coated.

Any damage to the coating of any surface not otherwise to be painted shall be made good by painting with two coats of black bituminous paint.

Pipes and fittings shall be jointed with caulked run lead, lead wool or caulking compound (see Chapter 25 Drainlayer).

Cast iron pipes and specials and sluice valves for water supply shall be as follows:

(a) Straight spigot and socket pipes:

Spun iron, B.S. 1211 (1958) Class B with Stanton or similar bolted gland joints.

(b) Cast iron spigot and socket specials (Bends, Tees, etc.):

Cast iron, B.S. 78: Part 2 (1965) Class B with Stanton or similar bolted gland joints.

(c) Cast iron flanged pipes and specials:

Cast iron, B.S. 2035 (1966) with flanges faced and drilled to B.S. 10 (1962) Table D.

(d) Sluice valves (gate valve):

To B.S. 1218 (1946) Class I or approved equivalent, and Plain ended, for use with A.C. pipe to B.S. 486 (1966) Class C or flanged, according to their positions. If flanged, flanges shall be drilled to B.S. 10 (1962) Table D. All sluice valves shall be clockwise opening.

(e) Cast iron specials for use with asbestos cement pipe:

To be suitable for use with asbestos cement pipe to B.S. 486 (1966) Class C.

Asbestos cement pipes.

S2104. Water supply pipes with diameter exceeding 2½" to be laid outdoors shall be asbestos cement pipes to comply with B.S. 486 (1966) Class "C".

These pipes are to be jointed with collar joints (Gibault joints) or with other equal approved fittings or upwards. In case of collar joints rubber rings shall be fitted at right angles to pipe centres and fixed to each pipe by means of collar fixing equipment complying with each pipe. In this case care is to be taken not to cause any twist on the rings, and to fix it to the correct position.

Vent gallery.

S2105. Top or end of ventilating pipes shall be fitted with approved galvanized iron grille screwed securely thereto.

Brass ware.

S2106. Draw-off taps and stopvalves shall be brass and shall comply with B.S. 1010 (1959). Fittings with a very low head of water shall have fixed jumpers (i.e. washer to rise with the spindle). All fittings shall have appropriate washers (composition washers unless otherwise approved).

Ballvalves shall be of brass, Portsmouth type, and shall comply with B.S. 1212 (1953) with copper or plastic floats to comply with B.S. 1968 (1953) or 2456 (1954) respectively. Ballvalves shall be of a pressure rating appropriate to their position.

All brass ware shall be submitted to the Engineer for his approval before fixing.

Cleaning.

A2107. All metal filings shall be carefully cleaned out from cisterns, tanks, etc. and pipes shall be free from filings and rust.

Underground pipes.

S2108. Underground pipes not under buildings shall be laid where practicable with a minimum cover over as follows:-

Distributing mains ..... 30"

Service or communication pipe

- under a road or pavement ..... 24"

- not under a road or pavement ... 18"

Trenches shall be excavated, centred and backfilled, and the surface reinstated, as described in Chapter 25 (Drainlayer). All clauses of Chapter 13 (Excavator and Earthwork) shall apply also to this work.

Pipe runs.

S2109. All pipework shall be run on the surface unless otherwise approved or shown on the Drawings. Pipework shall be neatly and accurately set out to straight lines or even falls as required, and brackets, clips, etc. shall be spaced evenly and symmetrically.

Joints.

S2110. (a) Joint of steel pipe and cast iron pipe:

Steel pipe shall be screwed at end, fixed with ring to form spigot end, packed with oakum, filled with molten lead at one pouring and caulked flush with rim.

(b) Joint of lead pipe and cast iron pipe:

Cast brass caulking ferrule shall be used and wiped soldered joint shall be made to lead pipe. Caulking shall be carried out as above for (a).

(c) Joint of lead pipe and steel pipe:

Cast brass solder nipple or bushing with screws shall be used and wiped soldred joint shall be made to lead pipe.

(d) Joint of asbestos cement pipe and steel pipe:

A flange on the steel pipe and cast iron flanged spigot shall be used in addition to a cast iron joint.

Cistern.

S2111. Cisterns for urinals shall comply with B.S. 1876 (1952) or approved equivalent, and cisterns for W.C.s shall comply with B.S. 1125 (1959) or approved equivalent.

Stopcock pits.

S2112. Pits for external stopcocks shall be of either 4½" brickwork laid dry size 8" internally, or a 8" diameter drain pipe, laid on a 3" concrete Class Z foundation, and with concrete Z cover at ground level to receive stopcock box and finished fair. Stopcock box shall be cast iron coated pattern with hinged cover, 6" diameter clear opening x 3" deep.

Sanitary fittings.

S2113. Sanitary fittings shall be supplied and fixed as specified. Fittings shall be correctly assembled and jointed together, and connected to services and wastes, brackets, lugs, etc. are to be carefully positioned and built in, screwed or plugged and screwed.

W.C. pans shall be of white porcelain and shall have cleaning holes. Each W.C. pan shall be provided with trap, paper roll holder, 3 gallon cistern, valveless cyphon, flush pipe and pull-chain.

W.C. pans shall be plugged or screwed to the floor, and shall be bedded and pointed in cement mortar. Outlets shall be neatly jointed to cast iron pipes with gaskin and cement and sand (1:1).

Squatting closet pans with floor treads shall be bedded in cement and sand to finish flush with floor. Outlets shall be jointed to soil pipes as last specified.

Urinal channels shall be bedded in cement mortar and pointed on exposed faces in white cement. Outlets shall be bedded in red lead putty and screwed into cast iron trap connector under. Urinal channels shall be of white porcelain. The cisterns for urinals shall be made of steel plate and equipped with automatic washer with capacity of 3 gallons.

Waste outlets of lavatory basins, sinks and showers shall be bedded in red lead putty. The basins shall be white enameled, 22" x 16", and shall be fitted with water cock, rubber waste plug and bracket.

Mirrors shall be 22" x 16" x ¼" thick waterproofed mirrors without frames and shall be fixed with 4 chromium-plated brass screws and rubber washers.

Traps.

S2114. Where traps are specified for sanitary fittings, they shall be of brass to comply with B.S. 1184 (1961). Traps connected to a soil pipe, or elsewhere specified, shall have a 3" seal: other traps may have a 1½" seal.

Overflows.

S2115. Overflows shall be run from all flushing cisterns to discharge through an external wall or as otherwise specified.

Wastes.

S2116. Waste pipes and cleaning holes shall be provided as shown on the Drawings. Waste pipes discharging into surface water channel shall be finished with a bend in the direction of flow.

Fire hydrants.

S2117. All hydrants shall be underground hydrants, screwdown type, with outlet screwed 2½" Vee thread, Streamline Pattern to B.S. 750 (1964) Type II anti-clockwise opening or approved equivalent, and shall be of a standard type as approved by the Kuching Water Board.

Those hydrants to be fixed elsewhere than on the wharf shall be provided with appropriate hydrant chambers and cast iron surface boxes which shall be heavy weight for road traffic with lids marked F.H.

Hydrant indicator posts shall be provided for all hydrants indicated in the preceding paragraph, and in accordance with the Drawing.

Fire fighting equipment generally and in particular hydrant outlets, hose couplings and similar, must conform to the relevant requirements of the Fire Authority (i.e. Kuching Municipal Council) to ensure interchangeability in an emergency.

Fire hose cabinets shall be of steel plate, constructed as shown on the Drawings and each shall be provided with one hose, one nozzle and one extra hose.

Hose shall be of linen 2½" diameter and each hydrant shall be provided with one 100' long hose. Fire nozzle shall be of chromium-coated bronze or brass with a 2½" diameter and shall be screwed for the connection to hose.

Standpipes.

S2118. Standpipes shall be metered, and have inlets screwed 2½" Vee thread and outlets 2½" instantaneous coupling and must be as approved by the Kuching Water Board.

Testing.

S2119. The whole of the plumbing installation shall be tested on completion to the satisfaction of the Engineer and the authorities concerned.

Local authorities.

S2120. All water supply installation including internal plumbing shall be in accordance with the requirements of the Water Supply Regulations 1958 as amended by the Water Supply Amendment Regulations 1964 and comply with the requirements of the Kuching Water Board.

Samples and working diagram.

S2121. Before the commencement of the Works, the Contractor shall submit samples of pipes, joints, jointing materials, cocks, sanitary fittings and other materials for use in the Works to the Engineer for his approval.

The Contractor, before commencing the Works, shall also submit the detailed working diagram of all portions of the Works to Engineer for his approval.

Contribution.

S2122. The Contractor shall allow for a sum of M$100,000.- entered in the Bill No. 28 - Provisional Sums and Contingency, as a contribution for water mains to be laid by the Kuching Water Board from the storage tank at Pending Heights to the boundary of the Site, including necessary meters, stopcocks and connections.

CHAPTER 22 PLASTERER AND PAVIOR

Cement and water.

S2201. Cement and water shall be as described in Chapter 15 (Concretor).

Sand.

S2202. Sand for general use shall be as described in Chapter 15 (Concretor), but that for finishing coats of plaster is to be of a finer grading, with 100 per cent passing a No. 7 B.S. Sieve.

Lime.

S2203. Lime shall be as described in Chapter 16 (Bricklayer).

Metal lathing.

S2204. Metal lathing shall be "Expamet" or equal approved bituminous coated expanded metal lathing, No. 22 gauge, 3/8" mesh (measured short way). Metal lathing for cement and sand mortar shall be No. 20 gauge.

Lathing shall be fixed with the long way of the mesh across the supports, and with the strands in the various sheets all sloping in one direction. Sheets shall be lapped 1" at ends and edges: no laps shall occur at angles or curves, and end laps shall occur only at supports. Side laps shall be wired with galvanized wire at 3" intervals.

Lathing shall be fixed to timber with galvanized staples at 4" intervals, and to steel work with galvanized wire at 4" intervals.

Mixing.

S2205. Plastering materials shall be mixed as described for mortar in Chapter 16 (Bricklayer) and shall be used fresh as provided therein.

Preparation of surfaces.

S2206. Brick faces shall be raked out or hacked for plastering as described in Chapter 16 (Bricklayer).

Concrete walls, columns, beams and soffits to be plastered shall be treated with a slurry of cement and coarse sand (1:2) either thrown on as a "Spatterdash" coat or brushed and stippled. The slurry shall be applied immediately after removal of the formwork, while the concrete is still green, and shall be wetted down one hour after application. Any concrete surfaces which have been allowed to mature before slurring shall be lightly hacked all over to form a key, brushed down, well wetted and then slurried.

The above requirements apply to all forms of plastering, including external rendering and screeds for tiling.

Concrete floors and roofs to be screeded or paved shall be well cleaned and wetted, (and, for pavings only,

wire brushed or hacked to expose the aggregate), and washed over with neat cement grout. This preparation may be omitted if the screed or paving is laid while the concrete is still green.

Plates, etc.

S2207. Timber plate, frames, etc. in walls to be plastered or screeded shall be covered with a strip of expanded metal lathing projecting at least 2" either side of the timber and fixed with galvanized staples.

Plastering generally.

S2208. All surfaces to be plastered or screeded, including previous coats, shall be brushed down to remove all dust and loose material and shall be well wetted.

All undercoats and screeds to receive tiling, paving, etc. shall be well scratched with a wire comb or trowel to form a key.

Each coat of plaster or screed shall be prevented from drying out too rapidly where necessary by spraying with water or other means, as directed by the Engineer.

Undercoats and screeds shall be allowed to set for at least seven days before application of the following coat or of the tiling, paving, etc.

Finishing coats shall be perfectly even and true, and of consistent finish.

Internal plaster.

S2209. Internal plastering to walls, columns, concrete soffits and beams shall be carried out in two coats as follows:-

(a) ½" undercoat of cement and sand (1:4).

(b) 3/8" finishing coat of cement, lime and sand (1:1:6 by volume), finished with a wood float.

Internal lime plaster.

S2210. Where so specified, lime plastering internally to walls, columns, concrete soffits and beams shall be carried out in two coats as follows:-

(a) 3/8" undercoat of cement, lime and sand (1:¼:12 by volume).

(b) ½" finishing coat of cement, lime and sand (1:12:2½ by volume), finished with a steel float.

External angles to walls and columns in this plaster shall be formed for a width of 2" on each face with a neat Keene's cement finishing coat on a cement and sand (1:3) backing.

External plaster.

S2211. External plastering to walls, beams and columns shall be carried out in two coats as follows:-

(a) 3/8" undercoat of cement and sand (1:3).

(b) 3/8" finishing coat of cement, lime and sand (1:1:6 by volume), finished with a wood float.

External plastering to concrete soffits, and beams therein, shall be carried out as described for internal plaster.

Where plastering is carried down to ground level a ½" wide V-joint shall be formed around the building at an approved level as a plinth line.

Plaster on lathing.

S2212. Plastering on metal lathing, internally or externally, shall be carried out in three coats to a total thickness of 5/8" from the face of the lathing, in cement, lime and sand (1:1:6 by volume) finished with a wood float.

Angles.

S2213. External angles on internal or external plaster shall be slightly rounded, and internal angles shall be a quarter-circle cove.

Mouldings, quirks, etc.

S2214. All mouldings and other features shall be even and true, with all mitred angles, stop ends, etc. neatly formed.

All plaster abutting projecting (fair faced) columns, timber posts or similar members shall be finished with a neat splay or quirk.

Screeds.

S2215. Cement and sand screeds shall be laid as required for floor or roof finishes or wall tiles, finished even and true to the exact line, level or falls as required. Screeds to receive tiles bedded in mortar shall be scrached to form a key: those to receive thermoplastic and similar pavings bedded in mastic or adhesive shall be finished perfectly smooth.

No screed shall be less than ½" thick unless otherwise specified. Screeds for pavings shall be adjusted in thickness to allow differing adjacent pavings to finish at the same level.

Screed for felt roofing shall be of (1:4) mix, and other screeds of (1:3) mix, unless otherwise specified.

Roof finishes.

S2216. Flat concrete roofs, or felt roofing thereon, shall be finished where so specified with a cement and sand (1:3) screed 1" thick, finished to falls of not less than 1" in 10'0" (or laid to fall with the roof if finished to falls) and trowelled hard and smooth. Excessive trowelling, resulting in formation of "laitance", shall be avoided.

The screed shall be laid in squares approximately 2'0" x 2'0", with ¼" wide joints filled in solid with approved mastic.

The screed shall be waterproofed with "Pudlo" or equal approved compound used in accordance with the manufacturer's instructions.

Exposed edges of the screed shall be finished fair. The screed shall be sloped to rainwater outlets, and made good around pipes, etc.

The screed shall be damp-cured for at least seven days after laying by covering with sand or sacking kept wet or by other approved means.

Cement rendering.

S2217. Cement rendering shall be composed of cement and sand (1:3). It shall be not less than ½" thick, laid in alternate bays not exceeding 12'0" in either direction unless otherwise specified, and shall be finished with a hard trowelled surface. Excessive trowelling, resulting in formation of "laitance", shall be avoided.

Rendering shall be damp-cured for at least seven days after laying by covering with sand or sacking kept wet or by other approved means.

Cement skirtings.

S2218. Cement skirtings where required shall be formed in cement and sand (1:3) of the height and profile specified, and shall be trowelled smooth. On flush skirting a ½" wide V-joint shall be formed at the junction with the plaster over: projecting skirtings shall be finished with a rounded top edge. Skirtings over cement renderings shall have a quarter-circle cove with ½" diameter at the junction with the paving.

All mitred angles, stop ends, etc. shall be neatly formed.

Glazed wall tiling.

S2219. Glazed wall tiles shall be sound and free from cracks and crazes, and shall be of regular size and shape and even colour. Unless otherwise specified, tiles shall be cushion edged white tiles.

Tiles shall be bedded in cement mortar (1:2½) at least ¼" thick on a prepared screed and the joints shall be grouted in white cement. Tiles shall be soaked in water for at least three hours before laying.

Tiles shall be laid to regular line and pattern as required, with even joints, not exceeding 1/16" wide. Tiling to ends of walls, faces or piers, or other narrow surfaces between two external angles be set out symmetrically in the width. Tiling shall be set out where possible so that cut tiles occur only at internal angles.

Where cushion edged tiles are used, no cut edge of a tile shall abut an uncut edge except at an internal angle: otherwise, both tiles shall be cut. Tiles shall be sorted and set out so as to mininise the effect of any unavoidable minor variation in colour.

All cutting shall be neatly and accurately carried out. Holes for screws or bolts shall be drilled with a special drill, and not cut.

Unless otherwise specified, tiling at external angles and exposed edges such as tops of dadoes and edges of splashbacks shall be finished with rounded-edge tiles, with the correct special fittings for all angles thereon.

Wall tiling shall be laid to project slightly more than the thickness of the tile in front of the adjacent wall plaster: the thickness of the screed under shall be such as to ensure this.

Mosaic tile paving.

S2220. Mosaic tiles shall be obtained from an approved supplier and shall be of approved size, colour and pattern. Tiles shall be of hard, dense, fine terrazzo or vitreous clay approximately 3/16" thick and shall be of even regular shape with square arrises.

Tiles, or paper-mounted panels of tiles, shall be bedded on a prepared level screed in cement mortar (1:2) approximately ¼" thick, and levelled. Mounting paper shall be removed and the joints grouted in white cement. The paving shall be cleaned immediately to remove all mortar from the surface of the tiles.

Tiles shall be set out symmetrically within each area and laid to regular line and pattern as required. Patterned mounted panels of tiles shall be adjusted as necessary to avoid a broken pattern and to reduce cutting. All cutting shall be neatly carried out. Joints shall not exceed 1/16" wide and joints between adjacent panels of tiles shall match those between individual tiles. Unless otherwise specified the edge row of tiles against walls shall be tilted at an angle of 45° to form a samll splayed internal angle, and the screed under shall be dubbed out to receive this.

Division strips.

S2221. 1/8" x 3/4" brass division strips shall be laid between different pavings. This applies to all in situ and tile pavings. Strips shall be indented or perforated for key, and shall be laid to accurate line and level.

Waterproofing.

S2222. Waterproofing of screeds, paving or rendering shall be carried out with "pudlo" or equal approved compound used in accordance with the manufacturer's instructions.

Sundry labours.

S2223. Plaster, screeds, paving and tiling shall be neatly made good around pipes, brackets, stays, etc. Where plaster, etc. has to be cut away for these the hole shall be formed to a regular outline, with the edges of the plaster undercut to form a key: the plaster in making good shall be finished flush with the surrounding plaster and later rubbed down.

Screeds and paving shall be formed to channels as required, and dished to outlets.

Protection.

S2224. No traffic shall be allowed on any paving until it has set or hardened sufficiently to allow this without damage. All pavings shall be covered up and protected as necessary as described in Chapter 12 (Preliminaries).

CHAPTER 23 GLAZIER

Glass generally.

S2301. Glass shall be of approved manufacture and shall comply with B.S. 952 (1964). It shall be free from blemishes, bubbles, waves and other defects.

Sheet glass.

S2302. Sheet glass shall be "ordinary glazing quality" (O.Q.) and 32 oz. weight unless otherwise specifed.

Obscured glass.

S2303. Obscured glass shall be of approved type and pattern. Where not otherwise specified or required it shall be cross-reeded glass, approximately 36 oz.

Polished plate glass.

S2304. Polished plate glass shall be "glazing for glazing" quality (G.G.) unless otherwise specified.

Louvre blades.

S2305. Glass louvre blades shall have all arrieses ground down. One-way mirrors shall be used for louvre windows of Security Office as shown on the Drawings.

Putty.

S2306. Putty for glazing to wood shall be best linseed oil putty, consisting of whitting thoroughly ground with boiled linseed oil to form a smooth paste, and shall comply with B.S. 544 (1934) or shall be of other equal approved manufacture.

Putty for glazing to metal shall be approved tropical metal glazing compound.

Glazing generally.

S2307. Glass shall be cut to suit the opening, leaving a clearance of 1/16" all round.

Obscured glass shall be cut and glazed so that the direction and face of the pattern is the same throughout.

Where wire glass is required to be "lined up" it shall be cut so that the wires in adjacent panes line up both horizontally and vertically.

Wood rebates shall be primed before puttying. No putty shall be painted until 14 days after glazing.

Glazing without beads.

S2308. Glass shall be well bedded and back puttied, and secured with sprigs (to wood) or glazing clips (to iron). Front putty shall be neatly finished to stop 1/16" from the sight line of the rebate.

Glazing with beads.

S2309. Unless a bedding strip is used, glass shall be well bedded and back puttied.

Where bedding strip is specified, this shall be wash leather, folded around the edge of the glass. Unless otherwise specified, bedding strip is reguired for all doors where glazed with beads.

CHAPTER 24 PAINTER

Materials generally.

S2401. All paints and other materials shall be of an approved brand delivered to the Site in unopened drums or packages, and shall be used strictly in accordance with the manufacturer's instructions.

Materials of anti-fungus quality shall be used where available from the manufacturer proposed.

No paints, etc. shall be thinned, tinted or otherwise added to except as directed by the manufacturers or the Engineer.

All finishing coats shall be to tints specified or approved by the Engineer.

Cement Paint and Emulsion Paint.

S2402. For all plastered external walls, cement paint of approved quality shall be used.

For all plastered internal walls, emulsion paint of approved quality shall be used.

Oil paint.

S2403. Unless otherwise specified, the final coat of oil paint on any surface shall be gloss finish, and all other coats shall be undercoats.

Approval and inspection.

S2404. No painting or decoration shall be carried out until the Engineer's approval has been obtained, and each coat shall be inspected and approved before the subsequent coat is applied.

Workmanship generally.

S2405. All painting and decoration shall be carried out by skilled workmen according to the best current practice and in accordance with the manufacturer's instructions.

All materials shall be applied by brush unless otherwise specified or approved. The correct type and size of brush shall be used according to the surface and item being treated and to the material being applied. Brushes shall be well cleaned after use.

All materials shall be thoroughly stirred before use after the removal of any skin, and shall be strained as necessary to remove all lumps. Opened cans shall be re-sealed when not in use.

Each coat of paint shall be a different tint from that to which it is applied, except in the case of white.

Each coat shall be allowed to harden before the next is applied.

Each coat of oil paint shall be lightly rubbed down with glass paper and dusted off before the next is applied. Where two finishing coats are applied, the first shall be rubbed down sufficiently to remove the gloss.

No painting or decoration shall be carried out externally during wet weather, and any surface damaged by rain before it has dried shall be made good or repainted as necessary at the Contractor's expense. Priming coats and undercoats shall not be left exposed to the weather for undue periods.

No finishing coats shall be applied until all dust and rubbish has been removed from that area.

Finished quality.

S2406. All finished paintwork and decoration shall be of uniform finish and colour, free from blemishes, brush-marks and tackiness.

Edges of paintwork shall be accurately cut in to line, and disfigurement of adjacent surfaces shall be avoided. Painting of sashes, etc. glazed with putty shall overlap the putty onto the glass, to finish exactly on the sight line of the rebate.

Surface preparation generally.

S2407. All surfaces shall be thoroughly dry and free of all dust, dirt and loose material before being painted or decorated.

All bolts, handles, escutcheons and other surface ironmongery, and all cover plates and removable fittings, shall be removed before painting or decoration is carried out, and subsequently replaced.

Surface preparation - plaster, etc.

S2408. Plastered, rendered, concrete, brick and similar surfaces shall be prepared as follows:-

(a) Cracks and other imperfections shall be pointed or cut out and made good.

(b) Surface shall be allowed to dry out for as long as possible, and in no case less than 7 days for cement paints and plastic emulsion paints, or less than one month for oil paints.

(c) Any efflorescence shall be removed by dry brushing followed by a damp cloth. This shall be repeated until no further efflorescence appears within 48 hours.

(d) Surface shall be rubbed down to remove all plaster nibs and other irregularities, and brushed down to remove dust.

(e) Surface shall be well wetted immediately before the finish is applied, and allowed to dry partially until it no longer shines.

Surface preparation - metalwork.

S2409. Metal surfaces shall be prepared as follows:-

(a) All dirt and grease shall be removed by wiping or washing.

(b) All rust, scale or loose priming paint shall be removed back to bare metal by wire brushing or chipping as required.

(c) Surface shall be rubbed down to remove all irregularities.

(d) Bare patches in metalwork delivered primed shall be brought forward with the appropriate primer before receiving the treatment specified.

Surface preparation - woodwork.

S2410. Surfaces of woodwork shall be prepared as follows:-

(a) All dirt, grease, etc. shall be cleaned off.

(b) Surface shall be rubbed down with glass paper to remove all projecting fibres, particular attention being paid to mouldings. All dust shall be removed.

For woodwork to be painted (not varnished or polished) the following additional treatment is required:-

(c) All knots and resin pockets shall be scraped and given two thin coats of patent knotting consisting of shellac dissolved in methylated spirits, free from rosin.

(d) After priming all crack, nail holes, open joints and other imperfections shall be made good with hard stopping consisting of paste white lead and gold size stiffened with whiting.

Sealers and primers.

S2411. All surfaces to be oil painted shall be treated with the appropriate sealer or primer, as follows:-

(a) Plastered, rendered, concrete, brick, asbestos cement and similar surfaces: apply one coat of alkali-resisting primer.

(b) Hardboard, fibreboard, etc.: apply one coat of plaster primer.

(c) Plastic surfaces: etch with abrasive paper and white spirit.

(d) Steel and iron surfaces: apply two coats of priming paint to comply with B.S. 2523 (1966) Type B or other equal primer approved by the Engineer to structural steel surfaces, and one coat of primer as mentioned above to other steel and iron surfaces. Edges shall be primed first and allowed to dry, and then the whole surface primed. Damaged surfaces after delivery shall be applied with the same primer to match adjacent surface.

(e) Galvanized or zinc surfaces: either apply one coat of calcium plumbate primer or etch with proprietary solution and apply one coat of zinc chromate primer. Etching solution shall be kept away from plaster, and shall be well washed off and the metal dried before priming.

(f) Woodwork: apply one coat of aluminium primer or, in the case of coarse grain timber, one coat of white-lead based primer (B.S. 2521 (1966) or other equal approved) thinned 10 per cent with white spirit. Two coats of primer shall be applied to end-grain surfaces.

No sealer or primer is required on surfaces to be emulsion painted unless so specified.

Priming joinery.

S2412. All joinery to be painted shall be primed before delivery to the Site or, in the case of joinery prepared on site, as soon as possible after preparation. Surfaces subsequently cut or damaged shall be re-primed.

All hidden faces of joinery, including the back of boarding, frames, skirtings, architraves, etc. and bottom edges of doors, shall be primed before fixing. Approved clear wood preservative shall be used instead, where adjacent faces have polished or natural finish.

Priming metalwork.

S2413. All steel and ironwork to be painted, except plumbing pipework and electrical conduit, shall be primed before assembly or fixing, including laps, ends for building in, and other concealed parts.

Nail heads in wall linings, etc.

S2414. Heads of nails or pins in hardboard, fibreboard and similar linings to be emulsion painted shall be spotted with one coat of primer and one undercoat of oil paint before the lining is decorated.

Number of coats.

S2415. Unless otherwise specified, the required finishes shall consist of the following treatments, in addition to the preparations, priming, etc. described above:-

(a) Emulsion painting	Two coats
(b) Oil painting	Three coats of woodwork, two coats elsewhere

Varnishing. S2416. Woodwork shall be prepared for varnishing as described above, particular attention being paid to cleanliness of the timber where clear varnish is required. Brushes and containers shall be kept scrupulously clean. Formation of froth and air bubbles shall be avoided.

Wood preservative. S2417. Timber for Carpenter's work shall be treated before fixing with wood preservative as provided in Chapter 18. (Carpenter), unless otherwise specified.

Samples, etc. S2418. Before the commencement of the works, the Contractor shall submit samples of paints and other materials to be used for the works to the Engineer for his approval.

The Contractor shall also submit samples of paints spread to surface of each material to the Engineer for his selection of the tint.

Protection. S2419. All other works, fittings, pavings, etc. shall be covered up and protected during decoration, and all splashes and paint marks shall be removed on completion.

Setting out.

S2501. All trenches and drains shall be set out accurately to straight lines and even falls as required, and the Contractor shall provide, set up and maintain all necessary bench marks, sight rails, boning rods, etc.

Trenches.

S2502. All trenches shall be excavated of sufficient width to allow adequate working space for pipe jointing.

Pockets shall be cut in the bottom of trenches for the sockets of pipes laid without concrete beds, to allow the barrels of the pipes to rest solidly on the ground and to provide hand room for jointing.

Turf and top soil shall be set aside and replaced on completion of the backfilling, except where on the site of new buildings, pavings, etc. Any existing pavings shall be reinstated as provided in Chapter 13 (Excavator and Earthwork).

Backfilling of trenches shall be as described in Chapter 13 (Excavator and Earthwork), except that filling to a height of 12" above the top of the pipes shall be with selected material carefully handpacked and well rammed on each side of the pipe.

Concrete beds, etc.

S2503. Concrete for drain beds and haunching shall be Class Z.

Beds under drain pipes where required shall be 6" thick and 12" wider than the external diameter of the pipe. The drain shall be haunched up on both sides from the outside edge of the bed to meet the barrel of the pipe tangentially.

Concrete beds shall be provided for all glazed stoneware drain pipes. No concrete beds are required for cast iron drain pipes.

Vertical and steeply sloping drains, as where branch pipes are vertically inserted into manholes and the like, shall be surrounded with concrete minimum 6" thick.

Gullies, traps and other similar fittings shall be set on a bed of concrete 6" thick and haunched up all round. Bends at feet of vertical soil, waste or rainwater pipes shall be similarly treated.

Drainlaying generally.

S2504. Laying of each part of drains shall be commenced at the lower end thereof. Socketed pipes shall be laid with the socket at the higher end of the pipe. Each pipe shall be accurately levelled and securely held in position before the joint is made.

Pipes shall be kept clear of all jointing material and other obstructions by means of a closely fitting pad drawn through as the work proceeds.

All openings left temporarily in the drains at junctions, ends, manholes, etc. shall be sealed to prevent the entry of surface water, earth or any other matter.

After drains laid by the Contractor have been connected to any other new or existing drainage or disposal system, care shall be taken to prevent damage to that system being caused by surface water, earth or any other matter entering the new drains, and the Contractor shall be responsible for the cost of making good any damage so caused.

Stoneware drains.

S2505. Stoneware pipes and fittings shall be British Standard quality to comply with B.S. 65 (1966). Stoneware traps, gullies, branch bends and similar fittings shall be of the pattern and dimensions stated in B.S. 539 (1951) and shall be sound, well glazed, impervious and free from fire cracks and other defects.

Joints between stoneware pipes and fittings shall be made with gaskin and cement mortar. The gaskin shall be tarred hemp yarn or similar material, wound around the spigot before insertion and then tamped lightly into the socket so as to occupy not more than one quarter of the depth thereof. Then the socket shall be filled with cement mortar (1:1), and the exposed surface of mortar shall be trowelled and finished to form a fillet of 45° angle with the barrel of the pipe.

Joints between stoneware and cast iron and those between steel and stoneware shall be similarly made.

Cast iron drains.

S2506. Cast iron drain pipes shall be cast iron to comply with B.S. 437 (1933) or spun cast iron Class B to comply with B.S. 1211 (1958) and shall have spigot and socket ends. Cast iron drain pipe bends, branches, traps, gullies and other fittings shall be of the pattern and dimensions stated in B.S. 1130 (1955) and shall be sound, free from flaws and defects, and of not less in thickness than that required by B.S. 437 (1933) for pipes of corresponding size.

All pipes and fittings shall be coated inside and out; the coating for fittings shall comply with the requirements for coating pipes given in B.S. 437 (1933) or B.S. 1211 (1958).

Any damage to the coating shall be made good by painting with two coats of black bituminous paint.

Joints between cast iron pipes and/or fittings shall be made by one of the following methods:-

(a) Run lead. White hemp yarn or lead strip shall be caulked in to centre the spigot in the socket, and molten lead shall then be run in and well caulked. The minimum depth of socket filled with run lead shall be as follows:-

Pipe diameter:-	2" - 5"	6"	7" - 12"
Depth of run lead:	1¾"	2"	2½"

(b) Lead wool. Leaded yarn or lead strip shall be caulked in to centre the spigot in the socket, and lead wool shall then be well caulded in skein by skein. The minimum depth of socket filled with lead wool shall be as follows:-

Pipe diameter:	2" - 5"	6" - 12"
Depth of run lead:	1¼"	1½"

(c) Caulking compound. Philplug "P.C.4" or equal approved cementatious caulking compound in rope form shall be well caulked in skein by skein with wetted caulking irons to fill the socket, all in accordance with the manufacturer's instructions.

Manholes.

S2507. Manholes shall be of precast reinforced concrete pipes or of cast-in-place reinforced concrete Class Y. Where cast-in-place concrete is used, the walls of the manholes shall be 4" thick and the manholes shall be reinforced with reinforcing bars ¼" diameter. Where precast concrete pipes are used, the quality of pipes including reinforcing bars must be approved by the Engineer. The dimensions given on the Drawings are inside diameters.

Bottoms of manholes shall be of concrete Class Z 6" thick and projecting 6" beyond the sides all round.

Channels in bottoms of manholes shall be glazed stoneware pipes or of mortar (1:3), half-round for main channels and three-quarter section for branch channels, of correct shape to suit the direction of the flow. The bottoms of the manholes shall be benched up around the channels in concrete Class Y rendered with cement and sand (1:2) ½" thick finished perfectly smooth: the benching rising vertically 3" from the sides of the main channel and then sloping up to the walls with a slope of 1 in 6 and dished to the branch channels.

Manhole cover-slabs shall be of 6" thick reinforced concrete Class Y and shall be reinforced with bars 3/8" diameter at centres not exceeding 6". Surfaces and edges of manholes shall be finished smooth.

Covers and frames shall be of tar-coated deodorant medium duty cast iron, and covers shall have a guard chain for burglarproof.

Where precast cover-slabs and manhole pipes are used, they shall be bedded in cement mortar (1:2); where internal surfaces do not have fair finishes, they shall be rendered and finished with cement mortar (1:3) ½" thick.

Manholes for waste water shall be at least 6" deep from drain pipe to bottom and shall have no invert. Cover-slabs and covers shall be the same with the manholes for soil water.

Intercepting traps.

S2508. Intercepting traps shall be set on and surrounded with concrete Class Z 6" in minimum thickness, and built into manhole sides and made good.

Intercepting traps shall have brass or galvanized iron stopper and frames, each with lever locking arm, chain and staple, the frame jointed to the socket as described for pipes and the staple built in to the manhole side.

Fresh air inlets.

S2509. Fresh air inlets shall be heavy galvanized iron with cast brass front, mica flap and mosquito proofing.

Septic tanks.

S2510. Septic tanks shall be constructed as shown on the Drawings and of the size specifed.

Reinforced concrete shall be Class X. Formwork shall be used for both faces of all walls. Walls internally, baffle walls and bottoms of septic tanks shall be rendered ½" thick in cement and sand (1:2) waterproofed with "Pudlo" or equal approved waterproofing compound used in accordance with the manufacturer's instructions, trowelled hard and smooth.

Cover-slabs of septic tanks shall have the same cast iron covers and frames as shown on the Drawings and as specified above for manholes.

Filters shall be constructed as shown on the Drawings and as specified above for septic tanks.

Sewage and sump pumps.

S2511. Sewage and sump pumps shall be centrifugal pumps directly connected with watertight canned type motor. Main bodies of pumps shall be of special cast iron, impellers being of phosphoric bronze, main shafts being stainless steel bars and bearings built-in anti-corrosive.

The Sewage pump shall have a special-shaped impeller to pass stone, cloth and any other matter.

Both sewage and sump pumps shall be so installed that they may be alternately and automatically operated by electrodes fixed in septic tanks.

Specifications for these pumps shall be as follows:-

	Sewage pump	Sump pump
Internal diameter	1½ in.	1½ in.
Capacity	25 gpm.	25 gpm.
Water head	30 ft.	21 ft.
Motor	1 HP.	½ HP.
Voltage	400 V.	400 V.
Phase	3	3

Drain levels.

S2512. Unless otherwise specified or shown on the Drawings the invert level at the head of each branch of the drains shall be 18" below finished ground or paving level, and the drains shall fall evenly from that point.

Inspection and testing.

S2513. Excavations shall be inspected before concrete or drains are laid, as previously specified.

All drains shall be tested before being haunched or surrounded with concrete, or before the trenches are backfilled in the case of drains without beds, and shall be tested again on completion of the Contract if required.

Drains and manholes shall be tested by filling with water, carried out to the satisfaction of the Engineer and authorities concerned. Any defect disclosed shall be made good, and that section retested. The Contractor shall provide all necessary stoppers and other apparatus, water and labour necessary for the testing, and shall pump or drain the system out on completion.

Concrete septic tanks shall be tested as described in Chapter 15 (Concretor).

Samples and working diagram.

S2514. Before the commencement of the works, the Contractor shall submit samples of pipe, joint, jointing material and other material for use in the works to the Engineer for his approval.

The Contractor, before commencing the works, shall

also submit the detailed working diagram of all portions of the works to the Engineer for his approval.

Local authorities.

S2515. The works shall be carried out with special attention being paid to ensure that the execution complies with the regulations of local authorities, including the Kuching Municipal Council.

Weighbridge.

S2601. Two units of weighbridges, type 5106, of 20 ton capacity, with platform size 20'0" x 9'0", complete with recording indicators, type DLB, as manufactured by W. & T. Avery Limited, Soho Foundry, Birmingham, 40, England, shall be installed according to the Drawings and instructions of the Engineer. The graduation of the indicators shall be of the British system.

Oil storage tank.

S2602. An underground storage tank of 1,000 gal. capacity complete with all the necessary pumps and pipings is to be provided by an oil company for the oil storage room of the vehicle shed. The provision of the storage tank is not included in the Contract Work, but the Contractor shall proceed with the Works without interfering with the installation of the tank, and the floor concrete shall be placed after the underground tank has been installed.

Fire hose tower.

S2603. A fire hose tower shall be provided in accordance with the Drawings.

Incinerator.

S2604. An incinerator shall be provided in accordance with the Drawings. Bottom layers of inside bricks shall be firebricks as shown on the Drawings.

Platform.

S2605. A platform shall be provided near the exit gate in accordance with the Drawings.

Paving for electrical sub-station.

S2606. A paving shall be provided for electrical sub-station in accordance with the Drawings.

SARAWAK, MALAYSIA

KUCHING PORT AUTHORITY

KUCHING PORT EXPANSION PROJECT

CONTRACT DOCUMENT

VOLUME 1

LIST OF BRITISH STANDARDS REFERRED TO IN THE SPECIFICATION FOR CIVIL ENGINEERING, BUILDING AND SANITARY WORKS.

B.S. NO.	DATE	TITLE
4.	1962	Structural steel section.
-	1962	Part 1: Hot-rolled sections.
-	1965	Part 2: Hot-rolled hollow sections.
10.	1962	flanges and bolting for pipes, valves and fittings.
12.	1958	Portland cement (ordinary and rapid-hardening).
21.	1957	Pipe threads.
31.	1940	Steel conduit and fittings for electrical wiring.
65 & 540.	1966	Clay drain and sewer pipes including surface water pipes and fittings.
229.	1957	Flameproof enclosure of electrical apparatus.
275.	1927	Dimensions of rivets (1/2 in to 1-3/4 in diameter).
277, 278.	1936	Ready mixed paints (oil gloss) zinc oxide base.
416.	1967	Cast iron spigot and socket soil, waste and ventilating pipes (sand cast and spun) and fittings.
434.	1960	Bitumen road emulsion (anionic).
437.	1933	Cast iron spigot and socket drain pipes.
443.	1961	Galvanized coatings on wire.
460.	1964	Cast iron rainwater goods.
486.	1966	Asbestos cement pressure pipes.

B.S. NO.	DATE	TITLE
497.	1967	Cast manhole covers, road gully gratings and frames, for drainage purposes.
539.	1951	Dimensions of drain fittings.
-	-	Part 1: Salt-glazed ware and glass (vitreous) enamelled salt-glazed fireclay.
-	-	Part 2: Scottish type. Salt-glazed ware and glass (vitreous) enamelled salt-glazed fireclay.
544.	1934	Linseed oil putty for use in wooden frames.
556.	1966	Concrete cylindrical pipes and fittings including manholes, inspection chambers and street gullies.
592.	1957	Included in B.S. 3100.
594.	1961	Rolled asphalt (hot process).
602, 1085.	1956	Lead pipes for other than chemical purposes.
639.	1964	Covered electrodes for the manual metal-arc welding of mild steel and medium-tensile steel.
641.	1951	Dimensions of small rivets for general purposes.
690.	1963	Asbestos-cement slates, corrugated sheets and semi-compressed flat sheets.
729.	1961	Zinc coatings on iron steel articles.
-	1961	Part 1: Hot-dip galvanized coatings.
747.	1961	Roofing felts (bitumen and fluxed pitch).
750.	1964	Underground fire hydrants and dimensions of surface box openings.
785.	1967	Hot-rolled bars and hard drawn wire for the reinforcement of concrete. Part 1: Hot-rolled steel bars.
812.	1967	Methods for the sampling and testing of mineral aggregates, sands and fillers.
882.	1965	Aggregates from natural sources for concrete (including granolithic).
890.	1966	Building limes.
916.	1953	Black bolts, screws and nuts.

B.S. NO.	DATE	TITLE
952.	1964	Classification of glass for glazing and terminology for work on glass.
1010.	1959	Draw-off taps and stopvalves for water services (screwdown pattern).
1052.	1942	Mild steel wire for general engineering purposes.
1085.	1956	(Included in B.S. 602.).
1125.	1959	W.C. flushing cisterns (including dual flush cisterns) and flush pipes.
1130.	1943	Schedule of cast iron drain fittings, spigot and socket type, for use with drain pipes to B.S. 437: 1933.
1142.	1961	Fibre building boards.
1144.	1967	Cold worked steel bars for the reinforcement of concrete.
1181.	1961	Clay flue linings and chimney pots (dimensions and workmanship only).
1184.	1961	Copper and copper alloy traps.
1211.	1958	Centrifugally cast (spun) iron pressure pipes for water, gas and sewage.
1212.	1953	Ballvalves (Portsmouth type) excluding floats.
1218.	1946	Sluice valves for waterworks purposes.
1256.	1952	Malleable cast iron (whiteheart process) and cast copper alloy pipe fittings for steam, air, water, gas and oil. Screwed B.S.P. taper male thread and parallel female thread.
1377.	1967	Methods of testing soils for civil engineering purposes.
1387.	1967	Steel tubes and tubulars suitable for screwing to B.S. 21 pipe threads. M + I
1449.	1962	Steel plate, sheet and strip.
-	-	Part 1A: Carbon steel plate and coil, rolled by the Continuous process.
-	1964	Part 2B: Carbon steel sheet, rolled by the non-continuous process.

B.S. NO.	DATE	TITLE
1449.	1964	Part 3 A: Hot-rolled mild and carbon steel strip.
-	-	Part 3 B: Cold rolled mild and carbon steel strip.
1455.	1963	Plywood manufactured from tropical hardwoods.
1478.	1967	Bending dimensions and scheduling of bars for the reinforcement of concrete.
1579.	1960	Connectors for timber.
1853.	1967	Tubular fluorescent lamps for general lighting service.
1856.	1964	General requirements for the metal-arc welding of mild steel.
1876.	1952	Automatic flushing cisterns for urinals.
1881.	1952	Method of testing concrete.
1924.	1967	Methods of test for stabilized soils.
1968.	1953	Floats for ballvalves (copper).
2004.	1961	PVC-insulated cables and flexible cords for electric power and lighting.
2035.	1966	Cast iron flanged pipes and flanged fittings.
2456.	1954	Floats for ballvalves (plastics) for cold water.
2521.	1966	Lead-based priming paints.
2523.	1966	Lead-based priming paints.
2708.	1956	Unified black square and hexagon bolts, screws and nuts (UNC and UNF threads). Normal series.
2818.		Auxiliaries for operation of fluorescent lamps on a.c. 50 c/s supplies.
-	1962	Part 1: Ballasts.
3100.	1967	Steel castings for general engineering purposes.
3148.	1959	Tests for water for making concrete.
3235.	1964	Test methods for bitumen.
3346.	1961	Armoured PVC-insulated cables.
3436.	1961	Ingot zinc.

B.S. NO.	DATE	TITLE
3690.	1963	Bitumens for road purposes.
3772.	1964	Starters for use with fluorescent lamps operating on a.c. 50 c/s supplies.
3921.	1965	Bricks and blocks of fired brickearth, clay or shale.
4017.	1966	Capacitors for use in tubular fluorescent, mercury, and sodium discharge lamp circuits.
4360.	1968	Weldable structural steels.

B.S.C.P. NO.	DATE	TITLE
CP 101.	1963	Foundations and substructures for non-industrial buildings of not more than four storeys.
112.	1967	The structural use of timber.
112. 101:	1951	Brickwork.
114.	1957	Structural use of reinforced concrete in buildings.

SARAWAK, MALAYSIA

KUCHING PORT AUTHORITY

KUCHING PORT EXPANSION PROJECT

List of Abbreviations used in this Document

A	-	ampere
AC	-	alternating current
AREs.	-	Assistant Resident Engineers
&.	-	and
B.M.	-	Bench Mark
B.S.	-	British Standard
C.	-	Centigrade
C.I.F.	-	Cost, Insurance and Freight
¢	-	cent
CC	-	cubic centimetre
Cm.	-	centimetre
Cm^2	-	square centimetre
Co.	-	Company
C.P.	-	Codes of Practice
Cu.	-	cubic
Cwt.	-	hundredweight
D.	-	diametre
DC	-	direct current
Do. or do.	-	ditto, same as before
dia.	-	diametre
etc.	-	et cetra
F.	-	Fahrenheit
F.O.B.	-	Free on board
ft.	-	foot(feet)
g.	-	gramme
gal.	-	gallon
hr.	-	hour
H.W.L.	-	High Water Level
HP	-	horsepower
in.	-	inch(es)
Kg.	-	Kilogramme

KPA	-	Kuching Port Authority
KST.	-	Kobe Steel Tie Rod
lb.	-	pound
lin.	-	linear
Ltd.	-	Limitted
m.	-	meter
Max.	-	maximum
mg.	-	milligramme
min.	-	minimum
M.L.W.	-	Mean Low Water
MPH	-	miles per hour
mm.	-	millimetre
mV.	-	millivolt
M$	-	Malaysia Dollar
N	-	north
No.	-	number
No(s).	-	number(s)
NW	-	north-west
OZ.	-	ounce
PC	-	prime cost
PS	-	provisional sum
PVC	-	Polyvinylchloride
RC	-	reinforced concrete
R.E.	-	Resident Engineer
S.	-	south
sec.	-	second
sq.	-	square
SW	-	south-west
SWG	-	Standard Wire Gauage
U.S.	-	United States
viz.	-	Videlicet, or Namely
W	-	west
WC	-	water-closet
yd.	-	yard
"	-	inch
'	-	foot or feet
o	-	degree
%	-	of units in proportion to one hundred