(d) Fillet welding

A minimun excess metal shall be left on the welded portion. The height of the excess metal shall be as small as possible and shall be not more than 0.1S + 1m (S being the specified size).

4.5.9 Test after Completion of Welding:

(a) After completion of welding, the welded work shall be tested according to the following particulars and the test results submitted to the Supervisor for his approval.

(1) Removal of slug on the welded surface shall be confirmed.

(2) Welded work shall be inspected to confirm that it is flawless.

(3) The size and shape of the deposited metal shall be measured.

(4) Penetration test shall be carried out if required.

(5) All of part of supersonic test, X-ray test and macro-structure test using end tabs shall be carried out in a limited area if required.

(6) If the tests mentioned above are carried out over an extended area, special instruction shall be observed.

(b) Upon completion of the above tests, inspection by the Supervisor shall be conducted.

4.5.10 Correction of Defective Weldment etc.:

(a) Correction of defective weldment

(1) Harmful defects such as poor fusion, poor penetration, mixing of slug, pits and blow holes which are found on the welded joints shall be removed and re-welded.

(2) Welded joint with cracks shall, in principle, be removed of deposited metal along the entire length of the joint and re-welded. Even when the limit of the cracks is known by appropriate test, deposited metal shall be removed for not less than 50 mm from the end of the crack and the joint re-welded.

(3) Undercuts, insufficient filling of crators, insufficient size of deposited metal and insufficient welding length shall be corrected.

(4) Excessive overlap and deposited metal shall be removed.

(5) Weldment showing remarkably poor appearance shall be corrected.

(b) Parent metal with cracks caused by welding shall be replaced.

(c) The diameter of welding rods or electrodes used for correction of defective weldment shall be not more than 4 mm.

4.5.11 Protection against Weather:

(a) No welding is allowed if the temperature surrounding welding work is below -15°C.

(b) No welding is allowed if the parent metal is wet with rain or snow or when the wind is strong. Provided however, if sufficient protective measure is taken, welding shall be permitted.

4.5.12 Painting of Field-Welded Work:

(a) Shop painting is not permitted for approximately 200 mm on both sides from the part where field welding is to be performed Provided however, painting harmless to welding may be permitted.

(b) Appropriate rust-proofing treatment shall be given on the parts to be field-welded where remarkable rusting is expected.

4.5.13 Accident Prevention:

Sufficient preventive measure shall be taken against accident arising from current leak, electric shock and electric arc and against fire from molten metal and electric arc.

4.5.14 Welding for the Related Works:

Unavoidable welding on the rolled steel shapes for performance of related works shall be carried out by a welder with skills mentioned in paragraph 5.5.4 with the approval of the Supervisor after it has been confirmed that such welding does not give adverse effect on the steel shapes.

4.6 PAINTING:

4.6.1 Painting:

(a) Painting shall conform to the requirements of Section 14.

(b) Steel sleeves welded to steel frame and used for reinforced concrete construction shall have their interior painted with anti-corrosive paint.

(c) No painting is permitted on the following parts.

(1) Part to be embedden in the concrete.

(2) Friction surface where high-tension bolts are used.

(3) Underside of base plates.

(4) Inside of closed section to be enclosed.

(5) Parts where painting is not suitable.

4.7 ANCHOR BOLTS:

4.7.1 General:

(a) Centering of anchor bolts shall be carried out true to base lines by use of a template and appropriate tools.

(b) Bolt holes on base plates shall have diameters not more than the sum of the bolt diameters and 5 mm.

(c) Bolts shall be provided with double nuts and washers. The threads on bolts shall conform with the requirements of 4.2.6. The tip of the bolt shall appear out of the nut by not less than three threads.

4.7.2 Holding of Bolts:

(a) Bolts shall be held in position accurately by use of templates and shall be fixed in place so that no movement or swing of the bolt tip shall occur.

(b) Bolts shall be positioned in place by use of steel bars or fixed to formes by use of appropriate material before placing concrete.

4.7.3 Curing:

Bolts shall be handled in such way that no bending is caused by impact. For prevention of damage to the threads, development of rusts and spoiling, bolts shall be wrapped with cloth and vinyl-tapes.

4.7.4 Finishing of levelling mortar for column base:

(a) Levelling mortar shall be spread with a thickness of 30 mm and the proportion by volume shall be one part cement to one part sand.

(b) Laitance shall be removed from teh concrete surface and the surface shall be roughened.

(c) Levelling mortar shall be spread in such manner that prior to erection of column, hard-mixed mortar shall be placed under the base plate at its center in required thickness and mortar shall be filled sufficiently under the entire underside of the base plate after the column has been erected. Provided however, if the size of the base plate is smaller than 300 m square, mortar shall be spread smooth to the required thickness, on which the column may be erected.

4.8 DELIVERY AND ERECTION OF STEEL FRAMES:

4.8.1 Delivery and Preparation for Erection:

(a) Steel members shall be delivered to the project site in the order of erection. Curing shall be carried out whenever required.

(b) Bends and warps of the members shall be corrected before erection.

4.8.2 Erection:

(a) Erection shall be carried out according to a fully studied program as to the sequence of erection and the need for reinforcement of frame during erection and in such manner as to insure safety of structure until the members are permanently joined against wind pressure, dead weight and special loads.

(b) Temporary bolts shall have the same diameter as for the permanent bolts and rivets. The number of bolts used for temporary tightening shall be not less than 1/3 of the entire number of permanent bolts or rivets and not less than two. High-tension bolts shall serve as temporary bolts mentioned in 4.4.9 (a). For welding, the entire number of the temporary bolts shall be tightened.

(c) If large loads such as materials or equipment is imposed on the steel frame, appropriate reinforcement shall be made.

(d) Steel members liable to bending when lifted shall be appropriately reinforced.

(e) Before the steel members are finally joined, warps shall be corrected and erection inspected by the contractor and the test results shall be submitted to the Supervisor for his approval.

4.8.3 Safety Control:

Equipment and tools of sufficient capacity shall be used for erection. Installation, maintenance and operation of erection equipment shall be properly carried out. Full measure shall be taken for safety of workers and accident prevention by proper maintenance of related facilities and imposition of restriction on the surrounding works.

4.9 LIGHT STEEL CONSTRUCTION:

4.9.1 General:

This paragraph applies to steel construction for which cold-rolled light steel shapes are used.

4.9.2 Materials:

(a) Steel shapes

(1) Light gauge steel shapes shall be the standard products made of SSC41 conforming to the requirements of JIS G3350 (Light steel shapes for ordinary structure) and those of 4.2.7 (a).

(2) Round steel bars shall be the standard products made of SR24 conforming to the requirements of JIS G3112 (Steel bar for reinforced concrete) or the standard products made of SS41 conforming to the requirements of JIS G3101 (Rolled steel shapes for ordinary structure).

(3) Products other than the standard products of JIS shall be subjected to tests mentioned in 4.2.7 (b).

(b) Electrodes for arc welding shall be the standard products conforming to the requirements of JIS Z3211 (Coated electrode for arc welding for soft steel) or to the requirements of JIS Z3210 (Coated electrode for arc welding for steel sheet). The diameters of the electrodes as related to the thickness of parent metals shall be as shown in Table 4.10.1.

Table 4. 9.1 Relation between the diameter of electrodes and the thickness of the parent metals (mm)

Diameter of electrodes	Thickness of parent metals
ϕ 3.2	Above 2.3
ϕ 2.6	Below 2.3

4.9.3 Method of Work:

(a) Pitch and bolt hole clearance for high-tension bolts, ordinary bolts and rivets shall be as shown in the drawings.

(b) Light gauge steel shapes shall be cut on a machine.

(c) Tubular members shall be capped at ends with same material as the tube proper.

(d) Ordinary bolting shall be performed as follows.

(1) The diameter of bolt holes shall be not more than 1.0 mm beyond the bolt diameters.

(2) Bolts shall be provided with double nuts to prevent loosening.

(3) Shear bolts shall be provided with washers to prevent the threads from touching the grip. Bolt tip shall extend out of the nut by not less than three threads.

(4) Bolts for fitting purlins and furring strips need not conform to the requirements of (2) and (3) above. Provided however, threades on the bolts shall extend out of the nut by not less than three threads.

SECTION 5
MASONRY

5.1 SCOPE OF WORK:

5.1.1 Extent: The work required under this section consists of all masonry and related items necessary to complete the work indicated on drawings and described in specifications.

5.2 SHOP DRAWINGS:

5.2.1 All shop drawings shall be submitted tothe Supervisor for his approval. These drawings shall show in detail the construction of all points of the work, including reinforcement, masonry joints and lintels, exact dimensions, kind of material to be used, and all other pertinent information. Furnish shop drawings in sufficient time and with such details and accuracy that the Engineer can approve dimensions of door frames and other items in advance of the actual execution of the work.

5.3 SAMPLE MATERIALS:

5.3.1 Samples of Material: Prior to installation, submit to the Supervisor for approval three (3) individual samples.

(a) Burnt clay bricks.

(b) Anchors and ties.

5.4 MASONRY MATERIALS:

5.4.1 Burnt Clay Bricks: Unless otherwise directed by the Supervisor,all bricks shall be made in Bangladesh. They shall be made of clay, and shall be hard, sound, square and clean with sharp well-defined arises and shall have sizes of follows:

Length: 247.65 mm (9'3/4")
Width : 120.65 mm (4'3/4")
Height: 69.85 mm (2'3/4")

5.4.2 Concrete Lintels: Except where steel or precast lintels are indicated, lintels in masonry walls and partitions shall be fabricated of reinforced concrete (M-150) in situ as shown on drawings, linetels shall

be built in place and the jointing of lintel units shall match the adjacent wall units.

5.4.3 Anchors and Ties: Anchors and ties shall be of zinc-coated steel, and shall be as shown drawings. Unless otherwise indicated, the cavity wall ties shall be of the butterfly twist type of 10 gauge mild steel wire zinc-coated. The length of ties shall be approximately 8 cm less than the total thickness of the wall.

5.4.4 Reinforcing Rods: Steel rods for lintels and other reinforcement not specified otherwise shall be as specified in "CONCRETE WORK."

5.5 MORTAR MATERIALS:

5.5.1 Portland Cement: See "CONCRETE WORK"

5.5.2 Sand: Sand to be used for mortar shall be clean and sharp. It shall be chemically and structurally stable and shall comply with the Table of Gradings given below.

Table of Grading - Percentage by Weight Passing Sieves						
Nominal Size of Sieves, mm	5	2.5	1.2	0.6	0.3	0.15
Sand, %	-	100	100~50	80~30	45~15	10~2

5.5.3 Mixing Water: See "CONCRETE WORK"

5.6 STORAGE OF MATERIALS:

5.6.1 Store materials under cover in a dry place and in a manner to prevent damage or intrusion of foreign matter. During freezing weather protect all masonry units with tarpaulins or other suitable material. Store masonry units under covers that will permit circulation of air and prevent excessive moisture absorption. Store cement in watertight sheds with elevated floors. Protect reinforcement from the element; immediately before placing reinforcement shall be free from loose rust, ice or other foreign coatings that will destroy or recuce the bond. Masonry units shall be protected against wetting prior to use.

5.7 CEMENT MORTAR:

5.7.1 Cement mortar shall consist of one part of Portland cement to four parts of sand by volume and shall, when a mortar plasticizer is to be used, consist of one part of Portland cement to six parts of sand by volume.

5.7.2 Plasticizers for mortar shall be of a manufacturer approved by the Engineer, and shall be used in strict accordance with the manufacture's instructions.

5.8 MIXING MORTAR:

5.8.1 Mix all cementitious materials and sand in a mechanical batch mixer for a minimum of 5 minutes. Adjust the consistency of the mortar to the satisfaction of the mason but and only as much water as is compatible with convenience in using the mortar. If the mortar begins to stiffen from evaporation or from absorption of a part of the mixing water, retemper the mortar immediately by adding water, and remix the mortar. All mortar shall be used within 1-1/2 hours of the initial mixing. It shall not be used after it has begun to set.

5.9 PRECAUTIONS AND GENERAL REQUIREMENTS:

5.9.1 Before closing up any pipe, duct or similar inaccessible spaces or shafts with masonry, remove all rubbish and sweep out the area to be enclosed.

5.9.2 Where fresh masonry joints masonry that is partially set or totally set, clean the exposed surface of the set masonry and wet it lightly so as to obtain the best possible bond with the new work. Remove all loose units and mortar. If it is necessary to "stop off" a horizontal run of masonry, this shall be done by racking back one-half brick length in each course.

5.9.3 Consult other trades and make provisions that will permit the installation of their work in a manner to avoid cutting and patching. Build-in work specified under other sections, as necessary, and as the work progresses. Set lintels in beds of mortar. Fill spaces around jambs and heads of door bucks and frames solidly with mortar. Build-in anchors and clips for windows.

5.10 LAYING BRICKS:

5.10.1 All brickwork shall be set out and built to the dimensions shown on drawings.

5.10.2 All bricks shall be properly spread with mortar before being laid and all joints shall be thoroughly flushed up solid through the full thickness of the wall at each course as the work proceeds.

5.10.3 All burnt clay bricks shall be soaked with water before being used and the tops of walls left off shall be wetted before work is recommenced. The faces of walls shall be kept clean and free from mortar droppings and splashes.

5.10.4 Unless otherwise indicated or directed, the gauge shall be ten courses to 70 cm for burnt clay brick walls.

5.10.5 Walls which are to be mortar shall have the horizontal joints raked out to a depth of 1-1/2 cm to form a key.

5.10.6 Walls shall be carried up regularly without leaving any part more than one meter lower than another unless the permission of the Supervisor is first obtained. Work which is left at different levels shall be racked back.

5.10.7 The courses of brickwork shall be properly levelled. The perpendicular joints shall be properly lined and jambs and other angles plumbed as the work proceeds.

5.10.8 All walls shall be thoroughly bonded in accordance with the best constructional practice and as directed by the Supervisor. Broken bricks shall not be used except where required for bond.

5.10.9 Build-in flashings, flashing blocks, access panels and other work at locations indicated on drawings.

5.11 CAVITY WALLS:

5.11.1 Cavity walls shall be built to the dimensions shown on drawings and the two thicknesses shall be bonded together with cavity wall ties spaced one meter apart horizontally and approximately 40 cm apart vertically and staggered. Extra ties shall be provided at reveals and openings.

5.11.2 Keep cavity air space and cross ties of reinforcing free of mortar drippings by using a continuous wood or metal strip set up temporari-

ly on wall anchors. Raise strip as the wall is built up.

5.11.3 Provide weep holes in horizontal joints of facing wall directly above wall flashings. Space weep holes 60 cm apart horizontally. Form holes by pressing short lengths of oil-soaked 8 mm diameter braided cotton sash cord into the mortar bed while soft. When the mortar has set, pull the cords from wall.

5.11.4 The cavity shall be kept clear by lifting screeds or other means approved by the Supervisor and shall be left clean at completion.

5.12 MISCELLANEOUS ITEMS:

5.12.1 Where cast-in-place lintels are used in masonry unit partitions, or back up, they shall be formed in place with special shaped bond-beam or lintel unit as hereinbefore specified. Lintel shall be reinforced as detailed and filled with Type M-150 concrete. Lintels shall have a minimum of 20 cm bearing at ends. Provide temporary support under lintels as necessary.

5.12.2 All brick walls shall be bonded to columns by means of wall ties of the butterfly type 3.2 mm mild steel wire, zinc coated, or of the type approved by the Supervisor, which are previously cast into concrete. The ties shall be 20 cm long, with 8 - 12 cm inbedded into the wall at rate of one tie each five courses of brickwork.

SECTION 6
WATERPROOFING

6.1 SCOPE OF WORK:

6.1.1 Extent: The work required under this section consists of all waterproofing, and related items necessary to complete the work indicated on drawings and described in specifications.

6.2 GENERAL REQUIREMENTS:

6.2.1 The waterproofing and dampproofing work shall be performed by a contractor who is regularly engaged and specializes in work of the character required by the Contract and in the application of the materials specified herein. Material shall be delivered to the site in manufacturer's original unopened containers with manufacturer's brand and name clearly marked thereon.

6.2.2 The materials and methods shall be as specified herein, unless they are contrary to the manufacturer's directions or to approved trade practice; or unless the Contractor believes they will not produce a watertight job which he will guarantee as required. Where any of the above conditions occur, the Contractor shall notify the Engineer in writing. Deviation from the procedure specified will be permitted only upon the Supervisor's approval and providing the work is guaranteed by the Contractor.

6.2.3 If, prior to beginning work, the Contractor does not notify the Supervisor in writing of any proposed changes, it will be assumed that he agrees that the materials and methods specified will produce the results desired, and that he will furnish the required guarantee.

6.3 LIME TERRACING:

6.3.1 Lime terracing (7:2:2) = (crushed bricks : lime : brick surky) shall be slowly finished to the illustrated thickness on concrete slab according to the local customs, being followed by finishing into 12 mm thick lime mortar (1:2).

6.4 WATERPROOFING MORTAR FINISHING:

6.4.1 The waterproof agent shall be any product of the following manufacturers or equivalent or better, and samples, reference data, and execution specifications shall be submitted to the Supervisor for approval and selection. The work shall be performed under the resposibility of the manufacturer concerned.
Material shall be the product of the manufacturer designated in Appendix (1) or equivalence thereof.

The work for waterproofing mortar-finish may be altered, upon approval by the Supervisor, by any other locally inherent method (such as lime terracing method) which shall be deemed effective for waterproofing.

6.5 ASPHALT WATER PROOFING

The water proof material shall be asphalt in toilets in 1st and 2nd floors.

SECTION 7
PLASTERING WORK

7.1 GENERAL

7.1.1 Preparation of the Surfaces to Receive Plastering Work:

(a) Concrete surfaces or other layers of plaster to receive plastering work shall be cleaned and appropriately dampened to prepare for the next layer of plaster.

(b) Loose surface to receive plaster shall be immediately repaired.

7.1.2 Curing:

(a) To protect the adjoining part or other finished surface from being soiled, these part or surface shall be covered with paper, wooden boards or canvas sheets.

(b) To prevent the plastered surface from being soiled and from premature drying, room windows shall be glazed or the plastered surface shall be covered with canvas sheets or dampened.

7.1.3 (a) Construction joints of concrete or places where cracks are likely to develop, shall be covered with cement mortar with metal lath.

(b) Joints of plaster work on the surface of different materials shall be provided with joint strips or bordering strips.

7.1.4 Samples:

Color and texture of plastering work shall be approved by the Supervisor by submitting a sample book or sample board.

7.2 TREATMENT OF SURFACE TO RECEIVE PLASTER

7.2.1 Treatment with Cement Mortar of Surface to Receice Plaster:

(a) Deformed or irregular surfaces of walls or floors made at concrete or brick shall be roughened and finished smooth with cement mortar to be left for not less than 7 days. This period may be reduced depending on the weather conditions.

Surfaces of remarkable deformation shall be repaired smooth by applying wire fabric and concrete using fine aggregate (fine pebbles).

(b) Following the treatment mentioned in (a) above, the surfaces shall be treated as follows.

(1) Outdoor concrete surfaces shall be washed with water by means of brushes to remove foreign matter that may be detrimental to bonding of cement mortar.

(2) Indoor concrete wall surfaces shall be washed clean with water by means of brushes. Provided, however, if washing is difficult because of construction time available, the surfaces may be dampened with water and scrubbed clean with brushes with the approval of the Engineer.
Plywood panel surfaces shall be cleaned and applied with cement paste of 1 to 2 mm thickness. If necessary water-retaining agent may be used in the application of cement paste.

(3) Concrete floor surface shall receive cement paste as soon after as the concrete is hardened. If the concrete is left hardened for a long time, the surface shall be washed and applied with cement paste by using brushes, rubbing the cement paste sufficiently on the surface.

7.3 APPLICATION OF MORTAR

7.3.1 Materials:

(a) Cement shall conform with the requirements of 6.2.1. Provided, however, Type B mixed cement may be used for trowel finish of floor mortar.

(b) White cement shall conform with the requirement of JIS R5210 (Portland cement).

(c) Additives shall be slaked lime for plastering, plaster, pozzolan and asbestos powder, etc. Materials affecting the color of the mortar shall not be used as additives for colored mortar.

(d) Sand shall be of good quality and shall be free from salt, mud, dust and organic matter of harmful quantity. Grading shall be such as to have a mixture of fine and coarse grains in appropriate proportion.

Table 7.3.1 Grading of Sand

Grading (%/Wt)	Place of Application
Percentage passing 5 mm sieve 100 0.15 mm sieve less than 10	Scratch coat, lathing, surface smoothing and brown coat.
Percentage passing 2.5 mm sieve 100 0.15 mm sieve less than 10	Finish coat

(e) Water shall be pure and free from injurious amount of salt, iron, sulfur and organic matter.

(f) Water retaining agent shall be methyl cellulose of specified manufacturer. Volume of use shall confirm with the manufacturer's specifications.

(g) Pigment shall be of inorganic nature and alkali resistant and shall show little discoloration against direct sunlight and non-corrosive to metal.

(h) Grading of color sand shall conform with the requirements of Table 7.3.1.

7.3.2 Proportioning and Thickness of Coating:

(a) Proportioning of mortar shall conform with the requirements of Table 7.3.2.

(b) Thickness of mortar coating shall be as follows:

(1) For ordinary application, the requirements shall be as shown in Table 7.3.2.

(2) For light application, the thickness may be reduced to 20 mm for floors and 15 mm for indoor walls by special instructions.

(3) For floors overlying water proofing layer or for risers, the thickness shall be not less than 15 mm.

Table 7.3.2 Proportioning (Volumetric Ratio) and Thickness of Coat (mm)

Grounds	Place		Scratch Coat, and Lathing		Smoothing and Brown Coat		Finish Coat			Thickness of Coat (mm)
			Cement	Sand	Cement	Sand	Cement	Sand	Additive	
Concrete, Concrete blocks and Bricks	Floor	Finish	-	-	-	-	1	2.5	-	30
		Grounds	-	-	-	-	1	3	-	
	Interior walls		1	2.5	1	3	1	3	As required	20
	Exterior walls, etc (excl. ceiling)		1	2	1	3	1	3	-	25
Lathsheet, Wire lath, Metal lath	Interior walls		1	3	1	3	1	3	As required	15
	Exterior walls		1	3	1	3	1	3	-	18

(Note) 1. When lathing, fibrous filler may be added where necessary.

2. In case of finish with linoleum sheet or vinyl floor tile, the thickness of floor mortar shall include the thickness of the finishing material.

3. Thickness of lathing shall not be included in the thickness of coat.

(c) Thickness of coat except for floor shall be more or less 7 mm.

(d) Additives shall be used in such quantity as not to give adverse effect to the strength of the mortar.

(e) Mortar shall be machine mixed. Provided, however, if the quantity is small, mortar may be mixed with hand.

7.3.3 Method of Work:

(a) Walls

(1) Scratch coat

(i) If cement paste is applied, treatment mentioned in 7.2.1 shall be given and scratch coat applied before the cement paste is dried.

(ii) Scratch coat shall extend the entire surface.

(iii) Lathing shall be performed with mortar coat approximately 1 mm thicker than the thickness of the lath.

(iv) Scratching shall be carried out with metal comb.

(v) Scratch coat and lathing shall be left for not less than 14 day until cracks are fully developed before applying brown coat. Provided, however, this period may be reduced depending on weather conditions with the approval of the Supervisor.

(2) Correction of uneven coat

(i) Correction shall be carried out if the coat is remarkably uneven.

(ii) If the correction is required locally, it shall be performed while the scratch coat is being applied in accordance with the procedure mentioned in (1) above.

(iii) If the correction is required for a comparatively large area, mortar applied for correction shall be scratched and left for not less than 7 days. Provided, however, this period may be reduced depending on the weather conditions.

(3) Brown coat

Brown coat at internal and external corners and round edges shall be applied with grounds to attain truly flat surfaces.

(4) Finish coat

After the brown coat is properly placed, finish coat shall be applied without trowel marks, paying due attention to the finish at the external and internal corners and around the edges.

(5) Kinds of finish

According to the places where plastering is performed the kinds of finish shall be as shown in Table 7.3.3.

Table 7.3.3 Kinds of Finish

Kinds of Finish	Place
Metal trowel	General plaster base, wall paper, plaster base for spray in office, waterproof plaster base.
Wooden trowel	Scratch coat to receive tiles, plaster base for spray in machine room, etc.
Brush	Cement plaster base for spray.
Wooden trowel or Brush	Plaster base for spray other than above.

(6) When a joint is provided, each section of the surface shall be divided accurately using a joint strip. After the finish is completed, the joint strip shall be removed and the joint finished.

(b) Floors

(1) When cement paste is used for plaster base, mortar plaster shall be applied immediately after the base is treated.

(2) Mortar plaster shall be applied true to lines and grades and shall be finished with a metal trowel. Provided, however, a wooden trowel may be used when the finish coat is of synthetic resin of comparative large thickness.

(3) Joints shall not be provided on the floor as a principle. Provided, however, if joints are provided, joints shall be impressed with an interval of 1.8 m for rooms and 3.6 m for corridors.

(c) Levelling mortar to receive tiles

(1) Thickness of the levelling mortar shall be determined depending upon the thickness of total finish or of tiles.

(2) Wall

(i) When tiles are applied on the mortar by pressure, or mosaic tiles are applied, the levelling mortar shall be applied as far as the brown coat.

(ii) When tiles are laid in stretcher course, the levelling mortar shall have a thickness of 6 mm (including the case in which metal lath is used).

(iii) When the wall is an exterior wall, expansion joints of not less than 10 mm shall be provided depending on the size of the tiles. The expansion joints shall be made of synthetic resin board of foam styrole and shall extend to bearing structure.

7.3.4 Application of Waterproofed Mortar:

(a) This paragraph applies to the places where light waterproofing is required.

(b) Waterproofing agent shall be the product of the manufacturers designated in Appendix (1).

(c) Proportioning shall be one part cement to two parts sand (volumetric) and the use of the waterpoofing agent shall be in conformity with the instructions of the manufacturer.

(d) When waterproofed mortar is applied on concrete surface, defective concrete surface shall be chipped off and patched with waterproofing mortar made of one part cement and two parts cement by volume. After the mortar has hardened, treatment mentioned in 8.2.1 shall be given.

(e) Waterproofed mortar shall be prepared with accurate measuring of materials and shall be well mixed together. Coat shall be applied in thickness of 15 mm with a trowel. For walls, two coats shall be applied.

SECTION 8

CARPENTRY AND JOINERY

8.1 SCOPE OF WORK:

8.1.1 Extent: The work required under this section consists of all carpentry and joinery and related items necessary to complete the work indicated on drawings and described in specifications.

8.1.2 Work not Included: The following items of work are included in other sections of this specification:

(a) Glazing, except as specifically included in this section.
(b) Finishing hardware, except as specified herein.
(c) Acoustical treatment, except as specified herein.
(d) Metal doors and frames, and metal windows.
(e) Concrete formwork.
(f) Cabinet work, except as specified herein.
(g) Folding partition.
(h) Building expansion joint filler.
(i) Finishing hardwares for wood doors and wood windows, except as specified herein.

8.2 SHOP DRAWINGS:

8.2.1 Submit shop drawings to the Supervisor for approval of all items of carpentry and joinery where so required herein. Obtain approval of drawings prior to proceeding with fabrication.

8.2.2 Shop drawings shall indicate the materials and species, matching of panels, arrangement, thicknesses, size of parts, construction, fastenings, blocking, clearances, assembly and erection details, applied finishes and surfacing, built-in hardware and necessary connections to work of other trades.

8.3 SAMPLES:

8.3.1 Submit samples in duplicate of the following materials or assemblies to the Supervisor for approval. Approval must be obtained prior to delivery or fabrication.

(a) Plywood.

(b) Asbestos cement board.

(c) Hardware to be used at toilet compartments.

(d) Insect screen.

8.3.2 Solid and veneered samples shall be typical of those proposed and shall show range, color, and grain to be furnished.

8.4 MATERIALS:

8.4.1 General:

(a) It should be noted that sizes shown on drawings are finished sizes.

(b) All timber shall be properly seasoned and shall be planed square, straight and true and shall be free from splits, shakes, cracks, splits, checks, loose or dead knots, insect attack including pinworm holes, or other defects.

(c) Timber shall be straight and true, and any warped or twisted timbers will be rejected.

(d) Unless otherwise indicated, carpentry work/structural timber work shall be executed in softwoods as follows:

Japanese cedar
(or hemlock
red cedar
white fir)

or other timber for structural use approved by the Supervisor.

(e) Timber to be used for joinery work shall, unless otherwise indicated, be hardwoods approved by the Supervisor.

8.4.2 Moisture Cotent (Average):

(a) Framing, sheathing, and exterior trim: 10%, not to exceed 19%.

(b) Interior finish woodwork: 6%, and not to exceed 12%.

8.4.3 Grades and Species of Wood:

(a) Grades and species of lumber, plywood, and joinery shall be as follows, except that grades and species hereinafter specified under specific items shall govern.

(1) Lumber and plywood shall be identified by the official grade-mark, except where grade-mark will interfere with the natural finish. In such case, the material shall be accompanied by a certificate of inspection issued by a lumber grading or inspection agency acceptable to the Supervisor.

(b) Framing and rough:

(1) Joists, built-up beams shall be first grade softwoods as Japanese cedar (or hemlock, red cedar, white fir) or equal.

(2) Studs, plate, ridge boards bracing, furrings for walls and ceilings, ground, cant strips, nailers, sleepers shall be second class softwoods as Japanese cedar (or hemlock, red cedar, white fir) or equal.

(c) Interior finish:

(1) Trim, door and window frames, window boards, ceiling boards, exposed solid wood parts of cabinet work or similar work shall be first grade hardwood approved by the Supervisor.

(2) Concealed solid wood parts of cabinet work or similar work shall be second grade hardwood approved by the Supervisor.

8.4.4 Plywood:

(a) Plywood shall be first grade imported material, approved by the Supervisor.

(b) Plywood shall consist of an odd number of plies arranged so that the grain of each layer is at right angles to the grain of the adjacent layer or layers. The plies shall be hot pressed during adhesion and shall have a minimum finished thickness of 6 mm, unless otherwise shown or specified.

(c) The face veneers shall be hard and durable and shall be capable of being finished to a smooth surface.

8.4.5 Miscellaneous Materials:

(a) Flexible boards shall be 4 mm thick unless otherwise indicated on drawings.

(b) Partex and veneered chip boards shall be indicated on drawings.

(c) Nailing blocks shall be first grade, Japanese cypress or equal.

(d) Bolts, spikes and other rough hardware, except as otherwise indicated or specified, shall be as required for the proper execution of the work under this section.

(e) Glue and adhesives:

(1) Glue for interior wood use shall be water resistant.

(2) Adhesive for installing cabinet works at damp places shall be waterproof.

(3) Adhesive for fixing nailing blocks on concrete or masonry walls shall be epoxide resin base glue specially fabricated for this sort of purposes.

8.5 WORKMANSHIP AND CONSTRUCTION (CARPENTRY):

8.5.1 Jointing: All framing shall be jointed or as is most appropriate in the circumstances. The joint shall be designed and constructed so that they will transmit the loads, and resist the stresses to which they will subjected, and the execution of all jointing shall be to the satisfaction of the Supervisor.

Unless otherwise indicated, all joints shall be secured with a suitable type and a sufficient number of nails.

A butt joint shall wherever be secured with nails driven from the far side of the flanking member (if any).

Surfaces are to be in good contact over the whole of the joint before fastenings are applied.

No nails, screws or bolts to be placed in any end split. If splitting is likely, to occur, holes for nails are to be pre-bored at diameters not exceeding 4/5 diameter of nail. Lead holes are to be bored for all screws.

Holes for bolts to be bored from both sides of the timbers of diameter 1.6 mm larger than that of the bolt. Nuts are to be brought up tight with care not to crush the timber under the washers.
Members of structural units shall be clamped and spiked together before drilling.

8.5.2 Coverings: Arrange and construct the framework so that all necessary support and fixing is provided for covering.

8.5.3 Frames: Every post, stud, beam, binder, joist, rafter and purlin shall extend in one piece between its supports or fixings, or shall otherwise be jointed in an approved manner to ensure the necessary structural stability.

8.5.4 Plates: Every plate shall, as far as possible, be in one piece between points of change of direction. Joints between continuing lengths, and at corners, shall be halved if the plates are in one thickness, or sufficiently lapped if the plates are in two thickness.
No plates shall be built into walls of masonry.
When the plates are supported over, or let into, the sides of studs, they shall be nailed to every stud. When they are to be laid over bearing walls of masonry or concrete, they shall be solidly bedded in cement mortar to the required level.

8.5.5 Anchors: trusses and other structures that require to be secured against displacement shall be suitably incorporated in the joints or by means of extra fixings at all points of support.

8.5.6 Beams and Binders: The timber is to be in one peace and in one length between supports. Joints between continuing length are to be suitably scarfed or spliced and secured with bolts and plates or metal straps.
Joints into or over posts are to be most appropriate type, and reinforced with metal straps where necessary to prevent displacement.

8.5.7 Strutting and Bracing: Where the framework is not otherwise restrained against lateral deformation, it shall be diagonally braced.
Lateral braces to restrain against winding and buckling shall be fixed to all beams of depth greater than 3 times their breadth and/or of length greater than 50 times their breadth. Lateral braces are to are to be at centres not exceeding 50 times the breadth of the beam.

8.6 FURRING:

8.6.1 Install furrings as shown on drawings and as specified herein.

8.6.2 Install with faces true to line and plumb, using wood shims as necessary.

8.6.3 (a) Metal ceiling suspenders and accessories shall be as follows:

(1) Cast iron inserts for mild steel rods/bolts hangers .

8.6.4 (b) Cast iron inserts or box type insert cases fabricated of zinc-coated sheet steel to be anchored in structural concrete ceiling slabs at bottoms shall be installed by nailing them onto formwork at the locations of ceiling hangers before concrete depositing. The locations of ceiling hangers shall be decided accurately according to the schedule of panelling shown on shop drawings, and shall be marked on formwork for concrete slabs before placing of reinforcement.

8.7 WORKMANSHIP AND FABRICATION (JOINERY/FINISH CARPENTRY):

8.7.1 All Exposed Faces: All timber that is to be exposed in the finished surfaces of joinery works shall be "wrought" and /or "sanded" on the appropriate face, unless otherwise specified.

8.7.2 Reasonable tolerance shall be provided at all connections between joinery works and the building carcass, whether of masonry or concrete construction, so that any irregularities, settlements or other movement shall be adequately compensated.

8.7.3 The Arrangement, jointing and fixing of all joinery works shall be such that shrinkage in any part and in any direction shall not impair the strength and appearance of the finished work, and not cause damage to contiguous materials or structures.

8.7.4 Perform all necessary mortising, tenoning, grooving, matching, tonguing, housing, rebating, and all other works required for correct jointing.

Provide all metal plates, screws, nails and other fixings that may be ordered by the Supervisor, or that may be necessary for the proper

construction of all framings, linings, etc., and for their supports and fixing in the building.

8.7.5 The joinery/finish carpentry shall be constructed exactly as shown on drawings. Where joints are not specifically indicated they shall be the recognized forms of joints for each position. General notes are as follows:

(a) Cut shapes sharp and true.

(b) Built-up items shall be glued as well as nailed.

(c) Blind nail where possible.

(d) Set finishing nails, used on exposed faces, to receive putty.

(e) Install door and window trim in single lengths.

(f) Scribe, miter, and join accurately and neatly to detail.

(g) Machine sand with grain in shop, and finish with hand sanding. Leave free from machine or tool marks that will show through finish.

(h) Leave work free from defects in any exposed parts.

(i) Rout or groove back of flat trim members.

(j) Secure trim with fine finishing nails, using screws and glue where required to assure permanent, tight joints.

(k) Bring interior finish materials into building only after concrete and mortar are thoroughly dry.

(l) Paneling of boards or plywoods shall be as detailed on drawings, and shall be assembled as shown on the shop drawings as to jointing and pattern arrangement. They shall be mounted in straight line and visible joints to be equally wide.

(m) Holes for nails or screws in flexible boards shall be drilles and must be not closer than 10 mm to edges. Nails or screws shall not more than 30 cm on centre apart.

(n) Mounting of gypsum wallboard shall be done with zinc-coated nails. Nails must be applied not closer than 10 mm to edges and not closer than 20 mm to corners.

(o) Plywoods of 9 mm thick and more shall be bonded to wood furrings with an approved synthetic resin adhesive. Unless otherwise indicated, joints shall be butt-joint. Plywood less than 9 mm shall be mounted by nails or screws. Nails and screws for damp place shall be zinc-coated. Nail length shall be at least 25 mm and 2.5 times board thickness. Distance between a nails or a screw and a board edge shall be at least 10 mm.

8.7.6 Except as specified herein, finishing hardwares for doors and windows are included in "DOORS AND WINDOWS".

8.8 DOOR FRAMES:

8.8.1 Door frames shall be shaped, framed, rebated, moulded and grooved in shapes and sizes as shown on approved shop drawings. Frame head shall be housed into jambs. The frames shall be fixed in, and secured to metal anchors.

8.8.2 Door sills, wrought, rebated, weathered, grooved and having the sizes to detail, shall be framed to jambs.

8.8.3 All door linings shall assemble in site and shall have shapes and sizes as shown on approved shop drawings.

8.9 DOORS:

8.9.1 Doors shall have sizes, designs, as shown on drawings, and shall be as detailed to approved shop drawings.

8.9.2 Doors

(a) Doors shall be skelton framed, and shall be chip board covered on both sides with 4 mm thick plywood for painting.

(b) The doors shall be lipped and edged with hardwood strips at the sides and shall be fitted and hung to the frames.

(c) The doors shall have solid blocks suitable for fitting lock devices.

(d) The doors indicated to have glazed openings and/or louvers shall be designed as shown on drawings and shall have glazing beads and/or inclined slats as indicated.

8.10 WALL AND CEILING PANELLING:

8.10.1 Paneling shall be as indicated on drawings.

8.10.2 Paneling of plywoods, flexible boards and R.W. sound absorbing boards shall, unless otherwise indicated, be executed with recessed joints at nailing strips, joists, studs or jointing strips finished for paint.
Ceiling plaster board panelling to receive mineral acoustic tile finish shall be butt jointed.

8.10.3 Where indicated on drawings, ceiling panelling shall have access panels and openings for lighting fixtures.

8.11 SKIRTINGS:

8.11.1 Supply hardwood or laminated hardwood skirtings as detailed to where indicated on drawings. Secure the skirtings to walls and partitions, and perform all necessary butts, and scribed or housed end joints, and scribe the lower edges of the skirtings to the countours of the flooring.

SECTION 9

DOORS, WINDOWS, SHUTTERS AND GLASSES

9.1 SCOPE OF WORK:

9.1.1 Extent: The work required under this section consists of all doors and windows and related items, including glass, glazing and finishing hardware, necessary to complete the work indicated on drawings and described in specifications.

Note: GLASS AND GLAZING and FINISHING HARDWARE specified in this Section are to be applied to WOOD DOORS and WOOD WINDOWS covered under "CARPENTRY AND JOINERY".

9.1.2 Work not Included: The following items of related work are specified and included in other sections of this specification:

(a) Wood doors and windows.

(b) Cabinet hardware.

(c) Toilet compartment.

(d) Drapery curtain hardware and curtain rails.

9.1.3 SHOP DRAWINGS, ETC.:

Shop drawings, hardware schedules and manuals for installation at site shall be submitted, in three (3) copies, to the Supervisor for his approval. When the products of above listed manufactures are to be applied, these documents may be inspected and approved by the representative of the Supervisor in Tokyo at the written request

of the Contractor.

9.1.4 SAMPLES:

Submit samples of the following to the Supervisor for approval, unless otherwise directed by the Supervisor.

(a) Clear sheet glass
(b) Patterned glass
(c) Glazing putty
(d) Lock sets
(e) Hinges
(f) Door stops
(g) Casement turn or fastener/morticed espagnolette bolt
(h) Pulls
(i) Push plates
(j) Flush bolts

9.2 STEEL DOORS:

9.2.1 MATERIALS:

Steel: Steel shall conform to the following requirements or equivalents:

(a) Mild steel: Hot rolled, conforming to JIS G 3131 SPHC.

(b) Cold finished steel: Mild steel, rolled or drawn, free from scale, accurate to size or gauge, conforming to JIS G 3141 SPCC.

(c) Structural steel shall conform to JIS G 3101, G 3106 or G 3350.

9.2.2 THICKNESS OF SHEET STEEL:

Except where other thickness are indicated or specified the thickness of sheet steel shall be not thinner than the following thickness.

Thickness of Sheet Steel

Classification	Item Description	Thickness (mm)
Doors	Frame in general	1.6
	Frame of hinged door having inside height of more than 1.8 m	2.3
	Architrave, auxiliary frame, etc.	1.6
	Door saddle	2.3
	Rail, stile, panel plate, flush plate	1.6

9.2.3 SHOP FINISH:

General: After fabrication, all surfaces of steel, except stainless steel, shall be cleaned, electro-galvanized except when zinc-coated steel sheets are used, phosphate treated and followed with prime coat as specified in "PAINTING".

Prime Coat: The type of paint for prime coat shall be compatible with the type of paint specified for application on steel parts at the project site.

9.2.4 GENERAL REQUIREMENTS:

(a) Furnish door and louvers of sizes indicated. Doors shall be 40 mm thick unless designated otherwise. The clearances for hinged doors shall be 3 mm at jambs and heads, 6 mm at meeting stiles of pairs of doors, and 6 mm at bottom unless indicated or specified otherwise.

(b) Construction and Workmanship: Construct windows, doors, grilles, and louvers to produce results specified and to assure neat appearance. Make joints by welding, or by mechanical fastenings. Joints shall be of strength to maintain the structural value of members connected. Welded joints shall be solid, have excess metal removed, and dressed smooth on exposed and contact surfaces. Joints formed with mechanical fastenings shall be closely fitted and made permanently watertight.

(c) Weather Seal for Doors: The top and bottom edges of all hollow metal doors shall be closed to provide a weather seal. This seal may be provided as part of the door construction or by the addition of inverted steel channels or other suitable shapes welded to the face sheets.

(d) Provisions for Hardware: Mortise, reinforce, drill and tap doors at factory to receive all mortise type hardware. Provide reinforcing only for doors to receive surface applied hardware, except push plates and armor plates; drilling and tapping for surface applied hardware will be done in the field. Provide metal reinforcing plates for locks and all mortised hardware; provide reinforcing plates for surface applied hardware as required. The gauges of metal for reinforcing plates shall comply with manufacturer's recommendations for the type of hardware used and the size and thickness of doors, provided that the thickness of steel plate used are not thinner than 3.2 mm.

(e) Accessories: Furnish all necessary fastenings, clips, fins, anchors, glazing beads, and other appurtenances necessary for complete installation of windows and doors. Except as specified otherwise, anchors and fastenings shall be steel, either hot-dipped galvanized or phosphate treated and painted.

9.2.5 FRAMES:

(a) Location and Type: All steel frames shall be formed of steel to sizes and shapes indicated. Frames shall be combination type with integral trim and fabricated with full welded unit or knock-down field assembled type construction at joints as indicated on approved shop drawings.

(b) Reinforcement: Provide concealed steel reinforcements for hardware as required. The gauges of steel for reinforcement shall be in accordance with the manufacturer's recommendations for the type of hardware and the shapes and sizes of the frames.

(c) Workmanship and Design: The finished work shall be strong and rigid, neat in appearance and free from defects. Fabricate moulded members straight and true with corner joints well formed, in true alignment and fastenings concealed where practicable. Provide plaster flanges and keys as detailed or required, for frames located in plaster walls.

(d) Forming Corner Joints: Joints for welded type frames shall be mitered or butted and continuously arc-welded for full depth and width of frame and trim. All contact edges shall be closed tight and all welds on exposed surfaces dressed smooth and flush. Joints for knock-down type frames shall be designed for simple field assembly of header to jamb members by concealed tenons, splice plates and bolts, or other type of concealed interlocking joint that will produce square and rigid corners and a tight fit; securely lock joints in place during erection and maintain alignment of adjoining members; provide anti-vibration lock nuts for all bolted connections.

(e) Provisions for Hardware: Frames shall be prepared at the factory for the installation of hardware. Frames shall be mortised, reinforced, drilled and tapped to templates to receive all mortised

hardware; frames to receive surface applied hardware shall be provided with reinforcing plates only. Provide cover boxes in back of all hardware cut-outs.

(f) Location of Hardware: The location of hardware for steel frames and doors shall be as specified hereinafter unless otherwise indicated.

(g) Structural Reinforcing Members: Where structural steel members are required at mullions, transoms or other locations, the structural steel shapes shall be provided as part of the frame assembly.

(h) Wall Anchors: Provide metal anchors of shapes and size required for the adjoining type of wall construction.
Fabricate jamb anchors of steel, not lighter than the gauge used for frame. Locate anchors on jambs near the top and bottom of each frame and at intermediate points not over 60 cm apart.
For frames set in previously placed concrete or masonry walls: Provide anchors or rough bucks, of design suitable for the purpose, and secure with expansion bolts.

(i) Floor Anchors: Provide floor clips of not less than 1.6 mm thick steel and fasten to bottom of each jamb member for anchoring frame to floor construction. Clips shall be fixed and drilled for 9 mm diameter anchor bolts.

(j) Shipment: For welded type frames, provide temporary steel spreaders fastened across bottom of frames; where construction will permit concealment, leave spreaders in place after installation; otherwise remove spreaders after frames are set and anchored. In place of spreaders, frames may be strapped together in pairs with heads inverted for bracing during shipment. Ship knock-down type frames in bundles securely strapped, or in packages. Before shipping, label each frame with metal or plastic tags to show their location, size, door swing and other pertinent information.

(k) Installation: Set frames in position, plumb, align and brace securely until permanent anchors are set. Anchor bottom of frames to floors with expansion bolts, or with power fasteners. Build wall anchors into walls, or secure to adjoining construction. Where frames require ceiling struts or other structural overhead bracing, they shall be anchored securely to ceilings, or structural framing above.

9.2.6 FLUSH DOORS:

(a) General Requirement: Doors indicated on drawings as flush doors including flush doors with glazed and louvered openings shall comply with the type of construction as hereinafter specified.

(b) Door Construction:

Construction: Construct doors of two outer steel sheets not thinner than 1.6 mm, with edges welded and finished flush. Seams or joints will not be permitted on door faces or edges. Reinforce the outer face sheets with 2.3 mm thick interlocking vertical channels or Z-shaped members spaced not over 30 cm apart and spot welded to outer face sheets. Provide continuous reinforcing channels welded to face sheets at top and bottom of door. Place cork, fiberboard, mineral wool board, or asbestos fillers in the spaces between reinforcing channels. Mouldings shall be not thinner than 1.2 mm thick steel.

9.2.7 AIRTIGHT DOORS AND FRAMES:

(a) Construction: Frames for doors indicated as airtight shall incorporate a continuous neoprene seal to prevent air leakage through the crevices between doors and frames.

(b) General: Doors provided for studio, master control room, control rooms and sound locks shall be soundproof doors and are to be included in 9.2.9.

9.2.8 INSTALLATION OF DOORS:

(a) General: Doors shall be installed and adjusted by experienced and qualified erectors, and using only skilled mechanics. Install doors and windows in accordance with manufacturer's instructions and approved shop or setting drawings, at the proper elevation and location, plumb, level and in alignment; properly brace frames to prevent distortion and misalignment. Protect doors and operating

parts against accumulation of cement and other building materials by keeping doors tightly closed and wired to frames. After installation doors shall be checked for operation and weathering.

(b) Mastic Sealant: All exterior metal to metal joints between members of doors, frames, mullions, and mullion covers shall be set in a mastic sealant of type recommended by the door manufacturer. Remove excess mastic before it hardens.

(c) Anchors and Fastenings: Anchor door frames to masonry, or to other adjoining or adjacent construction as shown on details and approved shop drawings. Where doors are set in prepared masonry openings, place the necessary anchorage or fins during progress of wall construction. Anchors and fastenings shall be built into, anchored, or bolted to the jambs of openings, and shall be fastened securely to the frames, and to the adjoining construction. Unless otherwise detailed, anchors shall be spaced not more than 45 cm apart on heads, jambs and sills. All anchors shall have sufficient strength to hold the member firmly in position.

(d) Adjustment after Installation: After doors have been installed and before completion of painting, all doors and hardware shall be adjusted to operate smoothly. Hardware and parts shall be lubricated as necessary.

9.2.9 Sound-proof Fixtures:

The sound-proof fixtures provided in this section shall refer to doors and windows to be furnished for the studio , gallery, sub-control room, master control room.

Fabrication and specification of such fixtures shall be same as the air-tight doors provided in 9.9 through 9.16, except that further accuracy shall be required for the fabrication and installation methods.

(a) Fabrication

(1) Approval of drawings

The manufacturer shall prepare the fabrication drawings, with due consideration to fitness of the fixtures, in compliance with the design drawings.

(2) Dimensional accuracy

The tolerance in height, width and diagonal length shall be as indicated in Table 9.5. Any possible distortion and bend of doors and frames shall be restrained below 2 mm.

Table 9-5

Hardware	Height	Width	Diagonal length
Steel door	3 mm and below	3 mm and below	4 mm and below
Inspection hole	3 mm and below	3 mm and below	4 mm and below

(3) Shop test

After completion of the product test shall be conducted, at the responsibility of the manufacturer, for construction, configuration, dimension and working condition in general aspect of the product in strict accordance with specifications and drawings. Particular care shall be required to examine adhesiveness of the air-tight material. The test schedule shall be prepared to indicate the shop test items. Any defect or deficiency shall be repaired upon noted in the test list and submitted to the Supervisor.

(b) Method of installation

Full care shall be required for installation by use of reinforcing material or others available in order to protect from

any possible hurt, damage or deformation which may arise from external force.

(1) Fixture to structural body

The fixtures shall be installed rigidly to the reinforcing rod of the structure after full check of the installed position and both horizontal and vertical exactness. All space around the framework shall be filled up with mortar grouting or chips-gravel concrete as indicated by the drawing or directed by the Supervisor. Any portion which should still require such filling shall be plastered with mortar so as to eliminate any gap with the structure.

The work shall undergo inspection by the Supervisor after finish. Any interior work shall not be performed before such inspection.

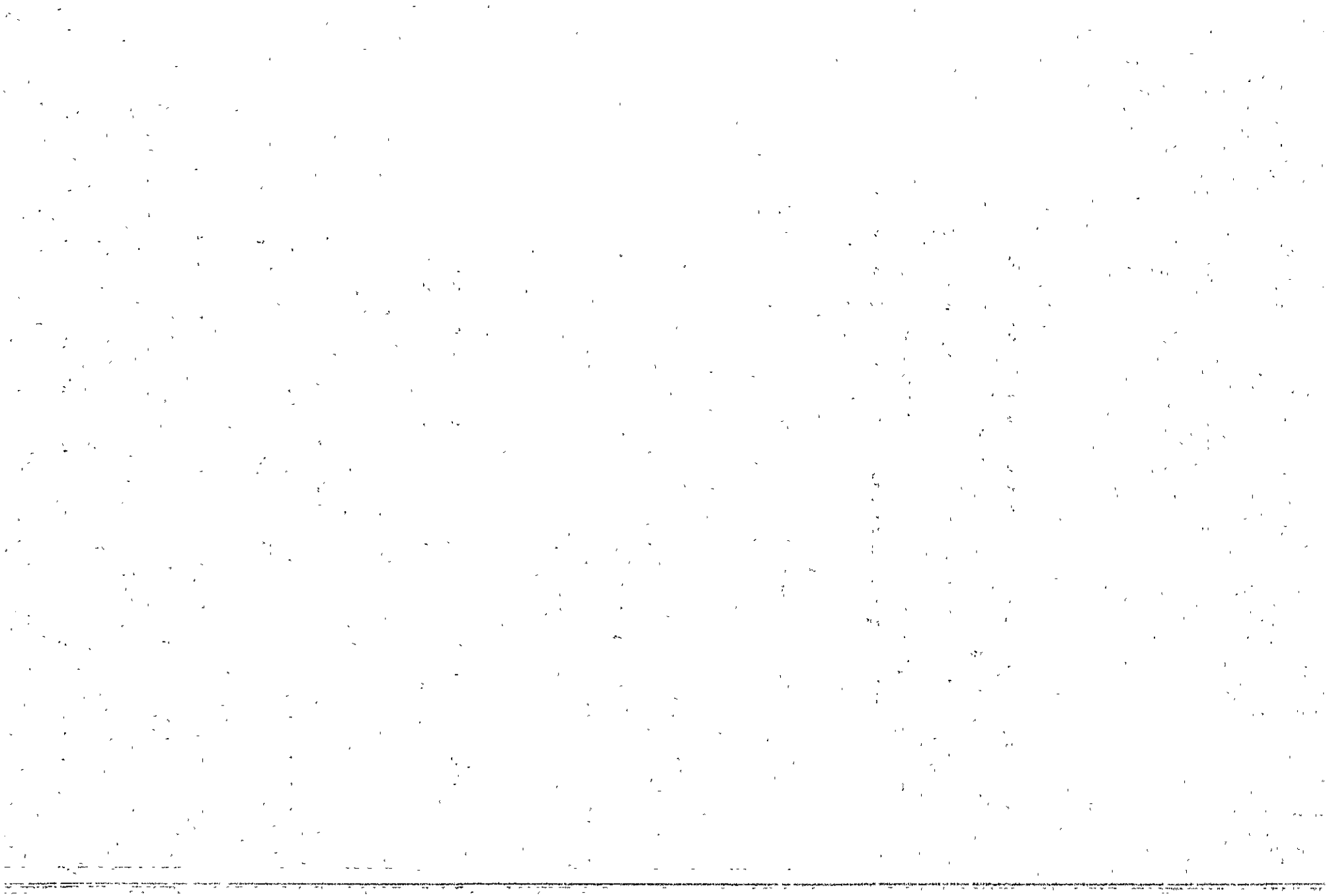
(2) Adjustment

Full check shall be made to see if the air-tight material as is used between the door and the frame has been adhered to the door face uniformly and solidly to make sure of no sound leakage. Necessary parts such as door stop or stopper shall be installed immediately and then adjustment shall be made carefully by repetition of opening or closing.

(c) Glass setting for inspection window

Polished glass with required thickness shall be used for the inspection window and shall be sheared and figured accurately with full consideration to the size of the H-rubber fitted part. Fixing of glass into the window frame shall be done at such timing that there may be no danger of causing glass breakage.

H-rubber shall be so fixed in place that the joint of the main body shall be at upper center and the joint of the wedge rubber shall be at lower center. H-rubber shall not be set in place at its elongated length.



9.3 FINISHING HARDWARE:

9.3.1 General:

(a) Finishing hardware shall be the products as hereinafter specified or the products of the manufacturers approved by the Engineer. As much hardware as possible shall be by the same manufacturer to maintain continuity of finish and style and to simplify maintenance and replacement.

(b) Include all fastenings with exposed surfaces matching finish of adjacent metal parts of hardware.

(c) Furnish hardware to template and with proper fastening for use with metal frames, and with hollow metal doors.

(d) Use box type strike plates on metal frames.

(e) Screws used in the work covered by this section shall be nickel plated phillips slotted type.

(f) General requirements for lock sets.

(1) The lock case shall be of steel or equally strong and durable material so as to withstand with a reasonable factor of safety, the stresses and effect of wear and tear for extended periods of service. Mechanical parts shall be of such material and design that they also meet the same criteria and are capable of withstanding normal rough usage for extended periods of service.

(2) Lock sets shall be equipped with both latchbolt and deadbolt (except dead locks).

(3) Lock sets shall be suitable for installation in metal or wood doors from 35 mm to 45 mm thickness.

(4) When installed in hollow metal doors, the lock set shall be capable of being equipped with an expansion brace type device to prevent the lock from vibrating or wobbling. This shall be in addition to the mounting screws in the face plate.

equipped with a hardened steel insert that will prevent sawing of the bolt to gain unauthorized entry.

(5) Lever handle spring mechanism shall be of such material and strength to prevent any sag or free play in the lever handle when in the neutral horizontal position.

(6) Cylinder lock set shall be capable of withstanding 100,000 repeated openings and closings without visible or detectable damage to or change in the mechanism, case or key and there shall be no visible or detectable change in the operation or function of the lock set.

9.3.2 Finishes:

(a) Lock and latch sets shall have nickel silver or stainless steel satin finish.

(b) Hinges for doors shall be of bronze with white bronze plated finish or stainless steel satin finished.

(c) Metal push plates shall be of stainless steel with satin finish.

(d) All other hardware shall be of bronze with white bronze plated finish or stainless steel with satin finish on exposed surfaces.

9.3.3 Lock and Latch Sets: Lock and latch sets shall be as manufactured by Hori Lock and Hardware Co., or equal. Handles shall be of lever type.

(a) Furnish a mortise bit key lock set for exterior doors except otherwise specified. Operation of the dead bolt shall be by key from both sides. Key holes shall be covered by movable plates from both sides.
(HORI NO. 1562, or equal)

(b) Furnish a mortise cylinder lock set for interior doors. Operation of the dead bolt shall be by key from outside and by thumb turn from inside.
(HORI NO. 1210-38, or equal)

9.3.4 Dead Locks: Dead locks shall be as manufactured by Hori Lock and Hardware Co., or equal.

(a) Furnish a mortise bit key dead lock for access doors. Operation of the dead bolts shall be by key from outside.
(HORI NO. 1364, or equal)

9.3.5 Hinges: Hinges shall be as manufactured by Hori Lock and Hardware Co., or equal.

(a) Hinges shall have oilite bearings for all doors except access doors.

(b) Hinges for metal doors shall be 150mm x 110mm full-mortise type.
(HORI NO. 2842, or equal)

(c) Hinges for wood doors shall be 127mm x 100mm full-mortise template type.
(HORI NO. 2800, or equal)

(d) Hinges for heavy duty metal doors shall be 150mm x 144mm heavy duty type.
(HORI NO. 2841, or equal)

9.3.6 Push Plates: Push plates for toilet compartment entrance doors shall be stainless steel with hair lined finish, 150mm x 250mm x 2mm in sizes, or the products approved by the Supervisor.

9.3.7 Pulls: Pulls shall be of brass or bronze with dull chrome plated finish and the products approved by the Supervisor.

9.3.8 Flush Bolts: Flush bolts for ordinary door shall be of brass or bronze with dull chrome plated finish, 30 cm in height by 25 mm in width, and the products approved by the Supervisor.
In case that flush bolts are used for the doors without saddle, provide proper metal sockets for floor to receive bolts.

9.3.9 Door Stops: Door stops shall be of brass or bronze with chrome plated finish, furnished with rubber bumper and the products approved by the Supervisor.

(a) Include fastening device appropriate for receiving surface.

(b) Wall type door stops shall be used when floor type door stops are not suitable.

(c) Door stops for exterior doors shall be furnished also with door holders.

9.3.10 Key Cabinet: Key cabinet of wood, paint finished, and of type approved by the Supervisor, shall be furnished by the Contractor.

(a) Cabinet shall be of sufficient capacity to accommodate all units plus 25%.

(b) Tag and file all keys in cabinet.

9.3.11 Hopper Window Hardware: Hinges and casement turns shall be furnished, and the hardware shall be the products approved by the Supervisor.

9.3.12 Casement Window Hardware: Hinges and morticed espagnolette bolts with lever handles shall be furnished, and the hardware shall be the product approved by the Supervisor.

9.3.13 KEYING:

(a) Provide three (3) keys each for all locks. Die stamp each key with number of lock change and set symbol number or letter.

(b) Bit key and cylinder locks shall be master keyed in each lockset type and three (3) master keys shall be furnished for each type.

9.3.14 PACKAGING AND IDENTIFICATION:

(a) Package each item of hardware separately in individual containers, complete with screws, keys, special wrenches, instructions, and installation templates necessary for accurately locating, setting, adjusting, and attaching hardware.

(b) Mark each container with number of door or window to which hardware item is to be applied, and with item number corresponding with hardware item number listed in the Contractor's hardware schedule.

(c) At the completion of the project, the Contractor shall turn over to the Supervisor all installation instructions, templates, and adjusting tools.

9.3.15 RECEIVING AND STORAGE:

(a) Provide adequately locked storage space with necessary open shelves, bins, and counters for assembling and grouping hardware before distribution and installation.

(b) Properly tag, index, and file all keys in key cabinet as directed.

(c) Hardware shall be checked after delivery to the project site before it is installed.

9.3.16 LOCATION:

Before installation of any hardware, obtain the Engineer's verification of the positioning of each type of assembly. This will include the exact location of each element of hardware such as locks, bolts, push plates, pulls and hinges.

Distances from the floor to center line of each hardware item shall be as tabulated below unless indicated or specified otherwise:

(a) Door locks: 950 mm from finish floor to center of strike.

(b) Door pulls: 950 mm from finish floor to center of grip.

(c) Push plates: 1,100 mm from finish floor to center of plate.

(d) Push-pull bars: 950 mm from finish floor to center of bar or center between bars and combination.

(e) Top hinges: To manufacturer's standard, but not greater than 250 mm from head of frame to center line of hinge.

(f) Bottom hinges: To manufacturer's standard, but not greater than 300 mm from finish floor to center line of hinge.

(g) Intermediate hinges: Equally spaced between top and bottom hinges. The space should not be more than 900 mm on center.

(h) Latches: 950 mm from finish floor to center of strike.

(i) Deadlocks only: 950 mm from finish floor to center of strike.

(j) Deadlocks with separate latch-set and/or pull: 1,250 mm from finish floor to center line of strike.

9.3.17 Hardware for Windows: Location of hardware shall be as standardized by the window manufacturer.

9.3.18 INSTALLATION:

(a) Install hardware accurately fitted, securely applied, and carefully adjusted. Install in accordance with manufacturer's instructions. Use care not to injure other work when installing.

(b) Provide and use boring jigs, mortising tools and other special equipment and appliances as required for proper installation of hardware items.

(c) When required, remove and replace doors so that door bottoms or tops may be painted.

(d) Cover visible hardware with masking tape or heavy cloth until painting is completed.

9.3.19 GENERAL SCHEDULE OF HARDWARE FOR DOORS:

Note: Doors more than 2.5 m high and/or more than 1.2 m wide shall be equipped with 2 pairs of hinges.

(a) Exterior Doors in General, Except as Specified Hereinafter:

(1) Metal pair of doors:

3 pairs, butt hinges, 150mm x 110mm (150mm x 144mm for heavy duty doors)

1 lock, mortise bit key lock

2 sets, flush bolts

1 stop with holder, floor type

(2) Wood single door:

1 1/2 pairs, butt hinge, 127mm x 100mm

1 look, mortise bit key lock

1 stop with holder, floor type

(3) Wood pair of doors:

3 pairs, butt hinge, 127mm x 100mm (4 pairs for heavy duty doors)

1 lock, mortise bit key lock

2 sets, flush bolts

1 stop with holder, floor type

(b) Interior Doors in General, Except as Specified Hereinafter:

(1) Metal single door:

1 1/2 pairs, butt hinges, 150mm x 110mm

1 lock, mortise cylinder lock

1 door stop, floor type

(2) Metal pair of doors:

3 pairs, butt hinges, 150mm x 110mm

1 lock, mortise cylinder lock

2 sets, flush bolts

1 stop, floor type

(3) Wood single door:

1 1/2 pairs, butt hinges, 127mm x 100mm

1 lock mortise cylinder lock

1 door stop, floor type

(4) Wood pair of doors:

3 pairs, butt hinges, 127mm x 100mm

1 lock, mortise cylinder lock

2 sets, flush bolts

1 stop, floor type

(5) Wood single door for access for duct shaft;

1 pair, butt hinges, 127mm x 110mm

1 lock, mortise bit key dead lock

1 pull

9.3.20 GENERAL SCHEDULE OF HARDWARE FOR WINDOWS:

(a) Casement windows: (for each ventilator)

1 pair, hinges

1 set, mortise espanolette bolt

9.4 MISCELLANEOUS ITEMS:

9.4.1 Protection of Doors and Windows: Care shall be taken in handling doors and windows during transportation and at job site. Store doors and windows upright on pieces of lumber in a dry location, and under cover. After installation, protect doors and windows from damage during subsequent construction activities. Damaged work will be rejected and shall be replaced with new work.

9.4.2 Cleaning of Metal Doors and Windows: Metal surfaces of doors and windows shall be cleaned on both the inside and outside of all mortar, plaster, paint and other foreign matter to present a neat appearance and prevent fouling of weathering surfaces, weather-stripping or the operation of hardware.

9.4.3 Hardwares and Accessories: Hardwares and accessories shall be of chromium plated yellow brass or of stainless steel. Door hinge shall be lavatory spring hinge of spring tension adjustable type, complete with lower springless hinge. A lavatory strike and door stop, a lavatory rim bolt a coat hook and bumper, and a paper holder shall be fasten fastened properly for each booth. All hardwares and accessories shall be the products approved by the Supervisor,

9.4.4 The doors and panels shall have solid blocks suitable for fitting the hardwares and accessories mentioned above.

9.5 GLASS AND GLAZING:

9.5.1 Kind and Quality of Glasses

(a) Transparent plate glass

(b) Transparent polished glass (Substitutive with frost glass)

(c) Figured glass

9.5.2 MATERIALS FOR GLAZING:

(a) Putty: Putty shall be the product conforming to JIS K 5592, oil putty, or the product approved by the Supervisor.

(b) Setting Blocks and Spacer Shims: Fabricate blocks and shims from neoprene, treated wood or lead; shape to the required sizes and thickness. The materials used for blocks and spacers must be compatible with the type of the compounds and sealants used and shall not cause staining or discoloration of the sealant or the frame.

9.5.3 SIZES, DELIVERY AND STORAGE OF GLASS:

(a) The sizes of glass indicated on drawings are approximate only; determine the actual sizes required by measuring frames to receive the glass at the project site, or from guaranteed dimensions provided by the frame supplier. Dimensions for glass and glass holding surrounds shall be coordinated to provide the following minimum clearances:

(1) At perimeter edge of the glass on all four sides provide clearance equal to glass thickness for single glass.

(2) The sealer space between face of glass and fixed or applied glazing stops, both indoors and outdoors, shall be not less than 1.5 mm plus glass and sash tolerance, but a 3 mm minimum.

(b) Deliver glass to site in suitable containers that will protect glass from the weather and from breakage. Carefully store material as directed in a safe place where breakage can be reduced to a minimum. Deliver sufficient glass to allow for normal breakage.

9.5.4 INSTALLATION OF GLASS:

(a) General Requirements: Apply putty, glazing compound, glazing sealant, glazing tape and gaskets uniformly with accurately formed corners and bevels. Remove excess compound from glass and sash. Use only recommended thinners, cleaners and solvents. Do not cut or dilute putty, glazing compounds or sealants without approval from the Supervisor. Make good contact with glass and frame when glazing and facing off. Do not set glass in wood or steel frames until frames have been primed and paint is dry. Do not apply any compound or sealant at temperatures lower than 5°C or on a damp, dirty or dusty surface. After glazing, doors and ventilators in sash shall be fixed so they cannot be operated until compound has set. Remove any excess sealants from glass and adjoining surfaces during the working time of the material; within 2 to 3 hours.

(1) Where setting blocks and spacer shims are required to be set into a glazing compound or sealant, they may be buttered with the compound or sealant, placed in position and allowed to firmly set prior to installation of glass.

(b) Sash and Frame Preparation and Acceptance: Inspect all sash, frames and surrounds to be glazed under this section and notify the Supervisor of any defects, improper materials or workmanship or other conditions which will affect satisfactory installation of glass. Do not proceed with glazing until such conditions have been corrected. Before starting glazing work, the glazier shall verify compliance with the requirements listed.

(1) That sash and frames are firmly anchored in proper position, plumb and square within 3 mm of nominal dimensions on approved shop drawings.

(2) That all rivet, screw, bolt or nail heads, welding fillets and other projections are removed from glazing rabbets to provide the specified clearances.

(3) That all corners and fabrication intersections are sealed and sash and frames are weather-tight.

(4) That rabbets at sills weep to outside and all rabbets are of sufficient depth and width to receive the glass and provide the required overlap of the glass.

(5) That all sealing surfaces of wood and steel sash and frames are prime painted.

(c) Preparation of Glass and Rabbets: Clean the sealing surfaces at perimeter of glass and the sealing surfaces of rabbets and stop beads before applying any glazing compound or sealant. Use only the approved solvents and cleaning agents recommended by the compound manufacturer.

(d) Positioning Glass: Center in glazing rabbet to maintain specified clearances at perimeter on all four sides. Maintain centered position of glass in rabbet and provide the required sealer thickness 3 mm minimum on both sides of glass. Whenever glass dimensions are larger than 1.2 m, provide setting blocks at the sill and spacer shims on all four sides; locate setting blocks one quarter way in from each end of glass.

(e) Stop Bead Glazing - Using Putty or Glazing Compound: Except where other materials or methods are specified hereinafter, use putty for bedding glass in wood frames and use elastic glazing compound for bedding glass in metal frames. Apply as follows:

(1) Apply ample back putty or compound to rabbet so that it will ooze out when pressing glass into position and completely cover glass in rabbet. Place setting blocks and spacer shims as required. Press glass into position.

(2) Secure glass in place by the application of stop beads. Bed stop beads against glass and bottom of rabbet with putty or compound leaving proper thickness between glass and stop beads. Secure stop beads in place with suitable fastenings. Strip surplus compound or putty from both sides of glass and tool at a slight angle to shed water and provide clean sight lines.

(f) Face Glazing:

(1) Apply ample back putty compound or sealant to rabbet in which shims have been set, so that it will ooze out when pressing glass into position.

(2) Secure glass in place with glazing points for wood frames and suitable clips for metal frames.

(3) Face putty front pane edge in rabbet with compound to form a smooth neat bevel 1.5 mm short of sight line and sloping away from glass. Miter bevel at corners. Strip all excess compound or sealant. Strip surplus back putty at a slight angle to slope away from glass.

9.6 STEEL EXPAND DOOR FABRICATION WORK :

9.6.1 Opening and closing functions :

(a) Type: manual operation

9.6.2 Material :

Steel

9.6.3 Fabrication Method :

(a) The fabrication drawing shall be prepared in accordance with the design drawing and this specification and shall be submitted to the supervisor for his approval.

(b) Manufacturing and fabrication shall be performed to comply accurately with the required shape, size and joint connection.

(c) The guide-rail shall be of embedded type and shall be bent to look like ⊔ . The anchor shall be fixed rigidly at a pitch of less than 600 m/m.

9.6.4 Others :

(a) The thorough-going shop test shall be conducted prior to shipment. With respect to test items in detail the test procedure shall be submitted, in advance, to the Supervisor for his approval.

(b) Full care shall be taken not to rush into winding operation until the finish coating will have completely been dried up.

SECTION 10

CERAMIC TILE

10.1 SCOPE OF WORK:

10.1.1 Extent: The work required under this section consists of all ceramic tile, accessories and related items necessary to complete the work indicated on drawings and described in specifications.

(a) Where tile wainscot is set by conventional mortar method, install tile before finish coat of plaster is applied above wainscots.

10.1.2 Type of Setting Beds: Conventional portland cement mortar setting bed shall be used for installing tile.

10.2 SHOP DRAWINGS:

Submit shop drawings for tile work to the Supervisor for approval.

10.3 SAMPLES:

10.3.1 Submit samples of wall tiles of obtainable colors to the Supervisor for approval. Approval must be obtained prior to delivery.

10.4 GENERAL REQUIREMENTS:

10.4.1 Colors of tiles shall be as selected by the Supervisor after award of contract, the Supervisor will furnish the Contractor with a schedule showing location of tile and color selected.

10.5 MATERIALS:

10.5.1 Wall Tiles: Standard grade glazed tile similar to "Ina Seito's Glazed Wall Tile" as manufactured by Ina Seito Co., Ltd., or equal; not less than 4.0 mm thick with cushion edges, a colored or white matt glazed finish and 98mm x 98mm in nominal face sizes,

unless otherwise indicated. Provide spacer lugs or other similar features on edges of tile.

10.5.2 Wall Tile Trim Shapes: Provide trim shapes as required. Trim shapes shall be of same type, color, thickness and finish as wall tile.

10.6 MATERIALS FOR SETTING TILE:

10.6.1 Portland Cement: See "CONCRETE WORK".

10.6.2 White Cement: See "PLASTERING".

10.6.3 Sand: See "PLASTERING".

10.6.4 Water: See "CONCRETE WORK".

10.7 LAYING OUT WORK:

10.7.1 Where possible, lay out work so that no tile less than half size occurs. For heights metrically stated, maintain full courses to produce nearest attainable heights without cutting tile. Align joints in wall tile vertically and horizontally.

10.8 MIXING AND PROPORTIONS:

10.8.1 Fine aggregates shall be measured in approved gauge boxes on a clean, dry, level surface. The cement shall be measured in one bag (50 kg) units and the water by volume. Materials shall be mixed as previously specified in "CONCRETE WORK".
The following Mixing Table shall be strictly adhered to in all cases. Variations will be permitted only with the prior written consent of the Supervisor.

Mixing Table

Nominal Mix	Cement kg	Fine Aggregate cub.m
1:2	750	1.00
1:4	350	1.00

10.9 INSTALLATION OF TILE: (WALL TILE)

10.9.1 Preparatory Work: Concrete or masonry surface shall be thoroughly cleaned and moistened directly before the scratch coat is applied.